

## **SYSMAC CS Series**

**CS1G/H-CPU□□H, CS1G/H-CPU□□-EV1**

# **Programmable Controllers**

# **OPERATION MANUAL**

# **OMRON**

**SYSMAC CS Series**  
**CS1G/H-CPU□□H,**  
**CS1G/H-CPU□□-EV1**  
**Programmable Controllers**  
**Operation Manual**

*Revised September 2002*



## Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

-  **DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
-  **WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
-  **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

## OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PLC” means Programmable Controller. “PC” is used, however, in some Programming Device displays to mean Programmable Controller.

## Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

**Note** Indicates information of particular interest for efficient and convenient operation of the product.

**1,2,3...** 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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# TABLE OF CONTENTS

|                                     |           |
|-------------------------------------|-----------|
| <b>PRECAUTIONS</b>                  | <b>xv</b> |
| 1 Intended Audience                 | xvi       |
| 2 General Precautions               | xvi       |
| 3 Safety Precautions                | xvi       |
| 4 Operating Environment Precautions | xviii     |
| 5 Application Precautions           | xviii     |
| 6 Conformance to EC Directives      | xxiii     |

## SECTION 1

|                                                             |          |
|-------------------------------------------------------------|----------|
| <b>Introduction</b>                                         | <b>1</b> |
| 1-1 Overview                                                | 2        |
| 1-2 CS-series Features                                      | 3        |
| 1-3 CS1-H CPU Unit Features                                 | 11       |
| 1-4 CS1 and CS1-H CPU Unit Comparison                       | 15       |
| 1-5 CS-series Function Tables                               | 20       |
| 1-6 CS1-H Functions Arranged by Purpose                     | 27       |
| 1-7 Comparison of CS-series PLCs and C200HX/HG/HE Operation | 29       |
| 1-8 Checking the Package                                    | 35       |
| 1-9 Initial Setup for CS1 CPU Units                         | 36       |
| 1-10 Using the Internal Clock                               | 39       |

## SECTION 2

|                                                |           |
|------------------------------------------------|-----------|
| <b>Specifications and System Configuration</b> | <b>41</b> |
| 2-1 Specifications                             | 42        |
| 2-2 CPU Unit Components                        | 52        |
| 2-3 Basic System Configuration                 | 57        |
| 2-4 Units                                      | 74        |
| 2-5 Expanded System Configuration              | 86        |
| 2-6 Unit Current Consumption                   | 99        |
| 2-7 CPU Bus Unit Setting Area Capacity         | 110       |
| 2-8 I/O Table Settings                         | 111       |

## SECTION 3

|                                                      |            |
|------------------------------------------------------|------------|
| <b>Nomenclature, Functions, and Dimensions</b>       | <b>115</b> |
| 3-1 CPU Units                                        | 116        |
| 3-2 File Memory                                      | 124        |
| 3-3 Programming Devices                              | 131        |
| 3-4 Power Supply Units                               | 141        |
| 3-5 Backplanes                                       | 144        |
| 3-6 Basic I/O Units                                  | 153        |
| 3-7 C200H High-density I/O Units (Special I/O Units) | 171        |
| 3-8 B7A Interface Units                              | 176        |
| 3-9 Analog Timer Units                               | 188        |

# TABLE OF CONTENTS

## SECTION 4

### **Operating Procedures . . . . . 193**

- 4-1 Introduction . . . . . 194
- 4-2 Examples . . . . . 196

## SECTION 5

### **Installation and Wiring . . . . . 207**

- 5-1 Fail-safe Circuits . . . . . 208
- 5-2 Installation . . . . . 210
- 5-3 Wiring . . . . . 228

## SECTION 6

### **DIP Switch Settings . . . . . 249**

- 6-1 DIP Switch Settings . . . . . 250

## SECTION 7

### **PLC Setup . . . . . 253**

- 7-1 PLC Setup . . . . . 254
- 7-2 Explanations of PLC Setup Settings . . . . . 271

## SECTION 8

### **I/O Allocations . . . . . 281**

- 8-1 I/O Allocations . . . . . 282
- 8-2 Data Exchange with CPU Bus Units . . . . . 296

## SECTION 9

### **Memory Areas . . . . . 301**

- 9-1 Introduction . . . . . 302
- 9-2 I/O Memory Areas . . . . . 303
- 9-3 Precautions in Using C200H Special I/O Units . . . . . 312
- 9-4 CIO Area . . . . . 313
- 9-5 C200H DeviceNet Area . . . . . 319
- 9-6 CS-series DeviceNet Area . . . . . 320
- 9-7 PLC Link Area . . . . . 322
- 9-8 Data Link Area . . . . . 324
- 9-9 CPU Bus Unit Area . . . . . 325
- 9-10 Inner Board Area . . . . . 326
- 9-11 Special I/O Unit Area . . . . . 327
- 9-12 SYSMAC BUS Area . . . . . 329
- 9-13 I/O Terminal Area . . . . . 330
- 9-14 Work Area . . . . . 331
- 9-15 Holding Area . . . . . 332
- 9-16 Auxiliary Area . . . . . 333
- 9-17 TR (Temporary Relay) Area . . . . . 349

# TABLE OF CONTENTS

|                                                    |                                                                    |            |
|----------------------------------------------------|--------------------------------------------------------------------|------------|
| 9-18                                               | Timer Area .....                                                   | 350        |
| 9-19                                               | Counter Area .....                                                 | 351        |
| 9-20                                               | Data Memory (DM) Area .....                                        | 352        |
| 9-21                                               | Extended Data Memory (EM) Area .....                               | 354        |
| 9-22                                               | Index Registers .....                                              | 356        |
| 9-23                                               | Data Registers .....                                               | 361        |
| 9-24                                               | Task Flags .....                                                   | 362        |
| 9-25                                               | Condition Flags .....                                              | 363        |
| 9-26                                               | Clock Pulses .....                                                 | 366        |
| 9-27                                               | Parameter Areas .....                                              | 366        |
| <br><b>SECTION 10</b>                              |                                                                    |            |
| <b>CPU Unit Operation and the Cycle Time. ....</b> |                                                                    | <b>371</b> |
| 10-1                                               | CPU Unit Operation .....                                           | 373        |
| 10-2                                               | CPU Unit Operating Modes .....                                     | 378        |
| 10-3                                               | Power OFF Operation .....                                          | 381        |
| 10-4                                               | Computing the Cycle Time .....                                     | 385        |
| 10-5                                               | Instruction Execution Times and Number of Steps .....              | 403        |
| <br><b>SECTION 11</b>                              |                                                                    |            |
| <b>Troubleshooting .....</b>                       |                                                                    | <b>431</b> |
| 11-1                                               | Error Log .....                                                    | 432        |
| 11-2                                               | Error Processing .....                                             | 433        |
| 11-3                                               | Troubleshooting Racks and Units .....                              | 453        |
| <br><b>SECTION 12</b>                              |                                                                    |            |
| <b>Inspection and Maintenance .....</b>            |                                                                    | <b>457</b> |
| 12-1                                               | Inspections .....                                                  | 458        |
| 12-2                                               | Replacing User-serviceable Parts .....                             | 460        |
| <br><b>Appendices</b>                              |                                                                    |            |
| A                                                  | Specifications of Basic I/O Units and High-density I/O Units ..... | 471        |
| B                                                  | Auxiliary Area .....                                               | 581        |
| C                                                  | Memory Map of PLC Memory Addresses .....                           | 615        |
| D                                                  | PLC Setup Coding Sheets for Programming Console .....              | 617        |
| E                                                  | Connecting to the RS-232C Port on the CPU Unit .....               | 629        |
| F                                                  | Restrictions in Using C200H Special I/O Units .....                | 637        |
| <br><b>Index .....</b>                             |                                                                    | <b>643</b> |
| <br><b>Revision History .....</b>                  |                                                                    | <b>653</b> |



## About this Manual:

This manual describes the installation and operation of the CS-series Programmable Controllers (PLCs) and includes the sections described on the following page. The CS Series and CJ Series are subdivided as shown in the following table.

| Unit               | CS Series                                       | CJ Series                                                   |
|--------------------|-------------------------------------------------|-------------------------------------------------------------|
| CPU Units          | CS1-H CPU Units: CS1H-CPU□□H<br>CS1G-CPU□□H     | CJ1-H CPU Units: CJ1H-CPU□□H<br>CJ1G-CPU□□H                 |
|                    | CS1 CPU Units: CS1H-CPU□□-EV1<br>CS1G-CPU□□-EV1 | CJ1 CPU Units: CJ1G-CPU□□-EV1<br>CJ1M CPU Units: CJ1M-CPU□□ |
| Basic I/O Units    | CS-series Basic I/O Units                       | CJ-series Basic I/O Units                                   |
| Special I/O Units  | CS-series Special I/O Units                     | CJ-series Special I/O Units                                 |
| CPU Bus Units      | CS-series CPU Bus Units                         | CJ-series CPU Bus Units                                     |
| Power Supply Units | CS-series Power Supply Units                    | CJ-series Power Supply Units                                |

Please read this manual and all related manuals listed in the following table and be sure you understand information provided before attempting to install or use CS1G/H-CPU□□-EV1 or CS1G/H-CPU□□H CPU Units in a PLC System.

| Name                                                                                                                                                    | Cat. No. | Contents                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SYSMAC CS Series<br>CS1G/H-CPU□□-EV1, CS1G/H-CPU□□H<br>Programmable Controllers Operation Manual                                                        | W339     | Provides an outlines of and describes the design, installation, maintenance, and other basic operations for the CS-series PLCs. (This manual)                                           |
| SYSMAC CS/CJ Series<br>CS1G/H-CPU□□-EV1, CS1G/H-CPU□□H, CJ1G/H-CPU□□H, CJ1M-CPU□□, CJ1G-CPU□□<br>Programmable Controllers Programming Manual            | W394     | This manual describes programming and other methods to use the functions of the CS/CJ-series PLCs.                                                                                      |
| SYSMAC CJ Series<br>CJ1G-CPU□□<br>Programmable Controllers Operation Manual                                                                             | W393     | Provides an outlines of and describes the design, installation, maintenance, and other basic operations for the CJ-series PLCs.                                                         |
| SYSMAC CS/CJ Series<br>CS1G/H-CPU□□-EV1, CS1G/H-CPU□□H, CJ1G/H-CPU□□H, CJ1M-CPU□□, CJ1G-CPU□□<br>Programmable Controllers Instructions Reference Manual | W340     | Describes the ladder diagram programming instructions supported by CS/CJ-series PLCs.                                                                                                   |
| SYSMAC CS/CJ Series<br>CQM1H-PRO01-E, C200H-PRO27-E, CQM1-PRO01-E<br>Programming Consoles Operation Manual                                              | W341     | Provides information on how to program and operate CS/CJ-series PLCs using a Programming Console.                                                                                       |
| SYSMAC CS/CJ Series<br>CS1G/H-CPU□□-EV1, CJ1G-CPU□□, CS1W-SCB21-V1/41-V1, CS1W-SCU21, CJ1W-SCU41<br>Communications Commands Reference Manual            | W342     | Describes the C-series (Host Link) and FINS communications commands used with CS/CJ-series PLCs.                                                                                        |
| SYSMAC WS02-CXP□□-E<br>CX-Programmer User Manual                                                                                                        | W361     | Provide information on how to use the CX-Programmer, a programming device that supports the CS/CJ-series PLCs, and the CX-Net contained within CX-Programmer.                           |
| SYSMAC WS02-CXP□□-E<br>CX-Server User Manual                                                                                                            | W362     |                                                                                                                                                                                         |
| SYSMAC CS/CJ Series<br>CS1W-SCB21-V1/41-V1, CS1W-SCU21, CJ1W-SCU41<br>Serial Communications Boards/Units Operation Manual                               | W336     | Describes the use of Serial Communications Unit and Boards to perform serial communications with external devices, including the usage of standard system protocols for OMRON products. |

## About this Manual, Continued

| Name                                                                                  | Cat. No. | Contents                                                                                                                         |
|---------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------|
| SYSMAC WS02-PSTC1-E<br>CX-Protocol Operation Manual                                   | W344     | Describes the use of the CX-Protocol to create protocol macros as communications sequences to communicate with external devices. |
| SYSMAC CS/CJ Series<br>CJ1W-ETN01/ENT11, CJ1W-ETN11 Ethernet Unit<br>Operation Manual | W343     | Describes the installation and operation of CJ1W-ETN01, CJ1W-ENT11, and CJ1W-ETN11 Ethernet Units.                               |

## About this Manual, Continued

This manual contains the following sections.

**Section 1** introduces the special features and functions of the CS-series PLCs and describes the differences between these PLCs and other PLCs.

**Section 2** provides tables of standard models, Unit specifications, system configurations, and a comparison between different Units.

**Section 3** provides the names of components and their functions for various Units. The Unit dimensions are also provided.

**Section 4** outlines the steps required to assemble and operate a CS-series PLC system.

**Section 5** describes how to install a PLC System, including mounting the various Units and wiring the System. Be sure to follow the instructions carefully. Improper installation can cause the PLC to malfunction, resulting in very dangerous situations.

**Section 6** describes the settings of the DIP switch and how they affect operation.

**Section 7** describes the settings in the PLC Setup and how they are used to control CPU Unit operation.

**Section 8** describes I/O allocations to Basic I/O Units, Special I/O Units, and CPU Bus Units, and data exchange with Units.

**Section 9** describes the structure and functions of the I/O Memory Areas and Parameter Areas.

**Section 10** describes the internal operation of the CPU Unit and the cycle used to perform internal processing.

**Section 11** provides information on hardware and software errors that occur during PLC operation.

**Section 12** provides inspection and maintenance information.

The **Appendices** provide Unit specifications, current/power consumptions, Auxiliary Area words and bits, a comparison of CS-series and previous PLCs, internal I/O addresses, and PLC Setup settings.



**WARNING** Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.





# PRECAUTIONS

This section provides general precautions for using the CS-series Programmable Controllers (PLCs) and related devices.

**The information contained in this section is important for the safe and reliable application of Programmable Controllers. You must read this section and understand the information contained before attempting to set up or operate a PLC system.**

|     |                                            |       |
|-----|--------------------------------------------|-------|
| 1   | Intended Audience .....                    | xvi   |
| 2   | General Precautions .....                  | xvi   |
| 3   | Safety Precautions.....                    | xvi   |
| 4   | Operating Environment Precautions .....    | xviii |
| 5   | Application Precautions .....              | xviii |
| 6   | Conformance to EC Directives .....         | xxiii |
| 6-1 | Applicable Directives .....                | xxiii |
| 6-2 | Concepts .....                             | xxiii |
| 6-3 | Conformance to EC Directives.....          | xxiii |
| 6-4 | Relay Output Noise Reduction Methods ..... | xxiv  |

## 1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.

## 2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating the Unit. Be sure to read this manual before attempting to use the Unit and keep this manual close at hand for reference during operation.

 **WARNING** It is extremely important that a PLC and all PLC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PLC System to the above-mentioned applications.

## 3 Safety Precautions

 **WARNING** The CPU Unit refreshes I/O even when the program is stopped (i.e., even in PROGRAM mode). Confirm safety thoroughly in advance before changing the status of any part of memory allocated to I/O Units, Special I/O Units, or CPU Bus Units. Any changes to the data allocated to any Unit may result in unexpected operation of the loads connected to the Unit. Any of the following operation may result in changes to memory status.

- Transferring I/O memory data to the CPU Unit from a Programming Device.
- Changing present values in memory from a Programming Device.
- Force-setting/-resetting bits from a Programming Device.
- Transferring I/O memory files from a Memory Card or EM file memory to the CPU Unit.
- Transferring I/O memory from a host computer or from another PLC on a network.

 **WARNING** Do not attempt to take any Unit apart while the power is being supplied. Doing so may result in electric shock.

-  **WARNING** Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock.
-  **WARNING** Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.
-  **WARNING** Do not touch the Power Supply Unit while power is being supplied or immediately after power has been turned OFF. Doing so may result in electric shock.
-  **WARNING** Provide safety measures in external circuits (i.e., not in the Programmable Controller), including the following items, to ensure safety in the system if an abnormality occurs due to malfunction of the PLC or another external factor affecting the PLC operation. Not doing so may result in serious accidents.
- Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.
  - The PLC will turn OFF all outputs when its self-diagnosis function detects any error or when a severe failure alarm (FALS) instruction is executed. As a countermeasure for such errors, external safety measures must be provided to ensure safety in the system.
  - The PLC outputs may remain ON or OFF due to deposition or burning of the output relays or destruction of the output transistors. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.
  - When the 24-V DC output (service power supply to the PLC) is overloaded or short-circuited, the voltage may drop and result in the outputs being turned OFF. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.
-  **Caution** Confirm safety before transferring data files stored in the file memory (Memory Card or EM file memory) to the I/O area (CIO) of the CPU Unit using a peripheral tool. Otherwise, the devices connected to the output unit may malfunction regardless of the operation mode of the CPU Unit.
-  **Caution** Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes. Serious accidents may result from abnormal operation if proper measures are not provided.
-  **Caution** Execute online edit only after confirming that no adverse effects will be caused by extending the cycle time. Otherwise, the input signals may not be readable.
-  **Caution** Confirm safety at the destination node before transferring a program to another node or changing contents of the I/O memory area. Doing either of these without confirming safety may result in injury.
-  **Caution** Tighten the screws on the terminal block of the AC Power Supply Unit to the torque specified in the operation manual. The loose screws may result in burning or malfunction.

## 4 Operating Environment Precautions

 **Caution** Do not operate the control system in the following locations:

- Locations subject to direct sunlight.
- Locations subject to temperatures or humidity outside the range specified in the specifications.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

 **Caution** Take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power supplies.

 **Caution** The operating environment of the PLC System can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the PLC System. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

## 5 Application Precautions

Observe the following precautions when using the PLC System.

- You must use the CX-Programmer (programming software that runs on Windows) if you need to program more than one task. A Programming Console can be used to program only one cyclic task plus interrupt tasks. A Programming Console can, however, be used to edit multitask programs originally created with the CX-Programmer.
- There are restrictions in the areas and addresses that can be accessed in I/O memory of the CS-series CPU Units when using the C200H Special I/O Units in combination with the following functions. (Refer to *Appendix D Restrictions in Using C200H Special I/O Units* for details.)
  - There are restrictions in data transfer with the CPU Unit when programming transfers inside an ASCII Unit using the PLC READ, PLC WRITE, and similar commands.
  - There are restrictions in data transfer with the CPU Unit for allocated bits and DM area specifications (areas and addresses for source and destination specifications).
  - The DeviceNet output area for a C200HW-DRM21-V1 DeviceNet Master Unit (CIO 0050 to CIO 0099) overlaps with the I/O bit area (CIO 0000 to CIO 0319). Do not use automatic allocations for I/O in any system where allocations to the DeviceNet system will overlap with allo-

cations to I/O Units. Instead, use a Programming Device or the CX-Programmer to manually allocate I/O for the DeviceNet devices, being sure that the same words and bits are not allocated more than once, and transfer the resulting I/O table to the CPU Unit. If DeviceNet communications are attempted when the same bits are allocated to both DeviceNet devices and I/O Units (which can occur even if automatic allocation is used), the DeviceNet devices and I/O Units may both exhibit faulty operation.

- Special bits and flags for PLC Link Units (CIO 0247 to CIO 0250) overlap with the I/O bit area (CIO 0000 to CIO 0319). Do not use automatic allocations for I/O in any system where allocations to the I/O Units will overlap with allocations to I/O Units. Instead, use a Programming Device or the CX-Programmer to manually allocate I/O to I/O Units, being sure that the special bits and flags for PLC Link Units are not used, and transfer the resulting I/O table to the CPU Unit. If operation is attempted when the special bits and flags for PLC Link Units are also allocated to I/O Units (which can occur even if automatic allocation is used), the PLC Link Units and I/O Units may both exhibit faulty operation.

 **WARNING** Always heed these precautions. Failure to abide by the following precautions could lead to serious or possibly fatal injury.

- Always connect to a ground of 100  $\Omega$  or less when installing the Units. Not connecting to a ground of 100  $\Omega$  or less may result in electric shock.
- A ground of 100  $\Omega$  or less must be installed when shorting the GR and LG terminals on the Power Supply Unit.
- Always turn OFF the power supply to the PLC before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
  - Mounting or dismounting Power Supply Units, I/O Units, CPU Units, Inner Boards, or any other Units.
  - Assembling the Units.
  - Setting DIP switches or rotary switches.
  - Connecting cables or wiring the system.
  - Connecting or disconnecting the connectors.

 **Caution** Failure to abide by the following precautions could lead to faulty operation of the PLC or the system, or could damage the PLC or PLC Units. Always heed these precautions.

- When using a CS1 CPU Unit for the first time, install the CS1W-BAT1 Battery provided with the Unit and clear all memory areas from a Programming Device before starting to program. (The Battery is installed in advance for CS1-H CPU Units, so initial Battery installation and the memory clear operation are not required.)
- When using the internal clock for a CS1 CPU Unit, turn ON power after installing the battery and set the clock from a Programming Device or using the DATE(735) instruction. The clock will not start until the time has been set. Refer to *1-9 Initial Setup for CS1 CPU Units* for details. (The Battery is installed in advance for CS1-H CPU Units, so clock does not need to be set.)

- The user program and parameter area data in CS1-H CPU Units is backed up in the built-in flash memory. The BKUP indicator will light on the front of the CPU Unit when the backup operation is in progress. Do not turn OFF the power supply to the CPU Unit when the BKUP indicator is lit. The data will not be backed up if power is turned OFF.
- If, when using a CS1-H CPU Unit, the PLC Setup is set to specify using the mode set on the Programming Console and a Programming Console is not connected, the CPU Unit will start in RUN mode. This is the default setting in the PLC Setup. (A CS1 CPU Unit will start in PROGRAM mode under the same conditions.)
- When creating an AUTOEXEC.IOM file from a Programming Device (a Programming Console or the CX-Programmer) to automatically transfer data at startup, set the first write address to D20000 and be sure that the size of data written does not exceed the size of the DM Area. When the data file is read from the Memory Card at startup, data will be written in the CPU Unit starting at D20000 even if another address was set when the AUTOEXEC.IOM file was created. Also, if the DM Area is exceeded (which is possible when the CX-Programmer is used), the remaining data will be written to the EM Area. Refer to information on file operations in the *CS/CJ Series Programming Manual* for details.
- Always turn ON power to the PLC before turning ON power to the control system. If the PLC power supply is turned ON after the control power supply, temporary errors may result in control system signals because the output terminals on DC Output Units and other Units will momentarily turn ON when power is turned ON to the PLC.
- Fail-safe measures must be taken by the customer to ensure safety in the event that outputs from Output Units remain ON as a result of internal circuit failures, which can occur in relays, transistors, and other elements.
- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.
- Interlock circuits, limit circuits, and similar safety measures in external circuits (i.e., not in the Programmable Controller) must be provided by the customer.
- Do not turn OFF the power supply to the PLC when data is being transferred. In particular, do not turn OFF the power supply when reading or writing a Memory Card. Also, do not remove the Memory Card when the BUSY indicator is lit. To remove a Memory Card, first press the memory card power supply switch and then wait for the BUSY indicator to go out before removing the Memory Card.
- If the I/O Hold Bit is turned ON, the outputs from the PLC will not be turned OFF and will maintain their previous status when the PLC is switched from RUN or MONITOR mode to PROGRAM mode. Make sure that the external loads will not produce dangerous conditions when this occurs. (When operation stops for a fatal error, including those produced with the FALS(007) instruction, all outputs from Output Unit will be turned OFF and only the internal output status will be maintained.)
- The contents of the DM, EM, and HR Areas in the CPU Unit are backed up by a Battery. If the Battery voltage drops, this data may be lost. Provide countermeasures in the program using the Battery Error Flag (A40204) to re-initialize data or take other actions if the Battery voltage drops.
- When supplying power at 200 to 240 V AC, always remove the metal jumper from the voltage selector terminals on the Power Supply Unit

(except for Power Supply Units with wide-range specifications). The product will be destroyed and must be replaced if 200 to 240 V AC is supplied while the metal jumper is attached. Refer to 5-3 *Wiring* for details.

- Always use the power supply voltages specified in the operation manuals. An incorrect voltage may result in malfunction or burning.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.
- Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.
- Do not apply voltages to the Input Units in excess of the rated input voltage. Excess voltages may result in burning.
- Do not apply voltages or connect loads to the Output Units in excess of the maximum switching capacity. Excess voltage or loads may result in burning.
- Disconnect the functional ground terminal when performing withstand voltage tests. Not disconnecting the functional ground terminal may result in burning.
- Install the Units properly as specified in the operation manuals. Improper installation of the Units may result in malfunction.
- Be sure that all the Backplane mounting screws, terminal block screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Leave the label attached to the Unit when wiring. Removing the label may result in malfunction if foreign matter enters the Unit.
- Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.
- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.
- Wire all connections correctly.
- Double-check all wiring and switch settings before turning ON the power supply. Incorrect wiring may result in burning.
- Mount Units only after checking terminal blocks and connectors completely.
- Be sure that the terminal blocks, Memory Units, expansion cables, and other items with locking devices are properly locked into place. Improper locking may result in malfunction.
- Check switch settings, the contents of the DM Area, and other preparations before starting operation. Starting operation without the proper settings or data may result in an unexpected operation.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in an unexpected operation.



- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
  - Changing the operating mode of the PLC.
  - Force-setting/force-resetting any bit in memory.
  - Changing the present value of any word or any set value in memory.
- Resume operation only after transferring to the new CPU Unit the contents of the DM Area, HR Area, and other data required for resuming operation. Not doing so may result in an unexpected operation.
- Do not pull on the cables or bend the cables beyond their natural limit. Doing either of these may break the cables.
- Do not place objects on top of the cables or other wiring lines. Doing so may break the cables.
- Do not use commercially available RS-232C personal computer cables. Always use the special cables listed in this manual or make cables according to manual specifications. Using commercially available cables may damage the external devices or CPU Unit.
- When replacing parts, be sure to confirm that the rating of a new part is correct. Not doing so may result in malfunction or burning.
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up. Not doing so may result in malfunction or damage.
- When transporting or storing circuit boards, cover them in antistatic material to protect them from static electricity and maintain the proper storage temperature.
- Do not touch circuit boards or the components mounted to them with your bare hands. There are sharp leads and other parts on the boards that may cause injury if handled improperly.
- Do not short the battery terminals or charge, disassemble, heat, or incinerate the battery. Do not subject the battery to strong shocks. Doing any of these may result in leakage, rupture, heat generation, or ignition of the battery. Dispose of any battery that has been dropped on the floor or otherwise subjected to excessive shock. Batteries that have been subjected to shock may leak if they are used.
- UL standards required that batteries be replaced only by experienced technicians. Do not allow unqualified persons to replace batteries.

## 6 Conformance to EC Directives

### 6-1 Applicable Directives

- EMC Directives
- Low Voltage Directive

### 6-2 Concepts

#### EMC Directives

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards (see the following note). Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer.

EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

**Note** Applicable EMC (Electromagnetic Compatibility) standards are as follows:

EMS (Electromagnetic Susceptibility): EN61131-2 and EN61000-6-2

EMI (Electromagnetic Interference): EN50081-2

(Radiated emission: 10-m regulations)

#### Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 V AC and 75 to 1,500 V DC meet the required safety standards for the PLC (EN61131-2).

### 6-3 Conformance to EC Directives

The CS-series PLCs comply with EC Directives. To ensure that the machine or device in which the CS-series PLC is used complies with EC Directives, the PLC must be installed as follows:

- 1,2,3...**
1. The CS-series PLC must be installed within a control panel.
  2. You must use reinforced insulation or double insulation for the DC power supplies used for the communications power supply and I/O power supplies.
  3. CS-series PLCs complying with EC Directives also conform to the Common Emission Standard (EN50081-2). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions. You must therefore confirm that the overall machine or equipment complies with EC Directives.

## 6-4 Relay Output Noise Reduction Methods

The CS-series PLCs conforms to the Common Emission Standards (EN50081-2) of the EMC Directives. However, noise generated by relay output switching may not satisfy these Standards. In such a case, a noise filter must be connected to the load side or other appropriate countermeasures must be provided external to the PLC.

Countermeasures taken to satisfy the standards vary depending on the devices on the load side, wiring, configuration of machines, etc. Following are examples of countermeasures for reducing the generated noise.

### Countermeasures

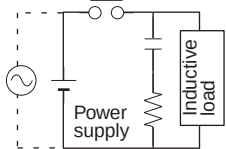
(Refer to EN50081-2 for more details.)

Countermeasures are not required if the frequency of load switching for the whole system with the PLC included is less than 5 times per minute.

Countermeasures are required if the frequency of load switching for the whole system with the PLC included is more than 5 times per minute.

### Countermeasure Examples

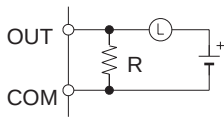
When switching an inductive load, connect an surge protector, diodes, etc., in parallel with the load or contact as shown below.

| Circuit                                                                                             | Current |     | Characteristic                                                                                                                                                                                                                                                                                                                      | Required element                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------|---------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                     | AC      | DC  |                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>CR method</p>  | Yes     | Yes | <p>If the load is a relay or solenoid, there is a time lag between the moment the circuit is opened and the moment the load is reset.</p> <p>If the supply voltage is 24 or 48 V, insert the surge protector in parallel with the load. If the supply voltage is 100 to 200 V, insert the surge protector between the contacts.</p> | <p>The capacitance of the capacitor must be 1 to 0.5 <math>\mu\text{F}</math> per contact current of 1 A and resistance of the resistor must be 0.5 to 1 <math>\Omega</math> per contact voltage of 1 V. These values, however, vary with the load and the characteristics of the relay. Decide these values from experiments, and take into consideration that the capacitance suppresses spark discharge when the contacts are separated and the resistance limits the current that flows into the load when the circuit is closed again.</p> <p>The dielectric strength of the capacitor must be 200 to 300 V. If the circuit is an AC circuit, use a capacitor with no polarity.</p> |

| Circuit                                | Current |     | Characteristic                                                                                                                                                                                                                                                                                                                                                                                                                 | Required element                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------|---------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        | AC      | DC  |                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <div>Diode method</div> <div></div>    | No      | Yes | <p>The diode connected in parallel with the load changes energy accumulated by the coil into a current, which then flows into the coil so that the current will be converted into Joule heat by the resistance of the inductive load.</p> <p>This time lag, between the moment the circuit is opened and the moment the load is reset, caused by this method is longer than that caused by the CR method.</p>                  | <p>The reversed dielectric strength value of the diode must be at least 10 times as large as the circuit voltage value.</p> <p>The forward current of the diode must be the same as or larger than the load current.</p> <p>The reversed dielectric strength value of the diode may be two to three times larger than the supply voltage if the surge protector is applied to electronic circuits with low circuit voltages.</p> |
| <div>Varistor method</div> <div></div> | Yes     | Yes | <p>The varistor method prevents the imposition of high voltage between the contacts by using the constant voltage characteristic of the varistor. There is time lag between the moment the circuit is opened and the moment the load is reset.</p> <p>If the supply voltage is 24 or 48 V, insert the varistor in parallel with the load. If the supply voltage is 100 to 200 V, insert the varistor between the contacts.</p> | ---                                                                                                                                                                                                                                                                                                                                                                                                                              |

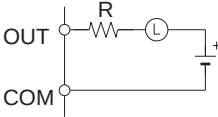
When switching a load with a high inrush current such as an incandescent lamp, suppress the inrush current as shown below.

Countermeasure 1



Providing a dark current of approx. one-third of the rated value through an incandescent lamp

Countermeasure 2



Providing a limiting resistor



# SECTION 1

## Introduction

This section introduces the special features and functions of the CS-series PLCs and describes the differences between these PLCs and other PLCs.

|       |                                                               |    |
|-------|---------------------------------------------------------------|----|
| 1-1   | Overview .....                                                | 2  |
| 1-2   | CS-series Features.....                                       | 3  |
| 1-2-1 | Features.....                                                 | 3  |
| 1-2-2 | Versatile Functions .....                                     | 8  |
| 1-3   | CS1-H CPU Unit Features .....                                 | 11 |
| 1-3-1 | High-speed Performance .....                                  | 11 |
| 1-3-2 | High-speed Structured Programming.....                        | 13 |
| 1-3-3 | More Instructions for Specific Applications.....              | 13 |
| 1-3-4 | Battery-free Operation with Flash Memory .....                | 14 |
| 1-3-5 | Better Compatibility with Other SYSMAC PLCs .....             | 14 |
| 1-3-6 | Refreshing Timer/Counter PVs in Binary .....                  | 14 |
| 1-4   | CS1 and CS1-H CPU Unit Comparison .....                       | 15 |
| 1-4-1 | CS1 and CS1-H CPU Unit Comparison.....                        | 15 |
| 1-4-2 | New Functions for Version-1 CS1 CPU Units .....               | 19 |
| 1-5   | CS-series Function Tables.....                                | 20 |
| 1-5-1 | Functions Arranged by Purpose .....                           | 20 |
| 1-5-2 | Communications Functions (Serial/Network) .....               | 25 |
| 1-6   | CS1-H Functions Arranged by Purpose .....                     | 27 |
| 1-7   | Comparison of CS-series PLCs and C200HX/HG/HE Operation ..... | 29 |
| 1-8   | Checking the Package .....                                    | 35 |
| 1-9   | Initial Setup for CS1 CPU Units.....                          | 36 |
| 1-10  | Using the Internal Clock .....                                | 39 |

## 1-1 Overview

The CS-series PLCs are medium-sized Programmable Controllers that provide improved programming efficiency by dividing the program into tasks. The CS-series PLCs also feature faster processing, higher capacities, multiple ports supporting protocol macros, improved seamless communications across three network levels, and much more, enabling them to flexibly handle advanced information capabilities as core FA controllers.

The CS Series includes both CS1 CPU Units and the high-speed CS1-H CPU Units.

**Note** Where differentiation is required, “CS1 CPU Units” or “CS1-H CPU Units” is specified in this manual. “CS1 CPU Units” includes model numbers CS1□-CPU□□-EV1. “CS1-H CPU Units” includes model numbers CS1□-CPU□□H.

### Improvements in Basic Performance

Faster instruction execution and peripheral servicing

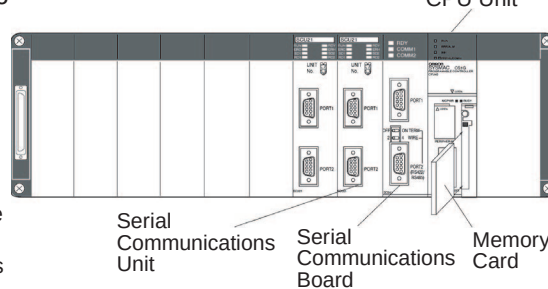
Larger memory capacity

Faster data exchange between Units and I/O memory access

Instruction operands can be specified binary or BCD

Programs from earlier PLCs are compatible

### CS-series PLC



### Structured Programming

The program is divided into tasks.

Symbols can be used in programming.

The overall performance of the system is improved by executing only the required tasks.

Modification and debugging are simplified.

The program arrangement can be changed.

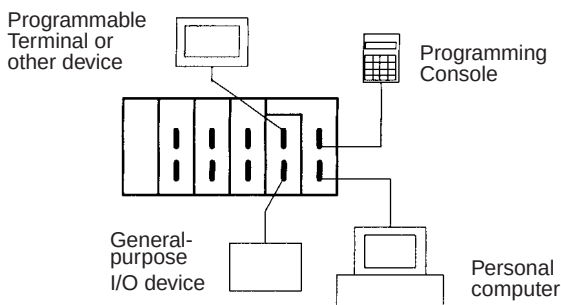
Step control and block programming instructions can be used.

Comments can be added to make the program easier to understand.

### Protocol Macro Function Serves Multiple Ports

Up to 34 ports can be connected (Serial Communications Boards + Serial Communications Units).

Different Protocol Macros can be allocated to each port.



### Remote Programming, Monitoring and Seamless Links between Networks

FINS commands allow communications between nodes in different networks.

Remote programming and monitoring can be performed.

### Full Complement of Versatile Functions

Memory Card and file processing functions

Simplify programs with specialized instructions such as the table data and text string processing instructions

Troubleshooting functions

Data tracing function

Minimum (fixed) cycle time function

I/O refreshing method selection

PLC Setup functions

Use Windows tools to create multiple environments in a single personal computer.

## 1-2 CS-series Features

### 1-2-1 Features

#### Improvements in Basic Performance

The CS-series PLCs provide higher speed, greater capacity, and more functions in a package as compact as the C200H PLCs.

#### **Faster Cycle Times**

Instruction processing times have been reduced to 0.02  $\mu$ s min. for basic instructions, 0.06  $\mu$ s min. for special instructions, and 0.8  $\mu$ s min. for floating-point calculations for CS1-H CPU Units and to 0.04  $\mu$ s min. for basic instructions, 0.12  $\mu$ s min. for special instructions, and 10.2  $\mu$ s min. for floating-point calculations for CS1 CPU Units. The time required for overseeing (overhead), I/O refreshing, and peripheral servicing has also been reduced dramatically.

#### **Extra Capacity for High Value-added Programs**

With capacity for 250,000 program steps, up to 448,000 words of Data Memory, and up to 5,120 I/O points, there is plenty of memory for complex programs, intricate interfaces, communications, and data processing.

#### **Binary Operand Settings Increase Setting Ranges**

In earlier PLCs, most instruction operands had to be specified in BCD (0 to 9,999), but in the CS-series PLCs they can be specified in binary (0 to FFFF hexadecimal or 0 to 65,535 decimal). As an example, the BLOCK TRANSFER instruction can now transfer data from up to 65,535 words rather than 9,999 words. Also the maximum DM address that can be indirectly addressed is now D32767 rather than the maximum DM address of D09999 in C200HX/HG/HE PLCs.

#### **Program Compatibility**

Programs from earlier OMRON PLCs (such as the C200H, C200HS, C200HX/HG/HE, and CV Series) can be imported into the CS-series PLCs.

#### **CS-series and C200H Units Supported**

High-density CS-series Units, such as the 96-point I/O Units and 8-point Analog I/O Units (4 inputs and 4 outputs) can be used together with the wide variety of C200H Units (about 90 models) can be used in a CS-series PLC.

#### **CS-series Long-distance Expansion Racks**

I/O Control Units and I/O Interface Units can be used to create systems containing CS-series Long-distance Expansion Racks. Up to two series of Long-distance Expansion Racks can be connected, each measuring up to 50 m, for a total coverage of 100 m. CS-series Long-distance Expansion Racks can be used to create high-speed, low-cost distribution systems without using Communications Units.

#### **Peripheral Servicing Priority Mode**

Although peripherals are normally serviced only once a cycle, a mode is available that enables periodic servicing within a cycle. Any five of the following can be specified for priority servicing: RS-232C port, peripheral port, Inner Boards, CS-series CPU Bus Units, and Special I/O Units. Priority servicing enables applications where faster servicing with priority over program execution is required, such when faster response for host monitoring is required for process control.

A CS1 CPU Unit with lot number 001201□□□□ or later (manufacture date of December 1, 2000 or later) is required to use the peripheral servicing priority mode. The Peripheral Servicing Priority Mode is supported by all CS1-H CPU Units.

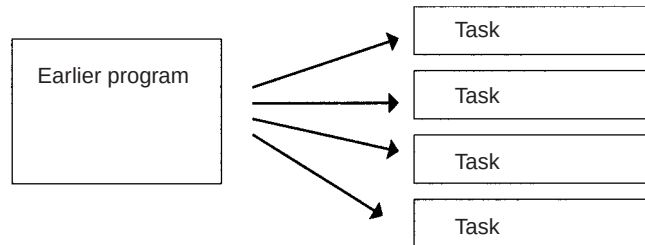


## Structured Programming

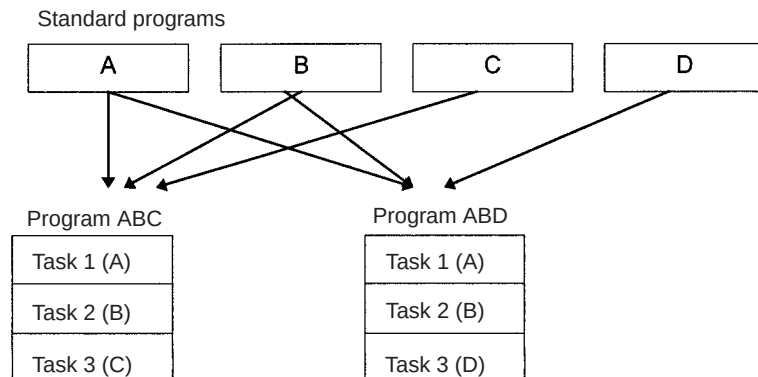
### Division of the Program into Tasks

When the program is divided into tasks that handle separate functions, control systems, or processes, several programmers can develop these separate tasks simultaneously.

There can be up to 32 regular (cyclically executed) tasks and 256 interrupt tasks. There are four types of interrupts: Power OFF Interrupts, Scheduled Interrupts, I/O Interrupts, and External I/O Interrupts. (External I/O Interrupts are generated from Special I/O Units or Serial Communications Boards.)



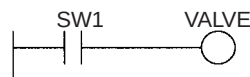
When a new program is being created, standard programs can be combined as tasks to create an entire program.



### Using Symbols

Arbitrary symbols (names up to 32 characters) that are independent of I/O terminal allocations can be used in programming. Standard programs created with symbols are more general and easier to reuse as tasks in different programs.

Symbols specified for bit address:



### Global and Local Symbols Supported

I/O names are handled as symbols which can be defined as global symbols, which apply to all of the programs in all tasks, or as local symbols, which apply to just the local task.

When the symbols are defined, you can choose to have the local symbols allocated to addresses automatically.

### Improve Overall System Response Performance

The response performance of the system can be improved by dividing the program into a system-management task and tasks used for control and executing only those control tasks that need to be executed.

**Simplify Program Modification**

- Debugging is more efficient when the job of modifying and debugging the tasks can be divided among several individuals.
- Program maintenance is easier because only the tasks affected by changes have to be modified when there are changes (such as changes in specifications).
- Several consecutive program lines can be modified with online editing.
- The amount the cycle time is extended during online editing has been reduced.

**Change Program Arrangement Easily**

When separate tasks have been programmed for different production models, the task control instructions can be used to switch the program quickly from production of one model to another.

**Step Control and Block Programming**

The step control and block programming instructions can be used to control repetitive processes that are difficult to program with ladder programming alone.

**Comments**

Several types of comments can be added to the program to make it easier to understand, including Rung comments, and I/O comments.

**Program Sections**

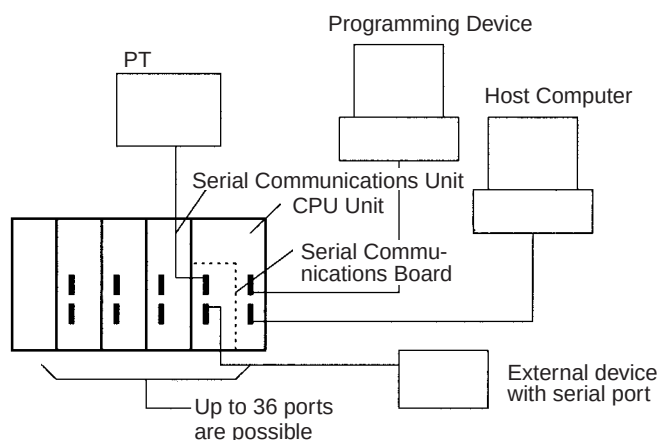
Programs can be made easier to understand visually by separating them into sections (with CX-Programmer version 2.0 or later).

**Port-specific Protocol Macro Function****Create Protocol Functions for All Ports**

The protocol macro function can be used to create versatile communications functions for any of the PLC's communications ports. The communications functions can have host link, NT Link, or protocol macro configurations and can be directed to RS-232C and RS-422/485 ports on any of the Units.

**1,2,3...**

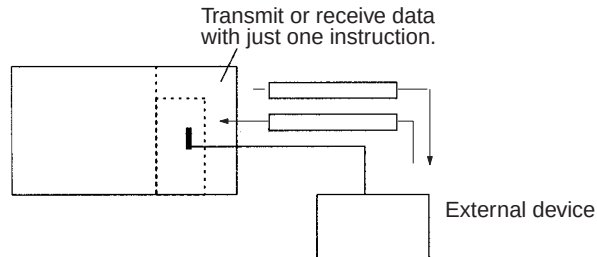
1. One Serial Communications Board can be mounted in the CPU Unit. (A Serial Communications Board has two serial communications ports.)
  2. Up to 16 Serial Communications Units can be connected to a CPU Unit. (Each Serial Communications Unit has two serial communications ports.)
- In total, up to 36 ports can be used.

**Standard Serial Communications with External Devices**

Messages can be transferred to and from standard serial devices with the protocol macro function (according to preset parameter settings). The protocol macro function supports processing options such as retries, timeout monitoring, and error checks.

Symbols that read and write data to the CPU Unit can be included in the communications frames, so data can be exchanged with the CPU Unit very easily. OMRON components (such as Temperature Controllers, ID System Devices, Bar Code Readers, and Modems) can be connected to a Serial Communications Board or Serial Communications Unit with the standard system protocol. It is also possible to change the settings if necessary.

**Note** The Serial Communications Board or Serial Communications Unit must be purchased separately to take advantage of this function.

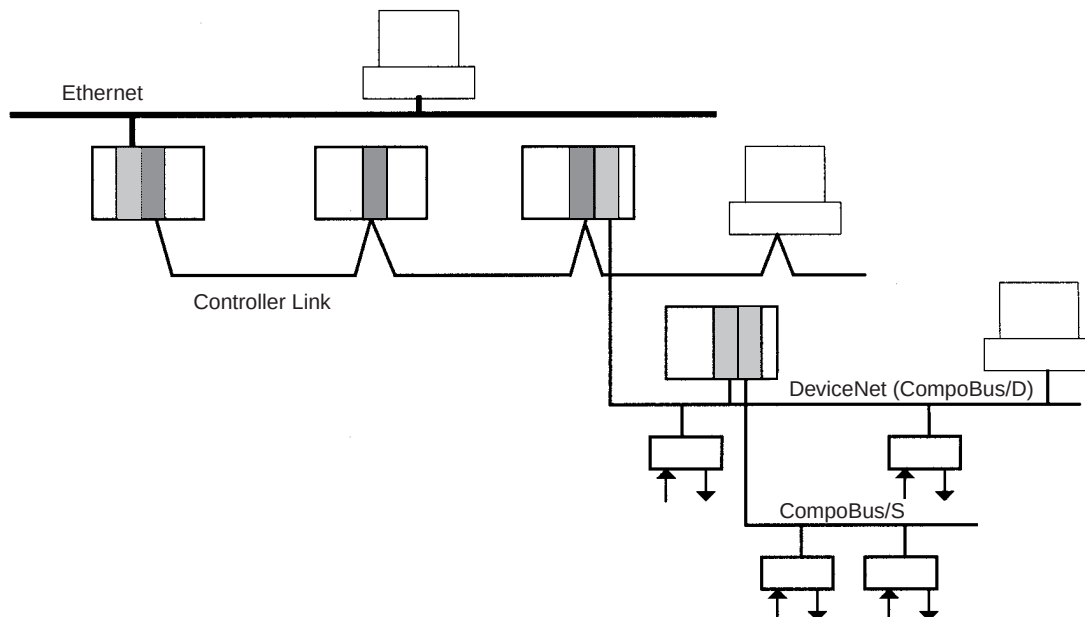


### Multilevel Network Configurations

Different network levels can be connected as shown in the following diagram. The multilevel configuration provides more flexibility in networking from the manufacturing site to production management. In particular, the DeviceNet network makes it very easy to connect devices from other manufacturers.

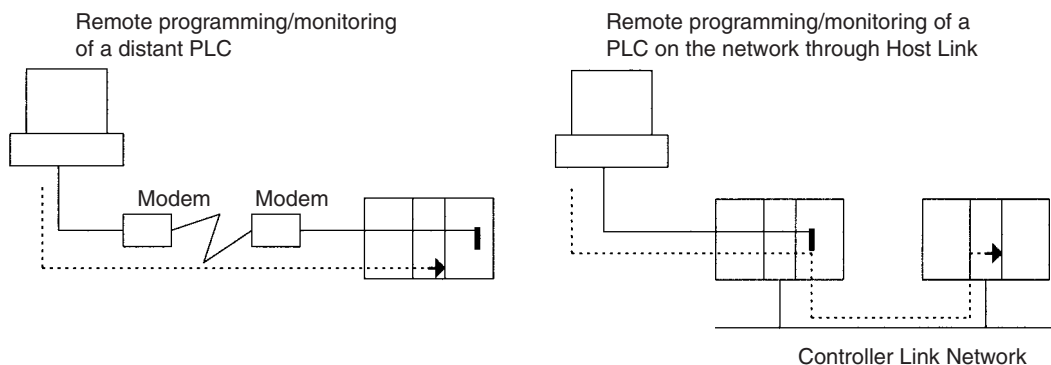
|                        |                        |
|------------------------|------------------------|
| OA Network:            | Ethernet               |
| FA Network:            | Controller Link        |
| DeviceNet*:            | DeviceNet (CompoBus/D) |
| High-speed ON/OFF bus: | CompoBus/S             |

Note \*Units that conform to JEMANET standards are also available.



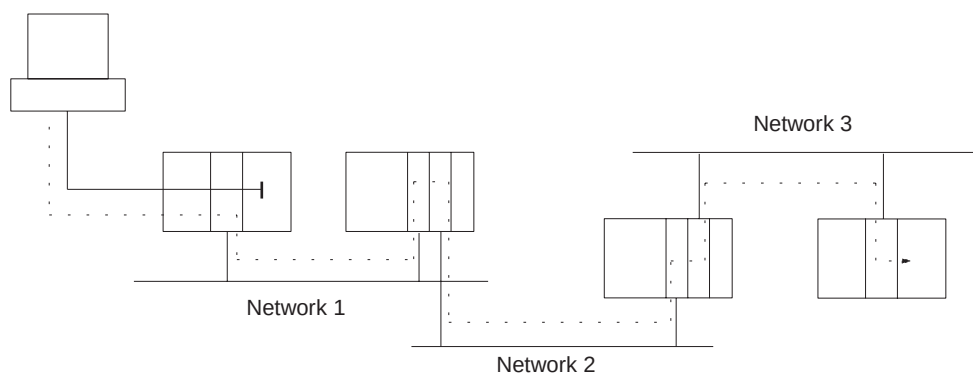
## Remote Monitoring and Programming

- 1,2,3...**
1. The host link function can operate through a modem, which allows monitoring of a distant PLC's operation, data transfers, or even online editing of a distant PLC's program by phone.
  2. PLCs in a network can be programmed and monitored through the Host Link.
  3. It is possible to communicate through 3 network levels even with different types of networks.

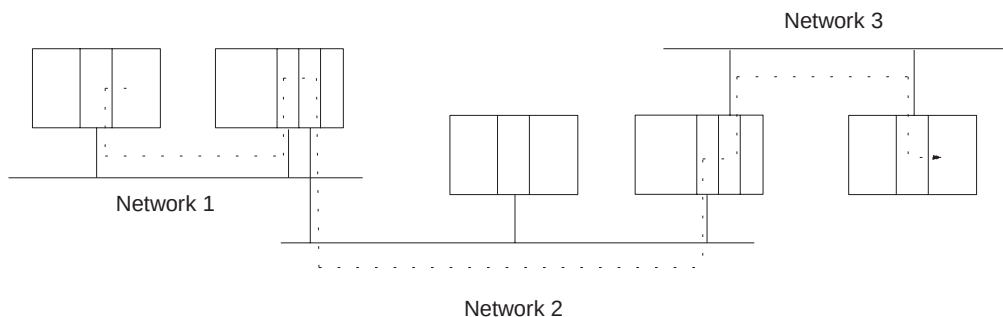


## Communications Across 3 Network Levels

Remote programming/monitoring of a PLC on a network up to 3 levels away (including the local network) for the same or different types of networks is possible through Host Link.



Message transfer between PLCs on a network 3 levels away (including the local network) for the same or different types of networks.



## High-speed Communications with PTs

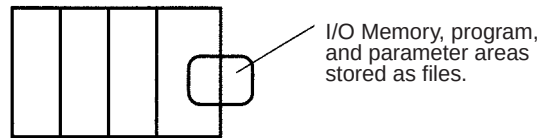
NT Link communications between an NS-series or NT31/NT631-V2 PT and a CS-series PLC are possible at high speed (except for pre-version 1 CS1 CPU Units).

## 1-2-2 Versatile Functions

### Memory Card and File Management Functions

#### Transfer Data to and from Memory Cards

Data area data, program data, and PLC Setup data can be saved as files on a Memory Card (compact flash memory). Data can be read and written from Programming Devices, instructions in the user program, or host computers. Memory Cards are available with capacities 8, 15, 30, and 48 Mbytes. (From the program, only I/O memory can be read and written and it must be read or written as a file.)



#### Convert EM Area Banks to File Memory

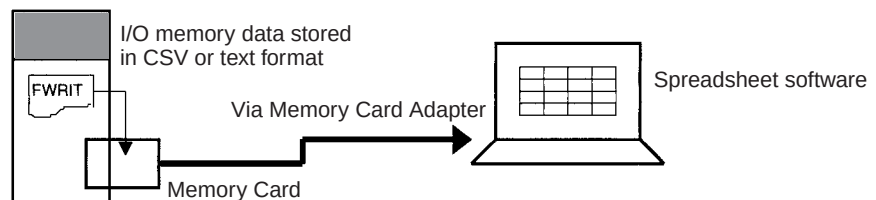
Part of the EM Area can be converted to file memory to provide file management capabilities without a Memory Card and with much faster access time than a Memory Card. (I/O comments can also be stored.)

#### Automatic File Transfer at Start-up

The PLC can be set up to transfer the program and/or PLC Setup files from the Memory Card when the PLC is turned ON. With this function, the Memory Card provides a flash-ROM transfer. This function can also be used to store and change PLC configurations quickly and easily.

#### I/O Memory Files in CSV and Text Format

It is now possible to save production results and other data (hexadecimal) from the CPU Unit I/O memory in a Memory Card in CSV or text format. The data can then be read and edited using personal computer spreadsheet software by means of a Memory Card Adapter. This function is not supported by pre-version-1 CS1 CPU Units.

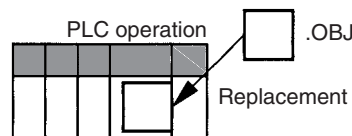


#### File Operations (Deleting, Creating Directories, etc.) from Ladder Programs

It is possible to format files, delete, copy, change file names, create new directories, and perform similar operations on a Memory Card from the ladder program during PLC operation. This function is not supported by pre-version-1 CS1 CPU Units.

#### Program Replacement During Operation

It is now possible to replace the entire user program in the CPU Unit from the Memory Card during operation. In this way, it is possible to switch PLC operation without stopping the PLC. This function is not supported by pre-version-1 CS1 CPU Units.

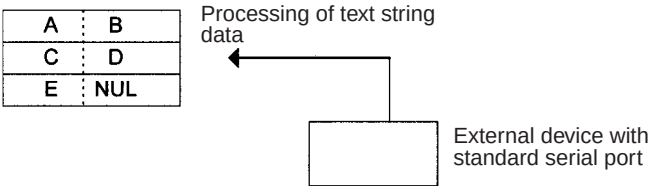


#### Easy Backups

It is now possible to back up all data (user programs, parameters, and I/O memory) to the Memory Card by pressing the Memory Card power supply switch. In this way, if a malfunction arises, it is possible to back up all data in the CPU Unit at the time without using a Programming Device. This function is not supported by pre-version-1 CS1 CPU Units.

Specialized Instructions Simplify Programming

**Text String Instructions** The text string instructions allow text processing to be performed easily from the ladder program. These instructions simplify the processing required when creating messages for transmission or processing messages received from external devices with the protocol macro function.



**Loop Instructions** The FOR(512), NEXT(513), and BREAK(514) instructions provide a very powerful programming tool that takes up little program capacity.

**Index Registers** Sixteen Index Registers are provided for use as pointers in instructions. An Index Register can be used to indirectly address any word in I/O memory. The CS-series PLCs also support the auto-increment, auto-decrement, and offset functions.

The Index Registers can be a powerful tool for repetitive processing (loops) when combined with the auto-increment, auto-decrement, and offset functions. Index Registers can also be useful for table processing operations such as changing the order of characters in text strings.

Table Data Processing Instructions

Stack Instructions

A region of I/O memory can be defined as a stack region. Words in the stack are specified by a stack pointer for easy FIFO (first-in first-out) or LIFO (last-in first-out) data processing.

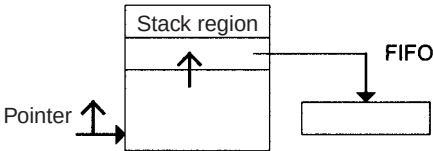
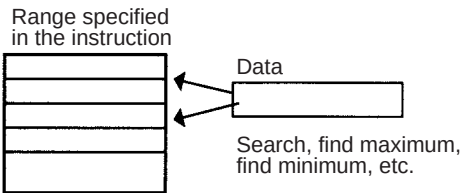


Table Processing

Range Instructions

These instructions operate on a specified range of words to find the maximum value or minimum value, search for a particular value, calculate the sum or FCS, or swap the contents of the leftmost and rightmost bytes in the words.

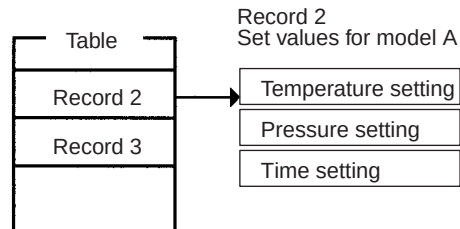


Record-table Instructions

Record-table instructions operate on specially defined data tables. The record table must be defined in advance with DIM(631), which declares the number of words in a record and the number of records in the table. Up to 16 record tables can be defined.

Record tables are useful when data is organized in records. As an example, if temperatures, pressures, or other set values for various models have been combined into a table, the record-table format makes it easy to store and read the set values for each model.

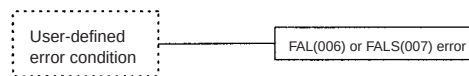
The SETR(635) can be used to store the first address of the desired record in an Index Register. Index Registers can then be used to simplify complicated processes such as changing the order of records in the record table, searching for data, or comparing data.



## Troubleshooting Functions

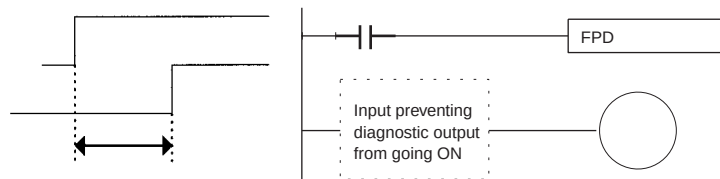
### Failure Diagnosis: FAL(006) and FALS(007)

The FAL(006) and FALS(007) can be used to generate a non-fatal or fatal error when the user-defined conditions are met. Records of these errors are stored in the error log just like system-generated errors.



### Failure Point Detection: FPD(269)

Diagnoses a failure in an instruction block by monitoring the time between execution of FPD(269) and execution of a diagnostic output and finding which input is preventing an output from being turned ON.



## Error Log Functions

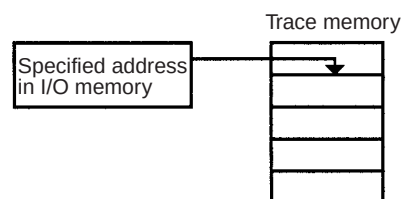
The error log contains the error code and time of occurrence for the most recent 20 errors (user-defined or system-generated errors).

## Maintenance Functions

The CS-series PLCs record information useful for maintenance, such as the number of power interruptions and the total PLC ON time.

## Data Trace Function

The content of the specified word or bit in I/O memory can be stored in trace memory by one of the following methods: scheduled sampling, cyclic sampling, or sampling at execution of TRSM(045).



## **Fixed Cycle Time Function**

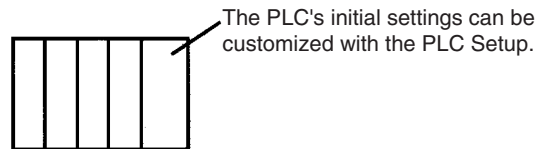
A fixed (minimum) cycle time can be set to minimize variations in I/O response times.

## **I/O Refreshing Methods**

I/O refreshing can be performed cyclically and immediately by programming the immediate-refreshing variation of the instruction.

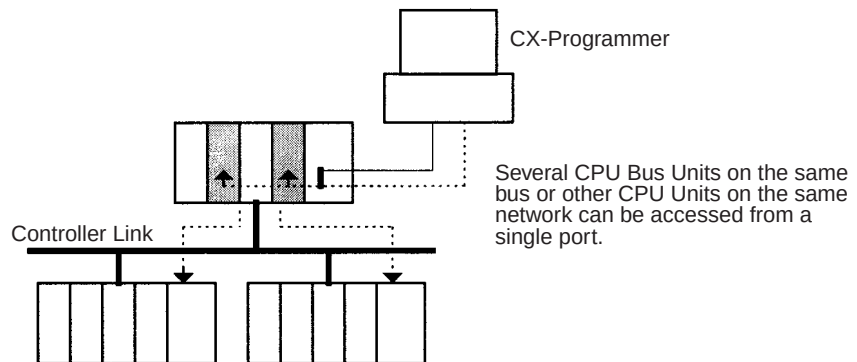
## **PLC Setup Functions**

PLC operation can be customized with PLC Setup settings, such as the maximum cycle time setting (watch cycle time) and the instruction error operation setting, which determines whether instruction processing errors and access errors are treated as non-fatal or fatal errors.



## **Windows Tools**

The single-port multiple-access (SPMA) function can be used to program and monitor other CPU Bus Units on the same bus (CPU Rack or Expansion Racks) or other CPU Units on the same network from a serial port on the CPU Unit or a Serial Communications Board.



# **1-3 CS1-H CPU Unit Features**

## **1-3-1 High-speed Performance**

### **Ultra High-speed Cycle Time**

The CS1-H CPU Units provide a cycle time that is three to four times faster than that of the CS1 CPU Units.

For example, a program consisting of 38 Ksteps of only basic instructions with 128 inputs and 128 outputs executes in 1 ms (4.2 ms for the CS1 CPU Units); a program consisting of 20 Ksteps of basic and special instructions in a 1:1 ratio with 128 inputs and 128 outputs executes in 1 ms (2.0 ms for the CS1 CPU Units); and a program consisting of 8 Ksteps of basic and special instructions in a 1:2 ratio with 64 inputs and 64 outputs executes in 0.5 ms (1.0 ms for the CS1 CPU Units).



The following factors give the CS1-H CPU Units their high speed.

**1,2,3...**

1. Instruction execution times: Only about 1/2 the time required for basic instructions, and only about 1/3 the time required for special instructions.
2. Better bus performance: Data transfers between the CPU Unit and Special I/O or Communications Units is about twice as fast, providing greater overall system performance.
3. Instruction execution is performed in parallel with peripheral servicing.
4. Other factors, including background execution of text string processing and table data processing instructions.

#### **Faster Execution of Common Instructions**

Extensive research on applications of CS1 CPU Units was used to identify the 20 most commonly used instructions of the more than 400 supported instructions (see below), and execution speed for these instructions was increased by 10 to 20 times previous performance.

CPS (SIGNED BINARY COMPARE)  
 JMP (JUMP)  
 CPSL (DOUBLE SIGNED BINARY COMPARE)  
 CJP (CONDITIONAL JUMP)  
 XFER (BLOCK TRANSFER)  
 BCNT (BIT COUNTER)  
 MOVB (MOVE BIT)  
 MLPX (DATA DECODER)  
 MOVD (MOVE DIGITS)  
 BCD (BINARY-TO-BCD)  
 BSET (BLOCK SET)  
 SBS/RET (SUBROUTINE CALL/RETURN)

#### **Transfer Speed between CPU Unit and CPU Bus Units Doubled**

The speed of transferring data between the CPU Unit and CPU Bus Units has been doubled to increase overall system performance.

#### **Parallel Processing of Instructions and Peripheral Servicing**

A special mode is supported that enables parallel processing of instruction execution and peripheral device servicing to support the following types of application.

- Extensive data exchange with a host not restricted by the program capacity in the CS1-H CPU Unit
- Consistently timed data exchange with SCADA software
- Eliminating the effects on cycle time of future system expansion or increases in communications

#### **Less Cycle Time Fluctuation for Data Processing**

Table data processing and text string processing, which often require time, can be separated over several cycles to minimize fluctuations in the cycle time and achieve stable I/O response.

#### **Better Data Link and Remote I/O Refreshing**

CPU Bus Unit refresh response has been increased both by reductions in the cycle time itself and by the addition of an immediate I/O refresh instruction for CPU Bus Units (DLNK(226)). This instruction will refresh data links, DeviceNet remote I/O, protocol macros, and other special data for CPU Bus Units.

The response of a CS1-H CPU Unit is approximately 2.4 times that of a CS1 CPU Unit. And, for a cycle time of approximately 100 ms or higher, the increase in the data link response is comparable to that for the cycle time.

#### **Immediate Refreshing for CPU Bus Units**

Although previously, I/O refreshing for CPU Bus Units was possible only after program executions, a CPU BUS I/O REFRESH instruction (DLNK(226)) has been added to enable immediate I/O refreshing for CPU Bus Units. Data links,

DeviceNet remote I/O, an other unique CPU Bus Unit refreshing can be refreshed along with words allocated to the CPU Bus Unit in the CIO and DM Areas whenever DLNK(226) is executed. This is particularly effective for longer cycle times (e.g., 100 ms or longer). (Data exchange for data links, DeviceNet remote I/O, and other network communications are also affected by the communications cycle time, i.e., DLNK(226) refreshes data only between the CPU Bus Units and the CPU Unit, not the data on the individual networks.)

## 1-3-2 High-speed Structured Programming

To further aid standardized programming, program structuring functions have been improved, as has program execution speed.

### More Cyclic Tasks

Tasks provide better efficiency by enabling programs to be separated by function or for development by different engineers. The CS1-H CPU Units support up to 288 cyclic tasks, an incredible increase over the previous maximum of 32 tasks.

### Common Processing from Multiple Tasks

Global subroutines that can be called by any task are now supported. These can be used for common processing from more than one task, for greater standardization.

### Faster Subroutine Instructions

Subroutine instruction are executed approximately 70 times faster to enable greater program modularization without having to be concerned about increasing the cycle time.

### Shared Index and Data Registers between Tasks

Although separate index and data registers can still be used in each task, they have been joined by shared index and data registers that can be used between tasks to reduce the time required to switch between tasks.

## 1-3-3 More Instructions for Specific Applications

Very specific control can be easily programmed for a much wider range of applications with the many new special instructions added to the CS1-H CPU Units.

### High-speed Positioning for XY Tables

Double-precision floating-point calculations are supported for the CS1-H CPU Units to provide even better precision for position control operations.

### Convert between Floating Point and Text String Data

To display floating-point data on PTs, the CS1-H CPU Units provide conversion instructions from floating-point data to text strings (ASCII). Conversion between ASCII and floating-point data is also possible so that ASCII data from serial communications with measurement devices can be used in calculations.

### Accurate Line Approximations

Unsigned 16-bit binary/BCD data, signed 16/32-bit binary data, or single-precision floating-point data can be used for line data, enabling precise (high data resolution) conversions, such as from a level meter (mm) to tank capacity (l) based on the shape of the tank.

### Realtime Workpiece Data Management

When loading and unloading workpieces from conveyor lines, workpiece information can be managed in realtime in table format.

### PID Autotuning

Autotuning is now supported for PID constants with the PID CONTROL instruction. The limit cycle method is used to ensure rapid autotuning. Very effective for multiloop PID control.

|                                                                     |                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>System Debugging through Error Simulation</b>                    | A specified error status can be created with the FAL/FALS instructions. This can be used effectively when depending systems. For example, errors can be simulated to produce corresponding displays on a PT to confirm that the correct messages are being displayed.              |
| <b>Program Simplification with More Specific Basic Instructions</b> | Programs that use a high quantity of basic instructions can be simplified through the use of differentiated forms of the LD NOT, AND NOT and OR NOT instructions, and through the use of OUT, SET, and RSET instructions that can manipulate individual bits in the DM or EM Area. |
| <b>Delayed Power OFF Processing for Specified Program Areas</b>     | The DI and EI instructions can be used to disable interrupts during specific portions of the program, for example, to prevent the power OFF interrupt from being executed until a specific instruction has been executed.                                                          |

### 1-3-4 Battery-free Operation with Flash Memory

Any user program or parameter area data transferred to the CPU Unit is automatically backed up in flash memory in the CPU Unit to enable battery-free operation without using a Memory Card.

**Note** Refer to information on flash memory in the *CS/CJ Series Programming Manual* (W394) for precautions on this function.

### 1-3-5 Better Compatibility with Other SYSMAC PLCs

|                            |                                                                                                                                                                                                                                                                      |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>C200HE/HG/HX PLCs</b>   | The AREA RANGE COMPARE (ZCP) and DOUBLE AREA RANGE COMPARE (ZCPI) instructions are supported in the CS1-H CPU Units to provide better compatibility with the C200HE/HG/HX PLCs.                                                                                      |
| <b>CVM1/CV-series PLCs</b> | The CONVERT ADDRESS FROM CV instruction allows real I/O memory addresses for the CVM1/CV-series PLCs to be converted to addresses for the CS-series PLCs, enabling programs with CVM1/CV-series addresses to be quickly converted for use with a CS-series CPU Unit. |

### 1-3-6 Refreshing Timer/Counter PVs in Binary

In addition to BCD, binary can also be set as the PV refresh method for timer/counter instructions. (This setting is possible, however, only with version 3.0 or later versions of the CX-Programmer.) This means that the settable time range for timer/counter instructions is increased from 0 to 9999 to 0 to 65,535. It also means that the results of calculations made with other instructions can be used without conversion.

## 1-4 CS1 and CS1-H CPU Unit Comparison

### 1-4-1 CS1 and CS1-H CPU Unit Comparison

| Item                                                           |                                 |            | CS1-H CPU Unit (CS1H-CPU6□H)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CS1 CPU Unit (CS1H-CPU6□-E)                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------|---------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instruction executions times                                   | Basic instructions              |            | LD: 0.02 μs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.04 μs                                                                                                                                                                                                                                                                                                                                    |
|                                                                |                                 |            | OUT: 0.02 μs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.17 μs                                                                                                                                                                                                                                                                                                                                    |
|                                                                | Special instructions            |            | Example                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                            |
|                                                                |                                 |            | XFER: 300 μs (for 1,000 words)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 633 μs (for 1,000 words)                                                                                                                                                                                                                                                                                                                   |
|                                                                |                                 |            | BSET: 200 μs (for 1,000 words)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 278 μs (for 1,000 words)                                                                                                                                                                                                                                                                                                                   |
|                                                                |                                 |            | BCD arithmetic: 8.2 μs min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 14 μs min.                                                                                                                                                                                                                                                                                                                                 |
|                                                                |                                 |            | Binary arithmetic: 0.18 μs min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.25 μs min.                                                                                                                                                                                                                                                                                                                               |
|                                                                |                                 |            | Floating-point math: 8 μs min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 10 μs min.                                                                                                                                                                                                                                                                                                                                 |
|                                                                |                                 |            | SBS/RET: 2.1 μs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 37 μs                                                                                                                                                                                                                                                                                                                                      |
| EM Area                                                        |                                 |            | 1 bank (32 Kwords) min. for all models                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Not supported by all models                                                                                                                                                                                                                                                                                                                |
| Overseeing processing time                                     |                                 |            | Normal mode: 0.3 ms<br>Parallel mode: 0.2 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.5 ms                                                                                                                                                                                                                                                                                                                                     |
| Execution timing                                               | CPU execution processing modes  |            | Any of the following 4 modes:<br>Normal (instructions and peripheral servicing perform consecutively)<br><br>Peripheral Servicing Priority Mode (instruction execution interrupted to service peripherals at a specific cycle and time; consecutive refreshing also performed)<br><br>Parallel Processing Mode with Synchronous Memory Access (instruction executed and peripheral services in parallel while synchronizing access to I/O memory)<br><br>Parallel Processing Mode with Asynchronous Memory Access (instruction executed and peripheral services in parallel without synchronizing access to I/O memory) | Either of following 2 modes:<br>Normal (instructions and peripheral servicing perform consecutively)<br><br>Peripheral Servicing Priority Mode (instruction execution interrupted to service peripherals at a specific cycle and time; consecutive refreshing also performed) (Add for CPU Units with lot number No. 001201□□□□ or later.) |
|                                                                |                                 |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                            |
|                                                                |                                 |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                            |
|                                                                |                                 |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                            |
|                                                                | CPU Bus Unit special refreshing | Data links | During I/O refresh period or via special CPU BUS UNIT I/O REFRESH instruction (DLNK(226))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | During I/O refresh period                                                                                                                                                                                                                                                                                                                  |
| DeviceNet remote I/O                                           |                                 |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                            |
| Protocol macro send/receive data                               |                                 |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                            |
| Refreshing of CIO and DM Areas words allocated to CPU Bus Unit |                                 |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                            |

| Item        |                                                                                        | CS1-H CPU Unit (CS1H-CPU6□H)                                                                                                                                                                                                                                                                                                                                | CS1 CPU Unit (CS1H-CPU6□E)                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tasks       | Cyclic execution of interrupt tasks via TKON instruction (called "extra cyclic tasks") | Supported<br>(Up to 255 extra cyclic tasks, increasing the total number of cyclic tasks to 288 max.)                                                                                                                                                                                                                                                        | Not supported<br>(No extra cyclic tasks; 32 cyclic tasks max.)                                                                                                                                                                                                                                                                                                                                                               |
|             | Independent/shared specifications for index and data registers                         | Supported<br>The time to switch between tasks can be reduced if shared registers are used.                                                                                                                                                                                                                                                                  | Not supported<br>(only independent registers for each task)                                                                                                                                                                                                                                                                                                                                                                  |
|             | Initialization when tasks are started                                                  | Supported<br>Task Startup Flags supported.                                                                                                                                                                                                                                                                                                                  | Only Task Flag for first execution                                                                                                                                                                                                                                                                                                                                                                                           |
|             | Starting subroutines from multiple tasks                                               | Global subroutines can be defined that can be called from more than one task.                                                                                                                                                                                                                                                                               | Not supported                                                                                                                                                                                                                                                                                                                                                                                                                |
|             | Interrupt task execution timing during instruction execution                           | <p>For instructions other than the following ones</p> <p>For BIT COUNTER (BCNT) or BLOCK TRANSFER (XFER) instructions</p>                                                                                                                                                                                                                                   | Any instruction that is being executed is interrupted when interrupt task conditions are met to start the interrupt task. If the cyclic task (including extra cyclic tasks) access the same data area words as the instruction that was interrupted, data may not be concurrent. To ensure data concurrency, the DI and EI instructions must be used to disable and enable interrupts during a specific part of the program. |
| Data backup | Backup to Memory Cards (simple backup function)                                        | In addition to the data listed at the right, data from Units and Boards mounted to the CPU Rack or Expansion Racks can also be backed up to the Memory Card (via pushbutton on front panel). This is very effective when replacing Units. Backup data includes scan lists for DeviceNet Units, protocol macros for Serial Communications Units/Boards, etc. | Only the user program parameters, and I/O memory in the CPU Unit                                                                                                                                                                                                                                                                                                                                                             |
|             | Automatic user program and parameter area backup to flash memory                       | Supported (enabling battery-free operation without a Memory Card)<br>The user program and parameter area data are automatically backed up the flash memory whenever they are transferred to the CPU Unit from the CX-Programmer, file memory, etc.                                                                                                          | Not supported                                                                                                                                                                                                                                                                                                                                                                                                                |
| I/O tables  | Detailed information on I/O table creation errors                                      | Detailed I/O table error information is stored in A261 whenever the I/O tables cannot be created for any reason.                                                                                                                                                                                                                                            | Not supported                                                                                                                                                                                                                                                                                                                                                                                                                |
|             | Displaying presence of first rack word setting on Programming Console                  | It's possible to confirm if the first rack word has been specified for the system on the Programming Console display.<br><br>The first rack word is specified from the CX-Programmer, making it previously impossible to confirm the setting from the Programming Console.                                                                                  | Not supported                                                                                                                                                                                                                                                                                                                                                                                                                |

| Item                                                 |                                                                                                            | CS1-H CPU Unit (CS1H-CPU6□H)                                                                                                                                                                                                  | CS1 CPU Unit (CS1H-CPU6□-E)                                                                                          |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Sequence instructions                                | Differentiated LD NOT, AND NOT, and OR NOT instructions                                                    | Supported                                                                                                                                                                                                                     | Not supported (Can be programmed by combining differentiated LD, AND, and OR instructions with the NOT instruction.) |
|                                                      | OUTB, SETB, and RSTB instructions to manipulate individual bits in DM and EM Area words                    | Supported                                                                                                                                                                                                                     | Not supported                                                                                                        |
| Timer/counter instructions                           | PV refresh method for TIM, TIMH, TMHH, TTIM, TIML, MTIM, CNT, CNTR, CNR, TIMW, TMHW, and CNTW instructions | Either BCD or binary can be selected (with CX-Programmer Ver. 3.0 or later versions)                                                                                                                                          | BCD only                                                                                                             |
| Special math instructions                            | 32-bit signed data line coordinates and X axis starting point specification for APR instruction            | Supported                                                                                                                                                                                                                     | Not supported                                                                                                        |
| Floating-point decimal instructions                  | Single-precision calculations and conversions                                                              | Supported (enabling standard deviation calculations)                                                                                                                                                                          | Not supported                                                                                                        |
|                                                      | Conversions between single-precision floating point and ASCII                                              | Supported<br>Floating point can be converted to ASCII for display on PTs<br>ASCII text strings from measurement devices can be converted to floating-point decimal for use in calculations.                                   | Not supported                                                                                                        |
|                                                      | Double-precision calculations and conversions                                                              | Supported (enabling high-precision positioning)                                                                                                                                                                               | Not supported                                                                                                        |
| Text string, table data, and data shift instructions | Text string and table data processing instruction execution                                                | Data processing can be performed normally or in the background (specified for each instruction)<br>(Using time slices to process instruction over several cycles reduces the effect of these instructions on the cycle time.) | Normal processing only                                                                                               |
|                                                      | Stack insertions/deletions/replacements and stack counts with table processing instructions                | Supported<br>Effective for tracking workpieces on conveyor lines.                                                                                                                                                             | Not supported                                                                                                        |
| Data control instructions                            | PID with autotuning                                                                                        | Supported (eliminating the need to turn PID constants)                                                                                                                                                                        | Not supported                                                                                                        |
| Subroutine instructions                              | Global subroutines                                                                                         | Supported (GSBS, GSBN, and GRET instructions)<br>Enables easier structuring of subroutines.                                                                                                                                   | Not supported                                                                                                        |
| Failure diagnosis instructions                       | Error log storage for FAL                                                                                  | Supported<br>FAL can be executed without placing an entry in the error log. (Only system FAL errors will be placed in the error log.)                                                                                         | Not supported                                                                                                        |
|                                                      | Error simulation with FAL/FALS                                                                             | Supported<br>Fatal and nonfatal errors can be simulated in the system to aid in debugging.                                                                                                                                    | Not supported                                                                                                        |
| Data comparison instructions                         | AREA RANGE COMPARE (ZCP) and DOUBLE RANGE COMPARE (ZCPL)                                                   | Supported                                                                                                                                                                                                                     | Not supported                                                                                                        |

| Item                                                                         |                                                                            | CS1-H CPU Unit (CS1H-CPU6□-H)                                                                                                                                                                                                                                  | CS1 CPU Unit (CS1H-CPU6□-E)                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Index register real I/O address conversion for CVM1/CV                       | Program and real I/O memory address compatibility with CVM1/CV-series PLCs | CVM1/CV-series real I/O memory addresses can be converted to CS-series addresses and placed in index registers or CS-series real I/O memory addresses in index registers can be converted to CVM1/CV-series addresses.                                         | Not supported                                                                                                                                                                                                                                 |
| Condition Flag saving and loading                                            | Compatibility with CVM1/CV-series PLCs                                     | Condition Flag status can be saved or loading using the SAVE CONDITION FLAGS (CCS) and LOAD CONDITION FLAGS (CCL) instructions, enabling applications where Condition Flag status must be passed between different program locations, tasks, or cycles.        | Not supported                                                                                                                                                                                                                                 |
| Startup mode for PLC Setup defaults when no Programming Console is connected |                                                                            | RUN mode                                                                                                                                                                                                                                                       | PROGRAM mode                                                                                                                                                                                                                                  |
| Operation after Unit/Inner Board startup processing                          | Starting servicing                                                         | Starting or not starting servicing for other Units even if an Inner Board has not completed startup processing can be specified in the PLC Setup.                                                                                                              | Servicing not started (fixed).                                                                                                                                                                                                                |
|                                                                              | CPU Unit startup                                                           | Starting or not starting (standby) the CPU Unit in MONITOR or RUN mode even if a Unit or an Inner Board has not completed startup processing can be specified in the PLC Setup.                                                                                | CPU Unit standby (fixed)                                                                                                                                                                                                                      |
| Disabling power interruptions in program sections                            |                                                                            | Supported<br>Instructions between DI and EI are executed without performing power OFF processing even if a power interruption has been detected and confirmed.                                                                                                 | Not supported                                                                                                                                                                                                                                 |
| Condition Flag operation                                                     |                                                                            | The statuses of the Equals, Negative, and Error Flags are maintained for execution of the following instructions.<br>TIM, TIMH, TMHH, CNT, IL, ILC, JMP0, JME0, XCHG, XCGL, MOVR, input comparison instructions, CMP, CMPL, CPS, CPSL, TST, TSTN, STC, and CLC | The Equals, Negative, and Error Flags are turned OFF after executing the following instructions.<br>TIM, TIMH, TMHH, CNT, IL, ILC, JMP0, JME0, XCHG, XCGL, MOVR, input comparison instructions, CMP, CMPL, CPS, CPSL, TST, TSTN, STC, and CLC |

## 1-4-2 New Functions for Version-1 CS1 CPU Units

The following functions have been added or improved in the version-1 CS1 CPU Units (CS1G/H-CPU□□-EV1; previous version: CS1G/H-CPU□□-E).

| Item                                                          | Function                                                                                                                                                                                                                                                                                                                                             | Application                                                                                                                                                                                                                                                                                                                                                                                         | Reference                                                                                                                           |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Support for CSV and TXT formats in data files                 | The FREAD/FWRIT instructions can be used to read and write hexadecimal I/O memory data in CSV or TXT format. (Previously, only binary format was supported.)                                                                                                                                                                                         | Production results from I/O memory in the CPU Unit can be written to a Memory Card in CSV/TXT format, the Memory Card can be used to read the data to a computer via a Memory Card Adapter, and the data can then be used in spreadsheet software on the computer.<br><br>Spreadsheet data from a computer can also be transferred in CSV/TXT format to the CPU Unit's I/O memory via Memory Cards. | <i>Section 5 File Memory Functions in the CS/CJ Series Programming Manual</i>                                                       |
| File operations for instructions (formatting, deleting, etc.) | The CPU Unit can send commands to itself using the CMND instruction to perform file operations. (The CPU Unit could previously not send FINS commands to itself.)                                                                                                                                                                                    | Files can be formatted, deleted, copied, or renamed and directories can be created on Memory Cards using ladder program instructions during operation.                                                                                                                                                                                                                                              |                                                                                                                                     |
| Program replacements during operation                         | The entire user program can be loaded from a Memory Card to the CPU Unit during operation to replace the program. (Previously only AUTOEXEC.OBJ could be used at startup to replace the program.)                                                                                                                                                    | Switching operations while the PLC is running.<br><br>Replacing the program without using a Programming Device.                                                                                                                                                                                                                                                                                     |                                                                                                                                     |
| DM and EM files for automatic transfer at startup             | DM and EM files can be automatically loaded to the CPU Unit at startup. (Previously only the data file AUTOEXEC.IOM could be used to load the Special I/O Unit and Inner Board areas starting at D20000 to the DM Area. For other parts of the DM Area, the FREAD instruction had to be used, i.e., automatic transfer at startup was not possible.) | Storing settings in the DM and EM Areas at startup.<br><br>Loading data automatically at startup instead of using FREAD.                                                                                                                                                                                                                                                                            |                                                                                                                                     |
| Simple backup function                                        | The user program, parameter data, and I/O memory data can be backed up to a Memory Card by pressing the memory card power button if simple backup was specified on the DIP switch. (Previously a write operation from a Programming Device was required to back up all of this data.)                                                                | All data could be backed up easily and quickly without a Programming Device whenever a problem occurs.                                                                                                                                                                                                                                                                                              |                                                                                                                                     |
| High-speed NT Links                                           | High-speed 1:N NT Links are supported, enabling faster communications with PTs (Programmable Terminals) than previously possible.<br><br>Only the following PTs support high-speed NT Links: NT31/NT631-V2 and the NS-series PT.                                                                                                                     | Better realtime performance for setting and monitoring operations on PTs.                                                                                                                                                                                                                                                                                                                           | <i>NT Link System (1:N Mode) under 2-5-2 Systems in this manual and 6-3-3 NT Link (1:N Mode) in CS/CJ Series Programming Manual</i> |
| High-speed online editing                                     | Less time is required to change part of the program when performing online editing in MONITOR mode. (Previously each cycle was increased by up to 90 ms, but the maximum increase for version-1 CPU Units is 12 ms.)                                                                                                                                 | The effects on the system are reduced when changing the program for maintenance during operation.                                                                                                                                                                                                                                                                                                   | <i>7-2-3 Online Editing in the CS/CJ Series Programming Manual</i>                                                                  |



## 1-5 CS-series Function Tables

The following tables list functions for the CS-series CPU Units (including both the CS1 CPU Units and the CS1-H CPU Units).

### 1-5-1 Functions Arranged by Purpose

|                                          | Purpose                                                                                                                                                        | Function | Reference                                                                                                                                                                                                                                                                                 |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Studying Basic Operations and the System | Studying the system configuration                                                                                                                              | →        | SECTION 2 Specifications and System Configuration                                                                                                                                                                                                                                         |
|                                          | Studying I/O allocations                                                                                                                                       | →        | SECTION 8 I/O Allocations                                                                                                                                                                                                                                                                 |
|                                          | Finding the installation dimensions                                                                                                                            | →        | 5-2-4 Mounting Dimensions                                                                                                                                                                                                                                                                 |
|                                          | Finding the installation method                                                                                                                                | →        | 5-2 Installation                                                                                                                                                                                                                                                                          |
|                                          | Setting the DIP switch                                                                                                                                         | →        | 3-1-2 Components                                                                                                                                                                                                                                                                          |
|                                          | Setting the PLC Setup                                                                                                                                          | →        | 7-1 PLC Setup                                                                                                                                                                                                                                                                             |
|                                          | Using special flags in the Auxiliary Area                                                                                                                      | →        | Appendix B Auxiliary Area                                                                                                                                                                                                                                                                 |
|                                          | Studying the cycle time                                                                                                                                        | →        | 10-3-2 Instruction Execution for Power Interruptions                                                                                                                                                                                                                                      |
|                                          | Troubleshooting                                                                                                                                                | →        | 11-2-4 Error Processing Flowchart                                                                                                                                                                                                                                                         |
| Improving Program Structure              | Standardizing programs as modules.                                                                                                                             | →        | Program with tasks to divide the program, specify symbols, and define local and global symbols.<br>Programming Manual (W394)                                                                                                                                                              |
|                                          | Developing a program with several programmers working in parallel.                                                                                             | →        |                                                                                                                                                                                                                                                                                           |
|                                          | Making the program easier to understand.                                                                                                                       | →        |                                                                                                                                                                                                                                                                                           |
|                                          | Creating step programs.                                                                                                                                        | →        | Use the step instructions.<br>Instructions Reference Manual (W340)                                                                                                                                                                                                                        |
|                                          | Using BASIC-like mnemonic instructions to program processes that are difficult to enter in the ladder diagram format (such as conditional branches and loops). | →        | Use the block programming instructions.                                                                                                                                                                                                                                                   |
| Simplifying the Program                  | Creating looped program sections.                                                                                                                              | →        | Use FOR(512) and NEXT(513) or JMP(004) and JME(005).<br>Instructions Reference Manual (W340)                                                                                                                                                                                              |
|                                          | Indirectly addressing DM words.                                                                                                                                | →        | All words in the DM and EM Areas can be indirectly addressed.<br>Programming Manual (W394)                                                                                                                                                                                                |
|                                          | Simplifying the program by switching to PLC memory address specification.                                                                                      | →        | Use Index Registers as pointers to indirectly address data area addresses.<br>The Index Registers are very useful in combination with loops, increment instructions, and table data processing instructions. The auto-increment, auto-decrement, and offset functions are also supported. |
|                                          | Consolidating instruction blocks with the same pattern but different addresses into a single instruction block.                                                | →        | Use MCRO(099).<br>Instructions Reference Manual (W340)                                                                                                                                                                                                                                    |

|                         | Purpose                                                                                     | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Reference                                                                                   |
|-------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Managing the Cycle Time | Reducing the cycle time.                                                                    | <ul style="list-style-type: none"> <li>• Use tasks to put parts of the program that don't need to be executed into "standby" status.</li> <li>• Use JMP(004) and JME(005) to jump parts of the task that don't need to be executed.</li> <li>• Convert parts of the task to sub-routines if they are executed only under particular conditions.</li> <li>• Disable a Unit's Special I/O Unit refreshing in the PLC Setup if it isn't necessary to exchange data with that Special I/O Unit every cycle.</li> </ul> | Programming Manual (W394)                                                                   |
|                         | Setting a fixed (minimum) cycle time.                                                       | Set a minimum cycle time in the PLC Setup.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                             |
|                         | Setting a maximum cycle time. (Generating an error for a cycle time exceeding the maximum.) | Set a maximum cycle time (watch cycle time) in the PLC Setup. If the cycle time exceeds this value, the Cycle Time Too Long Flag (A40108) will be turned ON and PLC operation will be stopped.                                                                                                                                                                                                                                                                                                                     | 7-1 PLC Setup                                                                               |
|                         | Reducing the I/O response time for particular I/O points.                                   | Use an I/O interrupt task, immediate refreshing, or IORF(097).                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Programming Manual (W394)                                                                   |
|                         | Receiving input pulses shorter than the cycle time.                                         | Use a quick-response input on a Unit with High-speed Inputs or a High-density I/O Unit (a Special I/O Unit).                                                                                                                                                                                                                                                                                                                                                                                                       | 3-6-3 Units with High-speed Inputs and 3-7 C200H High-density I/O Units (Special I/O Units) |
|                         | Finding the I/O refresh times for Units                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10-3-2 Instruction Execution for Power Interruptions                                        |
|                         | Studying the I/O response times                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10-4-6 I/O Response Time                                                                    |
|                         | Finding the increase in cycle time caused by online editing                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10-4-5 Online Editing Cycle Time Extension                                                  |
|                         | Giving priority to peripheral servicing over instruction execution                          | Use the Peripheral Servicing Priority Mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Programming Manual (W394)                                                                   |
| Using Interrupt Tasks   | Monitoring operating status at regular intervals.                                           | Use a scheduled interrupt task.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Programming Manual (W394)                                                                   |
|                         | Performing interrupt processing when an input goes ON.                                      | Use an I/O interrupt task.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                             |
|                         | Issuing an interrupt to the CPU when data is received through serial communications.        | Use a Serial Communications Board and external interrupt task or an ASCII Unit.                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                             |
|                         | Executing an emergency interrupt program when the power supply fails.                       | Use a power OFF interrupt task. Enable the power OFF interrupt task in the PLC Setup.                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                             |
|                         | Studying the interrupt response time                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10-4-7 Interrupt Response Times                                                             |
|                         | Finding the priority of interrupt tasks                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Programming Manual (W394)                                                                   |

|                                | Purpose                                                                                                                                                                                                                          | Function                                                                                                                                                                                                                                                                                                                          | Reference                            |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Data Processing                | Operating a FIFO or LIFO stack. ———→                                                                                                                                                                                             | Use the stack instructions (FIFO(633) and LIFO(634)).                                                                                                                                                                                                                                                                             | Instructions Reference Manual (W340) |
|                                | Performing basic operations on tables made up of 1-word records. ———→                                                                                                                                                            | Use range instructions such as MAX(182), MIN(183), and SRCH(181).                                                                                                                                                                                                                                                                 |                                      |
|                                | Performing complex operations on tables made up of 1-word records. ———→                                                                                                                                                          | Use Index Registers as pointers in special instructions.                                                                                                                                                                                                                                                                          |                                      |
|                                | Performing operations on tables made up of records longer than 1 word.<br>(For example, the temperature, pressure, and other manufacturing settings for different models of a product could be stored in separate records.) ———→ | Use Index Registers and the record-table instructions (DIM, GETR, etc.)                                                                                                                                                                                                                                                           | Programming Manual (W394)            |
| System Configuration           | Monitoring several different kinds of devices through the RS-232C port. ———→                                                                                                                                                     | Multiple serial ports can be installed with Serial Communications Units (protocol macro) and ASCII Units.                                                                                                                                                                                                                         | 2-3 Basic System Configuration       |
|                                | Changing protocol during operation (from a modem connection to host link, for example). ———→                                                                                                                                     | Use STUP(237), the CHANGE SERIAL PORT SETUP instruction.                                                                                                                                                                                                                                                                          | Instructions Reference Manual (W340) |
| Connecting Programming Devices | Connecting a Programming Console. ———→                                                                                                                                                                                           | Connect to the peripheral port with pin 4 of the CPU Unit's DIP switch OFF.                                                                                                                                                                                                                                                       | 3-3-2 Programming Consoles           |
|                                | Connecting a Programming Device (e.g., the CX-Programmer). ———→                                                                                                                                                                  | Connect to the peripheral port with pin 4 of the CPU Unit's DIP switch OFF or with pin 4 ON and the network type of the CX-Programmer set to the peripheral bus.<br>Connect to the RS-232C port with pin 5 of the CPU Unit's DIP switch ON or with pin 5 OFF and the network type of the CX-Programmer set to the peripheral bus. | 3-3-3 CX-Programmer                  |
|                                | Connecting a host computer. ———→                                                                                                                                                                                                 | Connect to the RS-232C port or peripheral port. (Set the communications mode to "host link" in the PLC Setup.)                                                                                                                                                                                                                    | 2-5 Expanded System Configuration    |
|                                | Connecting a PT. ———→                                                                                                                                                                                                            | Connect to the RS-232C port or peripheral port. (Set the communications mode to "NT Link" in the PLC Setup.)<br>Set the PT communications settings for a 1:N NT Link.                                                                                                                                                             |                                      |
|                                | Connecting a standard serial device to the CPU Unit (no-protocol mode). ———→                                                                                                                                                     | Connect to the RS-232C port. (Set the communications mode to "no-protocol" in the PLC Setup.)                                                                                                                                                                                                                                     |                                      |
|                                |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                   |                                      |
| Controlling Outputs            | Turning OFF all outputs on basic Output Units and High-density Output Units (a type of Special I/O Unit). ———→                                                                                                                   | Turn ON the Output OFF Bit (A50015).                                                                                                                                                                                                                                                                                              | Programming Manual (W394)            |
|                                | Maintaining the status of all outputs on Output Units when PLC operation stops (hot start). ———→                                                                                                                                 | Turn ON the IOM Hold Bit (A50012).                                                                                                                                                                                                                                                                                                |                                      |

| Purpose                |                                                                                                                                                                                                                  | Function                                                                                                                                               | Reference                            |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Controlling I/O Memory | Maintaining the previous contents of all I/O Memory at the start of PLC operation (hot start).                                                                                                                   | ————→ Turn ON the IOM Hold Bit (A50012).                                                                                                               | Programming Manual (W394)            |
|                        | Maintaining the previous contents of all I/O Memory when the PLC is turned on.                                                                                                                                   | ————→ Turn ON the IOM Hold Bit (A50012) and set the PLC Setup to maintain the status of the IOM Hold Bit at start-up. (IOM Hold Bit Status at Startup) |                                      |
| File Memory            | Automatically transferring the program, I/O Memory, and PLC Setup from the Memory Card when the PLC is turned on.                                                                                                | ————→ Enable the “automatic transfer at start-up” function by turning ON pin 2 of the CPU Unit’s DIP switch and create an AUTOEXEC file.               | Programming Manual (W394)            |
|                        | Creating a library of programs for different program arrangements.                                                                                                                                               | ————→ Memory Card functions (Program Files)                                                                                                            |                                      |
|                        | Creating a library of parameter settings for various PLC Racks and models.                                                                                                                                       | ————→ Memory Card functions (Parameter Files)                                                                                                          |                                      |
|                        | Creating a library of data files with settings for various PLC Racks, and CPU Bus Units.                                                                                                                         | ————→ Memory Card functions (Data Files)                                                                                                               |                                      |
|                        | Storing I/O Comment data within the Memory Card.                                                                                                                                                                 | ————→ Memory Card functions (Symbol Table Files)                                                                                                       |                                      |
|                        | Storing operating data (trend and quality data) within the CPU Unit during program execution.                                                                                                                    | ————→ EM File Memory Functions and the FREAD(700)/FWRITE(701) instructions                                                                             |                                      |
|                        | Switching PLC operation.                                                                                                                                                                                         | ————→ Memory Card functions (Program Replacement during PLC Operation) (except pre-version-1 CS1 CPU Units)                                            |                                      |
|                        | Reading and writing I/O memory data with a spreadsheet.                                                                                                                                                          | ————→ Read/write data files using instructions in CSV or text format (except pre-version-1 CS1 CPU Units).                                             |                                      |
| Text string processing | Performing string processing at the PLC which was performed at the host computer previously and reducing the program load at the host computer (operations such as read, insert, search, replace, and exchange). | ————→ Combine the Host Link function with the text string processing instructions.                                                                     | Instructions Reference Manual (W340) |
|                        | Performing string processing operations such as rearranging text strings.                                                                                                                                        | ————→ Use the string comparison instructions and index registers.                                                                                      |                                      |
|                        | Receiving data from external devices (such as bar code readers) through serial communications, storing the data in DM, and reading just the required string when it is needed.                                   | ————→ Combine the protocol macro function with the text string processing instructions.                                                                |                                      |

|                                      | Purpose                                                                                                                                              | Function                                                                                                                                                                           | Reference                         |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Maintenance and Debugging            | Changing the program while it is being executed.                                                                                                     | Use the online editing function from a Programming Device.<br>(Several instruction blocks can be changed with CX-Programmer.)                                                      | Programming Manual (W394)         |
|                                      | Sampling I/O Memory data.                                                                                                                            |                                                                                                                                                                                    |                                   |
|                                      | • Periodic sampling                                                                                                                                  | ————→ Data trace at regular intervals                                                                                                                                              |                                   |
|                                      | • Sampling at the end of each cycle                                                                                                                  | ————→ Data trace at the end of each cycle                                                                                                                                          |                                   |
|                                      | • Sampling at execution of TRSM(045)                                                                                                                 | ————→ Data trace each time that TRSM(045) is executed                                                                                                                              |                                   |
|                                      | Specifying the start-up operating mode.                                                                                                              | ————→ Set the PLC Setup to specify the desired operating mode at start-up. (Startup Mode)                                                                                          |                                   |
|                                      | Recording the time that power was turned on, the last time that power was interrupted, the number of power interruptions, and the total PLC on time. | ————→ These items are recorded automatically in the Auxiliary Area.                                                                                                                |                                   |
|                                      | Stopping the program for instruction execution errors.                                                                                               | ————→ Set the PLC Setup so that instruction errors are treated as fatal errors. (Instruction Error Operation)                                                                      | 2-5 Expanded System Configuration |
|                                      | Programming/monitoring the PLC remotely.                                                                                                             |                                                                                                                                                                                    |                                   |
|                                      | • Programming or monitoring a PLC on the network through Host Link.                                                                                  | ————→ Host Link → Network Gateway function                                                                                                                                         |                                   |
|                                      | • Programming or monitoring a PLC through modems.                                                                                                    | ————→ Host Link through modems                                                                                                                                                     |                                   |
|                                      | Programming/monitoring PLCs in other networks                                                                                                        | ————→ Communicate with PLCs up to 2 network levels away through Controller Link or Ethernet.                                                                                       |                                   |
| Error Processing and Troubleshooting | Generating a non-fatal or fatal error for user-defined conditions.                                                                                   |                                                                                                                                                                                    | Programming Manual (W394)         |
|                                      | • Non-fatal errors (Operation continues.)                                                                                                            | ————→ FAILURE ALARM: FAL(006)                                                                                                                                                      |                                   |
|                                      | • Fatal errors (PLC operation stops.)                                                                                                                | ————→ SEVERE FAILURE ALARM: FALS(007)                                                                                                                                              |                                   |
|                                      | Analyzing time and logic in execution of an instruction block.                                                                                       | ————→ FAILURE POINT DETECTION: FPD(269)                                                                                                                                            |                                   |
|                                      | Record information about errors, including user-defined errors, in the error log.                                                                    | ————→ Use the error log function. Up to 20 error records can be stored.                                                                                                            |                                   |
| Other Functions                      | Protecting the program.                                                                                                                              | ————→ Write-protect the user program memory.                                                                                                                                       | Programming Manual (W394)         |
|                                      | Allocating words in the I/O Area by specifying the first word allocated to each Rack.                                                                | ————→ Set the first word allocated to each Rack by registering the I/O table from the CX-Programmer. (Words must be allocated to Racks in the order that the Racks are connected.) |                                   |
|                                      | Reducing input chattering and the effects of noise.                                                                                                  | ————→ Specify the input response times for Basic I/O Units in the PLC Setup. (Basic I/O Unit Input Response Time)                                                                  |                                   |
|                                      | Creating a high-speed, low-cost distribution system without using Communications Units or Remote I/O Systems.                                        | ————→ Connect Long-distance Expansion Racks.                                                                                                                                       | 2-3 Basic System Configuration    |
|                                      | Giving priority to peripheral servicing over program execution.                                                                                      | ————→ Use Peripheral Servicing Priority Mode.                                                                                                                                      | Programming Manual (W394)         |

## 1-5-2 Communications Functions (Serial/Network)

| Purpose                                |                                                      | Protocol: Required Equipment                                                                                                                                                                                         | Reference                           |
|----------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Monitoring from the Host Computer      | RS-232C or RS-422/485                                | → Host Link:<br>Port in the CPU Unit, Serial Communications Board, or Serial Communications Unit                                                                                                                     | 2-5-2 Systems                       |
|                                        | Host Link communications from the PLC                | → Enclose a FINS command with a Host Link header and terminator and issue it from the PLC as a network communications instruction.                                                                                   |                                     |
|                                        | Network communications through RS-232C or RS-422/485 | → Controller Link and Ethernet communications are possible through the Host Link. (Enclose a FINS command with a Host Link header and terminator and issue it from the PLC as a network communications instruction.) |                                     |
|                                        | Network                                              | Control system → Controller Link:<br>Controller Link Unit or Controller Link Board                                                                                                                                   | 2-5-3 Communications Network System |
|                                        |                                                      | Information system → Ethernet: Ethernet Unit                                                                                                                                                                         |                                     |
| Connecting to a Standard Serial Device | Creating a custom, user-defined protocol             | → Protocol written in BASIC: ASCII Unit                                                                                                                                                                              | 2-5-2 Systems                       |
|                                        | Creating a simple protocol                           | → Protocol Macro:<br>Serial Communications Board or Serial Communications Unit                                                                                                                                       |                                     |
|                                        | High-speed data exchange                             | → Serial Communications Board or Serial Communications Unit                                                                                                                                                          |                                     |
|                                        | No protocol                                          | → No protocol:<br>CPU Unit's RS-232C port, ASCII Unit, or Protocol Macro                                                                                                                                             |                                     |
| Communicating with a PT                | Direct access                                        | → NT Link:<br>Port in the CPU Unit, Serial Communications Board, or Serial Communications Unit                                                                                                                       |                                     |
| Data Link between PLCs                 | High capacity or free word allocation                | → Controller Link: Controller Link Unit                                                                                                                                                                              | 2-5-3 Communications Network System |
|                                        | Low capacity and fixed word allocation               | → PLC Link: PLC Link Unit                                                                                                                                                                                            |                                     |
| Data Link between PLC and computer     |                                                      | → Controller Link:<br>Controller Link Unit or Controller Link Board                                                                                                                                                  |                                     |
| Message communications between PLCs    | Normal or high capacity                              | → Controller Link: Controller Link Unit                                                                                                                                                                              |                                     |
|                                        | Information system                                   | → Ethernet: Ethernet Unit                                                                                                                                                                                            |                                     |

| Purpose                                         |                                  | Protocol: Required Equipment                                                 | Reference                           |
|-------------------------------------------------|----------------------------------|------------------------------------------------------------------------------|-------------------------------------|
| Message communications between PLC and computer | Control system                   | Controller Link: Controller Link Unit or Controller Link Board               | 2-5-3 Communications Network System |
|                                                 | Information system               | Ethernet: Ethernet Unit                                                      |                                     |
| Remote I/O between PLC and Slaves               | High-density I/O                 | DeviceNet:                                                                   |                                     |
|                                                 | Free word allocation             | DeviceNet Master Unit and required Slave Units                               |                                     |
|                                                 | Multi-vendor capability          |                                                                              |                                     |
|                                                 | Analog I/O capability            |                                                                              |                                     |
|                                                 | Multi-level architecture         |                                                                              |                                     |
|                                                 | High-speed Remote I/O            | CompoBus/S: CompoBus/S Master Unit and required Slave Units                  |                                     |
|                                                 | Remote I/O Slave Rack connection | SYSMAC BUS Wired Remote I/O: SYSMAC BUS Master Unit and required Slave Units | 2-3 Basic System Configuration      |

## 1-6 CS1-H Functions Arranged by Purpose

|                  | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Increasing speed | Increasing the speed of both the instruction execution cycle and peripheral servicing. <ul style="list-style-type: none"> <li>Fast large-scale data exchange with the host is needed even though the PLC program is very large.</li> <li>Consistently timed data exchange with SCADA software is needed.</li> <li>Fast message communications and control are required between distributed PLCs.</li> <li>It is necessary to minimize the effects on the cycle time of future system expansion or increases in communications.</li> </ul> | Use the Parallel Processing Mode with Synchronous Memory Access or Parallel Processing Mode with Asynchronous Memory Access.<br><br>Using parallel processing enables the following savings.<br><br>For example, if the program consists of basic instructions with a cycle time of approximately 10 ms and one Ethernet Unit is being used, the cycle time will be reduced to approximately 90% of the time for the normal mode. and the peripheral servicing time will be reduced to approximately 40% of the time for the normal mode. |
|                  | Maintaining concurrency in the I/O memory data accessed for instruction execution and for peripheral servicing (for data larger than one word).                                                                                                                                                                                                                                                                                                                                                                                           | Use the Parallel Processing Mode with Synchronous Memory Access.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                  | Not necessarily maintaining concurrency in the I/O memory data accessed for instruction execution and for peripheral servicing (for data larger than one word).                                                                                                                                                                                                                                                                                                                                                                           | Use the Parallel Processing Mode with Asynchronous Memory Access.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                  | Giving priority to peripheral servicing over the instruction execution cycle (For example, to give priority to the read/write response of CPU Unit data from SCADA software for process control)                                                                                                                                                                                                                                                                                                                                          | The response of peripheral servicing can be adjusted by using the following modes (listed in order from highest response):<br><br>Parallel Processing Mode with Asynchronous Memory Access, Peripheral Servicing Priority Mode (with a long instruction execution cycle), Parallel Processing Mode with Synchronous Memory Access, Normal Mode                                                                                                                                                                                            |
|                  | Specifying where index and data registers are used independently by task or shared by tasks                                                                                                                                                                                                                                                                                                                                                                                                                                               | Set the program properties from the CX-Programmer to independent (default) or shared registers.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                  | Minimizing cycle time fluctuations and maintaining consistent I/O response even when extensive table data and text string data is being processed                                                                                                                                                                                                                                                                                                                                                                                         | Table data processing and text string processing, which often require time, can be set in the PLC Setup so that they are processed in the background. The default is for no background execution. (For background execution, time slicing is used to separate processing over several cycles.)<br><br>If background execution is used, the effect on the cycle time can be limited to 4% or less (PLC Setup default setting).                                                                                                             |
|                  | Improving data link response with a long cycle time (Controller Link or SYSMAC LINK)                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The CPU BUS UNIT I/O REFRESH instruction (DLNK(226)) can be used at one or more locations in the ladder program. This enables refreshing data links for specified Controller Link or SYSMAC LINK Units, whenever necessary, as well as during the I/O refresh period. (The actual data that is refreshed depends on the communications cycle time.)                                                                                                                                                                                       |
|                  | Improving DeviceNet remote I/O response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | The CPU BUS UNIT I/O REFRESH instruction (DLNK(226)) can be used in the ladder program. This enables refreshing remote I/O for DeviceNet Units, whenever necessary, as well as during the I/O refresh period. (The actual data that is refreshed depends on the communications cycle time.)                                                                                                                                                                                                                                               |
|                  | Improving the response of protocol macro data transfers for Serial Communications Units                                                                                                                                                                                                                                                                                                                                                                                                                                                   | The CPU BUS UNIT I/O REFRESH instruction (DLNK(226)) can be used at one or more locations in the ladder program. This enables refreshing data transferred for protocol macros executed by Serial Communications Units, whenever necessary, as well as during the I/O refresh period. (The actual data that is refreshed depends on the communications cycle time.)                                                                                                                                                                        |
|                  | Immediately refreshing status data and other words allocated to CPU Bus Units in the CIO Area whenever necessary (including Ethernet Units, Serial Communications Units, Controller Link Units, etc.)                                                                                                                                                                                                                                                                                                                                     | The CPU BUS UNIT I/O REFRESH instruction (DLNK(226)) can be used at one or more locations in the ladder program. This enables refreshing words allocated to CPU Bus Units in the CIO Area (25 words) whenever necessary, in the same way that the IORF instruction is used for other Units.                                                                                                                                                                                                                                               |



|                      | Purpose                                                                                                                                                                         | Function                                                                                                                                                                                                                       |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Increasing structure | Using more tasks                                                                                                                                                                | Define interrupt tasks as cyclic tasks (called "extra cyclic tasks").                                                                                                                                                          |
|                      | Reducing the cycle time even with structured programs using many tasks                                                                                                          | Use shared index and data registers.                                                                                                                                                                                           |
|                      | Using the same index or data registers in different tasks without saving and loading register contents                                                                          |                                                                                                                                                                                                                                |
|                      | Initializing processing when a task is started                                                                                                                                  | Use the Task Start Flags.                                                                                                                                                                                                      |
|                      | Using standard processing shared by more than one task                                                                                                                          | Use a global subroutine (GSBN to GRET) in interrupt task number 0.                                                                                                                                                             |
|                      | Standardization and program structure based on subroutines                                                                                                                      | Increase speed using subroutine instructions (SBS, SBN, and RET) and global subroutine instructions (GSBS, GSBN, and GRET)                                                                                                     |
| Special applications | Displaying floating-point decimal data on a PT                                                                                                                                  | Use the FLOATING- POINT TO ASCII instruction.                                                                                                                                                                                  |
|                      | Using text string data from measurement devices in calculations                                                                                                                 | Use the ASCII TO FLOATING-POINT instruction.                                                                                                                                                                                   |
|                      | Performing high-precision positioning, e.g., for XY tables                                                                                                                      | Use the Double-precision Floating-point instructions.                                                                                                                                                                          |
|                      | Managing information on workpieces flowing on a conveyer in realtime in table form, e.g., when workpieces are added or removed from the conveyor during processing              | Use the stack instructions.<br>STACK DATA READ, STACK DATA OVERWRITE, STACK DATA INSERT, and STACK DATA DELETE (Operate on a specified element in the stack.)<br>STACK SIZE READ (Counts the number of elements in the stack.) |
|                      | Performing high-precision linear approximations, e.g., converting a level meter reading in mm to a capacity value in liters according to the shape of a tank                    | Use the ARITHMETIC PROCESS instruction (unsigned 16-bit binary/BCD data, signed 16/32-bit binary data, or single-precision floating-point data can be used for line data).                                                     |
|                      | Autotuning PID constants (particularly to automatically tune PID constants and start the system faster when using multiloop PID)                                                | Use the PID CONTROL WITH AUTO TUNING instruction.                                                                                                                                                                              |
|                      | Saving and loading execution results (e.g., from comparison instructions) at different locations in a task or in different tasks                                                | Use the SAVE CONDITION FLAGS (CCS) and LOAD CONDITION FLAGS (CCL) instructions to save the current status of the Condition Flags or load the previous status.                                                                  |
|                      | Using a CVM1/CV-series program containing real I/O memory addresses in a CS-series CPU Unit                                                                                     | Use the CONVERT ADDRESS FROM CV (FRMCV) instruction.                                                                                                                                                                           |
|                      | Using I/O memory tables containing CVM1/CV-series real I/O memory addresses (e.g., to return the data to a CVM1/CV-series CPU Unit after processing by the CS-series CPU Unit). | Use the CONVERT ADDRESS TO CV (TOCV) instruction.                                                                                                                                                                              |
|                      | Disabling power interruptions during specific regions of the program                                                                                                            | Create program sections for which power interrupts have been disabled with the DI and EI instructions (set A530 to A5A5 Hex).                                                                                                  |

| Purpose                                     |                                                                                                                                                      | Function                                                                                                                                                                                               |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Debug-<br>ging and<br>main-<br>te-<br>nance | Not including user-defined FAL errors in the error log, e.g., when monitoring errors on a PT (System FAL errors will be included.)                   | Set the PLC Setup to not include user-defined FAL errors in the error log.                                                                                                                             |
|                                             | Simulating errors in the CPU Unit when debugging the system, e.g., to check error messages displayed on a PT                                         | Use FAL/FALS to simulate fatal and nonfatal system errors.                                                                                                                                             |
|                                             | Backing up data from Units/Boards other than the CPU Unit, e.g., DeviceNet Units, Serial Communications Units, etc.                                  | Use the simple backup operation, which includes data from specific Units/Boards (including device parameters from DeviceNet Units, protocol macro data from Serial Communications Units/Boards, etc.). |
|                                             | Finding errors occurring when creating I/O tables                                                                                                    | Use the detailed error information for I/O table creation stored in the AR Area.                                                                                                                       |
|                                             | Using battery-free operation (ROM operation) without a Memory Card                                                                                   | Use the automatic program/parameter area backup function to flash memory in the CPU Unit.                                                                                                              |
|                                             | Starting CPU Unit operation without waiting for Units/Boards with long startup times to complete startup processing (e.g., CS1 Bus Interface Boards) | Use the startup condition settings (allowing the CPU Unit to startup immediately in RUN or MONITOR mode even when startup processing has not been completed for other Units/Boards).                   |

## 1-7 Comparison of CS-series PLCs and C200HX/HG/HE Operation

Operation of the CS-series PLCs differs from that of the C200HX/HG/HE PLCs in several basic points, which are outlined in the following table. Refer to *Appendix A PLC Comparison* in the CS/CJ Series Programming Manual (W394) for differences between the CJ-series, CS-series, C200HX/HG/HE, CQM1H, and CV-series PLCs.

| Item              |                                                        | C200HX/HG/HE PLCs                                                                                                                                                                                                                                                                                                                                                                | CS-series PLCs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program Structure | Single program vs. multiple tasks                      | The program is executed as a single unit each cycle.<br>Interrupt programs are executed as subroutines with subroutine numbers 00 to 15 (I/O interrupts) and 99 (scheduled interrupt).<br>Both I/O interrupt (up to 16) and scheduled interrupt (just 1) programs are supported.                                                                                                 | In CS-series PLCs, the program is divided into tasks (cyclic tasks) that are executed in order when they are enabled. Interrupt programs are also entered as tasks (interrupt tasks).<br>The operation of a CS-series PLC is the same as a C200HX/HG/HE PLC when just one cyclic task (or extra cyclic task) is enabled.<br>CS-series PLCs support up to 32 cyclic tasks, 32 I/O interrupt tasks, 2 scheduled interrupt tasks, 1 power OFF interrupt task, and 256 external interrupt tasks.<br>With the CS1-H CPU Units, up to 255 interrupt tasks can be defined as cyclic tasks (called "extra cyclic tasks"). Thus, up to 288 extra cyclic tasks can be created (including normal cyclic tasks and extra cyclic tasks). |
| I/O allocation    | I/O Table Registration is supported in CS-series PLCs. | I/O allocation is determined solely by the slot location of Basic I/O Units and the unit number settings on Special I/O Units. IR Area words are automatically allocated to I/O Units and Special I/O Units without performing the I/O Table Registration operation.<br>(The I/O Table Registration operation is used to prevent Units from being installed in the wrong slots.) | In CS-series PLCs, word allocation doesn't depend only on slot position, and it isn't necessary to allocate words to an empty slot. If a Unit requires several words, those words can be allocated.<br>When a CS-series PLC is being used, the I/O Table Registration operation must be executed. If it isn't executed, the CPU Unit won't recognize each Basic I/O Unit, Special I/O Unit, and CS-series CPU Bus Unit that has been installed.                                                                                                                                                                                                                                                                             |

| Item       |                           |                                                                 | C200HX/HG/HE PLCs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | CS-series PLCs                                                                                                                                                                                                                                                                                        |
|------------|---------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Areas | CIO Area                  | I/O Area                                                        | IR 000 to IR 029,<br>IR 300 to IR 309<br>(Unlike the CS Series, word allocation is fixed.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CIO 0000 to CIO 0319 (CIO 0000 to CIO 0999 can be set if the first word on the Rack is set.)<br>(Unlike the C200HX/HG/HE PLCs, word allocation is flexible.)                                                                                                                                          |
|            |                           | C200H Group-2 High-density I/O Unit and B7A Interface Unit Area | IR 030 to IR 049,<br>IR 330 to IR 341<br>(These words are allocated to C200H Group-2 High-density I/O Units.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | None<br>(These words are allocated in the I/O Area.)                                                                                                                                                                                                                                                  |
|            |                           | Special I/O Unit Area                                           | IR 100 to IR 199,<br>IR 400 to IR 459                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CIO 2000 to CIO 2959                                                                                                                                                                                                                                                                                  |
|            |                           | DeviceNet Area and SYSMAC BUS Area                              | IR 050 to IR 099<br>IR 350 to IR 399<br>(Can be used as the DeviceNet Area or SYSMAC BUS Area, but not both.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | DeviceNet Area:<br>CIO 0050 to CIO 0099,<br>CIO 0350 to CIO 0399<br>SYSMAC BUS Area:<br>CIO 3000 to CIO 3049                                                                                                                                                                                          |
|            |                           | PLC Link Words                                                  | SR 247 to SR 250 (in SR Area)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | CIO 0247 to CIO 0250 and A442                                                                                                                                                                                                                                                                         |
|            |                           | Optical I/O Unit and I/O Terminal Area                          | Optical I/O Unit and I/O Terminal Area: IR 200 to IR 231                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | I/O Terminal Area:<br>CIO 3100 to CIO 3131                                                                                                                                                                                                                                                            |
|            |                           | Work/Internal I/O Area                                          | Work Areas:<br>IR 310 to IR 329, IR 342 to IR 349,<br>and IR 460 to IR 511                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Internal I/O Area:<br>CIO 1200 to CIO 1499<br>CIO 3800 to CIO 6143                                                                                                                                                                                                                                    |
|            | Work Area (WR)            |                                                                 | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Work Area: W000 to W511<br>(No new functions will be assigned to this area in future CPU versions; this area has been set aside for use as work words and bits.)                                                                                                                                      |
|            | Temporary Relay Area (TR) |                                                                 | TR 00 to TR 07                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | TR 00 to TR 15                                                                                                                                                                                                                                                                                        |
|            | Holding Relay Area (HR)   |                                                                 | HR 00 to HR 99                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | H 000 to H 511                                                                                                                                                                                                                                                                                        |
|            | Special Relay Area (SR)   |                                                                 | Special Relay Area:<br>SR 236 to SR 255,<br>SR 256 to SR 299                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Auxiliary Area:<br>A 000 to A 959                                                                                                                                                                                                                                                                     |
|            | Auxiliary Relay Area (AR) |                                                                 | Auxiliary Relay Area:<br>AR 00 to AR 27                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                       |
|            | Link Relay Area (LR)      |                                                                 | Link Relay Area: LR 00 to LR 63                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Link Area: CIO 1000 to CIO 1199                                                                                                                                                                                                                                                                       |
|            | DM Area                   |                                                                 | DM 0000 to DM 6143 (Normal DM):<br>Words in this range can be read and written by instructions and Programming Devices, although DM 6000 to DM 6030 are used for the Error Log and DM 1000 to DM 2599 are used by Special I/O Units.<br>DM 6144 to DM 6655 (Fixed DM):<br>Words in this range are read-only for instructions and can be read or written by Programming Devices.<br>DM 6550 to DM 6559 and DM 6600 to DM 6655 are used for the PLC Setup. The Programming Console can be used to convert up to 3,000 words from the user program area (UM) to Fixed DM words (DM 7000 to DM 9999). | D00000 to D32767<br>D20000 to D29599 are used by Special I/O Units, D30000 to D31599 are used by CS-series CPU Bus Units, and D32000 to D32099 are used by Inner Boards.<br><br>The Error Log is stored in A100 to A199 and the PLC Setup is stored in the Parameter Area (not a part of I/O Memory). |

| Item                            |                                               | C200HX/HG/HE PLCs                                                                                                                                               | CS-series PLCs                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Areas, continued           | EM Area                                       | EM 0000 to EM 6143<br>(3 banks max., 16 banks max. for ZE-version PLCs)<br>Basically, those EM Area instructions access the current bank, which can be changed. | E00000 to E32767<br>(13 banks max.)<br>Regular instructions can access data in the current bank or any other bank.<br>Part of the EM Area can be converted for use as file memory.                                                                                                                             |
|                                 | Timer Area                                    | Timer/Counter Area:<br>T/C 000 to T/C 511                                                                                                                       | T0000 to T4095                                                                                                                                                                                                                                                                                                 |
|                                 | Counter Area                                  | (Timers and counters share the same numbers.)                                                                                                                   | C0000 to C4095<br>(Timer and counter numbers are independent.)                                                                                                                                                                                                                                                 |
|                                 | Task Flag Area                                | None                                                                                                                                                            | TK00 to TK31                                                                                                                                                                                                                                                                                                   |
|                                 | Index Registers                               | None                                                                                                                                                            | IR0 to IR15                                                                                                                                                                                                                                                                                                    |
|                                 | Data Registers                                | None                                                                                                                                                            | DR0 to DR15                                                                                                                                                                                                                                                                                                    |
| Flags and Clock Pulses          | Arithmetic Flags (such as ER, EQ, and CY)     | Part of the SR Area                                                                                                                                             | Condition Flags:<br>In the CS Series, these Flags are in a separate area and are specified by labels rather than addresses. With the CX-Programmer, these are specified using global symbols, such as "P_ER" and "P_EQ." With a Programming Console, they are specified using "ER," "=", etc.                  |
|                                 | Clock pulses                                  | Part of the SR Area                                                                                                                                             | Clock Pulses:<br>In the CS-series PLCs these pulses are in a separate area and are specified by labels such as "P_1s" and "P_0_1s" rather than addresses.                                                                                                                                                      |
| PLC Setup                       | C200HX/HG/HE: DM Area<br>CS: Special Area     | The PLC Setup is stored in the DM Area (DM 6550 to DM 6559 and DM 6600 to DM 6655), so PLC Setup settings are made directly by specifying DM addresses.         | In the CS Series, the PLC Setup isn't stored in the DM Area, but a separate area (the Parameter Area) which isn't a part of I/O memory. The PLC Setup is edited with CX-Programmer in a table format and user-friendly dialogue. Individual PLC Setup addresses can also be edited with a Programming Console. |
| Instruction variations          | Up-differentiation                            | Supported                                                                                                                                                       | Supported<br>Including LD NOT, AND NOT, and OR NOT for CS1-H CPU Units.                                                                                                                                                                                                                                        |
|                                 | Down-differentiation                          | Supported                                                                                                                                                       | Supported for LD, AND, OR, RSET, and SET<br>Including LD NOT, AND NOT, and OR NOT for CS1-H CPU Units.                                                                                                                                                                                                         |
|                                 | Immediate refreshing                          | Not supported                                                                                                                                                   | Supported for LD, LD NOT, AND, AND NOT, OR, OR NOT, OUT, OUT NOT, RSET, SET, KEEP, DIFU, DIFD, CMP, CPS, and MOV                                                                                                                                                                                               |
|                                 | Up-differentiation and immediate refreshing   | Not supported                                                                                                                                                   | Supported for LD, LD NOT, AND, AND NOT, OR, OR NOT, RSET, SET, and MOV                                                                                                                                                                                                                                         |
|                                 | Down-differentiation and immediate refreshing | Not supported                                                                                                                                                   | Supported for LD, LD NOT, AND, AND NOT, OR, OR NOT, RSET, and SET                                                                                                                                                                                                                                              |
| Instruction operand data format |                                               | Basically operands are specified in BCD. In XFER(070), for example, the number of words is specified in BCD (0001 to 9999).                                     | Basically operands are specified in binary. In XFER(070), for example, the number of words is specified in binary (0001 to FFFF or 1 to 65,535 decimal).                                                                                                                                                       |

| Item                                         |                       | C200HX/HG/HE PLCs                                                                                                                                                                                                    | CS-series PLCs                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specifying operands requiring multiple words |                       | If an operand requiring multiple words is specified at the end of an area so that there are not enough words left in the area for the operand, the instruction will not be executed and the Error Flag will turn ON. | If an operand requiring multiple words is specified at the end of an area so that there are not enough words left in the area for the operand, the instruction can be executed and the Error Flag will not turn ON. The program, however, is checked when transferred from the CX-Programmer to the CPU Unit and cannot be transferred with incorrect operand specifications. Such programs also cannot be read from the CPU Unit. |
| Instructions                                 | Sequence Input        | Up and down-differentiated versions of LD, AND, and OR are not supported.<br>TST and TSTN not supported.                                                                                                             | Up and down-differentiated versions of LD, AND, and OR are supported.<br>TST and TSTN supported.                                                                                                                                                                                                                                                                                                                                   |
|                                              | Sequence Output       | SETA and RSTA not supported.                                                                                                                                                                                         | SETA and RSTA supported.<br>With the CS1-H CPU Units, bit addresses can be specified in the DM and EM areas using OUT, SET, and RSET.                                                                                                                                                                                                                                                                                              |
|                                              | Sequence Control      | CJP and CJPN not supported.                                                                                                                                                                                          | CJP and CJPN supported.                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                              | Timer/Counter         | TIML, MTIM, TMHH, and CNR not supported.                                                                                                                                                                             | TIML, MTIM, TMHH, and CNTR supported.                                                                                                                                                                                                                                                                                                                                                                                              |
|                                              | Comparison            | Input Comparison Instructions not supported.                                                                                                                                                                         | Input Comparison Instructions supported. ZCP and ZCPL supported for CS1-H CPU Units.                                                                                                                                                                                                                                                                                                                                               |
|                                              | Data Movement         | MOVL, MVNL, and XCGL not supported.                                                                                                                                                                                  | MOVL, MVNL, and XCGL supported.                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                              | Data Shift            | NSFL/NSFR, NASL/NASR, NSLL/NSRL, ASLL/ASRL, ROLL/RORL, RLNC/RRNC, and RLNL/RRNL not supported.                                                                                                                       | NSFL/NSFR, NASL/NASR, NSLL/NSRL, ASLL/ASRL, ROLL/RORL, RLNC/RRNC, and RLNL/RRNL supported.<br>ASFT can be executed in the background for CS1-H CPU Units.                                                                                                                                                                                                                                                                          |
|                                              | Increment/Decrement   | ++, ++L, --, --L, ++BL, and --BL not supported.                                                                                                                                                                      | ++, ++L, --, --L, ++BL, and --BL supported.                                                                                                                                                                                                                                                                                                                                                                                        |
|                                              | Symbol Math           | The same in both series.                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                              | Conversion            | SIGN, BINS, BCDS, BISL, and BDSL not supported.                                                                                                                                                                      | SIGN, BINS, BCDS, BISL, and BDSL supported.                                                                                                                                                                                                                                                                                                                                                                                        |
|                                              | Logic                 | ANDL, ORWL, XORL, XNRL, and COML not supported.                                                                                                                                                                      | ANDL, ORWL, XORL, XNRL, and COML supported.                                                                                                                                                                                                                                                                                                                                                                                        |
|                                              | Special Math          | ROTB not supported.                                                                                                                                                                                                  | ROTB supported.<br>SAVE CONDITION FLAGS (CCS) and LOAD CONDITION FLAGS (CCL) supported by CS1-H CPU Units.                                                                                                                                                                                                                                                                                                                         |
|                                              | Floating-point Math   | Not supported.                                                                                                                                                                                                       | Supported.<br>Floating-point math, floating-point to/from ASCII conversions, and double-precision floating-point math supported by CS1-H CPU Units.                                                                                                                                                                                                                                                                                |
|                                              | Table Data Processing | SSET, PUSH, LIFO, and FIFO not supported.                                                                                                                                                                            | SSET, PUSH, LIFO, and FIFO supported.<br>Stack insertions/deletions/replacements and stack counts supported by CS1-H CPU Units.<br>Background execution of SRCH, SWAP, MAX, MIN, SUM, and FCS supported by CS1-H CPU Units.                                                                                                                                                                                                        |
|                                              | Data Control          | SCL2 and SCL3 not supported.                                                                                                                                                                                         | SCL2 and SCL3 supported.<br>PID with autotuning supported by CS1-H CPU Units.                                                                                                                                                                                                                                                                                                                                                      |
|                                              | Subroutines           | The same in both series.                                                                                                                                                                                             | Global subroutines (GSBS, GSBN, and GRET) supported by CS1-H CPU Units.                                                                                                                                                                                                                                                                                                                                                            |
|                                              | Interrupt Control     | Interrupts controlled using one instruction (INT).                                                                                                                                                                   | Interrupts controlled using CLI, MSKS, and MSKR.                                                                                                                                                                                                                                                                                                                                                                                   |

| Item                              |                        | C200HX/HG/HE PLCs                                                                                                                                                                                                           | CS-series PLCs                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instructions, continued           | Step                   | The same in both series, although the specified control bit must be in the WR Area in CS-series PLCs.                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                   | I/O Units              | TKY, HKY, DSW, and CMCR supported.                                                                                                                                                                                          | TKY, HKY, DSW, and CMCR not supported. CPU BUS UNIT I/O REFRESH (DLNK(226)) supported by CS1-H CPU Units.                                                                                                                                                                                                                                                                                                                                                                   |
|                                   | Network                | CMND not supported.                                                                                                                                                                                                         | CMND supported.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                   | File Memory            | Not supported.                                                                                                                                                                                                              | Supported.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                   | Display                | LMSG (32-character message display) supported.                                                                                                                                                                              | MSG (32-character message display) available, but only 16 characters displayed on a Programming Console.                                                                                                                                                                                                                                                                                                                                                                    |
|                                   | Clock                  | CADD, CSUB, and DATE not supported.                                                                                                                                                                                         | CADD, CSUB, and DATE supported.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                   | Debugging              | The same in both series.                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                   | Failure Diagnosis      | The same in both series.                                                                                                                                                                                                    | Not storing user-defined FAL errors in the error log supported by CS1-H CPU Units. FAL/FALS error simulation supported by CS1-H CPU Units.                                                                                                                                                                                                                                                                                                                                  |
|                                   | Special                | XDMR and IEMS supported.                                                                                                                                                                                                    | SCAN not available                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                   | Block Programming      | Not supported.                                                                                                                                                                                                              | Supported.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                   | Text String Processing | Not supported.                                                                                                                                                                                                              | Supported. Background execution supported by CS1-H CPU Units.                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                   | Task Control           | Not supported.                                                                                                                                                                                                              | Supported.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| I/O Comment storage               |                        | A Programming Device can be used to divide the UM Area (user program memory area) into a program area, I/O comment area, and Expansion DM area. I/O comments can be stored in that I/O comment area.                        | In the CS-series PLCs, I/O comments can be stored in Memory Cards or EM file memory as variable files.                                                                                                                                                                                                                                                                                                                                                                      |
| Battery installation              |                        | A battery is installed in the CPU Unit when it is shipped from the factory.                                                                                                                                                 | The battery is not installed when a CS1 CPU Unit is shipped from the factory. Install the provided battery before using the PLC.<br><br>A battery is installed in a CS1-H CPU Unit when it is shipped from the factory, the same as it is for a C200HX/HG/HE CPU Unit.                                                                                                                                                                                                      |
| Clock function                    |                        | The internal clock is set when the PLC is shipped from the factory.                                                                                                                                                         | When the battery is installed in a CS1 CPU Unit, the clock will begin from an arbitrary value. Set the clock with a Programming Device or the DATE(735) instruction.<br><br>The internal clock is set when a CS1-H CPU Unit is shipped from the factory, the same as it is for a C200HX/HG/HE CPU Unit.                                                                                                                                                                     |
| Memory Cards and Memory Cassettes | I/O Memory             | All of I/O Memory can be saved to an EEPROM Memory Cassette by turning ON a control bit in the SR Area. A Programming Device (other than a Programming Console) can be used to read the data back from the Memory Cassette. | Any range of I/O Memory can be saved as a file in a Memory Card (flash ROM) or EM file memory with a Programming Device (including Programming Consoles) or the instruction provided for this operation. (With the -EV1 or later CS1 CPU Units and all CS1-H CPU Units, these files can also be saved in CSV or text format.) A Programming Device or instruction can be used to read the data from file memory. These operations can also be performed with FINS commands. |

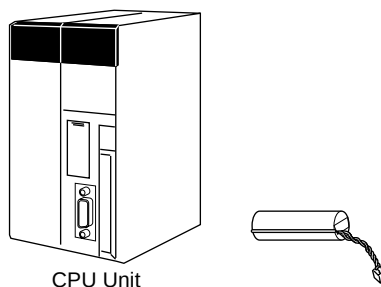
| Item                              |              | C200HX/HG/HE PLCs |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | CS-series PLCs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |                                                                                            |                                                                                                                                                                                                                                |
|-----------------------------------|--------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memory Cards and Memory Cassettes | User program |                   | The entire program can be saved to an EEPROM Memory Cassette by turning ON a control bit in the SR Area. A Programming Device (other than a Programming Console) can be used to read the data back from the Memory Cassette.<br><br>A standard EPROM Writer can be used to save the entire program to an EPROM Memory Cassette. A Programming Device can be used to read the data back from the Memory Cassette.<br><br>The PLC can be set to automatically read the entire program from the Memory Cassette (EEPROM or EPROM) when the PLC is turned on.                        | The entire program can be saved as a file in a Memory Card (flash ROM) or EM file memory with a Programming Device (including Programming Consoles) or the instruction provided for this operation. A Programming Device or instruction can be used to read the program back from file memory.<br>These operations can also be performed with FINS commands.<br><br>The PLC can be set to automatically read the entire program from the Memory Card when the PLC is turned on.<br><br>With the -EV1 or later, it is also possible to read (i.e., replace) the entire user program from the Memory Card during PLC operation. |                 |                                                                                            |                                                                                                                                                                                                                                |
|                                   |              |                   | Serial communications (peripheral port or RS-232C ports)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Peripheral port | Host link, customer (Programming Console and peripheral bus are automatically recognized.) | Host Link, peripheral bus, NT Link (1:N), (Programming Console and peripheral bus are automatically recognized.)<br><br>Custom protocols are not possible for the peripheral port.                                             |
|                                   |              |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | RS-232C port    | Host Link, NT Link (1:1), NT Link (1:N), custom, 1:1 link master, 1:1 link slave           | Host Link, peripheral bus, NT Link (1:N), custom 1:1 links and Programming Console are not supported for the RS-232C port.                                                                                                     |
|                                   |              |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Baud rate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Peripheral port | 2,400/4,800/9,600/19,200 bps                                                               | 300/600/1,200/2,400/4,800/9,600/19,200/38,400/57,600/115,200 bps<br><br>Baud rates of 38,400/57,600/ 115,200 bps are not standard for RS-232C. Your computer may not support these speeds. Use slower baud rates if necessary. |
|                                   |              | RS-232C port      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                                                                                            |                                                                                                                                                                                                                                |
| Interrupt control modes           |              |                   | There are two interrupt modes in C200HX/HG/HE PLCs: normal interrupt mode and high-speed interrupt mode.<br><br>Normal Interrupt Mode:<br>In this mode, the interrupt is not executed until the current process (Host Link servicing, Remote I/O servicing, Special I/O Unit servicing, or execution of an instruction) is completed.<br><br>High-speed Interrupt Mode:<br>In this mode, the interrupt stops the current process (Host Link servicing, Remote I/O servicing, Special I/O Unit servicing, or execution of an instruction) and executes the interrupt immediately. | CS-series PLCs operate in high-speed interrupt mode only. If an interrupt occurs during peripheral servicing, I/O refreshing, or execution of an instruction, that process will be stopped immediately and the task will be executed instead.<br><br>With CS1-H CPU Units, interrupt processing will also wait for completion of the BLOCK TRANSFER (XFER), BLOCK SET (BSET), and BIT COUNTER (BCNT) instructions.                                                                                                                                                                                                            |                 |                                                                                            |                                                                                                                                                                                                                                |

| Item                | C200HX/HG/HE PLCs                                                                                                                                                                                                                                     | CS-series PLCs                                                                                                                                                                                                                                                                                                                                                            |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPU processing mode | Normal Mode only (including instruction execution followed by I/O refreshing and peripheral servicing)<br>Peripheral servicing include servicing the RS-232C port, Host Link, peripheral bus, and Communications Units (e.g., Controller Link Units). | CS1 CPU Units: Normal Mode or Peripheral Servicing Priority Mode<br>CS1-H CPU Units: Normal Mode, Parallel Processing Mode with Asynchronous Memory Access, Parallel Processing Mode with Synchronous Memory Access, or Peripheral Servicing Priority Mode (Parallel processing executes peripheral servicing in parallel with instruction execution and I/O refreshing.) |
| Startup mode        | RUN mode was entered if the Startup Mode was set in the PLC Setup to 00: Switch Setting on Programming Console and the CPU Unit was started without a Programming Console connected.                                                                  | A CS1 CPU Unit will start in PROGRAM mode if the Startup Mode is set in the PLC Setup to PRCH: Switch Setting on Programming Console (default setting) and the CPU Unit is started without a Programming Console connected.<br>A CS1-H CPU Unit will start in RUN mode under the same conditions.                                                                         |

## 1-8 Checking the Package

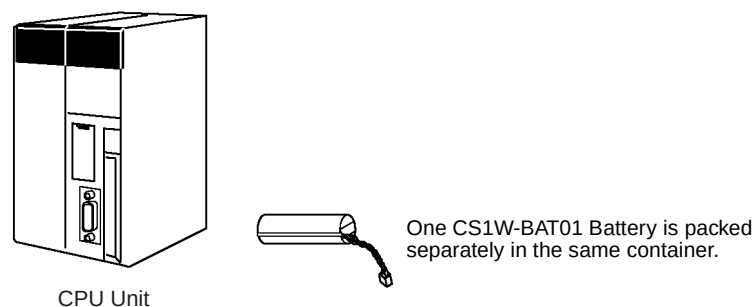
Check to be sure that the CPU Unit and Battery Unit are in good shape without any damage.

### CS1-H CPU Units



**Note** The CS1W-BAT01 will already be installed in the CPU Unit.

### CS1 CPU Units



**Note** The Battery Set is required to backup the user program in the RAM memory, the contents of the PLC Setup, the I/O memory holding areas, etc., when the power supply is turned OFF.



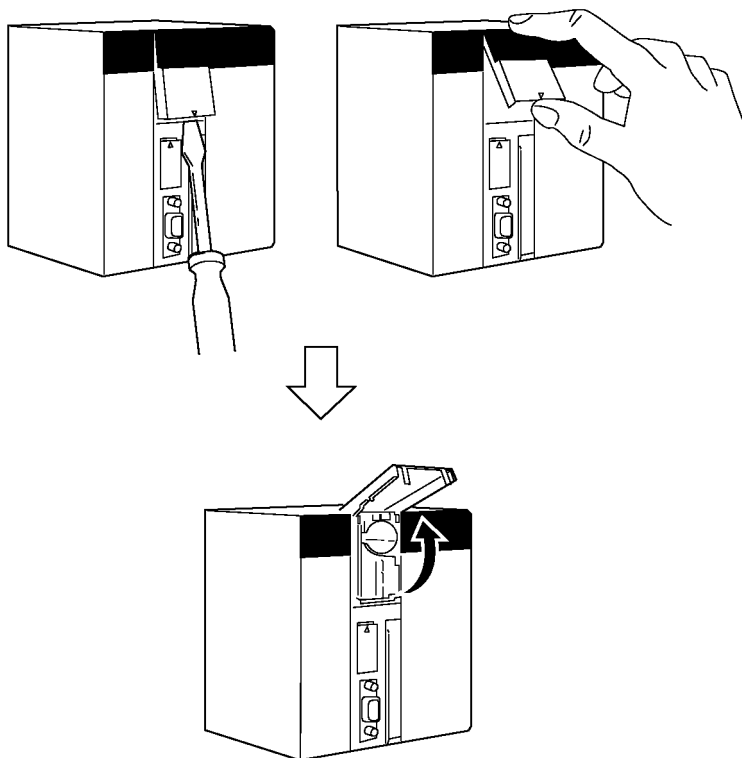
## 1-9 Initial Setup for CS1 CPU Units

Before using a CS1 CPU Unit, you must install the Battery Set in the CPU Unit using the following procedure.

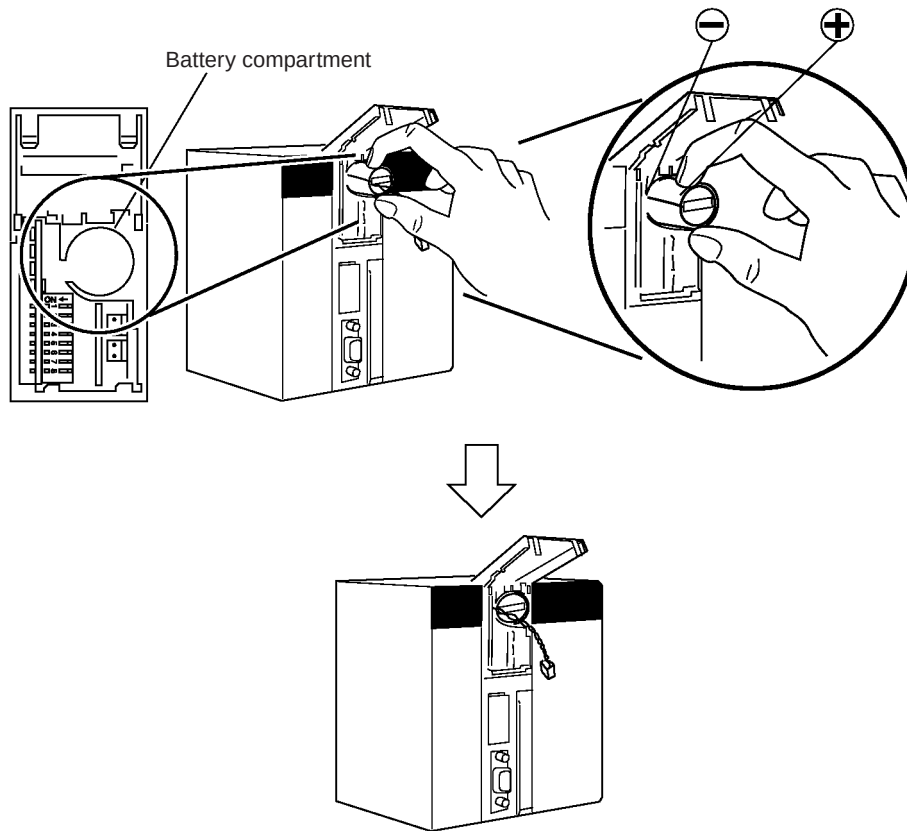
**Note** A Battery is installed to a CS1-H CPU Unit when it is shipped from the factory. There is no need to clear memory or set the time.

### Battery Installation

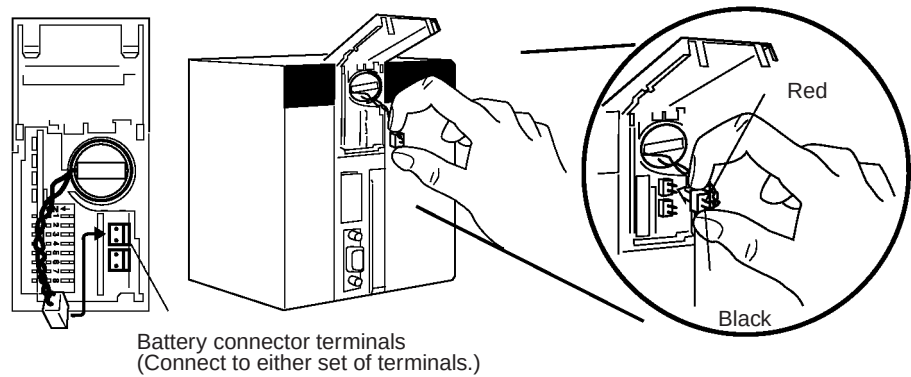
- 1,2,3...** 1. Insert a flat-blade screwdriver in the small gap at the bottom of the battery compartment and flip the cover upward to open it.



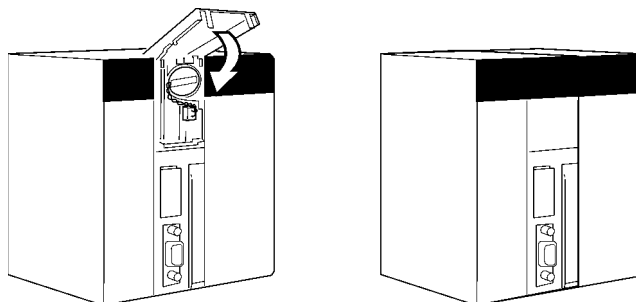
2. Hold the Battery Set with the cable facing outward and insert it into the battery compartment.



3. Connect the battery connector to the battery connector terminals. Connect the red wire to the top and the black wire to the bottom terminal. There are two sets of battery connector terminals; connect the battery to either one. It does not matter whether the top terminals or bottom terminals are used.



4. Fold in the cable and close the cover.



## Clearing Memory

After installing the battery, clear memory using the memory clear operation to initialize the RAM inside the CS1 CPU Unit.

### Programming Console

Use the following procedure from a Programming Console.



**Note** You cannot specify more than one cyclic task when clearing memory from a Programming Console. You can specify one cyclic task and one interrupt task, or one cyclic task and no interrupt task. Refer to *4-2 Examples* for more information on the memory clear operation. Refer to *SECTION 6 DIP Switch Settings* and *SECTION 11 Troubleshooting* for more information on tasks.

### CX-Programmer

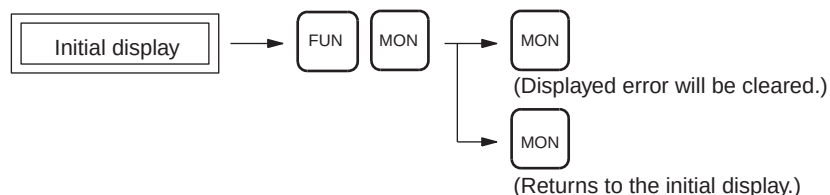
Memory can also be cleared from the CX-Programmer. Refer to the *CX-Programmer Operation Manual* for the actual procedure.

## Clearing Errors

After clearing memory, clear any errors from the CPU Unit, including the low battery voltage error.

### Programming Console

Use the following procedure from a Programming Console.



### CX-Programmer

Errors can also be cleared from the CX-Programmer. Refer to the *CX-Programmer Operation Manual* for the actual procedure.

**Note** When an Inner Board is mounted, an Inner Board routing table error may continue even after you have cancelled the error using the CX-Programmer. (A42407 will be ON for a Serial Communications Board.) If this occurs, either reset the power or restart the Inner Board, then cancel the error again.

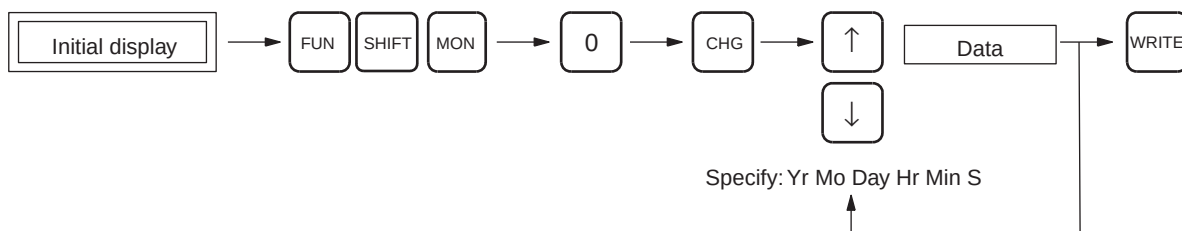
## 1-10 Using the Internal Clock

The internal clock of a CS1 CPU Unit is set to “00 year, 01 month, 01 day (00-01-01), 00 hours, 00 minutes, 00 seconds (00:00:00), and Sunday (SUN)” when the Battery Set is mounted in the CPU Unit.

When using the internal clock, turn ON the power supply after mounting the Battery Set and 1) use a Programming Device (Programming Console or CX-Programmer) to set the clock time, 2) execute the CLOCK ADJUSTMENT (DATE) instruction, or 3) send a FINS command to start the internal clock from the correct current time and date.

The Programming Console operation used to set the internal clock is shown below.

### Key Sequence





## SECTION 2

# Specifications and System Configuration

This section provides tables of standard models, Unit specifications, system configurations, and a comparison between different Units.

|       |                                          |     |
|-------|------------------------------------------|-----|
| 2-1   | Specifications .....                     | 42  |
| 2-1-1 | CPU Unit Specifications.....             | 42  |
| 2-1-2 | General Specifications .....             | 50  |
| 2-2   | CPU Unit Components .....                | 52  |
| 2-2-1 | Components .....                         | 52  |
| 2-2-2 | CS-series CPU Unit Capabilities .....    | 55  |
| 2-2-3 | Unit Classifications.....                | 56  |
| 2-2-4 | Data Communications .....                | 56  |
| 2-3   | Basic System Configuration .....         | 57  |
| 2-3-1 | Basic System Configuration.....          | 57  |
| 2-3-2 | CPU Rack .....                           | 60  |
| 2-3-3 | Expansion Racks.....                     | 64  |
| 2-3-4 | SYSMAC BUS Slave Racks.....              | 71  |
| 2-4   | Units .....                              | 74  |
| 2-4-1 | Basic I/O Units .....                    | 74  |
| 2-4-2 | Special I/O Units.....                   | 80  |
| 2-4-3 | CS-series CPU Bus Units .....            | 85  |
| 2-5   | Expanded System Configuration.....       | 86  |
| 2-5-1 | Serial Communications System .....       | 86  |
| 2-5-2 | Systems.....                             | 87  |
| 2-5-3 | Communications Network System .....      | 95  |
| 2-6   | Unit Current Consumption .....           | 99  |
| 2-6-1 | CPU Racks and Expansion Racks .....      | 99  |
| 2-6-2 | SYSMAC BUS Remote I/O Slave Racks.....   | 100 |
| 2-6-3 | Example Calculations.....                | 100 |
| 2-6-4 | Current Consumption Tables .....         | 102 |
| 2-7   | CPU Bus Unit Setting Area Capacity ..... | 110 |
| 2-8   | I/O Table Settings .....                 | 111 |
| 2-8-1 | Basic I/O Units .....                    | 111 |
| 2-8-2 | C200H Special I/O Units .....            | 112 |
| 2-8-3 | CS-series Special I/O Units .....        | 114 |
| 2-8-4 | CS-series CPU Bus Units .....            | 114 |

## 2-1 Specifications

### 2-1-1 CPU Unit Specifications

#### CPU Unit Comparison

##### CS1-H CPU Units

| CPU                                     | CS1H-CPU67H                                  | CS1H-CPU66H                                 | CS1H-CPU65H                                 | CS1H-CPU64H                                 | CS1H-CPU63H | CS1G-CPU45H                                 | CS1G-CPU44H                                 | CS1G-CPU43H | CS1G-CPU42H |
|-----------------------------------------|----------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|-------------|---------------------------------------------|---------------------------------------------|-------------|-------------|
| I/O bits                                | 5120                                         |                                             |                                             |                                             |             |                                             | 1280                                        | 960         |             |
| User program memory (steps) (See note.) | 250K                                         | 120K                                        | 60K                                         | 30K                                         | 20K         | 60K                                         | 30K                                         | 20K         | 10K         |
| Data memory                             | 32K words                                    |                                             |                                             |                                             |             |                                             |                                             |             |             |
| Extended data memory                    | 32K words x 13 banks<br>E0_00000 to E6_32767 | 32K words x 7 banks<br>E0_00000 to E6_32767 | 32K words x 3 banks<br>E0_00000 to E2_32767 | 32K words x 1 banks<br>E0_00000 to E0_32767 |             | 32K words x 3 banks<br>E0_00000 to E2_32767 | 32K words x 1 banks<br>E0_00000 to E2_32767 |             |             |
| Current consumption                     | 0.82 A at 5 V DC                             |                                             |                                             |                                             |             | 0.78 A at 5 V DC                            |                                             |             |             |

##### CS1 CPU Units

| CPU                                     | CS1H-CPU67-EV1                               | CS1H-CPU66-EV1                              | CS1H-CPU65-EV1                              | CS1H-CPU64-EV1                              | CS1H-CPU63-EV1 | CS1G-CPU45-EV1                              | CS1G-CPU44-EV1                              | CS1G-CPU43-EV1 | CS1G-CPU42-EV1 |
|-----------------------------------------|----------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|----------------|---------------------------------------------|---------------------------------------------|----------------|----------------|
| I/O bits                                | 5120                                         |                                             |                                             |                                             |                |                                             | 1280                                        | 960            |                |
| User program memory (steps) (See note.) | 250K                                         | 120K                                        | 60K                                         | 30K                                         | 20K            | 60K                                         | 30K                                         | 20K            | 10K            |
| Data memory                             | 32K words                                    |                                             |                                             |                                             |                |                                             |                                             |                |                |
| Extended data memory                    | 32K words x 13 banks<br>E0_00000 to E6_32767 | 32K words x 7 banks<br>E0_00000 to E6_32767 | 32K words x 3 banks<br>E0_00000 to E2_32767 | 32K words x 1 banks<br>E0_00000 to E0_32767 | Not supported  | 32K words x 3 banks<br>E0_00000 to E2_32767 | 32K words x 1 banks<br>E0_00000 to E2_32767 | Not supported  | Not supported  |
| Current consumption                     | 1.10 A at 5 V DC                             |                                             |                                             |                                             |                | 0.95 A at 5 V DC                            |                                             |                |                |

**Note** The number of steps in a program is not the same as the number of instructions. For example, LD and OUT require 1 step each, but MOV(021) requires 3 steps. The program capacity indicates the total number of steps for all instructions in the program. Refer to *10-5 Instruction Execution Times and Number of Steps* for the number of steps required for each instruction.

## Common Specifications

| Item                                        | Specification                                                                                                                                                                                                                                                                                                                                                                         | Reference                                                                                              |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Control method                              | Stored program                                                                                                                                                                                                                                                                                                                                                                        | ---                                                                                                    |
| I/O control method                          | Cyclic scan and immediate processing are both possible.                                                                                                                                                                                                                                                                                                                               | ---                                                                                                    |
| Programming                                 | Ladder diagram                                                                                                                                                                                                                                                                                                                                                                        | ---                                                                                                    |
| CPU processing mode                         | CS1-H CPU Units: Normal Mode, Parallel Processing Mode with Asynchronous Memory Access, Parallel Processing Mode with Synchronous Memory Access, or Peripheral Servicing Priority Mode<br>CS1 CPU Units, Pre-version: Normal Mode only<br>CS1 CPU Units, Version 1 or later: Normal Mode or Peripheral Servicing Priority Mode                                                        | ---                                                                                                    |
| Instruction length                          | 1 to 7 steps per instruction                                                                                                                                                                                                                                                                                                                                                          | Steps and number of steps per instruction: <i>10-5 Instruction Execution Times and Number of Steps</i> |
| Ladder instructions                         | Approx. 400 (3-digit function codes)                                                                                                                                                                                                                                                                                                                                                  | ---                                                                                                    |
| Execution time                              | CS1-H CPU Units:<br>Basic instructions: 0.02 $\mu$ s min.<br>Special instructions: 0.06 $\mu$ s min.<br>CS1 CPU Units:<br>Basic instructions: 0.04 $\mu$ s min.<br>Special instructions: 0.12 $\mu$ s min.                                                                                                                                                                            | Instruction execution times: <i>10-5 Instruction Execution Times and Number of Steps</i>               |
| Overhead processing time                    | CS1-H CPU Units:<br>Normal mode: 0.3 ms min.<br>Parallel processing: 0.2 ms min.<br>CS1 CPU Units:<br>0.5 ms min.                                                                                                                                                                                                                                                                     | ---                                                                                                    |
| Number of Expansion Racks                   | 7 max. (C200H Expansion I/O Racks: 3 max.)                                                                                                                                                                                                                                                                                                                                            | Expansion Racks: <i>2-3-3 Expansion Racks</i>                                                          |
| Number of tasks                             | 288 (cyclic tasks: 32, interrupt tasks: 256)<br><b>Note</b> Cyclic tasks are executed each cycle and are controlled with TKON(820) and TKOF(821) instructions.<br><b>Note</b> The following 4 types of interrupt tasks are supported.<br>Power OFF interrupt tasks: 1 max.<br>Scheduled interrupt tasks: 2 max.<br>I/O interrupt tasks: 32 max.<br>External interrupt tasks: 256 max. | Tasks: <i>Programming Manual (W394)</i>                                                                |
| Interrupt types                             | Scheduled Interrupts:<br>Interrupts generated at a time scheduled by the CPU Unit's built-in timer.<br>I/O Interrupts:<br>Interrupts from Interrupt Input Units.<br>Power OFF Interrupts:<br>Interrupts executed when the CPU Unit's power is turned OFF.<br>External I/O Interrupts:<br>Interrupts from the Special I/O Units, CS-series CPU Bus Units, or the Inner Board.          |                                                                                                        |
| Calling subroutines from more than one task | CS1-H CPU Units: Supported.<br>CS1 CPU Units: Not supported                                                                                                                                                                                                                                                                                                                           |                                                                                                        |



| Item                         |                       | Specification                                                                                                                                                                                                                                                                                                                                                                      | Reference                              |                                                                               |
|------------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------|
| CIO<br>(Core<br>I/O)<br>Area | I/O Area              | 5,120: CIO 000000 to CIO 031915 (320 words from CIO 0000 to CIO 0319)<br><br>The setting of the first word can be changed from the default (CIO 0000) so that CIO 0000 to CIO 0999 can be used.<br>I/O bits are allocated to Basic I/O Units, such as CS-series Basic I/O Units, C200H Basic I/O Units, and C200H Group-2 High-density I/O Units.                                  | Input and output bits: 9-4<br>CIO Area | The CIO Area can be used as work bits if the bits are not used as shown here. |
|                              | C200H DeviceNet Area  | 1,600 (100 words):<br>Outputs: CIO 005000 to CIO 009915 (words CIO 0050 to CIO 0099)<br>Inputs: CIO 035000 to CIO 039915 (words CIO 0350 to CIO 0399)<br><br>C200H DeviceNet Area bits are allocated to Slaves according to C200HW-CRW21-V1 DeviceNet Unit remote I/O communications.                                                                                              | 9-5 C200H DeviceNet Area               |                                                                               |
|                              | PLC Link Area         | 80 bits (5 words): CIO 024700 to CIO 025015 (words CIO 0247 to CIO 0250 and CIO A442)<br><br>When a PLC Link Unit is used in a PLC Link, use these bits to monitor PLC Link errors and the operating status of other CPU Units in the PLC Link.                                                                                                                                    | 9-7 PLC Link Area                      |                                                                               |
|                              | Link Area             | 3,200 (200 words): CIO 10000 to CIO 119915 (words CIO 1000 to CIO 1199)<br><br>Link bits are used for data links and are allocated to Units in Controller Link Systems and PLC Link Systems.                                                                                                                                                                                       | 9-8 Data Link Area                     |                                                                               |
|                              | CPU Bus Unit Area     | 6,400 (400 words): CIO 150000 to CIO 189915 (words CIO 1500 to CIO 1899)<br><br>CS-series CPU Bus Unit bits store the operating status of CS-series CPU Bus Units.<br>(25 words per Unit, 16 Units max.)                                                                                                                                                                           | 9-9 CPU Bus Unit Area                  |                                                                               |
|                              | Special I/O Unit Area | 15,360 (960 words): CIO 200000 to CIO 295915 (words CIO 2000 to CIO 2959)<br><br>Special I/O Unit bits are allocated to CS-series Special I/O Units and C200H Special I/O Units. (See Note.)<br>(10 words per Unit, 96 Units max.)<br><br><b>Note</b> Special I/O Units are I/O Units that belong to a special group called "Special I/O Units." Examples: C200H-ID215/OD215/MD215 | 9-11 Special I/O Unit Area             |                                                                               |
|                              | Inner Board Area      | 1,600 (100 words): CIO 190000 to CIO 199915 (words CIO 1900 to CIO 1999)<br><br>Inner Board bits are allocated to Inner Boards. (100 I/O words max.)                                                                                                                                                                                                                               | 9-10 Inner Board Area                  |                                                                               |
|                              | SYSMAC BUS Area       | 800 (50 words): CIO 300000 to CIO 304915 (words CIO 3000 to CIO 3049)<br><br>SYSMAC BUS bits are allocated to Slave Racks connected to SYSMAC BUS Remote I/O Master Units. (10 words per Rack, 5 Racks max.)                                                                                                                                                                       | 9-12 SYSMAC BUS Area                   |                                                                               |
|                              | I/O Terminal Area     | 512 (32 words): CIO 310000 to CIO 313115 (words CIO 3100 to CIO 3131)<br><br>I/O Terminal bits are allocated to I/O Terminal Units (but not to Slave Racks) connected to SYSMAC BUS Remote I/O Master Units. (1 word per Terminal, 32 Terminals max.)                                                                                                                              | 9-13 I/O Terminal Area                 |                                                                               |

| Item                                         |                          | Specification                                                                                                                                                                                                                                                                                          | Reference                      |                                                               |
|----------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------|
| CIO<br>(Core I/O)<br>Area,<br>contin-<br>ued | CS-series DeviceNet Area | 9,600 (600 words): CIO 320000 to CIO 379915 (words CIO 3200 to CIO 3799)<br><br>CS-series DeviceNet Area bits are allocated to Slaves according to C200HW-CRW21-V1 DeviceNet Unit remote I/O communications.                                                                                           | 9-6 CS-series DeviceNet Area   |                                                               |
|                                              |                          | Fixed allocation 1                                                                                                                                                                                                                                                                                     |                                | Outputs: CIO 3200 to CIO 3263<br>Inputs: CIO 3300 to CIO 3363 |
|                                              |                          | Fixed allocation 2                                                                                                                                                                                                                                                                                     |                                | Outputs: CIO 3400 to CIO 3463<br>Inputs: CIO 3500 to CIO 3563 |
|                                              |                          | Fixed allocation 3                                                                                                                                                                                                                                                                                     |                                | Outputs: CIO 3600 to CIO 3663<br>Inputs: CIO 3700 to CIO 3763 |
|                                              |                          | The following words are allocated to the CS-Series DeviceNet Unit functioning as a master when fixed allocations are used for the CS1W-DRM21 DeviceNet Unit.                                                                                                                                           |                                |                                                               |
|                                              |                          | Setting                                                                                                                                                                                                                                                                                                |                                | Master to slave                                               |
| Fixed allocation 1                           | Outputs: CIO 3370        | Inputs: CIO 3270                                                                                                                                                                                                                                                                                       |                                |                                                               |
| Fixed allocation 2                           | Outputs: CIO 3570        | Inputs: CIO 3470                                                                                                                                                                                                                                                                                       |                                |                                                               |
| Fixed allocation 3                           | Outputs: CIO 3770        | Inputs: CIO 3670                                                                                                                                                                                                                                                                                       |                                |                                                               |
| Internal I/O Area                            |                          | 4,800 (300 words): CIO 120000 to CIO 149915 (words CIO 1200 to CIO 1499)<br><br>37,504 (2,344 words): CIO 380000 to CIO 614315 (words CIO 3800 to CIO 6143)<br><br>These bits in the CIO Area are used as work bits in programming to control program execution. They cannot be used for external I/O. | ---                            |                                                               |
| Work Area                                    |                          | 8,192 bits (512 words): W00000 to W51115 (W000 to W511)<br>Controls the programs only. (I/O from external I/O terminals is not possible.)<br><br><b>Note</b> When using work bits in programming, use the bits in the Work Area first before using bits from other areas.                              | 9-14 Work Area                 |                                                               |
| Holding Area                                 |                          | 8,192 bits (512 words): H00000 to H51115 (H000 to H511)<br>Holding bits are used to control the execution of the program, and maintain their ON/OFF status when the PLC is turned OFF or the operating mode is changed.                                                                                | 9-15 Holding Area              |                                                               |
| Auxiliary Area                               |                          | Read only: 7,168 bits (448 words): A00000 to A44715 (words A000 to A447)<br><br>Read/write: 8,192 bits (512 words): A44800 to A95915 (words A448 to A959)<br><br>Auxiliary bits are allocated specific functions.                                                                                      | 9-16 Auxiliary Area            |                                                               |
| Temporary Area                               |                          | 16 bits (TR0 to TR15)<br>Temporary bits are used to temporarily store the ON/OFF execution conditions at program branches.                                                                                                                                                                             | 9-17 TR (Temporary Relay) Area |                                                               |
| Timer Area                                   |                          | 4,096: T0000 to T4095 (used for timers only)                                                                                                                                                                                                                                                           | 9-18 Timer Area                |                                                               |
| Counter Area                                 |                          | 4,096: C0000 to C4095 (used for counters only)                                                                                                                                                                                                                                                         | 9-19 Counter Area              |                                                               |

| Item                   | Specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Reference                           |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>DM Area</b>         | <p>32K words: D00000 to D32767</p> <p>Used as a general-purpose data area for reading and writing data in word units (16 bits). Words in the DM Area maintain their status when the PLC is turned OFF or the operating mode is changed.</p> <p>Internal Special I/O Unit DM Area: D20000 to D29599 (100 words × 96 Units)</p> <p>Used to set parameters for Special I/O Units.</p> <p>CPU Bus Unit DM Area: D30000 to D31599 (100 words × 16 Units)</p> <p>Used to set parameters for CPU Bus Units.</p> <p>Inner Board DM Area: D32000 to D32099</p> <p>Used to set parameters for Inner Boards.</p>                                                                         | 9-20 Data Memory (DM) Area          |
| <b>EM Area</b>         | <p>32K words per bank, 13 banks max.: E0_00000 to EC_32767 max. (Not available on some CPU Units.)</p> <p>Used as a general-purpose data area for reading and writing data in word units (16 bits). Words in the EM Area maintain their status when the PLC is turned OFF or the operating mode is changed.</p> <p>The EM Area is divided into banks, and the addresses can be set by either of the following methods.</p> <p>Changing the current bank using the EMBC(281) instruction and setting addresses for the current bank.</p> <p>Setting bank numbers and addresses directly.</p> <p>EM data can be stored in files by specifying the number of the first bank.</p> | 9-21 Extended Data Memory (EM) Area |
| <b>Data Registers</b>  | <p>DR0 to DR15</p> <p>Store offset values for indirect addressing. One register is 16 bits (1 word).</p> <p>CS1 CPU Units: Data registers used independently in each task.</p> <p>CS1-H CPU Units: Setting to use data registers either independently in each task or to share them between tasks.</p>                                                                                                                                                                                                                                                                                                                                                                        | 9-23 Data Registers                 |
| <b>Index Registers</b> | <p>IR0 to IR15</p> <p>Store PLC memory addresses for indirect addressing. One register is 32 bits (2 words).</p> <p>CS1 CPU Units: Index registers used independently in each task.</p> <p>CS1-H CPU Units: Setting to use index registers either independently in each task or to share them between tasks.</p>                                                                                                                                                                                                                                                                                                                                                              | 9-22 Index Registers                |
| <b>Task Flag Area</b>  | <p>32 (TK0000 to TK0031)</p> <p>Task Flags are read-only flags that are ON when the corresponding cyclic task is executable and OFF when the corresponding task is not executable or in standby status.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 9-24 Task Flags                     |
| <b>Trace Memory</b>    | 40,000 words (trace data: 31 bits, 6 words)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Programming Manual (W394)           |
| <b>File Memory</b>     | <p>Memory Cards: Compact flash memory cards can be used (MS-DOS format).</p> <p>EM file memory: Part of the EM Area can be converted to file memory (MS-DOS format).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Programming Manual (W394)           |

## Function Specifications

| Item                                                    | Specification                                                                                                                                                                                                                                                                                                                         | Reference                                                                                                                                                             |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Constant cycle time</b>                              | 1 to 32,000 ms (Unit: 1 ms)<br>When a parallel processing mode is used for a CS1-H CPU Unit, the cycle time for executing instructions is constant.                                                                                                                                                                                   | Cycle time: 10-4 Computing the Cycle Time<br>Constant cycle time: Programming Manual (W394)                                                                           |
| <b>Cycle time monitoring</b>                            | Possible (Unit stops operating if the cycle is too long): 1 to 40,000 ms (Unit: 10 ms)<br>When a parallel processing mode is used for a CS1-H CPU Unit, the instruction execution cycle is monitored. CPU Unit operation will stop if the peripheral servicing cycle time exceeds 2 s (fixed).                                        | Cycle time: 10-4 Computing the Cycle Time<br>Cycle time monitoring: Programming Manual (W394)                                                                         |
| <b>I/O refreshing</b>                                   | Cyclic refreshing, immediate refreshing, refreshing by IORF(097).<br>IORF(097) refreshes I/O bits allocated to Basic I/O Units and Special I/O Units.<br>With the CS1-H CPU Units, the CPU BUS UNIT I/O REFRESH (DLNK(226)) instruction can be used to refresh bits allocated to CPU Bus Units in the CIO and DM Areas.               | I/O refreshing: 10-4 Computing the Cycle Time<br>I/O refresh methods: Programming Manual (W394)                                                                       |
| <b>Timing of special refreshing for CPU Bus Units</b>   | Data links for Controller Link Units and SYSMAC LINK Units, remote I/O for DeviceNet Units, and other special refreshing for CPU Bus Units is performed at the following times:<br>CS1 CPU Units: I/O refresh period<br>CS1-H CPU Units: I/O refresh period and when the CPU BUS UNIT I/O REFRESH (DLNK(226)) instruction is executed | ---                                                                                                                                                                   |
| <b>I/O memory holding when changing operating modes</b> | Depends on the ON/OFF status of the IOM Hold Bit in the Auxiliary Area.                                                                                                                                                                                                                                                               | I/O memory: SECTION 9 Memory Areas<br>Holding memory areas when changing operating modes: Programming Manual (W394)<br>Holding I/O memory: 9-2-3 Data Area Properties |
| <b>Load OFF</b>                                         | All outputs on Output Units can be turned OFF when the CPU Unit is operating in RUN, MONITOR, or PROGRAM mode.                                                                                                                                                                                                                        | Load OFF: Programming Manual (W394)                                                                                                                                   |
| <b>Input response time setting</b>                      | Time constants can be set for inputs from Basic I/O Units. The time constant can be increased to reduce the influence of noise and chattering or it can be decreased to detect shorter pulses on the inputs.                                                                                                                          | Input response time: 10-4-6 I/O Response Time<br>Input response settings: Programming Manual (W394)                                                                   |
| <b>Startup mode setting</b>                             | Supported<br>The startup mode will be as follows if the PLC Setup is set to use the Programming Console mode (default) and a Programming Console is not connected:<br>CS1 CPU Units: PROGRAM mode<br>CS1-H CPU Units: RUN mode                                                                                                        | Startup mode: Programming Manual (W394)                                                                                                                               |
| <b>Flash memory (CS1-H CPU Units only)</b>              | The user program and parameter area data (e.g., PLC Setup) are always backed up automatically in flash memory.                                                                                                                                                                                                                        | ---                                                                                                                                                                   |

| Item                  | Specification                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                            | Reference                                                                                                                                                                       |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memory Card functions | Automatically reading programs (autoboot) from the Memory Card when the power is turned ON.                                                                                                                                                                                          | Supported                                                                                                                                                                                                  | Memory Cards and file memory: 3-2 File Memory and Programming Manual (W394)<br><br>Automatic file transfer at startup and file operations using CMND: Programming Manual (W394) |
|                       | Program replacement during PLC operation (except pre-version-1 CS1 CPU Units)                                                                                                                                                                                                        | Supported                                                                                                                                                                                                  | Replacing the program with CMND: Programming Manual (W394)                                                                                                                      |
|                       | Format in which data is stored in Memory Card                                                                                                                                                                                                                                        | User program: Program file format<br><br>PLC Setup and other parameters: Data file format<br>I/O memory: Data file format (binary format), text format, or CSV format (except pre-version-1 CS1 CPU Units) | Data stored in the Memory Card: Programming Manual (W394)                                                                                                                       |
|                       | Functions for which Memory Card read/write is supported                                                                                                                                                                                                                              | User program instructions, Programming Devices (including Programming Consoles), Host Link computers, AR Area control bits, easy backup operation                                                          | Memory Card read/write operations: Programming Manual (W394)                                                                                                                    |
| Filing                | Memory Card data and the EM (Extended Data Memory) Area can be handled as files.                                                                                                                                                                                                     |                                                                                                                                                                                                            | File memory: Programming Manual (W394)                                                                                                                                          |
| Debugging             | Control set/reset, differential monitoring, data tracing (scheduled, each cycle, or when instruction is executed), storing location generating error when a program error occurs                                                                                                     |                                                                                                                                                                                                            | Debugging, set/reset, differential monitoring, data tracing: Programming Manual (W394)                                                                                          |
| Online editing        | User programs can be overwritten in program-block units when the CPU Unit is in MONITOR or PROGRAM mode. This function is not available for block programming areas. With the CX-Programmer, more than one program block can be edited at the same time.                             |                                                                                                                                                                                                            | Operating modes: Programming Manual (W394)                                                                                                                                      |
| Program protection    | Overwrite protection: Set using DIP switch.<br>Copy protection: Password set using Programming Device.                                                                                                                                                                               |                                                                                                                                                                                                            | Program protection: Programming Manual (W394)                                                                                                                                   |
| Error check           | User-defined errors (i.e., user can define fatal errors and non-fatal errors)<br><br>The FPD(269) instruction can be used to check the execution time and logic of each programming block.<br><br>FAL and FALS instructions can be used with the CS1-H CPU Units to simulate errors. |                                                                                                                                                                                                            | Failure diagnosis: Programming Manual (W394)<br><br>Fatal and nonfatal errors: 11-2-4 Error Processing Flowchart<br>User-defined errors: Programming Manual (W394)              |
| Error log             | Up to 20 errors are stored in the error log. Information includes the error code, error details, and the time the error occurred.<br><br>A CS1-H CPU Unit can be set so that user-defined FAL errors are not stored in the error log.                                                |                                                                                                                                                                                                            | Error log: Programming Manual (W394)                                                                                                                                            |
| Serial communications | Built-in peripheral port: Programming Device (including Programming Console) connections, Host Links, NT Links<br><br>Built-in RS-232C port: Programming Device (excluding Programming Console) connections, Host Links, no-protocol communications, NT Links                        |                                                                                                                                                                                                            | Serial communications systems: 2-5-1 Serial Communications System<br><br>Serial communications: Programming Manual (W394)                                                       |
|                       | Serial Communications Board (sold separately): Protocol macros, Host Links, NT Links                                                                                                                                                                                                 |                                                                                                                                                                                                            |                                                                                                                                                                                 |
| Clock                 | Provided on all models. Accuracy: ± 30 s/mo. at 25°C (accuracy varies with the temperature)                                                                                                                                                                                          |                                                                                                                                                                                                            | Clock: Programming Manual (W394)                                                                                                                                                |
|                       | <b>Note</b> Used to store the time when power is turned ON and when errors occur.                                                                                                                                                                                                    |                                                                                                                                                                                                            |                                                                                                                                                                                 |

| Item                                            | Specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Reference                                                                                                                                    |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Power OFF detection time</b>                 | 10 to 25 ms (not fixed)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Power OFF operation and power OFF detection time: <i>10-3 Power OFF Operation</i>                                                            |
| <b>Power OFF detection delay time</b>           | 0 to 10 ms (user-defined, default: 0 ms)                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Power OFF detection delay time: <i>Programming Manual (W394)</i>                                                                             |
| <b>Memory protection</b>                        | <p>Held Areas: Holding bits, contents of Data Memory and Extended Data Memory, and status of the counter Completion Flags and present values.</p> <p><b>Note</b> If the IOM Hold Bit in the Auxiliary Area is turned ON, and the PLC Setup is set to maintain the IOM Hold Bit status when power to the PLC is turned ON, the contents of the CIO Area, the Work Area, part of the Auxiliary Area, timer Completion Flag and PVs, Index Registers, and the Data Registers will be saved for up to 20 days.</p> | Memory protection: <i>9-2-3 Data Area Properties</i>                                                                                         |
| <b>Sending commands to a Host Link computer</b> | FINS commands can be sent to a computer connected via the Host Link System by executing Network Communications Instructions from the PLC.                                                                                                                                                                                                                                                                                                                                                                      | Host Links and non-solicited communications: <i>2-5-2 Systems</i>                                                                            |
| <b>Remote programming and monitoring</b>        | Host Link communications can be used for remote programming and remote monitoring through a Controller Link System or Ethernet network.                                                                                                                                                                                                                                                                                                                                                                        | <p>Remote programming and monitoring: <i>Programming Manual (W394)</i></p> <p>Controller Link <i>2-5-3 Communications Network System</i></p> |
| <b>Three-level communications</b>               | Host Link communications can be used for remote programming and remote monitoring from devices on networks up to two levels away (Controller Link Network, Ethernet Network, or other network).                                                                                                                                                                                                                                                                                                                | Host Links and FINS message service: <i>2-5-2 Systems</i>                                                                                    |
| <b>Storing comments in CPU Unit</b>             | I/O comments can be stored in the CPU Unit in Memory Cards or EM file memory.                                                                                                                                                                                                                                                                                                                                                                                                                                  | I/O comments: <i>CX-Programmer User Manual</i>                                                                                               |
| <b>Program check</b>                            | <p>Program checks are performed at the beginning of operation for items such as no END instruction and instruction errors.</p> <p>CX-Programmer can also be used to check programs.</p>                                                                                                                                                                                                                                                                                                                        | Program check: <i>Programming Manual (W394)</i>                                                                                              |
| <b>Control output signals</b>                   | <p>RUN output: The internal contacts will turn ON (close) while the CPU Unit is operating.</p> <p>These terminals are provided only on the C200HW-PA204R and C200HW-PA209R Power Supply Units.</p>                                                                                                                                                                                                                                                                                                             | RUN output: <i>Programming Manual (W394)</i>                                                                                                 |
| <b>Battery life</b>                             | Battery Set: CS1W-BAT01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Battery life and replacement period: <i>12-2-1 Battery Replacement</i>                                                                       |
| <b>Self-diagnostics</b>                         | CPU errors (watchdog timer), I/O verification errors, I/O bus errors, memory errors, and battery errors.                                                                                                                                                                                                                                                                                                                                                                                                       | CPU, I/O bus, memory, and battery errors: <i>11-2-4 Error Processing Flowchart</i>                                                           |
| <b>Other functions</b>                          | Storage of number of times power has been interrupted. (Stored in A514.)                                                                                                                                                                                                                                                                                                                                                                                                                                       | Number of power interruptions: <i>10-3 Power OFF Operation</i>                                                                               |

## 2-1-2 General Specifications

| Item                             | Specifications                                                                                                                                                                                                                                                                                                      |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       |                                                                                                 |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Power Supply Unit                | C200HW-PA204                                                                                                                                                                                                                                                                                                        | C200HW-PA204S                                                                                                                          | C200HW-PA204R                                                                                                                     | C200HW-PA209R                                                                                                                                                                         | C200HW-PD024                                                                                    |
| Supply voltage                   | 100 to 120 V AC or 200 to 240 V AC, 50/60 Hz                                                                                                                                                                                                                                                                        |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       | 24 V DC                                                                                         |
| Operating voltage range          | 85 to 132 V AC or 170 to 264 V AC                                                                                                                                                                                                                                                                                   |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       | 19.2 to 28.8 V DC                                                                               |
| Power consumption                | 120 VA max.                                                                                                                                                                                                                                                                                                         |                                                                                                                                        |                                                                                                                                   | 180 VA max.                                                                                                                                                                           | 40 W max.                                                                                       |
| Inrush current                   | 30 A max.                                                                                                                                                                                                                                                                                                           |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       | 30 A max.                                                                                       |
| Output capacity                  | 4.6 A, 5 V DC                                                                                                                                                                                                                                                                                                       |                                                                                                                                        |                                                                                                                                   | 9 A, 5 V DC (including the CPU Unit power supply)                                                                                                                                     | 4.6 A, 5 V DC (including the CPU Unit power supply)                                             |
|                                  | 0.625 A, 26 V DC                                                                                                                                                                                                                                                                                                    | 0.625 A, 26 V DC<br>0.8 A, 24 V DC                                                                                                     | 0.625 A, 26 V DC                                                                                                                  | 1.3 A, 26 V DC                                                                                                                                                                        | 0.625 A, 26 V DC                                                                                |
|                                  | Total: 30 W max.                                                                                                                                                                                                                                                                                                    | Total: 30 W max.                                                                                                                       | Total: 30 W max.                                                                                                                  | Total: 45 W max.                                                                                                                                                                      | Total: 30 W max.                                                                                |
| Output terminal (service supply) | Not provided                                                                                                                                                                                                                                                                                                        | Provided.<br>At consumption of less than 0.3 A, 24-V DC supply will be +17% /–11%; at 0.3 A or greater, +10% /–11% (lot 0197 or later) | Not provided                                                                                                                      |                                                                                                                                                                                       | Not provided                                                                                    |
| RUN output (See note 2.)         | Not provided                                                                                                                                                                                                                                                                                                        |                                                                                                                                        | Contact configuration: SPST-NO<br>Switch capacity: 250 V AC, 2A (resistive load)<br>250 V AC, 0.5 A (induction load), 24 V DC, 2A | Contact configuration: SPST-NO<br>Switch capacity: 240 V AC, 2A (resistive load)<br>120 V AC, 0.5 A (induction load)<br>24 V DC, 2A (resistive load)<br>24 V DC, 2 A (induction load) | Not provided                                                                                    |
| Insulation resistance            | 20 MΩ min. (at 500 V DC) between AC external and GR terminals (See note.)                                                                                                                                                                                                                                           |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       | 20 MΩ min. (at 500 V DC) between DC external and GR terminals (See note.)                       |
| Dielectric strength              | 2,300 V AC 50/60 Hz for 1 min between AC external and GR terminals (See note.)<br>Leakage current: 10 mA max.                                                                                                                                                                                                       |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       | 1,000 V AC 50/60 Hz for 1 min between DC external and GR terminals, leakage current: 10 mA max. |
|                                  | 1,000 V AC 50/60 Hz for 1 min between AC external and GR terminals (See note.)<br>Leakage current: 10 mA max.                                                                                                                                                                                                       |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       |                                                                                                 |
| Noise immunity                   | 2 kV on power supply line (conforming to IEC61000-4-4)                                                                                                                                                                                                                                                              |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       |                                                                                                 |
| Vibration resistance             | 10 to 57 Hz, 0.075-mm amplitude, 57 to 150 Hz, acceleration: 9.8 m/s <sup>2</sup> in X, Y, and Z directions for 80 minutes (Time coefficient: 8 minutes ×coefficient factor 10 = total time 80 min.)<br>CPU Unit mounted to a DIN track: 2 to 55 Hz, 2.94 m/s <sup>2</sup> in X, Y, and Z directions for 20 minutes |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       |                                                                                                 |
| Shock resistance                 | 147 m/s <sup>2</sup> 3 times each in X, Y, and Z directions (according to JIS 0041)                                                                                                                                                                                                                                 |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       |                                                                                                 |
| Ambient operating temperature    | 0 to 55°C                                                                                                                                                                                                                                                                                                           |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       |                                                                                                 |
| Ambient operating humidity       | 10% to 90% (with no condensation)                                                                                                                                                                                                                                                                                   |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       |                                                                                                 |
| Atmosphere                       | Must be free from corrosive gases.                                                                                                                                                                                                                                                                                  |                                                                                                                                        |                                                                                                                                   |                                                                                                                                                                                       |                                                                                                 |

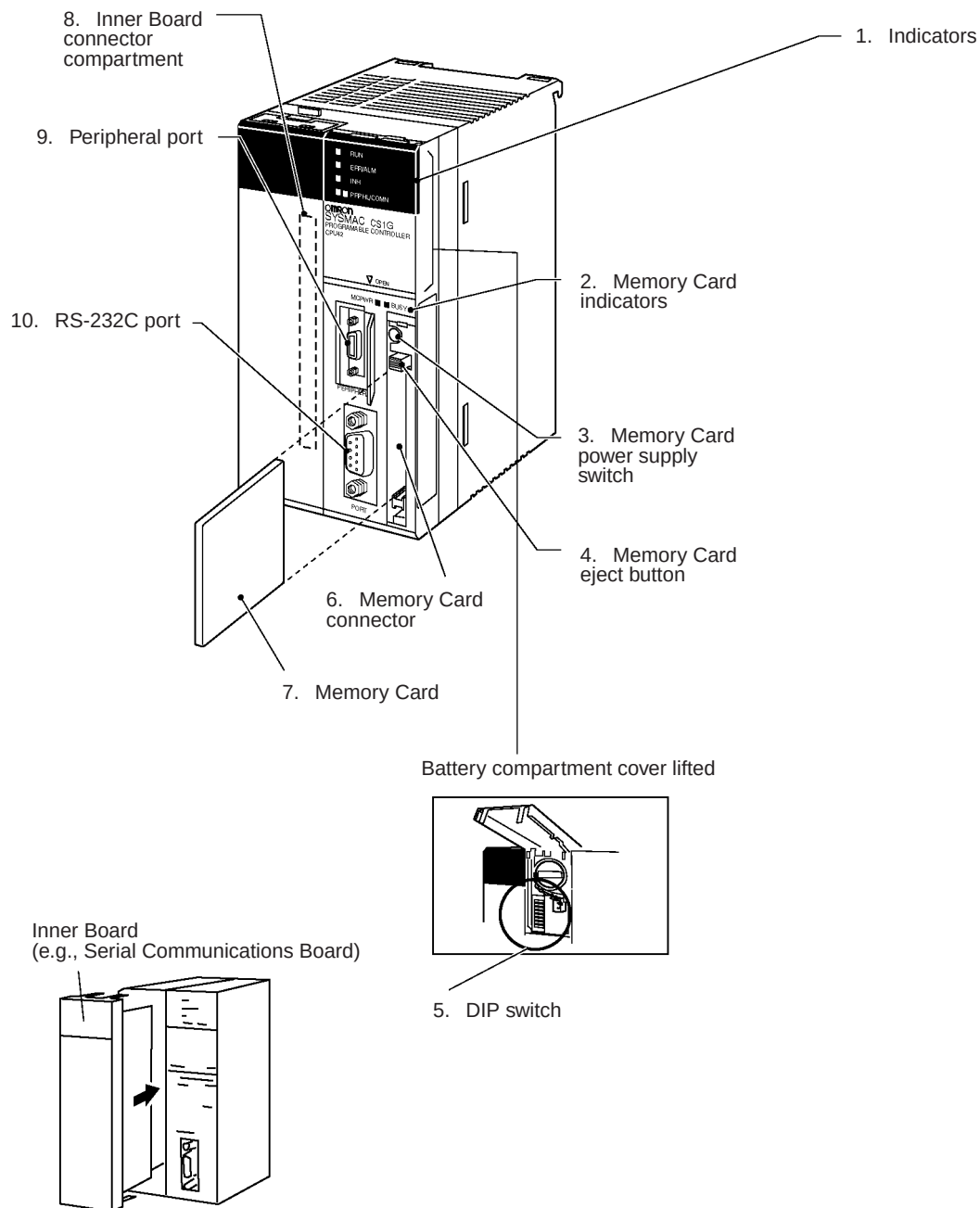
| Item                                              | Specifications                                                                                                                                                                                          |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ambient storage temperature</b>                | –20 to 75°C (excluding battery)                                                                                                                                                                         |
| <b>Grounding</b>                                  | Less than 100 $\Omega$                                                                                                                                                                                  |
| <b>Enclosure</b>                                  | Mounted in a panel.                                                                                                                                                                                     |
| <b>Weight</b>                                     | All models are each 6 kg max.                                                                                                                                                                           |
| <b>CPU Rack dimensions (mm)<br/>(See note 3.)</b> | 2 slots: 198.5 × 157 × 123 (W x H x D)<br>3 slots: 260 × 130 × 123 (W x H x D)<br>5 slots: 330 × 130 × 123 (W x H x D)<br>8 slots: 435 × 130 × 123 (W x H x D)<br>10 slots: 505 × 130 × 123 (W x H x D) |
| <b>Safety measures</b>                            | Conforms to cULus, NK, Lloyds, and EC directives.                                                                                                                                                       |

- Note**
1. Disconnect the Power Supply Unit's LG terminal from the GR terminal when testing insulation and dielectric strength.  
Testing the insulation and dielectric strength with the LG terminal and the GR terminals connected will damage internal circuits in the CPU Unit.
  2. Supported only when mounted to CPU Backplane.
  3. The depth is 153 mm for the C200HW-PA209R Power Supply Unit.



## 2-2 CPU Unit Components

### 2-2-1 Components



1,2,3...

**1. Indicators**

The following table describes the LED indicators on the front panel of the CPU Unit.

| Indicator                           | Meaning                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RUN (green)                         | Lights when the PLC is operating normally in MONITOR or RUN mode.                                                                                                                                                                                                                                                                                            |
| ERR/ALM (red)                       | Flashes if a non-fatal error occurs that does not stop the CPU Unit. If a non-fatal error occurs, the CPU Unit will continue operating.<br>Lights if a fatal error occurs that stops the CPU Unit or if a hardware error occurs. If a fatal or hardware error occurs, the CPU Unit will stop operating, and the outputs from all Output Units will turn OFF. |
| INH (orange)                        | Lights when the Output OFF Bit (A50015) turns ON. If the Output OFF Bit is turned ON, the outputs from all Output Units will turn OFF.                                                                                                                                                                                                                       |
| BKUP (orange; CS1-H CPU Units only) | Lights when data is being backed up from RAM to the flash memory.<br>Do not turn OFF the CPU Unit when this indicator is lit.                                                                                                                                                                                                                                |
| PRPHL (orange)                      | Flashes when the CPU Unit is communicating via the peripheral port.                                                                                                                                                                                                                                                                                          |
| COMM (orange)                       | Flashes when the CPU Unit is communicating via the RS-232C port.                                                                                                                                                                                                                                                                                             |
| MCPWR (green)                       | Flashes when power is being supplied to the Memory Card.                                                                                                                                                                                                                                                                                                     |
| BUSY (orange)                       | Flashes when the Memory Card is being accessed.                                                                                                                                                                                                                                                                                                              |

**2. Memory Card Indicators**

The MCPWR indicator flashes green when power is being supplied to the Memory Card and the BUSY indicator flashes orange when the Memory Card is being accessed.

**3. Memory Card Power Supply Switch**

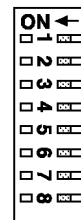
Press the Memory Card power supply switch to disconnect power before removing the Memory Card. Also, press the Memory Card Power Supply Switch to perform an easy backup operation (i.e., to write to or verify the Memory Card), or to stop the MCPWR indicator flashing due to a write or verify malfunction when performing an easy backup to the Memory Card.

**4. Memory Card Eject Button**

Press the Memory Card eject button to remove the Memory Card from the CPU Unit before turning the power OFF or to perform an easy backup operation.

**5. DIP Switch**

The CS1 CPU Unit has an 8-pin DIP switch that is used to set basic operational parameters for the CPU Unit. The DIP switch is located under the cover of the battery compartment. The DIP switch pin settings are described in the following table.



| Pin No.                             | Setting | Function                                                                                                                                                                   |
|-------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                   | ON      | Writing disabled for user program memory.                                                                                                                                  |
|                                     | OFF     | Writing enabled for user program memory.                                                                                                                                   |
| 2                                   | ON      | The user program is automatically transferred and executed when power is turned ON.                                                                                        |
|                                     | OFF     | The user program is automatically transferred but not executed when power is turned ON.                                                                                    |
| 3<br>(Not used by CS1-H CPU Units.) | ON      | CS1 CPU Units only: Programming Console messages displayed in English.                                                                                                     |
|                                     | OFF     | CS1 CPU Units only: Programming Console messages displayed in the language stored in system ROM. (Messages displayed in Japanese with the Japanese version of system ROM.) |
| 4                                   | ON      | Use peripheral port communications parameters set in the PLC Setup.                                                                                                        |
|                                     | OFF     | Auto-detect Programming Console or CX-Programmer communications parameters at the peripheral port.                                                                         |
| 5                                   | ON      | Auto-detect Programming Console or CX-Programmer communications parameters at the RS-232C port.                                                                            |
|                                     | OFF     | Use RS-232C port communications parameters set in the PLC Setup.                                                                                                           |
| 6                                   | ON      | User-defined pin. Turns OFF the User DIP Switch Pin Flag (A39512).                                                                                                         |
|                                     | OFF     | User-defined pin. Turns ON the User DIP Switch Pin Flag (A39512).                                                                                                          |
| 7                                   | ON      | Easy backup by reading/writing to Memory Card.                                                                                                                             |
|                                     | OFF     | Easy backup by verifying contents of Memory Card.                                                                                                                          |
| 8                                   | OFF     | Always OFF.                                                                                                                                                                |

#### 6. Memory Card Connector

The Memory Card connector connects the Memory Card to the CPU Unit.

#### 7. Memory Card

Memory Cards fit into the slot located on the lower right side of the CPU Unit. Memory Cards are not provided with the PLC and must be ordered separately and installed in the CPU Unit.

#### 8. Inner Board Connector Compartment

The Inner Board connector compartment is used to connect Inner Boards such as the Serial Communications Board.

#### 9. Peripheral Port

The peripheral port is connected to Programming Devices, such as a Programming Console or Host Computers. Refer to 3-1 CPU Units for details.

#### 10. RS-232C Port

The RS-232C port is connected to Programming Devices (excluding Programming Console), Host Computers, general-purpose external devices, Programmable Terminals, and other devices. Refer to 3-1 CPU Units for details.

## 2-2-2 CS-series CPU Unit Capabilities

### CS1-H CPU Units

| Model       | I/O bits                               | Program capacity | Data memory capacity<br>(See note.) | Ladder instruction processing speed | Internal communications ports     | Optional products                                                 |
|-------------|----------------------------------------|------------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------------------------------------|
| CS1H-CPU67H | 5120 bits<br>(Up to 7 Expansion Racks) | 250K steps       | 448K words                          | 0.02 μs                             | Peripheral port and RS-232C port. | Memory Cards<br>Inner Boards such as Serial Communications Boards |
| CS1H-CPU66H |                                        | 120K steps       | 256K words                          |                                     |                                   |                                                                   |
| CS1H-CPU65H |                                        | 60K steps        | 128K words                          |                                     |                                   |                                                                   |
| CS1H-CPU64H |                                        | 30K steps        | 64K words                           |                                     |                                   |                                                                   |
| CS1H-CPU63H |                                        | 20K steps        | 64K words                           |                                     |                                   |                                                                   |
| CS1G-CPU45H | 5120 bits<br>(Up to 7 Expansion Racks) | 60K steps        | 128K words                          | 0.04 μs                             |                                   |                                                                   |
| CS1G-CPU44H | 1280 bits<br>(Up to 3 Expansion Racks) | 30K steps        | 64K words                           |                                     |                                   |                                                                   |
| CS1G-CPU43H | 960 bits                               | 20K steps        | 32K words                           |                                     |                                   |                                                                   |
| CS1G-CPU42H | (Up to 2 Expansion Racks)              | 10K steps        | 32K words                           |                                     |                                   |                                                                   |

**Note** The available Data Memory capacity is the sum of the Data Memory (DM) and the Extended Data Memory (EM).

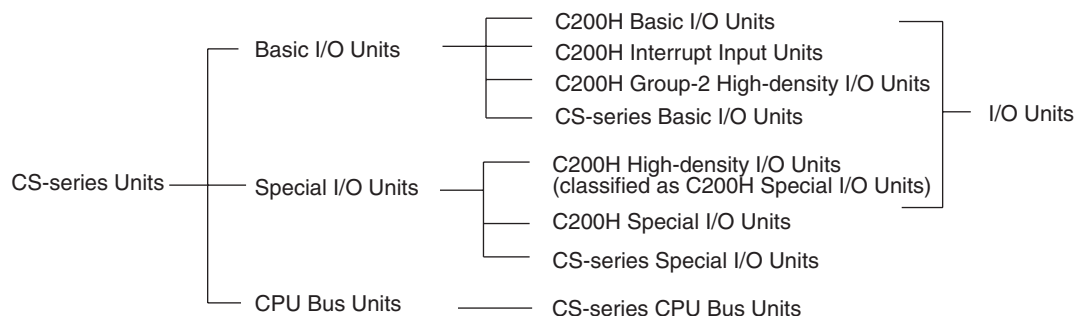
### CS1 CPU Units

| Model          | I/O bits                               | Program capacity | Data memory capacity<br>(See note.) | Ladder instruction processing speed | Internal communications ports     | Optional products                                                 |  |  |
|----------------|----------------------------------------|------------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------------------------------------|--|--|
| CS1H-CPU67-EV1 | 5120 bits                              | 250K steps       | 448K words                          | 0.04 μs                             | Peripheral port and RS-232C port. | Memory Cards<br>Inner Boards such as Serial Communications Boards |  |  |
| CS1H-CPU66-EV1 | (Up to 7 Expansion Racks)              | 120K steps       | 256K words                          |                                     |                                   |                                                                   |  |  |
| CS1H-CPU65-EV1 |                                        | 60K steps        | 128K words                          |                                     |                                   |                                                                   |  |  |
| CS1H-CPU64-EV1 |                                        | 30K steps        | 64K words                           |                                     |                                   |                                                                   |  |  |
| CS1H-CPU63-EV1 |                                        | 20K steps        | 64K words                           |                                     |                                   |                                                                   |  |  |
| CS1G-CPU45-EV1 | 5120 bits<br>(Up to 7 Expansion Racks) | 60K steps        | 128K words                          | 0.08 μs                             |                                   |                                                                   |  |  |
| CS1G-CPU44-EV1 | 1280 bits<br>(Up to 3 Expansion Racks) | 30K steps        | 64K words                           |                                     |                                   |                                                                   |  |  |
| CS1G-CPU43-EV1 | 960 bits                               | 20K steps        | 32K words                           |                                     |                                   |                                                                   |  |  |
| CS1G-CPU42-EV1 | (Up to 2 Expansion Racks)              | 10K steps        | 32K words                           |                                     |                                   |                                                                   |  |  |

**Note** The available Data Memory capacity is the sum of the Data Memory (DM) and the Extended Data Memory (EM).

### 2-2-3 Unit Classifications

CS-series CPU Units can exchange data with Basic I/O Units, Special I/O Units, and CS-series CPU Bus Units as shown in the following diagram.



### 2-2-4 Data Communications

#### CPU Unit Data Communications

| Unit                                                                        | Data Exchange during cyclic servicing (allocations)                                                           |                                                                                                      | Event service data communications (IORD/IOWR instruction) | I/O refreshing using IORF instruction  |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------|
| <b>CS-series Basic I/O Units</b>                                            | According to I/O allocations<br>(Words are allocated in order according to the position the Unit is mounted.) | I/O refreshing                                                                                       | Not provided.                                             | Yes                                    |
| <b>C200H Basic I/O Units</b>                                                |                                                                                                               |                                                                                                      |                                                           | Yes                                    |
| <b>C200H Group-2 High-density I/O Units (classified as Basic I/O Units)</b> |                                                                                                               |                                                                                                      |                                                           | Yes                                    |
| <b>CS-series Special I/O Units</b>                                          | Unit No. allocations                                                                                          | Special I/O Unit Area (CIO): 10 words/Unit<br>Special I/O Unit Area (DM): 100 words/Unit             | Yes<br>(Not available for some Units.)                    | Yes<br>(Not available for some Units.) |
| <b>C200H Special I/O Units</b>                                              |                                                                                                               |                                                                                                      | Yes<br>(Not available for some Units.)                    | Yes<br>(Not available for some Units.) |
| <b>CPU Bus Units</b>                                                        |                                                                                                               | CS-series CPU Bus Unit Area (CIO): 5 words/ Unit<br>CS-series CPU Bus Unit Area (DM): 100 words/Unit | Not provided.                                             | No                                     |

## CPU Unit Connections

| Unit                                                                    | Maximum Number of Units on CPU Racks and Expansion Racks | Racks to which Unit can be mounted |                           |                                            |                         |
|-------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------|---------------------------|--------------------------------------------|-------------------------|
|                                                                         |                                                          | CPU Rack<br>(See note 5.)          | C200H Expansion I/O Racks | CS-series Expansion Racks<br>(See note 5.) | SYSMAC BUS Slave Racks  |
| CS-series Basic I/O Units                                               | 80<br>(See note 1.)                                      | Yes                                | No                        | Yes                                        | No                      |
| C200H Basic I/O Units                                                   | 80<br>(See note 1.)                                      | Yes                                | Yes                       | Yes                                        | Yes                     |
| C200H Group-2 High-density I/O Units<br>(classified as Basic I/O Units) | 80<br>(See note 1.)                                      | Yes                                | Yes                       | Yes                                        | No                      |
| CS-series Special I/O Units                                             | 80<br>(See note 2 and 4.)                                | Yes                                | No                        | Yes                                        | No                      |
| C200H Special I/O Units                                                 | 16                                                       | Yes                                | Yes                       | Yes                                        | Yes (See note 3 and 4.) |
| CPU Bus Units                                                           | 16                                                       | Yes                                | No                        | Yes<br>(See note 3.)                       | No                      |

- Note**
1. The maximum number of Units on CPU Racks and Expansion Racks is 80 because there is a maximum of 80 slots.
  2. There is a maximum of 80 slots.
  3. Some CS-series CPU Bus Units cannot be mounted to a CS-series Expansion Rack.
  4. Up to 89 Special I/O Units can be mounted as follows: Up to 79 CS-series Special I/O Units can be mounted to the CPU Rack and CS-series Expansion Racks and up to 10 C200H Special I/O Units can be mounted to the SYSMAC BUS Slave Racks. The C200H Special I/O Units must be assigned unit numbers 0 to 9, and each Remote I/O Master Unit must be counted as a CS-series Special I/O Unit.
  5. C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

## 2-3 Basic System Configuration

### 2-3-1 Basic System Configuration

#### CPU Rack

A CPU Rack consists of a CPU Unit, a Power Supply Unit, a CPU Backplane, Basic I/O Units, Special I/O Units, and CPU Bus Units. A Serial Communications Board and Memory Card are optional.

- Note**
1. The Backplanes required depend on which CPU Racks, Expansion I/O Racks, and Slave Racks are used.
  2. Expansion Racks cannot be connected to a 2-slot CPU Rack.
  3. A maximum of four C200HS-INT01 Interrupt Input Units can be connected to one CPU Unit.

#### Expansion Racks

The Expansion Racks required for the C200H CPU Units and CS-series CPU Units are different.

- C200H Expansion I/O Racks can be connected to CPU Racks, CS-series Expansion Racks, or other C200H Expansion I/O Racks.

- CS-series Expansion Racks can be connected to CPU Racks or other CS-series Expansion Racks. A CS-series Expansion Rack consists of a Power Supply Unit, a CS-series Expansion Backplane or C200H Expansion I/O Backplane, a Basic I/O Unit, a Special I/O Unit, and a CS-series CPU Bus Unit.

Note a) CS-series Expansion Racks cannot be connected after C200H Expansion I/O Racks.

b) CS-series Basic I/O Units, CS-series Special I/O Units and CS-series CPU Bus Units cannot be mounted to C200H Expansion I/O Racks.

c) Interrupt Input Units cannot be mounted to CS-series Expansion Racks or C200H Expansion I/O Racks.

#### **CS-series Long-distance Expansion Racks**

I/O Control Units and I/O Interface Units can be used to create systems containing CS-series Long-distance Expansion Racks. Up to two series of Long-distance Expansion Racks can be connected, each measuring up to 50 m, for a total coverage of 100 m.

#### **SYSMAC BUS Slave Racks**

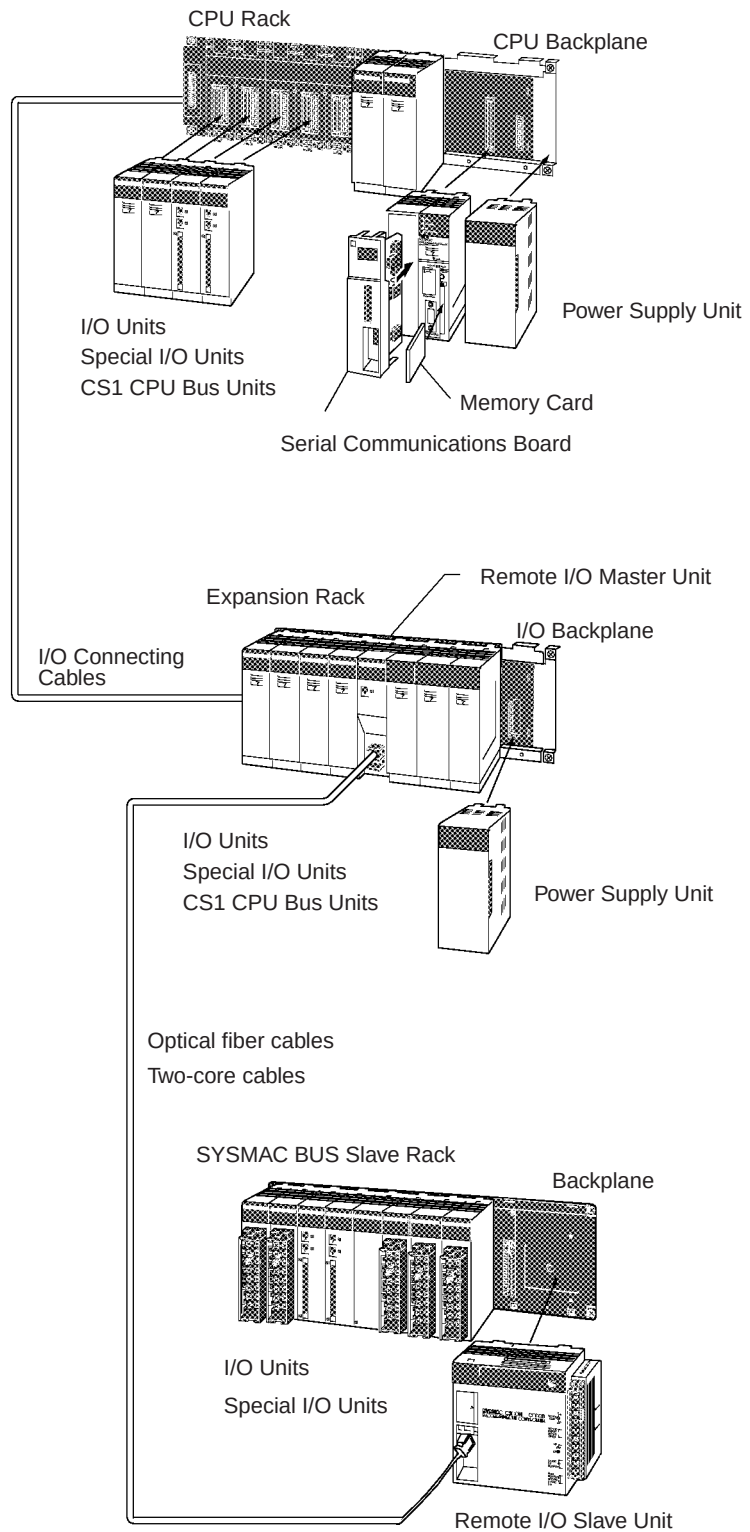
Up to 5 SYSMAC BUS Slave Racks can be connected to one SYSMAC BUS Remote I/O Master Unit. A maximum of 5 Units, however, can be connected to one CPU Unit.

A SYSMAC BUS Slave Rack consists of a Remote I/O Slave Unit, a Remote I/O Slave Rack Backplane, a Basic I/O Unit, and a Special I/O Unit.

#### **Note**

1. C200H Group-2 High-density I/O Units, Interrupt Input Units, CS-series Basic I/O Units, CS-series Special I/O Units and CS-series CPU Bus Units cannot be mounted to SYSMAC BUS Slave Racks.

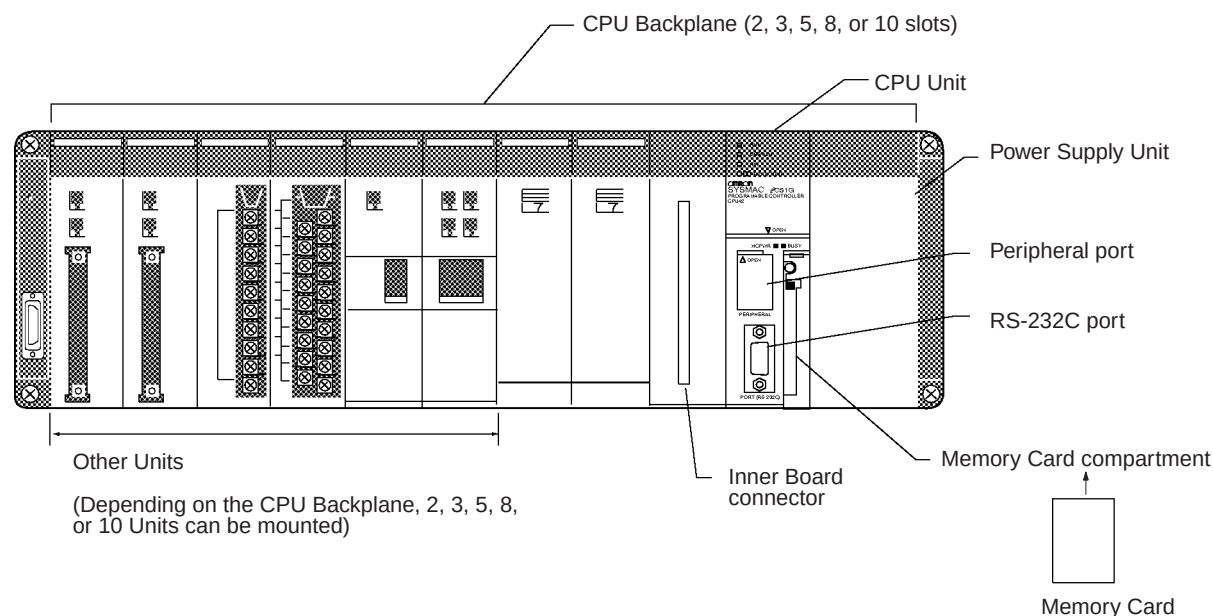
2. SYSMAC BUS Slave Racks can be connected to C200H Expansion I/O Racks using C200H I/O Connecting Cables.





## 2-3-2 CPU Rack

A CS-series CPU Rack consists of a CPU Backplane, a Power Supply Unit, and various other Units.



| Name     | Configuration               | Remarks                                                        |
|----------|-----------------------------|----------------------------------------------------------------|
| CPU Rack | CPU Backplane               | One of each Unit required for every CPU Rack.                  |
|          | CPU Unit                    |                                                                |
|          | Power Supply Unit           | Refer to the following table for details on applicable models. |
|          | Memory Card                 | Install as required.                                           |
|          | Serial Communications Board | Refer to the following table for details on applicable models. |

## Units

### CS1-H CPU Units

| Model       | Specifications                                                                                                     |
|-------------|--------------------------------------------------------------------------------------------------------------------|
| CS1H-CPU67H | I/O bits: 5,120, Program capacity: 250K steps<br>Data Memory: 448K words (DM: 32K words, EM: 32K words × 13 banks) |
| CS1H-CPU66H | I/O bits: 5,120, Program capacity: 120K steps<br>Data Memory: 256K words (DM: 32K words, EM: 32K words × 7 banks)  |
| CS1H-CPU65H | I/O bits: 5,120, Program capacity: 60K steps<br>Data Memory: 128K words (DM: 32K words, EM: 32K words × 3 banks)   |
| CS1H-CPU64H | I/O bits: 5,120, Program capacity: 30K steps<br>Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)    |
| CS1H-CPU63H | I/O bits: 5,120, Program capacity: 20K steps<br>Data Memory: 32K words (DM: 32K words, EM: 32K words × 1 banks)    |
| CS1H-CPU45H | I/O bits: 5,120, Program capacity: 60K steps<br>Data Memory: 128K words (DM: 32K words, EM: 32K words × 3 banks)   |
| CS1H-CPU44H | I/O bits: 1,280, Program capacity: 30K steps<br>Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)    |
| CS1H-CPU43H | I/O bits: 960, Program capacity: 20K steps<br>Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)      |
| CS1H-CPU42H | I/O bits: 960, Program capacity: 10K steps<br>Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)      |

## CS1 CPU Units

| Model          | Specifications                                                                                                     |
|----------------|--------------------------------------------------------------------------------------------------------------------|
| CS1H-CPU67-EV1 | I/O bits: 5,120, Program capacity: 250K steps<br>Data Memory: 448K words (DM: 32K words, EM: 32K words × 13 banks) |
| CS1H-CPU66-EV1 | I/O bits: 5,120, Program capacity: 120K steps<br>Data Memory: 256K words (DM: 32K words, EM: 32K words × 7 banks)  |
| CS1H-CPU65-EV1 | I/O bits: 5,120, Program capacity: 60K steps<br>Data Memory: 128K words (DM: 32K words, EM: 32K words × 3 banks)   |
| CS1H-CPU64-EV1 | I/O bits: 5,120, Program capacity: 30K steps<br>Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)    |
| CS1H-CPU63-EV1 | I/O bits: 5,120, Program capacity: 20K steps<br>Data Memory: 32K words (DM: 32K words, EM: None)                   |
| CS1G-CPU45-EV1 | I/O bits: 5,120, Program capacity: 60K steps<br>Data Memory: 128K words (DM: 32K words, EM: 32K words × 3 banks)   |
| CS1G-CPU44-EV1 | I/O bits: 1,280, Program capacity: 30K steps<br>Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)    |
| CS1G-CPU43-EV1 | I/O bits: 960, Program capacity: 20K steps<br>Data Memory: 32K words (DM: 32K words, EM: None)                     |
| CS1G-CPU42-EV1 | I/O bits: 960, Program capacity: 10K steps<br>Data Memory: 32K words (DM: 32K words, EM: None)                     |

## Other Units

| Name                          | Model         | Specifications                                                                                                 |
|-------------------------------|---------------|----------------------------------------------------------------------------------------------------------------|
| Standard CPU Backplanes       | CS1W-BC023    | 2 slots (Expansion Racks cannot be connected)                                                                  |
|                               | CS1W-BC033    | 3 slots                                                                                                        |
|                               | CS1W-BC053    | 5 slots                                                                                                        |
|                               | CS1W-BC083    | 8 slots                                                                                                        |
|                               | CS1W-BC103    | 10 slots                                                                                                       |
| CS-series-only CPU Backplanes | CS1W-BC022    | 2 slots (See note 1.)                                                                                          |
|                               | CS1W-BC032    | 3 slots (See note 1.)                                                                                          |
|                               | CS1W-BC052    | 5 slots (See note 1.)                                                                                          |
|                               | CS1W-BC082    | 8 slots (See note 1.)                                                                                          |
|                               | CS1W-BC102    | 10 slots (See note 1.)                                                                                         |
| Power Supply Units            | C200HW-PA204  | 100 to 120 V AC or 200 to 240 V AC                                                                             |
|                               | C200HW-PA204S | 100 to 120 V AC or 200 to 240 V AC (with 0.8 A 24 V DC service power supply)<br>Output capacity: 4.6 A, 5 V DC |
|                               | C200HW-PA204R | 100 to 120 V AC or 200 to 240 V AC (with RUN output)<br>Output capacity: 4.6 A, 5 V DC                         |
|                               | C200HW-PD024  | 24 V DC                                                                                                        |
|                               | C200HW-PA209R | 100 to 120 V AC or 200 to 240 V AC (with RUN output)<br>Output capacity: 9A, 5 V DC                            |
| Memory Cards                  | HMC-EF861     | Flash memory, 8 MB                                                                                             |
|                               | HMC-EF171     | Flash memory, 15 MB                                                                                            |
|                               | HMC-EF371     | Flash memory, 30 MB                                                                                            |
|                               | HMC-EF571     | Flash memory, 48 MB                                                                                            |
|                               | HMC-AP001     | Memory Card Adapter                                                                                            |
| Serial Communications Boards  | CS1W-SCB21    | 2 × RS-232C ports, protocol macro function                                                                     |
|                               | CS1W-SCB41    | 1 × RS-232C port + 1 × RS-422/485 port, protocol macro function                                                |

| Name                                                       | Model         | Specifications                                                                                                             |
|------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------|
| Programming Consoles                                       | CQM1H-PRO01-E | An English Keyboard Sheet (CS1W-KS001-E) is required.                                                                      |
|                                                            | CQM1-PRO01-E  |                                                                                                                            |
|                                                            | C200H-PRO27-E |                                                                                                                            |
| Programming Console Key Sheet                              | CS1W-KS001-E  | For CQM1-PRO01 or C200H-PRO27                                                                                              |
| Programming Console Connecting Cables                      | CS1W-CN114    | Connects the CQM1-PRO01-E Programming Console. (Length: 0.05 m)                                                            |
|                                                            | CS1W-CN224    | Connects the CQM1-PRO27-E Programming Console. (Length: 2.0 m)                                                             |
|                                                            | CS1W-CN624    | Connects the CQM1-PRO27-E Programming Console. (Length: 6.0 m)                                                             |
| Programming Device Connecting Cables (for peripheral port) | CS1W-CN118    | Connects DOS computers<br>D-Sub 9-pin receptacle (For converting between RS-232C cable and peripherals)<br>(Length: 0.1 m) |
|                                                            | CS1W-CN226    | Connects DOS computers<br>D-Sub 9-pin (Length: 2.0 m)                                                                      |
|                                                            | CS1W-CN626    | Connects DOS computers<br>D-Sub 9-pin (Length: 6.0 m)                                                                      |
| Programming Device Connecting Cables (for RS-232C port)    | XW2Z-200S-CV  | Connects DOS computers<br>D-Sub 9-pin (Length: 2.0 m), Static-resistant connector used.                                    |
|                                                            | XW2Z-500S-CV  | Connects DOS computers<br>D-Sub 9-pin (Length: 5.0 m), Static-resistant connector used.                                    |
|                                                            | XW2Z-200S-V   | Connects DOS computers<br>D-Sub 9-pin (Length: 2.0 m) (See note 2.)                                                        |
|                                                            | XW2Z-500S-V   | Connects DOS computers<br>D-Sub 9-pin (Length: 5.0 m) (See note 2.)                                                        |
| Battery Set                                                | CS1W-BAT01    | For CS Series only.                                                                                                        |

- Note**
1. C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only CPU Backplanes.
  2. A peripheral bus connection is not possible when connecting the CX-Programmer via an RS-232C Connecting Cable. Use the Host Link (SYSWAY) connection.

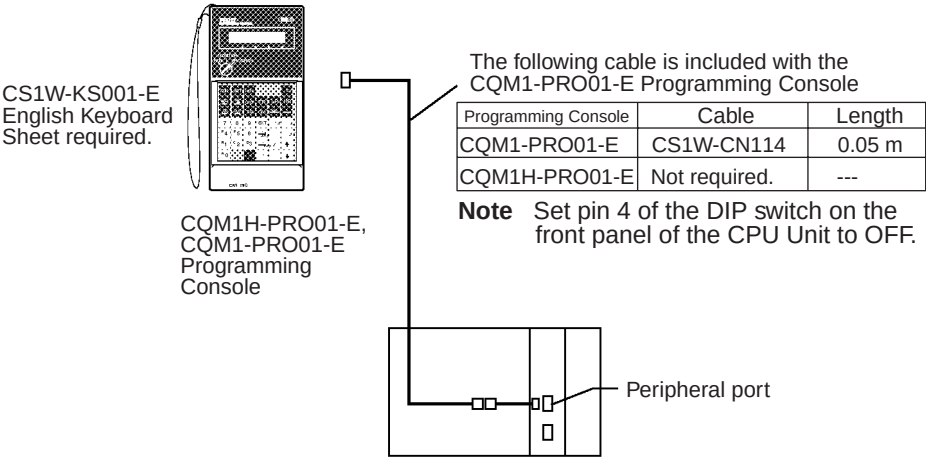
## Connecting Programming Devices

### Programming Console

When using a Programming Console, connect the Programming Console to the peripheral port of the CPU Unit and set pin 4 of the DIP switch on the front panel of the Unit to OFF (automatically uses default communications parameters for the peripheral port).

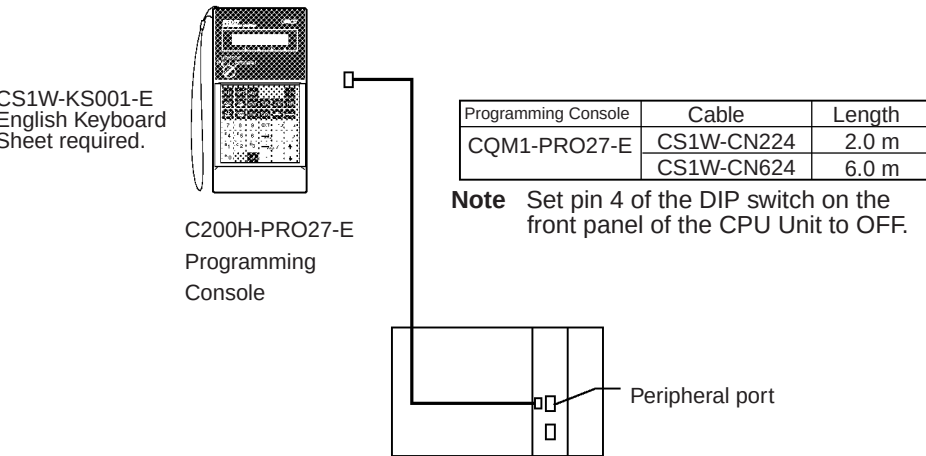
#### CQM1H-PRO01-E/CQM1-PRO01-E

The Programming Console can be connected only to the peripheral port.



**C200H-PRO27-E**

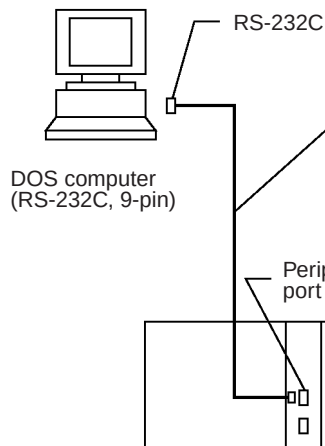
The Programming Console can be connected only to the peripheral port.



**Note** When an OMRON Programmable Terminal (PT) is connected to the RS-232C port and Programming Console functions are being used, do not connect the Programming Console at the same time.

## Connecting Personal Computers Running Support Software

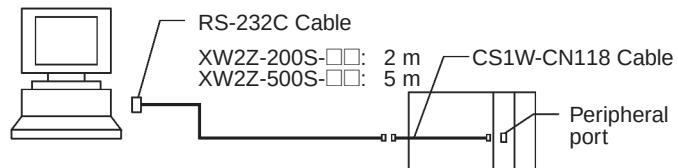
### Connecting to Peripheral Port



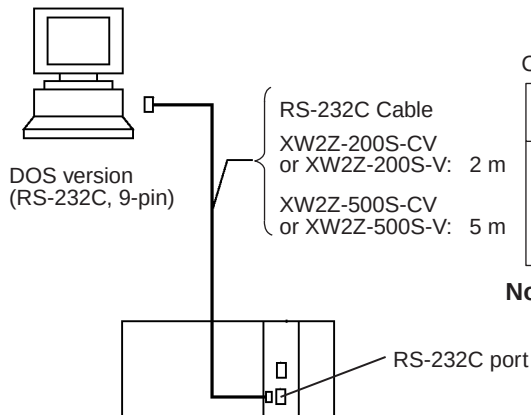
Connecting Cables for Peripheral Port

| Computer | Cable      | Length | Computer connector |
|----------|------------|--------|--------------------|
| DOS      | CS1W-CN118 | 0.1 m  | D-Sub, 9-pin       |
|          | CS1W-CN226 | 2.0 m  |                    |
|          | CS1W-CN626 | 6.0 m  |                    |

**Note** The CS1W-CN118 Cable is used with an RS-232C cable to connect to the peripheral port on the CPU Unit as shown below. The CS1W-CN118 Cable can not be used with an RS-232C cable whose model number ends in -V for a peripheral bus connection and must be used for a Host Link (SYSMAC WAY) connection.



### Connecting to RS-232C Port



Connecting Cables for RS-232C Port

| Computer | Cable                       | Length | Computer connector |
|----------|-----------------------------|--------|--------------------|
| DOS      | XW2Z-200S-CV or XW2Z-200S-V | 2.0 m  | D-Sub, 9-pin       |
|          | XW2Z-500S-CV or XW2Z-500S-V | 5.0 m  |                    |

**Note** The XW2Z-200S-CV and XW2Z-500S-CV use static-resistant connectors and can be connected to the peripheral bus or the Host Link. The XW2Z-200S-V and XW2Z-500S-V, however, can only be connected to the Host Link, not the peripheral bus.

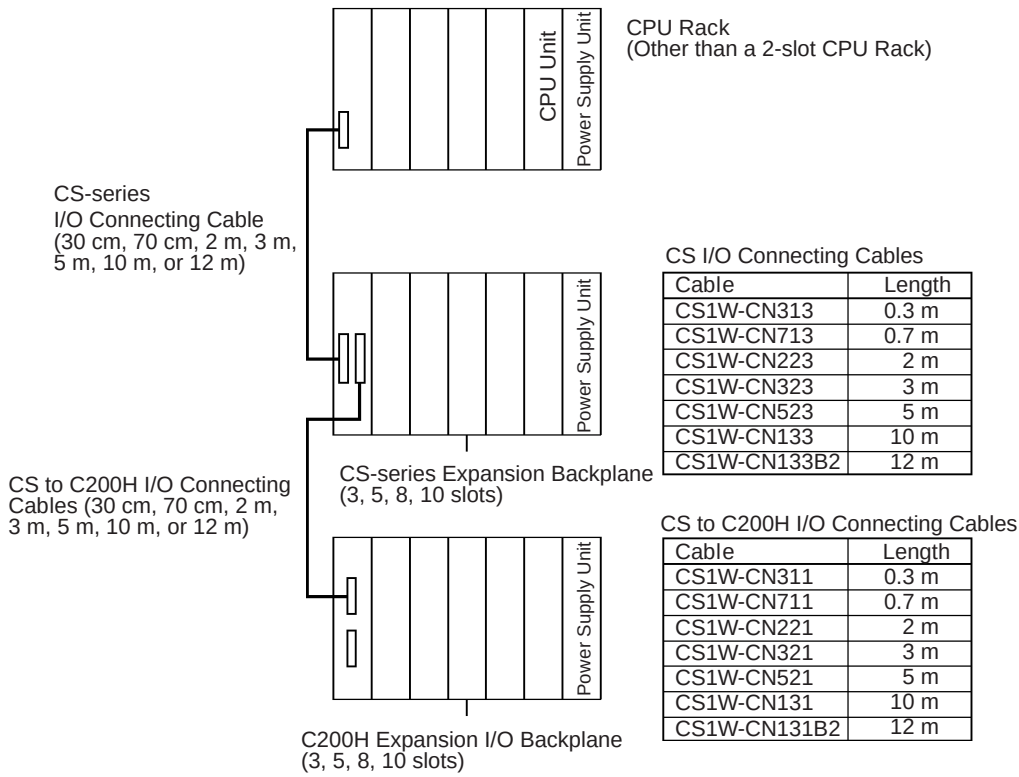
## 2-3-3 Expansion Racks

To expand the number of Units in the system, other Expansion Racks can be connected to CPU Racks. The other Expansion Racks that can be connected to the CPU Racks are Standard CS-series Expansion Racks, CS-series Long-distance Expansion Racks, CS-series-only Expansion Racks, and C200H Expansion I/O Racks.

C200H Expansion I/O Racks can be connected after CS-series Expansion Racks, however, the CS-series Expansion Racks cannot be connected after C200H Expansion I/O Racks.

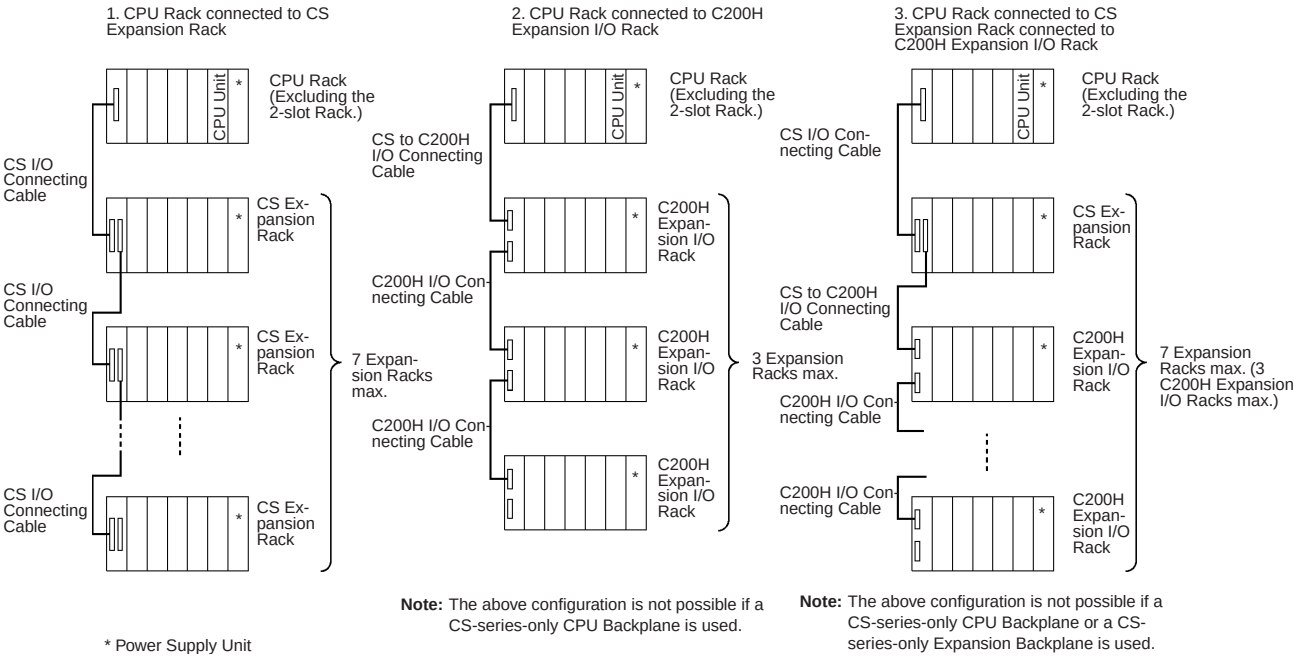
C200H Expansion I/O Racks cannot be connected in the same series as CS-series Long-distance Expansion Racks.

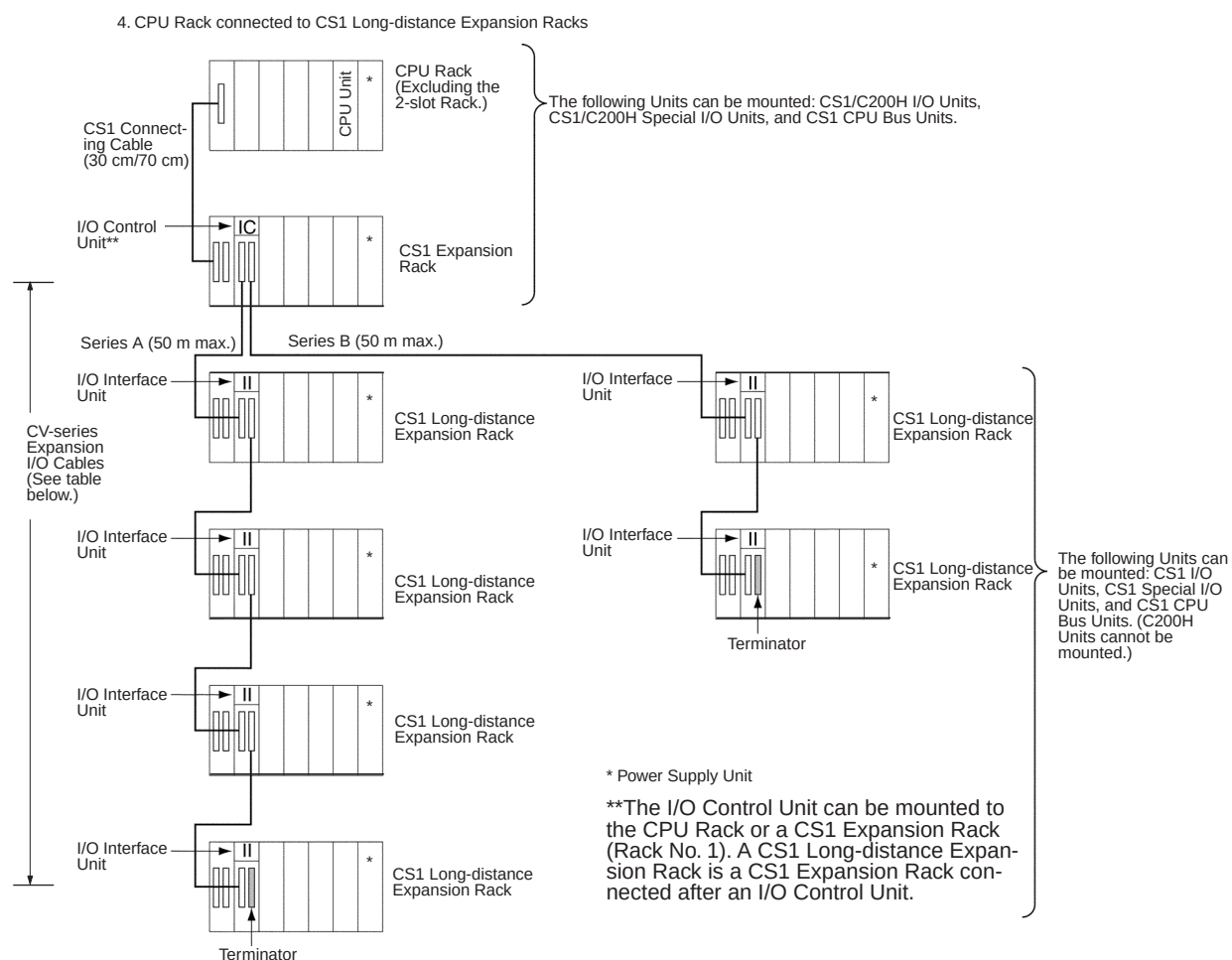
- Note**
1. Expansion Racks cannot be connected to a 2-slot CPU Backplanes.
  2. C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only CPU Expansion Racks.



Expansion Patterns

The following diagrams show the 4 possible expansion patterns.

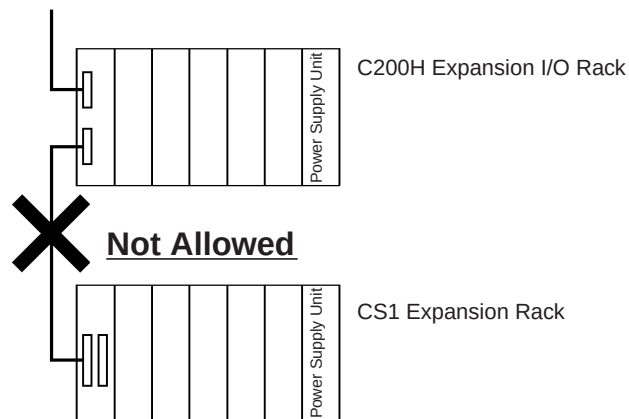




**Note** The following CV-series Expansion I/O Cables are used to connect to the CS-series Long-distance Expansion Racks (i.e., between the I/O Control Unit and the first I/O Interface Unit and between I/O Interface Units).

| Model number | Length |
|--------------|--------|
| CV500-CN312  | 0.3 m  |
| CV500-CN612  | 0.6 m  |
| CV500-CN122  | 1 m    |
| CV500-CN222  | 2 m    |
| CV500-CN322  | 3 m    |
| CV500-CN522  | 5 m    |
| CV500-CN132  | 10 m   |
| CV500-CN232  | 20 m   |
| CV500-CN332  | 30 m   |
| CV500-CN432  | 40 m   |
| CV500-CN532  | 50 m   |

**Note** CS-series Expansion Racks must be connected before C200H Expansion I/O Racks. The following configuration is not allowed.



### Maximum Expansion Racks

| Expansion pattern                                                                   | Rack                                                                  | Maximum No. of Racks                            | Remarks                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPU Rack with CS-series Expansion Racks                                             | CS-series Expansion Racks                                             | 7 Racks                                         | The total cable length must be 12 m or less.                                                                                                                                                                                          |
| CPU Rack with CS-series Expansion Racks and C200H Expansion I/O Racks               | CS-series Expansion Racks and C200H Expansion I/O Racks               | 7 Racks (with 3 C200H Expansion I/O Racks max.) |                                                                                                                                                                                                                                       |
| CPU Rack with C200H Expansion I/O Racks                                             | C200H Expansion I/O Racks                                             | 3 Racks                                         |                                                                                                                                                                                                                                       |
| CPU Rack with CS-series Expansion Racks and CS-series Long-distance Expansion Racks | CS-series Expansion Racks and CS-series Long-distance Expansion Racks | 7 Racks (with 1 CS-series Expansion Rack max.)  | <p>The total cable length must be 0.7 m or less to the last CS-series Expansion Rack.</p> <p>The total cable length must be 50 m or less each for up to two series of CS-series Long-distance Expansion Racks (100 m max. total).</p> |

**Note** C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only CPU Racks.



## Rack Configurations

| Rack                                    | Configuration                                                                                                                                                                                                                                                                                                                                                                  |                                   | Remarks                                                                                                                                                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard CS-series Expansion Racks      | CS-series Expansion Backplane                                                                                                                                                                                                                                                                                                                                                  |                                   | One of each Unit is required.<br><br><b>Note</b> CS-series Expansion Racks can be connected to C200H Expansion I/O Racks however, C200H Expansion I/O Racks must be connected after CS-series Expansion Racks.                                                                     |
|                                         | Power Supply Unit                                                                                                                                                                                                                                                                                                                                                              |                                   |                                                                                                                                                                                                                                                                                    |
|                                         | CPU Backplane or CS-series Expansion Backplane                                                                                                                                                                                                                                                                                                                                 | CS I/O Connecting Cables          |                                                                                                                                                                                                                                                                                    |
|                                         | C200H Expansion I/O Backplane                                                                                                                                                                                                                                                                                                                                                  | CS to C200H I/O Connecting Cables |                                                                                                                                                                                                                                                                                    |
| CS-series-only Expansion Racks          | CS-series-only Backplane                                                                                                                                                                                                                                                                                                                                                       |                                   | One of each Unit is required.<br><br><b>Note</b> C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.                                                                                                                                            |
|                                         | Power Supply Unit                                                                                                                                                                                                                                                                                                                                                              |                                   |                                                                                                                                                                                                                                                                                    |
|                                         | CPU Backplane or CS-series Expansion Backplane                                                                                                                                                                                                                                                                                                                                 | CS I/O Connecting Cables          |                                                                                                                                                                                                                                                                                    |
| C200H Expansion I/O Racks               | C200H Expansion I/O Backplane                                                                                                                                                                                                                                                                                                                                                  |                                   | One of each Unit is required.                                                                                                                                                                                                                                                      |
|                                         | Power Supply Unit                                                                                                                                                                                                                                                                                                                                                              |                                   |                                                                                                                                                                                                                                                                                    |
|                                         | CS-series Expansion Backplane                                                                                                                                                                                                                                                                                                                                                  | CS to C200H I/O Connecting Cables |                                                                                                                                                                                                                                                                                    |
|                                         | C200H Expansion I/O Backplane                                                                                                                                                                                                                                                                                                                                                  | C200H I/O Connecting Cables       |                                                                                                                                                                                                                                                                                    |
| CS-series Long-distance Expansion Racks | Mount an I/O Control Unit (CS1W-IC102) to the leftmost slot on the CPU Rack or the last CS-series Expansion Rack.<br>Mount an I/O Interface Unit (CS1W-II102) to the leftmost slot on each Long-distance Expansion Rack.<br>Attach a Terminator (CV500-TER01) to the last Long-distance Expansion Rack in each series. Two Terminators are provided with the I/O Control Unit. |                                   | Each I/O Control Unit and I/O Interface Unit requires one slot.<br>These Units are not allocated I/O words.<br>Use CV-series I/O Connecting Cables.<br>A CS-series Expansion Rack cannot be connected to a CS-series Long-distance Expansion Rack using a CS I/O Connecting Cable. |

## Configuration Device List

| Name                                          | Model        | Specifications       | Cable Length                                      |
|-----------------------------------------------|--------------|----------------------|---------------------------------------------------|
| Standard CS-series Expansion Backplanes       | CS1W-BI033   | 3 slots              | Can be used for Long-distance Expansion Racks.    |
|                                               | CS1W-BI053   | 5 slots              |                                                   |
|                                               | CS1W-BI083   | 8 slots              |                                                   |
|                                               | CS1W-BI103   | 10 slots             |                                                   |
| CS-series-only CS-series Expansion Backplanes | CS1W-BI032   | 3 slots (See note.)  | Can be used for Long-distance Expansion Racks.    |
|                                               | CS1W-BI052   | 5 slots (See note.)  |                                                   |
|                                               | CS1W-BI082   | 8 slots (See note.)  |                                                   |
|                                               | CS1W-BI102   | 10 slots (See note.) |                                                   |
| C200H Expansion I/O Backplanes                | C200HW-BI031 | 3 slots              | Cannot be used for Long-distance Expansion Racks. |
|                                               | C200HW-BI051 | 5 slots              |                                                   |
|                                               | C200HW-BI081 | 8 slots              |                                                   |
|                                               | C200HW-BI101 | 10 slots             |                                                   |

| Name                              | Model         | Specifications                                                                                                                          | Cable Length |
|-----------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Power Supply Units                | C200HW-PA204  | 100 to 120 V AC or 200 to 240 V AC<br>Output capacity: 4.6 A, 5 V DC                                                                    | ---          |
|                                   | C200HW-PA204S | 100 to 120 V AC or 200 to 240 V AC (with service supply: 0.8 A, 24 V DC)<br>Output capacity: 4.6 A, 5 V DC                              |              |
|                                   | C200HW-PA204R | 100 to 120 V AC or 200 to 240 V AC (with RUN output)<br>Output capacity: 4.6 A, 5 V DC                                                  |              |
|                                   | C200HW-PD024  | 24 V DC                                                                                                                                 |              |
|                                   | C200HW-PA209R | 100 to 120 V AC or 200 to 240 V AC (with RUN output)<br>Output capacity: 9 A, 5 V DC                                                    |              |
| CS I/O Connecting Cables          | CS1W-CN313    | Connects CS-series Expansion Backplanes to CPU Backplanes or other CS-series Expansion Backplanes.                                      | 0.3 m        |
|                                   | CS1W-CN713    |                                                                                                                                         | 0.7 m        |
|                                   | CS1W-CN223    |                                                                                                                                         | 2 m          |
|                                   | CS1W-CN323    |                                                                                                                                         | 3 m          |
|                                   | CS1W-CN523    |                                                                                                                                         | 5 m          |
|                                   | CS1W-CN133    |                                                                                                                                         | 10 m         |
|                                   | CS1W-CN133B2  |                                                                                                                                         | 12 m         |
| CS to C200H I/O Connecting Cables | CS1W-CN311    | Connects C200H Expansion I/O Backplanes to CPU Backplanes or CS-series Expansion Backplanes.                                            | 0.3 m        |
|                                   | CS1W-CN711    |                                                                                                                                         | 0.7 m        |
|                                   | CS1W-CN221    |                                                                                                                                         | 2 m          |
|                                   | CS1W-CN321    |                                                                                                                                         | 3 m          |
|                                   | CS1W-CN521    |                                                                                                                                         | 5 m          |
|                                   | CS1W-CN131    |                                                                                                                                         | 10 m         |
|                                   | CS1W-CN131B2  |                                                                                                                                         | 12 m         |
| C200H I/O Connecting Cables       | CS1W-CN311    | Connects C200H Expansion I/O Backplanes to other C200H Expansion I/O Backplanes.                                                        | 0.3 m        |
|                                   | CS1W-CN711    |                                                                                                                                         | 0.7 m        |
|                                   | CS1W-CN221    |                                                                                                                                         | 2 m          |
|                                   | CS1W-CN521    |                                                                                                                                         | 5 m          |
|                                   | CS1W-CN131    |                                                                                                                                         | 10 m         |
| I/O Control Unit                  | CS1W-IC102    | Mounts to the leftmost slot on the CPU Rack or a CS-series Expansion Rack to enable connecting CS-series Long-distance Expansion Racks. | ---          |
|                                   |               |                                                                                                                                         |              |
| I/O Interface Unit                | CS1W-II102    | Mounts to the leftmost slot on an CS-series Long-distance Expansion Rack.                                                               |              |

| Name                            | Model       | Specifications                                    | Cable Length |
|---------------------------------|-------------|---------------------------------------------------|--------------|
| CV-series I/O Connecting Cables | CV500-CN312 | Connects CS-series Long-distance Expansion Racks. | 0.3 m        |
|                                 | CV500-CN612 |                                                   | 0.6 m        |
|                                 | CV500-CN122 |                                                   | 1 m          |
|                                 | CV500-CN222 |                                                   | 2 m          |
|                                 | CV500-CN322 |                                                   | 3 m          |
|                                 | CV500-CN522 |                                                   | 5 m          |
|                                 | CV500-CN132 |                                                   | 10 m         |
|                                 | CV500-CN232 |                                                   | 20 m         |
|                                 | CV500-CN332 |                                                   | 30 m         |
|                                 | CV500-CN432 |                                                   | 40 m         |
|                                 | CV500-CN532 |                                                   | 50 m         |

**Note** C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only Expansion Backplanes.

### Connectable Units

The following table shows the Units that can be connected to CPU Racks, CS-series Expansion Racks, and C200H Expansion I/O Racks.

Refer to 2-4 *Units* for details on the limitations on each particular Unit.

| Unit                                    | CS-series Basic I/O Units | C200H Basic I/O Units | C200H Group-2 High-density I/O Units (Basic I/O Units) | CS-series Special I/O Units | C200H Special I/O Units (see note 2) | CPU Bus Units (see note 3) |
|-----------------------------------------|---------------------------|-----------------------|--------------------------------------------------------|-----------------------------|--------------------------------------|----------------------------|
| Standard CPU Rack                       | Yes                       | Yes                   | Yes                                                    | Yes                         | Yes                                  | Yes                        |
| CS-series-only CPU Rack                 | Yes                       | No                    | No                                                     | Yes                         | No                                   | Yes                        |
| Standard CS-series Expansion Racks      | Yes                       | Yes                   | Yes                                                    | Yes                         | Yes                                  | Yes                        |
| C200H Expansion I/O Racks               | No                        | Yes                   | Yes                                                    | No                          | Yes                                  | No                         |
| CS-series-only Expansion Racks          | Yes                       | No                    | No                                                     | Yes                         | No                                   | Yes                        |
| CS-series Long-distance Expansion Racks | Yes                       | No                    | No                                                     | Yes                         | No                                   | Yes (See note 2.)          |

- Note**
1. The CS1W-INT01 and C200HS-INT01 Interrupt Input Units are Basic I/O Units, but they can be mounted only to the CPU Rack.
  2. Although CS-series CPU Bus Units can be mounted to CS-series Long-distance Expansion Racks, it is not recommended because doing so will increase the cycle time.

### Maximum Number of Units

The maximum number of expansion slots is 80, so the maximum number of Units that can be connected is 80. The total number of each type of Unit is not limited in the mounting location.

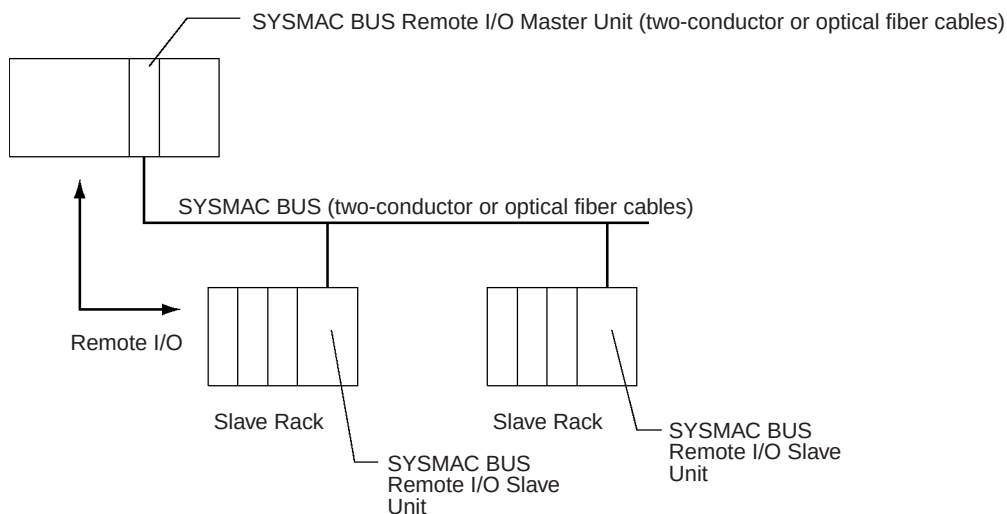
- Note**
1. CS1W-INT01 and C200HS-INT01 Interrupt Input Units are Basic I/O Units but can be connected to CPU Racks only (four C200HS-INT01 and two CS1W-INT01 Units max. per CPU Rack).
  2. Up to 16 C200H Special I/O Units can be mounted.
  3. Up to 16 CPU Bus Units can be mounted.

## 2-3-4 SYSMAC BUS Slave Racks

SYSMAC BUS Slave Racks are used to perform basic CS-series remote I/O communications. The SYSMAC BUS Slave Rack allows comparatively small-scale (512 bits max.) remote I/O communications using Basic I/O Units and Special I/O Units. The Slave Racks are connected using two-core cable or optical fiber cables. Units such as Basic I/O Units and Special I/O Units can be mounted to some Slave Racks. I/O Terminals can also be connected.

### Configuration

| Rack                   | Configuration         | Remarks                        |
|------------------------|-----------------------|--------------------------------|
| SYSMAC BUS Slave Racks | Backplane             | One of each required per Rack. |
|                        | Remote I/O Slave Unit |                                |



### Maximum No. of Units and Racks

| Per CPU Rack |              | Per Master Unit | Per Slave Rack                                     |
|--------------|--------------|-----------------|----------------------------------------------------|
| Master Units | Slave Racks  | Slave Racks     | Maximum Units                                      |
| 2 Units max. | 5 Racks max. | 5 Racks max.    | 10 Units max.<br>(depending on the Backplane used) |

### Configuration Devices

#### Master Units

| Unit                                       | Model           | Maximum Units per CPU Unit | Maximum Slave Racks and I/O bits per CPU Unit and Master Unit |                | Slave Rack communications cables                | Transmission distance (total extension) |
|--------------------------------------------|-----------------|----------------------------|---------------------------------------------------------------|----------------|-------------------------------------------------|-----------------------------------------|
|                                            |                 |                            | Slave Racks                                                   | I/O bits       |                                                 |                                         |
| SYSMAC BUS Wired Remote I/O Master Units   | C200H-RM201     | 2 Units                    | 5                                                             | 800 (50 words) | Two-core cable                                  | 200 m                                   |
| SYSMAC BUS Optical Remote I/O Master Units | C200H-RM001-PV1 | 2 Units                    | 5                                                             | 800 (50 words) | Optical fiber cable (PCF or APF)<br>(See note.) | PCF: 200 m<br>APF: 20 m                 |

**Note** PCF: Plastic Clad Optical Fiber Cable  
APF: All Plastic Optical Fiber Cable.

**Slave Racks**

| Name                                       | Model          | Specifications                                           | Remarks                            |
|--------------------------------------------|----------------|----------------------------------------------------------|------------------------------------|
| SYSMAC BUS Slave Rack Backplanes           | C200H-BC101-V2 | 10 Units                                                 | ---                                |
|                                            | C200H-BC081-V2 | 8 Units                                                  |                                    |
|                                            | C200H-BC051-V2 | 5 Units                                                  |                                    |
|                                            | C200H-BC031-V2 | 3 Units                                                  |                                    |
| SYSMAC BUS Wired Remote I/O Master Units   | C200H-RT201    | Power supply voltage: 100 to 120 V AC or 200 to 240 V AC | Power Supply Unit is not required. |
|                                            | C200H-RT202    | Power supply voltage: 24 V DC                            |                                    |
| SYSMAC BUS Optical Remote I/O Master Units | C200H-RT001-P  | Power supply voltage: 100 to 120 V AC or 200 to 240 V AC |                                    |
|                                            | C200H-RT002-P  | Power supply voltage: 24 V DC                            |                                    |

**Note** Words are allocated to Units on SYSMAC BUS Slave Racks from the SYSMAC BUS Area and not from the I/O Bit Area.

**Connectable Units**

| Unit                                  | CS-series Basic I/O Units | C200H Basic I/O Units | C200H Group-2 High-density I/O Units (Basic I/O Units) | CS-series Special I/O Units | C200H Special I/O Units | CPU Bus Units |
|---------------------------------------|---------------------------|-----------------------|--------------------------------------------------------|-----------------------------|-------------------------|---------------|
| <b>SYSMAC BUS Wired Slave Racks</b>   | No                        | Yes                   | No                                                     | No                          | Yes<br>(See Note.)      | No            |
| <b>SYSMAC BUS Optical Slave Racks</b> | No                        | Yes                   | No                                                     | No                          | Yes<br>(See Note.)      | No            |

- Note**
1. C200H DeviceNet Master Units (C200HW-DRM21-V1), CompoBus/S Master Units, PLC Link Units, and SYSMAC BUS Remote I/O Master Units cannot be connected to Wired Slave Racks.
  2. Special I/O Unit words (CIO 2000 to CIO 2959) are allocated to C200H Special I/O Units according to unit numbers.

3. Up to a total of 10 C200H Special I/O Units can be mounted to all Slave Racks in a SYSMAC BUS Remote I/O System. Only unit numbers 0 to 9 can be used. The number of C200H Special I/O Units that can be mounted to any one Slave Rack depends on the specific Units that are used, as shown in the following table. For the purpose of calculating the maximum number of Units, Units are classified into four groups, A to D.

| Group                                                   | A                                                                                                                                           | B                                                                                                                            | C                                     | D                                                        |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|----------------------------------------------------------|
| <b>Units</b>                                            | High-speed Counter Units, NC111/NC112/NC113/NC213 Position Control Units, ASCII Units, Analog I/O Units, ID Sensor Units, Fuzzy Logic Units | High-density I/O Units, Temperature Controller Units, Heating/Cooling Control Units, PID Control Units, Cam Positioner Units | Temperature Sensor Units, Voice Units | NC211/NC413 Position Control Units, Motion Control Units |
| <b>Maximum Units in each group for each Slave Rack</b>  | 4 Units max.                                                                                                                                | 8 Units max.                                                                                                                 | 6 Units max.                          | 2 Units max.                                             |
| <b>Maximum Units for all groups for each Slave Rack</b> | $3A + B + 2C + 6D \leq 12$ and $A + B + C + D \leq 8$                                                                                       |                                                                                                                              |                                       |                                                          |

**Note** I/O READ/WRITE instructions (IORD/IOWR) cannot be used with C200H Special I/O Units that are mounted to a Slave Rack.

## 2-4 Units

### 2-4-1 Basic I/O Units

#### Input Units

##### C200H Basic Input Units

| Name                  | Specifications              | Model        | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference                                                                                       |
|-----------------------|-----------------------------|--------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-------------------------------------------------------------------------------------------------|
|                       |                             |              |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |                                                                                                 |
| AC Input Units        | 100 to 120 V AC, 8inputs    | C200H-IA121  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 3-6 Basic I/O Units and Appendix A Specifications of Basic I/O Units and High-density I/O Units |
|                       | 100 to 120 V AC, 16inputs   | C200H-IA122  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |                                                                                                 |
|                       | 100 to 120 V AC, 16inputs   | C200H-IA122V | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |                                                                                                 |
|                       | 200 to 240 V AC, 8inputs    | C200H-IA221  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |                                                                                                 |
|                       | 200 to 240 V AC, 16inputs   | C200H-IA222  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |                                                                                                 |
|                       | 200 to 240 V AC, 16inputs   | C200H-IA222V | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |                                                                                                 |
| AC/DC Input Units     | 12 to 24 V AC/V DC, 8inputs | C200H-IM211  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |                                                                                                 |
|                       | 24 V AC/V DC, 16inputs      | C200H-IM212  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |                                                                                                 |
| DC Input Units        | 12 to 24 V DC, 8inputs      | C200H-ID211  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |                                                                                                 |
|                       | 24 V DC, 16 inputs          | C200H-ID212  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |                                                                                                 |
| Interrupt Input Units | 12 to 24 V DC, 8inputs      | C200HS-INT01 | 16                                              | Yes             | Yes                       | Yes (See note 1.)         | No                                      | No                     |                                                                                                 |

1. The interrupt function can be used only when the Unit is mounted to the CPU Rack. (The Interrupt Input Unit can be used as a regular I/O Unit on Expansion Racks.)
2. Can be used only with CPU Units with model numbers ending in "-V1," i.e., CS1W-CPU4□-V1 or CS1W-CPU6□-V1.
3. The C200H-ID001 (8 no-voltage contact inputs, NPN) cannot be used with CS-series PLCs.
4. C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

## C200H High-density Input Units (Group 2)

| Name           | Specifications     | Model       | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference |
|----------------|--------------------|-------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-----------|
|                |                    |             |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |           |
| DC Input Units | 24 V DC, 32 inputs | C200H-ID216 | 32                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
|                | 24 V DC, 32 inputs | C200H-ID218 | 32                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
|                | 12 V DC, 64 inputs | C200H-ID111 | 64                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
|                | 24 V DC, 64 inputs | C200H-ID217 | 64                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
|                | 24 V DC, 64 inputs | C200H-ID219 | 64                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |

**Note** C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

## CS-series Basic Input Units

| Name                   | Specifications                             | Model      | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference |
|------------------------|--------------------------------------------|------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-----------|
|                        |                                            |            |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |           |
| AC Input Units         | 100 to 120 V DC, 100 to 120 V AC 16 inputs | CS1W-IA111 | 16                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |           |
|                        | 200 to 240 V DC, 16 inputs                 | CS1W-IA211 | 16                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |           |
| DC Input Units         | 24 V DC, 16 inputs                         | CS1W-ID211 | 16                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |           |
| Interrupt Input Units  | 24 V DC, 16 inputs                         | CS1W-INT01 | 16                                              | Yes             | No                        | Yes (See notes 1, 2.)     | Yes (See notes 1, 2.)                   | No                     |           |
| High-speed Input Units | 24 V DC, 16 inputs                         | CS1W-IDP01 | 16                                              | Yes             | No                        | Yes (See note 1.)         | Yes (See note 1.)                       | No                     |           |
| DC Input Units         | 24 V DC, 32 inputs                         | CS1W-ID231 | 32                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |           |
|                        | 24 V DC, 64 inputs                         | CS1W-ID261 | 64                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |           |
|                        | 24 V DC, 96 inputs                         | CS1W-ID291 | 96                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |           |

- Note**
1. The interrupt function can be used only when the Unit is mounted to the CPU Rack. (The Interrupt Input Unit can be used as a regular I/O Unit on Expansion Racks.)
  2. Can be used only with CPU Units with model numbers ending in “-V1,” i.e., CS1W-CPU4□-V1 or CS1W-CPU6□-V1.
  3. The C200H-ID001 (8 no-voltage contact inputs, NPN) cannot be used with CS-series PLCs.



## Basic Output Units

### C200H Basic Output Units

| Name                             | Specifications                                                  | Model                                 | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference |
|----------------------------------|-----------------------------------------------------------------|---------------------------------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-----------|
|                                  |                                                                 |                                       |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |           |
| Relay Output Units               | 250 V AC/24 V DC, 2 A, independent contacts, 5 outputs max.     | C200H-OC223                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, independent contacts, 8 outputs max.     | C200H-OC224                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, independent contacts, 8 outputs max.     | C200H-OC224V (no longer manufactured) | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, independent contacts, 8 outputs max.     | C200H-OC224N                          | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, 8 outputs max.                           | C200H-OC221                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, 12 outputs max.                          | C200H-OC222                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, 12 outputs max.                          | C200H-OC222V (no longer manufactured) | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, 12 outputs max.                          | C200H-OC222N                          | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, 16 outputs max.                          | C200H-OC226 (no longer manufactured)  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, 16 outputs max.                          | C200H-OC226N                          | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC/24 V DC, 2 A, 16 outputs max.                          | C200H-OC225                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
| Triac Output Units               | 250 V AC, 1 A, 8 outputs, with fuse burnout detection circuit   | C200H-OA221 (no longer manufactured)  | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC, 1.2 A, 8 outputs, with fuse burnout detection circuit | C200H-OA223                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC, 0.3 A, 12 outputs                                     | C200H-OA222V                          | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 250 V AC, 0.5 A, 12 outputs                                     | C200H-OA224                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
| Transistor Output Units, Sinking | 24 V DC, 2.1 A, 8 outputs                                       | C200H-OD213                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 12 to 48 V DC, 1 A, 8 outputs                                   | C200H-OD411                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 24 V DC, 0.3 A, 12 outputs                                      | C200H-OD211                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                  | 24 V DC, 0.3 A, 16 outputs                                      | C200H-OD212                           | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |

| Name                              | Specifications                                            | Model       | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference |
|-----------------------------------|-----------------------------------------------------------|-------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-----------|
|                                   |                                                           |             |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |           |
| Transistor Output Units, Sourcing | 24 V DC, 0.8 A, 8 outputs, load short-circuit protection. | C200H-OD214 | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                   | 5 to 24 V DC, 0.3 A, 8 outputs                            | C200H-OD216 | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                   | 5 to 24 V DC, 0.3 A, 12 outputs                           | C200H-OD217 | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |
|                                   | 24 V DC, 1 A, 16 outputs, load short-circuit protection.  | C200H-OD21A | 16                                              | Yes             | Yes                       | Yes                       | No                                      | Yes                    |           |

**Note** C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

### C200H High-density Group-two Output Units

| Name                    | Specifications                                                              | Model       | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference |
|-------------------------|-----------------------------------------------------------------------------|-------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-----------|
|                         |                                                                             |             |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |           |
| Transistor Output Units | 4.5 V DC/16 mA to 26.4 V/100 mA, 32 sinking outputs                         | C200H-OD218 | 32                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
|                         | 4.5 V DC/16 mA to 26.4 V/100 mA, 64 sinking outputs                         | C200H-OD219 | 64                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
|                         | 24 V DC, 0.5 A, 32 outputs, sourcing outputs, load short-circuit protection | C200H-OD21B | 32                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |

**Note** C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

## CS-series Basic Output Units

| Name                    | Specifications                                                                | Model      | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference                                                                                       |
|-------------------------|-------------------------------------------------------------------------------|------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-------------------------------------------------------------------------------------------------|
|                         |                                                                               |            |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |                                                                                                 |
| Relay Output Units      | 250 V AC/ 24 V DC, 2 A; 120 V DC, 0.1 A; 8 points, independent contacts       | CS1W-OC201 | 16                                              | Yes             | No                        | Yes                       | Yes                                     | No                     | 3-6 Basic I/O Units and Appendix A Specifications of Basic I/O Units and High-density I/O Units |
|                         | 250 V AC/24 V DC, 2 A; 120 V DC, 0.1 A; 16 points                             | CS1W-OC211 | 16                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
| Triac Output Units      | 250 V AC, 1.2 A, 8 outputs, with fuse burnout detection circuit               | CS1W-OA201 | 16                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                         | 250 V AC, 0.5 A, 16 outputs                                                   | CS1W-OA211 | 16                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
| Transistor Output Units | 12 to 24 V DC, 0.5 A, 16 sinking outputs                                      | CS1W-OD211 | 16                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                         | 12 to 24 V DC, 0.5 A, 32 sinking outputs                                      | CS1W-OD231 | 32                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                         | 12 to 24 V DC, 0.3 A, 64 sinking outputs                                      | CS1W-OD261 | 64                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                         | 12 to 24 V DC, 0.1 A, 96 sinking outputs, with fuse burnout detection circuit | CS1W-OD291 | 96                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                         | 24 V DC, 0.5 A, 16 sourcing outputs, load short-circuit protection            | CS1W-OD212 | 16                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                         | 24 V DC, 0.3 A, 32 sourcing outputs, load short-circuit protection            | CS1W-OD232 | 32                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                         | 24 V DC, 0.3 A, 64 sourcing outputs, load short-circuit protection            | CS1W-OD262 | 64                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                         | 24 V DC, 0.1 A, 96 sourcing outputs, with fuse burnout detection circuit      | CS1W-OD292 | 96                                              | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |

**Mixed I/O Units****CS-series Basic I/O Units**

| Name                             | Specifications                                                                                     | Model      | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference                                                                                       |
|----------------------------------|----------------------------------------------------------------------------------------------------|------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-------------------------------------------------------------------------------------------------|
|                                  |                                                                                                    |            |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |                                                                                                 |
| DC Input/Transistor Output Units | 24V DC, 32 inputs<br>12 to 24 V DC, 0.3A, 32 sinking outputs                                       | CS1W-MD261 | 64-point I/O                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 3-6 Basic I/O Units and Appendix A Specifications of Basic I/O Units and High-density I/O Units |
|                                  | 24V DC, 48 inputs<br>12 to 24 V DC, 0.1A, 48 sinking outputs, with fuse burnout detection circuit  | CS1W-MD291 | 96-point I/O                                    | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                                  | 24V DC, 32 inputs<br>24 V DC, 0.3A, 32 sourcing outputs, load short-circuit protection.            | CS1W-MD262 | 64-point I/O                                    | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
|                                  | 24V DC, 48 inputs<br>12 to 24 V DC, 0.1A, 48 sourcing outputs, with fuse burnout detection circuit | CS1W-MD292 | 96-point I/O                                    | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |
| TTL I/O Units                    | 5 V DC, 3.5 mA, 32 inputs<br>5 V DC, 35 mA, 32 outputs                                             | CS1W-MD561 | 64-point I/O                                    | Yes             | No                        | Yes                       | Yes                                     | No                     |                                                                                                 |

**B7A Interface Units****C200H Basic I/O Units**

| Name             | Specifications | Model       | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference |
|------------------|----------------|-------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-----------|
|                  |                |             |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |           |
| B7A Input Units  | 16 inputs      | C200H-B7A11 | 16                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
| B7A Output Units | 16 outputs     | C200H-B7A01 | 16                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |

**Note** C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

**C200H High-density I/O Units (Group 2)**

| Name             | Specifications        | Model       | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference |
|------------------|-----------------------|-------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-----------|
|                  |                       |             |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |           |
| B7A Input Units  | 32 inputs             | C200H-B7AI2 | 32                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
| B7A Output Units | 32 outputs            | C200H-B7AO2 | 32                                              | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
| B7A I/O Units    | 16 inputs, 16 outputs | C200H-B7A21 | 32-point I/O                                    | Yes             | Yes                       | Yes                       | No                                      | No                     |           |
|                  | 32 inputs, 32 outputs | C200H-B7A22 | 64-point I/O                                    | Yes             | Yes                       | Yes                       | No                                      | No                     |           |

**Note** C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

**Analog Timer Unit****C200H Basic Unit**

| Name               | Specifications | Model       | Number of bits allocated (CIO 0000 to CIO 0319) | Mountable Racks |                           |                           |                                         |                        | Reference              |
|--------------------|----------------|-------------|-------------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|------------------------|
|                    |                |             |                                                 | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |                        |
| Analog Timer Units | 4-point timer  | C200H-TM001 | 16 points                                       | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 3-9 Analog Timer Units |

**Note** C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

**2-4-2 Special I/O Units****C200H Special I/O Units****C200H High-density I/O Units**

- Note**
- Functionally, these Units are I/O Units, but are categorized as Special I/O Units.
  - C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

| Name                             | Specifications                         | Model       | Number of words allocated (CIO 2000 to CIO 2959) | Number of words allocated (D20000 to D29599) | Mountable Racks |                           |                           |                                         |                        | Unit No. | Reference                                                                                                                        |
|----------------------------------|----------------------------------------|-------------|--------------------------------------------------|----------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------|
|                                  |                                        |             |                                                  |                                              | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |          |                                                                                                                                  |
| DC Input Units                   | 24 V DC, 32 inputs                     | C200H-ID215 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | 3-7 C200H High-density I/O Units (Special I/O Units) and Appendix A Specifications of Basic I/O Units and High-density I/O Units |
| TTL Input Units                  | 5 V DC, 32 inputs                      | C200H-ID501 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |                                                                                                                                  |
| Transistor Output Units          | 24 V DC, 32 sinking outputs            | C200H-OD215 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |                                                                                                                                  |
| TTL Output Units                 | 5 V DC, 32 sinking outputs             | C200H-OD501 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |                                                                                                                                  |
| TTL I/O Units                    | 5 V DC, 16 inputs, 16 sinking outputs  | C200H-MD501 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |                                                                                                                                  |
| DC Input/Transistor Output Units | 24 V DC, 16 inputs, 16 sinking outputs | C200H-MD215 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |                                                                                                                                  |
|                                  | 12 V DC, 16 inputs, 16 sinking outputs | C200H-MD115 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |                                                                                                                                  |

## C200H Special I/O Units

**Note** C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

| Name                                | Specifications                                                                                | Model       | Number of words allocated (CIO 2000 to CIO 2959) | Number of words allocated (D20000 to D29599) | Mountable Racks |                           |                           |                                         |                        | Unit No. | Reference |
|-------------------------------------|-----------------------------------------------------------------------------------------------|-------------|--------------------------------------------------|----------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|----------|-----------|
|                                     |                                                                                               |             |                                                  |                                              | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |          |           |
| Temperature Control Units           | Thermocouple input, time-proportioning PID, or ON/OFF transistor output                       | C200H-TC001 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W225      |
|                                     | Thermocouple input, time-proportioning PID, or ON/OFF voltage output                          | C200H-TC002 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Thermocouple input, PID current output                                                        | C200H-TC003 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Temperature-resistance thermometer input, time-proportioning PID, or ON/OFF transistor output | C200H-TC101 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Temperature-resistance thermometer input, time-proportioning PID, or ON/OFF voltage output    | C200H-TC102 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Temperature-resistance thermometer input, PID current output                                  | C200H-TC103 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
| Heat/Cool Temperature Control Units | Thermocouple input, time-proportioning PID, or ON/OFF transistor output                       | C200H-TV001 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W240      |
|                                     | Thermocouple input, time-proportioning PID, or ON/OFF voltage output                          | C200H-TV002 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Thermocouple input, PID current output                                                        | C200H-TV003 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Temperature-resistance thermometer input, time-proportioning PID, or ON/OFF transistor output | C200H-TV101 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Temperature-resistance thermometer input, time-proportioning PID, or ON/OFF voltage output    | C200H-TV102 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Temperature-resistance thermometer input, PID current output                                  | C200H-TV103 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
| Temperature Sensor Units            | Thermocouple input, K(CA) or J(IC), selectable                                                | C200H-TS001 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W124      |
|                                     |                                                                                               | C200H-TS002 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Temperature-resistance thermometer, JPt 100 Ω                                                 | C200H-TS101 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Temperature-resistance thermometer, Pt 100 Ω                                                  | C200H-TS102 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
| PID Control Units                   | Voltage output/current input, time-proportioning PID, or ON/OFF transistor output             | C200H-PID01 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W241      |
|                                     | Voltage output/current input, time-proportioning PID, or ON/OFF voltage output                | C200H-PID02 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
|                                     | Voltage output/current input, PID current output                                              | C200H-PID03 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |           |
| Cam Positioner Units                | 48 cam outputs (16 external outputs and 32 internal outputs)<br>Resolver speed: 20 μs (5 kHz) | C200H-CP114 | 10 words                                         | 11 words                                     | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W224      |

| Name                     | Specifications                                                                                                            | Model          | Number of words allocated (CIO 2000 to CIO 2959) | Number of words allocated (D20000 to D29599) | Mountable Racks |                           |                           |                                         |                        | Unit No. | Reference    |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------|----------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|----------|--------------|
|                          |                                                                                                                           |                |                                                  |                                              | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |          |              |
| ASCII Units              | 24-Kbyte RAM                                                                                                              | C200H-ASC02    | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W165         |
|                          | 200-Kbyte RAM, 2 RS-232C ports                                                                                            | C200H-ASC11    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   | W306         |
|                          | 200-Kbyte RAM, RS-232C port, RS-422/485 port                                                                              | C200H-ASC21    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   |              |
|                          | 200-Kbyte RAM, 3 RS-232C ports                                                                                            | C200H-ASC31    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   |              |
| Analog Input Units       | 4 to 20 mA, 1 to 5/0 to 10 V (selectable), 4 inputs, 1/4,000 resolution                                                   | C200H-AD001    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W229         |
|                          | 4 to 20 mA, 1 to 5/0 to 10 V/-10 to +10 V (selectable); 8 inputs; 1/4,000 resolution                                      | C200H-AD002    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   |              |
|                          | 4 to 20 mA, 1 to 5/0 to 10 V/-10 to +10 V (selectable); 8 inputs; 1/4,000 resolution                                      | C200H-AD003    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   | W345         |
| Analog Output Units      | 4 to 20 mA, 1 to 5/0 to 10 V (selectable); 2 outputs; 1/4,000 resolution                                                  | C200H-DA001    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W229         |
|                          | 4 to 20 mA, -10 to +10 V (selectable), 4 outputs                                                                          | C200H-DA002    | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   | W325         |
|                          | 1 to 5 V, 0 to 10 V, -10 to +10 V (selectable), 8 outputs; 1/4,000 resolution                                             | C200H-DA003    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   |              |
|                          | 4 to 20 mA, 8 outputs; 1/4,000 resolution                                                                                 | C200H-DA004    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   |              |
| Analog I/O Units         | 2 inputs (4 to 20 mA, 1 to 5 V, etc.)<br>2 outputs (4 to 20 mA, 1 to 5 V, etc.)                                           | C200H-MAD01    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   |              |
| High-speed Counter Units | One-axis pulse input, counting rate: 50 kcps max.                                                                         | C200H-CT001-V1 | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W141         |
|                          | One-axis pulse input, counting rate: 75 kcps max., line driver compatible                                                 | C200H-CT002    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |              |
|                          | Two-axis pulse input, counting rate: 75 kcps max., line driver compatible                                                 | C200H-CT021    | 20 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   | W311         |
| Motion Control Units     | G-language programmable, two-axis analog outputs                                                                          | C200H-MC221    | 20 words                                         | 100 words (Uses first 2 words.)              | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   | W315<br>W314 |
| Position Control Units   | Two axes, pulse output for each axis, speeds: 1 to 250,000 pps, directly connects to servomotor driver                    | C200H-NC211    | 20 words                                         | 200 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W166         |
|                          | One axis, pulse output, speed: 1 to 99990 pps                                                                             | C200H-NC111    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W137         |
|                          | One axis, pulse output, speeds 1 to 250,000 pps, directly connects to servomotor driver, line driver compatible (Z level) | C200H-NC112    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W128         |
|                          | One axis, pulse output, speeds 1 to 500,000 pps, directly connects to servomotor driver                                   | C200H-NC113    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   | W334         |
|                          | Two axes, pulse output for each axis, speeds 1 to 500,000 pps, directly connects to servomotor driver                     | C200H-NC213    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   |              |
|                          | Four axes, pulse output for each axis, speeds 1 to 500,000 pps, directly connects to servomotor driver                    | C200H-NC413    | 20 words                                         | 200 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to F   |              |
| ID Sensor Units          | Electromagnetic coupling                                                                                                  | C200H-IDS01-V1 | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W153         |
|                          | Microwave type                                                                                                            | C200H-IDS21    | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   |              |
| Voice Unit (See note 6.) | Adaptive differential pulse-code modulation                                                                               | C200H-OV001    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W172         |
| Fuzzy Logic Unit         | 8 inputs, 4 outputs                                                                                                       | C200H-FZ001    | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | Yes                    | 0 to 9   | W208         |

| Name                               | Specifications                                         | Model           | Number of words allocated (CIO 2000 to CIO 2959) | Number of words allocated (D20000 to D29599) | Mountable Racks |                           |                           |                                         |                        | Unit No. | Reference |
|------------------------------------|--------------------------------------------------------|-----------------|--------------------------------------------------|----------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|----------|-----------|
|                                    |                                                        |                 |                                                  |                                              | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |          |           |
| JPCN-1 Unit                        | Settable as master or slave                            | C200H-JRM21     | 10 words                                         | 100 words                                    | Yes             | Yes                       | Yes                       | No                                      | No                     | 0 to F   | ---       |
| DeviceNet Master Units             | DeviceNet Remote I/O, 1,600 bits max.                  | C200HW-DRM21-V1 | (See note 1.)                                    | None                                         | Yes             | Yes                       | Yes                       | No                                      | No                     | 0 to F   | W347      |
| C200H I/O Link Units               | DeviceNet Slave, 512 inputs/512 outputs max.           | C200HW-DRT21    | 10 words                                         | None                                         | Yes             | Yes                       | Yes                       | No                                      | No                     | 0 to F   | W347      |
| Compo-Bus/S Master Units           | CompoBus/S Remote I/O, 256 bits max.                   | C200HW-SRM21-V1 | 10 words or 20 words                             | None                                         | Yes             | Yes                       | Yes                       | No                                      | No                     | 0 to F   | W266      |
| PLC Link Units                     | PLC Link, single level: 32 units, multilevel: 16 Units | C200H-LK401     | (See note 2.)                                    | None                                         | Yes             | Yes                       | Yes                       | No                                      | No                     | 0 to 9   | W135      |
| SYSMAC BUS Remote I/O Master Units | Wired                                                  | C200H-RM201     | (See note 3.)                                    | ---                                          | Yes             | Yes                       | Yes                       | No                                      | No                     | 0 to 3   | W120      |
|                                    | Optical                                                | C200H-RM001-PV1 |                                                  | ---                                          | Yes             | Yes                       | Yes                       | No                                      | No                     | 0 to 3   | W136      |

- Note**
1. The DeviceNet Slaves are allocated up to 1,600 I/O bits (100 words) in the DeviceNet Area.
  2. PLC Link Units are allocated up to 1,024 bits (64 words) in the Link Area.
  3. Each Slave Rack connected to a Remote I/O Master Unit is allocated 10 words in the SYSMAC BUS Area. Each I/O Terminal is allocated 1 word in the I/O Terminal Area.
  4. The C200HW-CLK21 Controller Link Unit (C200HX/HG/HE) cannot be used. Use the CS1W-CLK21 Controller Link Unit (CS-series CPU Bus Unit). Data links and message services are supported between C200HX/HG/HE and CS-series PLCs.
  5. The C200H-LK□□□-□□ Host Link Unit (C200H, C200HS, C200HX/HG/HE) cannot be used. Use the CS1W-SCU21 Serial Communications Unit (CS-series CPU Bus Unit).
  6. Observe the following precautions when using the C200H-OV001 Voice Unit.
    - The Voice Unit cannot be used if an OMRON Programmable Terminal (PT) set for NT Link Mode is connected to the peripheral port or RS-232C port on the CPU Unit.
    - When using both a Voice Unit and an OMRON PT, connect the PT to a CS1W-SCB□□□ Serial Communications Board or to a CS1W-SCU□□□ Serial Communications Unit.
    - When a Voice Unit is mounted, set to baud rate for the peripheral port or RS-232C port on the CPU Unit to 9,600 bps or less when communicating with a computer or other external device.



## CS-series Special I/O Units

| Name                                                      | Specifications                                                                   | Model      | Number of words allocated (CIO 2000 to CIO 2959) | Number of words allocated (D20000 to D29599) | Mountable Racks |                           |                           |                                         |                        | Unit No.              | Reference |
|-----------------------------------------------------------|----------------------------------------------------------------------------------|------------|--------------------------------------------------|----------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|-----------------------|-----------|
|                                                           |                                                                                  |            |                                                  |                                              | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |                       |           |
| Analog I/O Unit                                           | 4 inputs (4 to 20 mA, 1 to 5 V, etc.)<br>4 outputs (1 to 5 V, 0 to 10 V, etc.)   | CS1W-MAD44 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               | W345      |
| Analog Input Unit                                         | 4 inputs (4 to 20 mA, 1 to 5 V, etc.)                                            | CS1W-AD041 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
|                                                           | 8 inputs (4 to 20 mA, 1 to 5 V, etc.)                                            | CS1W-AD081 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Analog Output Unit                                        | 4 outputs (1 to 5 V, 4 to 20 mA, etc.)                                           | CS1W-DA041 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
|                                                           | 8 outputs (1 to 5 V, etc.)                                                       | CS1W-DA08V | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
|                                                           | 8 outputs (4 to 20 mA)                                                           | CS1W-DA08C | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Isolated Thermocouple Input Unit                          | 4 inputs (D, E, J, K, N, R, S, T, or $\pm 80$ mV DC)                             | CS1W-PTS01 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               | W368      |
| Isolated Resistance Thermometer Input Unit                | 4 inputs (Pt100, JPt100)                                                         | CS1W-PTS02 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Isolated Ni508 $\Omega$ Resistance Thermometer Input Unit | 4 inputs (Ni508 $\Omega$ )                                                       | CS1W-PTS03 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Isolated 2-wire Transmission Device Input Unit            | 4 inputs (1 to 5 V, 4 to 20 mA) 2-wire transmission device power supply built in | CS1W-PTW01 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Isolated DC Input Unit                                    | 4 inputs (1 to 5 V, 4 to 20 mA, etc.)                                            | CS1W-PDC01 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Isolated Control Output Unit (Analog Output Unit)         | 4 outputs (1 to 5 V, 4 to 20 mA)                                                 | CS1W-PMV01 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Power Transducer Input Unit                               | 8 inputs (-1 to 1 mA, 0 to 1 mA)                                                 | CS1W-PTR01 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               | W376      |
| DC Input Unit (100 mA)                                    | 8 inputs (-100 to 100 mV, 0 to 100 mV)                                           | CS1W-PTR02 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Isolated Pulse Input Unit                                 | 4 pulse inputs (0 to 20 kpulses/s, 0 to 20 pulses/s)                             | CS1W-PPS01 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Position Control Units                                    | Pulse output, 1 axis, 1 to 500 kpulses/s, open-collector output                  | CS1W-NC113 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
|                                                           | Pulse output, 1 axis, 1 to 500 kpulses/s, line-driver output                     | CS1W-NC133 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
|                                                           | Pulse outputs, 2 axes, 1 to 500 kpulses/s, open-collector outputs                | CS1W-NC213 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
|                                                           | Pulse outputs, 2 axes, 1 to 500 kpulses/s, line-driver outputs                   | CS1W-NC233 | 10 words                                         | 100 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
|                                                           | Pulse outputs, 4 axes, 1 to 500 kpulses/s, open-collector outputs                | CS1W-NC413 | 20 words                                         | 200 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
|                                                           | Pulse output, 4 axes, 1 to 500 kpulses/s, line-driver outputs                    | CS1W-NC433 | 20 words                                         | 200 words                                    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95               |           |
| Motion Control Units                                      | Two axes, analog output for each axis, supports G-language                       | CS1W-MC221 | 30 words                                         | None                                         | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95 (See note 1.) | W359      |
|                                                           | Four axes, analog output for each axis, supports G-language                      | CS1W-MC421 | 50 words                                         | None                                         | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95 (See note 2.) |           |

| Name                      | Specifications                                                                   | Model      | Number of words allocated (CIO 2000 to CIO 2959) | Number of words allocated (D20000 to D29599) | Mountable Racks |                           |                           |                                         |                        | Unit No. | Reference |
|---------------------------|----------------------------------------------------------------------------------|------------|--------------------------------------------------|----------------------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|----------|-----------|
|                           |                                                                                  |            |                                                  |                                              | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |          |           |
| Customizable Counter Unit | 4 Kwords, 12 contact inputs, 8 contact outputs                                   | CS1W-HIO01 | 10 words                                         | 100 words (90 for general data ex-change)    | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95  | W384      |
|                           | 4 Kwords, 12 contact inputs, 8 contact outputs, 2 pulse inputs, 2 pulse outputs  | CS1W-HCP22 | 10 words                                         |                                              | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95  |           |
|                           | 4 Kwords, 12 contact inputs, 8 contact outputs, 2 pulse inputs, 2 analog outputs | CS1W-HCA22 | 10 words                                         |                                              | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to 95  |           |

- Note**
1. Allocated three unit numbers.
  2. Allocated five unit numbers.

### 2-4-3 CS-series CPU Bus Units

| Name                       | Specifications                                                                     | Model      | Number of words allocated CIO 1500 to CIO 1899 | Number of words allocated D30000 to D31599 | CPU Bus Unit System Settings | Mountable Racks |                           |                           |                                         |                        | Unit No.            | Reference |
|----------------------------|------------------------------------------------------------------------------------|------------|------------------------------------------------|--------------------------------------------|------------------------------|-----------------|---------------------------|---------------------------|-----------------------------------------|------------------------|---------------------|-----------|
|                            |                                                                                    |            |                                                |                                            |                              | CPU Rack        | C200H Expansion I/O Racks | CS-series Expansion Racks | CS-series Long-distance Expansion Racks | SYSMAC BUS Slave Racks |                     |           |
| Controller Link Units      | Wired                                                                              | CS1W-CLK21 | 25 words                                       | 100 words                                  | Used (data link tables)      | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to F (See note 1) | W309      |
|                            | Optical                                                                            | CS1W-CLK11 | 25 words                                       | 100 words                                  | Used (data link tables)      | Yes             | No                        | Yes                       | Yes                                     | No                     |                     |           |
|                            | Optical ring, H-PCF cable                                                          | CS1W-CLK12 | 25 words                                       | 100 words                                  | Used (data link tables)      | Yes             | No                        | Yes                       | Yes                                     | No                     |                     |           |
|                            | Optical ring, GI cable                                                             | CS1W-CLK52 | 25 words                                       | 100 words                                  | Used (data link tables)      | Yes             | No                        | Yes                       | Yes                                     | No                     |                     |           |
| SYSMAC LINK Units          | Coaxial                                                                            | CS1W-SLK21 | 25 words                                       | 100 words                                  | Used (data link tables)      | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to F (See note 1) | W367      |
|                            | Optical                                                                            | CS1W-SLK11 | 25 words                                       | 100 words                                  | Used (data link tables)      | Yes             | No                        | Yes                       | Yes                                     | No                     |                     |           |
| Serial Communications Unit | Two RS-232C Ports                                                                  | CS1W-SCU21 | 25 words                                       | 100 words                                  | Not used                     | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to F (See note 1) | W336      |
| Ethernet Unit              | 10Base-5, FINS communications, socket service, FTP server, and mail communications | CS1W-ETN01 | 25 words                                       | 100 words                                  | Used                         | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to F (See note 1) | W343      |
|                            | 10Base-T, FINS communications, socket service, FTP server, and mail communications | CS1W-ETN11 | 25 words                                       | 100 words                                  | Used                         | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to F (See note 1) |           |
| Device-Net Unit            | Device-Net remote I/O 2,048 pt, user settings without Configurator                 | CS1W-DRM21 | 25 words                                       | 100 words                                  | Not used                     | Yes             | No                        | Yes                       | Yes                                     | No                     | 0 to F              | W380      |
| Loop Control Unit          | PID operations: 32 max. Loop, process operations: 250 max.                         | CS1W-LC001 | 25 words                                       | None                                       | Not used                     | Yes             | No                        | No                        | No                                      | No                     | 0 to F (See note 2) | W374 W375 |

- Note**
1. A maximum of four Units can be mounted.
  2. A maximum of three Units can be mounted.
  3. Some CPU Bus Units are allocated words in the CPU Bus Unit Setting Area. The system must be designed so that the number of words allocated in the CPU Bus Unit Setting Area does not exceed its capacity. Refer to 2-7 *CPU Bus Unit Setting Area Capacity* for details.

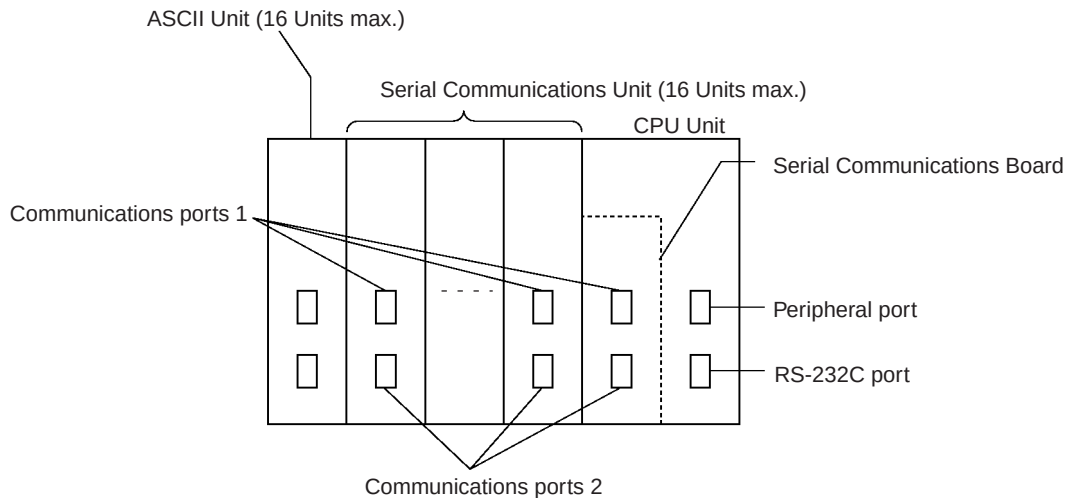
## 2-5 Expanded System Configuration

### 2-5-1 Serial Communications System

The CS-series system configuration can be expanded by using the following serial communications ports.

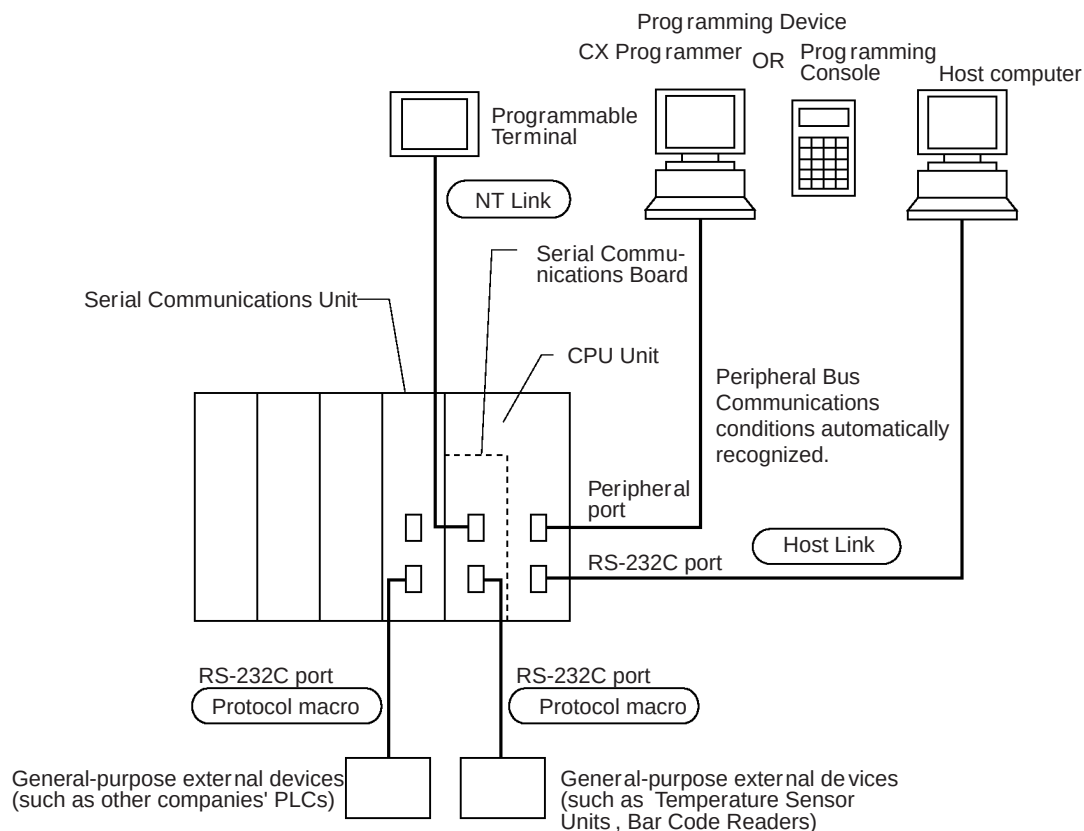
- CPU Unit built-in ports  $\times 2$  (peripheral port and RS-232C port)
- Serial Communications Board ports  $\times 2$  (RS-232C or RS-422/485)
- Serial Communications Unit ports  $\times 2$  (RS-232C)
- ASCII Unit ports  $\times 2$  (RS-232C or RS-422/485)

- 1,2,3...**
1. If the CPU Unit built-in ports, the Serial Communications Board ports, or Serial Communications Unit ports are used, words can be allocated to various protocols, such as Host Link and protocol macro.
  2. Up to 16 Serial Communications Units and 16 ASCII Units can be connected to one CPU Unit. The system configuration can then be expanded by connecting devices with RS-232C or RS-422/485 ports, such as Temperature Sensor Units, Bar Code Readers, ID Systems, personal computers, Board Computers, Racks, and other companies' PLCs.



Expanding the system configuration as shown above allows a greater number of serial communications ports, and greater flexible and simpler support for different protocols.

## System Configuration Example



Refer to page 91 for a table showing which communications protocols are supported by each Unit.

### 2-5-2 Systems

The serial communications port mode (protocol) can be switched in the CPU Unit's PLC Setup. Depending on the protocol selected, the following systems can be configured.

#### Protocols

The following protocols support serial communications.

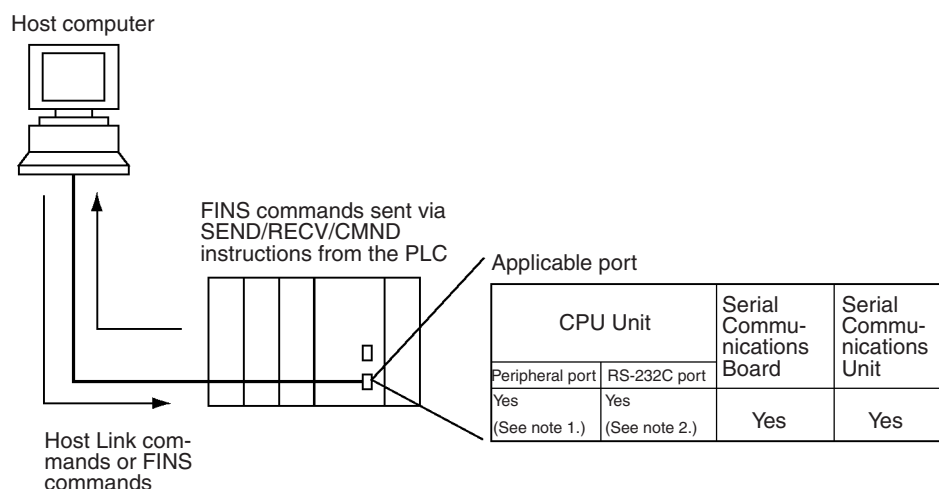
| Protocol                              | Main connection                                   | Use                                                                                                    | Applicable commands, communications instructions                                    |
|---------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Host Link (SYSMAC WAY)                | Personal computer<br>OMRON Programmable Terminals | Communications between the Host computer and the PLC. Commands can be sent to a computer from the PLC. | Host Link commands/ FINS commands. Commands can be sent to a computer from the PLC. |
| No-protocol (customer) communications | General-purpose external devices                  | No-protocol communications with general-purpose devices.                                               | TXD(236) instruction, RXD(235) instruction                                          |
| NT Links (1: N)                       | OMRON Programmable Terminals                      | High-speed communications with Programmable Terminals via direct access.                               | None                                                                                |
| Peripheral bus (See note 1.)          | Programming Devices CX-Programmer                 | Communications between Programming Devices and the PLC from the computer.                              | None                                                                                |

| Protocol                                        | Main connection                  | Use                                                                                                                                                                                                | Applicable commands, communications instructions |
|-------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Protocol macro (See note 2.)                    | General-purpose external devices | Sending and receiving messages (communications frames) according to the communications specifications of external devices. (SYSMAC-PST is used to create protocols by setting various parameters.) | PMCR(260) instruction                            |
| General-purpose (BASIC languages) (See note 3.) | General-purpose external devices | Free communications with general-purpose external devices using BASIC commands.                                                                                                                    | BASIC program                                    |

- Note**
1. The peripheral bus mode is used for Programming Devices excluding Programming Console. If Programming Console is to be used, set pin 4 of the DIP switch on the front panel of the Unit to OFF so that the default peripheral port communications parameters are used instead of those specified in the PLC Setup.
  2. Serial Communications Unit or Serial Communications Board required.
  3. ASCII Unit required.

### Host Link System (SYSWAY Mode)

The Host Link System allows the I/O memory of the PLC to be read/written, and the operating mode to be changed from a Host computer (personal computer or Programmable Terminal) by executing Host Link commands or FINS commands that are preceded by a header and followed by a terminator. Alternatively, FINS commands (preceded by a header and followed by a terminator) can be sent to a computer connected via the Host Link System by executing Network Communications Instructions (SEND(090), RECV(098), and CMND(490)) from the CPU Unit.

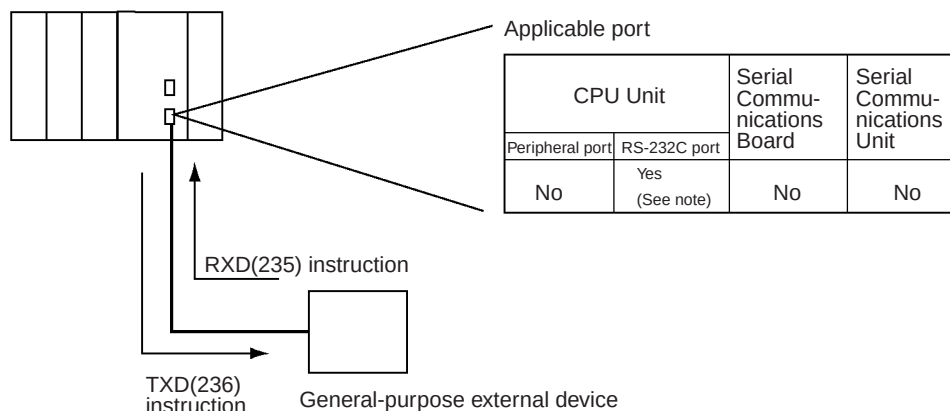


- Note**
1. Set pin 4 of the DIP switch on the front panel of the CPU Unit to ON, and set the serial communications mode in the PLC Setup to Host Link.
  2. Set pin 5 of the DIP switch on the front panel of the CPU Unit to OFF, and set the serial communications mode in the PLC Setup to Host Link.

### No-protocol (Custom) Communications System

No-protocol communications allow simple data transmissions, such as inputting bar code data and outputting printer data using communications port I/O

instructions TXD(236) and RXD(235). The start and completion codes can be set and, RS and CS signal control is also possible with no-protocol communications.



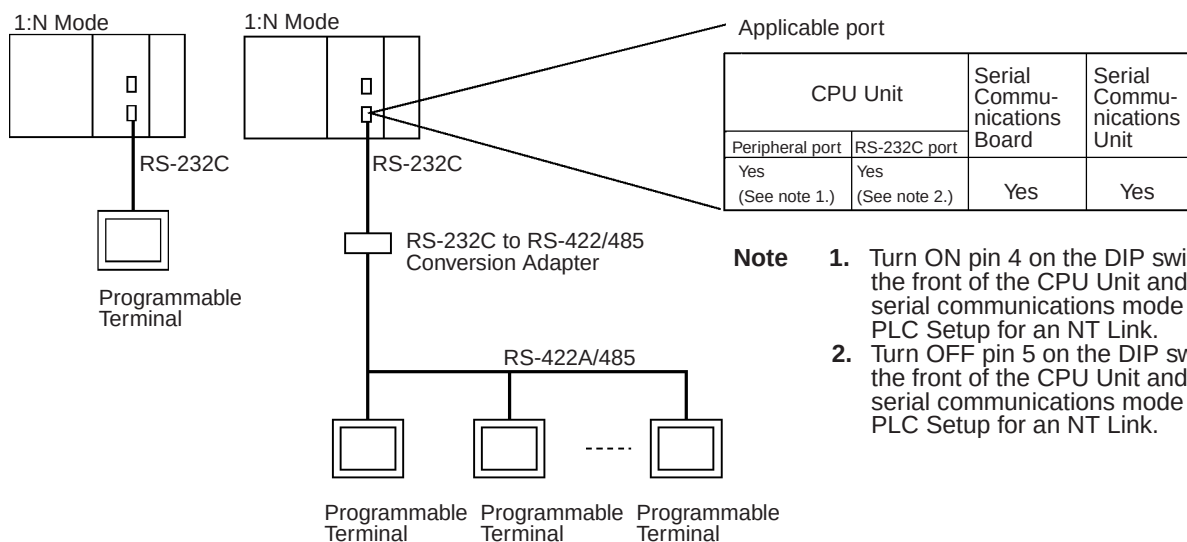
**Note** Set pin 5 of the DIP switch on the front panel of the CPU Unit to OFF, and set the serial communications mode in the PLC Setup to no-protocol communications.

### NT Link System (1:N Mode)

If the PLC and Programmable Terminal (PT) are connected together using RS-232C ports, the allocations for the PT's status control area, status notify area, objects such as touch switches, indicators, and memory maps can be allocated in the I/O memory of the PLC. The NT Link System allows the PT to be controlled by the PLC, and the PT can periodically read data from the status control area of the PLC, and perform necessary operations if there are any changes in the area. The PT can communicate with the PLC by writing data to the status notify area of the PLC from the PT. The NT Link system allows the PT status to be controlled and monitored without using PLC ladder programs. The ratio of PLCs to PTs is 1: n ( $8 \geq n \geq 1$ ).

Set the PT communications settings for a 1:N NT Link. Either one or up to eight PTs can be connected to each PLC.

Version-1 CPU Units support high-speed NT Links (1:N mode). In this way, equipment monitoring and settings can be made faster from the PT. The applicable PTs are the NS-series PTs, the NT31(C)-V2 and the NT631(C)-V2.



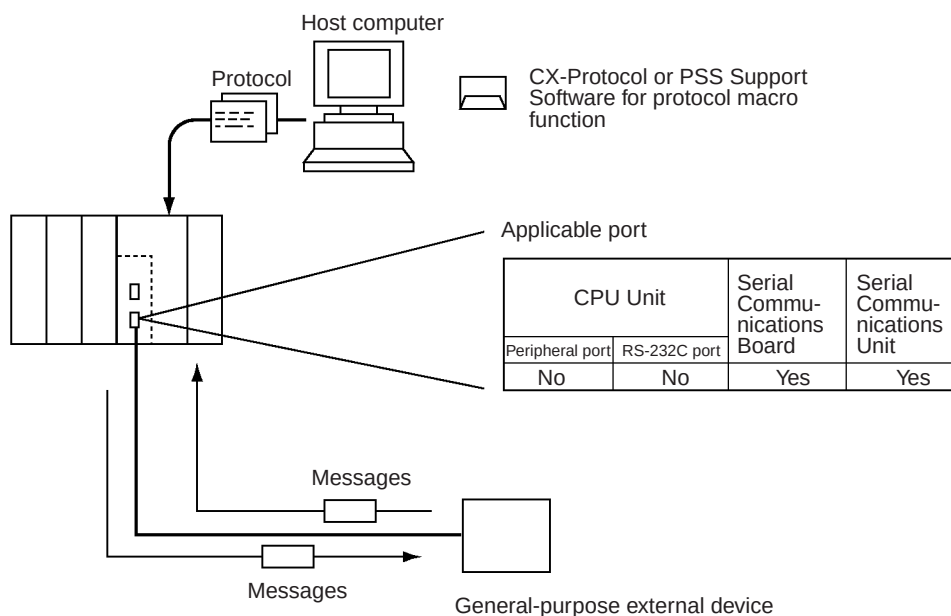
- Note**
1. Turn ON pin 4 on the DIP switch on the front of the CPU Unit and set the serial communications mode in the PLC Setup for an NT Link.
  2. Turn OFF pin 5 on the DIP switch on the front of the CPU Unit and set the serial communications mode in the PLC Setup for an NT Link.

- Note**
1. The PLC can be connected to any PT port that supports 1:N NT Links. It cannot be connected to the RS-232C ports on the NT30 or NT30C, because these ports support only 1:1 NT Links.
  2. The NT20S, NT600S, NT30, NT30C, NT620S, NT620C, and NT625C cannot be used if the CPU Unit's cycle time is 800 ms or longer (even if only one of these PTs is connected).
  3. The Programming Console functionality of a PT (Expansion Function) can be used only when the PT is connected to the RS-232C or peripheral port on the CPU Unit. It cannot be used when connected to an RS-232C or RS-422A/485 port on a Serial Communications Board or Serial Communications Unit.
  4. When more than one PT is connected to the same PLC, be sure that each PT is assigned a unique unit number. Malfunctions will occur if the same unit number is set on more than one PT.
  5. The 1:1 and 1:N NT Link protocols are not compatible with each other, i.e., they are separate serial communications protocols.

## Protocol Macros

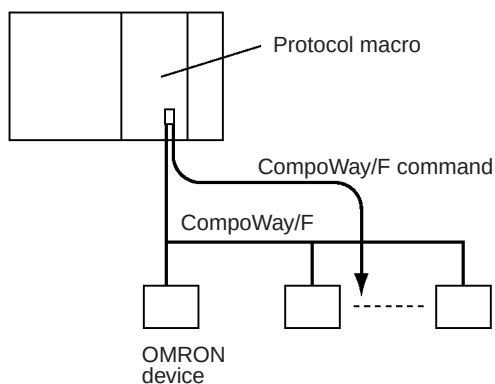
The CX-Protocol is used to create data transmission procedures (protocols) for general-purpose external devices according to the communications specifications (half-duplex or full-duplex, asynchronous) of the general-purpose external devices. The protocols that have been created are then recorded in a Serial Communications Board, enabling data to be sent to and received from the external devices by simply executing the PMCR(260) instruction in the CPU Unit. Protocols for data communications with OMRON devices, such as Temperature Controller, Intelligent Signal Processors, Bar Code Readers, and Modems, are supported as standard protocols. (See note.)

**Note** The standard protocols are provided with the CX-Protocol, Serial Communications Boards, and Serial Communications Units.



## CompoWay/F (Host Function)

The CS-series CPU Unit can operate as a host to send CompoWay/F commands to OMRON components connected in the system. CompoWay/F commands are executed by using the CompoWay/F send/receive sequences in the standard protocols of the protocol macro function.



### Unit/Protocol Compatibility

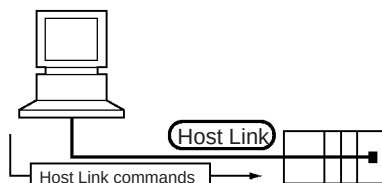
| Unit                         | Model          | Port                    | Peripheral bus (See Note.) | Host Link | No-protocol (customer) communications | Protocol macro | NT Link (1:N Mode) | General-purpose (using BASIC) |
|------------------------------|----------------|-------------------------|----------------------------|-----------|---------------------------------------|----------------|--------------------|-------------------------------|
| CPU Units                    | CS1G/H-CPU□□-E | Peripheral              | Yes                        | Yes       | ---                                   | ---            | Yes                | ---                           |
|                              |                | RS-232C                 | Yes                        | Yes       | Yes                                   | ---            | Yes                | ---                           |
| Serial Communications Boards | CS1W-SCB21     | RS-232C                 | ---                        | Yes       | ---                                   | Yes            | Yes                | ---                           |
|                              |                | RS-232C                 | ---                        | Yes       | ---                                   | Yes            | Yes                | ---                           |
|                              | CS1W-SCB41     | RS-232C                 | ---                        | Yes       | ---                                   | Yes            | Yes                | ---                           |
|                              |                | RS-422/485              | ---                        | Yes       | ---                                   | Yes            | Yes                | ---                           |
| Serial Communications Units  | CS1W-SCU21     | RS-232C                 | ---                        | Yes       | ---                                   | Yes            | Yes                | ---                           |
|                              |                | RS-232C                 | ---                        | Yes       | ---                                   | Yes            | Yes                | ---                           |
| ASCII Units                  | C200H-ASC11    | RS-232C                 | ---                        | ---       | ---                                   | ---            | ---                | Yes                           |
|                              |                | RS-232C                 | ---                        | ---       | ---                                   | ---            | ---                | Yes                           |
|                              | C200H-ASC21    | RS-232C                 | ---                        | ---       | ---                                   | ---            | ---                | Yes                           |
|                              |                | RS-422/485              | ---                        | ---       | ---                                   | ---            | ---                | Yes                           |
|                              | C200H-ASC31    | RS-232C                 | ---                        | ---       | ---                                   | ---            | ---                | Yes                           |
|                              |                | RS-232C                 | ---                        | ---       | ---                                   | ---            | ---                | Yes                           |
|                              |                | RS-232C (Terminal port) | ---                        | ---       | ---                                   | ---            | ---                | Yes                           |

**Note** The peripheral bus mode is used for Programming Devices excluding Programming Console. If Programming Console is to be used, set pin 4 of the DIP switch on the front panel of the Unit to OFF so that the default peripheral port communications parameters are used instead of those specified in the PLC Setup.

### Host Link System

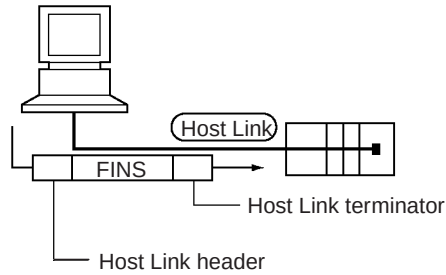
The following system configurations are possible for a Host Link System.

#### C-mode Commands

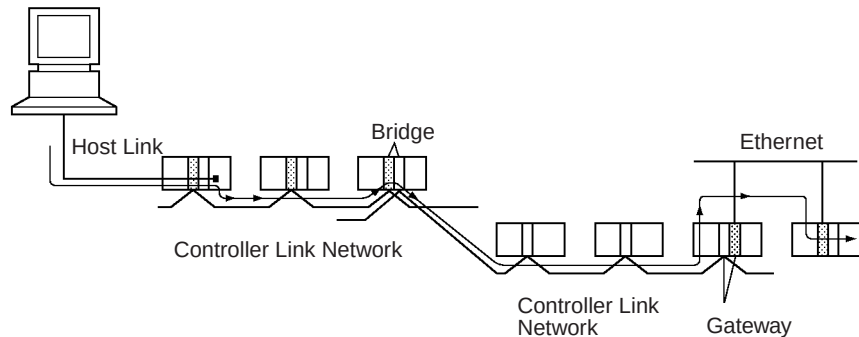
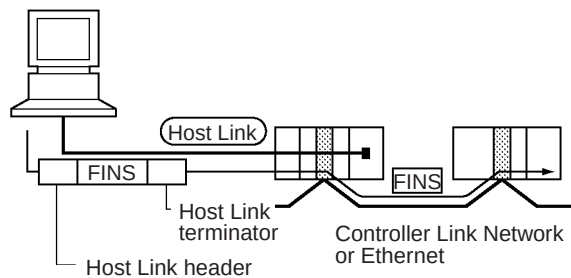




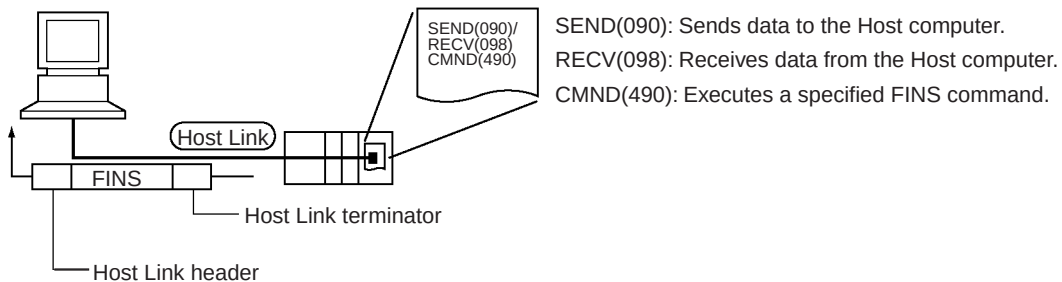
## FINS Commands



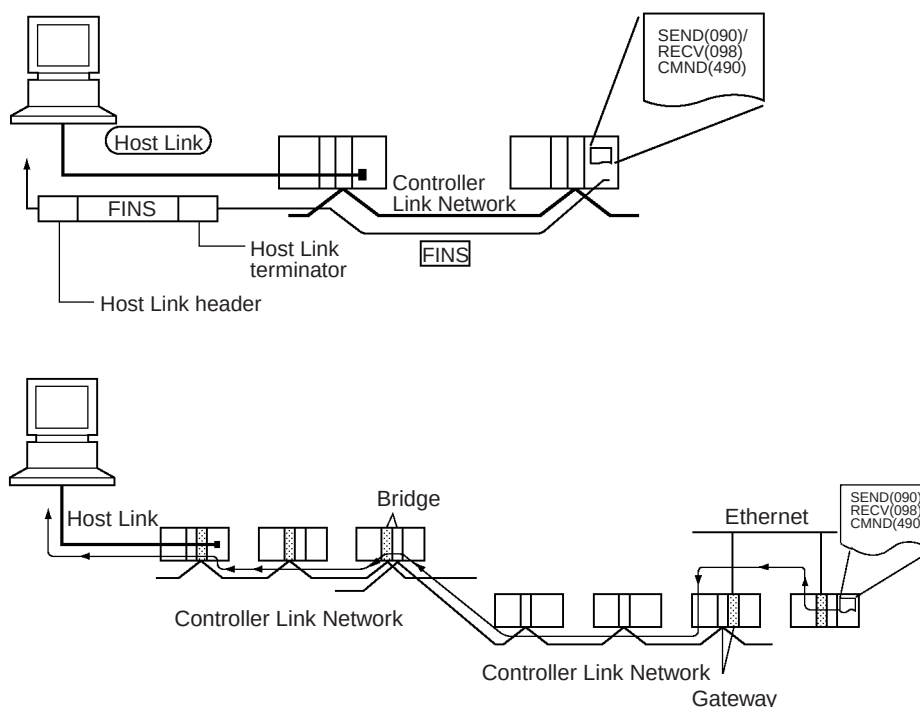
In Host Link mode, FINS commands contained between a header and terminator can be sent from the host computer to any PLC on the Network. Communications are possible with PLCs on the same or different types of interconnected Networks up to two levels away (three levels including the local level but not including the Host Link connection).



## Communications from Host Computer



In Host Link mode, FINS commands contained between a header and terminator can be sent from the host computer to any PLC on the Network. Communications are possible with PLCs on the same or different types of interconnected Networks up to two levels away (three levels including the local level but not including the Host Link connection).

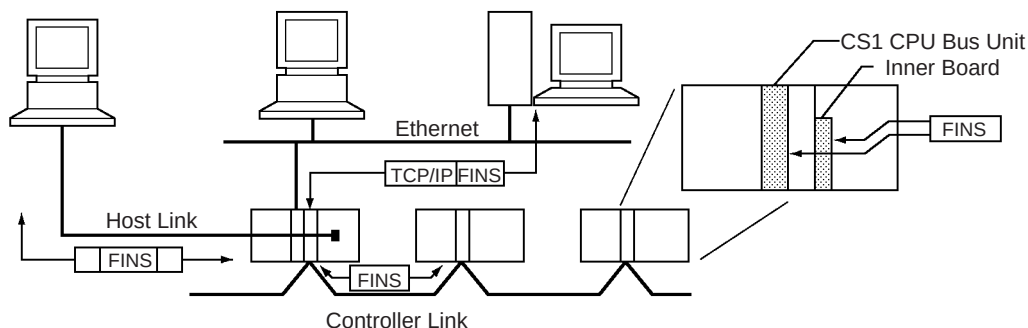


## FINS Messages

FINS (Factory Interface Network Service) messages are commands and responses that are used as a message service in an OMRON Network. FINS messages enable the user to control operations such as sending and receiving data and changing operating modes when necessary. The features of FINS messages are as follows:

### Flexible Communications

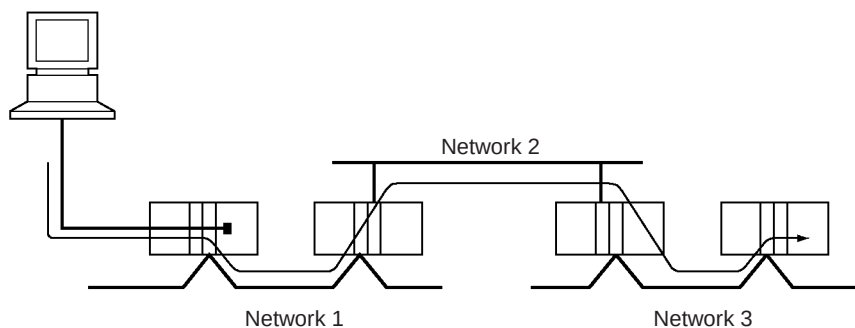
FINS messages are defined in the application layer and do not rely on the physical layer, data link layer, or other lower-level layers. This enables flexible communications on the CPU bus and different types of networks. Basically, communications with Ethernet, SYSMAC NET, SYSMAC LINK, Controller Link, DeviceNet, or Host Link Networks, and between the CPU Unit and CPU Bus Units or Inner Boards is possible via the CPU bus.



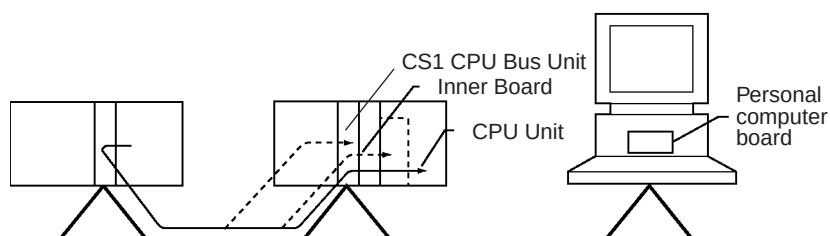
**Note** A TCP/IP header must be attached to the FINS command for an Ethernet Network, and a Host Link header must be attached to the FINS command for a Host Link Network

**Supports Network Relay**

Up to three network levels, including the local network, can be bypassed to access other Racks.

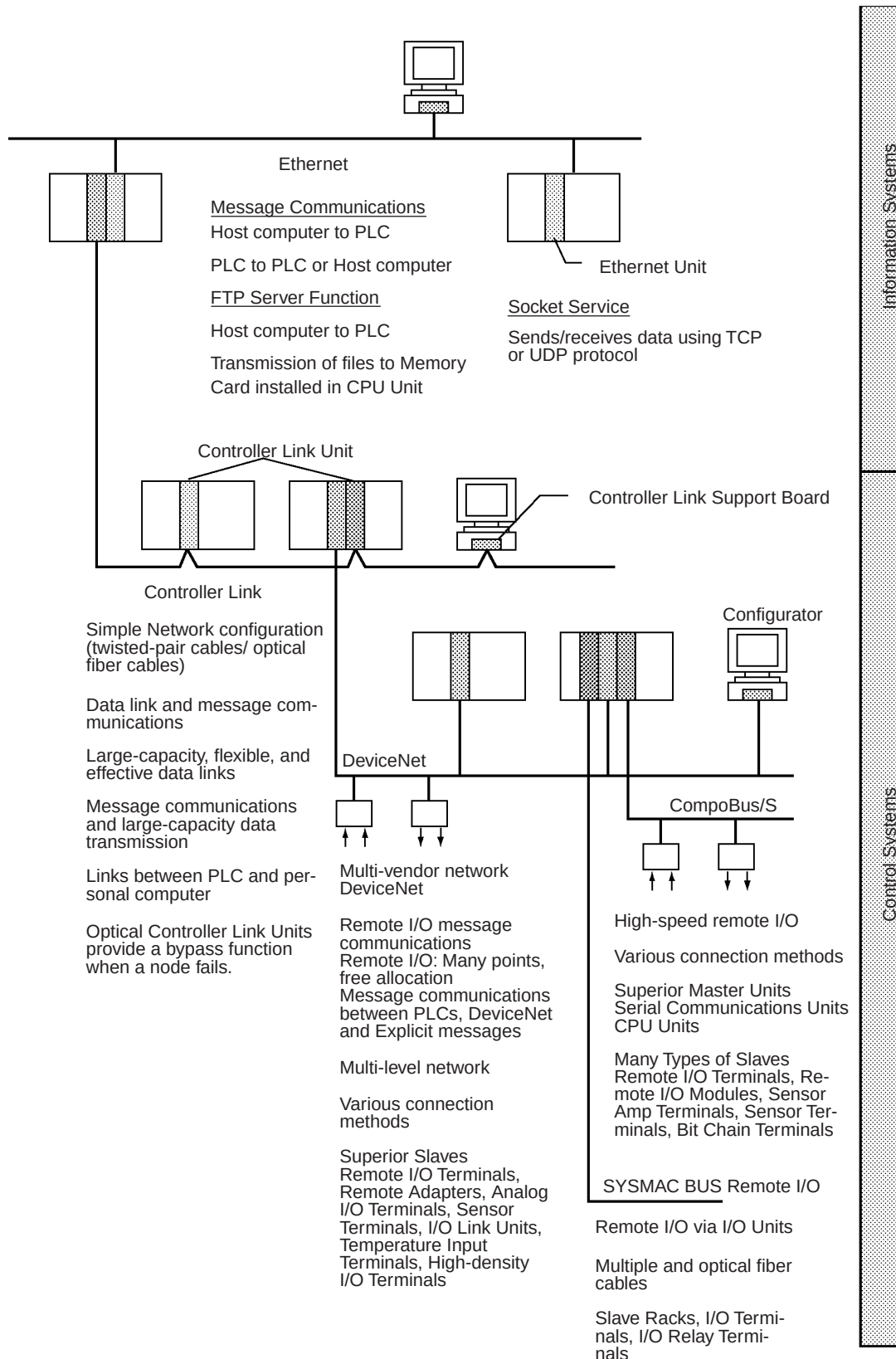
**Access to CPU Unit Plus Other Devices on Racks**

The CPU Unit, CS-series CPU Bus Units, personal computers (boards), Inner Boards, and other devices can be identified and specified using unit addresses.



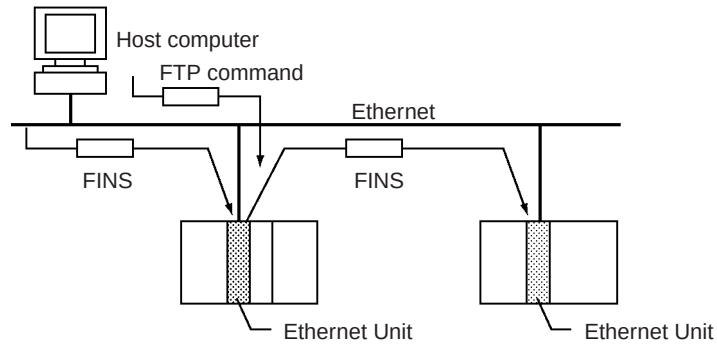
### 2-5-3 Communications Network System

The following network systems can be configured when using CS-series Units.



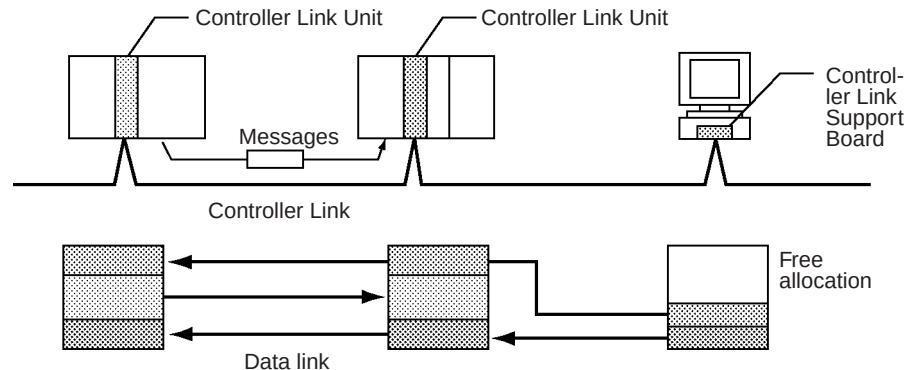
## Ethernet

If an Ethernet Unit is connected to the system, FINS messages can be used to communicate between the Host computer connected to the Ethernet and the PLC, or between PLCs. By executing FTP commands for the PLC from the Host computer connected to the Ethernet, the contents of the files on the Memory Card installed in the CPU Unit can be read or written (transferred). Data can be sent and received using UDP and TCP protocols. These functions enable a greater compatibility with information networks.



## Controller Link

The Controller Link Network is the basic framework of the OMRON PLC FA Network. Connecting a Controller Link Unit to the network enables data links between PLCs, so that data can be shared without programming, and FINS message communications between PLCs, which enable separate control and data transfer when required. The Controller Link Network connections use either twisted-pair cables or optical fiber cables. Data links and message communications are also possible between the PLC and personal computer. Data links enable large-capacity and free allocations. FINS message communications also allow large-capacity data transfer.

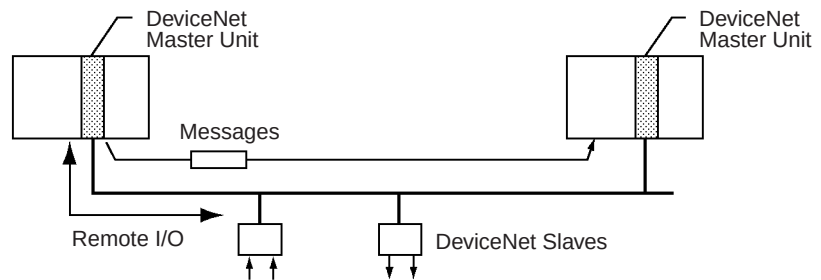


## DeviceNet

DeviceNet is a multi-vendor network consisting of multi-bit control and information systems and conforms to the Open Field DeviceNet specification. Connecting a DeviceNet Master Unit to the network enables remote I/O communications between the PLC and the Slaves on the network. Remote I/O communications enable large-capacity I/O and user-set allocations. Analog I/O Terminals are used for the Slaves. Message communications are possible between PLCs and between the PLC and DeviceNet devices manufactured by other companies.

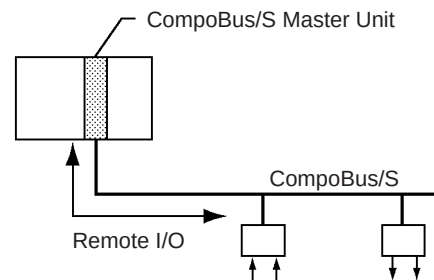
The following Units can be used to connect to a DeviceNet network from a CS-series PLC. There are differences in functionality, including in the words that are allocated for fixed allocations.

| Name                        | Model           | Classification         | Master/slave     | Fixed allocations for remote I/O master |                                                                                                                                                                                                                                  |
|-----------------------------|-----------------|------------------------|------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CS-series DeviceNet Unit    | CS1W-DRM21      | CS-series CPU Bus Unit | Master and slave | In CS-series DeviceNet Area             | Outputs: CIO 0050 to CIO 0099<br>Inputs: CIO 0350 to CIO 0399                                                                                                                                                                    |
| C200H DeviceNet Master Unit | C200HW-DRM21-V2 | C200H Special I/O Unit | Master only      | In C200H DeviceNet Area                 | One of following three groups<br>Outputs: CIO 3200 to CIO 3263<br>Inputs: CIO 3300 to CIO 3363<br>Outputs: CIO 3400 to CIO 3463<br>Inputs: CIO 3500 to CIO 3563<br>Outputs: CIO 3600 to CIO 3663<br>Inputs: CIO 3700 to CIO 3763 |



## CompoBus/S

CompoBus/S is a high-speed ON/OFF bus for remote I/O communications. Connecting a CompoBus/S Master Unit to the network allows remote I/O communications between the PLC and Slaves. High-speed communications are performed with 256 points in a cycle time of 1 ms max.



**Communications Network Overview**

| System               | Network                   | Function                                                             | Communications                                                          | Communications Device                                          |
|----------------------|---------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------|
| Information networks | Ethernet                  | Between Host computer and PLC.                                       | FINS message communications                                             | Ethernet Unit                                                  |
|                      |                           | Between PLCs.                                                        |                                                                         |                                                                |
|                      |                           | Between Host computer and Memory Card installed in CPU Unit.         | FTP server                                                              |                                                                |
|                      |                           | Between PLC and nodes with socket service, such as UNIX computers.   | Socket service                                                          |                                                                |
|                      | Controller Link           | Between PLC and personal computer directly connected to the Network. | FINS message communications                                             | Controller Link Support Board and Controller Link Unit         |
|                      |                           |                                                                      | Data link (offset, simple settings)                                     |                                                                |
|                      | RS-232C → Controller Link | Between Host Link computer and PLC on the Network.                   | Host Link commands and gateway.                                         | RS-232C cables and Controller Link Unit                        |
| Control networks     | Controller Link           | Between PLCs.                                                        | FINS message communications                                             | Controller Link Unit                                           |
|                      |                           |                                                                      | Data link (offset, simple settings)                                     |                                                                |
|                      | PLC Link                  |                                                                      | Simple data link                                                        | PLC Link Unit                                                  |
|                      | DeviceNet                 | PLC and Network devices (Slaves).                                    | FINS message communications in an open network.                         | C200H DeviceNet Master Unit (C200HW-DRM21-V1) and Configurator |
|                      |                           |                                                                      | Large-capacity remote I/O (fixed or free allocation) in an open network |                                                                |
|                      | CompoBus/S                |                                                                      | High-speed remote I/O in a network with OMRON devices only.             | CompoBus/S Master Unit                                         |

**Communications Specifications**

| Network         | Communications |           |               | Max. baud rate | Communications distance                             | Max. No. of Units | Communications medium                                 | Data link capacity (per network) | Max. remote I/O points | Connectable devices                  |
|-----------------|----------------|-----------|---------------|----------------|-----------------------------------------------------|-------------------|-------------------------------------------------------|----------------------------------|------------------------|--------------------------------------|
|                 | Mes-sages      | Data link | Re-remote I/O |                |                                                     |                   |                                                       |                                  |                        |                                      |
| Ethernet        | Yes            | ---       | ---           | 10 Mbps        | 2.5 km                                              | ---               | Same axis                                             | ---                              | ---                    | Host computer-to-PLC, PLC-to-PLC     |
| Controller Link | Yes            | Yes       | ---           | 2 Mbps         | Twisted-pair cables: 500 m<br>Optical cables: 20 km | 32                | Special (twisted-pair) cables or optical fiber cables | 32000 words                      | ---                    | PLC-to-PLC, personal computer-to-PLC |
| PLC Link        | ---            | Yes       | ---           | 128 Kbps       | 500 m                                               | 32                | RS-232C, RS-422, optical fiber cables                 | 64 words                         | ---                    |                                      |

| Network    | Communications |           |                 | Max. baud rate                                                                         | Communica-<br>tions distance | Max. No. of Units | Communica-<br>tions medium          | Data link capacity (per network) | Max. remote I/O points | Connectable devices                                                                                                                                      |
|------------|----------------|-----------|-----------------|----------------------------------------------------------------------------------------|------------------------------|-------------------|-------------------------------------|----------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | Mes-sages      | Data link | Re-<br>mote I/O |                                                                                        |                              |                   |                                     |                                  |                        |                                                                                                                                                          |
| DeviceNet  | Yes            | ---       | Yes             | 500 Kbps<br>Communica-<br>tions cycle:<br>Approx. 5 ms (128 inputs, 128 out-puts)      | 100 m                        | 63                | Special cables                      | ---                              | 2,048                  | PLC-to-Slave<br>(Slaves: Remote I/O Terminals, Remote Adapters. Sensor Terminals, CQM1 I/O Link Units, Analog Out-put Terminals, Analog Input Terminals) |
| CompoBus/S | ---            | ---       | Yes             | 750 Kbps<br>Communica-<br>tions cycle:<br>Approx. 1 ms max. (128 inputs, 128 out-puts) | 100 m                        | 32                | Two-core wires, special flat cables | ---                              | 256                    | PLC-to-Slave<br>(Slaves: Remote I/O Terminals, Remote I/O Modules. Sensor Terminals, Sensor Amp Terminals, Bit Chain Terminals)                          |

## 2-6 Unit Current Consumption

The amount of current/power that can be supplied to the Units mounted in a Rack is limited by the capacity of the Rack's Power Supply Unit. Refer to the following tables when designing your system so that the total current consumption of the mounted Units does not exceed the maximum current for each voltage group and the total power consumption does not exceed the maximum for the Power Supply Unit.

### 2-6-1 CPU Racks and Expansion Racks

The following table shows the maximum currents and power that can be supplied by Power Supply Units in CPU Racks and Expansion Racks (both CS-series Expansion Racks and C200H Expansion I/O Racks).

When calculating current/power consumption in a CPU Rack, be sure to include the power required by the CPU Rack and CPU Unit themselves. Likewise, be sure to include the power required by the Expansion Rack itself. When calculating current/power consumption in an Expansion Rack.

| Power Supply Unit | Max. Current Consumption   |                     |                      | Max. Total Power Consumption |
|-------------------|----------------------------|---------------------|----------------------|------------------------------|
|                   | 5-V group (Internal logic) | 26-V group (Relays) | 24-V group (Service) |                              |
| C200HW-PA204      | 4.6 A                      | 0.625 A             | None                 | 30 W                         |
| C200HW-PA204S     | 4.6 A                      | 0.625 A             | 0.8 A                | 30 W                         |
| C200HW-PA204R     | 4.6 A                      | 0.625 A             | None                 | 30 W                         |



| Power Supply Unit | Max. Current Consumption   |                     |                      | Max. Total Power Consumption |
|-------------------|----------------------------|---------------------|----------------------|------------------------------|
|                   | 5-V group (Internal logic) | 26-V group (Relays) | 24-V group (Service) |                              |
| C200HW-PD204      | 4.6 A                      | 0.625 A             | None                 | 30 W                         |
| C200HW-PA209R     | 9 A                        | 1.3 A               | None                 | 45 W                         |

## 2-6-2 SYSMAC BUS Remote I/O Slave Racks

The following table shows the maximum currents and power that can be supplied by Power Supply Units in SYSMAC BUS Remote I/O Slave Racks. Be sure to include the power required by the Rack itself When calculating current/power consumption.

| Slave Unit              | Max. Current Consumption   |                     |                      | Max. Total Power Consumption |
|-------------------------|----------------------------|---------------------|----------------------|------------------------------|
|                         | 5-V group (Internal logic) | 26-V group (Relays) | 24-V group (Service) |                              |
| C200H-RT201 (Wired)     | 2.7 A                      | 0.625 A             | 0.8 A                | 28 W                         |
| C200H-RT202 (Wired)     | 2.7 A                      | 0.625 A             | None                 | 23 W                         |
| C200H-RT001-P (Optical) | 2.7 A                      | 0.625 A             | 0.8 A                | 28 W                         |
| C200H-RT002-P (Optical) | 2.7 A                      | 0.625 A             | None                 | 23 W                         |

The current consumed by each voltage group must not exceed the maximum current shown in the table above.

- 1,2,3...**
1. Current required at 5 V DC by all Units (A) ≤ Max. Current shown in table
  2. Current required at 26 V DC by all Units (B) ≤ Max. Current shown in table
  3. Current required at 24 V DC by all Units (C) ≤ Max. Current shown in table

Also, the power consumed by all Units must not exceed the maximum shown in the table above.

$$A \times 5 \text{ V DC} + B \times 26 \text{ V DC} + C \times 24 \text{ V DC} \leq \text{Max. Power shown in table}$$

## 2-6-3 Example Calculations

### Example 1

In this example, the following Units are mounted to a CPU Rack with a C200HW-PA204S Power Supply Unit.

| Unit                           | Model       | Quantity   | Voltage group |         |         |
|--------------------------------|-------------|------------|---------------|---------|---------|
|                                |             |            | 5 V DC        | 26 V DC | 24 V DC |
| CPU Backplane (8 slots)        | CS1W-BC083  | 1          | 0.11 A        | ---     | ---     |
| CPU Unit                       | CS1H-CPU66  | 1          | 1.10 A        | ---     | ---     |
| Input Units                    | C200H-ID216 | 2          | 0.10 A        | ---     | ---     |
|                                | CS1W-ID291  | 2          | 0.20 A        | ---     | ---     |
| Output Units                   | C200H-OC221 | 2          | 0.01 A        | 0.075 A | ---     |
| Special I/O Unit               | C200H-NC213 | 1          | 0.30 A        | ---     | ---     |
| CS-series CPU Bus Unit         | CS1W-CLK21  | 1          | 0.33 A        | ---     | ---     |
| Service power supply (24 V DC) |             | 0.3 A used | ---           | ---     | 0.3 A   |

**Current Consumption**

| Group   | Current consumption                                                                                                                                                                 |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 V DC  | $0.11\text{ A} + 1.10\text{ A} + 0.10\text{ A} \times 2 + 0.20\text{ A} \times 2 + 0.01\text{ A} \times 2 + 0.30\text{ A} + 0.33\text{ A}$<br>$= 2.46\text{ A} (\leq 4.6\text{ A})$ |
| 26 V DC | $0.075\text{ A} \times 2 = 15\text{ A} (\leq 0.625\text{ A})$                                                                                                                       |
| 24 V DC | $0.3\text{ A} = 3\text{ A} (\leq 0.8\text{ A})$                                                                                                                                     |

**Power Consumption**

$$\begin{aligned}
 &2.46\text{ A} \times 5\text{ V} + 0.15\text{ A} \times 26\text{ V} + 0.3\text{ A} \times 24\text{ V} \\
 &= 12.3\text{ W} + 3.9\text{ W} + 7.2\text{ W} \\
 &= 23.4\text{ W} (\leq 30\text{ W})
 \end{aligned}$$

**Example 2**

In this example, the following Units are mounted to a CS-series Expansion Rack with a C200HW-PA209R Power Supply Unit.

| Unit                                     | Model      | Quantity | Voltage group |         |         |
|------------------------------------------|------------|----------|---------------|---------|---------|
|                                          |            |          | 5 V DC        | 26 V DC | 24 V DC |
| CS-series Expansion Backplane (10 slots) | CS1W-BI103 | 1        | 0.23 A        | ---     | ---     |
| Input Units                              | CS1W-ID291 | 2        | 0.20 A        | ---     | ---     |
| Output Units                             | CS1W-OD291 | 8        | 0.48 A        | ---     | ---     |

**Current Consumption**

| Group   | Current consumption                                                                                 |
|---------|-----------------------------------------------------------------------------------------------------|
| 5 V DC  | $0.23\text{ A} + 0.20\text{ A} \times 2 + 0.48\text{ A} \times 8 = 4.47\text{ A} (\leq 9\text{ A})$ |
| 26 V DC | ---                                                                                                 |
| 24 V DC | ---                                                                                                 |

**Power Consumption**

$$4.47\text{ A} \times 5\text{ V} = 22.35\text{ W} (\leq 45\text{ W})$$

**Example 3**

In this example, the following Units are mounted to a SYSMAC BUS Remote I/O Slave Rack with a C200H-RT201 Slave Unit.

| Unit         | Model       | Quantity | Voltage group |         |         |
|--------------|-------------|----------|---------------|---------|---------|
|              |             |          | 5 V DC        | 26 V DC | 24 V DC |
| Input Units  | C200H-ID211 | 2        | 0.11 A        | ---     | ---     |
| Output Units | C200H-OD411 | 3        | 0.14 A        | ---     | ---     |

**Current Consumption**

| Group   | Current consumption                                                                   |
|---------|---------------------------------------------------------------------------------------|
| 5 V DC  | $0.11\text{ A} \times 2 + 0.14\text{ A} \times 3 = 0.64\text{ A} (\leq 2.7\text{ A})$ |
| 26 V DC | ---                                                                                   |
| 24 V DC | ---                                                                                   |

**Power Consumption**

$$0.64\text{ A} \times 5\text{ V} = 3.2\text{ W} (\leq 28\text{ W})$$

## 2-6-4 Current Consumption Tables

### 5-V DC Voltage Group

| Name                                                                                                                | Model           | Current consumption (A)                      |
|---------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------|
| CS1-H CPU Units<br>(These values include current consumption by a Programming Console or CX-Programmer connection.) | CS1H-CPU67H     | 0.82 (See note.)                             |
|                                                                                                                     | CS1H-CPU66H     | 0.82 (See note.)                             |
|                                                                                                                     | CS1H-CPU65H     | 0.82 (See note.)                             |
|                                                                                                                     | CS1H-CPU64H     | 0.82 (See note.)                             |
|                                                                                                                     | CS1H-CPU63H     | 0.82 (See note.)                             |
|                                                                                                                     | CS1H-CPU45H     | 0.78 (See note.)                             |
|                                                                                                                     | CS1H-CPU44H     | 0.78 (See note.)                             |
|                                                                                                                     | CS1H-CPU43H     | 0.78 (See note.)                             |
|                                                                                                                     | CS1H-CPU42H     | 0.78 (See note.)                             |
| CS1 CPU Units<br>(These values include current consumption by a Programming Console or CX-Programmer connection.)   | CS1H-CPU67-EV1  | 1.10 (See note.)                             |
|                                                                                                                     | CS1H-CPU66-EV1  | 1.10 (See note.)                             |
|                                                                                                                     | CS1H-CPU65-EV1  | 1.10 (See note.)                             |
|                                                                                                                     | CS1H-CPU64-EV1  | 1.10 (See note.)                             |
|                                                                                                                     | CS1H-CPU63-EV1  | 1.10 (See note.)                             |
|                                                                                                                     | CS1H-CPU45-EV1  | 0.95 (See note.)                             |
|                                                                                                                     | CS1H-CPU44-EV1  | 0.95 (See note.)                             |
|                                                                                                                     | CS1H-CPU43-EV1  | 0.95 (See note.)                             |
|                                                                                                                     | CS1H-CPU42-EV1  | 0.95 (See note.)                             |
| Serial Communications Boards                                                                                        | CS1W-SCB21      | 0.28 + 0.15 x (No. of points)<br>(See note.) |
|                                                                                                                     | CS1W-SCB41      | 0.37 + 0.15 x (No. of points)<br>(See note.) |
| Standard CPU Backplanes                                                                                             | CS1W-BC023      | 0.11                                         |
|                                                                                                                     | CS1W-BC033      | 0.11                                         |
|                                                                                                                     | CS1W-BC053      | 0.11                                         |
|                                                                                                                     | CS1W-BC083      | 0.11                                         |
|                                                                                                                     | CS1W-BC103      | 0.11                                         |
| CS-series-only CPU Backplanes                                                                                       | CS1W-BC022      | 0.11                                         |
|                                                                                                                     | CS1W-BC032      | 0.11                                         |
|                                                                                                                     | CS1W-BC052      | 0.11                                         |
|                                                                                                                     | CS1W-BC082      | 0.11                                         |
|                                                                                                                     | CS1W-BC102      | 0.11                                         |
| Standard CS-series Expansion Backplanes                                                                             | CS1W-BI033      | 0.23                                         |
|                                                                                                                     | CS1W-BI053      | 0.23                                         |
|                                                                                                                     | CS1W-BI083      | 0.23                                         |
|                                                                                                                     | CS1W-BI103      | 0.23                                         |
| CS-series-only Expansion Backplanes                                                                                 | CS1W-BI032      | 0.23                                         |
|                                                                                                                     | CS1W-BI052      | 0.23                                         |
|                                                                                                                     | CS1W-BI082      | 0.23                                         |
|                                                                                                                     | CS1W-BI102      | 0.23                                         |
| C200H Expansion I/O Backplanes                                                                                      | C200HW-BI031    | 0.15                                         |
|                                                                                                                     | C200HW-BI051    | 0.15                                         |
|                                                                                                                     | C200HW-BI081-V1 | 0.15                                         |
|                                                                                                                     | C200HW-BI101-V1 | 0.15                                         |
| I/O Control Units                                                                                                   | CS1W-IC102      | 0.92                                         |
| I/O Interface Units                                                                                                 | CS1W-II102      | 0.23                                         |

**Note** NT-AL001 Link Adapters consume 0.15/Unit when used.

### Basic I/O Unit

| Category                               | Name                  | Model        | Current consumption (A) |
|----------------------------------------|-----------------------|--------------|-------------------------|
| C200H Input Units                      | DC Input Units        | C200H-ID211  | 0.11                    |
|                                        |                       | C200H-ID212  | 0.01                    |
|                                        | AC Input Units        | C200H-IA121  | 0.01                    |
|                                        |                       | C200H-IA122  | 0.01                    |
|                                        |                       | C200H-IA122V | 0.01                    |
|                                        |                       | C200H-IA221  | 0.01                    |
|                                        |                       | C200H-IA222  | 0.01                    |
|                                        |                       | C200H-IA222V | 0.01                    |
|                                        | AC/DC Input Units     | C200H-IM211  | 0.01                    |
|                                        |                       | C200H-IM212  | 0.01                    |
|                                        | B7A Interface Units   | C200H-B7A11  | 0.10                    |
|                                        |                       | C200H-B7A12  | 0.10                    |
|                                        | Interrupt Input Unit  | C200HS-INT01 | 0.02                    |
| C200H Group-2 High-density Input Units | DC Input Units        | C200H-ID216  | 0.10                    |
|                                        |                       | C200H-ID217  | 0.12                    |
|                                        |                       | C200H-ID218  | 0.10                    |
|                                        |                       | C200H-ID219  | 0.12                    |
|                                        |                       | C200H-ID111  | 0.12                    |
| CS-series Basic Input Units            | DC Input Units        | CS1W-ID211   | 0.10                    |
|                                        |                       | CS1W-ID231   | 0.15                    |
|                                        |                       | CS1W-ID261   | 0.15                    |
|                                        |                       | CS1W-ID291   | 0.20                    |
|                                        | AC Input Units        | CS1W-IA111   | 0.11                    |
|                                        |                       | CS1W-IA211   | 0.11                    |
|                                        | Interrupt Input Unit  | CS1W-INT01   | 0.10                    |
|                                        | High-speed Input Unit | CS1W-IDP01   | 0.10                    |

| Category                                | Name                             | Model                   | Current consumption (A) |
|-----------------------------------------|----------------------------------|-------------------------|-------------------------|
| C200H Output Units                      | Relay Output Units               | C200H-OC221             | 0.01                    |
|                                         |                                  | C200H-OC222             | 0.01                    |
|                                         |                                  | C200H-OC222V            | 0.01                    |
|                                         |                                  | C200H-OC222N            | 0.01                    |
|                                         |                                  | C200H-OC225             | 0.05                    |
|                                         |                                  | C200H-OC226             | 0.03                    |
|                                         |                                  | C200H-OC226N            | 0.03                    |
|                                         |                                  | C200H-OC223             | 0.01                    |
|                                         |                                  | C200H-OC224             | 0.01                    |
|                                         |                                  | C200H-OC224V            | 0.01                    |
|                                         |                                  | C200H-OC224N            | 0.01                    |
|                                         |                                  | Transistor Output Units | C200H-OD411             |
|                                         | C200H-OD213                      |                         | 0.14                    |
|                                         | C200H-OD214                      |                         | 0.14                    |
|                                         | C200H-OD216                      |                         | 0.01                    |
|                                         | C200H-OD211                      |                         | 0.16                    |
|                                         | C200H-OD217                      |                         | 0.01                    |
|                                         | C200H-OD212                      |                         | 0.18                    |
|                                         | C200H-OD21A                      |                         | 0.10                    |
|                                         | B7A Interface Units              | C200H-B7AO1             | 0.10                    |
|                                         |                                  | C200H-B7AO2             | 0.18                    |
|                                         | Triac Output Units               | C200H-OA223             | 0.27                    |
|                                         |                                  | C200H-OA222V            | 0.18                    |
|                                         |                                  | C200H-OA224             | 0.27                    |
| C200H Group-2 High-density Output Units | Transistor Output Units          | C200H-OD218             | 0.18                    |
|                                         |                                  | C200H-OD21B             | 0.18                    |
|                                         |                                  | C200H-OD219             | 0.27                    |
| CS-series Basic Output Units            | Relay Output Units               | CS1W-OC201              | 0.10                    |
|                                         |                                  | CS1W-OC211              | 0.13                    |
|                                         | Transistor Output Units          | CS1W-OD211              | 0.17                    |
|                                         |                                  | CS1W-OD212              | 0.17                    |
|                                         |                                  | CS1W-OD231              | 0.27                    |
|                                         |                                  | CS1W-OD232              | 0.27                    |
|                                         |                                  | CS1W-OD261              | 0.39                    |
|                                         |                                  | CS1W-OD262              | 0.39                    |
|                                         |                                  | CS1W-OD291              | 0.48                    |
|                                         |                                  | CS1W-OD292              | 0.48                    |
|                                         | Triac Output Units               | CS1W-OA201              | 0.23                    |
| CS1W-OA211                              |                                  | 0.41                    |                         |
| CS-series Mixed I/O Units               | DC Input/Transistor Output Units | CS1W-MD261              | 0.27                    |
|                                         |                                  | CS1W-MD262              | 0.27                    |
|                                         |                                  | CS1W-MD291              | 0.35                    |
|                                         |                                  | CS1W-MD292              | 0.35                    |
| TTL I/O Units                           |                                  | CS1W-MD561              | 0.27                    |

| Category            | Name | Model       | Current consumption (A) |
|---------------------|------|-------------|-------------------------|
| B7A Interface Units |      | C200H-B7A01 | 0.10                    |
|                     |      | C200H-B7A02 | 0.10                    |
|                     |      | C200H-B7A21 | 0.10                    |
|                     |      | C200H-B7A22 | 0.10                    |
| Analog Timer Unit   |      | C200H-TM001 | 0.06                    |

**Special I/O Units**

| Category                                            | Name                                 | Model       | Current consumption (A) |
|-----------------------------------------------------|--------------------------------------|-------------|-------------------------|
| C200H High-density I/O Units<br>(Special I/O Units) | DC Input Unit                        | C200H-ID215 | 0.13                    |
|                                                     | TTL Input Unit                       | C200H-ID501 | 0.13                    |
|                                                     | Transistor Output Unit               | C200H-OD215 | 0.22                    |
|                                                     | TTL Output Unit                      | C200H-OD501 | 0.22                    |
|                                                     | TTL I/O Unit                         | C200H-MD501 | 0.18                    |
|                                                     | DC Input/<br>Transistor Output Units | C200H-MD215 | 0.18                    |
|                                                     |                                      | C200H-MD115 | 0.18                    |

| Category                | Name                                | Model          | Current consumption (A)          |
|-------------------------|-------------------------------------|----------------|----------------------------------|
| C200H Special I/O Units | Temperature Control Units           | C200H-TC001    | 0.33                             |
|                         |                                     | C200H-TC002    | 0.33                             |
|                         |                                     | C200H-TC003    | 0.33                             |
|                         |                                     | C200H-TC101    | 0.33                             |
|                         |                                     | C200H-TC102    | 0.33                             |
|                         |                                     | C200H-TC103    | 0.33                             |
|                         | Heat/Cool Temperature Control Units | C200H-TV001    | 0.33                             |
|                         |                                     | C200H-TV002    | 0.33                             |
|                         |                                     | C200H-TV003    | 0.33                             |
|                         |                                     | C200H-TV101    | 0.33                             |
|                         |                                     | C200H-TV102    | 0.33                             |
|                         |                                     | C200H-TV103    | 0.33                             |
|                         | Temperature Sensor Units            | C200H-TS001    | 0.45                             |
|                         |                                     | C200H-TS002    | 0.45                             |
|                         |                                     | C200H-TS101    | 0.45                             |
|                         |                                     | C200H-TS102    | 0.45                             |
|                         | PID Control Units                   | C200H-PID01    | 0.33                             |
|                         |                                     | C200H-PID02    | 0.33                             |
|                         |                                     | C200H-PID03    | 0.33                             |
|                         | Cam Positioner Unit                 | C200H-CP114    | 0.30                             |
|                         | ASCII Units                         | C200H-ASC02    | 0.20                             |
|                         |                                     | C200H-ASC11    | 0.25                             |
|                         |                                     | C200H-ASC31    | 0.30                             |
|                         | Analog Input Units                  | C200H-AD001    | 0.55                             |
|                         |                                     | C200H-AD002    | 0.45                             |
|                         |                                     | C200H-AD003    | 0.10                             |
|                         | Analog Output Units                 | C200H-DA001    | 0.65                             |
|                         |                                     | C200H-DA002    | 0.60                             |
|                         |                                     | C200H-DA003    | 0.10                             |
|                         |                                     | C200H-DA004    | 0.10                             |
|                         | Analog I/O Unit                     | C200H-MAD01    | 0.10                             |
|                         | High-speed Counter Units            | C200H-CT001-V1 | 0.30                             |
|                         |                                     | C200H-CT002    | 0.30                             |
|                         |                                     | C200H-CT021    | 0.45                             |
|                         | Motion Control Unit                 | C200H-MC221    | 0.65<br>(0.85 with Teaching Box) |

| Category                | Name                              | Model           | Current consumption (A) |
|-------------------------|-----------------------------------|-----------------|-------------------------|
| C200H Special I/O Units | Position Control Units            | C200H-NC211     | 0.50                    |
|                         |                                   | C200H-NC111     | 0.15                    |
|                         |                                   | C200H-NC112     | 0.15                    |
|                         |                                   | C200HW-NC113    | 0.30                    |
|                         |                                   | C200HW-NC213    | 0.30                    |
|                         |                                   | C200HW-NC413    | 0.50                    |
|                         | ID Sensor Units                   | C200H-IDS01-V1  | 0.25                    |
|                         |                                   | C200H-IDS21     | 0.25                    |
|                         | Voice Unit                        | C200H-OV001     | 0.30                    |
|                         | DeviceNet Master Unit             | C200HW-DRM21-V1 | 0.25                    |
|                         | CompoBus/S Master Unit            | C200HW-SRM21-V1 | 0.15                    |
|                         | PLC Link Unit                     | C200H-LK401     | 0.35                    |
|                         | SYSMAC BUS Remote I/O Slave Units | C200H-RM201     | 0.20                    |
|                         |                                   | C200H-RM001-PV1 | 0.20                    |



| Category                    | Name                                                      | Model              | Current consumption (A)                     |
|-----------------------------|-----------------------------------------------------------|--------------------|---------------------------------------------|
| CS-series Special I/O Units | Analog I/O Unit                                           | CS1W-MAD44         | 0.20                                        |
|                             | Analog Input Units                                        | CS1W-AD041/081     | 0.13                                        |
|                             | Analog Output Units                                       | CS1W-DA041/08V/08C | 0.13                                        |
|                             | Isolated Thermocouple Input Unit                          | CS1W-PTS01         | 0.15                                        |
|                             | Isolated Resistance Thermometer Input Unit                | CS1W-PTS02         | 0.15                                        |
|                             | Isolated Ni508 $\Omega$ Resistance Thermometer Input Unit | CS1W-PTS03         | 0.15                                        |
|                             | Isolated 2-wire Transmission Device Input Unit            | CS1W-PTW01         | 0.15                                        |
|                             | Isolated DC Input Unit                                    | CS1W-PDC01         | 0.15                                        |
|                             | Isolated Control Output Unit (Analog Output Unit)         | CS1W-PMV01         | 0.15                                        |
|                             | Power Transducer Input Unit                               | CS1W-PTR01         | 0.15                                        |
|                             | DC Input Unit (100 mA)                                    | CS1W-PTR02         | 0.15                                        |
|                             | Isolated Pulse Input Unit                                 | CS1W-PPS01         | 0.20                                        |
|                             | Motion Control Units                                      | CS1W-MC221         | 0.6 (0.80 when connected to a Teaching Box) |
|                             |                                                           | CS1W-MC421         | 0.7 (1.00 when connected to a Teaching Box) |
|                             | Position Control Units                                    | CS1W-NC113         | 0.25                                        |
|                             |                                                           | CS1W-NC133         | 0.25                                        |
|                             |                                                           | CS1W-NC213         | 0.25                                        |
|                             |                                                           | CS1W-NC233         | 0.25                                        |
|                             |                                                           | CS1W-NC413         | 0.36                                        |
|                             |                                                           | CS1W-NC433         | 0.36                                        |
|                             | Customizable Counter Units                                | CS1W-HIO01         | 0.60                                        |
|                             |                                                           | CS1W-HCP22         | 0.80                                        |
|                             |                                                           | CS1W-HCA22         | 0.75                                        |

## CS-series CPU Bus Units

| Category                | Name                        | Model      | Current consumption (A) |
|-------------------------|-----------------------------|------------|-------------------------|
| CS-series CPU Bus Units | Controller Link Unit        | CS1W-CLK21 | 0.33                    |
|                         |                             | CS1W-CLK11 | 0.47                    |
|                         |                             | CS1W-CLK12 | 0.58                    |
|                         |                             | CS1W-CLK52 | 0.65                    |
|                         | Serial Communications Units | CS1W-SCU21 | 0.30 (See note.)        |
|                         | SYSMAC LINK Unit            | CS1W-SLK21 | 0.48                    |
|                         |                             | CS1W-SLK11 | 0.47                    |
|                         | Ethernet Unit               | CS1W-ETN01 | 0.40                    |
|                         |                             | CS1W-ETN11 | 0.40                    |
|                         | DeviceNet Unit              | CS1W-DRM21 | 0.29                    |
|                         | Loop Control Unit           | XS1W-LC001 | 0.36                    |

**Note** NT-AL001 Link Adapters consume 0.15/Unit when used

## Current Consumptions for 26-V Supply

| Category                     | Name                      | Model          | Current consumption (A)                   |
|------------------------------|---------------------------|----------------|-------------------------------------------|
| C200H Output Units           | Relay Contact Output Unit | C200H-OC221    | 0.075 for 8 points when ON simultaneously |
|                              |                           | C200H-OC222    |                                           |
|                              |                           | C200H-OC223    |                                           |
|                              |                           | C200H-OC224    |                                           |
|                              |                           | C200H-OC225    |                                           |
|                              | Transistor Output Units   | C200H-OC222V/N | 0.09 for 8 points when ON simultaneously  |
|                              |                           | C200H-OC226(N) |                                           |
|                              |                           | C200H-OC224V/N |                                           |
| C200H Special I/O Units      | Analog Input Units        | C200H-OD216    | 0.075 for 8 points when ON simultaneously |
|                              |                           | C200H-OD217    |                                           |
|                              | Analog Output Units       | C200H-AD003    | 0.10                                      |
|                              |                           | C200H-DA003    | 0.20                                      |
|                              | Analog I/O Units          | C200H-DA004    | 0.25                                      |
|                              |                           | C200H-MAD01    | 0.2                                       |
| CS-series Basic Output Units | ID Sensor Units           | C200H-IDS01-V1 | 0.12                                      |
|                              |                           | C200H-IDS21    | 0.12                                      |
|                              | Relay Output Units        | CS1W-OC201     | 0.006 per ON output point                 |
|                              |                           | CS1W-OC211     | 0.006 per ON output point                 |

| Category                    | Name                                              | Model          | Current consumption (A) |
|-----------------------------|---------------------------------------------------|----------------|-------------------------|
| CS-series Special I/O Units | Analog I/O Unit                                   | CS1W-MAD44     | 0.20                    |
|                             | Analog Input Unit                                 | CS1W-AD041/081 | 0.10                    |
|                             | Analog Output Unit                                | CS1W-DA041/08V | 0.18                    |
|                             |                                                   | CS1W-DA08C     | 0.25                    |
|                             | Isolated Thermo-couple Input Unit                 | CS1W-PTS01     | 0.15                    |
|                             | Isolated Resistance Thermometer Input Unit        | CS1W-PTS02     | 0.15                    |
|                             | Isolated Ni508Ω Resistance Thermometer Input Unit | CS1W-PTS03     | 0.15                    |
|                             | Isolated 2-wire Transmission Device Input Unit    | CS1W-PTW01     | 0.16                    |
|                             | Isolated DC Input Unit                            | CS1W-PDC01     | 0.15                    |
|                             | Isolated Control Output Unit (Analog Output Unit) | CS1W-PMV01     | 0.16                    |
|                             | Power Transducer Input Unit                       | CS1W-PTR01     | 0.08                    |
|                             | DC Input Unit (100 mA)                            | CS1W-PTR02     | 0.08                    |
|                             | Isolated Pulse Input Unit                         | CS1W-PPS01     | 0.16                    |
|                             | Customizable Counter Unit                         | CS1W-HCA22     | 0.15                    |

## 2-7 CPU Bus Unit Setting Area Capacity

Settings for most CPU Bus Units and Inner Boards are stored in the CPU Bus Unit Setting Area in the CPU Unit. Refer to 9-27 *Parameter Areas* for details. The CPU Bus Units are allocated the required number of works for settings from this area.

There is a limit to the capacity of the CPU Bus Unit Setting Area of 10,752 bytes (10 Kbytes). The system must be designed so that the number of words used in the CPU Bus Unit Setting Area by all of the CPU Bus Units and the Inner Board does not exceed this capacity. If the wrong combination of Units is used, the capacity will be exceeded and either Units will operate from default settings only or will not operate at all.

The following table shows the number of bytes required in the CPU Bus Unit Setting Area by each Unit and the Inner Board. Any Unit or Inner Board with a usage of "0" does not use the CPU Bus Unit Setting Area at all.

| Classification          | Name                        | Model number     | Capacity (bytes) |
|-------------------------|-----------------------------|------------------|------------------|
| CS-series CPU Bus Units | Controller Link Unit        | CS1W-CLK21/11/12 | 512              |
|                         | SYSMAC LINK Unit            | CS1W-SLK21/11    | 512              |
|                         | Serial Communications Unit  | CS1W-SCU21       | 0                |
|                         | Ethernet Unit               | CS1W-ETN01       | 412              |
|                         | DeviceNet Unit              | CS1W-DRM21       | 0                |
|                         | Loop Control Unit           | CS1W-LC001       | 0                |
| Inner Boards            | Serial Communications Board | CS1W-SCB01       | 0                |

## 2-8 I/O Table Settings

The following settings are used in the I/O tables on the CX-Programmer.

### 2-8-1 Basic I/O Units

| Name                                                      | Model                              | Unit type                     | Number of unit numbers | Allocated words |         |
|-----------------------------------------------------------|------------------------------------|-------------------------------|------------------------|-----------------|---------|
|                                                           |                                    |                               |                        | Inputs          | Outputs |
| AC Input Units                                            | CS1W-IA111                         | 16-point Input Unit           | ---                    | ---             | ---     |
|                                                           | CS1W-IA211                         | 16-point Input Unit           | ---                    | ---             | ---     |
|                                                           | CS1W-IA121/221                     | 8-point Input Unit            | ---                    | ---             | ---     |
|                                                           | CS1W-IA122/122V/222/222V           | 16-point Input Unit           | ---                    | ---             | ---     |
| AC/DC Input Units                                         | C200H-IM211                        | 8-point Input Unit            | ---                    | ---             | ---     |
|                                                           | C200H-IM212                        | 16-point Input Unit           | ---                    | ---             | ---     |
| DC Input Units                                            | CS1W-ID211                         | 16-point Input Unit           | ---                    | ---             | ---     |
|                                                           | CS1W-ID231                         | 32-point Input Unit           | ---                    | ---             | ---     |
|                                                           | CS1W-ID261                         | 64-point Input Unit           | ---                    | ---             | ---     |
|                                                           | CS1W-ID291                         | 96-point Input Unit           | ---                    | ---             | ---     |
|                                                           | C200H-ID211                        | 8-point Input Unit            | ---                    | ---             | ---     |
|                                                           | C200H-ID212                        | 16-point Input Unit           | ---                    | ---             | ---     |
| DC Input Units classified as C200H Group-2 Units          | C200H-ID216/218                    | 32-point Input Unit           | ---                    | ---             | ---     |
|                                                           | C200H-ID111/217/219                | 64-point Input Unit           | ---                    | ---             | ---     |
| Interrupt Input Units                                     | CS1W-INT01                         | 16-point Interrupt Input Unit | ---                    | ---             | ---     |
|                                                           | C200HS-INT01                       | 8-point Interrupt Input Unit  | ---                    | ---             | ---     |
| High-speed Input Unit                                     | CS1W-IDP01                         | 16-point Input Unit           | ---                    | ---             | ---     |
| Contact Output Units                                      | CS1W-OC201                         | 16-point Output Unit          | ---                    | ---             | ---     |
|                                                           | CS1W-OC211                         | 16-point Output Unit          | ---                    | ---             | ---     |
|                                                           | C200H-OC221/223/224/224V/224N      | 8-point Output Unit           | ---                    | ---             | ---     |
|                                                           | C200H-OC222/222V/222N/225/226/226N | 16-point Output Unit          | ---                    | ---             | ---     |
| Triac Output Units                                        | CS1W-OA201                         | 16-point Output Unit          | ---                    | ---             | ---     |
|                                                           | CS1W-OA211                         | 16-point Output Unit          | ---                    | ---             | ---     |
|                                                           | CS1W-OA221/223                     | 16-point I/O Unit             | ---                    | ---             | ---     |
|                                                           | CS1W-OA222V/224                    | 16-point Output Unit          | ---                    | ---             | ---     |
| Transistor Output Units                                   | CS1W-OD211/212                     | 16-point Output Unit          | ---                    | ---             | ---     |
|                                                           | CS1W-OD231/232                     | 32-point Output Unit          | ---                    | ---             | ---     |
|                                                           | CS1W-OD261/262                     | 64-point Output Unit          | ---                    | ---             | ---     |
|                                                           | CS1W-OD291/292                     | 96-point Output Unit          | ---                    | ---             | ---     |
|                                                           | C200H-OD213/411/214                | 16-point I/O Unit             | ---                    | ---             | ---     |
|                                                           | C200H-OD216                        | 8-point Output Unit           | ---                    | ---             | ---     |
|                                                           | C200H-OD211/212/217/21A            | 16-point Output Unit          | ---                    | ---             | ---     |
| Transistor Output Units classified as C200H Group-2 Units | C200H-OD218/21B                    | 32-point Output Unit          | ---                    | ---             | ---     |
|                                                           | C200H-OD219                        | 64-point Output Unit          | ---                    | ---             | ---     |
| DC Input/Transistor Output Units                          | CS1W-MD261/262                     | 64-point I/O Unit             | ---                    | ---             | ---     |
|                                                           | CS1W-MD291/292                     | 96-point I/O Unit             | ---                    | ---             | ---     |

| Name                                                  | Model       | Unit type            | Number of unit numbers | Allocated words |         |
|-------------------------------------------------------|-------------|----------------------|------------------------|-----------------|---------|
|                                                       |             |                      |                        | Inputs          | Outputs |
| B7A Interface Units                                   | C200H-B7AI1 | 16-point Input Unit  | ---                    | ---             | ---     |
|                                                       | C200H-B7AO1 | 16-point Output Unit | ---                    | ---             | ---     |
| B7A Interface Units classified as C200H Group-2 Units | C200H-B7A12 | 32-point Input Unit  | ---                    | ---             | ---     |
|                                                       | C200H-B7A02 | 32-point Output Unit | ---                    | ---             | ---     |
|                                                       | C200H-B7A21 | 32-point I/O Unit    | ---                    | ---             | ---     |
|                                                       | C200H-B7A22 | 64-point I/O Unit    | ---                    | ---             | ---     |
| Analog Timer Unit                                     | C200H-TM001 | 16-point I/O Unit    | ---                    | ---             | ---     |

- Note**
1. An I/O setting error will occur if Units are not set correctly.
  2. An I/O verification error will occur if the number of input or output words is set incorrectly.

## 2-8-2 C200H Special I/O Units

| Name                          | Model                               | Unit type               | Number of unit numbers | Allocated words |        |
|-------------------------------|-------------------------------------|-------------------------|------------------------|-----------------|--------|
|                               |                                     |                         |                        | Input           | Output |
| High-density I/O Units        | C200H-ID501/215                     | Other Special I/O Units | 1                      | 2               | 0      |
|                               | C200H-OD501/215 (standard mode)     | Other Special I/O Units | 1                      | 0               | 2      |
|                               | C200H-OD501/215 (dynamic mode)      | Other Special I/O Units | 1                      | 0               | 8      |
|                               | C200H-MD501/215/115 (standard mode) | Other Special I/O Units | 1                      | 1               | 1      |
|                               | C200H-MD501/215/115 (dynamic mode)  | Other Special I/O Units | 1                      | 8               | 0      |
| Temperature Control Units     | C200H-TC001/002/003/101/102/103     | Other Special I/O Units | 1                      | 7               | 3      |
| Heating/Cooling Control Units | C200H-TV001/002/003/101/102/103     | Other Special I/O Units | 1                      | 7               | 3      |
| Temperature Sensor Units      | C200H-TS001/002/101/102             | Other Special I/O Units | 1                      | 5               | 1      |
| PID Control Units             | C200H-PID01/02/03                   | Other Special I/O Units | 1                      | 7               | 3      |
| Cam Positioner Unit           | C200H-CP114                         | Other Special I/O Units | 1                      | 8               | 2      |
| ASCII Units                   | C200H-ASC02                         | Other Special I/O Units | 1                      | 1               | 3      |
|                               | C200H-ASC11/21/31                   | Other Special I/O Units | 1                      | 5               | 5      |
| Analog Input Units            | C200H-AD001                         | Other Special I/O Units | 1                      | 5               | 1      |
|                               | C200H-AD002                         | Other Special I/O Units | 1                      | 9               | 1      |
|                               | C200H-AD003 (normal mode)           | Other Special I/O Units | 1                      | 9               | 1      |
|                               | C200H-AD003 (adjustment mode)       | Other Special I/O Units | 1                      | 2               | 8      |
| Analog Output Units           | C200H-DA001                         | Other Special I/O Units | 1                      | 1               | 3      |
|                               | C200H-DA002                         | Other Special I/O Units | 1                      | 0               | 4      |
|                               | C200H-DA003/004 (normal mode)       | Other Special I/O Units | 1                      | 1               | 9      |
|                               | C200H-DA003/004 (adjustment mode)   | Other Special I/O Units | 1                      | 2               | 8      |
| Analog I/O Units              | C200H-MAD01 (normal mode)           | Other Special I/O Units | 1                      | 5               | 5      |
|                               | C200H-MAD01 (adjustment mode)       | Other Special I/O Units | 1                      | 2               | 8      |

| Name                                       | Model                                  | Unit type               | Number of unit numbers | Allocated words |        |
|--------------------------------------------|----------------------------------------|-------------------------|------------------------|-----------------|--------|
|                                            |                                        |                         |                        | Input           | Output |
| High-speed Counter Units                   | C200H-CT001-V1/CT002 (mode 1 or 2)     | High-speed Counter Unit | 1                      | 6               | 4      |
|                                            | C200H-CT001-V1/CT002 (mode 3)          | High-speed Counter Unit | 1                      | 5               | 4      |
|                                            | C200H-CT001-V1/CT002 (mode 4, 5, or 6) | High-speed Counter Unit | 1                      | 4               | 4      |
|                                            | C200H-CT021                            | High-speed Counter Unit | 1                      | 8               | 2      |
| Motion Control Units                       | C200H-MC221                            | Position Control Unit   | 2                      | 12              | 8      |
| Position Control Units                     | C200H-NC111/112                        | Position Control Unit   | 1                      | 5               | 5      |
|                                            | C200H-NC211                            | Position Control Unit   | 2                      | 10              | 10     |
|                                            | C200H-NC114                            | Position Control Unit   | 1                      | 3               | 2      |
|                                            | C200HW-NC213                           | Position Control Unit   | 1                      | 6               | 4      |
|                                            | C200HW-NC413                           | Position Control Unit   | 2                      | 12              | 8      |
| ID Sensor Units                            | C200H-IDS01-V1/IDS21                   | Other Special I/O Units | 1                      | 1               | 4      |
| Voice Unit                                 | C200H-OV001                            | Other Special I/O Units | 1                      | 1               | 5      |
| Fuzzy Logic Control Unit                   | C200H-FZ001                            | Other Special I/O Units | 1                      | 1               | 4      |
| JPCN-1 Unit                                | C200H-JRM21                            | Other Special I/O Units | 1                      | 2               | 8      |
| C200H DeviceNet Master Unit                | C200HW-DRM21-V1                        | Other Special I/O Units | 1                      | 9               | 1      |
| DeviceNet Slave Unit (C200H I/O Link Unit) | C200HW-DRT21                           | Other Special I/O Units | 1                      | 5               | 5      |
| CompoBus/S Master Unit                     | C200HW-SRM21-V1 (unit number 1)        | Other Special I/O Units | 1                      | 6               | 4      |
|                                            | C200HW-SRM21-V1 (unit number 2)        | Other Special I/O Units | 2                      | 12              | 8      |
| PLC Link Unit                              | C200H-LK401                            | LK401 PLC Link Unit     | ---                    | ---             | ---    |
| SYSMAC BUS Remote I/O Master Unit          | C200H-RM001-PV1/RM201                  | SYSBUS Master           | ---                    | ---             | ---    |

**Note** A Special I/O setting error will occur if Units, the number of input, or the number of output words is set incorrectly.

### 2-8-3 CS-series Special I/O Units

| Name                                              | Model                  | Unit type               | Number of unit numbers | Allocated words |         |
|---------------------------------------------------|------------------------|-------------------------|------------------------|-----------------|---------|
|                                                   |                        |                         |                        | Inputs          | Outputs |
| Analog I/O Unit                                   | CS1W-MAD44             | Other Special I/O Units | 1                      | 5               | 5       |
| Analog Input Units                                | CS1W-AD041/081         | Other Special I/O Units | 1                      | 9               | 1       |
| Analog Output Units                               | CS1W-DA041/08V/08C     | Other Special I/O Units | 1                      | 1               | 9       |
| Isolated Thermocouple Input Unit                  | CS1W-PTS01             | Other Special I/O Units | 1                      | 10              | 0       |
| Isolated Resistance Thermometer Input Unit        | CS1W-PTS02             | Other Special I/O Units | 1                      | 10              | 0       |
| Isolated Ni508Ω Resistance Thermometer Input Unit | CS1W-PTS03             | Other Special I/O Units | 1                      | 10              | 0       |
| Isolated 2-wire Transmission Device Input Unit    | CS1W-PTW01             | Other Special I/O Units | 1                      | 10              | 0       |
| Isolated DC Input Unit                            | CS1W-PDC01             | Other Special I/O Units | 1                      | 10              | 0       |
| Isolated Control Output Unit (Analog Output Unit) | CS1W-PTR01             | Other Special I/O Units | 1                      | 10              | 0       |
| Power Transducer Input Unit                       | CS1W-PTR02             | Other Special I/O Units | 1                      | 10              | 0       |
| DC Input Unit (100 mA)                            | CS1W-PMV01             | Other Special I/O Units | 1                      | 5               | 5       |
| Isolated Pulse Input Unit                         | CS1W-PPS01             | Other Special I/O Units | 1                      | 10              | 0       |
| Motion Control Units                              | CS1W-MC221             | Other Special I/O Units | 3                      | 20              | 10      |
|                                                   | CS1W-MC421             | Other Special I/O Units | 5                      | 32              | 18      |
| Position Control Units                            | CS1W-NC113/133         | Other Special I/O Units | 1                      | 3               | 2       |
|                                                   | CS1W-NC213/233         | Other Special I/O Units | 1                      | 6               | 4       |
|                                                   | CS1W-NC413/433         | Other Special I/O Units | 2                      | 12              | 8       |
| Customizable Counter Units                        | CS1W-HIO01/HCP22/HCA22 | Other Special I/O Units | 1                      | 5               | 5       |

**Note** A Special I/O setting error will occur if Units, the number of input, or the number of output words is set incorrectly.

### 2-8-4 CS-series CPU Bus Units

| Name                       | Model               | Unit type                  | Number of unit numbers | Allocated words |         |
|----------------------------|---------------------|----------------------------|------------------------|-----------------|---------|
|                            |                     |                            |                        | Inputs          | Outputs |
| Controller Link Units      | CS1W-CLK11/21/12/52 | Controller Link Unit       | ---                    | ---             | ---     |
| Serial Communications Unit | CS1W-SCU21          | Serial Communications Unit | ---                    | ---             | ---     |
| Ethernet Units             | CS1W-ETN01/11       | Ethernet Unit              | ---                    | ---             | ---     |
| SYSMAC LINK Unit           | CS1W-SLK21          | SYSMAC LINK Unit           | ---                    | ---             | ---     |
| Loop Control Unit          | CS1W-LC001          | Loop Control Unit          | ---                    | ---             | ---     |
| DeviceNet Unit             | CS1W-DRM21          | DeviceNet Unit             | ---                    | ---             | ---     |

**Note** The DeviceNet Unit is not support by CX-Programmer version 2.0 or earlier, and I/O tables containing the DeviceNet Unit cannot be created with these versions. Create the tables online.

## SECTION 3

# Nomenclature, Functions, and Dimensions

This section provides the names of components and their functions for various Units. The Unit dimensions are also provided.

|       |                                                                                 |     |
|-------|---------------------------------------------------------------------------------|-----|
| 3-1   | CPU Units . . . . .                                                             | 116 |
| 3-1-1 | Models . . . . .                                                                | 116 |
| 3-1-2 | Components . . . . .                                                            | 117 |
| 3-1-3 | CPU Unit Memory Block Map . . . . .                                             | 120 |
| 3-1-4 | Dimensions . . . . .                                                            | 124 |
| 3-2   | File Memory . . . . .                                                           | 124 |
| 3-2-1 | Files Handled by CPU Unit . . . . .                                             | 125 |
| 3-2-2 | Initializing File Memory . . . . .                                              | 126 |
| 3-2-3 | Using File Memory . . . . .                                                     | 126 |
| 3-2-4 | Memory Card Dimensions . . . . .                                                | 129 |
| 3-2-5 | Installing and Removing the Memory Card . . . . .                               | 129 |
| 3-3   | Programming Devices . . . . .                                                   | 131 |
| 3-3-1 | Overview . . . . .                                                              | 131 |
| 3-3-2 | Programming Consoles . . . . .                                                  | 133 |
| 3-3-3 | CX-Programmer . . . . .                                                         | 135 |
| 3-3-4 | Peripheral Port Specifications . . . . .                                        | 138 |
| 3-3-5 | RS-232C Port Specifications . . . . .                                           | 138 |
| 3-4   | Power Supply Units . . . . .                                                    | 141 |
| 3-4-1 | Power Supply Units . . . . .                                                    | 141 |
| 3-4-2 | Components and Switch Settings . . . . .                                        | 141 |
| 3-4-3 | Dimensions . . . . .                                                            | 143 |
| 3-4-4 | Selecting a Power Supply Unit . . . . .                                         | 144 |
| 3-5   | Backplanes . . . . .                                                            | 144 |
| 3-5-1 | CPU Backplanes . . . . .                                                        | 144 |
| 3-5-2 | CS-series Expansion Backplanes . . . . .                                        | 147 |
| 3-5-3 | C200H Expansion I/O Backplanes . . . . .                                        | 148 |
| 3-5-4 | I/O Control Units, I/O Interface Units, and Terminators . . . . .               | 149 |
| 3-6   | Basic I/O Units . . . . .                                                       | 153 |
| 3-6-1 | C200H and CS-series Basic I/O Units with Terminal Blocks . . . . .              | 153 |
| 3-6-2 | Interrupt Input Units . . . . .                                                 | 159 |
| 3-6-3 | Units with High-speed Inputs . . . . .                                          | 165 |
| 3-6-4 | CS-series Basic I/O Units with Connectors (32-, 64-, and 96-pt Units) . . . . . | 166 |
| 3-6-5 | C200H Group-2 High-density I/O Units . . . . .                                  | 169 |
| 3-7   | C200H High-density I/O Units (Special I/O Units) . . . . .                      | 171 |
| 3-8   | B7A Interface Units . . . . .                                                   | 176 |
| 3-8-1 | Standard B7A Interface Units (Basic I/O Units) . . . . .                        | 176 |
| 3-8-2 | Group-2 B7A Interface Units . . . . .                                           | 178 |
| 3-9   | Analog Timer Units . . . . .                                                    | 188 |



## 3-1 CPU Units

### 3-1-1 Models

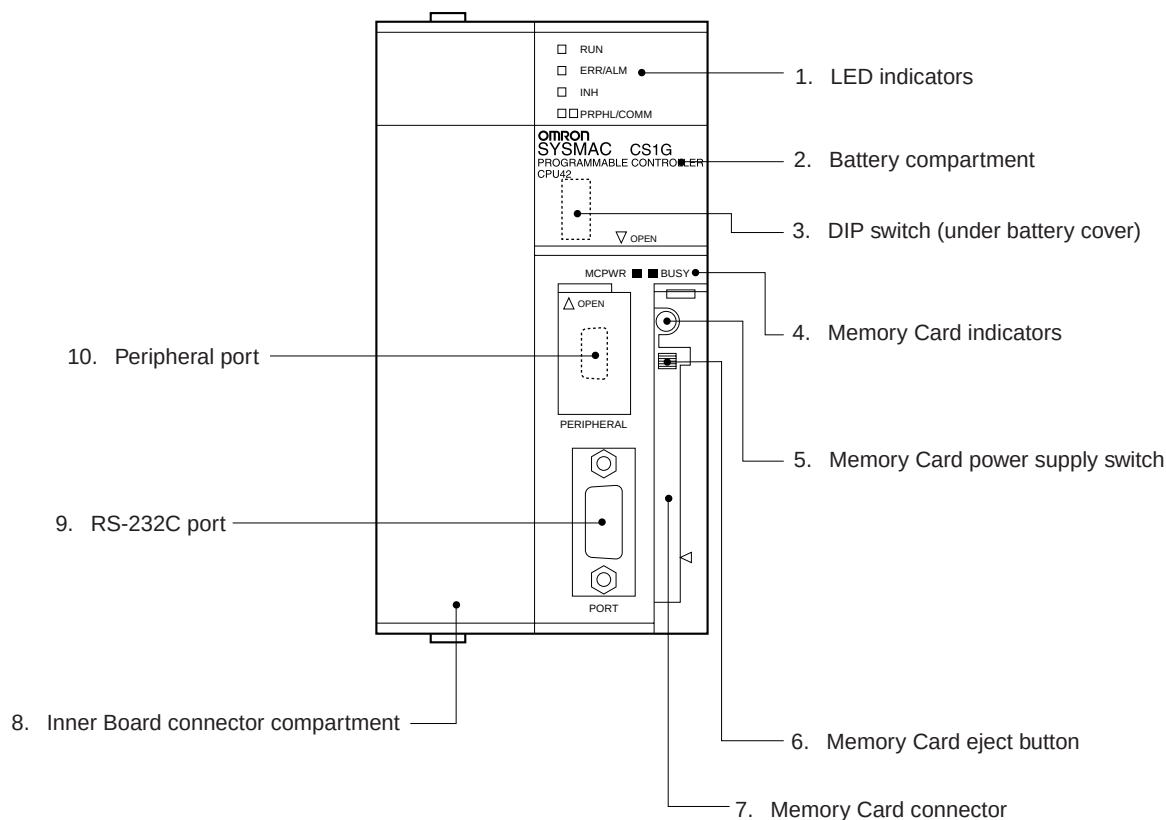
#### CS1-H CPU Units

| I/O points | Expansion Racks | Programming | Data Memory (DM + EM) | LD instruction processing time | Model       | Weight     |
|------------|-----------------|-------------|-----------------------|--------------------------------|-------------|------------|
| 5,120      | 7 max.          | 250K steps  | 448K words            | 0.02 $\mu$ s                   | CS1H-CPU67H | 350 g max. |
|            |                 | 120K steps  | 256K words            |                                | CS1H-CPU66H |            |
|            |                 | 60K steps   | 128K words            |                                | CS1H-CPU65H |            |
|            |                 | 30K steps   | 64K words             |                                | CS1H-CPU64H |            |
|            |                 | 20K steps   | 64K words             |                                | CS1G-CPU63H |            |
|            |                 | 60K steps   | 128K words            | 0.04 $\mu$ s                   | CS1G-CPU45H |            |
| 1,280      | 3 max.          | 30K steps   | 64K words             |                                | CS1G-CPU44H |            |
| 960        | 2 max.          | 20K steps   | 64K words             |                                | CS1G-CPU43H |            |
|            |                 | 10K steps   | 64K words             |                                | CS1G-CPU42H |            |

#### CS1 CPU Units

| I/O points | Expansion Racks | Programming | Data Memory (DM + EM) | LD instruction processing time | Model          | Weight     |
|------------|-----------------|-------------|-----------------------|--------------------------------|----------------|------------|
| 5,120      | 7 max.          | 250K steps  | 448K words            | 0.04 $\mu$ s                   | CS1H-CPU67-EV1 | 400 g max. |
|            |                 | 120K steps  | 256K words            |                                | CS1H-CPU66-EV1 |            |
|            |                 | 60K steps   | 128K words            |                                | CS1H-CPU65-EV1 |            |
|            |                 | 30K steps   | 64K words             |                                | CS1H-CPU64-EV1 |            |
|            |                 | 20K steps   | 32K words             |                                | CS1G-CPU63-EV1 |            |
|            |                 | 60K steps   | 128K words            | 0.08 $\mu$ s                   | CS1G-CPU45-EV1 |            |
| 1,280      | 3 max.          | 30K steps   | 64K words             |                                | CS1G-CPU44-EV1 |            |
| 960        | 2 max.          | 20K steps   | 32K words             |                                | CS1G-CPU43-EV1 |            |
|            |                 | 10K steps   | 32K words             |                                | CS1G-CPU42-EV1 |            |

### 3-1-2 Components



A CS1 CPU Unit is shown above.

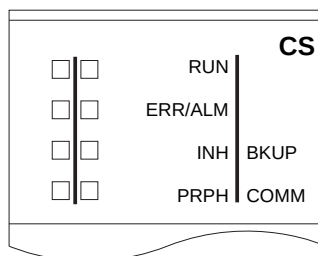
#### Indicators

The following table describes the LED indicators located on the front panel of the CPU Units.

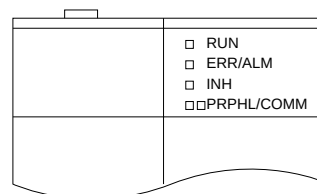
| Indicator                   | Color  | Status   | Meaning                                                                                                                                                                                                               |
|-----------------------------|--------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RUN                         | Green  | ON       | PLC is operating normally in MONITOR or RUN mode.                                                                                                                                                                     |
|                             |        | Flashing | System download mode error or DIP switch settings error.                                                                                                                                                              |
|                             |        | OFF      | PLC has stopped operating while in PROGRAM mode, or has stopped operating due to a fatal error, or is downloading data from the system.                                                                               |
| ERR/ALM                     | Red    | ON       | A fatal error has occurred (including FALS instruction execution), or a hardware error (watchdog timer error) has occurred.<br>The CPU Unit will stop operating, and the outputs from all Output Units will turn OFF. |
|                             |        | Flashing | A non-fatal error has occurred (including FAL instruction execution)<br>The CPU Unit will continue operating.                                                                                                         |
|                             |        | OFF      | CPU Unit is operating normally.                                                                                                                                                                                       |
| INH                         | Orange | ON       | Output OFF Bit (A50015) has been turned ON. The outputs from all Output Units will turn OFF.                                                                                                                          |
|                             |        | OFF      | Output OFF Bit (A50015) has been turned OFF.                                                                                                                                                                          |
| BKUP (CS1-H CPU Units only) | Orange | ON       | User program and parameter area data is being backed up to flash memory in the CPU Unit or being restored from flash memory.<br><b>Note</b> Do not turn OFF the power supply to the PLC while this indicator is lit.  |
|                             |        | OFF      | Data is not being written to flash memory.                                                                                                                                                                            |
| PRPHL                       | Orange | Flashing | CPU Unit is communicating (sending or receiving) via the peripheral port.                                                                                                                                             |
|                             |        | OFF      | CPU Unit is not communicating via the peripheral port.                                                                                                                                                                |

| Indicator | Color  | Status   | Meaning                                                                                                                                                                                                                        |
|-----------|--------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COMM      | Orange | Flashing | CPU Unit is communicating (sending or receiving) via the RS-232C port.                                                                                                                                                         |
|           |        | OFF      | CPU Unit is not communicating via the RS-232C port.                                                                                                                                                                            |
| MCPWR     | Green  | ON       | Power is being supplied to the Memory Card.                                                                                                                                                                                    |
|           |        | Flashing | Flashes once: Easy backup read, write, or verify normal<br>Flashes five times: Easy backup write malfunction<br>Flashes three times: Easy backup write warning<br>Flashes continuously: Easy backup read or verify malfunction |
|           |        | OFF      | Power is not being supplied to the Memory Card.                                                                                                                                                                                |
| BUSY      | Orange | Flashing | Memory Card is being accessed.                                                                                                                                                                                                 |
|           |        | OFF      | Memory Card is not being accessed.                                                                                                                                                                                             |

CS1-H CPU Unit



CS1 CPU Unit



**DIP Switch Settings**

| Pin no. | Setting | Function                                                                                                                                                             | Usage                                                                                                                                                                                                                                                                                                                                                                   | Default |
|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1       | ON      | Writing disabled for user program memory. (See Note.)                                                                                                                | Used to prevent programs from being accidentally overwritten from Programming Devices (including Programming Console).                                                                                                                                                                                                                                                  | OFF     |
|         | OFF     | Writing enabled for user program memory.                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                         |         |
| 2       | ON      | The user program is automatically transferred from the Memory Card when power is turned ON.                                                                          | Used to store the programs in the Memory Card to switch operations, or to automatically transfer programs at power-up (Memory Card ROM operation).<br><b>Note</b> When pin 7 is ON, easy backup reading from the Memory Card is given priority, so even if pin 2 is ON, the user program is not automatically transferred from the Memory Card when power is turned ON. | OFF     |
|         | OFF     | The user program is not automatically transferred from the Memory Card when power is turned ON.                                                                      |                                                                                                                                                                                                                                                                                                                                                                         |         |
| 3       | ON      | CS1 CPU Unit: Programming Console messages displayed in English.                                                                                                     | CS1 CPU Unit: Turn ON to display Programming Console messages in English.<br><b>Note</b> This pin is not used on CS1-H CPU Units.                                                                                                                                                                                                                                       | ON      |
|         | OFF     | CS1 CPU Unit: Programming Console messages displayed in the language stored in system ROM. (Messages displayed in Japanese with the Japanese version of system ROM.) |                                                                                                                                                                                                                                                                                                                                                                         |         |
| 4       | ON      | Peripheral port communications parameters set in the PLC Setup are used.                                                                                             | Turn ON to use the peripheral port for a device other than Programming Console or CX-Programmer (Peripheral bus only).                                                                                                                                                                                                                                                  | OFF     |
|         | OFF     | Peripheral port communications parameters set using Programming Console or CX-Programmer (Peripheral bus only) are used.                                             |                                                                                                                                                                                                                                                                                                                                                                         |         |
| 5       | ON      | RS-232C port communications parameters set using a CX-Programmer (Peripheral bus only) are used.                                                                     | Turn ON to use the RS-232C port for a Programming Device.                                                                                                                                                                                                                                                                                                               | OFF     |
|         | OFF     | RS-232C port communications parameters set in the PLC Setup are used.                                                                                                |                                                                                                                                                                                                                                                                                                                                                                         |         |
| 6       | ON      | User-defined pin. Turns OFF the User DIP Switch Pin Flag (A39512).                                                                                                   | Set pin 6 to ON or OFF and use A39512 in the program to create a user-defined condition without using an I/O Unit.                                                                                                                                                                                                                                                      | OFF     |
|         | OFF     | User-defined pin. Turns ON the User DIP Switch Pin Flag (A39512).                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                         |         |
| 7       | ON      | Writing from the CPU Unit to the Memory Card.                                                                                                                        | Press and hold the Memory Card Power Supply Switch for three seconds.<br><b>Note</b> Normally, this pin should be left turned OFF.                                                                                                                                                                                                                                      | OFF     |
|         |         | Restoring from the Memory Card to the CPU Unit.                                                                                                                      | To read from the Memory Card to the CPU Unit, turn ON the PLC power.<br>This operation is given priority over automatic transfer (pin 2 is ON) when power is ON.                                                                                                                                                                                                        |         |
|         | OFF     | Verifying contents of Memory Card.                                                                                                                                   | Press and hold the Memory Card Power Supply Switch for three seconds.                                                                                                                                                                                                                                                                                                   |         |
| 8       | OFF     | Always OFF.                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                         | OFF     |

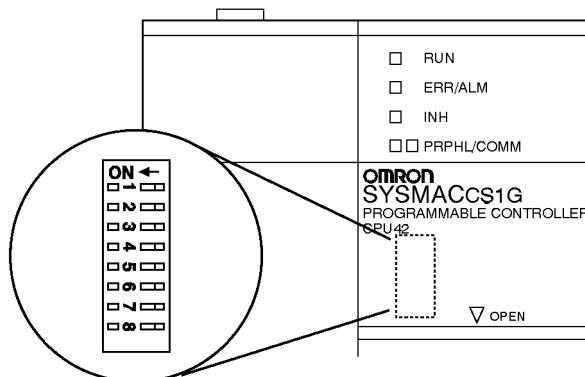
**Note**

- The following data cannot be overwritten when pin 1 is ON:

- All parts of the user program (programs in all tasks)
- All data in the parameter area (such as the PLC Setup and I/O table)

When pin 1 is ON, the user program and parameter area will not be cleared when the memory clear operation is performed from a Programming Device.

2. The CPU Unit will not enter any mode except PROGRAM mode after backing up data to a Memory Card using DIP switch pin 7. To enter RUN or MONITOR mode, turn OFF the power supply, turn OFF pin 7, and then restart the PLC. This will enable changing the operating mode as normal.



### 3-1-3 CPU Unit Memory Block Map

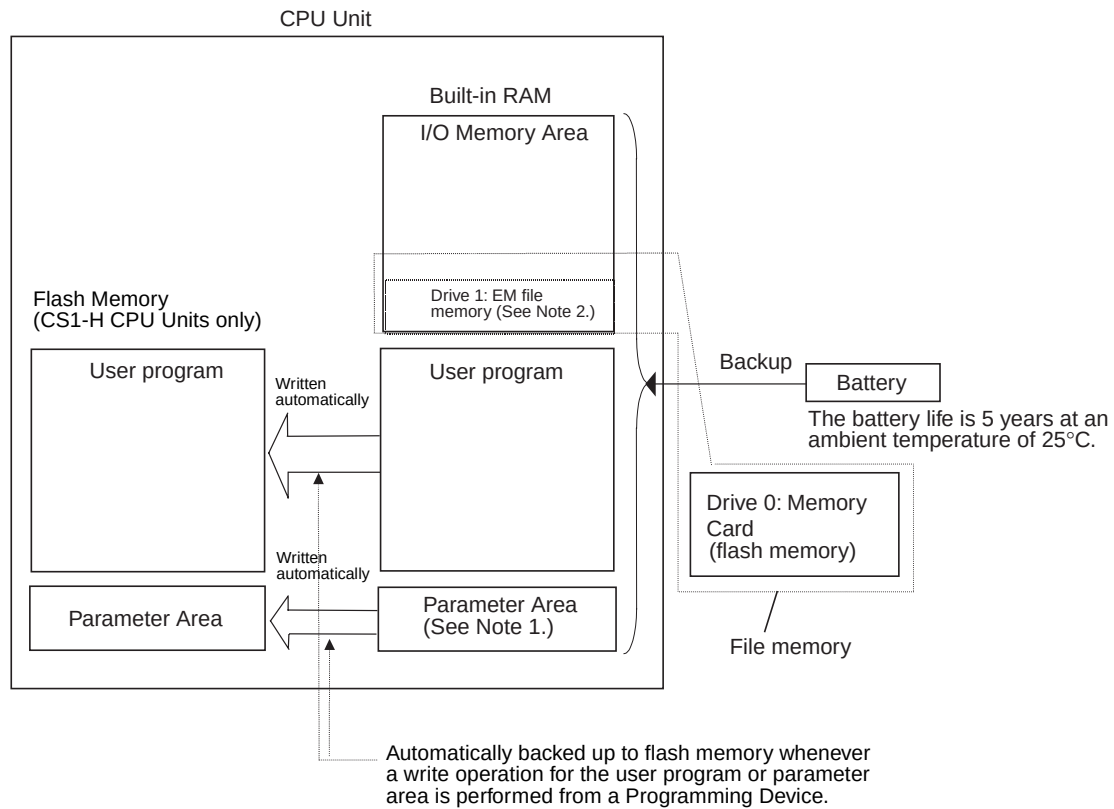
The memory of CS-series CPU Units is configured in the following blocks.

- I/O Memory: The data areas accessible from the user program
- User Memory: The user program and parameter areas (See Note 1.)

The above memory is backed up using a CS1W-BAT01 Battery. If the battery voltage is low, the data in these areas will be lost.

With the CS1-H CPU Units, however, the CPU Unit has a built-in flash memory to which the user program and parameter area data is backed up whenever the user memory is written to, including data transfers and online editing from a Programming Device (CX-Programmer or Programming Console, data transfers from a Memory Card, etc. The user program and the parameter area data will thus not be lost when using a CS1-H CPU Unit.

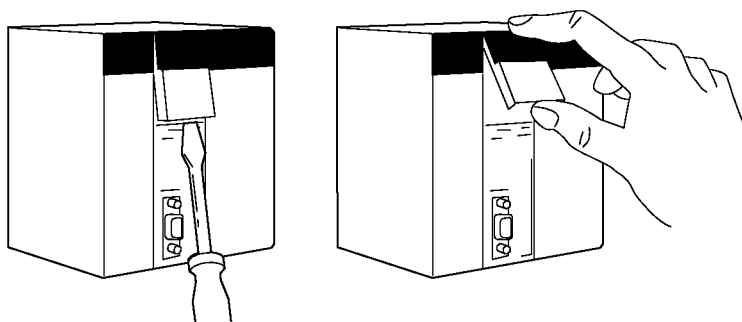
**Caution** Always install the CS1W-BAT01 Battery before first using a CS1 CPU Unit.



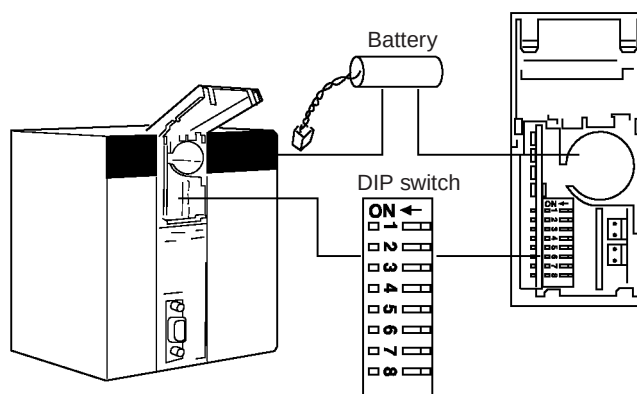
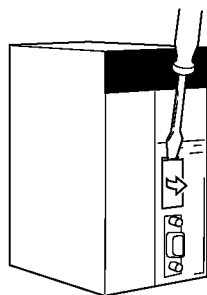
- Note**
1. The Parameter Area stores system information for the CPU Unit, such as the PLC Setup.
  2. Part of the EM (Extended Data Memory) Area can be converted to file memory to handle data files and program files in RAM memory format, which has the same format as Memory Cards. File memory in the EM Area is backed up by a battery.

**Opening the Battery Compartment Cover**

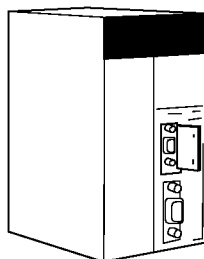
Insert a small flat-blade screwdriver into the opening at the bottom of the battery compartment cover and lift open the cover.



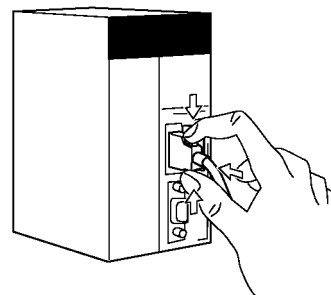
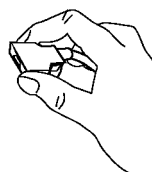
Insert a small flat-blade screwdriver into the opening at the bottom of the battery compartment cover and lift open the cover.

**Opening the Peripheral Port Cover and Connecting Cables**

Insert a small flat-blade screwdriver into the opening at the top of the port cover and pull open.



Make sure the connector is in facing the correct direction

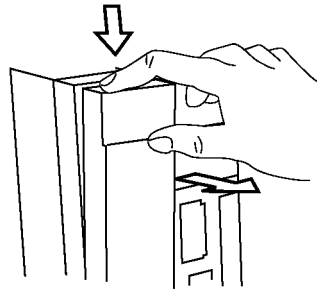


Hold the grips on the side of the connector and push into the port.

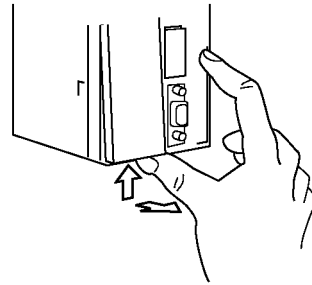
## Installing Inner Boards

1,2,3...

1. Press in the lever at the top of the Inner Board connector compartment and pull out.

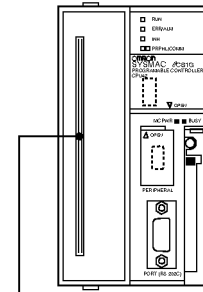
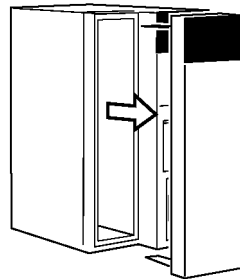


Press in the lever on the top of the cover and pull out.



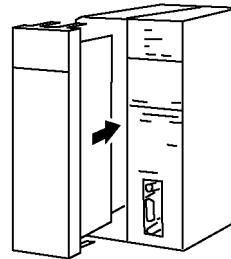
Press in the lever on the bottom of the cover and pull out.

2. Remove the cover of the Inner Board connector compartment.



Inner Board connector

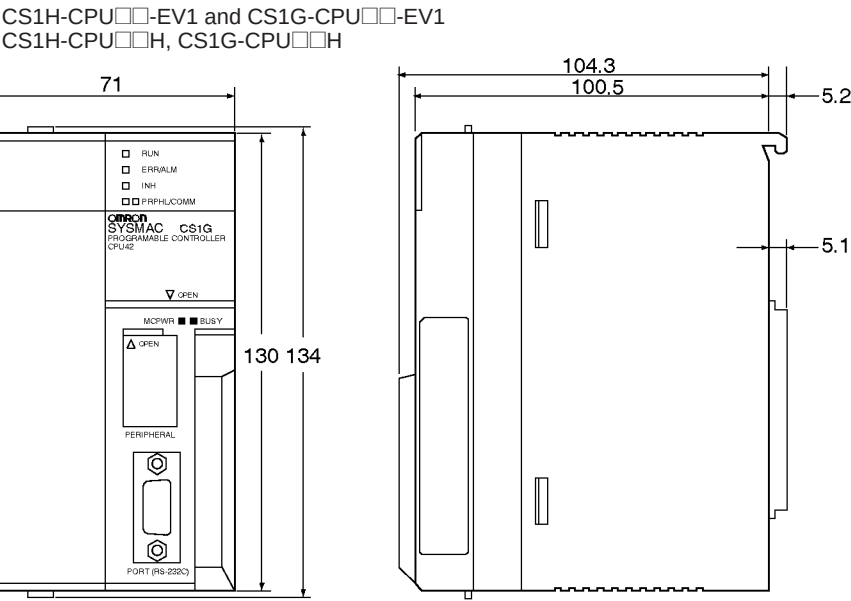
3. Insert the Inner Board into the compartment.



- Note**
1. Always make sure the power is OFF before installing the Inner Board. Installing the Inner Board when the power is ON may cause CPU Unit malfunction, damage to internal components, and improper communications.
  2. Before installing the Inner Board, be sure to touch a grounded metal object to discharge static electricity from your body.



3-1-4 Dimensions

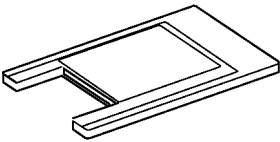


3-2 File Memory

For CS-series CPU Units, the Memory Card and a specified part of the EM Area can be used to store files. All user programs, the I/O Memory Area, and the Parameter Area can be stored as files.

| File memory                                                                                                                                                                  | Memory type  | Memory capacity | Model     |        |     |                                                                                                       |                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------|-----------|--------|-----|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <div>Memory Card</div> <div></div>                                                        | Flash memory | 8 Mbytes        | HMC-EF861 |        |     |                                                                                                       |                                                                                              |
|                                                                                                                                                                              |              | 15 Mbytes       | HMC-EF171 |        |     |                                                                                                       |                                                                                              |
|                                                                                                                                                                              |              | 30 Mbytes       | HMC-EF371 |        |     |                                                                                                       |                                                                                              |
|                                                                                                                                                                              |              | 48 Mbytes       | HMC-EF571 |        |     |                                                                                                       |                                                                                              |
| <div>EM file memory</div> <div><table><tr><td>Bank 0</td></tr><tr><td>Bank n</td></tr><tr><td>⋮</td></tr><tr><td>Bank C</td></tr></table><div>↑ EM file memory ↓</div></div> | Bank 0       | Bank n          | ⋮         | Bank C | RAM | The maximum capacity of the CPU Unit's EM Area (e.g., the maximum capacity for a CPU67 is 832 Kbytes) | The specified bank (set in the PLC Setup) to the last bank of the EM Area in the I/O Memory. |
| Bank 0                                                                                                                                                                       |              |                 |           |        |     |                                                                                                       |                                                                                              |
| Bank n                                                                                                                                                                       |              |                 |           |        |     |                                                                                                       |                                                                                              |
| ⋮                                                                                                                                                                            |              |                 |           |        |     |                                                                                                       |                                                                                              |
| Bank C                                                                                                                                                                       |              |                 |           |        |     |                                                                                                       |                                                                                              |

- Note**
1. A Memory Card can be written up to approximately 100,000 times. (Each write operation to the Memory Card must be counted regardless of the size of the write.) Be particularly careful not to exceed the life of the Memory Card when writing to it from the ladder program.
  2. The HMC-AP001 Memory Card Adapter is shown below.



### 3-2-1 Files Handled by CPU Unit

Files are ordered and stored in the Memory Card or EM file memory according to the file name and the extension attached to it.

#### General-use Files

| File type       | Contents                                                                                                                                    |                                           | File name     | Extension |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------|-----------|
| Data files      | Specified range in I/O memory                                                                                                               | Binary                                    | *****         | .IOM      |
|                 |                                                                                                                                             | Text (except pre-version-1 CS1 CPU Units) | (See note 1.) | .TXT      |
|                 |                                                                                                                                             | CSV (except pre-version-1 CS1 CPU Units)  |               | .CSV      |
| Program files   | All user programs                                                                                                                           |                                           | (See note 1.) | .OBJ      |
| Parameter files | PLC Setup, registered I/O tables, routing tables, CS-series CPU Bus Unit settings, SYSMAC LINK link tables, and Controller Link link tables |                                           |               | .STD      |

#### Files Transferred Automatically at Startup

| File type       | Contents                                                                                                                                    | File name | Extension |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| Data files      | DM area data (stores data for specified number of words starting from D20000)                                                               | AUTOEXEC  | .IOM      |
|                 | DM area data (stores data for specified number of words starting from D00000) (except pre-version-1 CS1 CPU Units)                          | ATEXECMD  | .IOM      |
|                 | EM area for bank No. □ (stores data for specified number of words starting from E□_00000) (except pre-version-1 CS1 CPU Units)              | ATEXECE□  | .IOM      |
| Program files   | All user programs                                                                                                                           | AUTOEXEC  | .OBJ      |
| Parameter files | PLC Setup, registered I/O tables, routing tables, CS-series CPU Bus Unit settings, SYSMAC LINK link tables, and Controller Link link tables | AUTOEXEC  | .STD      |

#### Easy Backup Files (except pre-version-1 CS1 CPU Units)

| File type  | Contents                                                                             | File name | Extension |
|------------|--------------------------------------------------------------------------------------|-----------|-----------|
| Data files | Words allocated to Special I/O Units, CPU Bus Units, and Inner Boards in the DM area | BACKUP    | .IOM      |
|            | CIO area                                                                             | BACKUPIO  | .IOR      |
|            | General-purpose DM area                                                              | BACKUPDM  | .IOM      |
|            | General-purpose EM area                                                              | BACKUPE□  | .IOM      |

| File type                                      | Contents                                                                                                                                     | File name | Extension |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| Program files                                  | All user programs                                                                                                                            | BACKUP    | .OBJ      |
| Parameter files                                | PLC Setup, registered I/O tables, routing tables, CS-series CPU Bus Unit settings, SYS-MAC LINK link tables, and Controller Link link tables |           | .STD      |
| Unit/Board backup files (CS1-H CPU Units only) | Data from specific Units or Boards.                                                                                                          | BACKUP□□  | .PRM      |

- Note**
1. Specify 8 ASCII characters. For a file name with less than 8 characters, add spaces (20 Hex).
  2. Always specify the name of files to be transferred automatically at power-up as AUTOEXEC.

### 3-2-2 Initializing File Memory

| File memory    | Initializing procedure                                                                                                                                                                                               | Data capacity after initialization                        |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Memory Card    | 1. Install Memory Card into CPU Unit.<br>2. Initialize the Memory Card using a Programming Device (including Programming Console).                                                                                   | Essentially the specific capacity of the Memory Card      |
| EM file memory | 1. Convert the part of the EM Area from the specified bank No. to the last bank No. to file memory in the PLC Setup.<br>2. Initialize the EM file memory using a Programming Device (excluding Programming Console). | 1 bank:      Approx. 61 KB<br>13 banks:    Approx. 825 KB |

### 3-2-3 Using File Memory

**Note** For details on using file memory, refer to the *SECTION 12 Inspection and Maintenance*.

#### Memory Cards

##### Reading/Writing Files Using Programming Device

| File             | File name and extension | Data transfer direction           |
|------------------|-------------------------|-----------------------------------|
| Program files    | *****.OBJ               | Between CPU Unit and Memory Card, |
| I/O memory files | *****.IOM               |                                   |
| Parameter files  | *****.STD               |                                   |

- 1,2,3...**
1. Install the Memory Card into the CPU Unit.
  2. Initialize the Memory Card if necessary.
  3. Name the file containing the data in the CPU Unit and save the contents in the Memory Card.
  4. Read the file that is saved in the Memory Card to the CPU Unit.

**Automatically Transferring Memory Card Files to the CPU Unit at Power-up**

| File             | File name and extension                      | Data transfer direction      |
|------------------|----------------------------------------------|------------------------------|
| Program files    | AUTOEXEC.OBJ                                 | From Memory Card to CPU Unit |
| I/O memory files | AUTOEXEC.IOM<br>ATEXECDM.IOM<br>ATEXECE□.IOM |                              |
| Parameter files  | AUTOEXEC.STD                                 |                              |

- 1,2,3...**
1. Install the Memory Card into the CPU Unit.
  2. Set pin 2 of the DIP switch to ON.
  3. The files are read automatically when the power is turned ON.

**Reading/Writing I/O Memory Files Using FREAD(700)and FWRT(701)**

| File             | File name and extension             | Data transfer direction          |
|------------------|-------------------------------------|----------------------------------|
| I/O memory files | *****.IOM<br>*****.TXT<br>*****.CSV | Between CPU Unit and Memory Card |

- 1,2,3...**
1. Install the Memory Card into the CPU Unit.
  2. Initialize the Memory Card using a Programming Device.
  3. Using the FWRT(701) instruction, name the file of the specified I/O memory area, and save to the Memory Card.
  4. Using the FREAD(700) instruction, read the I/O memory files from the Memory Card to the I/O memory in the CPU Unit.

**Note** When using spreadsheet software to read data that has been written to the Memory Card in CSV or text format, it is now possible to read the data using Windows applications by mounting a Memory Card in the personal computer card slot using a HMC-AP001 Memory Card Adapter (except pre-version-1 CS1 CPU Units).

**Reading and Replacing Program Files during Operation (except pre-version-1 CS1 CPU Units)**

| File          | File name and extension | Data transfer direction |
|---------------|-------------------------|-------------------------|
| Program files | *****.OBJ               | Memory Card to CPU Unit |

- 1,2,3...**
1. Install a Memory Card into the CPU Unit.
  2. Set the following information: Program File Name (A654 to A657) and Program Password (A651).
  3. Next, from the program, turn ON the Replacement Start Bit (A65015).

**Backing Up or Restoring CPU Unit Data or Data for Specific Units and Boards (except pre-version-1 CS1 CPU Units)**

| File                                           | File name and extension | Data transfer direction                   |
|------------------------------------------------|-------------------------|-------------------------------------------|
| Program files                                  | BACKUP.OBJ              | CPU Unit to Memory Card (when backing up) |
| Data files                                     | BACKUP.IOM              |                                           |
|                                                | BACKUPIO.IOR            | Memory Card to CPU Unit (when restoring)  |
|                                                | BACKUPDM.IOM            |                                           |
|                                                | BACKUPE□.IOM            |                                           |
| Parameter files                                | BACKUP.STD              |                                           |
| Unit/Board backup files (CS1-H CPU Units only) | BACKUP□□.PRM            |                                           |

- 1,2,3...**
1. Install a Memory Card into the CPU Unit.
  2. Turn ON pin 7 on the DIP switch.

### Transferring Files between Memory Cards and the CX-Programmer

3. To back up data, press and hold the Memory Card Power Supply Switch for three seconds. To restore data, turn ON the PLC power.

The following files can be transferred between a Memory Card and the CX-Programmer.

| File         | File name and extension | Data transfer direction               |
|--------------|-------------------------|---------------------------------------|
| Symbols file | SYMBOLS.SYM             | Between CX-Programmer and Memory Card |
| Comment file | COMMENTS.CNT            |                                       |

**1,2,3...**

1. Insert a formatted Memory Card into the CPU Unit.
2. Place the CX-Programmer online and use the file transfer operations to transfer the above files from the personal computer to the PLC or from the PLC to the personal computer.

## EM File Memory

### Reading/Writing EM File Memory Files Using Programming Device

| File             | File name and extension | Data transfer direction             |
|------------------|-------------------------|-------------------------------------|
| Program files    | *****.OBJ               | Between CPU Unit and EM file memory |
| I/O memory files | *****.IOM               |                                     |
| Parameter files  | *****.STD               |                                     |

**1,2,3...**

1. Convert the part of the EM Area specified by the first bank number into file memory in the PLC Setup.
2. Initialize the EM file memory using a Programming Device.
3. Name the data in the CPU Unit and save in the EM file memory using the Programming Device.
4. Read the EM file memory files to the CPU Unit using the Programming Device.

### Reading/Writing I/O Memory Files in EM File Memory Using FREAD(700)and FWRIT(701)

| File             | File name and extension | Data transfer direction             |
|------------------|-------------------------|-------------------------------------|
| I/O memory files | *****.IOM               | Between CPU Unit and EM file memory |

**1,2,3...**

1. Convert the part of the EM Area specified by the first bank number into file memory in the PLC Setup.
2. Initialize the EM file memory using a Programming Device.
3. Using the FWRIT(701) instruction, name the specified area in I/O memory with a file name and save in the EM file memory.
4. Using the FREAD(700) instruction, read the I/O memory files from the EM file memory to the I/O memory in the CPU Unit.

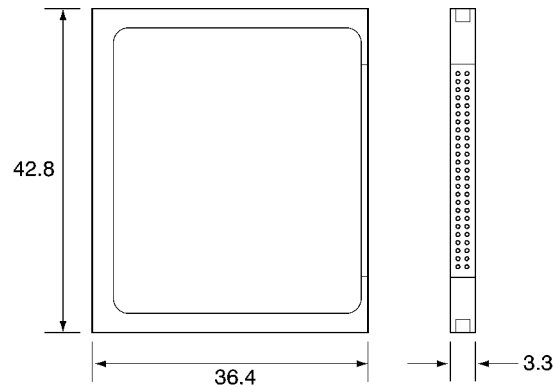
**Note** The following files can be transferred between EM file memory and the CX-Programmer.

| File         | File name and extension | Data transfer direction                  |
|--------------|-------------------------|------------------------------------------|
| Symbols file | SYMBOLS.SYM             | Between CX-Programmer and EM file memory |
| Comment file | COMMENTS.CNT            |                                          |

**1,2,3...**

1. Format the EM Area in the CPU Units as file memory.
2. Place the CX-Programmer online and use the file transfer operations to transfer the above files from the personal computer to the PLC or from the PLC to the personal computer.

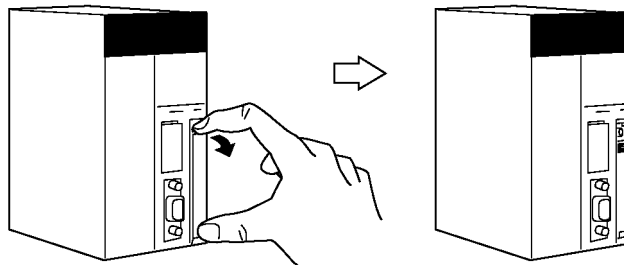
### 3-2-4 Memory Card Dimensions



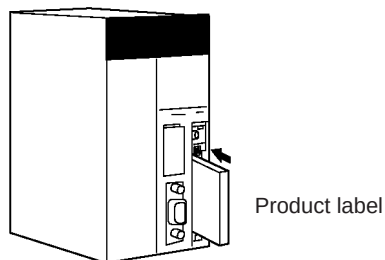
### 3-2-5 Installing and Removing the Memory Card

#### Installing the Memory Card

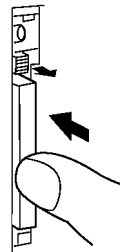
- 1,2,3...** 1. Pull the top end of the Memory Card cover forward and remove from the Unit.



2. Insert the Memory Card with the label facing to the right. (Insert with the  $\Delta$  on the Memory Card label and the  $\triangleleft$  on the CPU Unit facing each other.)

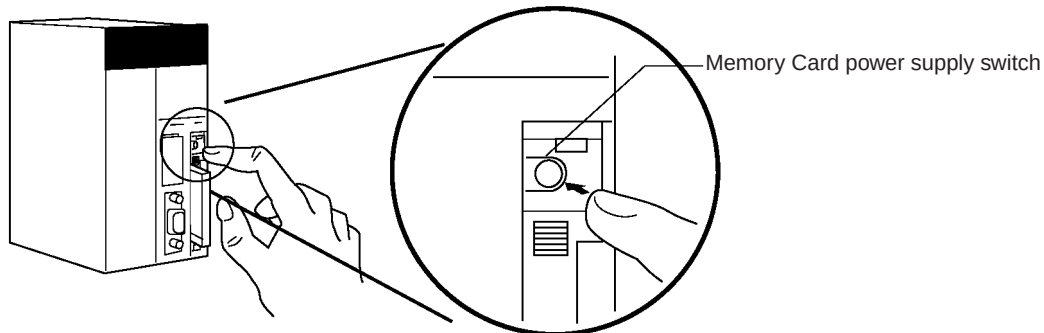


3. Push the Memory Card securely into the compartment. If the Memory Card is inserted correctly, the Memory Card eject button will be pushed out.

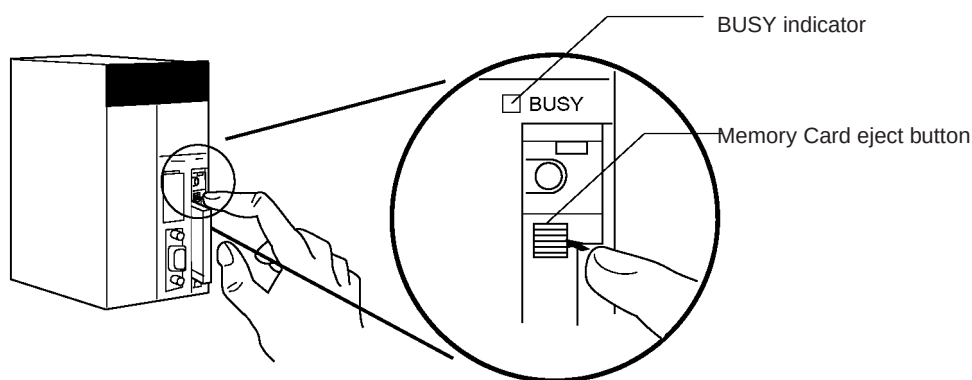


## Removing the Memory Card

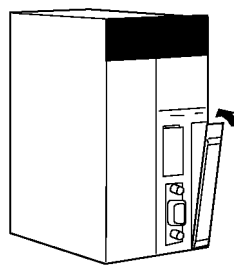
- 1,2,3... 1. Press the Memory Card power supply switch.



2. Press the Memory Card eject button after the BUSY indicator is no longer lit.

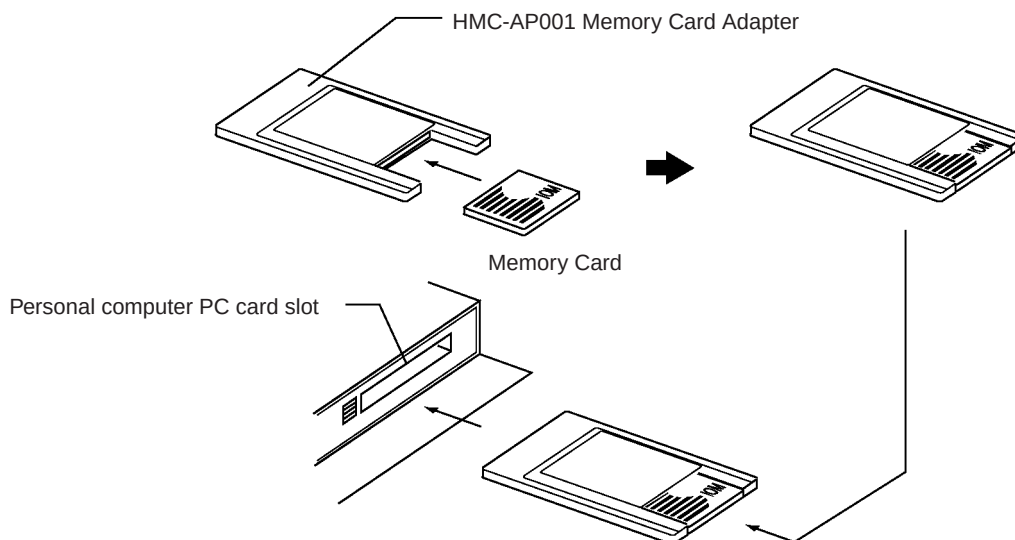


3. The Memory Card will eject from the compartment.  
4. Remove the Memory Card cover when a Memory Card is not being used.



- Note**
1. Never turn OFF the PLC while the CPU is accessing the Memory Card.
  2. Never remove the Memory Card while the CPU is accessing the Memory Card. Press the Memory Card power supply switch and wait for the BUSY indicator to go OFF before removing the Memory Card. In the worst case, the Memory Card may become unusable if the PLC is turned OFF or the Memory Card is removed while the Card is being accessed by the CPU.
  3. Never insert the Memory Card facing the wrong way. If the Memory Card is inserted forcibly, it may become unusable.

## Installing the Memory Card into a Personal Computer



- Note**
1. When a Memory Card is inserted into a computer using a Memory Card Adapter, it can be used as a standard storage device, like a floppy disk or hard disk.
  2. When deleting all of the data in a Memory Card or formatting it in any way, always place it in the CPU Unit and perform the operation from the CX-Programmer or a Programming Console.

## 3-3 Programming Devices

### 3-3-1 Overview

There are 2 types of Programming Devices that can be used: Any of three models of Hand-held Programming Consoles or the CX-Programmer, which is operated on a Windows computer. The CX-Programmer is usually used to write the programs, and a Programming Console is then used to change the operating modes, edit the programs, and monitor a limited number of points.

The following table provides a comparison between the CX-Programmer functions and the Programming Console functions.

| Function                           |                              | Programming Console                                     | CX-Programmer                                                                                                                                |
|------------------------------------|------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Editing and referencing I/O tables |                              | Yes                                                     | Yes                                                                                                                                          |
| Selecting tasks                    |                              | Yes                                                     | Yes                                                                                                                                          |
| Writing programs                   | Inputting instructions       | Writes instructions one at a time using mnemonics       | Writes multiple blocks using mnemonics or ladder programs                                                                                    |
|                                    | Inputting addresses          | Addresses only                                          | Addresses or symbols                                                                                                                         |
|                                    | I/O comment, rung comment    | No                                                      | Yes                                                                                                                                          |
|                                    | Setting global/local symbols | No                                                      | Yes (Automatic allocation of local symbols)                                                                                                  |
| Editing programs                   |                              | Inserts instructions and searches for program addresses | Yes<br>(Cutting, pasting, inserting within programs; searching/exchanging instructions, addresses, and symbols; displaying cross-references) |
| Checking programs                  |                              | No                                                      | Yes                                                                                                                                          |
| Monitoring programs                |                              | Monitors in program address units                       | Monitors multiple blocks                                                                                                                     |

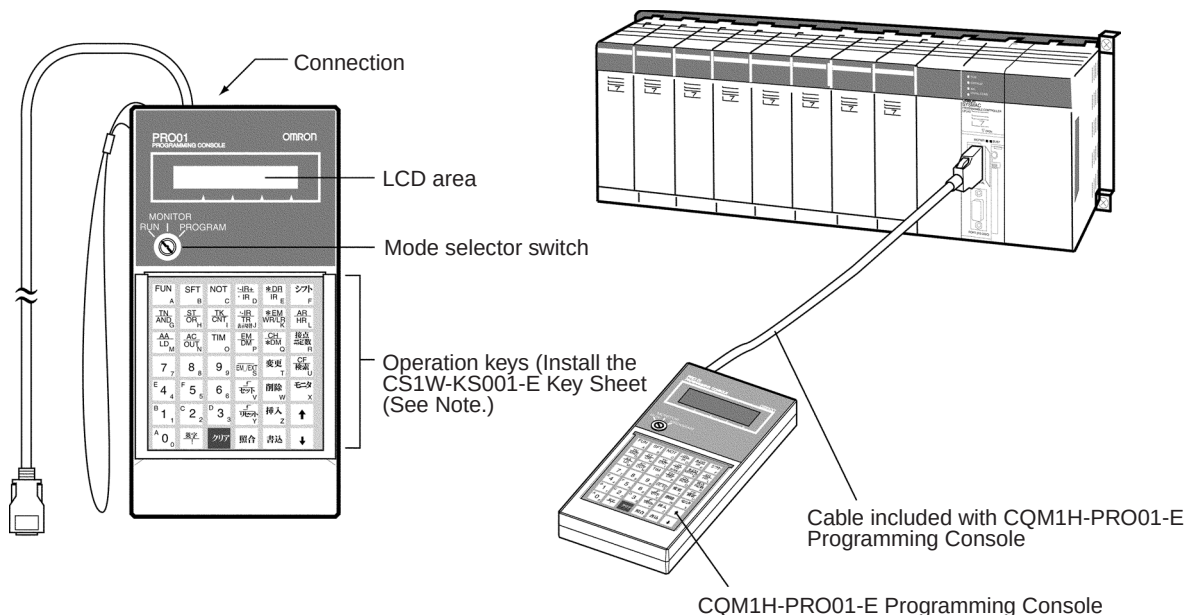


| Function                           |                                                     | Programming Console                                | CX-Programmer                  |
|------------------------------------|-----------------------------------------------------|----------------------------------------------------|--------------------------------|
| Monitoring I/O memory              |                                                     | Simultaneous, 2 points max.                        | Monitors multiple points       |
| Changing I/O memory present values |                                                     | Changes 1 point at a time                          | Yes                            |
| Online editing                     |                                                     | Edits in instruction units                         | Edits multiple adjacent blocks |
| Debugging                          | Changing timer and counter settings                 | Yes                                                | Yes                            |
|                                    | Control set/ reset                                  | Executes 1 point at a time (or resets all at once) | Yes                            |
|                                    | Differentiation monitoring                          | Yes                                                | Yes                            |
|                                    | Reading cycle time                                  | Yes                                                | Yes                            |
|                                    | Data tracing                                        | No                                                 | Yes                            |
|                                    | Time chart monitoring                               | No                                                 | Yes                            |
| Reading error information          |                                                     | Yes (error message display)                        | Yes                            |
| Reading error log                  |                                                     | No                                                 | Yes                            |
| Reading/setting timer information  |                                                     | Yes                                                | Yes                            |
| Reading/setting PLC parameters     |                                                     | Yes                                                | Yes                            |
| Setting CPU Bus Unit parameters    |                                                     | No                                                 | Yes                            |
| File memory operations             | Initializing Memory Card                            | Yes                                                | Yes                            |
|                                    | Initializing EM file memory                         | Yes                                                | Yes                            |
|                                    | Transferring files between CPU Unit and file memory | Yes                                                | Yes                            |
| Remote programming and monitoring  | Between Host Link and Network PLC                   | No                                                 | Yes                            |
|                                    | Via modem                                           | No                                                 | Yes                            |
| Setting password protection        |                                                     | No                                                 | Yes                            |
| Managing files                     |                                                     | No                                                 | Manages files by project.      |
| Printing                           |                                                     | No                                                 | Yes                            |

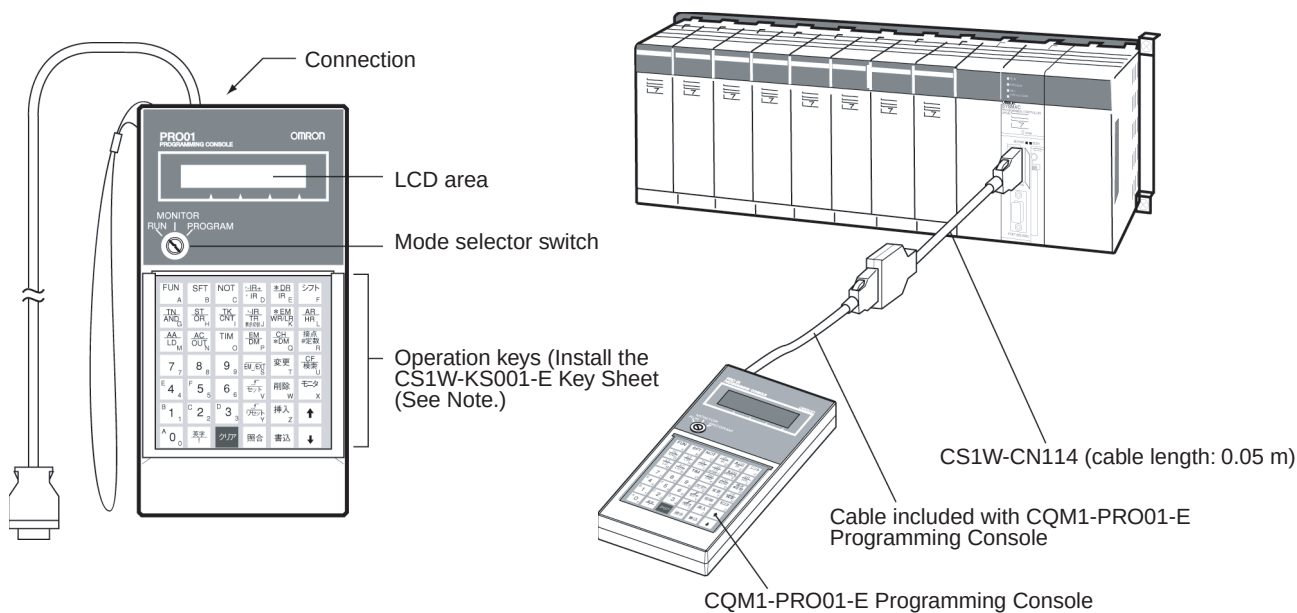
## 3-3-2 Programming Consoles

There are three Programming Consoles that can be used with the CS-series CPU Units: The CQM1H-PRO01-E, CQM1-PRO01-E, and C200H-PRO27-E. These Programming Consoles are shown here.

### CQM1H-PRO01-E Programming Console

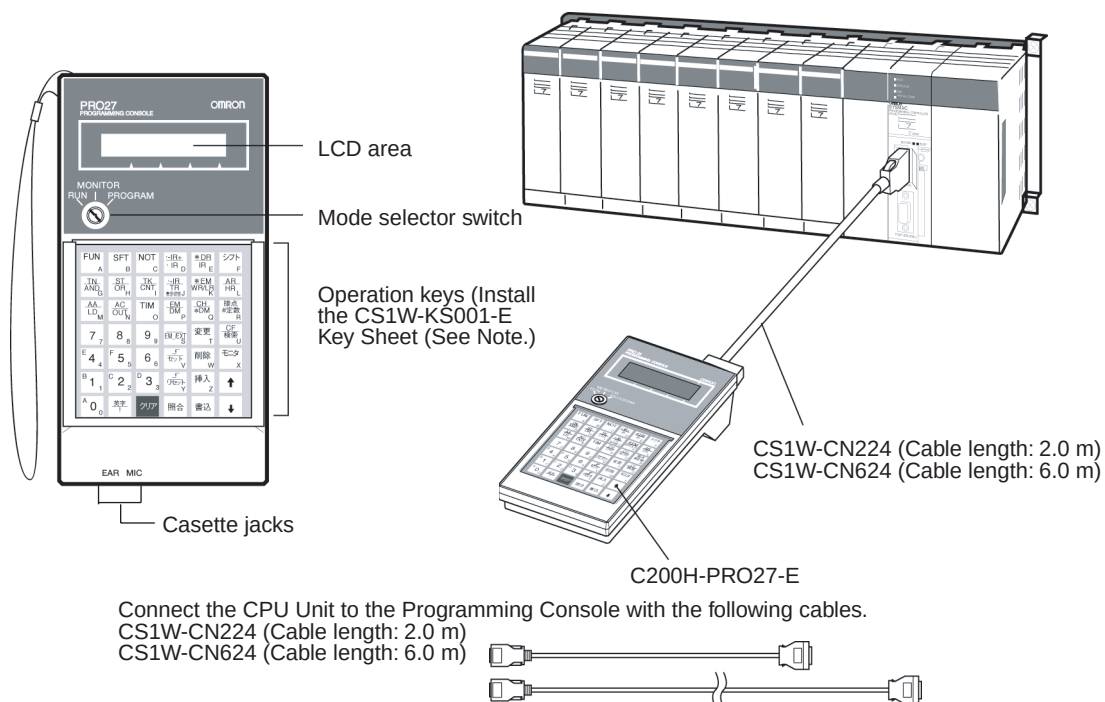


### CQM1-PRO01-E Programming Console



Connect the CPU Unit to the Programming Console with the following cables.  
CS1W-CN114 (Cable length: 0.05 m)



**C200H-PRO27-E Programming Console**

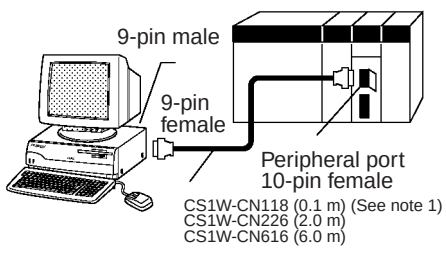
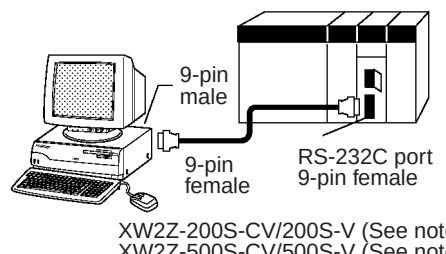
**Note** The Key Sheet is not used with CS-series CPU Units.

### 3-3-3 CX-Programmer

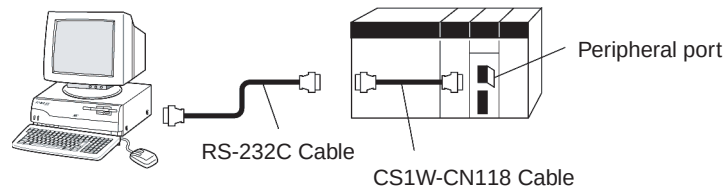
| Item                             | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicable PLC                   | CS-series, CJ-series, CV-series, C200HX/HG/HE (-Z), C200HS, CQM1, CPM1, CPM1A, SRM1, C1000H/2000H                                                                                                                                                                                                                                                                                                                                                                                                                       |
| OS                               | Microsoft Windows 95 (See note.), 98, NT 4.0 (Service Pack 6), 2000, Me, XP                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Personal computer                | DOS version                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Connection method                | CPU Unit's peripheral port or built-in RS-232C port                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Communications protocol with PLC | Peripheral bus or Host Link                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Offline operation                | Programming, I/O memory editing, creating I/O tables, setting PLC parameters, printing, program changing                                                                                                                                                                                                                                                                                                                                                                                                                |
| Online operation                 | Transmitting, referencing, monitoring, creating I/O tables, setting PLC parameters                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Basic functions                  | 1.Programming: Creates and edits ladder programs and mnemonic programs for the applicable PLC.<br>2.Creating and referencing I/O tables.<br>3.Changing the CPU Unit operating mode.<br>4.Transferring: Transfers programs, I/O memory data, I/O tables, PLC Setup, and I/O comments between the personal computer and the CPU Unit.<br>5.Program execution monitoring: Monitors I/O status/present values on ladder displays, I/O status/present values on mnemonic displays, and present values on I/O memory displays |

**Note** Windows 95 cannot be used when connecting via a Controller Link Support Board (PCI bus) or a SYSMAC LINK Support Board (PCI bus).

### Connections

| Personal computer | Peripheral port connection                                                                                                                                                                                                                                                                                                   | RS-232C port connection                                                                                                                                                                                                                                                                                                     |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DOS               |  <p>9-pin male<br/>9-pin female<br/>Peripheral port<br/>10-pin female</p> <p>CS1W-CN118 (0.1 m) (See note 1)<br/>CS1W-CN226 (2.0 m)<br/>CS1W-CN616 (6.0 m)</p> <p>CS1W-CN118<br/>CS1W-CN226<br/>CS1W-CN616</p> <p>9-pin female 10-pin</p> |  <p>9-pin male<br/>9-pin female<br/>RS-232C port<br/>9-pin female</p> <p>XW2Z-200S-CV/200S-V (See note 2)<br/>XW2Z-500S-CV/500S-V (See note 2)</p> <p>XW2Z-200S-CV/200S-V or<br/>XW2Z-500S-CV/500S-V</p> <p>9-pin female 9-pin male</p> |

- Note** 1. The CS1W-CN118 Cable is used with one of the RS-232C Cables shown on the right (XW2Z-□□□S-□□) to connect to the peripheral port on the CPU Unit.



2. If cables with model numbers ending in -V instead of -CV are used to connect the computer running the CX-Programmer to the RS-232C port (including when using a CS1W-CN118 Cable), a peripheral bus connection cannot be used. Use a Host Link (SYSMAC WAY) connection. To connect to the port using a peripheral bus connection, prepare an RS-232C cable as described in 3-3-5 RS-232C Port Specifications.

### CX-Programmer Connecting Cables

| Unit                               | Unit port                                     | Computer | Computer port      | Serial communications mode  | Model        | Length | Cable notes                       |
|------------------------------------|-----------------------------------------------|----------|--------------------|-----------------------------|--------------|--------|-----------------------------------|
| CPU Units                          | Peripheral port                               | DOS      | D-Sub, 9-pin, male | Peripheral Bus or Host Link | CS1W-CN226   | 2.0 m  | ---                               |
|                                    |                                               |          |                    |                             | CS1W-CN626   | 6.0 m  |                                   |
|                                    | Built-in RS-232C port<br>D-Sub, 9-pin, female | DOS      | D-Sub, 9-pin, male | Peripheral Bus or Host Link | XW2Z-200S-CV | 2 m    | Use a static-resistant connector. |
|                                    |                                               |          |                    |                             | XW2Z-500S-CV | 5 m    |                                   |
| Serial Communications Boards/Units | RS-232C Port<br>D-Sub, 9-pin, female          | DOS      | D-Sub, 9-pin, male | Host Link                   | XW2Z-200S-CV | 2 m    | Use a static-resistant connector. |
|                                    |                                               |          |                    |                             | XW2Z-500S-CV | 5 m    |                                   |

- Note** 1. Before connecting a connector from the above table to an RS-232C port, touch a grounded metal object to discharge static electricity from your body.  
The XW2Z-□□□S-CV Cables have been strengthened against static because they use a static-resistant connector hood (XM2S-0911-E). Even so, always discharge static electricity before touching the connectors.
2. Do not use commercially available RS-232C personal computer cables. Always use the special cables listed in this manual or make cables according to manual specifications. Using commercially available cables may damage the external devices or CPU Unit.

### RS-232C Cables for a Peripheral Port

| Unit      | Unit port                | Computer | Computer port      | Serial communications mode  | Model                             | Length              | Cable notes                                          |
|-----------|--------------------------|----------|--------------------|-----------------------------|-----------------------------------|---------------------|------------------------------------------------------|
| CPU Units | Built-in peripheral port | DOS      | D-Sub, 9-pin, male | Peripheral Bus or Host Link | CS1W-CN118 + XW2Z-200S-CV/500S-CV | 0.1 m+ (2 m or 5 m) | XW2Z-□□□S-CV models use a static-resistant connector |

### Using a CQM1-CIF01/02 Cable for a Peripheral Port

| Unit      | Unit port                | Com-puter | Computer port      | Serial communications mode | Model                   | Length         | Cable notes |
|-----------|--------------------------|-----------|--------------------|----------------------------|-------------------------|----------------|-------------|
| CPU Units | Built-in peripheral port | DOS       | D-Sub, 9-pin, male | Host Link                  | CS1W-CN114 + CQM1-CIF02 | 0.05 m + 3.3 m | ---         |

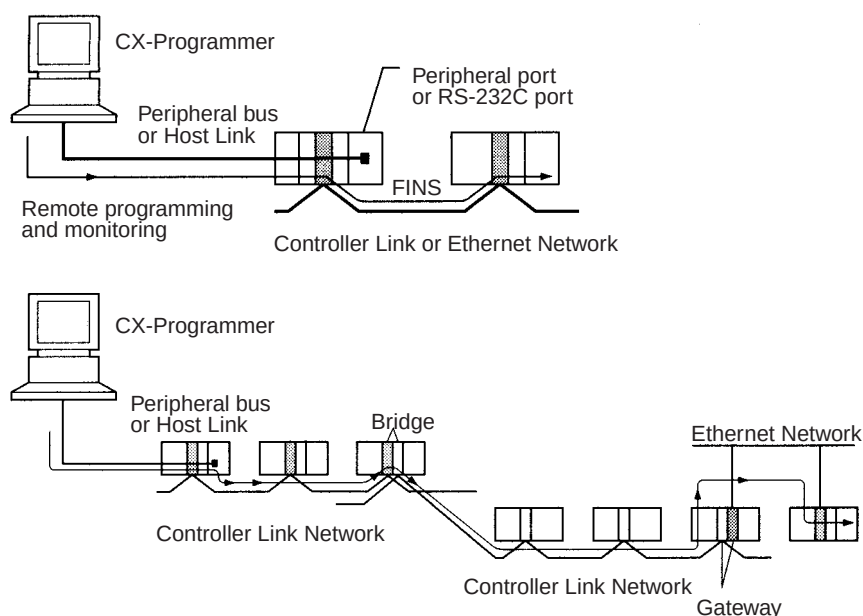
### Using a RS-232C Cable for a IBM PC/AT or Compatible

| Unit                                | Unit port                                     | Com-puter | Computer port      | Serial communications mode | Model       | Length | Cable notes |
|-------------------------------------|-----------------------------------------------|-----------|--------------------|----------------------------|-------------|--------|-------------|
| CPU Units                           | Built-in RS-232C port<br>D-Sub, 9-pin, female | DOS       | D-Sub, 9-pin, male | Host Link                  | XW2Z-200S-V | 2 m    | ---         |
|                                     |                                               |           |                    |                            | XW2Z-500S-V | 5 m    |             |
| Serial Communications Boards/ Units | RS-232C port<br>D-Sub, 9-pin, female          | DOS       | D-Sub, 9-pin, male | Host Link                  | XW2Z-200S-V | 2 m    |             |
|                                     |                                               |           |                    |                            | XW2Z-500S-V | 5 m    |             |

### Communications Modes when Connecting a CX-Programmer to a CS-series CPU Unit

| Serial communications mode | Characteristics                                                                                                                                                                                                                                                                                                                                |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Peripheral Bus             | High-speed communications are possible. Consequently, connecting via a peripheral bus is recommended when using a CX-Programmer.<br>Only 1:1 connection is possible.<br>When using a CS-series CPU Unit, the baud rate of the communications devices can be automatically recognized for connection.                                           |
| Host Link                  | This is a communications protocol with a general-purpose host computer.<br>Either 1:1 or 1:N connections are possible.<br>Host Link communications are slow compared with the Peripheral Bus communications.<br>The following connections are possible: Via a modem or optical fiber adapter, over long distance using a RS-422A/485, and 1:N. |

**Note** The CX-Programmer can be used for remote programming and monitoring. It can be used to program and monitor not only the PLC to which it is directly connected, but also to program and monitor any PLC connected through a Controller Link or Ethernet network to which the PLC that the CX-Programmer is connected to is a part of. All programming and monitoring functionality for the directly connected PLC is supported for remote programming and monitoring, the PLC can be connected though either the peripheral or an RS-232C port, and either the peripheral bus or Host Link bus can be used. Remote programming is possible for up to three levels of networks (counting the local network but not counting the peripheral bus or Host Link connection between the CX-Programmer and the local PLC).



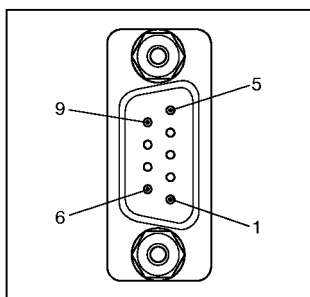
### 3-3-4 Peripheral Port Specifications

#### Protocol PLC Setup and DIP Switch Settings

| Pin No. 4 | Peripheral port settings (in PLC Setup)                                                                                                      |                |                                |                                            |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------|--------------------------------------------|
|           | Default value: 0 Hex                                                                                                                         | NT Link: 2 Hex | Peripheral bus: 4 Hex          | Host Link: 5 Hex                           |
| OFF       | Programming Console or other CX-Programmer through peripheral bus (automatically detects the Programming Device's communications parameters) |                |                                |                                            |
| ON        | Host computer or CX-Programmer (Host Link)                                                                                                   | PT (NT Link))  | CX-Programmer (Peripheral bus) | Host computer or CX-Programmer (Host Link) |

### 3-3-5 RS-232C Port Specifications

#### Connector Pin Arrangement

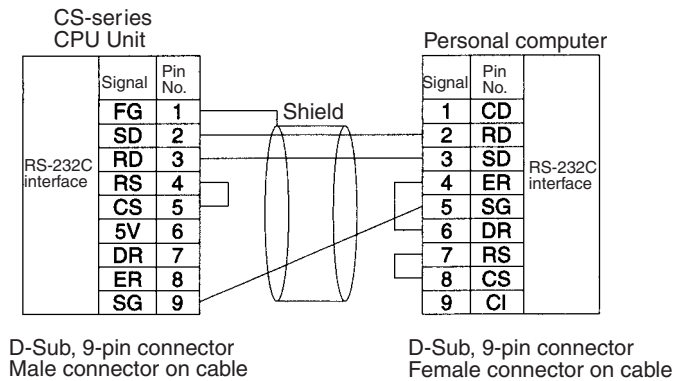


| Pin No.        | Signal   | Name                | Direction |
|----------------|----------|---------------------|-----------|
| 1              | FG       | Protection earth    | ---       |
| 2              | SD (TXD) | Send data           | Output    |
| 3              | RD (RXD) | Receive data        | Input     |
| 4              | RS (RTS) | Request to send     | Output    |
| 5              | CS (CTS) | Clear to send       | Input     |
| 6              | 5 V      | Power supply        | ---       |
| 7              | DR (DSR) | Data set ready      | Input     |
| 8              | ER (DTR) | Data terminal ready | Output    |
| 9              | SG (0 V) | Signal ground       | ---       |
| Connector hood | FG       | Protection earth    | ---       |

**Note** Do not use the 5-V power from pin 6 of the RS-232C port for anything but the NT-AL001-E Link Adapter. Using this power supply for any other external device may damage the CPU Unit or the external device.

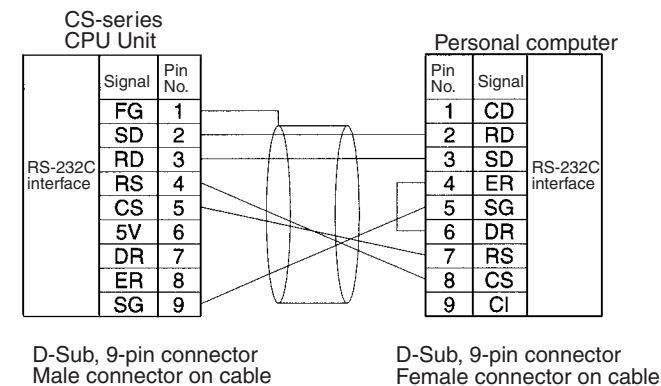
Connection between CS-series CPU Unit and Personal Computer

The following connections are in Host Link serial communications mode.



- Note**
1. Refer to *Appendix E Connecting to the RS-232C Port on the CPU Unit* when converting between RS-232C and RS-422A/485 for 1:N connections.
  2. Refer to *Appendix E Connecting to the RS-232C Port on the CPU Unit* when making your own RS-232C cable.

The following connections are in Peripheral Bus serial communications mode.



Applicable Connectors

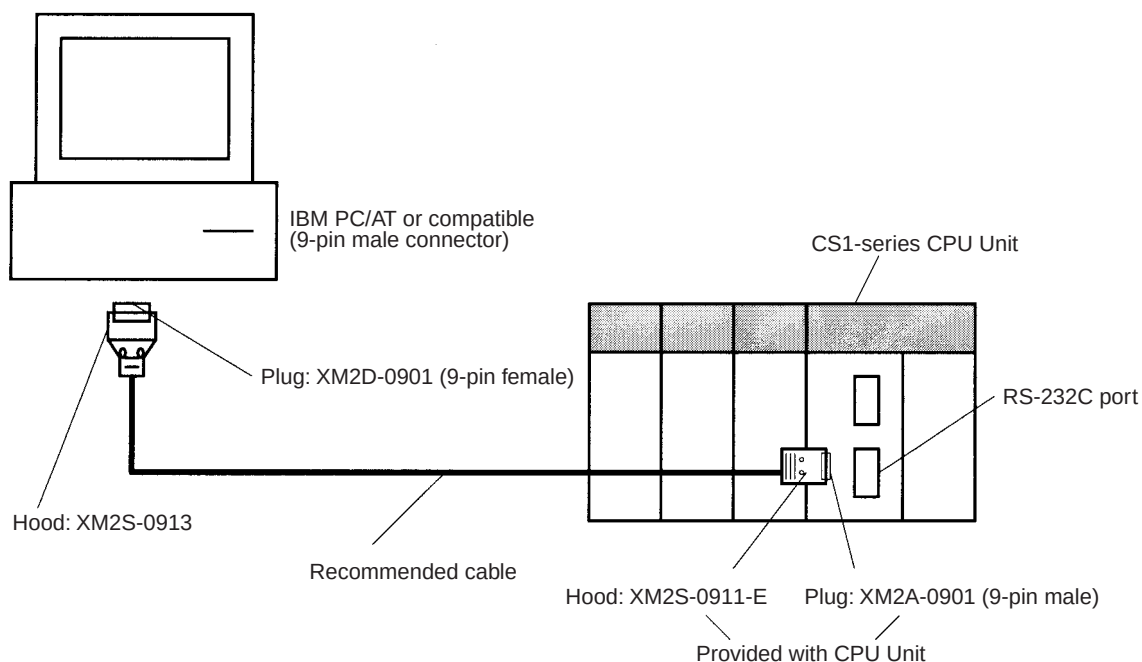
CPU Unit Connector

| Item | Model       | Specifications           |                                                     |
|------|-------------|--------------------------|-----------------------------------------------------|
| Plug | XM2A-0901   | 9-pin male               | Used together (One of each provided with CPU Unit.) |
| Hood | XM2S-0911-E | 9-pin, millimeter screws |                                                     |



## Personal Computer Connector

| Item | Model     | Specifications     |               |
|------|-----------|--------------------|---------------|
| Plug | XM2D-0901 | 9-pin female       | Used together |
| Hood | XM2S-0913 | 9-pin, inch screws |               |



**Note** Use the special cables provided from OMRON for all connections whenever possible. If cables are produced in-house, be sure they are wired correctly. External devices and the CPU Unit may be damaged if general purpose (e.g., computer to modem) cables are used or if wiring is not correct.

## Recommended Cables

Fujikura Ltd.: UL2464 AWG28 × 5P IFS-RVV-SB (UL product)  
AWG 28 × 5P IFVV-SB (non-UL product)

Hitachi Cable, Ltd.: UL2464-SB(MA) 5P × 28AWG (7/0.127) (UL product)  
CO-MA-VV-SB 5P × 28AWG (7/0.127) (non-UL product)

## RS-232C Port Specifications

| Item                  | Specification                                                    |
|-----------------------|------------------------------------------------------------------|
| Communications method | Half duplex                                                      |
| Synchronization       | Start-stop                                                       |
| Baud rate             | 0.3/0.6/1.2/2.4/4.8/9.6/19.2/38.4/57.6/115.2 kbps<br>(See note.) |
| Transmission distance | 15 m max.                                                        |
| Interface             | EIA RS-232C                                                      |
| Protocol              | Host Link, NT Link, 1:N, No-protocol, or Peripheral Bus          |

**Note** Baud rates for the RS-232C are specified only up to 19.2 kbps. The CS Series supports serial communications from 38.4 kbps to 115.2 kbps, but some computers cannot support these speeds. Lower the baud rate if necessary.

## Protocol PLC Setup and DIP Switch Settings

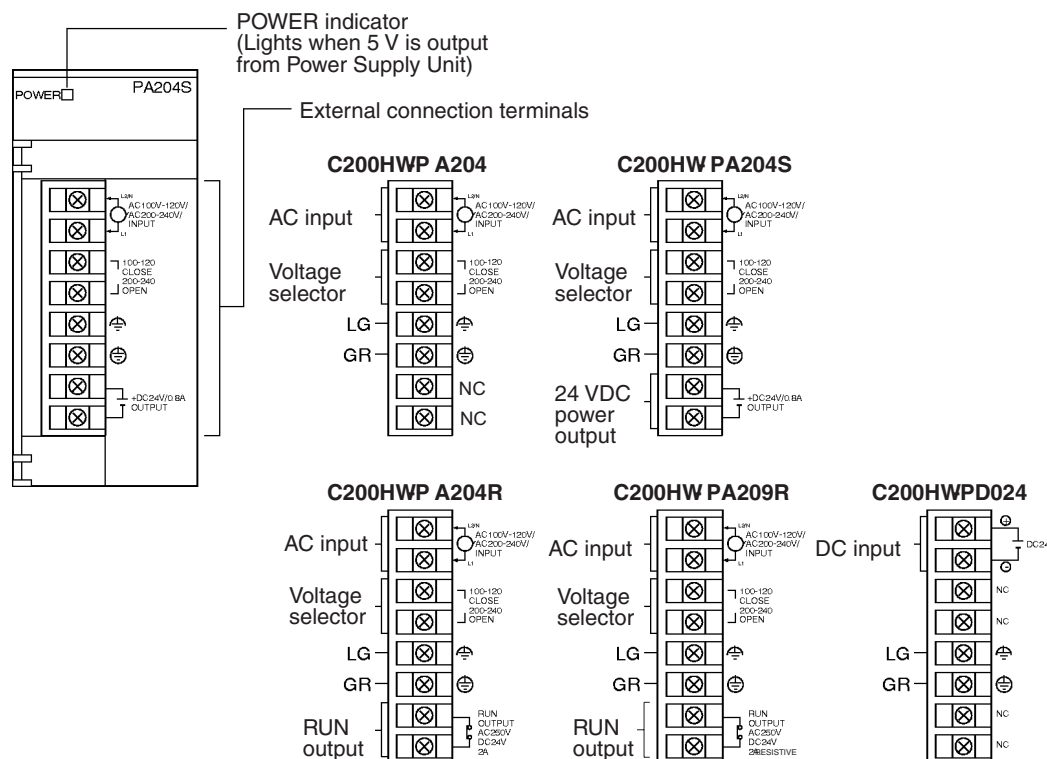
| Pin No. 5 | RS-232C port settings (in PLC Setup)                                                                                                                             |                   |                                                |                                |                                            |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------|--------------------------------|--------------------------------------------|
|           | Default value:<br>0 Hex                                                                                                                                          | NT Link:<br>2 Hex | No protocol:<br>3 Hex                          | Peripheral bus:<br>4 Hex       | Host Link:<br>5 Hex                        |
| OFF       | Host computer or CX-Programmer (Host Link)                                                                                                                       | PT (NT Link)      | General-purpose external devices (No protocol) | CX-Programmer (Peripheral bus) | Host computer or CX-Programmer (Host Link) |
| ON        | CX-Programmer (not a Programming Console) connected through the peripheral bus. (The Programming Device's communications parameters are detected automatically.) |                   |                                                |                                |                                            |

## 3-4 Power Supply Units

### 3-4-1 Power Supply Units

| Power supply voltage                                                  | Output                   | Power output terminals | RUN output | Model         | Weight       |
|-----------------------------------------------------------------------|--------------------------|------------------------|------------|---------------|--------------|
| 100 to 120 V AC<br>or<br>200 to 240 V AC<br>(selectable using jumper) | 4.6 A at 5 V DC,<br>30 W | No                     | No         | C200HW-PA204  | 500 g max.   |
|                                                                       |                          | Yes                    | No         | C200HW-PA204S | 500 g max.   |
|                                                                       |                          | 0.8 A at 24 V DC       | No         | C200HW-PA204R | 500 g max.   |
|                                                                       | 9 A at 5 V DC,<br>45 W   | No                     | Yes        | C200HW-PA209R | 1,000 g max. |
| 24 V DC                                                               | 4.6 A at 5 V DC,<br>30 W | No                     | No         | C200HW-PD024  | 550 g max.   |

### 3-4-2 Components and Switch Settings



**Note** 100 to 120 V AC: Closed circuit, 200 to 240 V AC: Open circuit  
Always open the circuit (remove the metal jumper) before applying a voltage of 200 to 240 V AC.

**AC Input**

Either a power supply of 100 to 120 V AC or 200 to 240 V AC can be selected.

**Voltage Selector**

Before applying a voltage of 100 to 120 V AC, close the circuit using the metal jumper.

**Note** Always remove the metal jumper before applying a voltage of 200 to 240 V AC. Not doing so will damage the Unit.

**LG**

Ground to a resistance of 100  $\Omega$  or less to increase noise resistance and avoid electric shock.

**GR**

Ground to a resistance of 100  $\Omega$  or less to avoid electric shock.

**24-V DC Power Output**

This terminal outputs a service voltage of 24 V DC. Use this terminal to supply power to DC Input Units (C200HW-PA204S only). The total current consumption of the 5-V and 24-V outputs must be 30 W max.

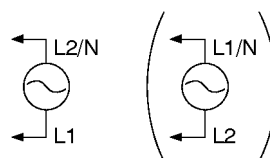
**DC Input**

24-V DC power is supplied from this terminal.

**RUN Output**

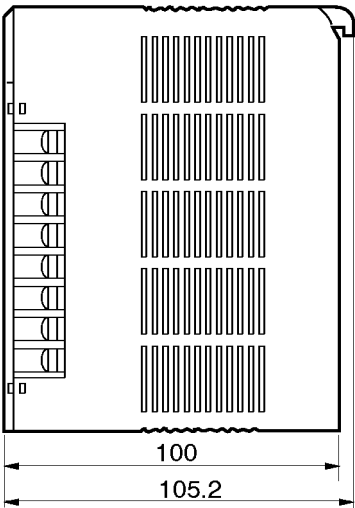
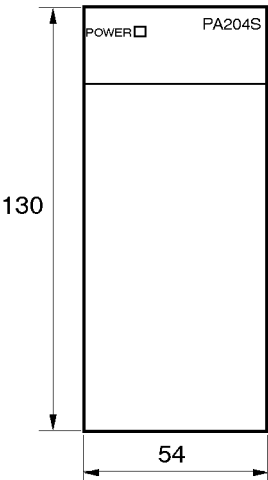
The internal contact turns ON when the CPU Unit is operating (RUN or MONITOR mode).

**Note** The L2/N and L1 display on the AC power supply terminal is L1/N and L2 on some products, however, the function and performance of the terminals are the same.

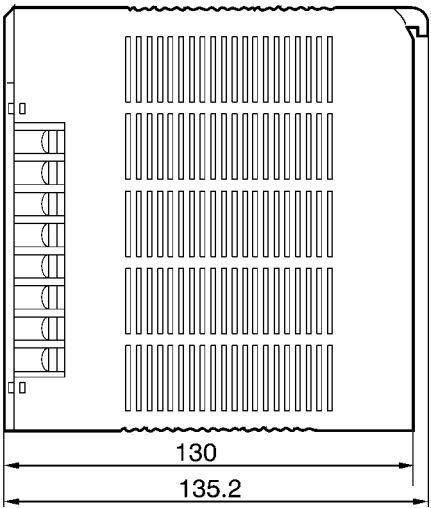
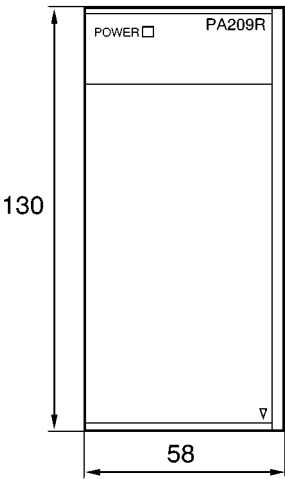


3-4-3 Dimensions

C200HW-PA204  
C200HW-PA204S  
C200HW-PA204R  
C200HW-PA209R  
C200HW-PD204



C200HW-PA209R



### 3-4-4 Selecting a Power Supply Unit

After determining what power supply voltage is required and whether power output terminals and a RUN output are required, calculate the current and power requirements for each Rack.

#### Condition 1: Current Requirements

There are three voltage groups for internal power consumption: 5 V DC, 26 V DC, and 24 V DC.

##### Current Consumption at 5 V DC (Internal Logic Power Supply)

The following table shows the current that can be supplied to Units (including the CPU Unit) and Backplanes that use 5-V DC power.

| Power Supply Unit      | Maximum current at 5 V DC |
|------------------------|---------------------------|
| C200HW-PA204/204S/204R | 4.6 A                     |
| C200HW-PD204           |                           |
| C200HW-PA209R          | 9 A                       |

##### Current Consumption at 26 V DC (Relay Driving Power Supply)

The following table shows the current that can be supplied to Units that use 26-V DC power.

| Power Supply Unit      | Maximum current at 26 V DC |
|------------------------|----------------------------|
| C200HW-PA204/204S/204R | 0.625 A                    |
| C200HW-PD204           |                            |
| C200HW-PA209R          | 1.3 A                      |

##### Current Consumption at 24 V DC (Power Output Terminals)

The C200HW-PA204S Power Supply Unit can supply up to 0.8 A at 24 V DC through its power output terminals.

#### Condition 2: Power Requirements

The following table shows the maximum total power that can be supplied at 5 V DC, 26 V DC, and 24 V DC.

| Power Supply Unit      | Maximum total power output |
|------------------------|----------------------------|
| C200HW-PA204/204S/204R | 30 W                       |
| C200HW-PD204           |                            |
| C200HW-PA209R          | 45 W                       |

Refer to 2-6 *Unit Current Consumption* for tables showing the current consumed by each particular Unit as well as example calculations.

## 3-5 Backplanes

### 3-5-1 CPU Backplanes

#### CPU Backplane Models

##### Standard CS-series CPU Backplanes

| Number of slots | Model      |
|-----------------|------------|
| 2 slots         | CS1W-BC023 |
| 3 slots         | CS1W-BC033 |
| 5 slots         | CS1W-BC053 |

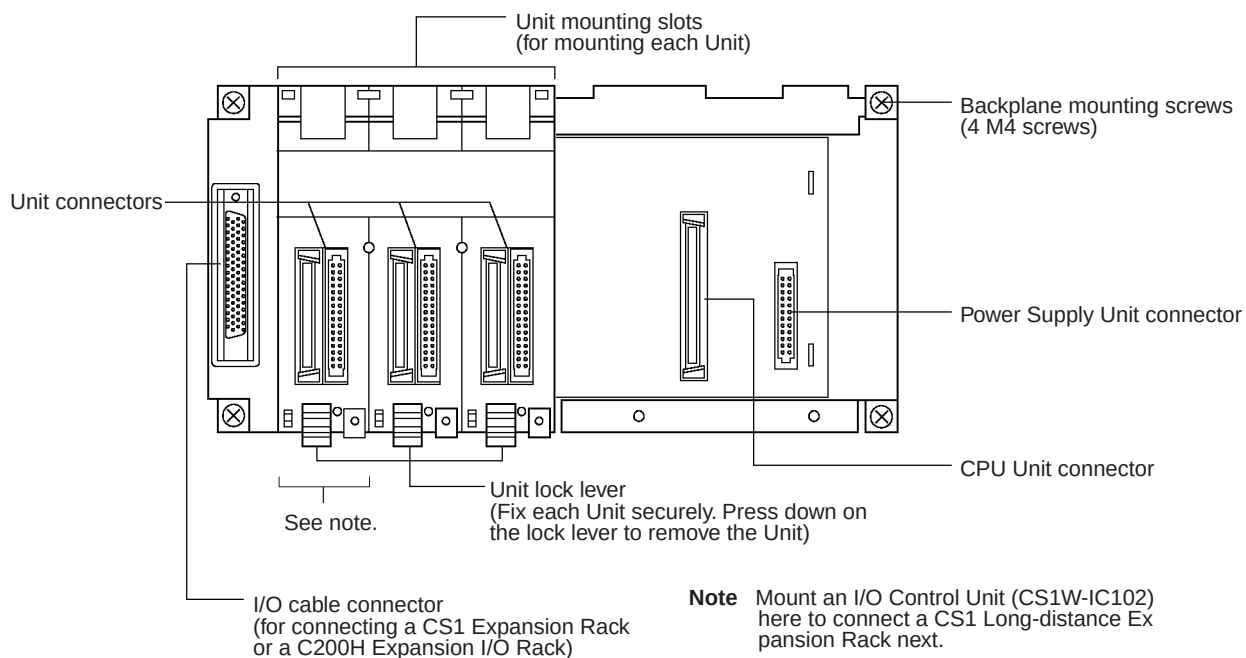
| Number of slots | Model      |
|-----------------|------------|
| 8 slots         | CS1W-BC083 |
| 10 slots        | CS1W-BC103 |

#### CS-series-only CPU Backplanes

| Number of slots | Model      |
|-----------------|------------|
| 2 slots         | CS1W-BC022 |
| 3 slots         | CS1W-BC032 |
| 5 slots         | CS1W-BC052 |
| 8 slots         | CS1W-BC082 |
| 10 slots        | CS1W-BC102 |

**Note** C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only CPU Backplanes.

### Components and Switch Settings

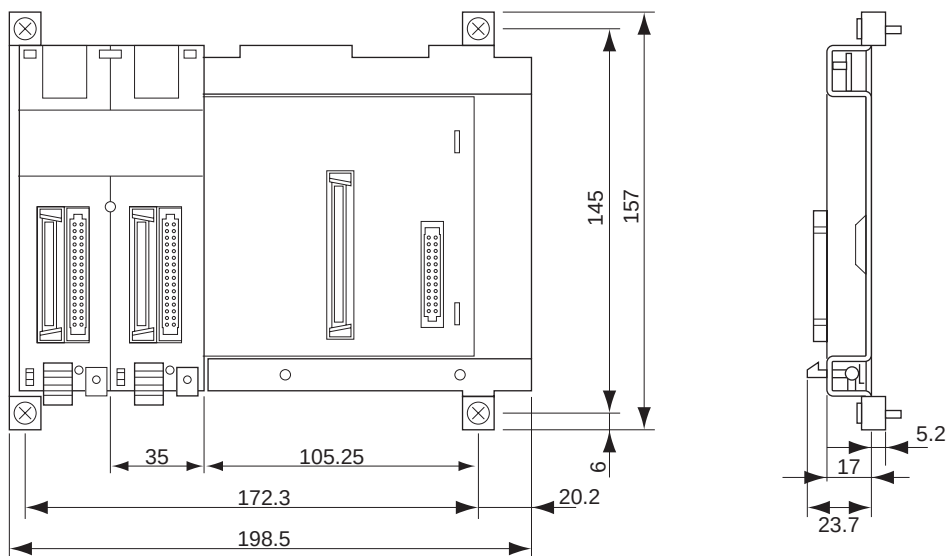


**Note** Always cover the connectors that are not being used with Connector Covers (sold separately) as a measure against dust.

| Name                                       | Model       |
|--------------------------------------------|-------------|
| C200H Unit Connector Cover                 | C500-COV01  |
| CS-series Special I/O Unit Connector Cover | CV500-COV01 |

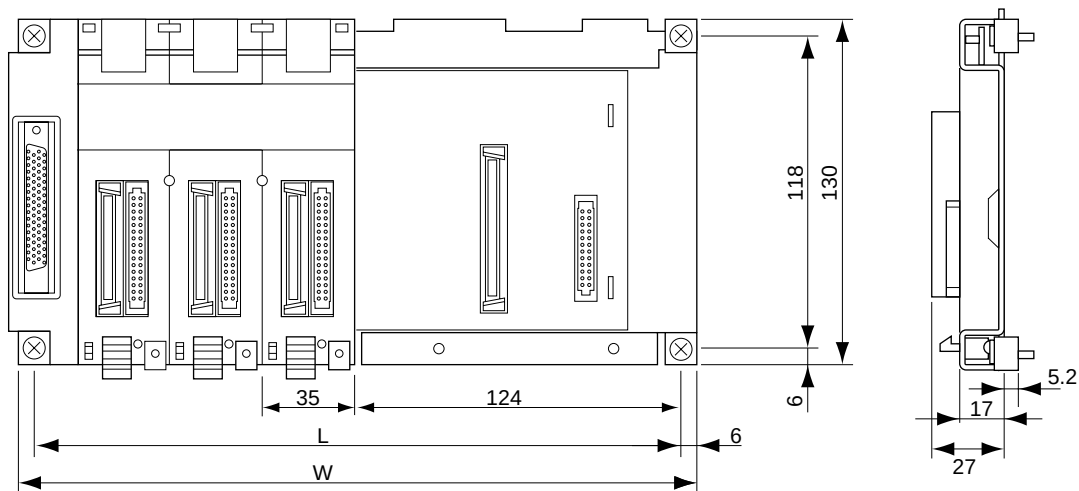
## Dimensions and Weights

### CS1W-BC023 (2 Slots)



Weight: 600 g max.

### CS1W-BC□□□ (3, 5, 8, or 10 Slots)



| Model      | Number of slots | L (mm) | W (mm) | Weight (max.) |
|------------|-----------------|--------|--------|---------------|
| CS1W-BC033 | 3               | 246    | 260    | 750 g         |
| CS1W-BC053 | 5               | 316    | 330    | 900 g         |
| CS1W-BC083 | 8               | 421    | 435    | 1,200 g       |
| CS1W-BC103 | 10              | 491    | 505    | 1,400 g       |
| CS1W-BC032 | 3               | 246    | 260    | 750 g         |
| CS1W-BC052 | 5               | 316    | 330    | 900 g         |
| CS1W-BC082 | 8               | 421    | 435    | 1,200 g       |
| CS1W-BC102 | 10              | 491    | 505    | 1,400 g       |

## 3-5-2 CS-series Expansion Backplanes

CS-series Expansion Backplanes are used for both CS-series Expansion Racks and CS-series Long-distance Expansion Racks.

### CS-series Expansion Backplane Models

#### Standard CS-series Expansion Backplane

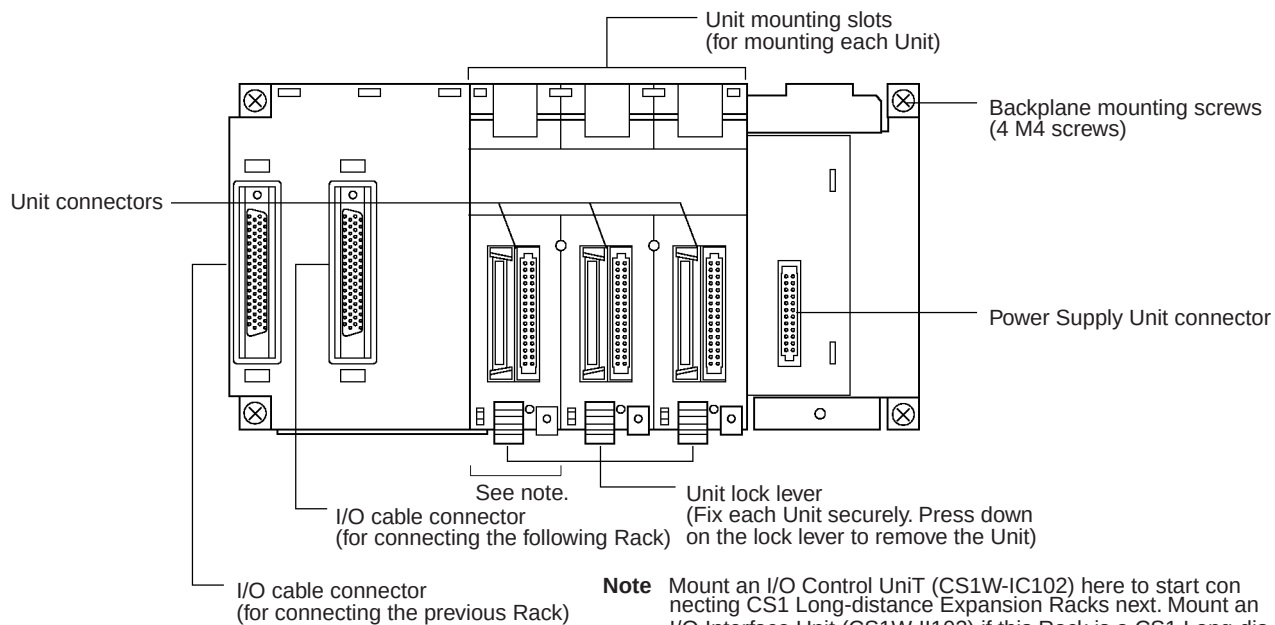
| Number of slots | Model      |
|-----------------|------------|
| 3 slots         | CS1W-BI033 |
| 5 slots         | CS1W-BI053 |
| 8 slots         | CS1W-BI083 |
| 10 slots        | CS1W-BI103 |

#### CS-series-only Expansion Backplane

| Number of slots | Model      |
|-----------------|------------|
| 3 slots         | CS1W-BI032 |
| 5 slots         | CS1W-BI052 |
| 8 slots         | CS1W-BI082 |
| 10 slots        | CS1W-BI102 |

**Note** C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only Expansion Backplanes.

### Components and Switch Settings

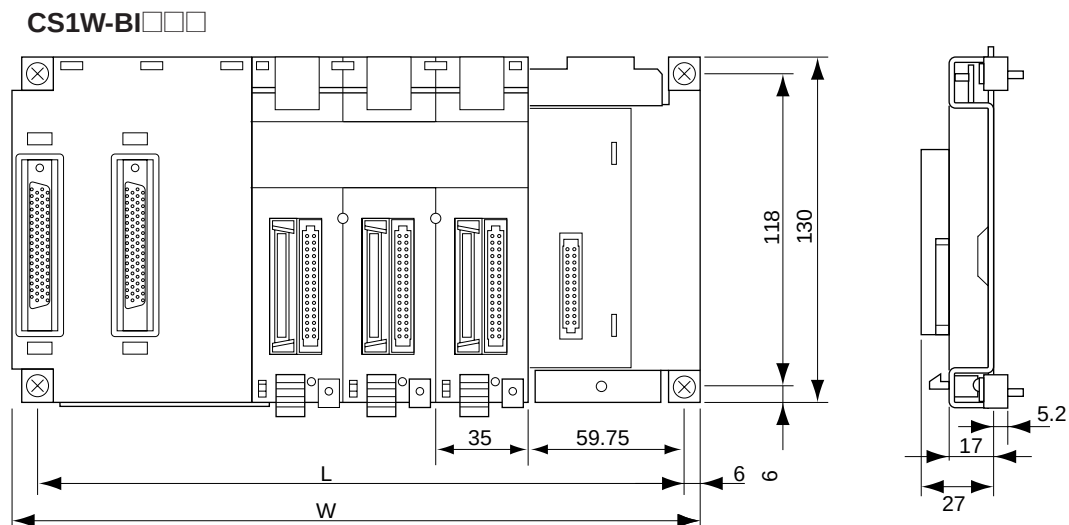


**Note** Always cover the connectors that are not being used with Connector Covers (sold separately) as a measure against dust.

| Name                                   | Model       |
|----------------------------------------|-------------|
| C200H Unit Connector Cover             | C500-COV01  |
| CS-series CPU Bus Unit Connector Cover | CV500-COV01 |



## Dimensions



| Model      | Number of slots | L (mm) | W (mm) | Weight (max.) |
|------------|-----------------|--------|--------|---------------|
| CS1W-BI033 | 3               | 246    | 260    | 750 g         |
| CS1W-BI053 | 5               | 316    | 330    | 900 g         |
| CS1W-BI083 | 8               | 421    | 435    | 1,200 g       |
| CS1W-BI103 | 10              | 491    | 505    | 1,400 g       |
| CS1W-BI032 | 3               | 246    | 260    | 750 g         |
| CS1W-BI052 | 5               | 316    | 330    | 900 g         |
| CS1W-BI082 | 8               | 421    | 435    | 1,200 g       |
| CS1W-BI102 | 10              | 491    | 505    | 1,400 g       |

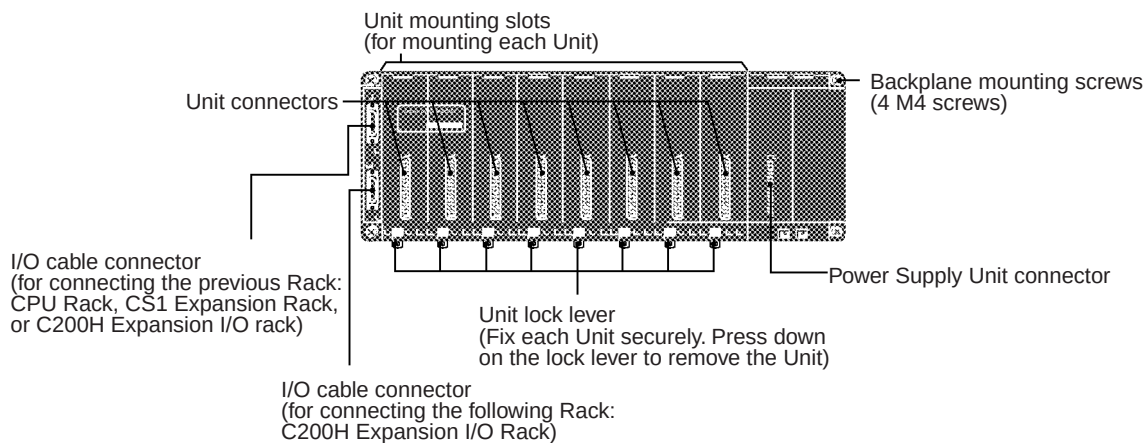
### 3-5-3 C200H Expansion I/O Backplanes

C200H Expansion I/O Racks cannot be connected together with CS-series Long-distance Expansion Racks.

#### C200H Expansion I/O Backplane Models

| Number of slots | Model        |
|-----------------|--------------|
| 3 slots         | C200HW-BI031 |
| 5 slots         | C200HW-BI051 |
| 8 slots         | C200HW-BI081 |
| 10 slots        | C200HW-BI101 |

#### Components and Switch Settings

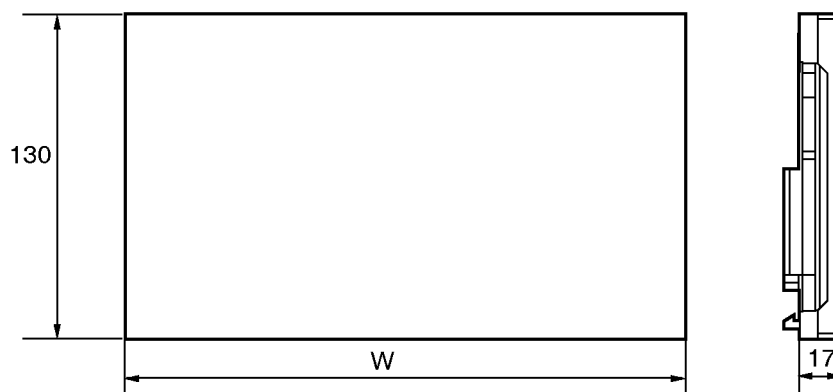


**Note** Always cover the connectors that are not being used with Connector Covers (sold separately) as a measure against dust.

| Name                                   | Model       |
|----------------------------------------|-------------|
| C200H Unit Connector Cover             | C500-COV01  |
| CS-series CPU Bus Unit Connector Cover | CV500-COV01 |

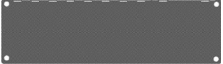
## Dimensions

**C200HW-BI□□□**



| Model           | Number of slots | W (mm) | Weight (max.) |
|-----------------|-----------------|--------|---------------|
| C200HW-BI031    | 3               | 189    | 500 g         |
| C200HW-BI051    | 5               | 259    | 650 g         |
| C200HW-BI081-V1 | 8               | 364    | 950 g         |
| C200HW-BI101-V1 | 10              | 434    | 1,100 g       |

## Optional Products

| Product                                                                                                                                               | Specifications                                                                                                                         | Number of slots | Model        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------|
| Backplane Insulation Plate (for C200H Expansion I/O Backplane)<br> | Used to electrically insulate the C200H Expansion I/O Rack from the mounting surface in the control panel to improve noise resistance. | 3 slots         | C200HW-ATT32 |
|                                                                                                                                                       |                                                                                                                                        | 5 slots         | C200HW-ATT52 |
|                                                                                                                                                       |                                                                                                                                        | 8 slots         | C200HW-ATT82 |
|                                                                                                                                                       |                                                                                                                                        | 10 slots        | C200HW-ATTA2 |

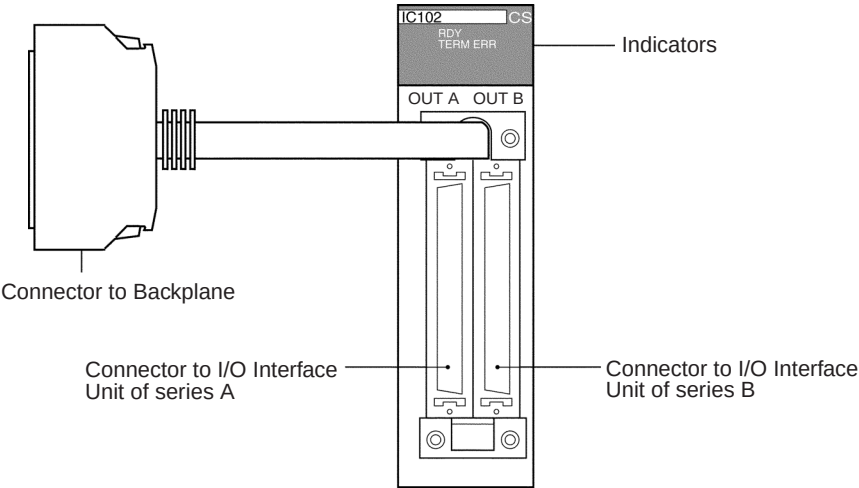
### 3-5-4 I/O Control Units, I/O Interface Units, and Terminators

I/O Control Units and I/O Interface Units are used to create CS-series Long-distance Expansion Racks. Terminators are connected to the last CS-series Long-distance Expansion Rack in each series. (Up to two series of CS-series Long-distance Expansion Racks can be connected.)

#### CS1W-IC102 I/O Control Unit

An I/O Control Unit is connected to the leftmost slot on the CPU Rack or the last CS-series Expansion Rack to start connecting CS-series Long-distance Expansion Racks.

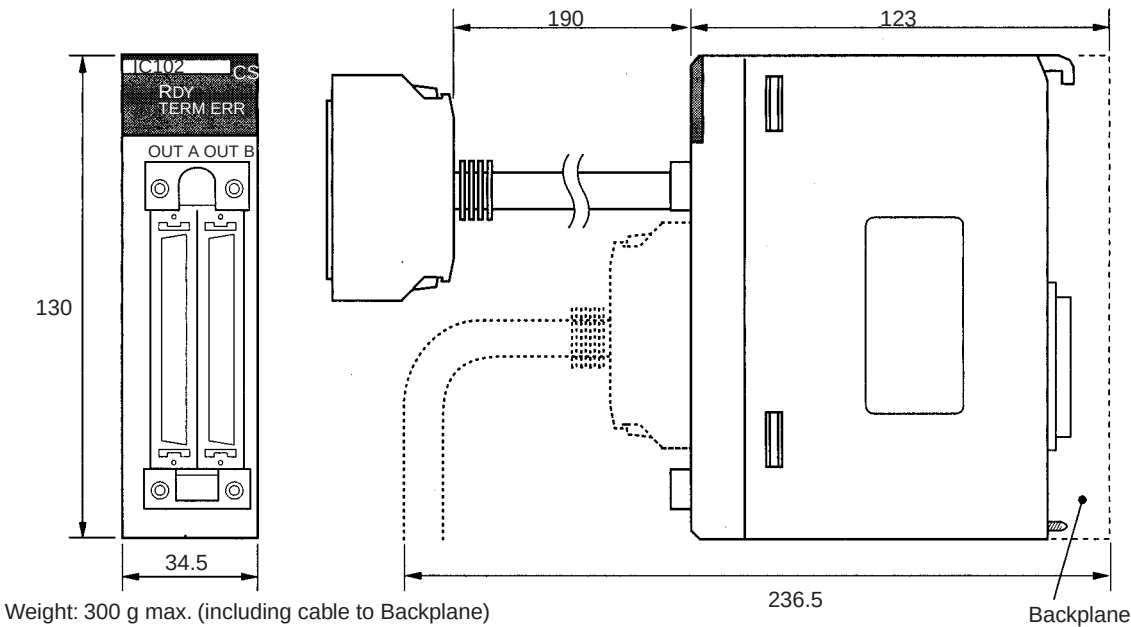
Part Names and Functions



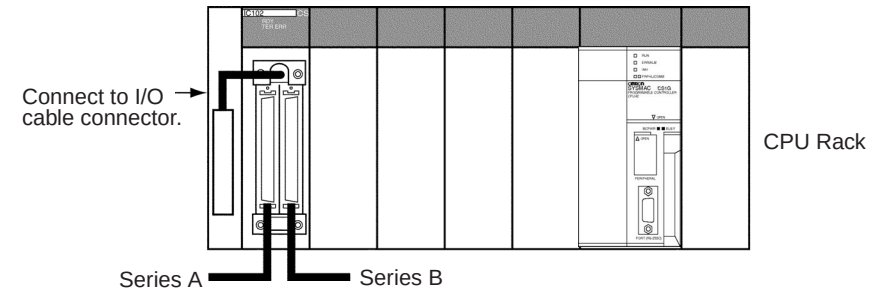
Indicators

| Indicator      | Status  | Meaning               |
|----------------|---------|-----------------------|
| RDY (green)    | Lit     | Operating normally.   |
|                | Not lit | Bus error.            |
| TERM ERR (red) | Lit     | Terminator missing.   |
|                | Not lit | Terminator connected. |

Dimensions and Weight



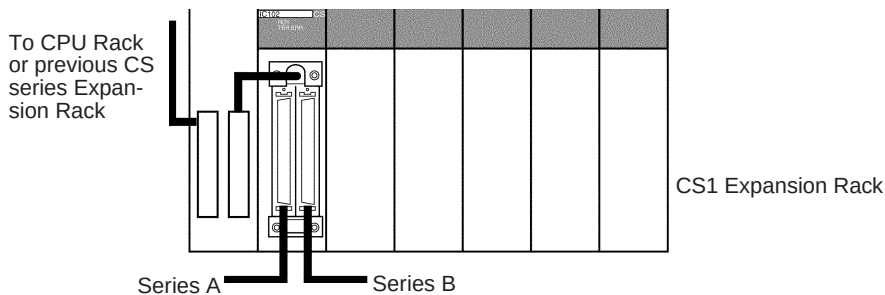
Connection Method on CPU Rack



**Note** Connect a Terminator (CV500-TER01) to the unused connector when connecting only series A or series B.

Connection Method on CS-series Expansion Rack

Connect the I/O Control Unit to the output I/O cable connector (right side).

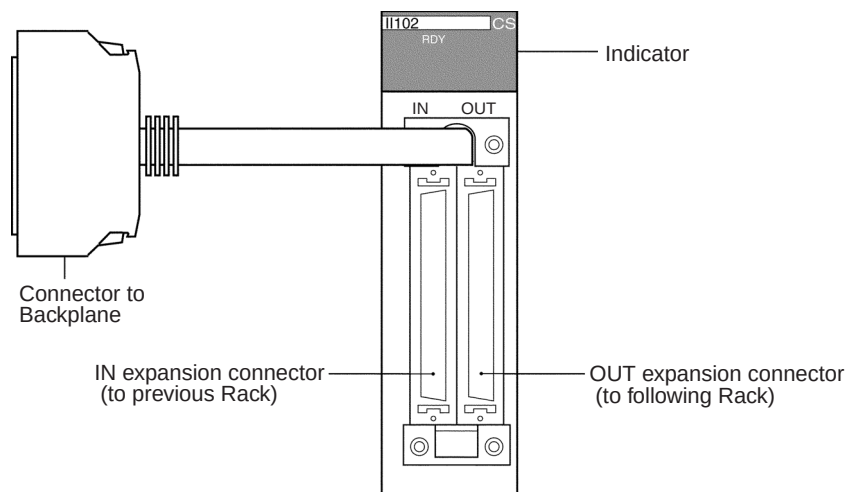


**Note** Connect a Terminator (CV500-TER01) to the unused connector when connecting only series A or series B.

CS1W-II102 I/O Interface Unit

Mount an I/O Interface Unit to the leftmost slot on each CS-series Long-distance Expansion Rack.

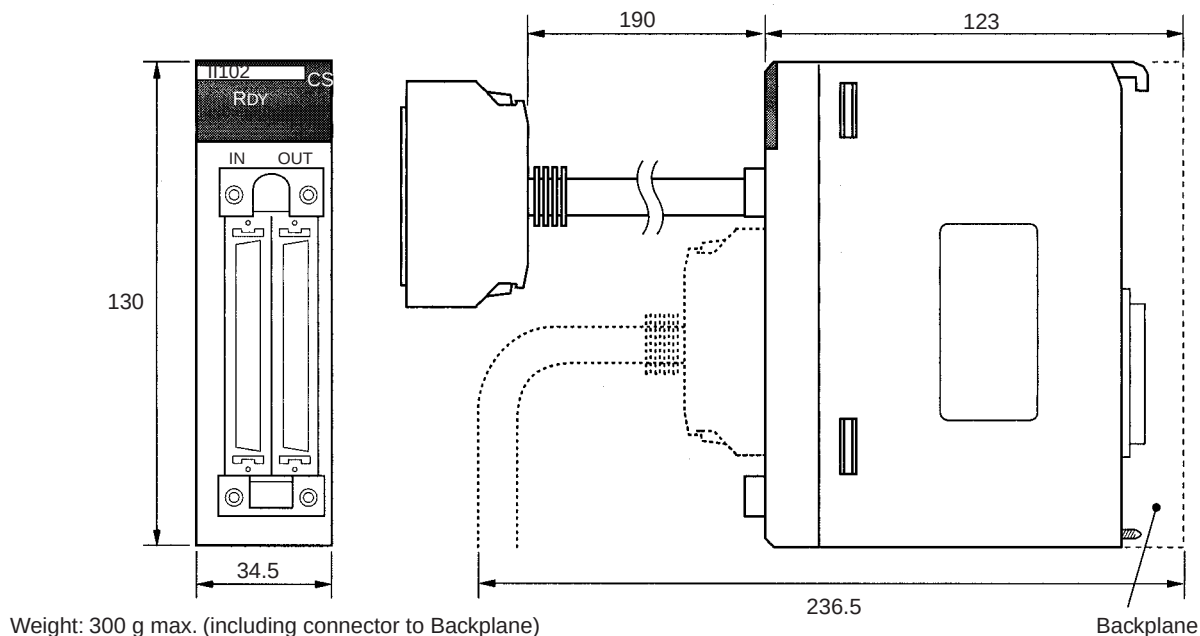
Part Names and Functions



Indicator

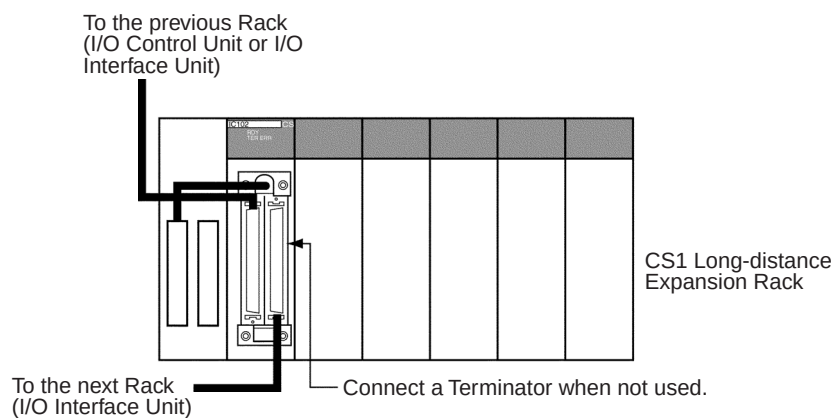
| Indicator   | Status  | Meaning                                |
|-------------|---------|----------------------------------------|
| RDY (green) | Lit     | Operating normally.                    |
|             | Not lit | Bus error (bus reset) or system error. |

## Dimensions and Weight



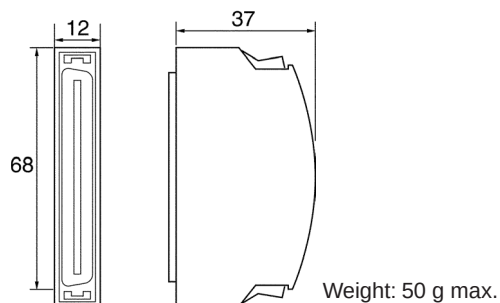
## Connection Method

Connect the I/O Interface Unit to the input I/O cable connector on the Backplane (left side). Always connect a Terminator (CV500-TER01) to the connector for the next Rack when it is not used (i.e., on the last CS-series Long-distance Expansion Rack in the series).



## CV500-TER01 Terminator

Two Terminators are provided with an I/O Control Unit



## 3-6 Basic I/O Units

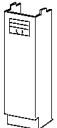
### 3-6-1 C200H and CS-series Basic I/O Units with Terminal Blocks

| Name                                                 |                          | Specifications                                                                   | Model                                         | External view/<br>dimensions<br>reference No. |
|------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Basic Input<br>Units (with<br>terminal<br>blocks)    | AC Input Units           | 100 to 120 V AC, 100 to 120 V DC, 16 inputs                                      | CS1W-IA111                                    | 5                                             |
|                                                      |                          | 100 to 120 V AC, 8 inputs                                                        | C200H-IA121                                   | 1                                             |
|                                                      |                          | 100 to 120 V AC, 16 inputs                                                       | C200H-IA122                                   | 3                                             |
|                                                      |                          |                                                                                  | C200H-IA122V                                  | 3                                             |
|                                                      |                          | 200 to 240 V AC, 8 inputs                                                        | C200H-IA221                                   | 1                                             |
|                                                      |                          | 200 to 240 V AC, 16 inputs                                                       | C200H-IA222                                   | 3                                             |
|                                                      |                          |                                                                                  | C200H-IA222V                                  | 3                                             |
|                                                      |                          | 200 to 240 V AC, 16 inputs                                                       | CS1W-IA211                                    | 5                                             |
|                                                      | AC/DC Input<br>Units     | 12 to 24 V AC/V DC, 8 inputs                                                     | C200H-IM211                                   | 1                                             |
|                                                      |                          | 24 V AC/V DC, 16 inputs                                                          | C200H-IM212                                   | 3                                             |
|                                                      | DC Input Units           | 12 to 24 V DC, 8 inputs                                                          | C200H-ID211                                   | 1                                             |
|                                                      |                          | 12 to 24 V DC, 16 inputs                                                         | C200H-ID212                                   | 3                                             |
|                                                      |                          | 24 V DC, 16 inputs                                                               | CS1W-ID211                                    | 5                                             |
|                                                      | Interrupt Input<br>Units | 24 V DC, 16 inputs                                                               | CS1W-INT01                                    | 5                                             |
|                                                      |                          | 12 to 24 V DC, 8 inputs                                                          | C200HS-INT01                                  | 1                                             |
|                                                      | High-speed Input<br>Unit | 24 V DC, 16 inputs                                                               | CS1W-IDP01                                    | 5                                             |
| C200H Out-<br>put Units (with<br>terminal<br>blocks) | Relay Output<br>Units    | 2 A at 250 V AC/24 V DC max., 0.1 A at 120 V DC, independent contacts, 8 outputs | CS1W-OC201                                    | 5                                             |
|                                                      |                          | 2 A at 250 V AC/24 V DC max., 0.1 A at 120 V DC, 16 outputs                      | CS1W-OC211                                    | 5                                             |
|                                                      |                          | 2 A at 250 V AC/24 V DC max., independent contacts, 5 outputs                    | C200H-OC223                                   | 1                                             |
|                                                      |                          | 2 A at 250 V AC/24 V DC max., independent contacts, 8 outputs                    | C200H-OC224                                   | 3                                             |
|                                                      |                          |                                                                                  | C200H-OC224N                                  | 3                                             |
|                                                      |                          |                                                                                  | C200H-OC224V<br>(no longer manu-<br>factured) | 3                                             |
|                                                      |                          |                                                                                  | C200H-OC124N                                  |                                               |
|                                                      |                          | 2 A at 250 V AC/24 V DC max., 8 outputs                                          | C200H-OC221                                   | 1                                             |
|                                                      |                          | 2 A at 250 V AC/24 V DC max., 12 outputs                                         | C200H-OC222                                   | 3                                             |
|                                                      |                          |                                                                                  | C200H-OC222V<br>(no longer manu-<br>factured) | 3                                             |
|                                                      |                          |                                                                                  | C200H-OC222N                                  | 3                                             |
|                                                      |                          | 2 A at 250 V AC/24 V DC max., 16 outputs                                         | C200H-OC225                                   | 3                                             |
|                                                      |                          |                                                                                  | C200H-OC226 (no<br>longer manufac-<br>tured)  | 4                                             |
|                                                      |                          |                                                                                  | C200H-OC226N                                  | 4                                             |

| Name                                                 |                                      | Specifications                                                            | Model                                        | External view/<br>dimensions<br>reference No. |
|------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------|
| C200H Out-<br>put Units (with<br>terminal<br>blocks) | Triac Output Units                   | 1.2 A at 250 V AC max., 8 outputs, with fuse<br>burnout detection circuit | CS1W-OA201                                   | 5                                             |
|                                                      |                                      | 1 A at 250 V AC max., 8 outputs, with fuse<br>burnout detection circuit   | C200H-OA221 (no<br>longer manufac-<br>tured) | 1                                             |
|                                                      |                                      | 1.2 A at 250 V AC max., 8 outputs, with fuse<br>burnout detection circuit | C200H-OA223                                  | 2                                             |
|                                                      |                                      | 0.3 A at 250 V AC max., 12 outputs                                        | C200H-OA222V                                 | 3                                             |
|                                                      |                                      | 0.5 A at 250 V AC max., 12 outputs                                        | C200H-OA224                                  | 3                                             |
|                                                      |                                      | 0.5 A at 250 V AC max., 16 outputs                                        | CS1W-OA211                                   | 5                                             |
|                                                      | Transistor Output<br>Units, Sinking  | 2.1 A at 24 V DC, 8 outputs                                               | C200H-OD213                                  | 1                                             |
|                                                      |                                      | 1 A at 12 to 48 V DC, 8 outputs                                           | C200H-OD411                                  | 1                                             |
|                                                      |                                      | 0.3 A at 24 V DC, 12 outputs                                              | C200H-OD211                                  | 3                                             |
|                                                      |                                      | 0.3 A at 24 V DC, 16 outputs                                              | C200H-OD212                                  | 3                                             |
|                                                      |                                      | 0.5 A at 12 to 24 V DC, 16 outputs                                        | CS1W-OD211                                   | 5                                             |
|                                                      | Transistor Output<br>Units, Sourcing | 0.8 A at 24 V DC, load short-circuit protec-<br>tion, 8 outputs           | C200H-OD214                                  | 1                                             |
|                                                      |                                      | 0.3 A at 5 to 24 V DC common, 8 outputs                                   | C200H-OD216                                  | 1                                             |
|                                                      |                                      | 0.3 A at 5 to 24 V DC common, 12 outputs                                  | C200H-OD217                                  | 3                                             |
|                                                      |                                      | 0.5 A at 24 V DC, load short-circuit protec-<br>tion, 16 outputs          | CS1W-OD212                                   | 5                                             |
|                                                      |                                      | 1 A at 24 V DC, load short-circuit protection,<br>16 outputs              | C200H-OD21A                                  | 3                                             |

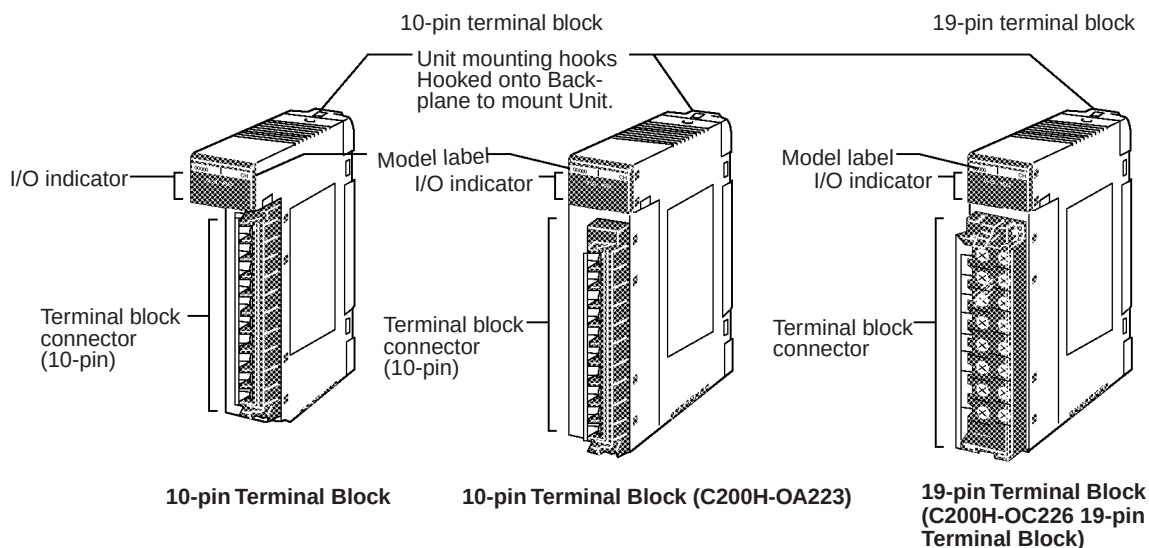
**Note** Immediate refreshing (!) or refreshing using IORF(097) is possible for all C200H Basic I/O Units.

### Optional Products

| Name                                                                                                                 | Specifications                                                                                    | Model           |
|----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------|
| I/O Unit Cover<br>                | Cover for 10-pin terminal<br>block; 8-point Input/5-point<br>Output Unit                          | C200H-COV11     |
| Terminal Block Covers<br>         | Short protection for 10-pin<br>terminal block (package of<br>10 covers); 8 inputs, 8 out-<br>puts | C200H-COV02     |
|                                                                                                                      | Short protection for 19-pin<br>terminal block (package of<br>10 covers); 12 inputs, 12<br>outputs | C200H-COV03     |
| CS-series Special I/O Unit<br>Connector Cover                                                                        | Protective cover for<br>unused connectors on<br>Backplane                                         | CV500-COV01     |
| C200H Unit Connector<br>Cover<br> | Protective cover for<br>unused connectors on<br>Backplane                                         | C200H-COV01     |
| Relay<br>                         | 24 V DC, C200H-OC221/<br>OC222/OC223/OC224/<br>OC225                                              | G6B-1174P-FD-US |

## Components and Switch Settings

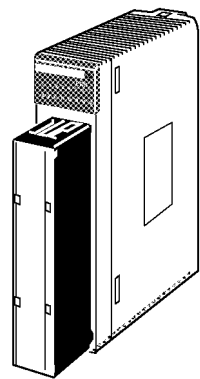
### C200H 10-pin/19-pin Terminal Block



| 10-pin terminal block |                                                 |                                                                                             | 19-pin terminal block |               |                                                                                                                                                                                                       |
|-----------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | 8-point Unit                                    | C200H-ID211,<br>C200H-IM211,<br>C200H-IA121,<br>C200H-IA221,<br>C200H-OC221,<br>C200H-OD216 |                       | 16-point Unit | C200H-ID212,<br>C200H-IA122,<br>C200H-IA222,<br>C200H-IM212,<br>C200H-IA122V,<br>C200H-IA222V,<br>C200H-OD21A,<br>C200H-OD212,<br>C200H-OC225,<br>C200H-OC226N,<br>C200H-OC226<br>(illustrated above) |
|                       | 8-point Unit<br>F indicator (fuse<br>burnt out) | C200H-OD213,<br>C200H-OD411,<br>C200H-OA221,<br>C200H-OA223<br>(illustrated above)          |                       |               |                                                                                                                                                                                                       |
|                       | 8-point Unit<br>ALARM indicator                 | C200H-OD214                                                                                 |                       | 12-point Unit | C200H-OC222,<br>C200H-OC222V,<br>C200H-OD211,<br>C200H-OD217,<br>C200H-OA224,<br>C200H-OA222V<br>C200H-OC222N                                                                                         |
|                       | 5-point Unit                                    | C200H-OC223                                                                                 |                       | 8-point Unit  | C200H-OC224,<br>C200H-224V,<br>C200H-224N                                                                                                                                                             |



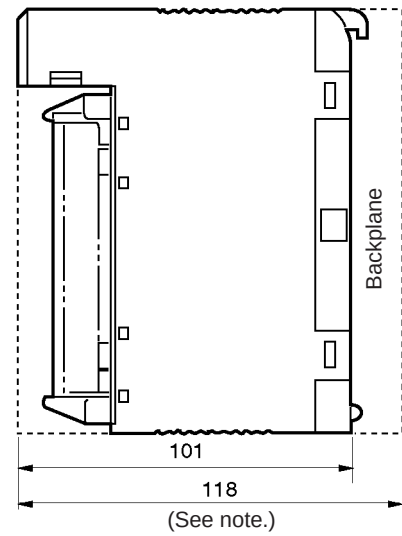
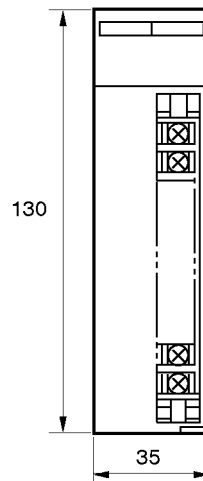
CS-series Basic Input Units (20-pin Terminal Block)



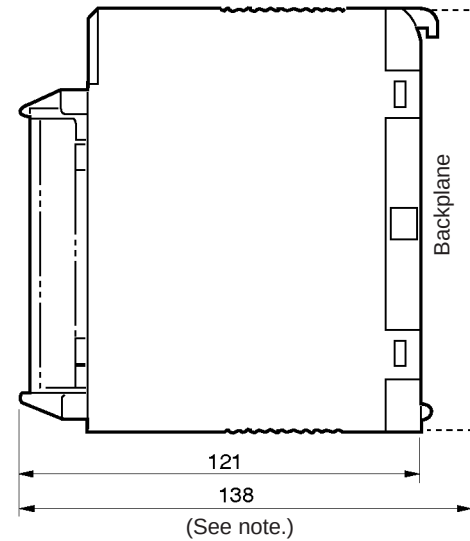
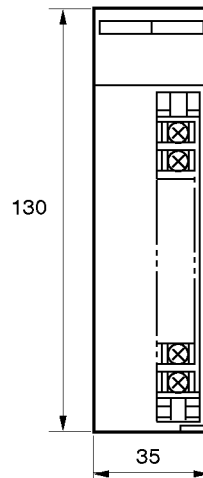
| 20-pin terminal block                                                              |               |                                                                            |                                                                                                  |                                                                     |            |
|------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------|
| <div><div>CS</div><div>0 1 2 3 4 5 6 7</div><div>8 9 10 11 12 13 14 15</div></div> | 16-point Unit | CS1W-I D211<br>INT01<br>IDP01<br>OD211<br>IA111<br>IA211<br>OC211<br>OA211 | <div><div>CS</div><div>0 1 2 3 4 5 6 7</div><div>8 9 10 11 12 13 14 15</div><div>ERR</div></div> | 16-point Units<br>with ERR indica-<br>tor (load short-cir-<br>cuit) | CS1W-OD212 |
| <div><div>CS</div><div>0 1 2 3 4 5 6 7</div></div>                                 | 8-point Unit  | CS1W- OC201                                                                | <div><div>CS</div><div>0 1 2 3 4 5 6 7</div><div>ERR</div></div>                                 | 8-point Units<br>with ERR indica-<br>tor (fuse burnout)             | CS1W-OA201 |

**Dimensions****C200H Units with 10-pin Terminal Blocks**

C200H-IA121  
C200H-IA221  
C200H-ID211  
C200H-IM211  
C200H-OA221  
C200H-OC221  
C200H-OC223  
C200H-OD216  
C200H-OD213  
C200H-OD411  
C200H-OD214



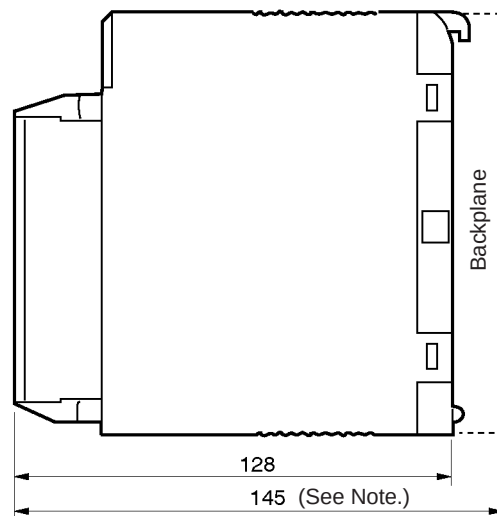
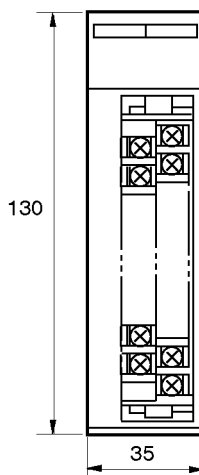
C200H-OA223



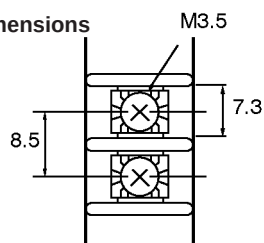
**Note** The heights of the Units including the Backplane are 5 mm greater on the CPU Backplane and CS-series Expansion Backplane (123 and 143 mm).

## Units with 19-pin Terminal Blocks

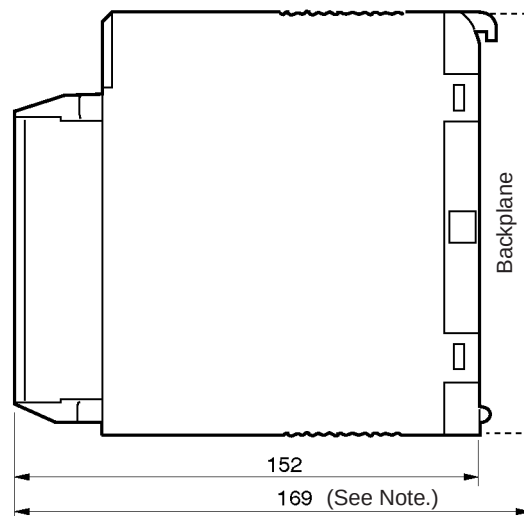
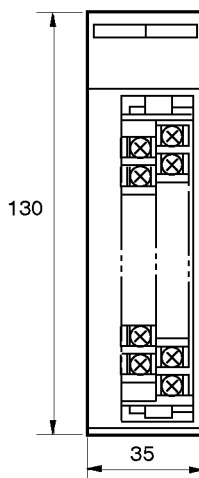
C200H-IA122  
 C200H-IA122V  
 C200H-IA222  
 C200H-IA222V  
 C200H-ID212  
 C200H-IM212  
 C200H-OA222V  
 C200H-OA224  
 C200H-OC222  
 C200H-OC222V  
 C200H-OC224  
 C200H-OC224V  
 C200H-OC225  
 C200H-OD211  
 C200H-OD212  
 C200H-OD217  
 C200H-OD21A  
 C200H-OC222N  
 C200H-OC224N



Terminal Dimensions



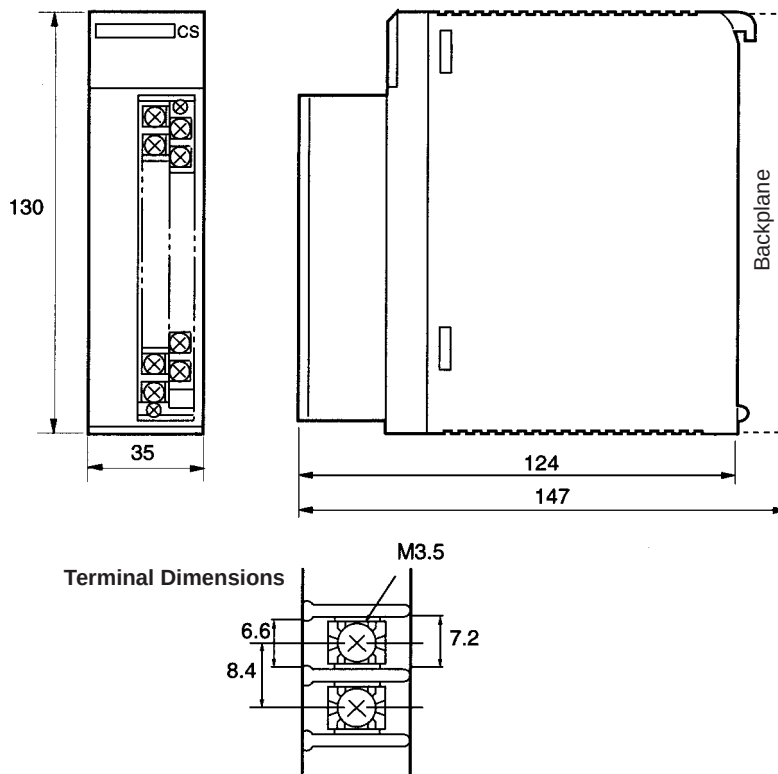
C200H-OC226  
 C200H-OC226N



**Note** The heights of the Units including the Backplane are 5 mm greater on the CPU Backplane and CS-series Expansion Backplane (150 and 174 mm).

## CS-series Basic I/O Units (20-pin Terminal Blocks)

CS1W-IA111  
 CS1W-IA211  
 CS1W-ID211  
 CS1W-INT01  
 CS1W-IDP01  
 CS1W-OD211  
 CS1W-OD212  
 CS1W-OA201  
 CS1W-OA211  
 CS1W-OC201  
 CS1W-OC211

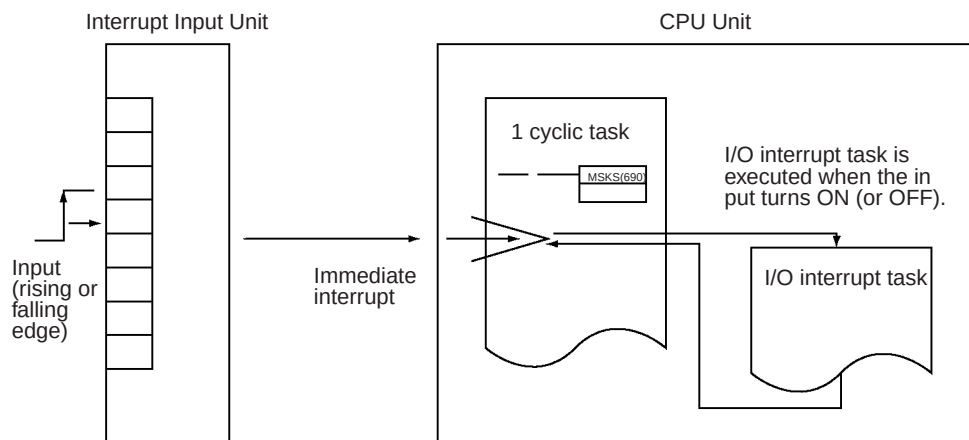


## 3-6-2 Interrupt Input Units

## Functions

Interrupt Input Units are used to execute interrupt programs on the rising or falling edge of an input signal (See note.). When the specified interrupt input turns ON (or OFF), execution of the cyclic program in the CPU Unit is interrupted and an I/O interrupt task (task number 100 to 131) is executed. When execution of the I/O interrupt task has been completed, the cyclic program is again executed starting from the instruction after which it was interrupted.

**Note** Only the CS1W-INT01 can detect falling edges. The interrupt control instructions, however, can be used to switch between upward and downward differentiation.



**Applicable Units**

Either of the following Interrupt Input Units can be used.

| Model        | Specifications    | No. of Units mountable to CPU Rack |
|--------------|-------------------|------------------------------------|
| CS1W-INT01   | 24 V DC 16 inputs | 2 max.                             |
| C200HS-INT01 | 24 V DC 8 inputs  | 4 max.                             |

**Application Precautions**

All Interrupt Input Units must be mounted to the CPU Rack. The interrupt input function will not be supported if an Interrupt Input Unit is mounted to an Expansion Rack. If mounted to an Expansion Rack, the Unit can be used as a normal I/O Unit.

There are limits to the number of Interrupt Input Units that can be mounted. (See table, above.)

Use only CS-series or only C200H Interrupt Input Units on the same CPU Rack. The CS-series and C200H Interrupt Input Units cannot be used together.

Can be used only with CPU Units with model numbers ending in “-V1,” i.e., CS1W-CPU4□-V1 or CS1W-CPU6□-V1.

The input response time cannot be changed for the CS1W-INT01, and the related portions of the Basic I/O Unit input time constants in the PLC Setup, and the setting status in A220 to A259 will not be valid.

Use CX-Programmer Version 2.0 or later when using the CS1W-INT01 Interrupt Input Unit. Earlier versions of CX-Programmer do not support this Unit. (The Programming Consoles, however, can be used for this Unit.)

**Input Signal Width**

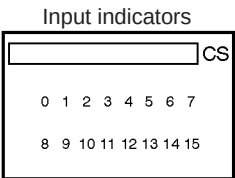
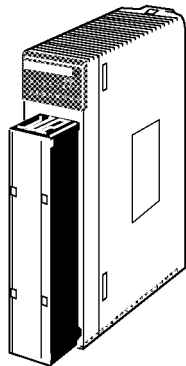
Input signals must meet the following conditions.



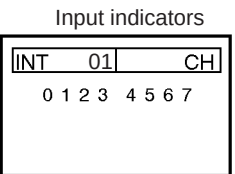
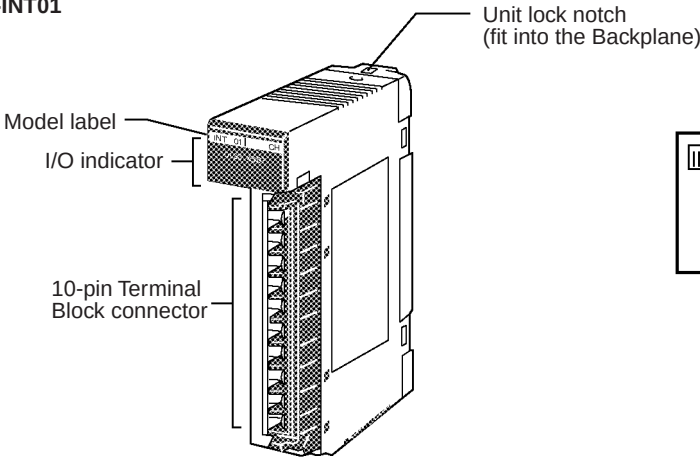
| Unit         | ON time     | OFF time    |
|--------------|-------------|-------------|
| CS1W-INT01   | 0.1 ms min. | 0.5 ms min. |
| C200HS-INT01 | 0.2 ms min. | 0.5 ms min. |

Components

CS1W-INT01



C200HS-INT01



Using I/O Interrupts

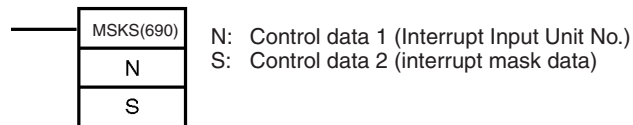
- 1,2,3...**
1. Mount the Input Interrupt Unit to the CPU Rack and create the I/O tables.
  2. Create the I/O task (see note 1).
  3. Use the SET INTERRUPT MASK Instruction (MSKS(690)) in the cyclic program to enable the required interrupt input numbers (see note 1).
  4. Turn ON or OFF the inputs on the Interrupt Input Unit for the interrupt input numbers that have been enabled.

- Note**
1. The relationship between Interrupt Input Unit numbers, interrupt input numbers, and I/O interrupt tasks is shown in the following table.

| Model        | Interrupt Input Unit number | Interrupt input number | I/O interrupt task number |
|--------------|-----------------------------|------------------------|---------------------------|
| CS1W-INT01   | 0                           | 0 to 15                | 100 to 115                |
|              | 1                           |                        | 116 to 131                |
| C200HS-INT01 | 0                           | 0 to 7                 | 100 to 107                |
|              | 1                           |                        | 108 to 115                |
|              | 2                           |                        | 116 to 123                |
|              | 3                           |                        | 124 to 131                |

2. The CS1W-INT01 can set to detect either rising or falling edges.

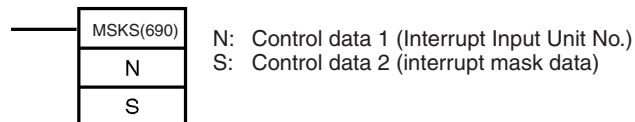
## MSKS(690) Instruction

Specifying Rising/Falling Edge for CS1W-INT01

The MSKS(690) instruction is used to set rising edge or falling edge detection for each interrupt input number.

- The value of N will determine which Interrupt Input Unit will perform the I/O interrupt processing.
- The value of S will determine rising or falling edge detection for each interrupt input number.

| Operand | Value            |              | Details                                                                                                                                                                                                                               |
|---------|------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | CS1W-INT01       | C200HS-INT01 |                                                                                                                                                                                                                                       |
| N       | 2, 3             | ---          | Interrupt Input Unit Number<br>Numbers 2 and 3 are assigned to the Units in order from left to right.<br>2:Interrupt Input Unit 0 (interrupt task numbers 100 to 115)<br>3:Interrupt Input Unit 1 (interrupt task numbers 116 to 131) |
| S       | 0000 to FFFF Hex | ---          | Rising/Falling Edge Designation<br>Bits 00 to 15 correspond to the interrupt input numbers (interrupt tasks 100 to 115 or 116 to 131).<br>0:Rising edge<br>1:Falling edge                                                             |

Specifying I/O Interrupt Processing

The MSKS(690) instruction is used to set I/O interrupt processing or scheduled interrupt processing.

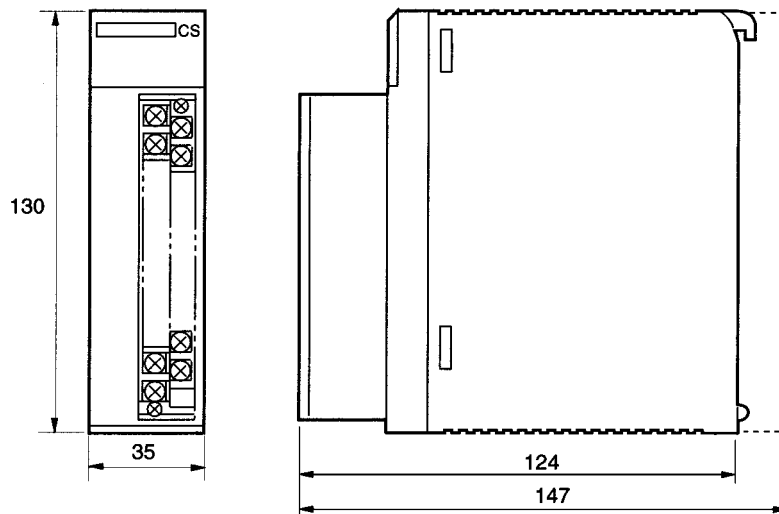
- The value of N will determine which Interrupt Input Unit will perform the I/O interrupt processing.
- The value of S will determine which interrupt number will be enabled.

| Operand | Value            |                  | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | CS1W-INT01       | C200HS-INT01     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| N       | 0, 1             | 0 to 3           | <p>Interrupt Input Unit Number</p> <p>Numbers are assigned to the Units in order from left to right.</p> <p>CS1W-INT01 (unit numbers 0 and 1)</p> <p>0:Interrupt Input Unit 0 (interrupt task numbers 100 to 115)</p> <p>1:Interrupt Input Unit 1 (interrupt task numbers 116 to 131)</p> <p>CS1W-INT01 (unit numbers 0 to 3)</p> <p>0:Interrupt Input Unit 0 (interrupt task numbers 100 to 107)</p> <p>1:Interrupt Input Unit 1 (interrupt task numbers 108 to 115)</p> <p>2:Interrupt Input Unit 2 (interrupt task numbers 116 to 123)</p> <p>3:Interrupt Input Unit 3 (interrupt task numbers 123 to 131)</p> |
| S       | 0000 to FFFF Hex | 0000 to 00FF Hex | <p>Interrupt Mask Data</p> <p>Bits 00 to 15 for the CS1W-INT01 and the right-most 8 bits for the C200H-INT01 are used for the Interrupt Input Unit's interrupt input number.</p> <p>1:Interrupt masked (interrupt input disabled)</p> <p>0:Interrupt valid (interrupt input enabled)</p>                                                                                                                                                                                                                                                                                                                          |

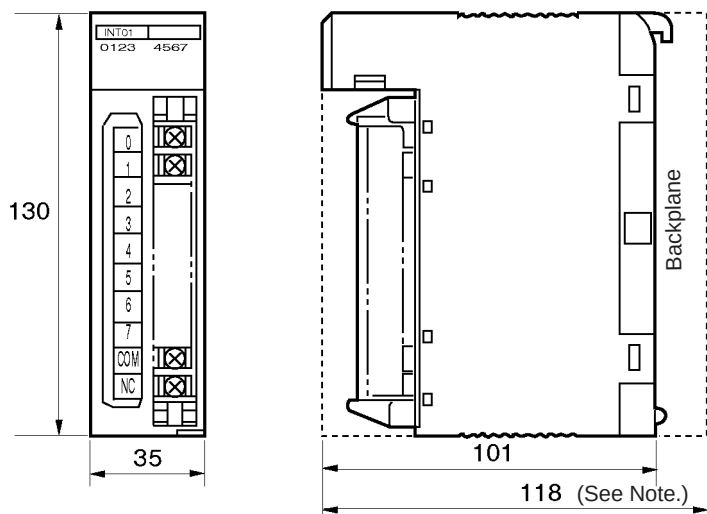


## Dimensions

CS1W-INT01



C200HS-INT01



**Note** The height of the Unit including the Backplane is 5 mm greater on the CPU Backplane and CS-series Expansion Backplane (123 mm).

### 3-6-3 Units with High-speed Inputs

#### Functions

The CS1W-IDP01 enables inputting pulse signals that are shorter than the cycle time of the CPU Unit. C200H High-density I/O Units (Special I/O Units) also supported high-speed inputs.

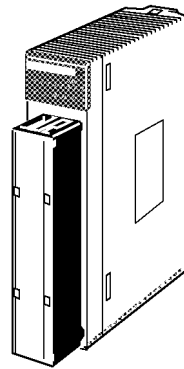
#### I/O Units with High-speed Inputs

| Model       | Name                            | Specifications                 |
|-------------|---------------------------------|--------------------------------|
| CS1W-IDP01  | High-speed Input Unit           | 24 V DC, 16 inputs             |
| C200H-ID501 | TTL Input Unit                  | 5 V DC, 32 inputs              |
| C200H-ID215 | DC Input Unit                   | 24 V DC, 32 inputs             |
| C200H-MD501 | TTL I/O Unit                    | 5 V DC, 16 inputs/16 outputs   |
| C200H-MD115 | DC Input/Transistor Output Unit | 12 V DC, 16 inputs/16 outputs  |
| C200H-MD215 |                                 | 24 V DC, 16 inputs/16 outputs, |

**Note** Refer to 3-7 C200H High-density I/O Units (Special I/O Units) for details on C200H High-density I/O Units

#### Components

##### CS1W-IDP01

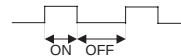


Input indicators

|                       |    |
|-----------------------|----|
|                       | CS |
| 0 1 2 3 4 5 6 7       |    |
| 8 9 10 11 12 13 14 15 |    |

#### Input Signal Width

High-speed input signals must meet the following conditions for the ON time.



| Model                                  | ON time                      |
|----------------------------------------|------------------------------|
| CS1W-IDP01                             | 0.1 ms min.                  |
| C200H-ID501/215<br>C200H-MD501/215/115 | 1.0/4.0 ms min. (switchable) |

#### Dimensions

The High-speed Input Unit has the same dimensions as the Interrupt Input Unit. Refer to page 164.

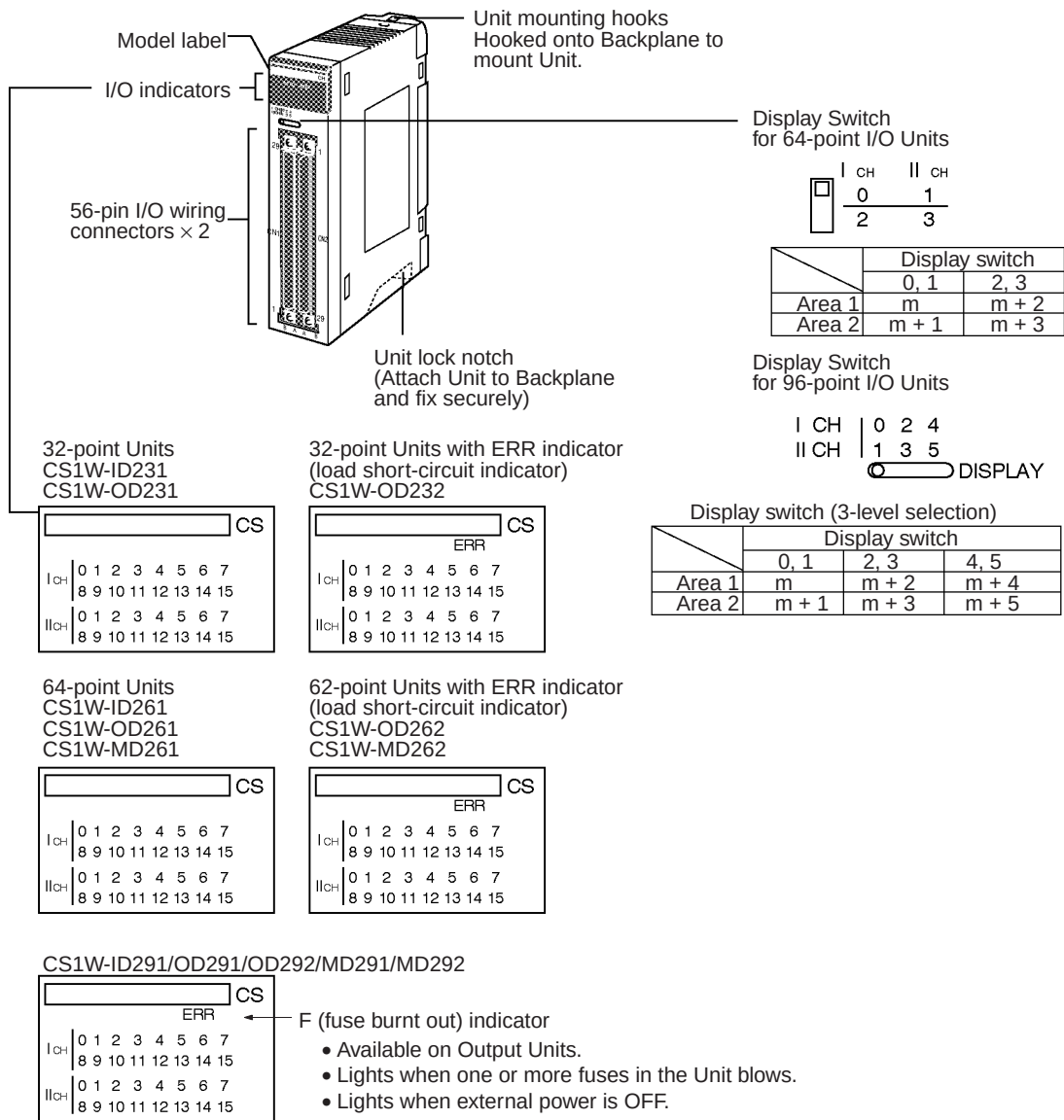
### 3-6-4 CS-series Basic I/O Units with Connectors (32-, 64-, and 96-pt Units)

CS-series Basic I/O Units are classified as Basic I/O Units.

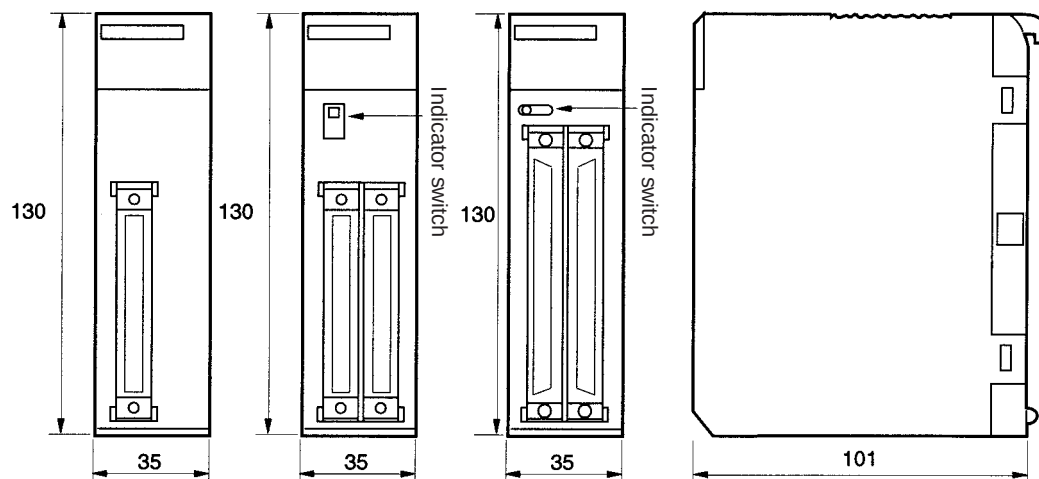
#### Models

| Name                                      | Specifications                                                                                          | Model      |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------|------------|
| DC Input Unit                             | 24 V DC, 32 inputs                                                                                      | CS1W-ID231 |
|                                           | 24 V DC, 64 inputs                                                                                      | CS1W-ID261 |
|                                           | 24 V DC, 96 inputs                                                                                      | CS1W-ID291 |
| Transistor Output Unit, Sinking           | 0.5 A at 12 to 24 V DC, 32 outputs                                                                      | CS1W-OD231 |
|                                           | 0.3 A at 12 to 24 V DC, 64 outputs                                                                      | CS1W-OD261 |
|                                           | 0.1 A at 12 to 24 V DC, with fuse burn-out detection circuit, 96 outputs                                | CS1W-OD291 |
| Transistor Output Unit, Sourcing          | 0.5 A at 24 V DC, load short-circuit protection, 16 outputs                                             | CS1W-OD212 |
|                                           | 0.5 A at 24 V DC, load short-circuit protection, 32 outputs                                             | CS1W-OD232 |
|                                           | 0.3 A at 24 V DC, load short-circuit protection, 64 outputs                                             | CS1W-OD262 |
|                                           | 0.1 A at 24 V DC, with fuse burnout detection circuit, 96 outputs                                       | CS1W-OD292 |
| DC Input/Transistor Output Unit, Sinking  | 24 V DC input, 0.3 A output at 12 to 24 V DC, 32 inputs/32 outputs                                      | CS1W-MD261 |
|                                           | 24 V DC input, 0.1 A output at 12 to 24 V DC, with fuse burnout detection circuit, 48 inputs/48 outputs | CS1W-MD291 |
| DC Input/Transistor Output Unit, Sourcing | 24 V DC input, 0.3 A output at 24 V DC, load short-circuit protection, 32 inputs/32 outputs             | CS1W-MD262 |
|                                           | 24 V DC input, 0.1 A output at 24 V DC, with fuse burnout detection circuit, 48 inputs/48 outputs       | CS1W-MD292 |
| TTL I/O Unit                              | 3.5 mA at 5 V DC, 32 inputs<br>35 mA at 5 V DC, 32 outputs                                              | CS1W-MD561 |

**Note** Immediate refreshing (!) or refreshing using IORF(097) is possible for CS-series High-density I/O Units.



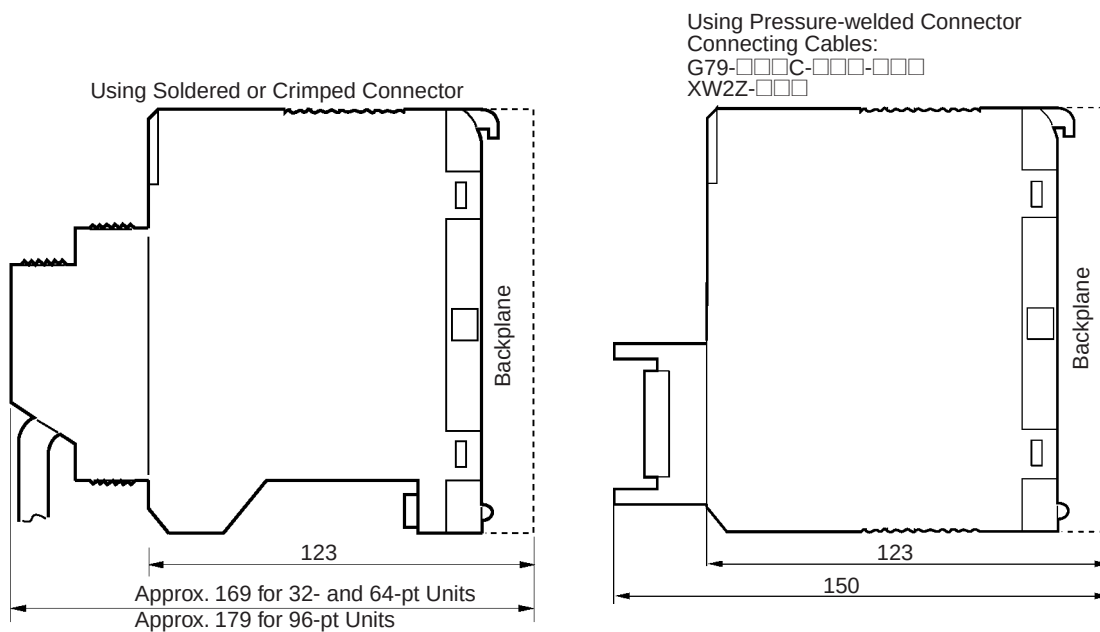
## Dimensions



Units with One  
40-pin connector  
CS1W-ID231  
CS1W-OD231  
CS1W-OD232

Units with Two  
40-pin connectors  
CS1W-ID261  
CS1W-OD261  
CS1W-OD262  
CS1W-MD261  
CS1W-MD262

Units with 56-pin  
connectors  
CS1W-ID291  
CS1W-OD291  
CS1W-OD292  
CS1W-MD291  
CS1W-MD292



### 3-6-5 C200H Group-2 High-density I/O Units

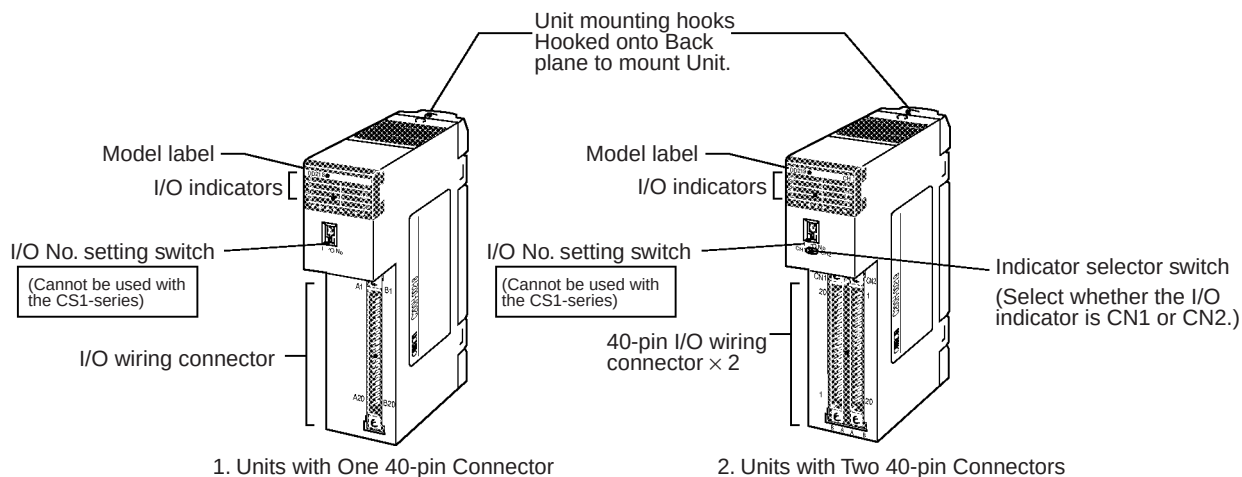
C200H Group-2 High-density I/O Units are classified as Basic I/O Units.

#### Models

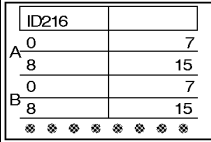
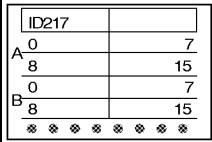
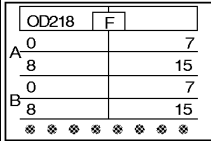
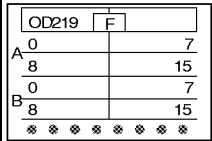
| Name                   | Specifications                                       | Model       | Appearance/<br>dimensions<br>reference No. |
|------------------------|------------------------------------------------------|-------------|--------------------------------------------|
| DC Input Unit          | 24 V DC, input current:<br>4.1 mA typical, 32 inputs | C200H-ID216 | 1                                          |
|                        | 24 V DC, input current:<br>6 mA typical, 32 inputs   | C200H-ID218 | 1                                          |
|                        | 12 V DC, 64 inputs                                   | C200H-ID111 | 2                                          |
|                        | 24 V DC, input current:<br>4.1 mA typical, 64 inputs | C200H-ID217 | 2                                          |
|                        | 24 V DC, input current:<br>6 mA typical, 64 inputs   | C200H-ID219 | 2                                          |
| Transistor Output Unit | 16 mA at 4.5 V to 100 mA<br>at 26.4 V, 32 outputs    | C200H-OD218 | 1                                          |
|                        | 16 mA at 4.5 V to 100 mA<br>at 26.4 V, 64 outputs    | C200H-OD219 | 2                                          |
|                        | 24 V DC, 0.5 A, sourcing,<br>32 inputs               | C200H-OD21B | 1                                          |

- Note**
1. C200H Group-2 High-density I/O Units cannot be mounted to SYSMAC BUS Slave Racks.
  2. Immediate refreshing (!) is not possible for C200H Group-2 High-density I/O Units, but refreshing using IORF (097) is possible for these Units.

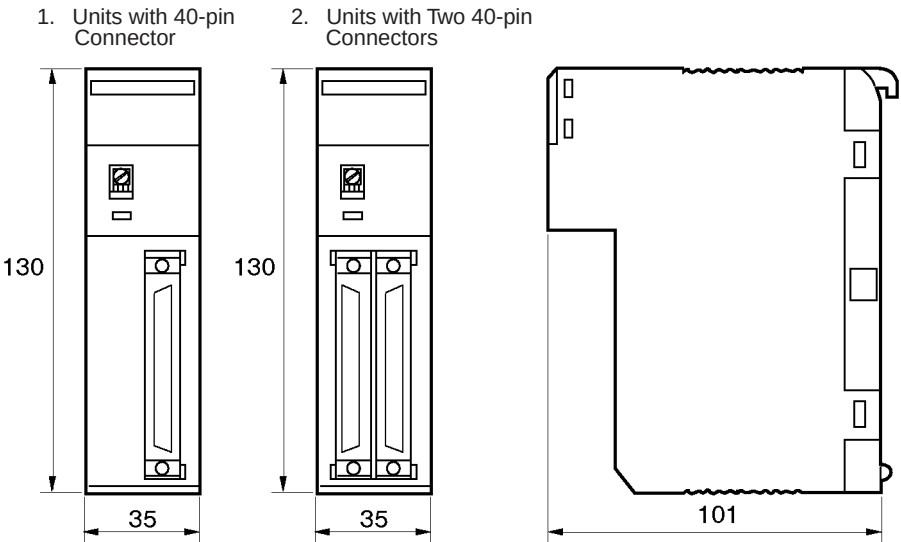
#### Components and Switch Settings



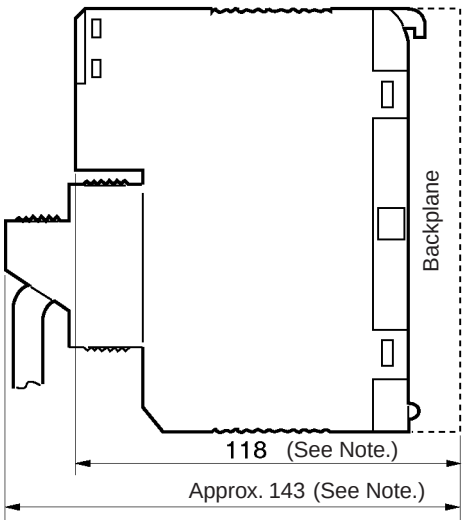
- Note** The I/O number setting switch on the front panel of C200H Group-2 High-density I/O Units is not used for the CS Series, i.e., the I/O number setting will not affect allocations. Words are allocated to the Units according to their position on the Rack in the same way as for Basic I/O Units.

| Units with One 40-pin Connector                                                   |                                                  |             | Units with Two 40-pin Connectors                                                   |                                                  |                            |
|-----------------------------------------------------------------------------------|--------------------------------------------------|-------------|------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------|
|  | 32-point Unit                                    | C200H-ID216 |  | 64-point Unit                                    | C200H-ID111<br>C200H-ID217 |
|  | 32-point Unit<br>F (fuse burnt out)<br>indicator | C200H-OD218 |  | 64-point Unit<br>F (fuse burnt out)<br>indicator | C200H-OD219                |

Dimensions



Unit Dimensions with Backplane and Connector



**Note** The height of the Unit including the Backplane is 5 mm greater on the CPU Backplane and CS-series Expansion Backplane (123 and 148 mm).

## 3-7 C200H High-density I/O Units (Special I/O Units)

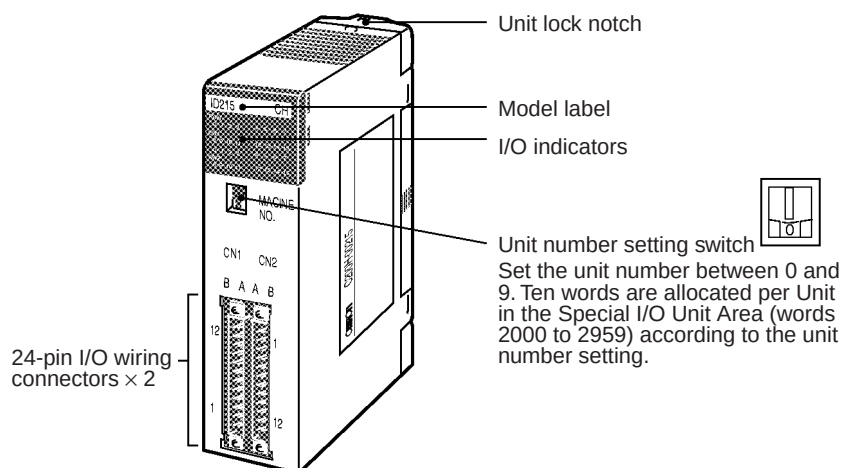
C200H High-density I/O Units are classified as C200H Special I/O Units.

### Models

| Name                            | Specifications                | Model       | Dynamic I/O mode | Static I/O mode   |
|---------------------------------|-------------------------------|-------------|------------------|-------------------|
| TTL Input Unit                  | 5 V DC, 32 inputs             | C200H-ID501 | ---              | High-speed inputs |
| DC Input Unit                   | 24 V DC, 32 inputs            | C200H-ID215 | ---              | High-speed inputs |
| TTL Output Unit                 | 5 V DC, 32 outputs            | C200H-OD501 | 128 outputs      | ---               |
| Transistor Output Unit          | 24 V DC, 32 outputs           | C200H-OD215 | 128 outputs      | ---               |
| TTL I/O Unit                    | 5 V DC, 16 inputs/16 outputs  | C200H-MD501 | 128 inputs       | High-speed inputs |
| DC Input/Transistor Output Unit | 12 V DC, 16 inputs/16 outputs | C200H-MD115 | 128 inputs       | High-speed inputs |
|                                 | 24 V DC, 16 inputs/16 outputs | C200H-MD215 | 128 inputs       | High-speed inputs |

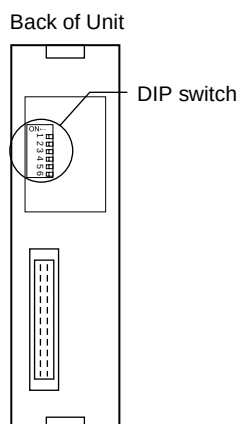
**Note** Immediate refreshing (!) is not possible for C200H High-density I/O Units, but refreshing using IORF (097) is possible.

### Components and Switch Settings



- Note**
1. Be sure to turn OFF the power supply to the PLC before setting the unit number.
  2. Set the unit number using a flat-blade screwdriver.
  3. Do not stop in the middle of setting the value (between 0 and 9) or the setting will not be complete.
  4. Make sure that the groove in the unit number setting switch does not become damaged.





| Model       | RUN mode            |                                     | High-speed inputs                 |              | High-speed input minimum response pulse |      | Normal input response time |             | Dynamic data output logic         |                                   |
|-------------|---------------------|-------------------------------------|-----------------------------------|--------------|-----------------------------------------|------|----------------------------|-------------|-----------------------------------|-----------------------------------|
|             | SW1                 |                                     | SW2                               |              | SW3                                     |      | SW4                        |             | SW5                               |                                   |
|             | ON                  | OFF                                 | ON                                | OFF          | ON                                      | OFF  | ON                         | OFF         | ON                                | OFF                               |
| C200H-ID501 | ---                 | ---                                 | High-speed input function enabled | Normal input | 4 ms                                    | 1 ms | ---                        | ---         | 15 ms max.                        | 2.5 ms max.                       |
| C200H-ID215 | ---                 | ---                                 | High-speed input function enabled | Normal input | 4 ms                                    | 1 ms | ---                        | ---         | 15 ms max.                        | 2.5 ms max.                       |
| C200H-OD501 | 128 dynamic outputs | 32 static outputs                   | ---                               | ---          | ---                                     | ---  | ---                        | ---         | Positive logic output (See Note.) | Negative logic output (See Note.) |
| C200H-OD215 | 128 dynamic outputs | 32 static outputs                   | ---                               | ---          | ---                                     | ---  | ---                        | ---         | Positive logic output (See Note.) | Negative logic output (See Note.) |
| C200H-MD501 | 128 dynamic inputs  | 16 static inputs, 16 static outputs | High-speed input function enabled | Normal input | 4 ms                                    | 1 ms | 15 ms max.                 | 2.5 ms max. | ---                               | ---                               |
| C200H-MD115 | 128 dynamic inputs  | 16 static inputs, 16 static outputs | High-speed input function enabled | Normal input | 4 ms                                    | 1 ms | 15 ms max.                 | 2.5 ms max. | ---                               | ---                               |
| C200H-MD215 | 128 dynamic inputs  | 16 static inputs, 16 static outputs | High-speed input function enabled | Normal input | 4 ms                                    | 1 ms | 15 ms max.                 | 2.5 ms max. | ---                               | ---                               |

**Note** Negative and positive logic output are only available with 128-point dynamic output mode.

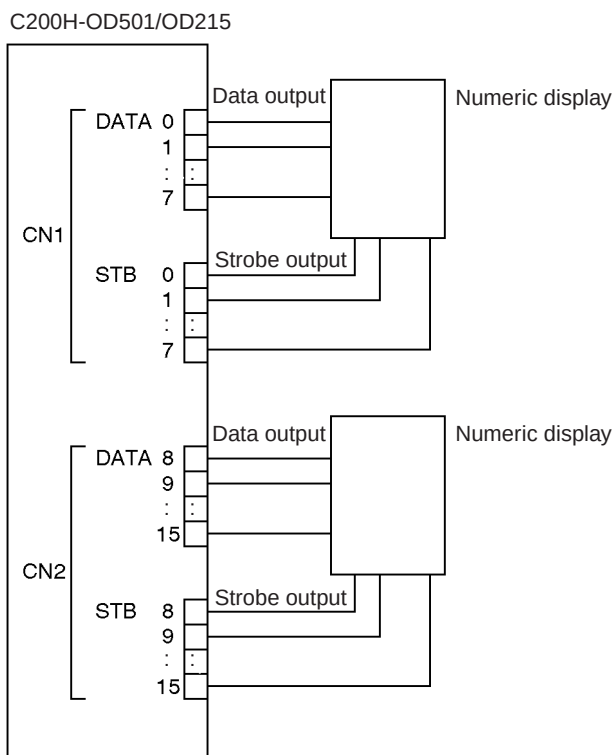
C200H High-density I/O Units are classified as C200H Special I/O Units and have the following functions.

**Dynamic I/O Mode**

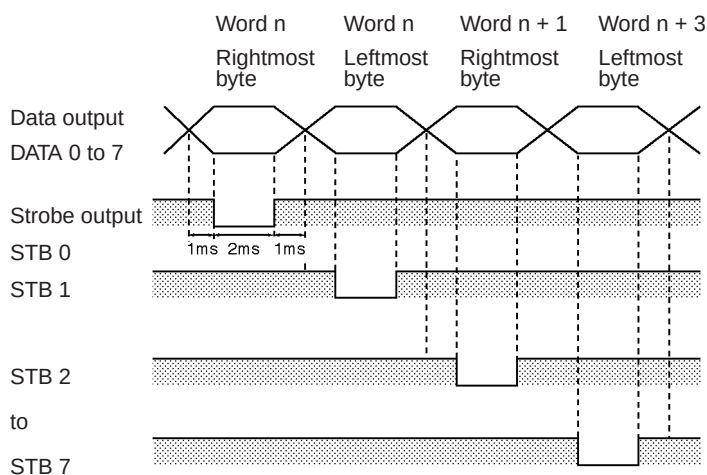
The High-density I/O Units (other than the C200H-ID501 and C200H-ID215) can provide high-density I/O rather than the normal output (static output mode) and I/O (static I/O mode). High-density I/O (dynamic output and dynamic input modes: 128 points) is achieved by combining the I/O signals with a strobe signal output. The High-density I/O Units require less wiring, use a numeric display device in dynamic output mode with large number capacity, and use keyboard switches in dynamic input mode.

**High-speed Inputs**

The High-density I/O Units (other than the C200H-OD501 and C200H-OD502) also provide high-speed inputs. High-speed inputs are possible with 8 input points. This function enables accurate reading of short pulse inputs from photomicroswitches and other devices.

**Dynamic I/O Mode****Dynamic Output Mode**

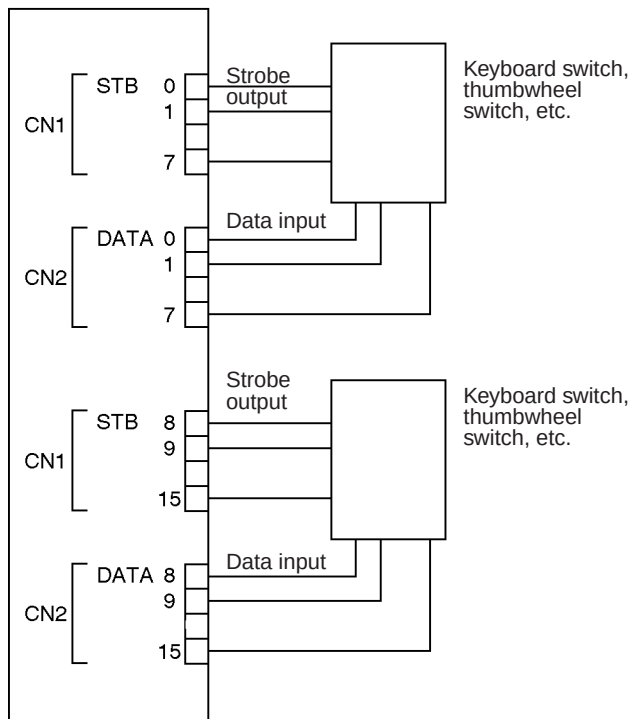
By combining data signals (DATA 0 to 7 and DATA 8 to 15) with strobe signals (STB 0 to 7/ STB 8 to 15, 128 bits (8 words) can be output to a numerical display device as shown in the following diagram.



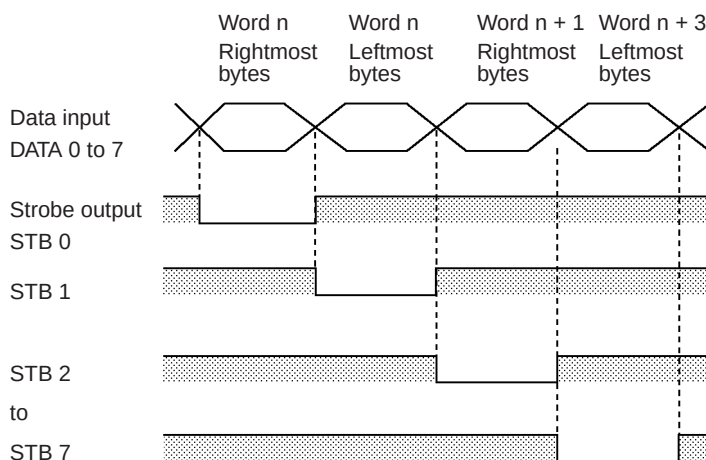
DATA 8 to 15 can also be output as STB 8 to 15 at the same time.

### Dynamic Input Mode

C200H-MD501/MD115/MD215



Using strobe signals STB 0 to 7 as outputs, data signals DATA 0 to 7 as inputs, strobe signals STB 8 to 15 as outputs, and data signals DATA 8 to 15 as inputs, 128 bits (8 words) can be input from strobe input keyboard switches or thumbwheel switches as shown in the following diagram.

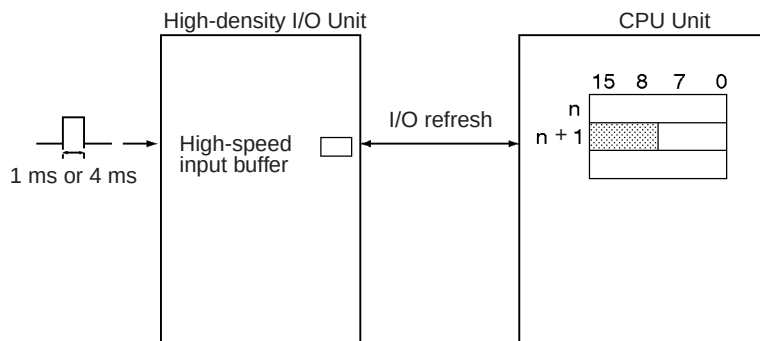


DATA 8 to 15 can also be output as STB 8 to 15 at the same time.

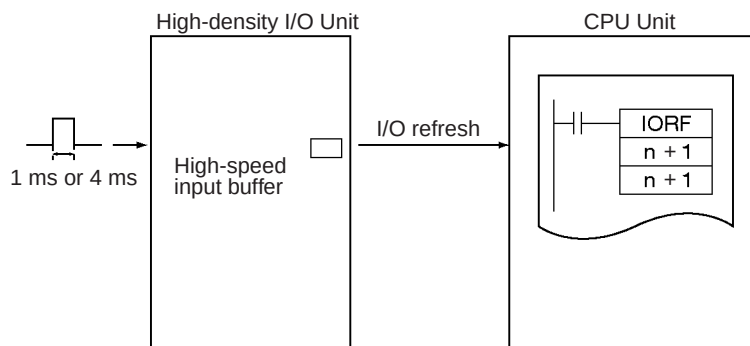
### High-speed Inputs

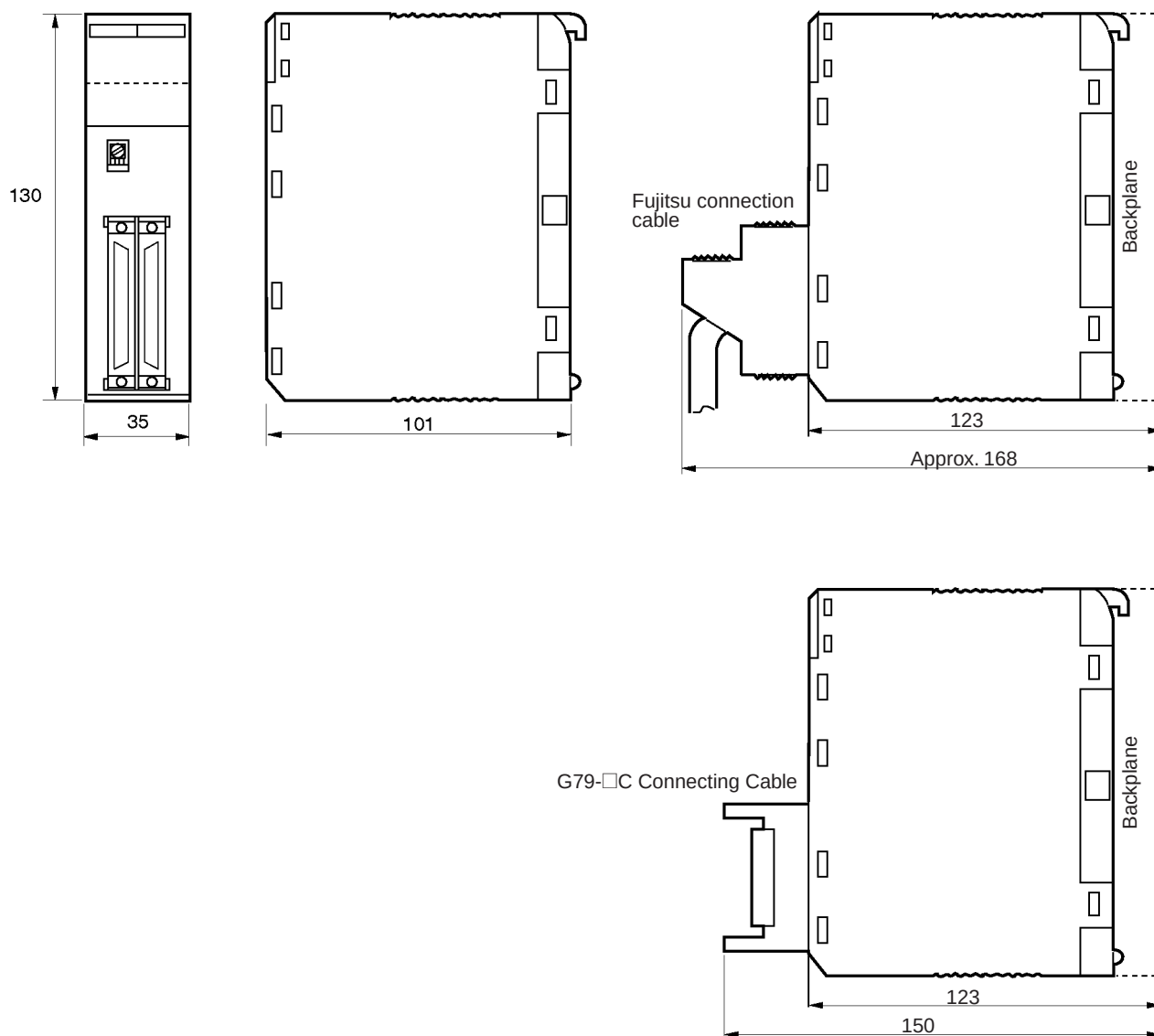
The inputs 8 to 15 from the CN2 connector can be used for pulse input. The minimum pulse width is 1 ms or 4 ms (selectable).

A High-density I/O Unit will recognize a pulse input when the pulse input occurs (i.e., the inputs turns ON and then OFF again), and the pulse width is greater than 1 ms or 4 ms (according to the selected minimum pulse width). The data is refreshed in the Special I/O Unit Area (word  $n + 1$ , bits 8 to 15) of I/O memory during the CPU Unit's I/O refresh period.



The High-density I/O Unit data in the high-speed input buffer can also be refreshed during program execution by executing the IORF(097) instruction for the desired Special I/O Unit.



**Dimensions****3-8 B7A Interface Units****3-8-1 Standard B7A Interface Units (Basic I/O Units)**

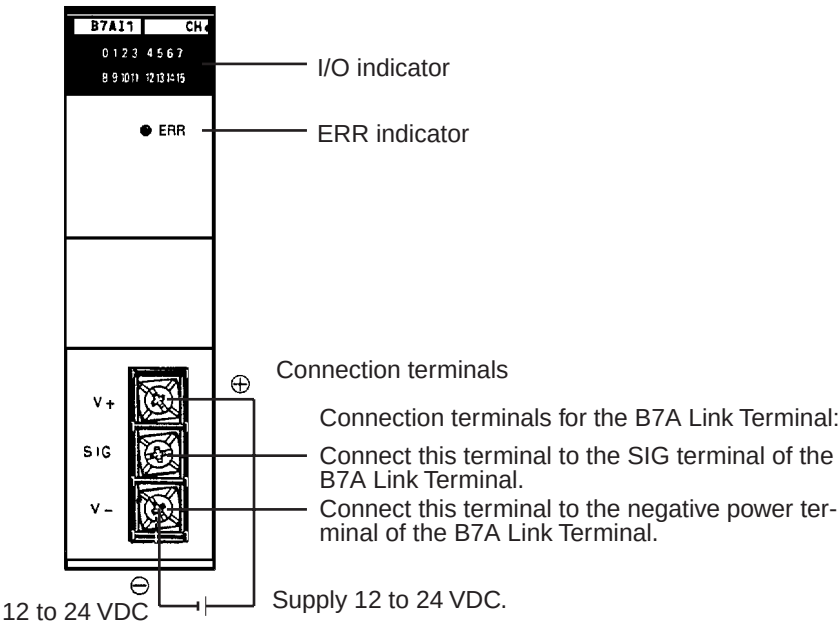
The Standard B7A Interface Unit used with the B7A Link Terminal allows the transmission and reception of 16-point I/O data over two wires.

The following Standard B7A Interface Unit and B7A Link Terminal models are available.

| B7A Interface Unit           | B7A Link Terminals                                              |
|------------------------------|-----------------------------------------------------------------|
| 16-point input: C200H-B7AI1  | B7A-T6□1 (Screw terminal models)<br>B7A-T6D2 (Modular models)   |
| 16-point output: C200H-B7AO1 | B7A-R6□□1 (Screw terminal models)<br>B7A-R6A52 (Modular models) |

**Note** If the B7A Interface Unit is mounted to a Rack with a C200HW-PD024 24-V DC Power Supply Unit, supply 24 V DC from an independent power supply to the B7A Interface Unit or use a transformer to separate the power supply line

to the B7A Interface Unit from the power supply lines to the CPU Unit and I/O Power Supply Unit.



**I/O Indicator** Indicates the ON or OFF status of input from the B7A Link Terminal or the ON and OFF status of output to the B7A Link Terminal.

**ERR Indicator** Incorporated by the B7A11 and lit when the B7A11's data transmission or reception is abnormal.

**Connection Terminals** SIG: Connects to the SIG terminal of the B7A Link Terminal.  
V-: Connects to the negative power terminal of the B7A Link Terminal.

**Caution** If the terminals are not connected correctly, the internal circuitry of the B7A Link Terminal will be damaged.

- Note**
1. The transmission cable must be a VCTF cable with a thickness of 0.75 mm<sup>2</sup> minimum.
  2. Do not wire power lines or high-tension lines along with the transmission cable in the same conduit.

**Input Mode Selector** The B7A11 incorporates an input mode selector on the back panel of the Unit, with which the following modes can be set.

| Input mode                        |          | 15 points + 1 error                                                                                    | 16 points                                                    |
|-----------------------------------|----------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| Function                          |          | Fifteen-point input from the B7A Link Terminal is effective. Bit 15 is used as transmission error bit. | Sixteen-point input from the B7A Link Terminal is effective. |
| Switch setting                    |          | Upper side                                                                                             | Lower side                                                   |
| Bit no. allocation                | 00 to 14 | Input 00 to input 14                                                                                   | Input 00 to input 14                                         |
|                                   | 15       | Transmission error bit                                                                                 | Input 15                                                     |
| Status of input indicator lamp 15 |          | Not used                                                                                               | Lit when input 15 is ON. Not lit when input 15 is OFF.       |
| Status of the ERR indicator       |          | Lit when there is a transmission error and OFF during normal transmission                              |                                                              |

The ERR indicator is lit when an error occurs. If the error is corrected, the ERR indicator is OFF at the next transmission cycle.

When there is a transmission error, the B7A Link Terminal will hold the data just before the occurrence of the transmission error. If there is a transmission error because the B7A Link Terminal is turned off, however, data 0 is transmit-

ted in the first transmission cycle when the B7A Link Terminal is turned on again.

Transmission errors between the C200H-B7AO1 and B7A Link Terminal are detected by the B7A Link Terminal only. Check the ERR indicator and error bit for any error.

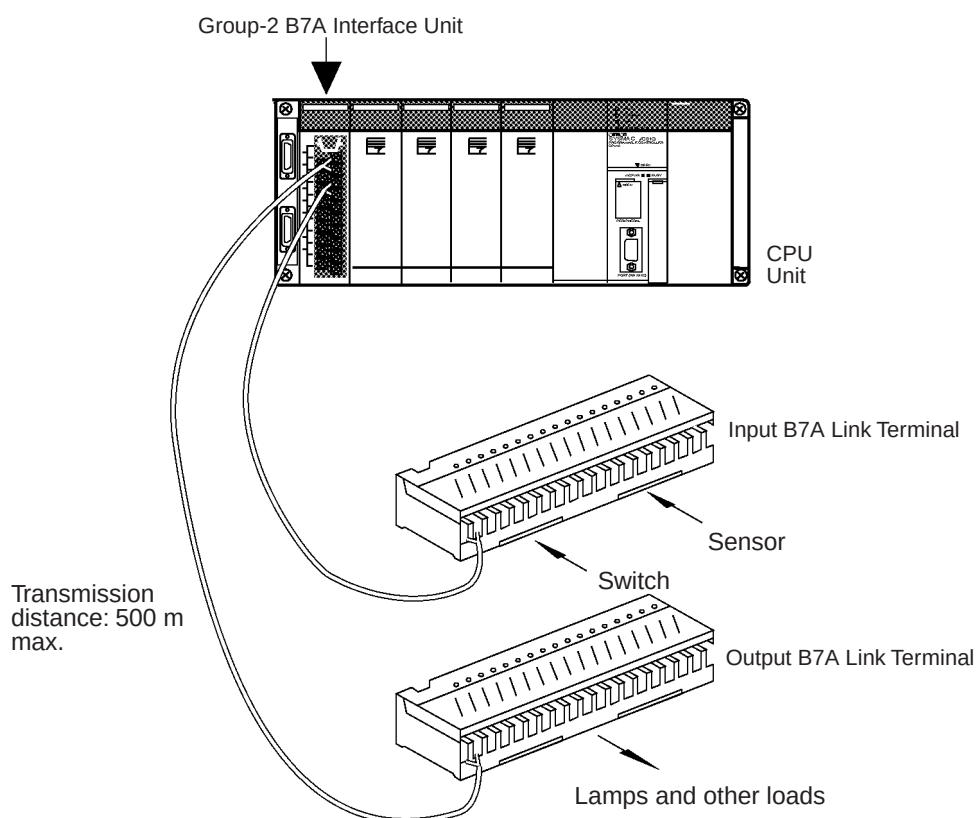
### Performance Specifications

| Item                               | C200H-B7AI1                                                                                                                                                                                                            | C200H-B7AO1                         |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| I/O points                         | 16 points or 15 points and 1 error input                                                                                                                                                                               | 16 output points                    |
| Transmission distance              | 500 m max. if power is supplied to the Interface Unit and B7A Link Terminal separately.<br>100 m max. if power is supplied to the Interface Unit and B7A Link Terminal from a single power supply. (24 V DC $\pm$ 10%) |                                     |
| Transmission delay                 | Typ. 19.2 ms, 31 ms max.                                                                                                                                                                                               |                                     |
| Minimum input time (see note 1)    | —                                                                                                                                                                                                                      | 16 ms                               |
| Internal current consumption       | 5 V DC, 100 mA max.                                                                                                                                                                                                    |                                     |
| External power supply (see note 2) | 12 to 24 V DC $\pm$ 10%, 10 mA min.                                                                                                                                                                                    | 12 to 24 V DC $\pm$ 10%, 30 mA min. |
| Weight                             | 200 g max.                                                                                                                                                                                                             |                                     |

- Note**
1. The minimum input time refers to the minimum time required for reading the input signals from the CPU Unit. The ON/OFF width of the signal transmitted from the CPU Unit to the Output Relay of the B7A Interface Unit should be set to a value larger than the minimum input time.
  2. The value of the external power supply does not include the value required by the B7A Link Terminal.

## 3-8-2 Group-2 B7A Interface Units

### Features and System Configuration



A Group-2 B7A Interface Unit (C200H-B7A□□) used with two or four B7A Link Terminals allows the transmission and reception of 32-point or 64-point I/O data over two-conductor cables.

Group-2 B7A Interface Units can be mounted to a CPU Rack or an Expansion I/O Rack. They cannot be mounted to Slave Racks.

Units with 32 I/O points are allocated two words; Units with 64 I/O points are allocated four words.

Refer to the *B7A Link Terminals Datasheet* for more information on B7A Link Terminals.

## Models

The following Group-2 B7A Interface Units are available.

| B7A Interface Unit | Inputs    | Outputs   |
|--------------------|-----------|-----------|
| C200H-B7A12        | 32 points | None      |
| C200H-B7A02        | None      | 32 points |
| C200H-B7A21        | 16 points | 16 points |
| C200H-B7A22        | 32 points | 32points  |

## Comparison between Standard and Group-2 B7A Interface Units

| Type     | Models      | Word allocations                      | Connectable B7A Link Terminals                                  |                                               |                                                                                           |
|----------|-------------|---------------------------------------|-----------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------|
|          |             |                                       | Transmission delay                                              | Transmission errors                           | Points                                                                                    |
| Standard | C200H-B7A11 | Same as I/O Units (in order mounted). | Standard types only (19.2 ms)                                   | Input status held automatically               | 16-point Terminals only (10-point, 32-point, and mixed I/O Terminals cannot be connected. |
|          | C200H-B7A02 |                                       |                                                                 |                                               |                                                                                           |
| Group 2  | C200H-B7A12 | Same as I/O Units (in order mounted). | Standard (19.2 ms) and high-speed (3 ms) types (set via switch) | Switch setting to hold or reset Input status. |                                                                                           |
|          | C200H-B7A02 |                                       |                                                                 |                                               |                                                                                           |
|          | C200H-B7A21 |                                       |                                                                 |                                               |                                                                                           |
|          | C200H-B7A22 |                                       |                                                                 |                                               |                                                                                           |

- Note**
1. With CS-series PLCs, I/O is allocated to Group-2 B7A Interface Units just like other Basic I/O Units (allocating outputs first and then inputs for I/O Units). The unit number setting on the front panel of the Group-2 B7A Interface Unit does not affect I/O allocations.

| Name                                | Model       | Words per Unit | Order of allocation               |
|-------------------------------------|-------------|----------------|-----------------------------------|
| 32-point Input Unit                 | C200H-B7A12 | 2              | 2 input words                     |
| 32-point Output Unit                | C200H-B7A02 |                | 2 output words                    |
| 16-point Input/16-point Output Unit | C200H-B7A21 |                | 1 output word then 1 input word   |
| 32-point Input/32-point Output Unit | C200H-B7A22 | 4              | 2 output words then 2 input words |

2. B7A Link Terminals with 10 points or those with 8 input and 8 output points cannot be connected to the B7A Interface Units. B7A Link Terminals with 16 points, two circuits of 16 points each (32 points total) or 16 points of mixed I/O can be connected.

## Connectable B7A Link Terminals

Only 16-point B7A Link Terminals can be connected to a B7A Interface Unit. These are listed in the following tables.



## Input Terminals

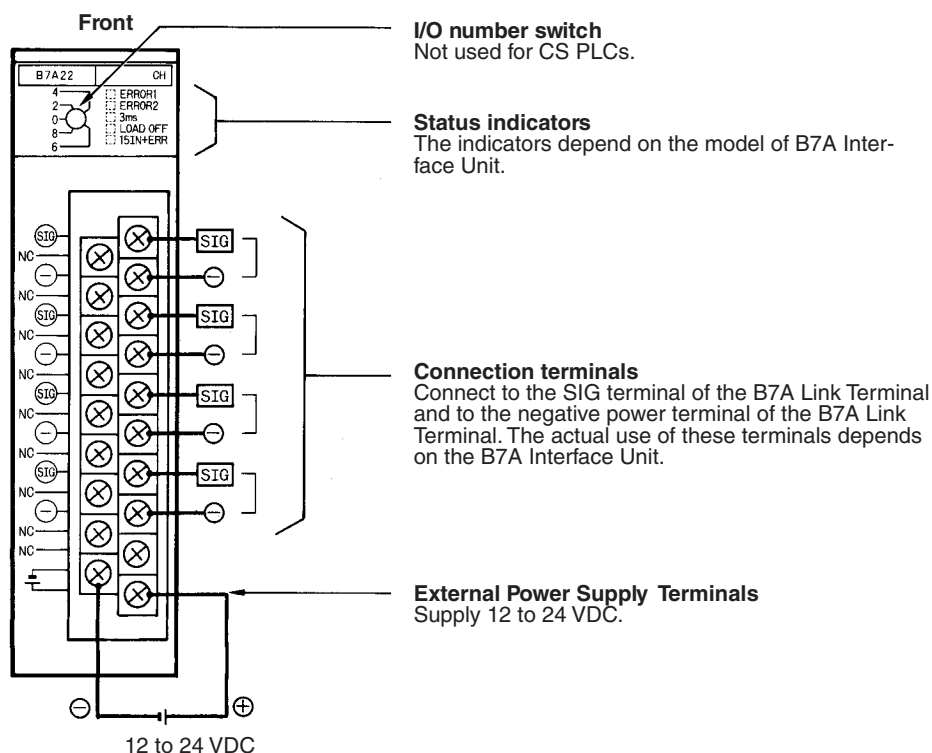
| Type            | Model     | Transmission delay |
|-----------------|-----------|--------------------|
| Screw terminals | B7A-T6□1  | Standard (19.2 ms) |
|                 | B7AS-T6□1 |                    |
|                 | B7A-T6□6  | High-speed (3 ms)  |
|                 | B7AS-T6□6 |                    |
| Modular         | B7A-T6D2  | Standard (19.2 ms) |
|                 | B7A-T6D7  | High-speed (3 ms)  |
| PLC connectors  | B7A-T□E3  | Standard (19.2 ms) |
|                 | B7A-T□E8  | High-speed (3 ms)  |

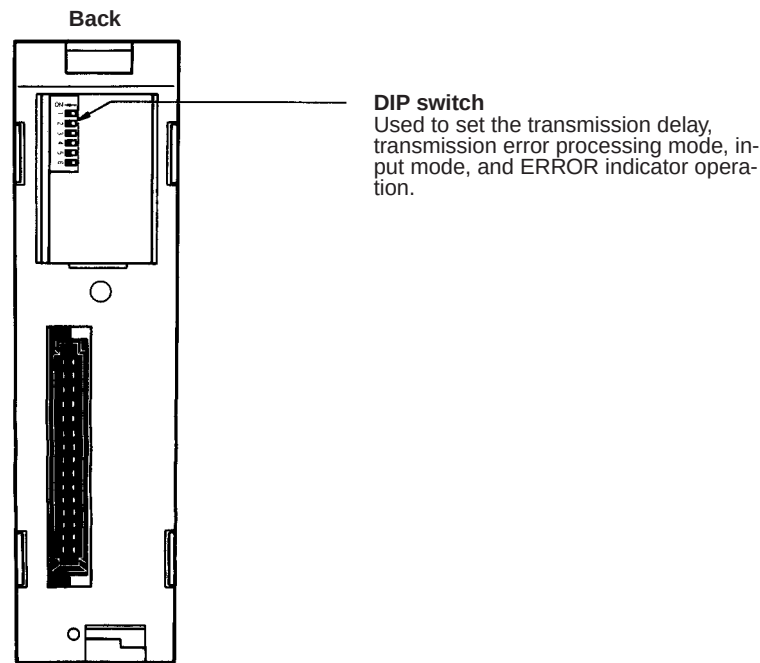
## Output Terminals

| Type            | Model      | Transmission delay |
|-----------------|------------|--------------------|
| Screw terminals | B7A-R6□□1  | Standard (19.2 ms) |
|                 | B7AS-R6□□1 |                    |
|                 | B7A-R6□□6  | High-speed (3 ms)  |
|                 | B7AS-R6□□6 |                    |
| Modular         | B7A-R6A52  | Standard (19.2 ms) |
|                 | B7A-R6A57  | High-speed (3 ms)  |
| PLC connectors  | B7A-R□A□3  | Standard (19.2 ms) |
|                 | B7A-R□A□8  | High-speed (3 ms)  |

- Note**
1. Do not connect Terminals with different transmission delays to the same Interface Unit. Doing so will cause a transmission error.
  2. Only 16-point or 32-point B7A Link Terminals can be connected to B7A Interface Units. Mixed I/O B7A Link Terminals and 10-point B7A Link Terminals cannot be connected.

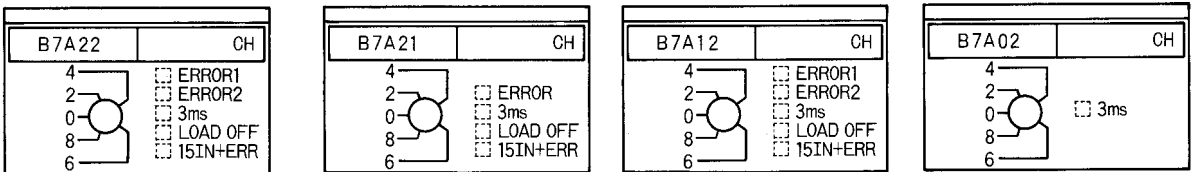
## Parts and Names (C200H-B7A22 shown below)





Indicator Operation

The indicators depend on the model of B7A Interface Unit, as shown below.



| Name                        |                               | Color  | Function                                                                                                                                                                                           |
|-----------------------------|-------------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ERROR 1<br>ERROR 2<br>ERROR | Input trans-<br>mission error | Red    | Lights when an error occurs in transmissions from an Input B7A Link Terminal. For the B7A12/22, ERROR 1 is for the first word allocated to the B7A Interface Unit; ERROR 2 is for the second word. |
| 3ms                         | Transmission<br>delay setting | Orange | Lit when the transmission delay is set to the high-speed setting (3 ms).<br>Not lit when the transmission delay is set to the standard setting (19.2 ms).                                          |
| LOAD OFF                    | Transmission<br>error process | Orange | Lit when the processing for transmission errors is set to reset input status.<br>Not lit when the processing for transmission errors is set to hold input status.                                  |
| 15IN+ERR                    | Input mode<br>setting         | Orange | Lit when the input mode is set to use 15 inputs and 1 error input.<br>Not lit when the input mode is set to use 16 inputs.                                                                         |

**Note** With CS-series PLCs, I/O is allocated to Group-2 B7A Interface Units just like other Basic I/O Units. The unit number setting on the front panel of the Group-2 B7A Interface Unit is not used and does not affect I/O allocations.

**DIP Switch Settings**

Set the DIP switch as described before for the various models of B7A Interface Units.

**C200H-B7A22/12**

| Pin | Function                   | OFF                | ON                      |
|-----|----------------------------|--------------------|-------------------------|
| 1   | Transmission delay         | Standard (19.2 ms) | High-speed (3 ms)       |
| 2   | Transmission error process | Hold status        | Reset Inputs            |
| 3   | Input mode                 | 16 inputs          | 15 inputs + error input |
| 4   | ERROR 1 indicator enable   | Disabled           | Enabled                 |
| 5   | ERROR 2 indicator enable   | Disabled           | Enabled                 |
| 6   | Not used.                  | NA                 | NA                      |

Factory settings: Pins 4 and 5 ON, others OFF.

**C200H-B7A21**

| Pin | Function                   | OFF                | ON                      |
|-----|----------------------------|--------------------|-------------------------|
| 1   | Transmission delay         | Standard (19.2 ms) | High-speed (3 ms)       |
| 2   | Transmission error process | Hold status        | Reset Inputs            |
| 3   | Input mode                 | 16 inputs          | 15 inputs + error input |
| 4   | ERROR indicator enable     | Disabled           | Enabled                 |
| 5   | Not used.                  | NA                 | NA                      |
| 6   | Not used.                  | NA                 | NA                      |

Factory settings: Pin 5 ON, others OFF.

**C200H-B7A02**

| Pin | Function           | OFF                | ON                |
|-----|--------------------|--------------------|-------------------|
| 1   | Transmission delay | Standard (19.2 ms) | High-speed (3 ms) |
| 2   | Not used.          | NA                 | NA                |
| 3   | Not used.          | NA                 | NA                |
| 4   | Not used.          | NA                 | NA                |
| 5   | Not used.          | NA                 | NA                |
| 6   | Not used.          | NA                 | NA                |

Factory settings: All pins OFF.

**Transmission Delay**

Pin 1 is used to set the transmission delay. The same delay is used for all words allocated to the Unit.

Set the transmission delay to match that of the B7A Link Terminal. A transmission error will occur if the same transmission delay is not set.

The “3ms” indicator will be lit whenever the high-speed (3 ms) transmission delay is set.

**Transmission Error Process**

Pin 2 is used to turned ON to specify resetting input status when transmission errors occur. If pin 2 is turned OFF, input status will be held when transmission errors occur.

The LOAD OFF indicator will be lit whenever pin 2 is turned ON.

**Input Mode**

Pin 3 is turned ON to specify use of only 15 inputs and the use of bit 15 as a Transmission Error Flag. If pin 3 is OFF, 16 normal inputs can be used.

The “15IN+ERR” indicator will be lit whenever pin 3 is turned ON.

**ERROR Indicators**

Pin 4 or pins 4 and 5 are turned ON to enable the ERROR, ERROR 1, and/or ERROR 2 indicators. These indicators will not light even if a transmission error occurs if the corresponding pin is turned OFF.

**Transmission Error Precautions****Startup**

The Transmission Error Flag for the B7A Interface Unit will be OFF when power is turned on to the CS-series PLCs. If normal transmissions with the B7A Link Terminal are not possible within about 10 ms, the Transmission Error Flag (bit 15) will turn ON (i.e., if its operation is enabled by the input mode setting).

All input bits will remain OFF until normal transmissions are achieved.

**Inputs**

When a transmission error occurs, input status will be either held or all inputs will be reset according to the setting for the transmission error process, and the Transmission Error Flag (bit 15) will turn ON (i.e., if its operation is enabled by the input mode setting). The Transmission Error Flag will go OFF and the input status will return to normal when normal transmissions are achieved again.

**Outputs**

Transmission errors for Output B7A Link Terminals are not detected at the B7A Interface Unit and must be confirmed using the error indicators or error outputs on the Link Terminal.

**Wiring****Terminal Names and Allocations**

The use of the terminals depends on the model of the B7A Interface Unit. "m" indicates the first word allocated to the Unit.

**C200H-B7A22**

| Terminal | Name     | Function                                                        | Word  |
|----------|----------|-----------------------------------------------------------------|-------|
| B0       | SIG OUT1 | Connect to SIG terminal on Output B7A Link Terminal.            | m     |
| B1       | – OUT1   | Connect to – power supply terminal on Output B7A Link Terminal. |       |
| B2       | SIG OUT2 | Connect to SIG terminal on Output B7A Link Terminal.            | m + 1 |
| B3       | – OUT2   | Connect to – power supply terminal on Output B7A Link Terminal. |       |
| B4       | SIG IN1  | Connect to SIG terminal on Input B7A Link Terminal.             | m + 2 |
| B5       | – IN1    | Connect to – power supply terminal on Input B7A Link Terminal.  |       |
| B6       | SIG IN2  | Connect to SIG terminal on Input B7A Link Terminal.             | m + 3 |
| B7       | – IN2    | Connect to – power supply terminal on Input B7A Link Terminal.  |       |
| B8       | NC       | Not used.                                                       | ---   |
| A0 to A7 |          |                                                                 |       |
| B9       | +V       | Connect to + terminal on external power supply.                 |       |
| A8       | –V       | Connect to – terminal on external power supply.                 |       |

**C200H-B7A21**

| Terminal | Name     | Function                                                        | Word  |
|----------|----------|-----------------------------------------------------------------|-------|
| B0       | SIG OUT1 | Connect to SIG terminal on Output B7A Link Terminal.            | m     |
| B1       | – OUT1   | Connect to – power supply terminal on Output B7A Link Terminal. |       |
| B2, B3   | NC       | Not used.                                                       | ---   |
| B4       | SIG IN1  | Connect to SIG terminal on Input B7A Link Terminal.             | m + 1 |
| B5       | – IN1    | Connect to – power supply terminal on Input B7A Link Terminal.  |       |

| Terminal             | Name | Function                                        | Word |
|----------------------|------|-------------------------------------------------|------|
| B6 to B8<br>A0 to A7 | NC   | Not used.                                       | ---- |
| B9                   | +V   | Connect to + terminal on external power supply. |      |
| A8                   | –V   | Connect to – terminal on external power supply. |      |

**C200H-B7A12**

| Terminal             | Name    | Function                                                       | Word  |
|----------------------|---------|----------------------------------------------------------------|-------|
| B0                   | SIG IN1 | Connect to SIG terminal on Input B7A Link Terminal.            | m     |
| B1                   | – IN1   | Connect to – power supply terminal on Input B7A Link Terminal. |       |
| B2, B3               | NC      | Not used.                                                      | ---   |
| B4                   | SIG IN2 | Connect to SIG terminal on Input B7A Link Terminal.            | m + 1 |
| B5                   | – IN2   | Connect to – power supply terminal on Input B7A Link Terminal. |       |
| B6 to B8<br>A0 to A7 | NC      | Not used.                                                      | ---   |
| B9                   | +V      | Connect to + terminal on external power supply.                |       |
| A8                   | –V      | Connect to – terminal on external power supply.                |       |

**C200H-B7A02**

| Terminal             | Name     | Function                                                        | Word  |
|----------------------|----------|-----------------------------------------------------------------|-------|
| B0                   | SIG OUT1 | Connect to SIG terminal on Output B7A Link Terminal.            | m     |
| B1                   | – OUT1   | Connect to – power supply terminal on Output B7A Link Terminal. |       |
| B2, B3               | NC       | Not used.                                                       | ---   |
| B4                   | SIG OUT2 | Connect to SIG terminal on Output B7A Link Terminal.            | m + 1 |
| B5                   | – OUT2   | Connect to – power supply terminal on Output B7A Link Terminal. |       |
| B6 to B8<br>A0 to A7 | NC       | Not used.                                                       | ---   |
| B9                   | +V       | Connect to + terminal on external power supply.                 |       |
| A8                   | –V       | Connect to – terminal on external power supply.                 |       |

**Recommended Cables and Transmission Distance**

The following cables are recommended to connect the B7A Interface Unit to B7A Link Terminals. The wiring method and transmission distance depend on the transmission delay and on whether or not a common power supply is being used for the B7A Link Terminal and the Interface Unit.

**Standard Transmission Delays (19.2 ms): Cap-tire Cable**

| Power supply | Cable                                     | Transmission distance |
|--------------|-------------------------------------------|-----------------------|
| Common       | VCTF, 0.75 mm <sup>2</sup> x 3 conductors | 100 m max.            |
| Separate     | VCTF, 0.75 mm <sup>2</sup> x 2 conductors | 500 m max.            |

**High-speed Transmission Delays (3 ms): Shielded Cable**

| Power supply | Cable                                               | Transmission distance |
|--------------|-----------------------------------------------------|-----------------------|
| Common       | Shielded cable, 0.75 mm <sup>2</sup> x 3 conductors | 50 m max.             |
| Separate     | Shielded cable, 0.75 mm <sup>2</sup> x 2 conductors | 100 m max.            |

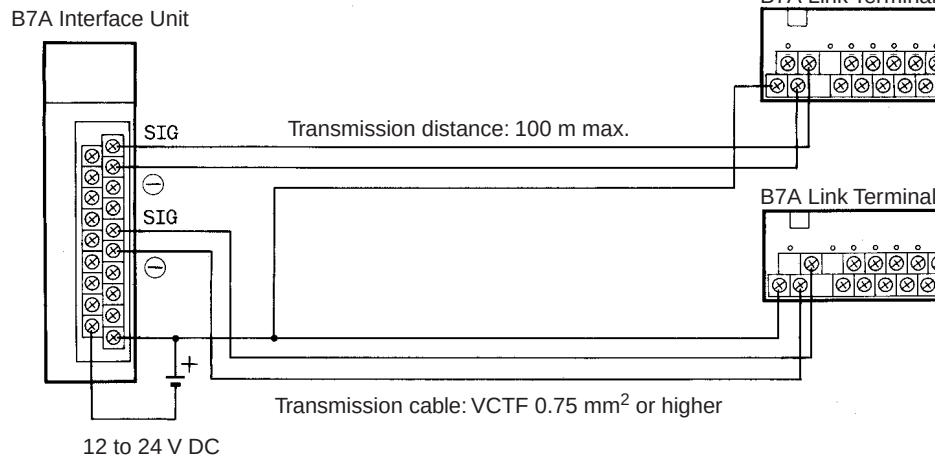
### Terminal Construction

Use hook-type crimp connectors with a line thickness of 0.25 to 1.65 mm<sup>2</sup>.  
The construction of the terminals is shown in the illustration.

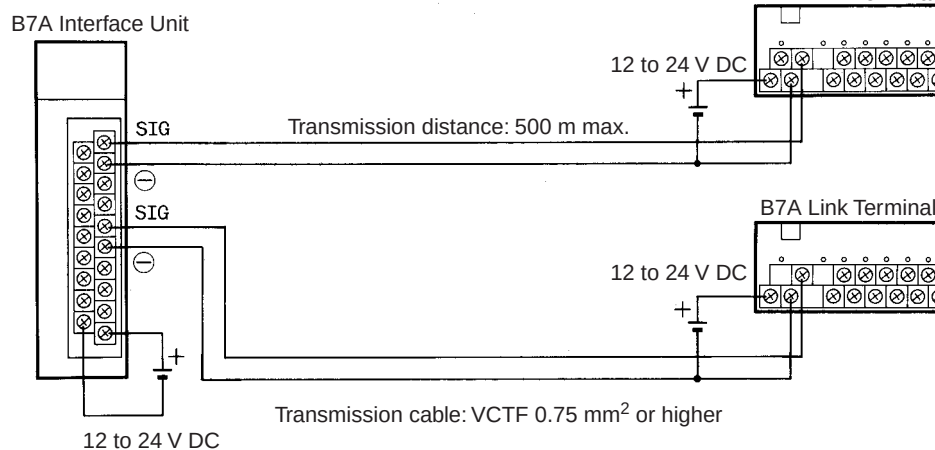
### Wiring Method

#### Standard Transmission Delays (19.2 ms)

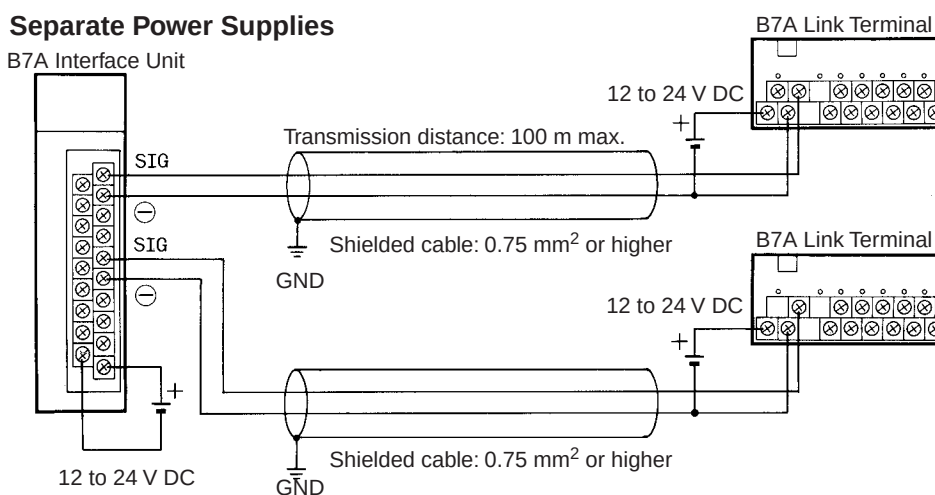
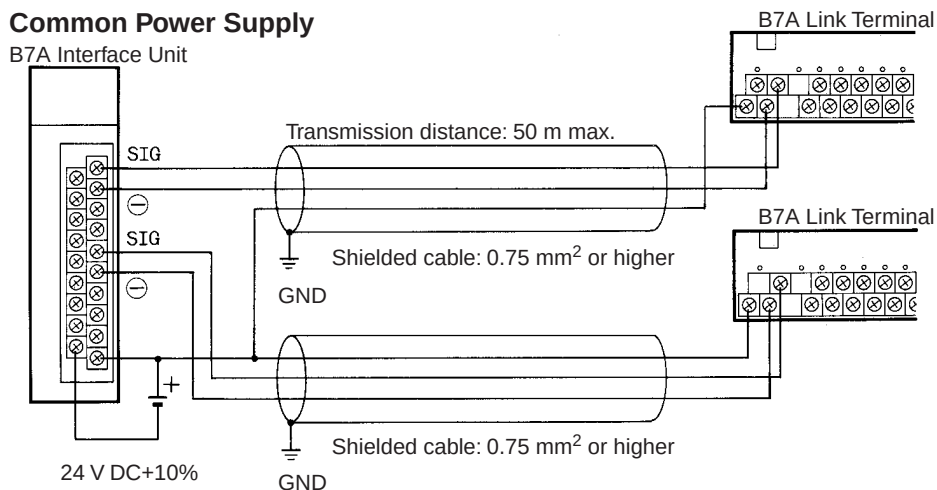
##### Common Power Supply



##### Separate Power Supplies



## High-speed Transmission Delays (3 ms): Shielded Cable

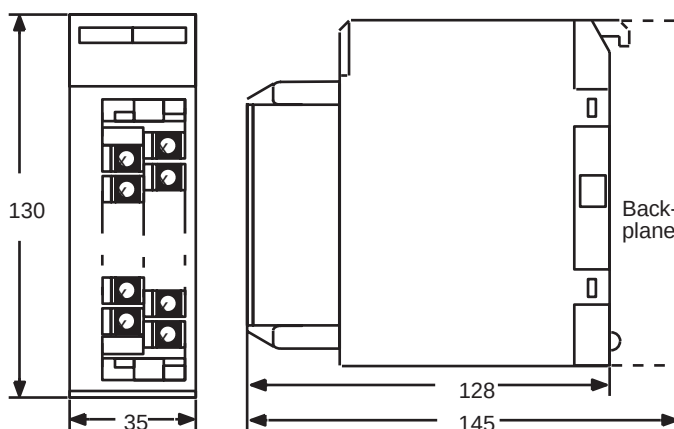


- Note**
1. We recommend grounding the shielded cable.
  2. If shielded cable is not used, the maximum transmission distance is 10 m regardless of whether a common or separate power supplies are used. (Use 0.75 mm<sup>2</sup> or higher VCTF cable.)
  3. To prevent noise on the transmission cable, do not lay it near power cables or high-voltage lines.

**Specifications**

| Item                               | C200H-B7A12                                                            | C200H-B7A02      | C200H-B7A21                                                             | C200H-B7A22                                                              |
|------------------------------------|------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------|
| I/O points                         | 32 input points or 30 input points and 2 error inputs                  | 32 output points | 16 output points and 16 input points or 15 input points + 1 error input | 32 output points and 32 input points or 30 input points + 2 error inputs |
| Transmission method                | One-way distributed multiplex transmission                             |                  |                                                                         |                                                                          |
| Transmission distance (see note 1) | Standard: 500 m max.<br>High-speed: 100 m max.                         |                  |                                                                         |                                                                          |
| Transmission delay                 | Standard: Typ. 19.2 ms, 31 ms max.<br>High-speed: Typ. 3 ms, 5 ms max. |                  |                                                                         |                                                                          |
| Minimum input time (see note 2, 3) | Standard: 16 ms<br>High-speed: 2.4 ms                                  |                  |                                                                         |                                                                          |
| Internal current consumption       | 5 V DC, 100 mA max.                                                    |                  |                                                                         |                                                                          |
| External power supply (see note 4) | 12 to 24 V DC $\pm 10\%$                                               |                  |                                                                         |                                                                          |
|                                    | 0.05 A min.                                                            | 0.06 A min.      | 0.05 A min.                                                             | 0.08 A min.                                                              |
| Weight                             | 300 g max.                                                             |                  |                                                                         |                                                                          |
| Dimensions                         | 35 x 130 x 128 mm (W x H x D)                                          |                  |                                                                         |                                                                          |

- Note**
1. The transmission distance also depends on whether a common or separate power supplies are used.
  2. The minimum input time refers to the minimum time required for reading the input signals from the CPU Unit.
  3. The ON/OFF width of the signal transmitted from the CPU Unit to the Output Relay of the B7A Interface Unit should be set to a value larger than the minimum input time.
  4. The capacity of the external power supply does not include the capacity required by the B7A Link Terminal.

**Dimensions**



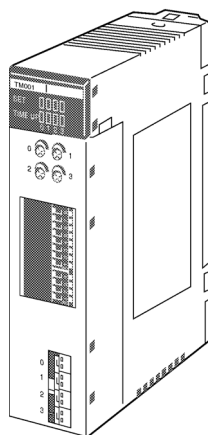
## 3-9 Analog Timer Units

Analog Timer Units are classified as Basic I/O Units.

Analog Timer Units have 4 built-in timers (numbers 0 to 3). The timer settings can be adjusted using the internal and external variable resistors without requiring a Programming Device. The timer can also be used as an accumulative register to temporarily pause the timer operation using a timer pause input.

### Models

| Name              | Specifications                                                                       | Model       |
|-------------------|--------------------------------------------------------------------------------------|-------------|
| Analog Timer Unit | 4-point timer<br>Timer settings: 0.1 to 1.0 s, 1.0 to 10 s, 10 to 60 s, 1 to 10 min. | C200H-TM001 |

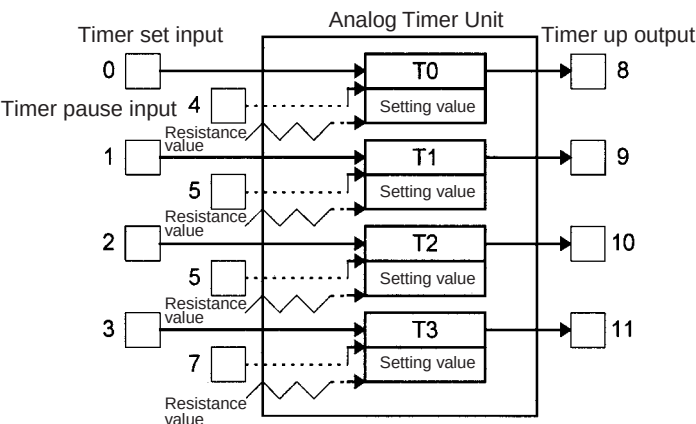


The Analog Timer Unit is classified as a Basic I/O Unit and is allocated one word in the I/O Area. The word (16 bits) allocated to the Unit is used for the 4 timers' start input, pause input, time-up output, and data transfer with the CPU Unit.

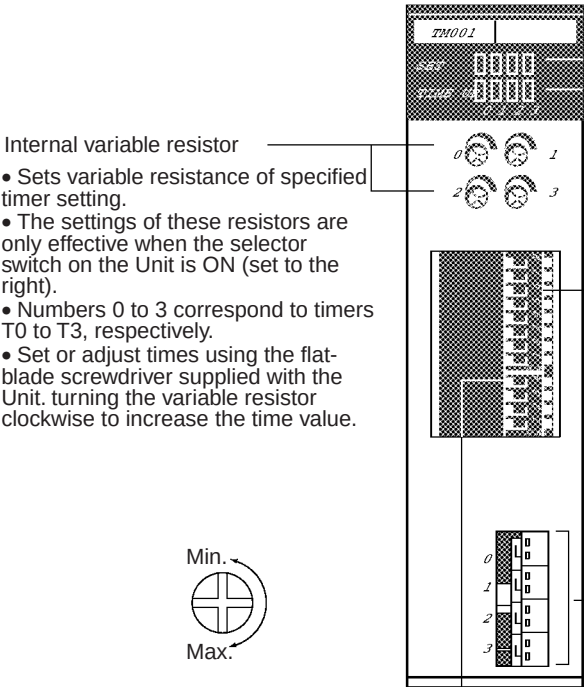
| Allocated words  | Bits             | Details         | Direction                     |
|------------------|------------------|-----------------|-------------------------------|
| 1 word (16 bits) | 4 (bits 0 to 3)  | Set Bit         | CPU Unit to Analog Timer Unit |
|                  | 4 (bits 4 to 7)  | Pause Inputs    | CPU Unit to Analog Timer Unit |
|                  | 4 (bits 8 to 11) | Time-up Outputs | Analog Timer Unit to CPU Unit |

The timer settings are adjusted using the internal and external variable resistors. The timer settings can be selected using the DIP switch for each timer number from one of the following four settings.

0.1 to 1 s, 1 to 10 s, 10 to 60 s, 1 to 10 min



Components and Switch Settings



Internal variable resistor

- Sets variable resistance of specified timer setting.
- The settings of these resistors are only effective when the selector switch on the Unit is ON (set to the right).
- Numbers 0 to 3 correspond to timers T0 to T3, respectively.
- Set or adjust times using the flat-blade screwdriver supplied with the Unit, turning the variable resistor clockwise to increase the time value.



| INT/EXT selector switch |                            |
|-------------------------|----------------------------|
| ON                      | Internal variable resistor |
| OFF                     | External variable resistor |

|     |     |     |     |
|-----|-----|-----|-----|
| T0  | T1  | T2  | T3  |
| SW4 | SW3 | SW2 | SW1 |

Timer status indicators

The SET indicators in the top row light when the corresponding timer is operating and the TIME UP indicators in the bottom row light when the corresponding time is up.

Time range setting

Each timer uses 2 pins. The upper 8 pins 8 to 1 are used for timers T0 to T3 as follows:

(0: OFF, 1: ON)

| Timer | Pin | 0.1 to 1 s | 1 to 10 s | 10 to 60 s | 1 to 10 m |
|-------|-----|------------|-----------|------------|-----------|
| T0    | 8   | 0          | 1         | 0          | 1         |
|       | 7   | 0          | 0         | 1          | 1         |
| T1    | 6   | 0          | 1         | 0          | 1         |
|       | 5   | 0          | 0         | 1          | 1         |
| T2    | 4   | 0          | 1         | 0          | 1         |
|       | 3   | 0          | 0         | 1          | 1         |
| T3    | 2   | 0          | 1         | 0          | 1         |
|       | 1   | 0          | 0         | 1          | 1         |

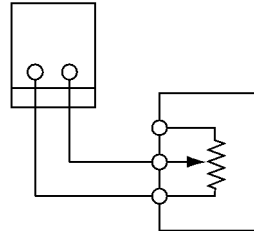
External variable resistor connectors

- Cable connector for when timer is set with external volume instead of internal volume.
- Turn OFF (set to left) the Internal/external volume selector switch.
- Numbers 0 to 3 correspond to timers T0 to T3.
- The external volume resistance is 20 kΩ.
- Use the following connectors. The C4K-CN223 (2 m) connector with cable can also be used.

| Name      | Model         | Manufacturer                              |
|-----------|---------------|-------------------------------------------|
| Connector | IL-2S-S3L-(N) | Japan Aviation Electronics Industry, Ltd. |
| Contact   | IL-C2-1-10000 |                                           |

- Note**
1. When the internal variable resistor is used, make sure that the external variable resistor connector for the same timer number is open. Otherwise the internal variable resistor settings will not function properly.
  2. Use AWG 28 to AWG 22 lead wires for the external variable resistor connectors.
  3. Soldering is not required to wire the external variable resistor connectors. Wire the connector as shown in the following diagram.

Analog Timer Unit connector



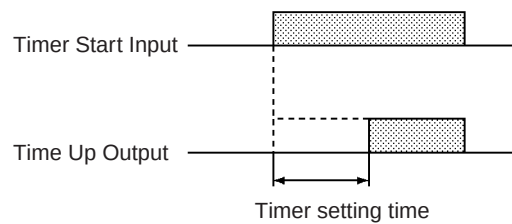
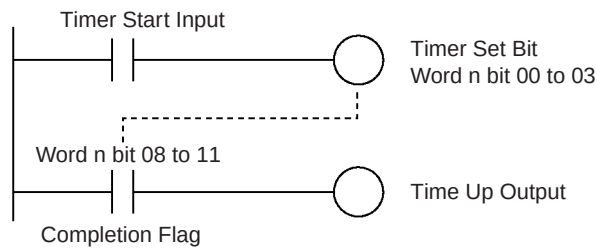
External variable resistor: 20 k $\Omega$   
 Diameter: 16  
 Shaft length: 15 mm  
 Check manufacturer's specifications

### Analog Timer Unit Specifications

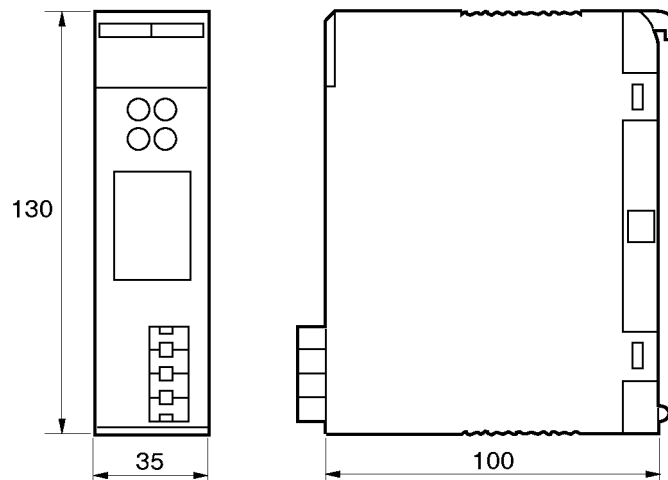
| Item                         | Specifications                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------|--------|--|----|--------|------------|--------------------------|----|--------|------------|----|--------|------------|----|--------|------------|----|--------|--------------------|-------------------------|----|--------|--------------------|----|--------|--------------------|----|--------|--------------------|----|-------|--------------------|---------------------|----|-------|--------------------|----|-------|--------------------|----|-------|--------------------|----|-----|----------|--|----|-----|----------|--|----|-----|----------|--|----|-----|----------|--|
| Oscillation method           | CR oscillation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| Number of timer points       | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| Time setting range           | Use the DIP switch to set any of the following four ranges.<br>0.1 to 1 s (typical)<br>1 to 10 s (typical)<br>10 to 60 s (typical)<br>1 to 10 min (typical)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| Timer pause function         | The timing operation can be paused by the user program, so the timers can be used as cumulative registers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| Operation indicators         | SET and TIME UP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| External variable resistor   | Either the external variable resistor or the internal variable resistor can be selected using the INT/EXT selector switch on the front panel of the Unit. External variable resistors are connected by wiring the connector. Use 20 kΩ variable resistors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| Relay number allocations     | <div>One word (16 bits) is allocated in the I/O Area.</div> <table><thead><tr><th>Bit</th><th>I/O</th><th>Word n</th><th></th></tr></thead><tbody><tr><td>00</td><td>Output</td><td>T0 Set Bit</td><td rowspan="4">"1" when time is running</td></tr><tr><td>01</td><td>Output</td><td>T1 Set Bit</td></tr><tr><td>02</td><td>Output</td><td>T2 Set Bit</td></tr><tr><td>03</td><td>Output</td><td>T3 Set Bit</td></tr><tr><td>04</td><td>Output</td><td>T0 Pause Input Bit</td><td rowspan="4">0: Operates<br/>1: Stops</td></tr><tr><td>05</td><td>Output</td><td>T1 Pause Input Bit</td></tr><tr><td>06</td><td>Output</td><td>T2 Pause Input Bit</td></tr><tr><td>07</td><td>Output</td><td>T3 Pause Input Bit</td></tr><tr><td>08</td><td>Input</td><td>T0 Completion Flag</td><td rowspan="4">"1" when time is up</td></tr><tr><td>09</td><td>Input</td><td>T1 Completion Flag</td></tr><tr><td>10</td><td>Input</td><td>T2 Completion Flag</td></tr><tr><td>11</td><td>Input</td><td>T3 Completion Flag</td></tr><tr><td>12</td><td>---</td><td>Not Used</td><td></td></tr><tr><td>13</td><td>---</td><td>Not Used</td><td></td></tr><tr><td>14</td><td>---</td><td>Not Used</td><td></td></tr><tr><td>15</td><td>---</td><td>Not Used</td><td></td></tr></tbody></table> | Bit                | I/O                      | Word n |  | 00 | Output | T0 Set Bit | "1" when time is running | 01 | Output | T1 Set Bit | 02 | Output | T2 Set Bit | 03 | Output | T3 Set Bit | 04 | Output | T0 Pause Input Bit | 0: Operates<br>1: Stops | 05 | Output | T1 Pause Input Bit | 06 | Output | T2 Pause Input Bit | 07 | Output | T3 Pause Input Bit | 08 | Input | T0 Completion Flag | "1" when time is up | 09 | Input | T1 Completion Flag | 10 | Input | T2 Completion Flag | 11 | Input | T3 Completion Flag | 12 | --- | Not Used |  | 13 | --- | Not Used |  | 14 | --- | Not Used |  | 15 | --- | Not Used |  |
| Bit                          | I/O                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Word n             |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 00                           | Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | T0 Set Bit         | "1" when time is running |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 01                           | Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | T1 Set Bit         |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 02                           | Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | T2 Set Bit         |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 03                           | Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | T3 Set Bit         |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 04                           | Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | T0 Pause Input Bit | 0: Operates<br>1: Stops  |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 05                           | Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | T1 Pause Input Bit |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 06                           | Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | T2 Pause Input Bit |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 07                           | Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | T3 Pause Input Bit |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 08                           | Input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | T0 Completion Flag | "1" when time is up      |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 09                           | Input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | T1 Completion Flag |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 10                           | Input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | T2 Completion Flag |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 11                           | Input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | T3 Completion Flag |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 12                           | ---                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Not Used           |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 13                           | ---                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Not Used           |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 14                           | ---                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Not Used           |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| 15                           | ---                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Not Used           |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| Internal current consumption | 60 mA 5 V DC max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |
| Weight                       | 200 g max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                          |        |  |    |        |            |                          |    |        |            |    |        |            |    |        |            |    |        |                    |                         |    |        |                    |    |        |                    |    |        |                    |    |       |                    |                     |    |       |                    |    |       |                    |    |       |                    |    |     |          |  |    |     |          |  |    |     |          |  |    |     |          |  |

## Timer Operation

- When the Timer Start Input turns ON, the Timer Set Bits allocated to the Analog Timer Unit (word n bits 00 to 03) turn ON, and the Analog Timer will operate. The timer set indicator (SET) on the Analog Timer Unit will light.
- After the time specified by the internal variable resistor or external variable resistor has elapsed, the Unit's Completion Output (word n bits 08 to 11) will turn ON, and the Time Up Output will turn ON. The TIME UP indicator on the Analog Timer Unit will turn light.



## Dimensions





# SECTION 4

## Operating Procedures

This section outlines the steps required to assemble and operate a CS-series PLC system.

|     |                        |     |
|-----|------------------------|-----|
| 4-1 | Introduction . . . . . | 194 |
| 4-2 | Examples . . . . .     | 196 |

## 4-1 Introduction

The following procedure outlines the recommended steps to follow when preparing CS-series PLCs for operation.

**1,2,3...**

1. Install the provided battery in the CPU Unit (CS1 CPU Units only).
2. Installation

Set the DIP switches on the front of each Unit as required.  
Mount the CPU Unit, Power Supply Unit, and other Units to the Backplane.  
Install the Inner Board and Memory Card if required.  
See 5-2 *Installation* for details.
3. Wiring

Connect the power supply wiring, I/O wiring, and Programming Device (CX-Programmer or Programming Console). Connect communications wiring as required.  
See 5-3 *Wiring* for details on power supply and I/O wiring.  
See 2-3 *Basic System Configuration* for details on connecting Programming Devices.
4. Initial Settings (Hardware)

Set the DIP switches and Rotary switches on the front of the CPU Unit and other Units.  
See 6-1 *DIP Switch Settings* for details.
5. Checking Initial Operation
  - a) Set the operating mode to PROGRAM mode and connect the Programming Console.
  - b) Turn the power on after checking the power supply wiring and voltage. Check the Power Supply Unit's POWER indicator and Programming Console's display.
6. Clearing Memory

This step is necessary only for CS1 CPU Units. It can be skipped for CS1-H CPU Units.

Using the CX-Programmer:

  - a) Connect the system online. Online connection can also be made by selecting "Work Online" from the PLC menu.
  - b) Double-click Error Log and select the Error Log tab.
  - c) Click "Clear All" and then click Yes.

Using a Programming Console:

  - d) When only cyclic task 0 is being used, specify no interrupt tasks when clearing memory.
  - e) When cyclic task 0 and one or more interrupt tasks are being used, specify interrupt tasks when clearing memory.
7. Registering the I/O Table

Check the Units to verify that they are installed in the right slots. With the PLC in PROGRAM mode, register the I/O table from the Programming Device (CX-Programmer or Programming Console). (Another method is to create the I/O table in CX-Programmer and transfer it to the CPU Unit.)  
See 8-1 *I/O Allocations* for details.
8. PLC Setup Settings

With the PLC in PROGRAM mode, change the settings in the PLC Setup as necessary from the Programming Device (CX-Programmer or Program-

ming Console). (Another method is to change the PLC Setup in CX-Programmer and transfer it to the CPU Unit.)

See 7-1 *PLC Setup* for details.

9. DM Area Settings

- a) Use a Programming Device (CX-Programmer or Programming Console) to make any necessary settings in the parts of the DM Area that are allocated to Special I/O Units, CS-series CPU Bus Units, and Inner Boards.
- b) Reset the power (ON → OFF → ON) or toggle the Restart Bit for each Unit or Board. See the Unit's or Board's Operation Manual for details.

10. Writing the Program

Write the program with the CX-Programmer or a Programming Console.

11. Transferring the Program (CX-Programmer Only)

With the PLC in PROGRAM mode, transfer the program from CX-Programmer to the CPU Unit.

See 7-1 *Program Transfer of CS/CS Series Programmable Controllers (W394)* for details.

12. Testing Operation

a) Checking I/O Wiring

|                      |                                                                                                                                                                                                             |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Output wiring</b> | With the PLC in PROGRAM mode, force-set output bits and check the status of the corresponding outputs.                                                                                                      |
| <b>Input wiring</b>  | Activate sensors and switches and either check the status of the indicators on the Input Unit or check the status of the corresponding input bits with the Programming Device's Bit/Word Monitor operation. |

b) Auxiliary Area Settings (As Required)

Check operation of special Auxiliary Area Settings such as the following:

|                           |                                                                                                                                       |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Output OFF Bit</b>     | When necessary, turn ON the Output OFF Bit (A50015) from the program and test operation with the outputs forced OFF.                  |
| <b>Hot Start Settings</b> | When you want to start operation (switch to RUN mode) without changing the contents of I/O memory, turn ON the IOM Hold Bit (A50012). |

c) Trial Operation

Test PLC operation by switching the PLC to MONITOR mode.

d) Monitoring and Debugging

Monitor operation from the Programming Device. Use functions such as force-setting/force-resetting bits, tracing, and online editing to debug the program.

See SECTION 7 *Program Transfer, Trial Operation, and Debugging of CS/CS Series Programmable Controllers (W394)* for details.

13. Saving and Printing the Program

14. Running the Program

Switch the PLC to RUN mode to run the program.



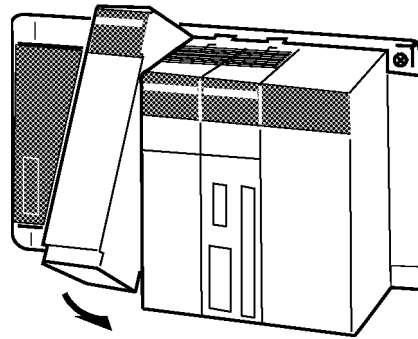
## 4-2 Examples

### 1. Battery Installation

Before using a CS1 CPU Unit, be sure to install the provided battery in the CPU Unit.

### 2. Installation

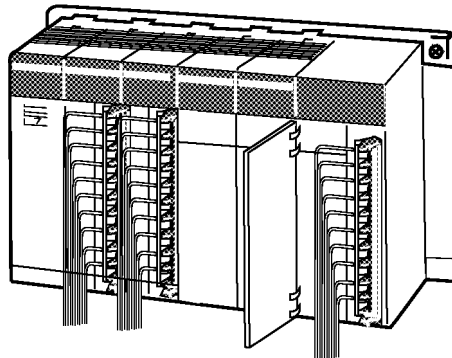
Mount the Backplane and install each Unit. When necessary, install the Inner Board or Memory Card.



Make sure that the total power consumption of the Units is less than the maximum capacity of the Power Supply Unit.

### 3. Wiring

Connect the power supply and I/O wiring.



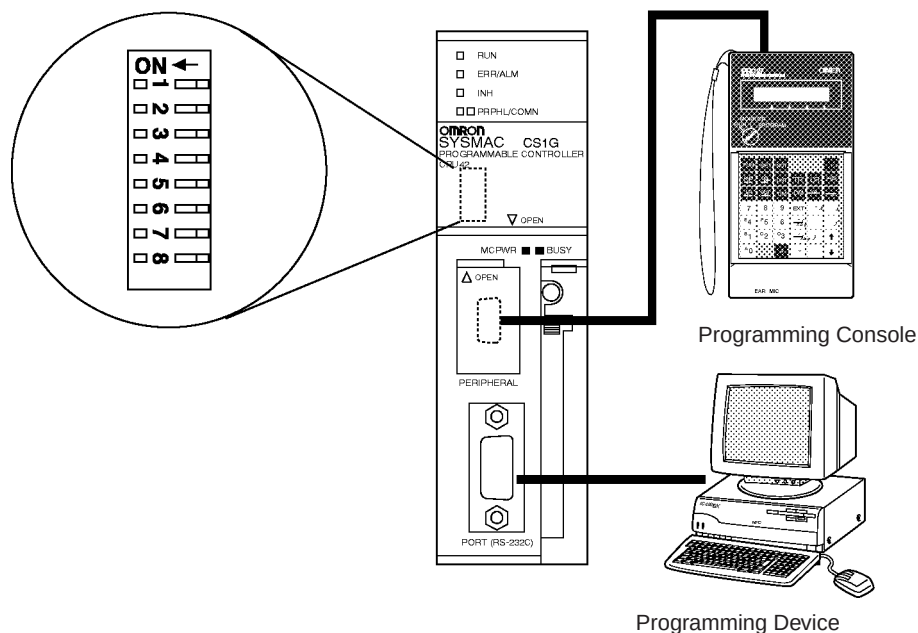
**Note** When 220-V AC power (200 to 240 V AC) is being supplied, be sure to remove the jumper bar that shorts the voltage selector terminals. The Power Supply Unit will be damaged if 220 V AC is supplied with the jumper bar connected.

### 4. Initial Settings (Hardware)

Make necessary hardware settings such as the DIP switch settings on the CPU Unit. In particular, be sure that the settings for the peripheral port and RS-232C port are correct.

In the following example, a Programming Console is connected to the peripheral port so pin 4 is turned OFF. A Programming Device other than a Programming Console is connected to the RS-232C port, so pin 5 is turned ON.

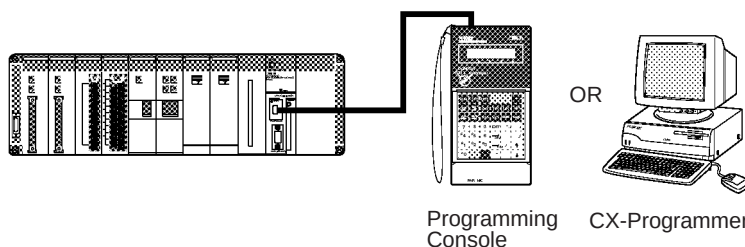
**Note** When devices other than a Programming Console and Programming Device are connected to the peripheral port and RS-232C port, turn ON pin 4 and turn OFF pin 5.



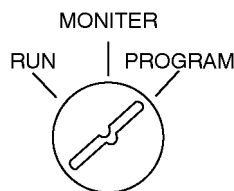
## 5. Checking Initial Operation

Use the following procedure to turn on the PLC and check initial operation.

- 1,2,3...** 1. Connect the Programming Console to the CPU Unit's peripheral port (the upper port).



2. Set the Programming Console's Mode Switch to PROGRAM mode.

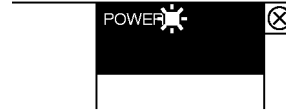


3. Check the power supply wiring and voltage and turn on the power.  
In particular, check that the voltage selector terminals (just below the power input terminals on the Power Supply Unit) are open when 220 V AC power is being supplied. These terminals should be connected only when 110 V AC power is being supplied.

**Caution** The Unit will be damaged if 220 V AC power is supplied and the voltage selector terminals are connected.

**Note** If, when using a CS1-H CPU Unit, the PLC Setup is set to specify using the mode set on the Programming Console and a Programming Console is not connected, the CPU Unit will start in RUN mode. This is the default setting in the PLC Setup. (A CS1 CPU Unit will start in PROGRAM mode under the same conditions.)

4. Check that the Power Supply Unit's POWER indicator is lit.



5. Check that the Programming Console has the following display.

```
<PROGRAM>
PASSWORD!
```

6. Press the password (the Clear and Monitor Keys) and check that the Programming Console has the following display.

CLR MON <PROGRAM> BZ

## 6. Clearing Memory

This step is necessary only for CS1 CPU Units. It can be skipped for CS1-H CPU Units.

### Clearing Memory with a Programming Console

Only one cyclic task can be created when programming with a Programming Console, although it is possible to create two or more interrupt tasks with interrupt task numbers ranging from 1 to 3 or 100 to 131.

**Note** Data areas won't be cleared if they are removed from the display. If no data areas are removed, the entire I/O memory area and PLC Setup will be cleared.

Connect to the PLC (online) and perform the memory clear operation.

**1,2,3...**

1. Clear memory.

CLR 0000000 CT\*\*

SET NOT RESET 0000000MEMORY CLR  
CHWA TCDE P

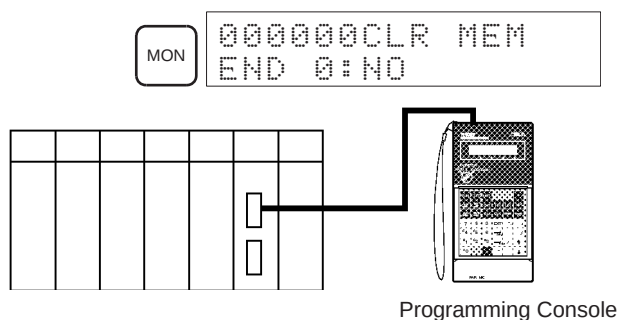
MON 0000000CLR MEM?  
0:ALL 1:TASK

0 0000000CLR MEM?  
INT 0:NO 1:YES

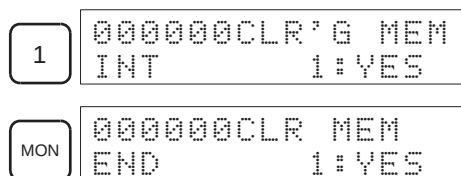
2. Indicate whether interrupt tasks will be created.

- If no interrupt tasks are being created, press the **0** and **MON** Keys.

0 0000000CLR'G MEM  
INT 0:NO

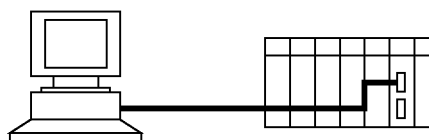


- If one or more interrupt tasks are being created, press the **1** and **MON** Keys.



### **Clearing Memory with CX-Programmer**

Multiple cyclic tasks and interrupt tasks can be created when CX-Programmer is used. Connect the computer and PLC, switch to online mode, and perform the all clear operation from the PLC Errors Window.



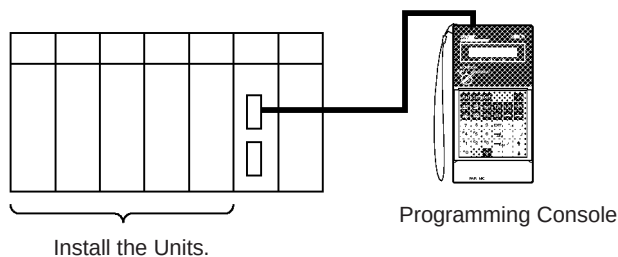
## **7. Registering the I/O Table**

Registering the I/O table allocates I/O memory to the Units actually installed in the PLC. This operation is required in CS-series PLCs.

**Note** The user program and parameter area data in CS1-H CPU Units is backed up in the built-in flash memory. The BKUP indicator will light on the front of the CPU Unit when the backup operation is in progress. Do not turn OFF the power supply to the CPU Unit when the BKUP indicator is lit. The data will not be backed up if power is turned OFF.

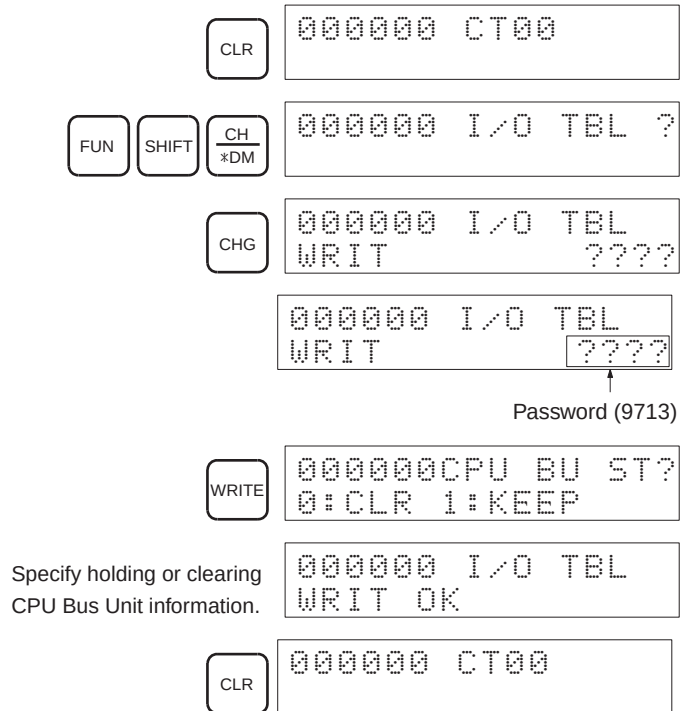
### **Using a Programming Console**

Use the following procedure to register the I/O table with a Programming Console.

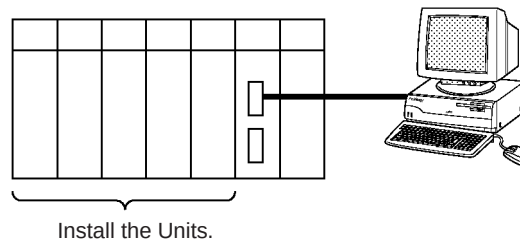


- 1,2,3...**
1. Install all of the Units in the PLC.
  2. Connect the Programming Console to the peripheral port.  
(It can be connected with the power on.)

## 3. Register the I/O tables.

**Using the CX-Programmer Online**

Use the following procedure to register the I/O table with the CX-Programmer that is connected to the PLC.

**1,2,3...**

1. Install all of the Units in the PLC.
2. Connect the host computer to the peripheral port or RS-232C port. (The power must be OFF.)  
Note If the host computer is being connected to the RS-232C port, pin 5 of the CPU Unit's DIP switch must be set to ON.
3. Double-click **I/O Table** on the project tree in the main window. The I/O Table Window will be displayed.
4. Select **Options** and then **Create**. The models and positions of Units mounted to the Racks will be written to the Registered I/O Table in the CPU Unit.

**Using the CX-Programmer Offline**

Use the following procedure to create the I/O table offline with the CX-Programmer and later transfer the I/O table from to the CPU Unit.



- 1,2,3...
1.

Double-click **I/O Table** on the project tree in the main window. The I/O Table Window will be displayed.
2.

Double-click the Rack to be edited. The slots for that Rack will be displayed.
3.

Right-click the slots to be edited and select the desired Units from the pull-down menu.
4.

Select **Options** and then **Transfer to PLC** to transfer the I/O table to the CPU Unit.

- Note
1.

The first word allocated to each Rack can be set in the PLC Setup.
2.

With the CS1-H CPU Units, detailed I/O table error information is stored in A261 whenever the I/O tables cannot be created for any reason. This information can be used to facilitate troubleshooting if an error occurs.

8. PLC Setup Settings

These settings are the CPU Unit's software configuration. See 7-1 PLC Setup for details on the settings.

The PLC Setup settings are arranged by word addresses when a Programming Console is used to make PLC Setup settings. This example shows a Programming Console used to make the following settings:

- Set a Minimum Cycle Time in 1-ms units.
- Set a Watch Cycle Time (maximum cycle time) in 10-ms units.

Setting with a Programming Console



| Address | Bits    | Setting                             | Setting range                                    |
|---------|---------|-------------------------------------|--------------------------------------------------|
| 208     | 0 to 15 | Minimum cycle time setting          | 0001 to 7D00                                     |
| 209     | 15      | Enable for Watch Cycle Time setting | 0:Use default<br>1: Use setting in bits 0 to 14. |
|         | 0 to 14 | Watch Cycle Time setting            | 0001 to 0FA0                                     |

- Note
- When a host computer or PT is connected to the peripheral port or RS-232C port, the port must be set for Host Link or NT Link communications in the PLC Setup. When a standard serial device is connected, the port must be set for no-protocol communications in the PLC Setup.

CLR

0000000 CT00

FUN

VRFY

PC SETUP  
0:MODE1:PC SETUP

1

PC SETUP  
+000 0000

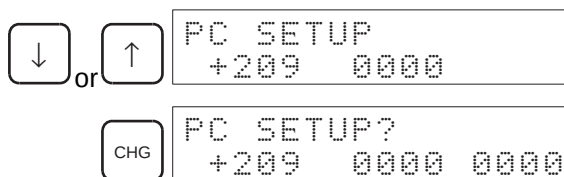
Specifying a word address in the PLC Setup.  
(Example: 209)

2

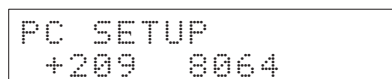
0

9

PC SETUP  
+209



Example: Input 8064.

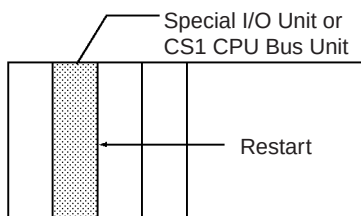


## 9. DM Area Settings

The following table shows the parts of the DM Area are allocated to Special I/O Units, CS-series CPU Bus Units, and Inner Boards for initial settings. The actual settings depend on the model of Unit or Inner Board being used.

| Unit/Board        | Allocated words                         |
|-------------------|-----------------------------------------|
| Special I/O Units | D20000 to D29599 (100 words × 96 Units) |
| CPU Bus Units     | D30000 to D31599 (100 words × 16 Units) |
| Inner Board       | D32000 to D32099 (100 words × 1 Board)  |

After writing the initial settings to the DM Area, be sure to restart the Units by turning the PLC off and then on again or toggling the Restart Bits for the affected Units.



## 10. Writing the Program

Write the program with the CX-Programmer or a Programming Console.

Unlike earlier OMRON PLCs, the CS-series PLC's program can be divided into independently executable tasks. A single cyclic task can be written for program execution like earlier PLCs or several cyclic tasks can be written for a more flexible and efficient program. The following table shows the differences when programming with CX-Programmer or a Programming Console.

| Programming Device  | Relationship between Tasks and Program                     | Writing a new program                         |                                                                 | Editing an existing program |                    |
|---------------------|------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------|-----------------------------|--------------------|
|                     |                                                            | Cyclic tasks                                  | Interrupt tasks                                                 | Cyclic tasks                | Interrupt tasks    |
| CX-Programmer       | Specify the type of task and task number for each program. | All can be written.<br>(Cyclic tasks 0 to 31) | All can be written.<br>(Interrupt tasks 0 to 255)               | All can be edited.          | All can be edited. |
| Programming Console | Task = program<br>(Cyclic task 0 is the main program)      | Only one can be written.<br>(Cyclic task 0)   | Several can be written.<br>(Interrupt tasks 1 to 3, 100 to 131) | All can be edited.          | All can be edited. |

**Note** When writing the program with a Programming Console, specify whether there are interrupt tasks during the memory clear operation.

### 11. Transferring the Program

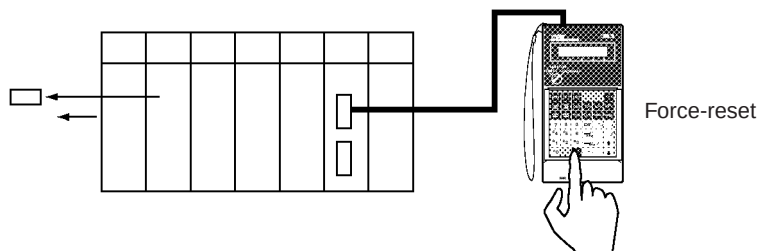
When the program has been created in a Programming Device other than a Programming Console, it must be transferred to the PLC's CPU Unit.

### 12. Testing Operation

Before performing a Trial Operation in MONITOR mode, check the I/O wiring.

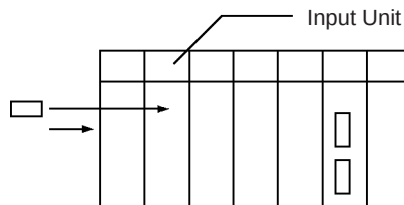
#### Check Output Wiring

With the PLC in PROGRAM mode, force-set and force-reset output bits and verify that the corresponding outputs operate properly.



#### Check Input Wiring

Activate input devices such as sensors and switches and verify that the corresponding indicators on the Input Units light. Also, use the Bit/Word Monitor operation in the Programming Device to verify the operation of the corresponding input bits.

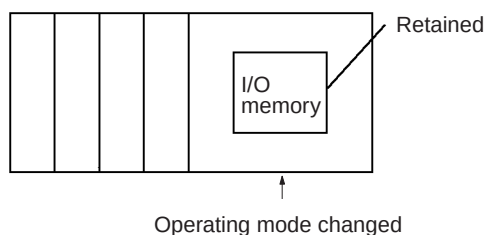


### 13. Auxiliary Area Settings

Make any required Auxiliary Area settings, such as the ones shown below. These settings can be made from a Programming Device (including a Programming Console) or instructions in the program.

#### IOM Hold Bit (A50012)

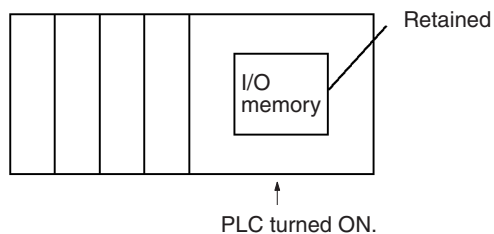
Turning ON the IOM Hold Bit protects the contents of I/O memory (the CIO Area, Work Area, Timer Completion Flags and PVs, Index Registers, and Data Registers) that would otherwise be cleared when the operating mode is switched from PROGRAM mode to RUN/MONITOR mode or vice-versa.



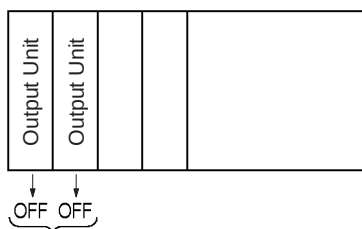


**IOM Hold Bit Status at Startup**

When the IOM Hold Bit has been turned ON and the PLC Setup is set to protect the status of the IOM Hold Bit at startup (PLC Setup address 80 bit 15 turned ON), the contents of I/O memory that would otherwise be cleared will be retained when the PLC is turned ON.

**Output OFF Bit (A50015)**

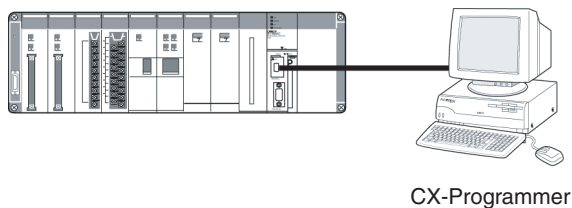
Turning ON the Output OFF Bit causes all outputs on Basic I/O Units and Special I/O Units to be turned OFF. The outputs will be turned OFF regardless of the PLC's operating mode.

**14. Trial Operation**

Use the Programming Console or Programming Device (CX-Programmer) to switch the CPU Unit to MONITOR mode.

**Using CX-Programmer**

The PLC can be put into MONITOR mode with a host computer running CX-Programmer.

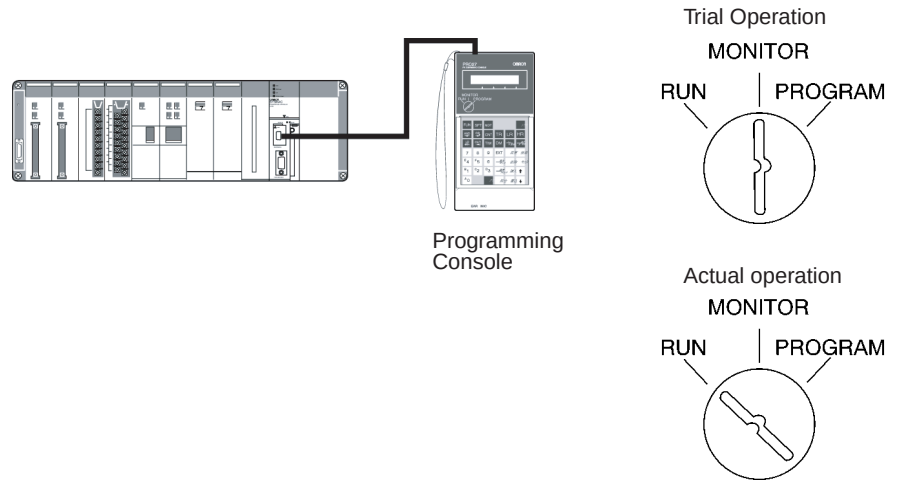


Trial Operation  
Select **PLC, Mode, RUN.**

Actual operation  
Select **PLC, Mode, RUN.**

Using a Programming Console

Turn the Mode Switch to MONITOR for the Trial Operation. (Turn the switch to RUN for full-scale PLC operation.)



15. Monitoring and Debugging

There are several ways to monitor and debug PLC operation, including the force-set and force-reset operations, differentiation monitoring, time chart monitoring, data tracing, and online editing.

Force-Set and Force-Reset

When necessary, the force-set and force-reset operations can be used to force the status of bits and check program execution.

When a Programming Console is being used, monitor the bits with Bit/Word Monitor or 3-word Monitor. Press the SHIFT+SET Keys to force-set a bit or press the SHIFT+RESET Keys to force-reset a bit. The forced status can be cleared by pressing the NOT Key.

| CX-Programmer                                                                                                  | Programming Console                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Click the bit to be force-set or force-reset.<br>2. Select <b>Force On</b> or <b>Off</b> from the PLC menu. | <div><div>Bit/Word Monitor display</div><div>3-word Monitor display</div></div> <div><div>Force-set: SHIFT SET</div><div>Force-reset: SHIFT SET</div><div>Clear: NOT</div></div> |

**Differentiation Monitor**

The differentiation monitor operation can be used to monitor the up or down differentiation of particular bits.

When a Programming Console is being used, monitor the bit with Bit/Word Monitor. Press the SHIFT+Up Arrow Keys to specify up differentiation or press the SHIFT+Down Arrow Keys to specify down differentiation.

| CX-Programmer                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Programming Console                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>1. Click the bit for differential monitoring.</div> <div>2. Click <b>Differential Monitor</b> from the PLC Menu. The Differential Monitor Dialog Box will be displayed.</div> <div>3. Click <b>Rising</b> or <b>Falling</b>.</div> <div>4. Click the <b>Start</b> Button. The buzzer will sound when the specified change is detected and the count will be incremented.</div> <div>5. Click the <b>Stop</b> Button. Differential monitoring will stop.</div> | <div><div>Bit/Word Monitor display</div><div><div>Detect up-differentiation:SHIFT↑</div><div>Detect down-differentiation:SHIFT↓</div></div></div> |

**Time Chart Monitoring**

The CX-Programmer's time chart monitor operation can be used to check and debug program execution.

**Data Tracing**

The CX-Programmer's data trace operation can be used to check and debug program execution.

**Online Editing**

When a few lines of the program in the CPU Unit have to be modified, they can be edited online with the PLC in MONITOR mode or PROGRAM mode. When more extensive modifications are needed, upload the program from the CPU Unit to the host computer, make the necessary changes, and transfer the edited program back to the CPU Unit.

**16. Save and Print the Program**

To save the program, select **File** and then **Save** (or **Save As**) from the CX-Programmer menus.

To print the program, select **File** and then **Print** from the CX-Programmer menus.

**17. Run the Program**

Switch the PLC to RUN mode to run the program.

## SECTION 5

### Installation and Wiring

This section describes how to install a PLC System, including mounting the various Units and wiring the System. Be sure to follow the instructions carefully. Improper installation can cause the PLC to malfunction, resulting in very dangerous situations.

|       |                                                            |     |
|-------|------------------------------------------------------------|-----|
| 5-1   | Fail-safe Circuits .....                                   | 208 |
| 5-2   | Installation .....                                         | 210 |
| 5-2-1 | Installation and Wiring Precautions .....                  | 210 |
| 5-2-2 | Installation in a Control Panel .....                      | 212 |
| 5-2-3 | Mounting Height .....                                      | 214 |
| 5-2-4 | Mounting Dimensions .....                                  | 215 |
| 5-2-5 | Mounting Units to the Backplane .....                      | 216 |
| 5-2-6 | DIN Track Mounting .....                                   | 218 |
| 5-2-7 | I/O Connecting Cables .....                                | 220 |
| 5-2-8 | Inner Board Installation .....                             | 226 |
| 5-3   | Wiring .....                                               | 228 |
| 5-3-1 | Power Supply Wiring .....                                  | 228 |
| 5-3-2 | Wiring CS-series and C200H Basic I/O Units .....           | 234 |
| 5-3-3 | Wiring CS-series and C200H I/O Units with Connectors ..... | 236 |
| 5-3-4 | Connecting I/O Devices .....                               | 243 |
| 5-3-5 | Reducing Electrical Noise .....                            | 247 |

## 5-1 Fail-safe Circuits

Be sure to set up safety circuits outside of the PLC to prevent dangerous conditions in the event of errors in the PLC or external power supply.

### Supply Power to the PLC before Outputs

If the PLC's power supply is turned on after the controlled system's power supply, outputs in Units such as DC Output Units may malfunction momentarily. To prevent any malfunction, add an external circuit that prevents the power supply to the controlled system from going on before the power supply to the PLC itself.

### Managing PLC Errors

When any of the following errors occurs, PLC operation will stop and all outputs from Output Units will be turned OFF.

- Operation of the Power Supply Unit's overcurrent protection circuit
- A CPU error (watchdog timer error) or CPU on standby
- A fatal error\* (memory error, I/O bus error, duplicate number error, Inner Board stopped error, too many I/O points error, program error, cycle time too long error, or FALS(007) error)

Be sure to add any circuits necessary outside of the PLC to ensure the safety of the system in the event of an error that stops PLC operation.

**Note** \*When a fatal error occurs, all outputs from Output Units will be turned OFF even if the IOM Hold Bit has been turned ON to protect the contents of I/O memory. (When the IOM Hold Bit is ON, the outputs will retain their previous status after the PLC has been switched from RUN/MONITOR mode to PROGRAM mode.)

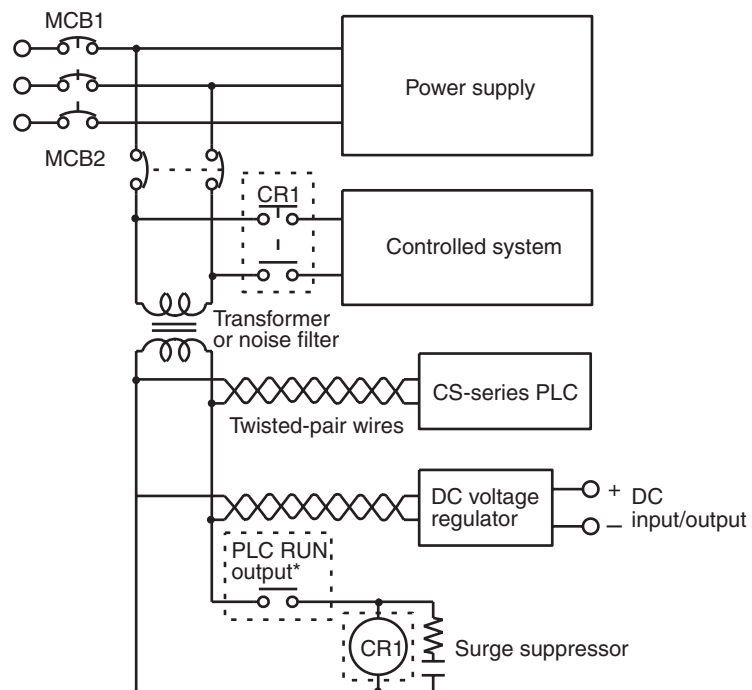
### Managing Output Malfunctions

It is possible for an output to remain ON due to a malfunction in the internal circuitry of the Output Unit, such as a relay or transistor malfunction. Be sure to add any circuits necessary outside of the PLC to ensure the safety of the system in the event that an output fails to go OFF.

### Emergency Stop Circuit

The following emergency stop circuit controls the power supply to the controlled system so that power is supplied to the controlled system only when the PLC is operating and the RUN output is ON.

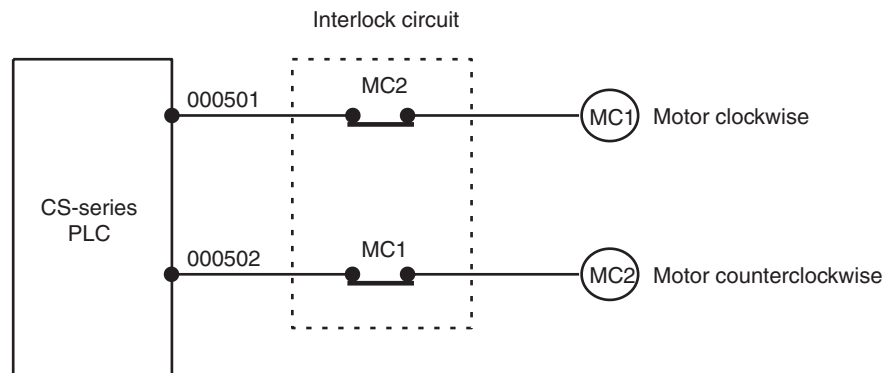
An external relay (CR1) is connected to the RUN output from the Power Supply Unit as shown in the following diagram.



**Note** \*This configuration is possible with the C200HW-PA204R and C200HW-PA204R Power Supply Units only. When a Power Supply Unit without a RUN output is used, program the Always ON Flag (A1) as the execution condition for an output point from an Output Unit.

## Interlock Circuits

When the PLC controls an operation such as the clockwise and counterclockwise operation of a motor, provide an external interlock such as the one shown below to prevent both the forward and reverse outputs from turning ON at the same time.



This circuit prevents outputs MC1 and MC2 from both being ON at the same time even if both CIO 000500 and CIO 000501 are both ON, so the motor is protected even if the PLC is programmed improperly or malfunctions.

## 5-2 Installation

### 5-2-1 Installation and Wiring Precautions

Be sure to consider the following factors when installing and wiring the PLC to improve the reliability of the system and make the most of the PLC's functions.

#### Ambient Conditions

Do not install the PLC in any of the following locations.

- Locations subject to ambient temperatures lower than 0°C or higher than 55°C.
- Locations subject to drastic temperature changes or condensation.
- Locations subject to ambient humidity lower than 10% or higher than 90%.
- Locations subject to corrosive or flammable gases.
- Locations subject to excessive dust, salt, or metal filings.
- Locations that would subject the PLC to direct shock or vibration.
- Locations exposed to direct sunlight.
- Locations that would subject the PLC to water, oil, or chemical reagents.

Be sure to enclose or protect the PLC sufficiently in the following locations.

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power lines.

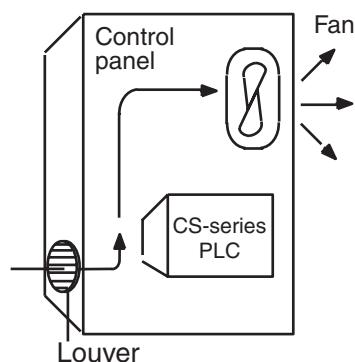
#### Installation in Cabinets or Control Panels

When the PLC is being installed in a cabinet or control panel, be sure to provide proper ambient conditions as well as access for operation and maintenance.

##### **Temperature Control**

The ambient temperature within the enclosure must be within the operating range of 0°C to 55°C. When necessary, take the following steps to maintain the proper temperature.

- Provide enough space for good air flow.
- Do not install the PLC above equipment that generates a large amount of heat such as heaters, transformers, or high-capacity resistors.
- If the ambient temperature exceeds 55°C, install a cooling fan or air conditioner.



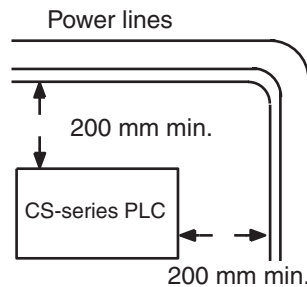
- If a Programming Console will be left on the PLC, the ambient temperature must be within the Programming Console's operating range of 0°C to 45°C.

#### Accessibility for Operation and Maintenance

- To ensure safe access for operation and maintenance, separate the PLC as much as possible from high-voltage equipment and moving machinery.
- The PLC will be easiest to install and operate if it is mounted at a height of about 1.3 m (4 feet).

#### Improving Noise Resistance

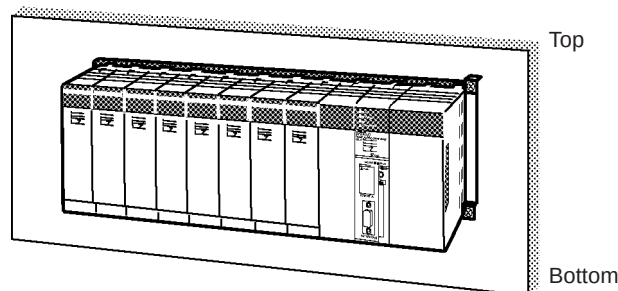
- Do not mount the PLC in a control panel containing high-voltage equipment.
- Install the PLC at least 200 mm (6.5 feet) from power lines.



- Ground the mounting plate between the PLC and the mounting surface.
- When I/O Connecting Cables are 10 m or longer, connect the control panels in which Racks are mounted with heavier power wires (3 wires at least 2 mm<sup>2</sup> in cross-sectional area).

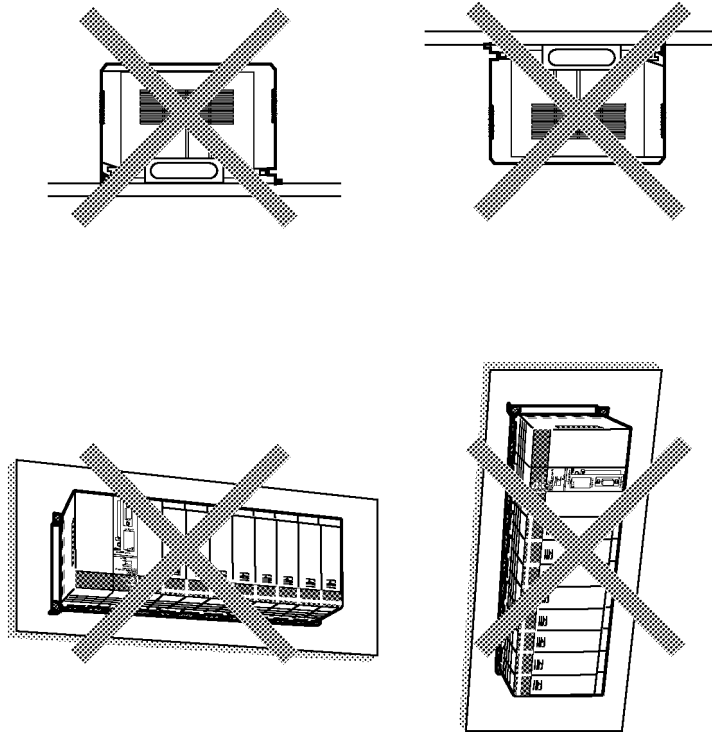
#### PLC Orientation

- Each Rack must be mounted in an upright position to provide proper cooling.



- Do not install a Rack in any of the following positions.

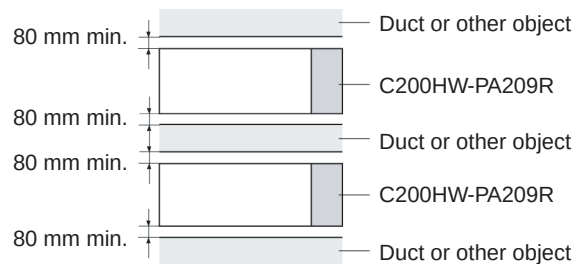




### 5-2-2 Installation in a Control Panel

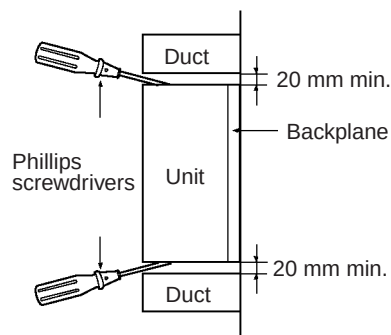
- A typical installation is a CPU Rack mounted above an Expansion Rack on a mounting plate in the control panel.
- The spacing between the CPU Rack and Expansion Rack (or between two Expansion Racks) should be sufficient to allow space for a wiring duct, wiring, air circulation, and replacement of Units in the Racks.

**Note** If the C200HW-PA209R Power Supply Unit is to be used at an ambient temperature of 50 °C or higher, provide a minimum space of 80 mm between the top of the Unit and any other objects, e.g., ceiling, wiring ducts, structural supports, devices, etc.



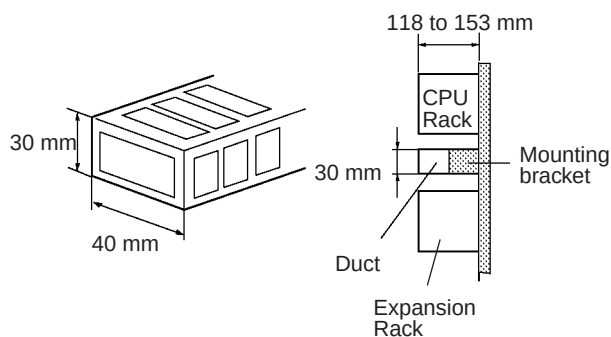
- Up to 7 Expansion Racks can be connected.  
Each I/O Connecting Cable can be up to 12 m long, but the sum total of all cables between the CPU Rack and Expansion Racks must be 12 m or less.
- The mounting plate should be grounded completely and we recommend using a mounting plate that has been plated with a good conductor to improve noise resistance.
- If all of the Racks cannot be mounted to the same mounting plate, the individual plates should be securely connected together using 3 wires of at least 2 mm<sup>2</sup> in cross-sectional area.
- The Backplanes are mounted to the plate(s) with four M4 screws each.

- Whenever possible, route I/O wiring through wiring ducts or raceways. Install the duct so that it is easy to fish wire from the I/O Units through the duct. It is handy to have the duct at the same height as the Racks.



### Wiring Ducts

The following example shows the proper installation of wiring duct.



**Note** Tighten the Unit mounting screws, PLC Rack mounting screws, terminal block screws, and cable screws to the following torques.

#### Unit Mounting Screws

|                    |           |
|--------------------|-----------|
| CPU Unit:          | 0.9 N • m |
| Power Supply Unit: | 0.9 N • m |
| I/O Units:         | 0.4 N • m |

Backplane Mounting Screws: 0.9 N • m

#### Terminal Screws

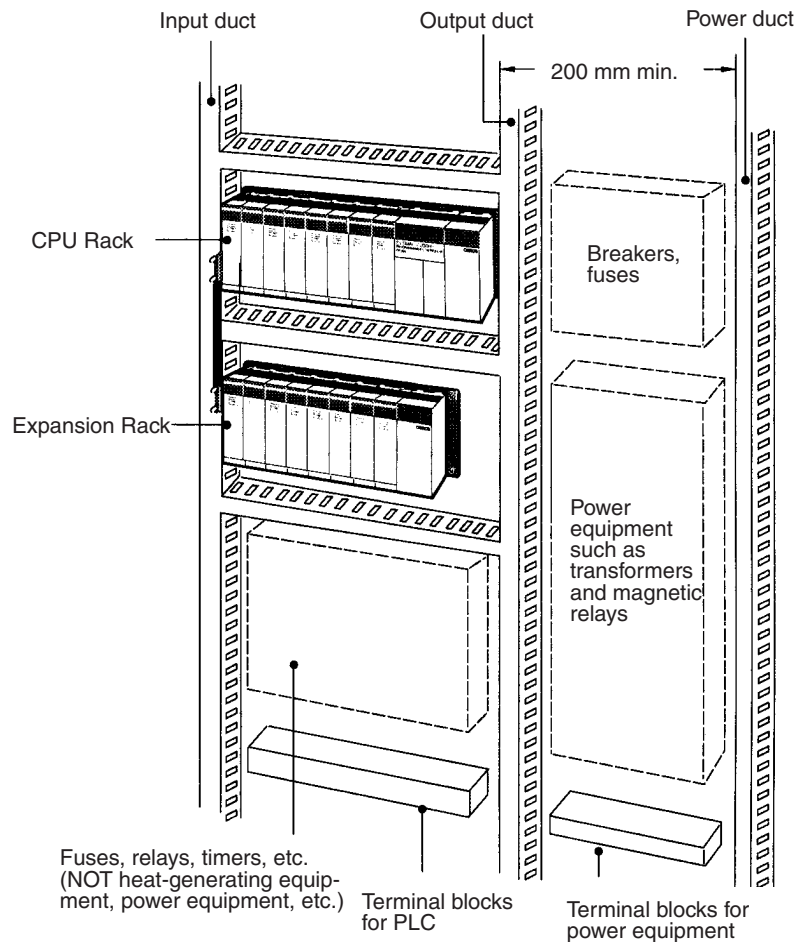
|       |           |
|-------|-----------|
| M3.5: | 0.8 N • m |
| M3:   | 0.5 N • m |

#### Cable Connector Screws

|       |           |
|-------|-----------|
| M2.6: | 0.2 N • m |
|-------|-----------|

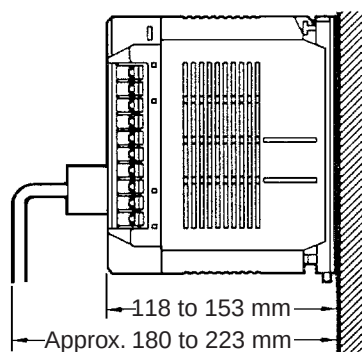
### Routing Wiring Ducts

Install the wiring ducts at least 20 mm between the tops of the Racks and any other objects, (e.g., ceiling, wiring ducts, structural supports, devices, etc.) to provide enough space for air circulation and replacement of Units. If the C200HW-PA209R Power Supply Unit is to be used at an ambient temperature of 50 °C or higher, provide a minimum space of 80 mm.



### 5-2-3 Mounting Height

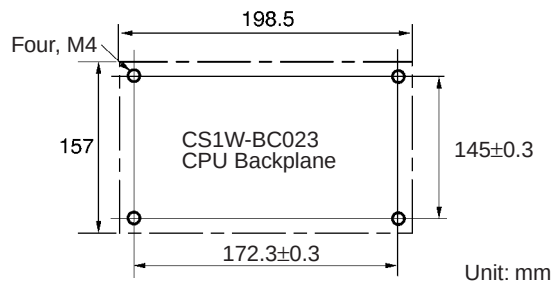
The mounting height of CPU Racks, Expansion Racks, or Slave Racks is 118 to 153 mm for a CS-series Backplane, depending on I/O Units mounted. If Programming Devices or connecting cables are attached, the additional dimensions must be taken into account. Allow sufficient clearance in the control panel in which the PLC is mounted.



## 5-2-4 Mounting Dimensions

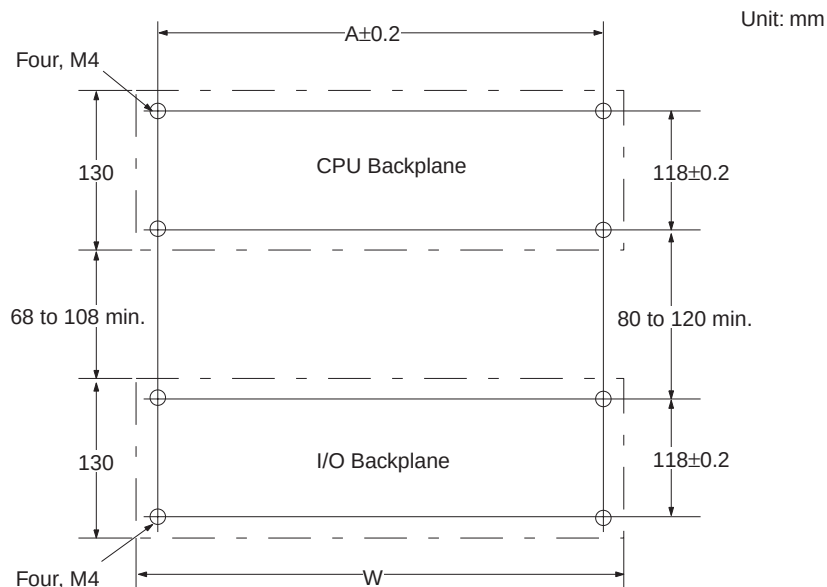
### Backplanes

#### CPU Backplane with 2 Slots



**Note** Expansion Backplanes cannot be connected to 2-slot CPU Backplanes.

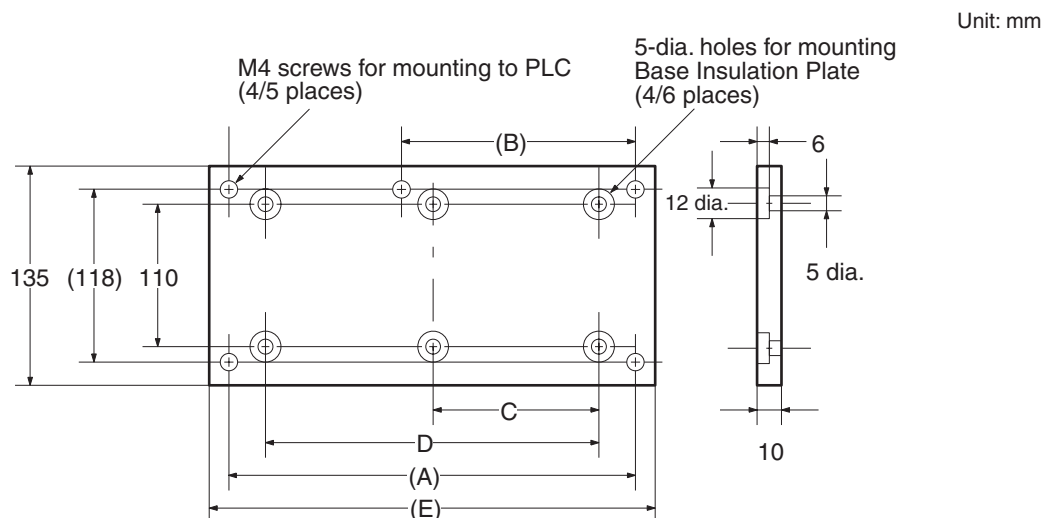
#### CPU Backplane with 3, 5, 8, or 10 Slots



| Backplane                     |                                | Model        | A      | W      |
|-------------------------------|--------------------------------|--------------|--------|--------|
| Standard CPU Backplanes       |                                | CS1W-BC033   | 246 mm | 260 mm |
|                               |                                | CS1W-BC053   | 316 mm | 330 mm |
|                               |                                | CS1W-BC083   | 421 mm | 435 mm |
|                               |                                | CS1W-BC103   | 491 mm | 505 mm |
| CS-series-only CPU Backplanes |                                | CS1W-BC032   | 246 mm | 260 mm |
|                               |                                | CS1W-BC052   | 316 mm | 330 mm |
|                               |                                | CS1W-BC082   | 421 mm | 435 mm |
|                               |                                | CS1W-BC102   | 491 mm | 505 mm |
| Expansion Backplanes          | CS-series Expansion Backplanes | CS1W-BI033   | 246 mm | 260 mm |
|                               |                                | CS1W-BI053   | 316 mm | 330 mm |
|                               |                                | CS1W-BI083   | 421 mm | 435 mm |
|                               |                                | CS1W-BI103   | 491 mm | 505 mm |
|                               | C200H Expansion I/O Backplanes | C200HW-BI031 | 245 mm | 259 mm |
|                               |                                | C200HW-BI051 | 316 mm | 330 mm |
|                               |                                | C200HW-BI081 | 350 mm | 364 mm |
|                               |                                | C200HW-BI101 | 420 mm | 434 mm |

## Backplane Insulation Plates

Backplane Insulation Plates can be installed on C200H I/O Backplanes only. There are four models available, corresponding to the number of slots on the Backplane. The dimensions at locations A, B, C, D, and E are shown below in millimeters for each Backplane Insulation Plate.



### Insulation Plates for I/O Backplanes

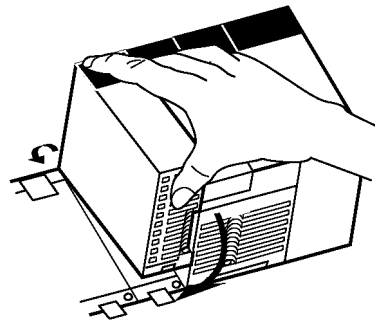
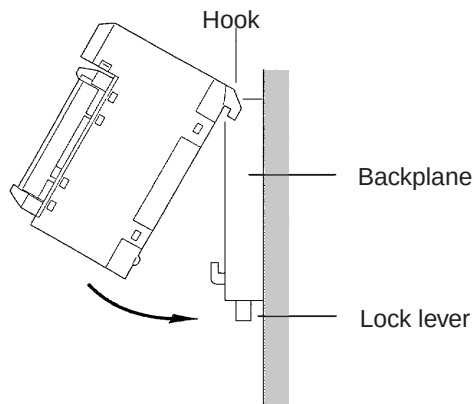
| Specifications | Model        | Dimensions (mm) |     |     |     |     |
|----------------|--------------|-----------------|-----|-----|-----|-----|
|                |              | E               | D   | C   | B   | A   |
| For 3 slots    | C200HW-ATT32 | 190             | 140 | --- | --- | 175 |
| For 5 slots    | C200HW-ATT52 | 260             | 210 | --- | --- | 245 |
| For 8 slots    | C200HW-ATT82 | 365             | 315 | --- | --- | 350 |
| For 10 slots   | C200HW-ATTA2 | 435             | 385 | --- | --- | 420 |

## 5-2-5 Mounting Units to the Backplane

There are two methods for mounting or removing Units in the Backplane. The following table shows which method to use for each type of Unit.

| Group | Unit type                                                                                                                                                       | Installation method                                                                                                        | Removal method                                                                      |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| A     | CS-series CPU Units, Power Supply Units, CS-series Basic I/O Units, CS-series Special I/O Units, CS-series CPU Bus Units, and SYSMAC BUS Remote I/O Slave Units | Hook the top of the Unit into the slot on the Backplane and tighten the screw on the bottom of Unit.                       | Loosen the screw on the bottom of the Unit and rotate the Unit upward.              |
| B     | C200H Basic I/O Units, C200H Special I/O Units                                                                                                                  | Hook the top of the Unit into the slot on the Backplane and secure the bottom of the Unit with the Backplane's lock lever. | Press and hold the lock lever at the bottom of the Unit and rotate the Unit upward. |

- 1,2,3...** 1. Mount the Unit to the Backplane by hooking the top of the Unit into the slot on the Backplane and rotating the I/O Unit downwards. (Groups A and B)



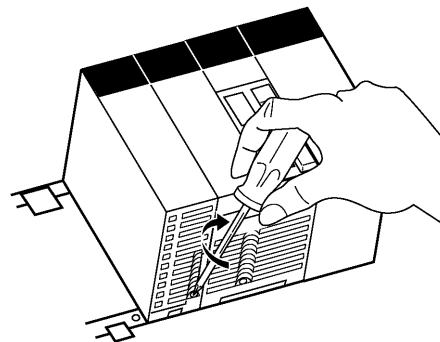
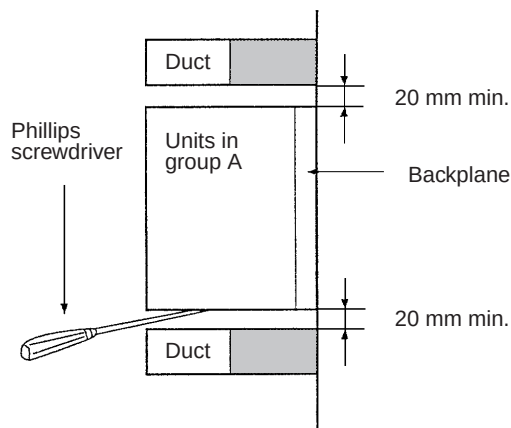
2. Make sure that the connector on the back of the Unit is properly inserted into the connector in the Backplane. (Groups A and B)
3. With the Group-A Units, use a Phillips-head screwdriver to tighten the screw on the bottom of Unit. The screwdriver must be held at a slight angle, so be sure to leave enough space below each Rack.

**Note** The screws at the bottoms of the Units must be tightened to the following torques.

CPU Unit: 0.9 N • m

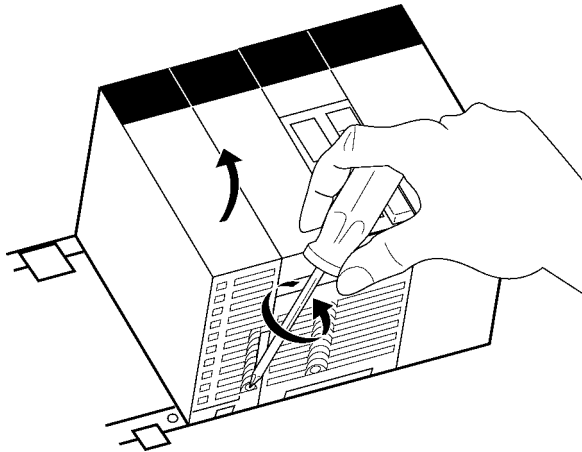
Power Supply Unit: 0.9 N • m

I/O Units: 0.4 N • m

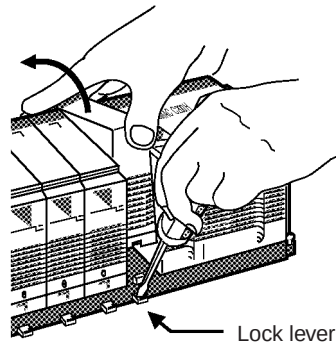


With Group-B Units, the lock lever will snap into place when the Unit is properly inserted. Check that the lock lever is engaged and the Unit is secure.

4. To remove a Group-A Unit, use a phillips-head screwdriver to loosen the screw at the bottom of the Unit, rotate the Unit upward, and remove it.



To remove a Group-B Unit, hold down the lock lever with a tool such as a screwdriver, rotate the Unit upward, and remove it.



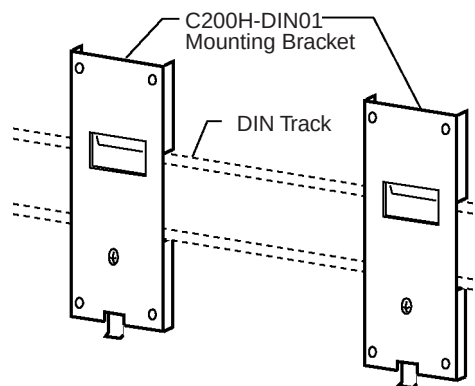
## 5-2-6 DIN Track Mounting

Do not use DIN Track to mount Backplane in locations subject to vibration; use locking screws to attach the Backplane directly.

Mount the DIN Track in the control panel with M4 screws in at least three places. Tighten the mounting screws to a torque of 1.2 N•m.

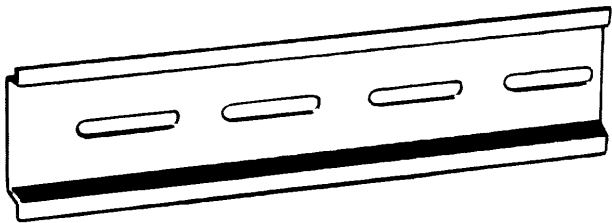
### DIN Track Mounting Bracket

Use DIN Track Mounting Brackets to mount Racks to the DIN Track.



DIN Track

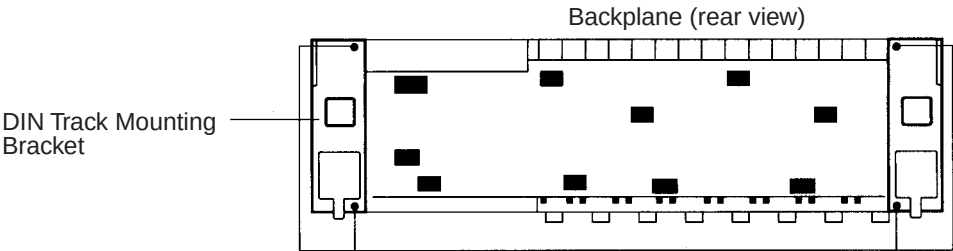
The following DIN Tracks are available.



| Model     | Specification           |
|-----------|-------------------------|
| PFP-50N   | 50 cm long, 7.3 mm high |
| PFP-100N  | 1 m long, 7.3 mm high   |
| PFP-100N2 | 1 m long, 16 mm high    |

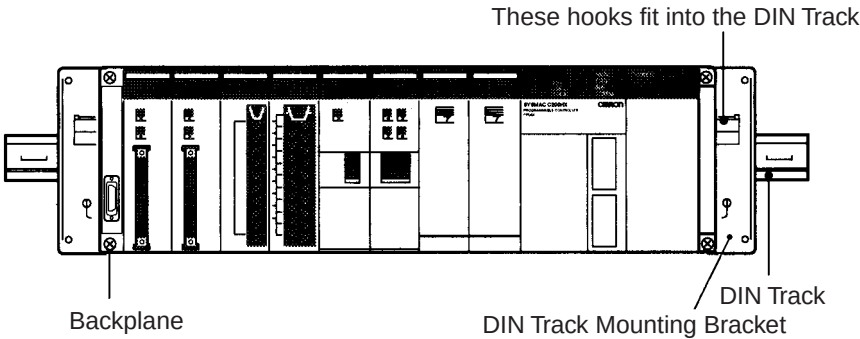
DIN Track Installation

- 1,2,3... 1. Attach Mounting Brackets to each side (left and right) of the Backplane as shown below.



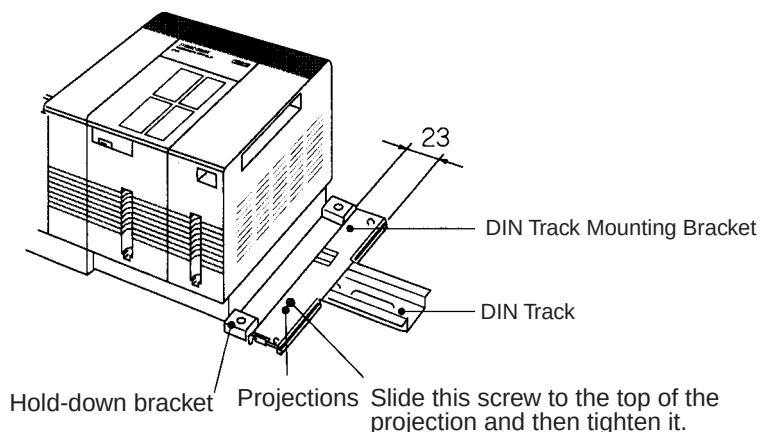
There are two Backplane mounting screws each on the left and right sides of the Backplane. Use these screws to attach the DIN Track Mounting Brackets to the Backplane. (Tighten to a torque of 0.9 N•m.)

2. Mount the Backplane to the DIN Track so that the hooks on the Mounting Brackets fit into the upper portion of the DIN Track as shown below.





- Loosen the hold-down bracket's screws and slide the Backplane upward so that the Mounting Bracket and Backplane clamp securely onto the DIN Track. Tighten the screws to a torque of 0.5 N•m.



### 5-2-7 I/O Connecting Cables

I/O Connecting Cables are used to connect the CPU Rack and Expansion Racks. There are four types of I/O Connecting Cables.

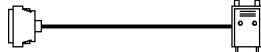
| Type                                                                                 | Model number | Connectors            |                       | Usage                                                                                       |
|--------------------------------------------------------------------------------------|--------------|-----------------------|-----------------------|---------------------------------------------------------------------------------------------|
|                                                                                      |              | CPU Rack end          | Expansion Rack end    |                                                                                             |
| CS → CS<br>I/O Connecting Cables                                                     | CS1W-CN□□3   | Simple lock connector | Simple lock connector | CPU Rack → CS-series Expansion Rack                                                         |
|                                                                                      |              |                       |                       | CS-series Expansion Rack → CS-series Expansion Rack                                         |
| CS → C200H<br>I/O Connecting Cables                                                  | CS1W-CN□□1   | Simple lock connector | Two-screw connector   | CPU Rack → C200H Expansion I/O Rack                                                         |
|                                                                                      |              |                       |                       | CS-series Expansion Rack → C200H Expansion I/O Rack                                         |
| C200H → C200H<br>I/O Connecting Cables                                               | C200H-CN□□1  | Two-screw connector   | Two-screw connector   | C200H Expansion I/O Rack → C200H Expansion I/O Rack                                         |
| Cables for CS-series Long-distance Expansion Racks (CV-series I/O Connecting Cables) | CV500-CN□□2  | Simple lock connector | Simple lock connector | CPU Rack or CS-series Long-distance Expansion Rack → CS-series Long-distance Expansion Rack |

## Available Models

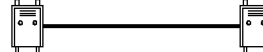
CS1 → CS1 I/O  
Connecting Cables



CS1 → C200H I/O  
Connecting Cables



C200H → C200H I/O  
Connecting Cables



Cables for CS1 Long-distance  
Expansion Racks (CV-series  
I/O Connecting Cables)



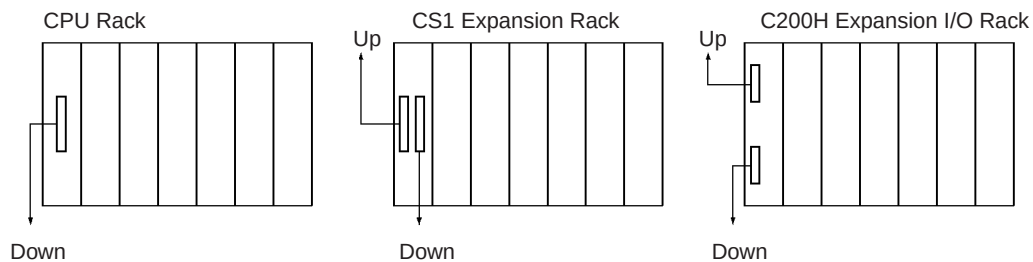
| Model number | Cable length |
|--------------|--------------|
| CS1W-CN313   | 0.3 m        |
| CS1W-CN713   | 0.7 m        |
| CS1W-CN223   | 2 m          |
| CS1W-CN323   | 3 m          |
| CS1W-CN523   | 5 m          |
| CS1W-CN133   | 10 m         |
| CS1W-CN133B2 | 12 m         |

| Model number | Cable length |
|--------------|--------------|
| CS1W-CN311   | 0.3 m        |
| CS1W-CN711   | 0.7 m        |
| CS1W-CN221   | 2 m          |
| CS1W-CN321   | 3 m          |
| CS1W-CN521   | 5 m          |
| CS1W-CN131   | 10 m         |
| CS1W-CN131B2 | 12 m         |

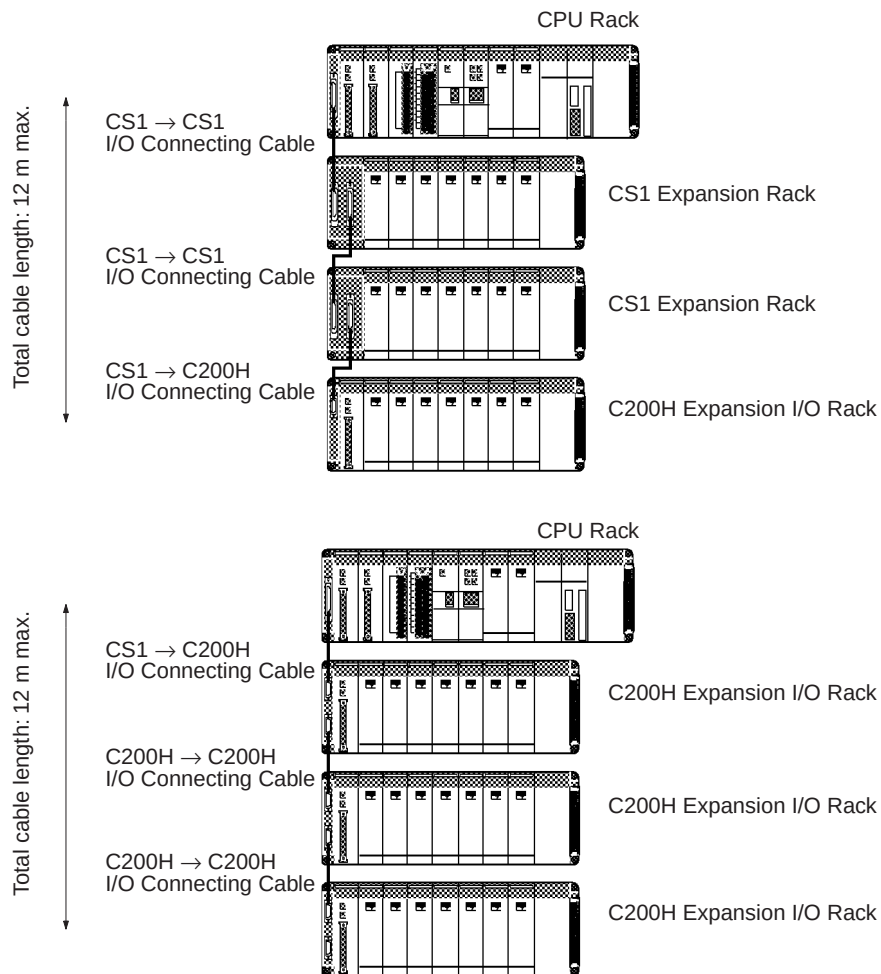
| Model number | Cable length |
|--------------|--------------|
| CS1W-CN311   | 0.3 m        |
| CS1W-CN711   | 0.7 m        |
| CS1W-CN221   | 2 m          |
| CS1W-CN521   | 5 m          |
| CS1W-CN131   | 10 m         |

| Model number | Cable length |
|--------------|--------------|
| CV500-CN312  | 0.3 m        |
| CV500-CN612  | 0.6 m        |
| CV500-CN122  | 1 m          |
| CV500-CN222  | 2 m          |
| CV500-CN322  | 3 m          |
| CV500-CN522  | 5 m          |
| CV500-CN132  | 10 m         |
| CV500-CN232  | 20 m         |
| CV500-CN332  | 30 m         |
| CV500-CN432  | 40 m         |
| CV500-CN532  | 50 m         |

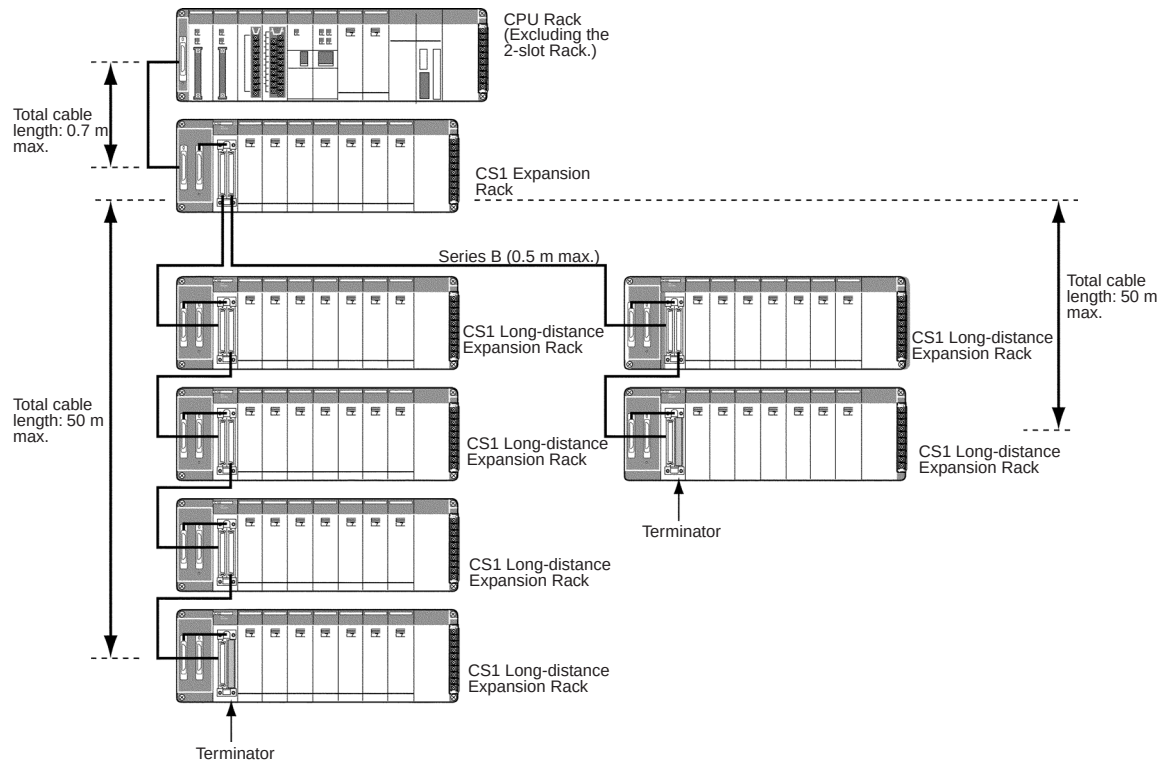
- Install the Racks and select I/O Connecting Cables so that the total length of all I/O Connecting Cables does not exceed 12 m.
- The following diagram shows where each I/O Connecting Cable must be connected on each Rack. The Rack will not operate if the cables aren't connected properly. (The "up" direction is towards the CPU Unit and "down" is away from the CPU Unit.)



- The following diagram shows two examples of proper Rack connections.



## Example



- I/O Control Unit can also be mounted on the CPU Rack.
- Only one CS-series Expansion Rack can be connected.
- The cable length between the CPU Rack and CS-series Expansion Rack must be 0.7 m max.
- Up to two series of CS-series Long-distance Expansion Racks can be connected.
- A maximum of seven CS-series and CS-series Long-distance Expansion Racks can be connected (including all Racks in both series).
- Each series of CS-series Long-distance Expansion Racks must be 50 m max. with a total of 100 m max. for both series.
- C200H Expansion I/O Racks cannot be connected together with CS-series Long-distance Expansion Racks.
- A CS-series Expansion Rack cannot be connected to a CS-series Long-distance Expansion Rack using a CS I/O Connecting Cable.

## Cable Connections

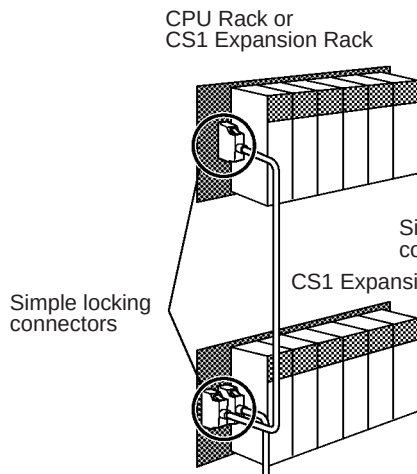
There are two types of connectors used in the I/O Connecting Cables: Simple locking connectors for CS-series Racks and screw-in connectors for C200H Racks.

The connectors can be inserted only one way; they cannot be inserted upside down. Be sure that the connectors fit properly as they are inserted.

#### CS1 → CS1

##### I/O Connecting Cable

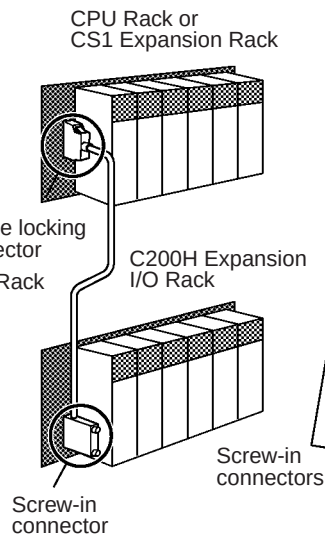
This cable has simple locking connectors on both ends.



#### CS1 → C200H

##### I/O Connecting Cable

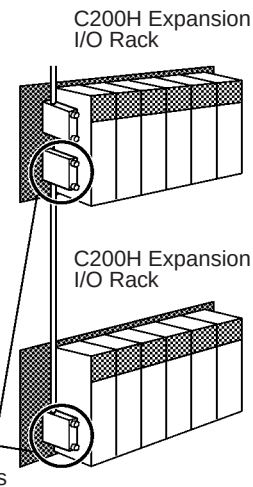
This cable has a simple locking connector on one end and a screw-in connector on the other.



#### C200H → C200H

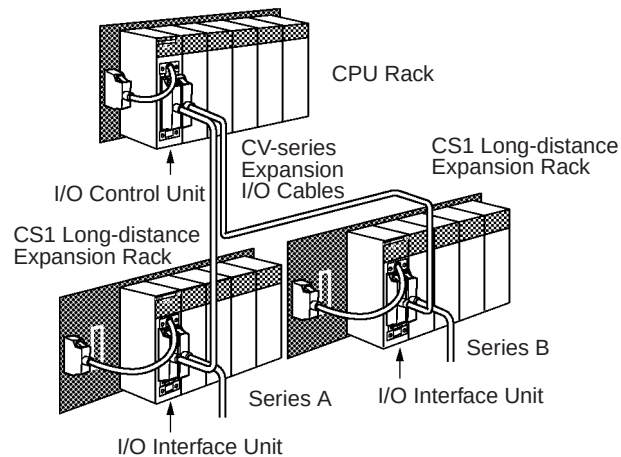
##### I/O Connecting Cable

This cable has screw-in connectors on both ends.

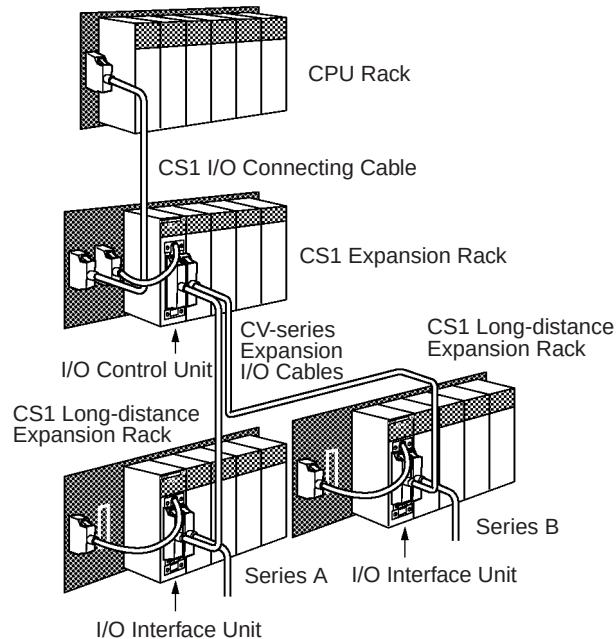


### Cables to CS-series Long-distance Expansion Racks

#### Mounting the I/O Control Unit to the CPU Rack



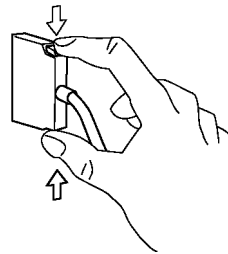
### **Mounting the I/O Control Unit to a CS-series Expansion Rack**



### **Connecting the Simple Locking Connectors**

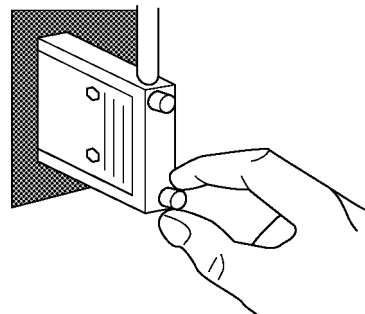
Press the tabs on the end of the connector and insert the connector until it locks in place. The PLC will not operate properly if the connector isn't inserted completely.

Note When using an I/O Connecting Cable with a locking connector, be sure that the connector is firmly locked in place before using it.



### **Connecting the Screw-in Connectors**

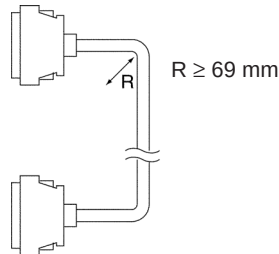
Insert the connector and secure it by tightening the two screws to a torque of 0.2 N•m. The PLC will not operate properly if the connector isn't inserted completely. To remove the connector, simply loosen the screws and pull it out.



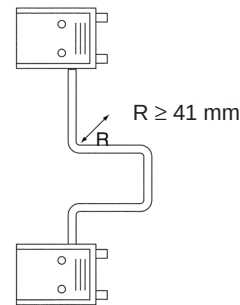
Do not route the I/O Connecting Cables through ducts that contain the I/O or power wiring.

- An I/O bus error will occur and the PLC will stop if an I/O Connecting Cable's connector separates from the Rack. Be sure that the connectors are secure.
- A 75-mm hole will be required if the I/O Connecting Cable must pass through a hole when connecting a CS-series Long-distance Expansion Rack and a 63-mm hole will be required for Cables connecting other Racks. The cables can withstand a pulling force up to 49 N (11 lbs), so be sure that they aren't pulled too forcefully.
- The I/O Connecting Cables mustn't be bent too severely. The minimum bending radii are shown in the following diagram.
- Always turn OFF the power supply to the PLC before connecting Cables.

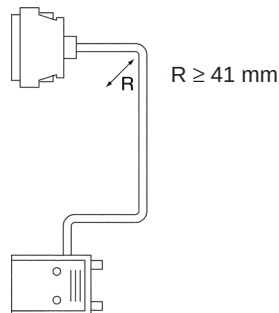
CS1 → CS1 I/O Connecting Cable  
(Cable diameter: 8.6 mm)



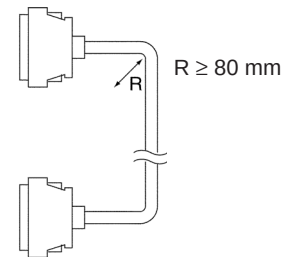
C200H → C200H I/O Connecting Cable  
(Cable diameter: 5.1 mm)



CS1 → C200H I/O Connecting Cable  
(Cable diameter: 5.1 mm)



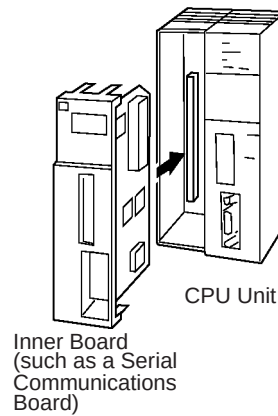
Cables for CS1 Long-distance Expansion Racks  
(Cable diameter: 10 mm)



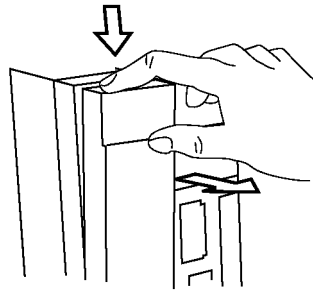
### 5-2-8 Inner Board Installation

Always turn the power off before installing or removing the Inner Board. Installing or removing the Inner Board with the power on can cause the CPU Unit to malfunction, damage internal components, or cause communications errors.

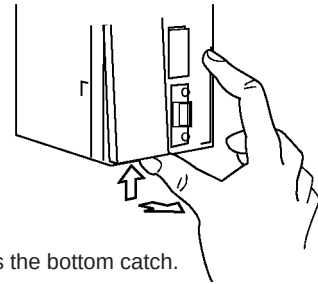
Before installing the Inner Board, be sure to first touch a grounded metallic object, such as a metal water pipe, in order to discharge any static build-up.



- 1,2,3...** 1. Press the catches at the top and bottom of the Inner Board compartment cover and pull the cover forward.

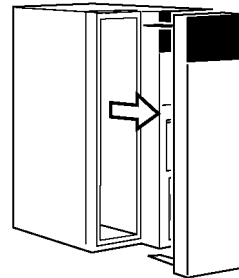


Press the top catch.

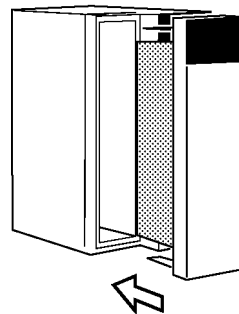


Press the bottom catch.

2. Remove the Inner Board compartment cover.



3. Align the Inner Board with the groove and slide it into the compartment.



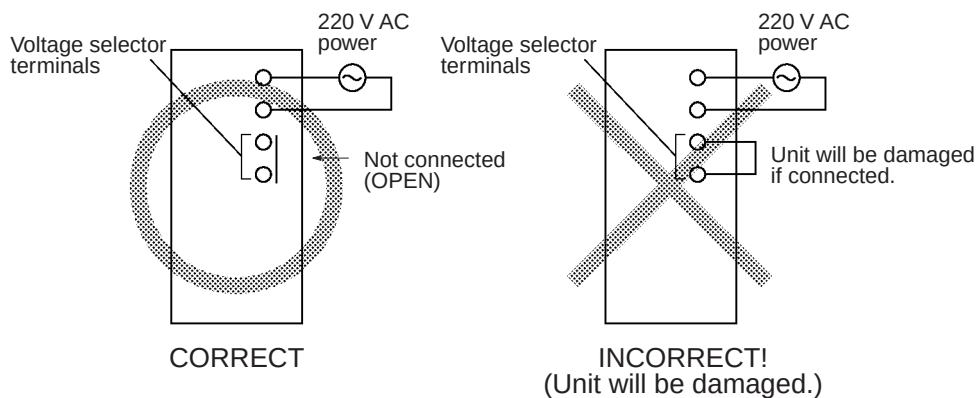


## 5-3 Wiring

### 5-3-1 Power Supply Wiring

#### AC Power Supply Units

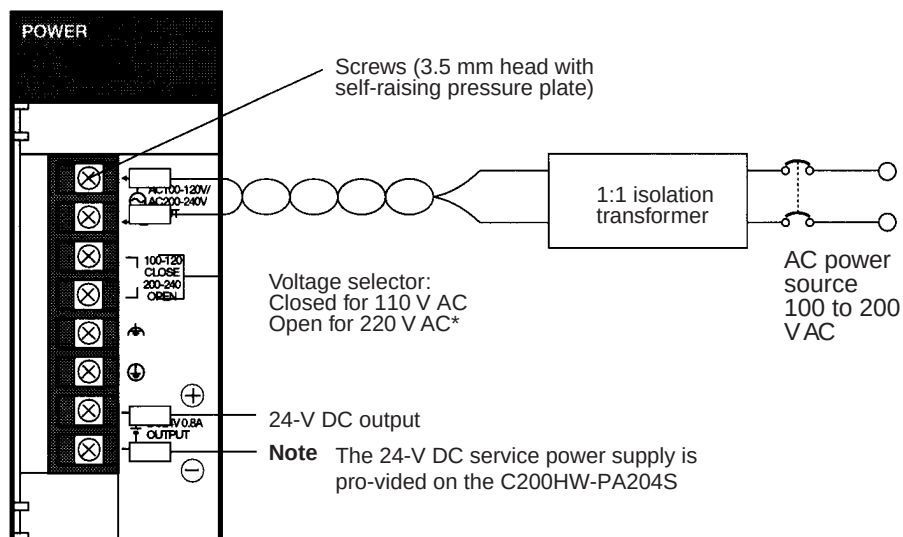
When 220 V AC power (200 to 240 V AC) is being supplied, be sure to remove the jumper bar that shorts the voltage selector terminals. The Unit will be damaged if 220 V AC is supplied with the jumper bar connected.



**Note** If 110 V AC power is supplied but the jumper bar has been removed to select 220 V AC, the Unit will not operate because the power supply voltage will be below the 85% minimum level.

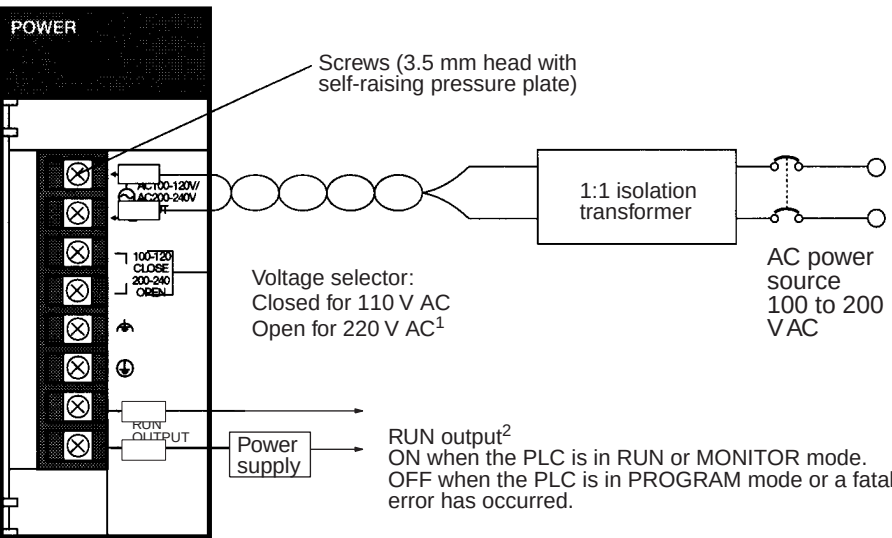
- Do not remove the protective label from the top of the Unit until wiring has been completed. This label prevents wire strands and other foreign matter from entering the Unit during wiring procedures.

#### C200HW-PA204 or C200HW-PA204S Power Supply Unit



**Note** To prevent damage, be sure that the jumper bar on the voltage selector terminals has been removed before applying 220 V AC power.

C200HW-PA204R or C200HW-PA209R Power Supply Unit



- Note**
1. To prevent damage, be sure that the jumper bar on the voltage selector terminals has been removed before applying 220 V AC power.
  2. If a Power Supply Unit without a RUN output is being used, an output that acts as a RUN output can be created by programming the Always ON Flag (A1) as the execution condition for an output from an Output Unit.

AC Power Source

- Supply 100 to 120 V AC or 200 to 240 V AC.
- Keep voltage fluctuations within the specified range:

| Supply voltage  | Allowable voltage fluctuations |
|-----------------|--------------------------------|
| 100 to 120 V AC | 85 to 132 V AC                 |
| 200 to 240 V AC | 170 to 264 V AC                |

- The terminal block indicator L2/N-L1 may appear as L1/N-L2 in some Units, but the function of the terminals is the same.
- If one power supply phase of the equipment is grounded, connect the grounded phase side to the L2/N (or L1/N if so indicated) terminal.

Voltage Selector

Shorted: 100 to 120 V AC  
Open: 200 to 240 V AC  
Short-circuit the voltage selector terminals with the jumper bar to select 100 to 120 V AC supply voltage. For 200 to 240 V AC leave them open.

**Note** The Power Supply Unit will be damaged if 200 to 240 V AC power is supplied and the voltage selector terminals are connected with the jumper bar.

Isolation Transformer

The PLC's internal noise isolation circuits are sufficient to control typical noise in power supply lines, but noise between the PLC and ground can be significantly reduced by connecting a 1-to-1 isolation transformer. Do not ground the secondary coil of the transformer.

Power Consumption

The power consumption will be 120 VA max. per Rack, but there will be a surge current of at least 5 times the max. current when power is turned ON.

24-V DC Output  
(C200HW-PA204S Only)

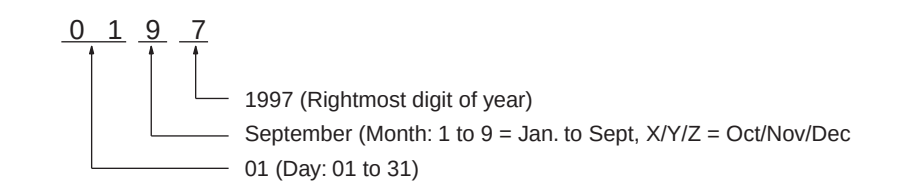
Use these terminals as the power supply for 24-V DC Input Units. Never externally short these terminals; PLC operation will stop if these terminals are shorted.

Although the 24-V DC output can supply up to 0.8 A, the combined power consumption for both 5 V DC and 24 V DC must be 30 W or less, i.e., the capacity of the 24-V DC output will be reduced if the Units mounted to the Rack consume a lot of current. Refer to *Appendix C Unit Current and Power Consumption* for the power consumption of each Unit.

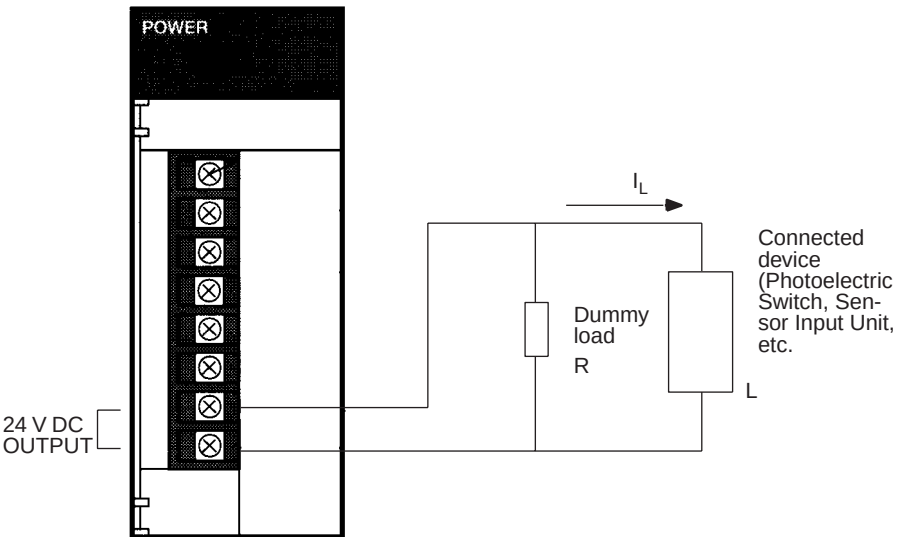
The output voltage of the 24-V DC output will vary with the current consumption of the load as shown in the following table. Be sure to check the current consumption and allowable voltage ranges of the devices connected before using these terminals.

| Load current on 24-V DC output                         | Less than 0.3 A | 0.3 A or higher |
|--------------------------------------------------------|-----------------|-----------------|
| Accuracy of 24-V DC output for lot No. 0197 or later   | +17%<br>-11%    | +10%<br>-11%    |
| Accuracy of 24-V DC output for lot No. 3187 or earlier | +10%<br>-20%    |                 |

**Note** Lot numbers are as shown in the following diagram.



We recommend connecting a dummy load as shown in the following diagram if the maximum operating voltage of the connected device is 26.4 V (24 V +10%).



Resistance of the dummy load:

$$R = \frac{24}{0.3 - I_L}$$

120    when  $I_L = 0.1 \text{ A}$   
240    when  $I_L = 0.2 \text{ A}$   
Not necessary when  $I_L = 0.3 \text{ A}$   
( $I_L$ : Total current of connected devices)

Power rating of the dummy load (with a safety factor of 5):

$$W = (0.3 - I_L) \times 26.4 \times 5$$

30 W (120    ) when  $I_L = 0.1 \text{ A}$   
15 W (240    ) when  $I_L = 0.2 \text{ A}$

**Note** Since the dummy load will generate heat, be careful not to allow any combustible materials to come in contact with the resistor.

### RUN Output (C200HW-PA204R/209R)

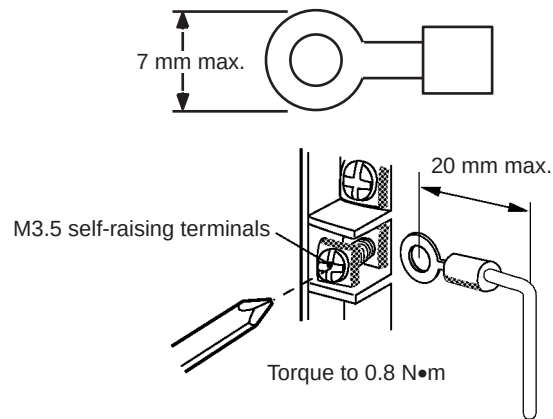
This output is ON whenever the CPU Unit is operating in RUN or MONITOR mode; it is OFF when the CPU Unit is in PROGRAM mode or a fatal error has occurred.

The RUN output can be used to control external systems, such as in an emergency stop circuit that turns off the power supply to external systems when the PLC is not operating. (See 5-1 *Fail-safe Circuits* for more details on the emergency stop circuit.)

|                            | C200HW-PA204R                                                                  | C200HW-PA209R                                                                                                                           |
|----------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Contact form               | SPST-NO                                                                        | SPST-NO                                                                                                                                 |
| Maximum switching capacity | 250 V AC: 2 A for resistive loads<br>0.5 A for inductive loads<br>24 V DC: 2 A | 240 V AC: 2 A for resistive loads<br>120 V AC: 0.5 A for inductive loads<br>24 V DC: 2 A for resistive loads<br>2 A for inductive loads |

### Crimp Terminals

The terminals on the Power Supply Unit are M3.5, self-raising terminals with screws. Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Tighten the terminal block screws to the torque of 0.8 N • m. Use round-type crimp terminals (M3.5) having the dimensions shown below.



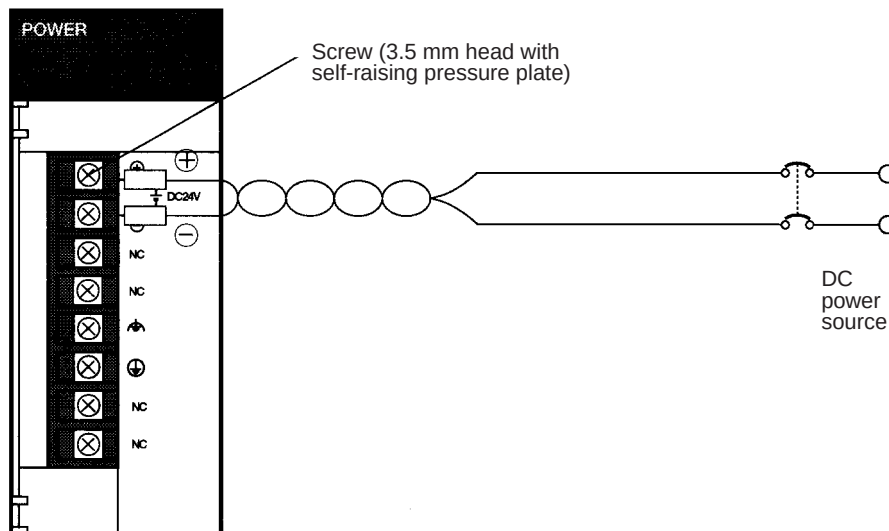
**Caution** Tighten the AC power supply terminal block screws to the torque of 0.8 N • m. Loose screws may result in short-circuit, malfunction, or fire.

- Note**
1. Supply power to all of the Power Supply Units from the same source.
  2. Be sure to check the setting of the voltage selector before supplying power.
  3. Do not forget to remove the label from the top of the Power Supply Unit after wiring the Unit. The label will block air circulation needed for cooling.

## DC Power Supplies

Do not remove the protective label from the top of the Unit until wiring has been completed. This label prevents wire strands and other foreign matter from entering the Unit during wiring procedures. (Remove the label after wiring has been completed to allow air circulation needed for cooling.)

### C200HW-PD024 Power Supply Unit



### DC Power Source

Supply 24 V DC. Keep voltage fluctuations within the specified range (19.2 to 28.8 V DC).

### Power Supply Capacity

The maximum power consumption is 40 W per Rack, but there will be a surge current of about 5 times that level when the power is turned on.

### Crimp Terminals

The terminals on the Power Supply Unit are M3.5, self-raising terminals with screws. Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Tighten the terminal block screws to the torque of 0.8 N • m. Use crimp terminals (M3.5) having the dimensions shown below.



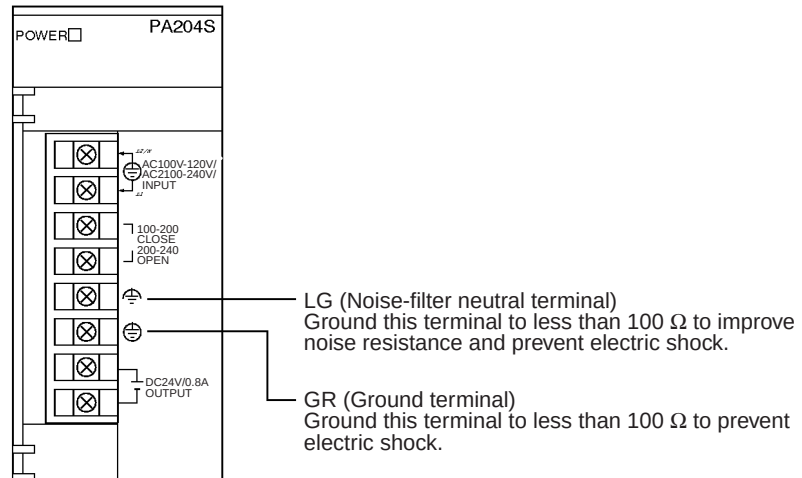
Be sure not to reverse the positive and negative leads when wiring the power supply terminals.

Supply power to all of the Power Supply Units from the same source.

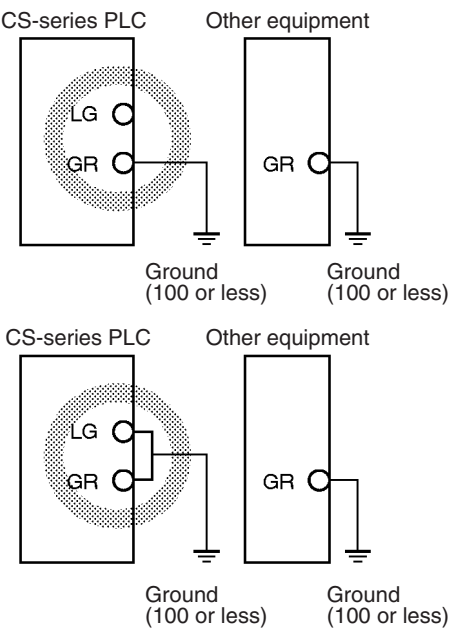
Do not forget to remove the label from the top of the Power Supply Unit after wiring the Unit. The label will block air circulation needed for cooling.

## Grounding

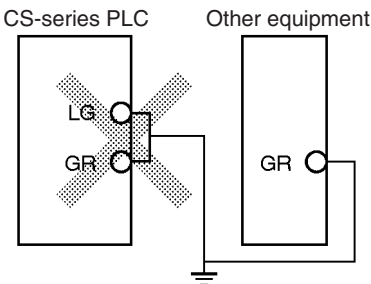
The diagram below shows the location of the ground and line ground terminals.



- To help prevent electrical shock, ground the ground terminal (GR: ⊕) with a ground resistance of less than 100 Ω using a 14-gauge wire (minimum cross-sectional area of 2 mm<sup>2</sup>).
- The line ground terminal (LG: ⊕) is a noise-filtered neutral terminal. If noise is a significant source of errors or electrical shocks are a problem, connect the line ground terminal to the ground terminal and ground both with a ground resistance of less than 100 Ω.
- The ground wire should not be more than 20 m long.
- The following grounding configurations are acceptable.
- The CS-series Backplanes are designed to be mounted so that they are isolated (separated) from the mounting surface to protect them from the effects of noise in the installation environment (e.g., the control panel). (C200HX/HG/HE and C200H Backplanes are mounted directly to the mounting surface. If Expansion I/O is being affected by control panel or other environmental noise, use the C200HW-ATT□□ or C200H-ATT□□ Backplane Insulation Plates to isolate the Backplanes.



- Do not share the PLC's ground with other equipment or ground the PLC to the metal structure of a building. The configuration shown in the following diagram may worsen operation.



Crimp Terminals

The terminals on the Power Supply Unit are M3.5, self-raising terminals with screws. Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Tighten the terminal block screws to the torque of 0.8 N•m. Use crimp terminals (M3.5) having the dimensions shown below.



5-3-2 Wiring CS-series and C200H Basic I/O Units

I/O Unit Specifications

Double-check the specifications for the I/O Units. In particular, do not apply a voltage that exceeds the input voltage for Input Units or the maximum switching capacity for Output Units. Doing so may result in breakdown, damage, or fire.

When the power supply has positive and negative terminals, be sure to wire them correctly.

Electric Wires

The following wire gauges are recommended.

| Terminal Block Connector | Wire Size                                    |
|--------------------------|----------------------------------------------|
| 10-terminal              | AWG 22 to 18 (0.32 to 0.82 mm <sup>2</sup> ) |
| 19-terminal/20-terminal  | AWG 22 (0.32 mm <sup>2</sup> )               |

**Note** The current capacity of electric wire depends on factors such as the ambient temperature and insulation thickness as well as the gauge of the conductor.

### Crimp Terminals

The terminals on the Power Supply Unit are M3.5, self-raising terminals with screws. Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Tighten the terminal block screws to the torque of  $0.8 \text{ N} \cdot \text{m}$ . Use crimp terminals (M3.5) having the dimensions shown below.

#### 10-terminal or 19-terminal Terminal Blocks



#### 20-terminal Terminal Blocks



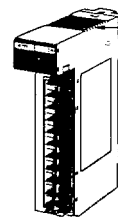
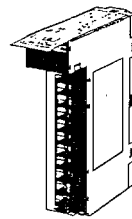
### Wiring

Do not remove the protective label from the top of the Unit until wiring has been completed. This label prevents wire strands and other foreign matter from entering the Unit during wiring procedures. (Remove the label after wiring has been completed to allow air circulation needed for cooling.)

During wiring

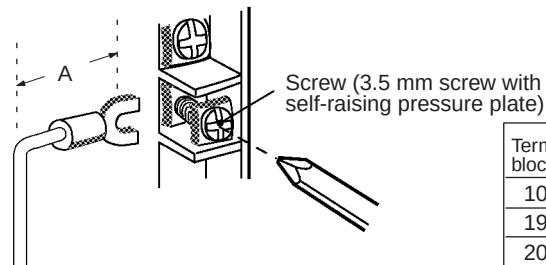


After wiring



Remove the label.

- Wire the Units so that they can be easily replaced. In addition, make sure that the I/O indicators are not covered by the wiring.
- Do not place the wiring for I/O Units in the same duct or raceway as power lines. Inductive noise can cause errors in operation.
- Tighten the terminal screws to the torque of  $0.8 \text{ N} \cdot \text{m}$ .
- The terminals have screws with 3.5-mm diameter heads and self-raising pressure plates. Connect the lead wires to the terminals as shown below.

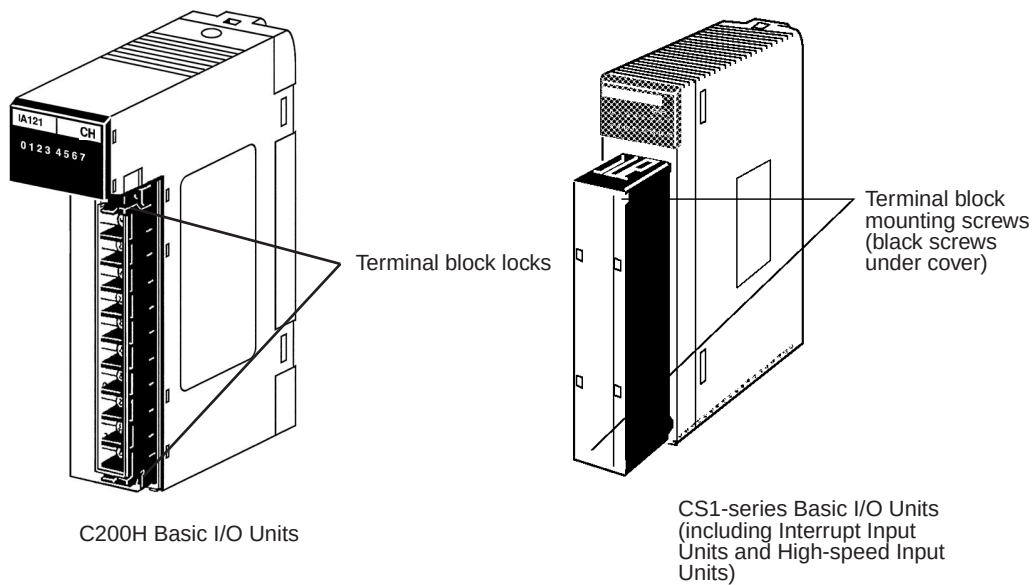


| Terminal block | A     |
|----------------|-------|
| 10P            | 23 mm |
| 19P            | 14 mm |
| 20P            | 18 mm |

### Terminal Blocks

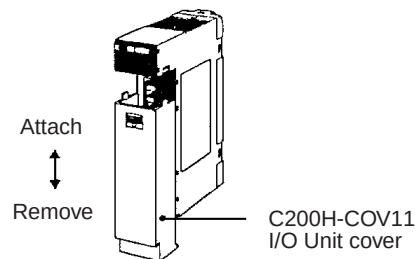
The I/O Units are equipped with removable terminal blocks. The lead wires do not have to be removed from the terminal block to remove it from an I/O Unit. The terminal block on a C200H Basic I/O Units can be removed by pressing the terminal block locks. The terminal block on a CS-series Basic I/O Units can be removed by taking out the terminal block mounting screws.





### I/O Unit Covers

The C200H-COV11 Cover is available to cover the terminal block on Units with 10-terminal terminal block connectors. These Covers can be purchased separately if extra protection is required.



### 5-3-3 Wiring CS-series and C200H I/O Units with Connectors

This section describes wiring for the following Units:

- C200H Group-2 High-density I/O Units
- CS-series Basic I/O Units with Connectors (32-, 64-, and 96-point Units)
- C200H High-density I/O Units (Special I/O Units)

C200H High-density I/O Units and CS-series Basic I/O Units with connectors use special connectors to connect to external I/O devices. The user can combine a special connector with cable or use a preassembled OMRON cable to connect a High-density I/O Unit to a terminal block or Relay Terminal. The available OMRON cables are described later in this section.

CS-series Basic I/O Units with connectors have the same connector pin allocations as the C200H High-density I/O Units to make them compatible.

- Be sure not to apply a voltage that exceeds the input voltage for Input Units or the maximum switching capacity for Output Units.
- When the power supply has positive and negative terminals, be sure to wire them correctly. Loads connected to Output Units may malfunction if the polarity is reversed.
- Use reinforced insulation or double insulation on the DC power supply connected to DC I/O Units when required by EC Directives (low voltage).
- When connecting the connector to the I/O Unit, tighten the connector screws to a torque of 0.2 N • m.

- Turn ON the power after checking the connector's wiring. Do not pull the cable. Doing so will damage the cable.
- Bending the cable too sharply can damage or break wiring in the cable.

## Available Connectors

### C200H Group-2 High-density I/O Units and CS-series Basic 32- and 64-point I/O Units

Use the following connectors when assembling a connector and cable.

The following connectors are recommended for attachment to C200H Group-2 High-density I/O Units and CS-series 32- and 64-point I/O Units.

| Connection                          | Pins | OMRON set  | Fujitsu parts                                                                 |
|-------------------------------------|------|------------|-------------------------------------------------------------------------------|
| Solder-type<br>(included with Unit) | 40   | C500-CE404 | Socket: FCN-361J040-AU<br>Connector bar: FCN-360C040-J2                       |
| Crimp-type                          | 40   | C500-CE405 | Socket: FCN-363J040<br>Connector bar: FCN-360C040-J2<br>Contacts: FCN-363J-AU |
| Crimp-type                          | 40   | C500-CE403 | FCN-367J040-AU                                                                |

**Note** Solder-type connectors are included with each Unit.

### CS-series 96-point Basic I/O Units

The following connectors are recommended for attachment to CS-series 96-point I/O Units.

| Connection                          | Pins | OMRON set  | Fujitsu parts                                                                 |
|-------------------------------------|------|------------|-------------------------------------------------------------------------------|
| Solder-type<br>(included with Unit) | 56   | CS1W-CE561 | Socket: FCN-361J056-AU<br>Connector bar: FCN-360C056-J2                       |
| Crimp-type                          | 56   | CS1W-CE562 | Socket: FCN-363J056<br>Connector bar: FCN-360C056-J2<br>Contacts: FCN-363J-AU |
| Crimp-type                          | 56   | CS1W-CE563 | FCN-367J056-AU                                                                |

**Note** Solder-type connectors are included with each Unit.

### C200H High-density I/O Units

The following connectors are recommended for attachment to C200H High-density I/O Units.

| Connection                          | Pins | OMRON set  | Fujitsu parts                                                                 |
|-------------------------------------|------|------------|-------------------------------------------------------------------------------|
| Solder-type<br>(included with Unit) | 24   | C500-CE241 | Socket: FCN-361J024-AU<br>Connector bar: FCN-360C024-J2                       |
| Crimp-type                          | 24   | C500-CE242 | Socket: FCN-363J024<br>Connector bar: FCN-360C024-J2<br>Contacts: FCN-363J-AU |
| Crimp-type                          | 24   | C500-CE243 | FCN-367J024-AU/F                                                              |

**Note** Solder-type connectors are included with each Unit.

## Wire

We recommend using cable with wire gauges of AWG 24 or AWG 26 (0.2 mm<sup>2</sup> to 0.08 mm<sup>2</sup>). Use cable with external wire diameters of 1.61 mm max.

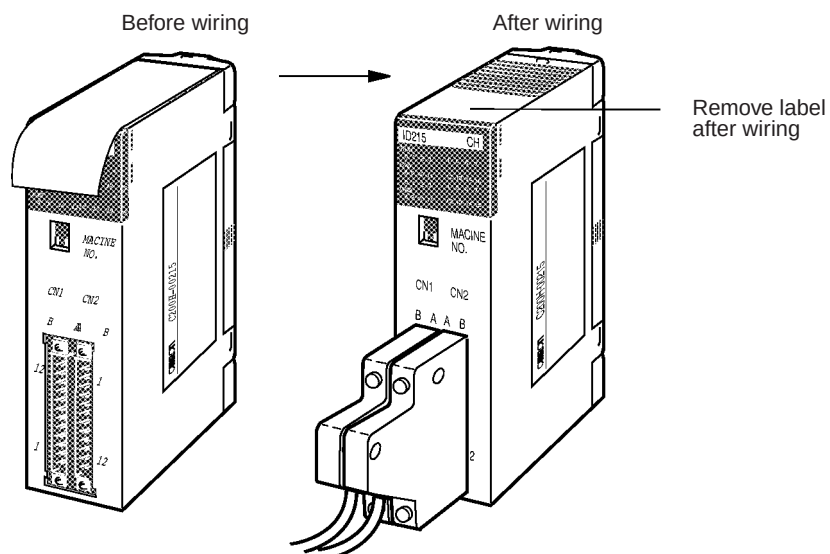
## Wiring Procedure

The wiring procedure is the same for the C200H Group-2 High-density I/O Units, CS-series High-density I/O Units, and C200H High-density I/O Units (C200H Special I/O Units).

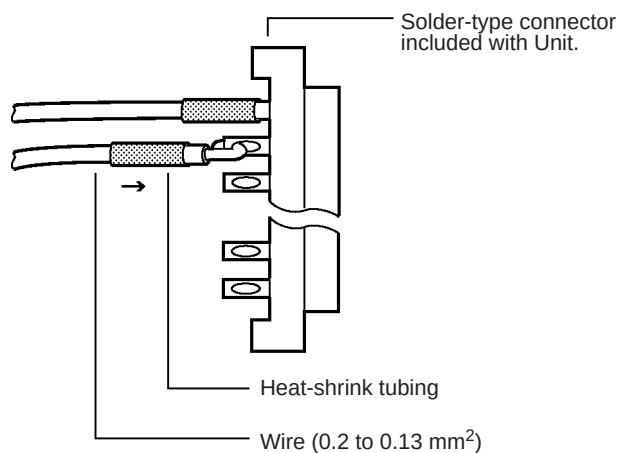
**1,2,3...**

1. Check that each Unit is installed securely.  
Note Do not force the cables.
2. Do not remove the protective label from the top of the Unit until wiring has been completed. This label prevents wire strands and other foreign matter

from entering the Unit during wiring. (Remove the label after wiring has been completed to allow air circulation needed for cooling.)

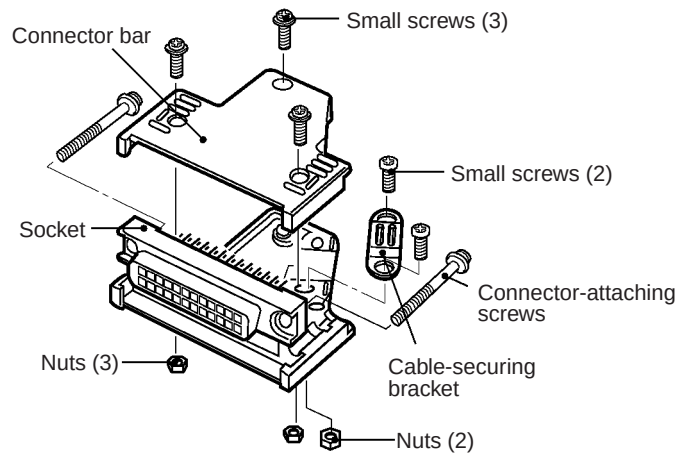


- When solder-type connectors are being used, be sure not to accidentally short adjacent terminals. Cover the solder joint with heat-shrink tubing.

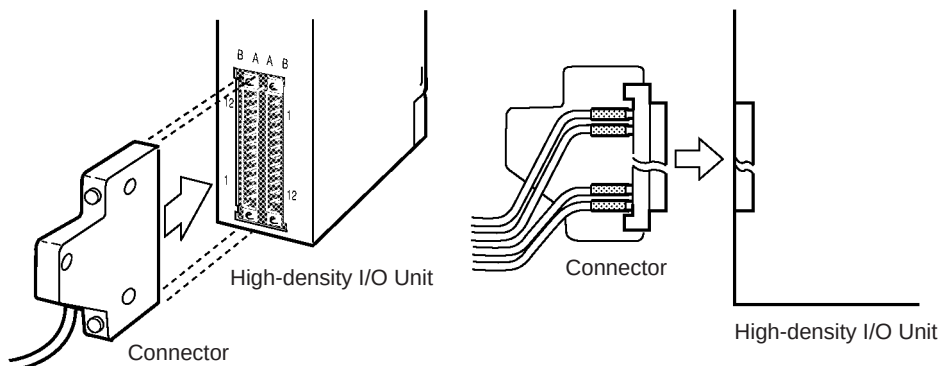


**Note** Double-check to make sure that the Output Unit's power supply leads haven't been reversed. If the leads are reversed, the Unit's internal fuse will blow and the Unit will not operate.

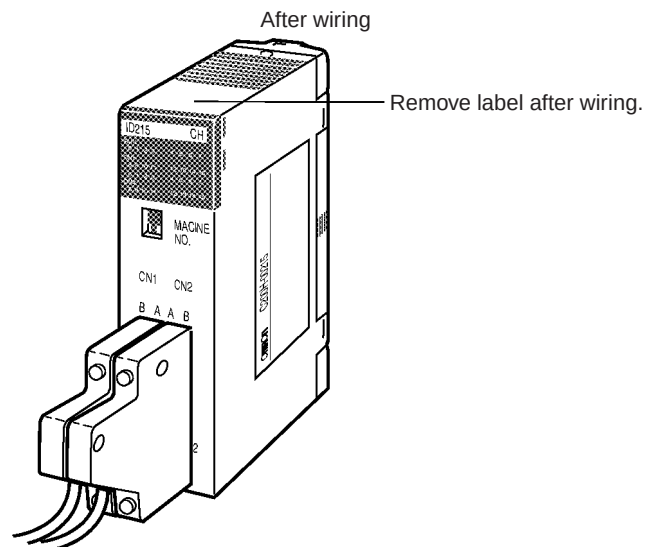
4. Assemble the connector (included or purchased separately) as shown in the following diagram.



5. Insert the wired connector.



6. Remove the protective label after wiring has been completed to allow air circulation needed for cooling.



Tighten the connector-attaching screws to a torque of 0.2 N•m.

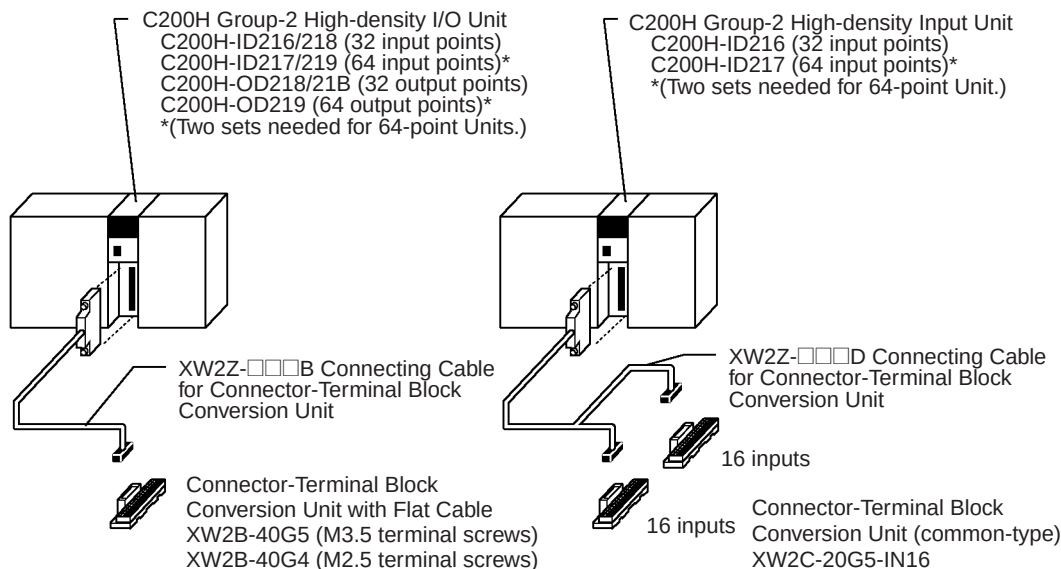
## Preassembled Cables

The following examples show applications for preassembled OMRON Cables. Contact your OMRON dealer for more details.

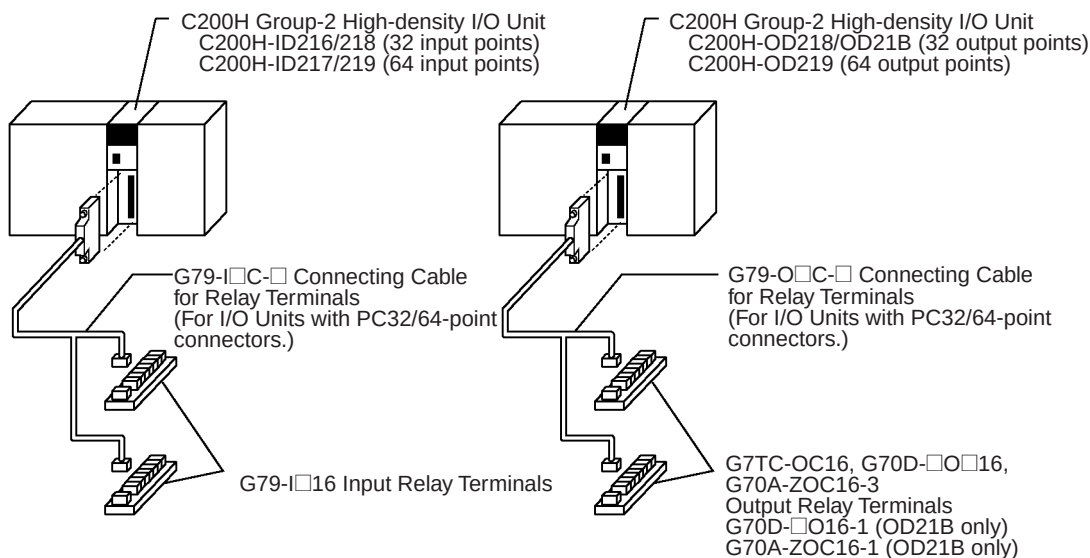
### C200H Group-2 High-density I/O Units

The following cables are compatible with C200H Group-2 High-density I/O Units.

#### 1,2,3... 1. Connecting to a terminal block.



#### 2. Connecting to a Relay Terminal.

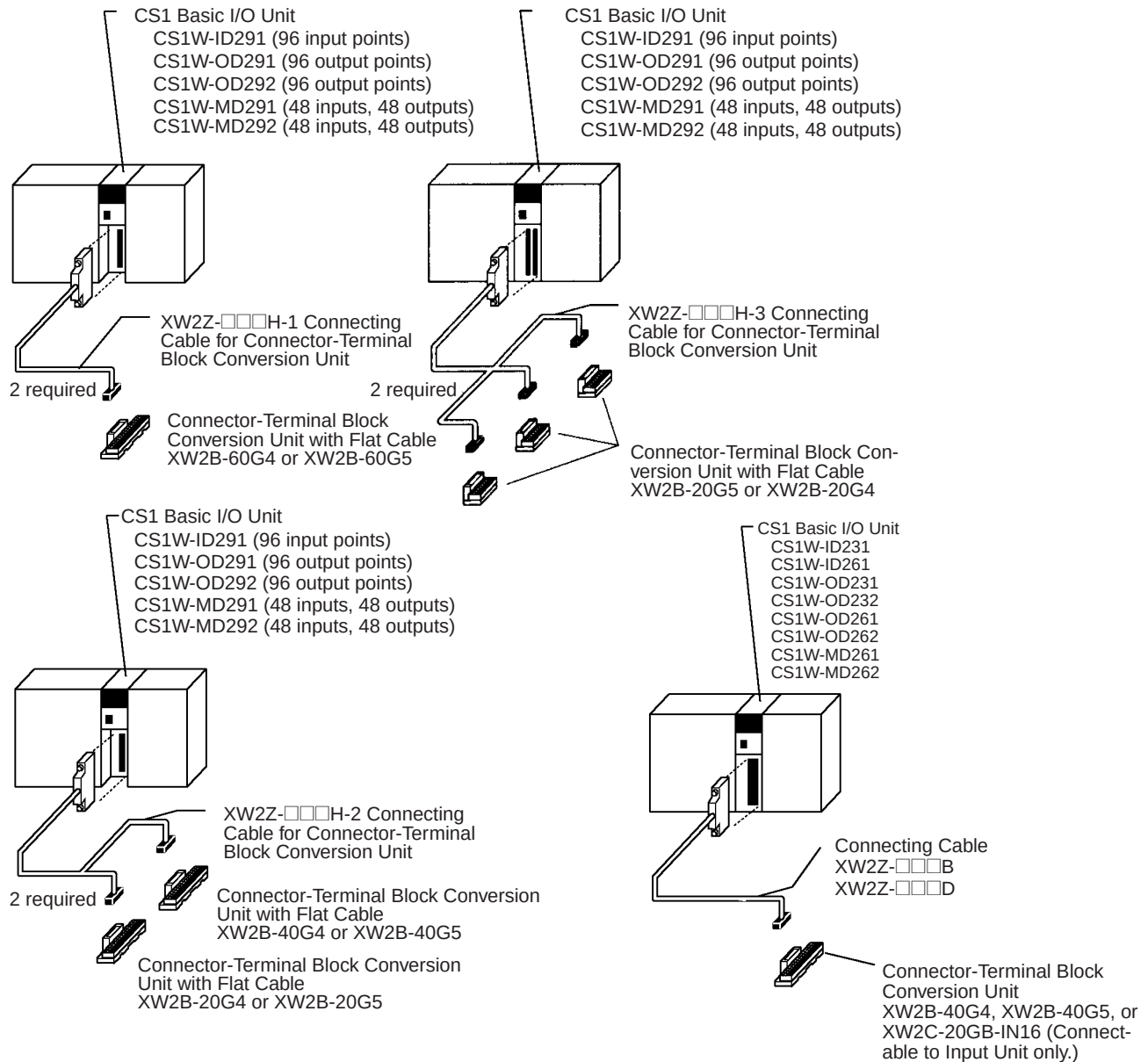


### CS-series Basic I/O Units with Connectors

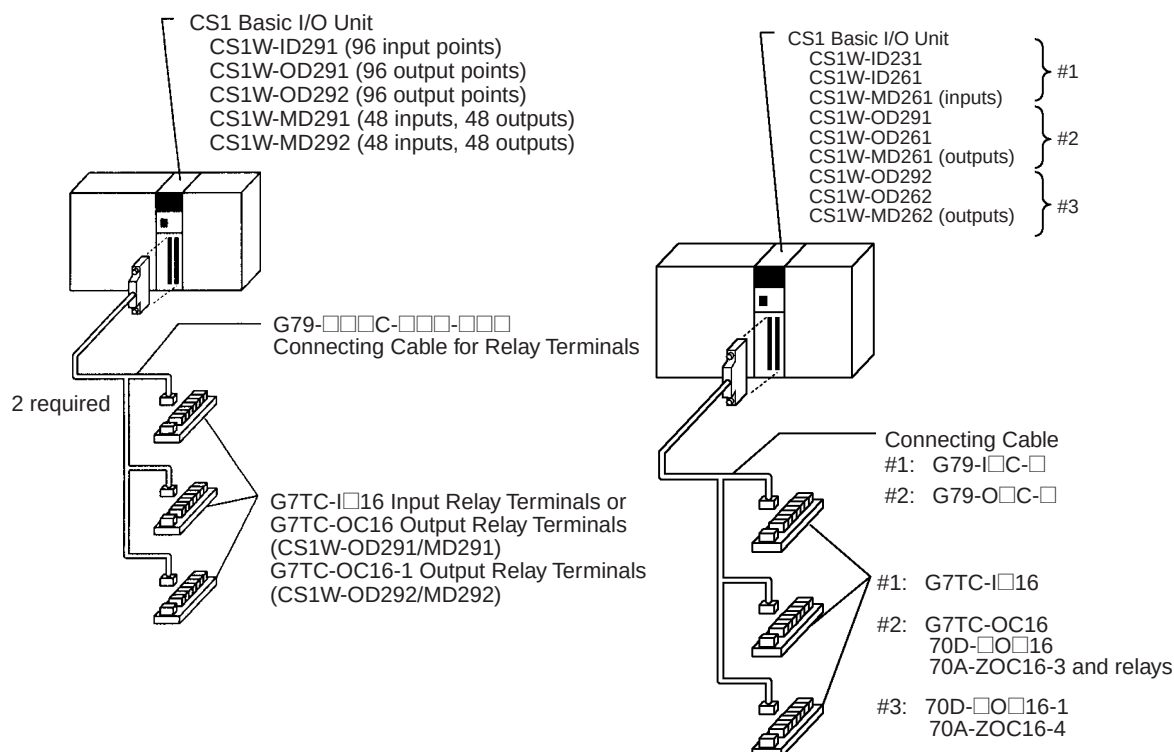
The following cables are compatible with CS-series High-density I/O Units.

**1,2,3...**

1. Connecting to a terminal block. (Two of the following Cables and Conversion Units are required.)



2. Connecting to a Relay Terminal. (Two of the following Cables and Relay Terminals are required.)

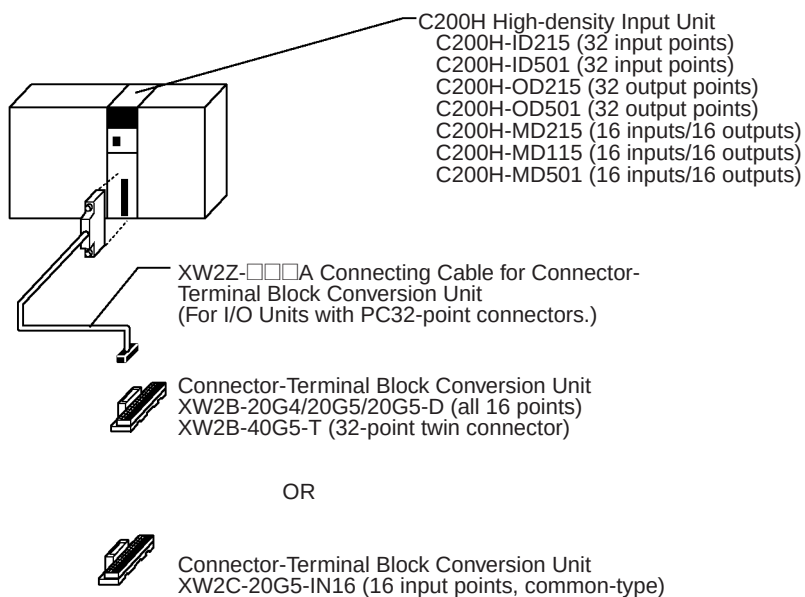


### C200H High-density I/O Units

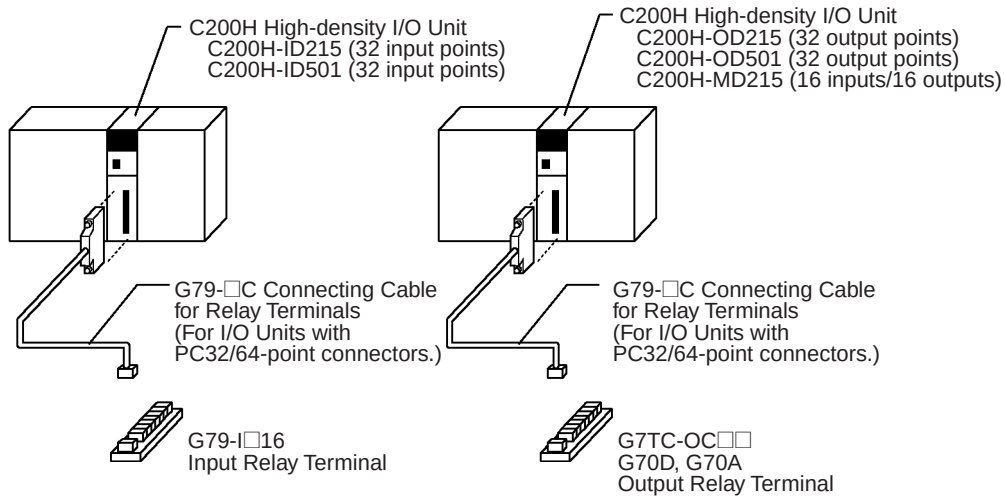
The following cables are compatible with C200H High-density I/O Units (a kind of C200H Special I/O Unit).

1,2,3...

1. Connecting to a terminal block.



## 2. Connecting to a Relay Terminal.



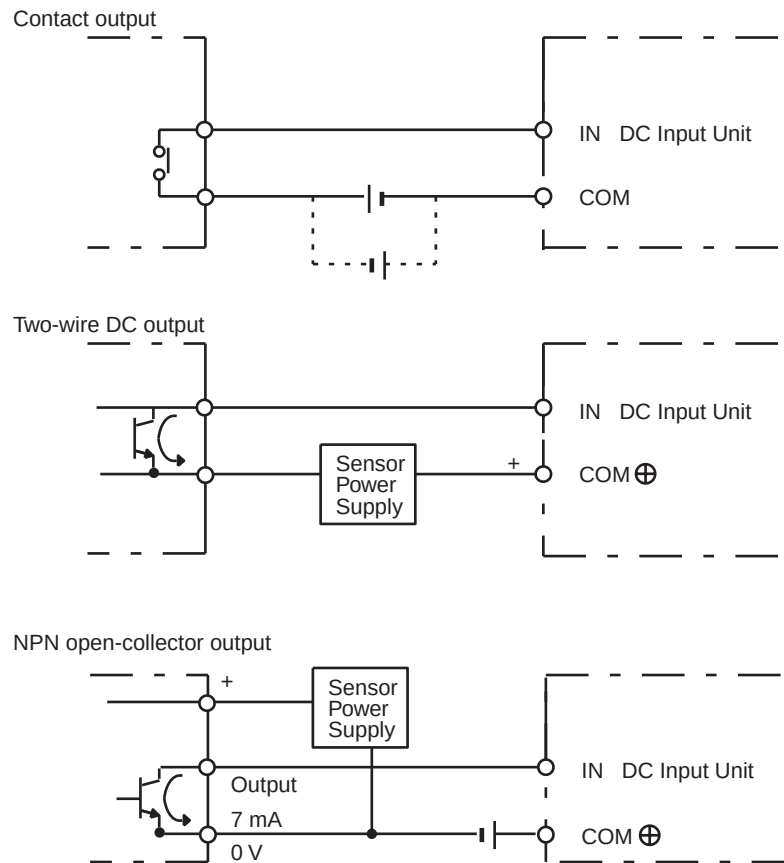
## 5-3-4 Connecting I/O Devices

Input Devices

Use the following information for reference when selecting or connecting input devices.

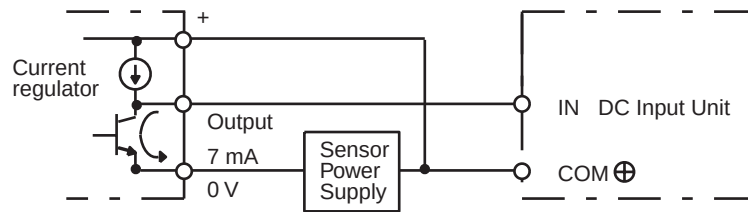
**DC Input Units**

The following types of DC input devices can be connected.

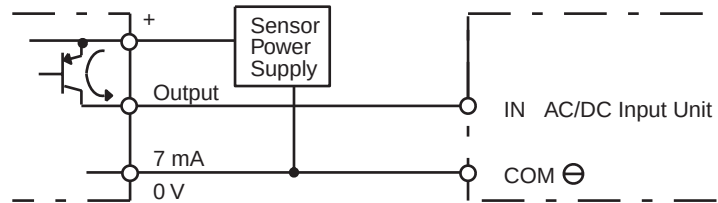




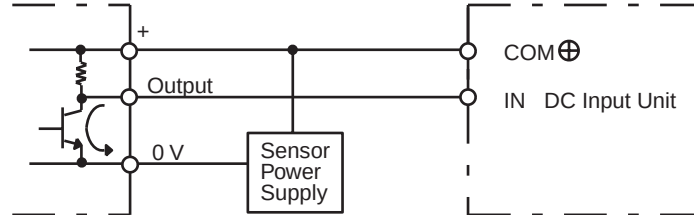
NPN current output



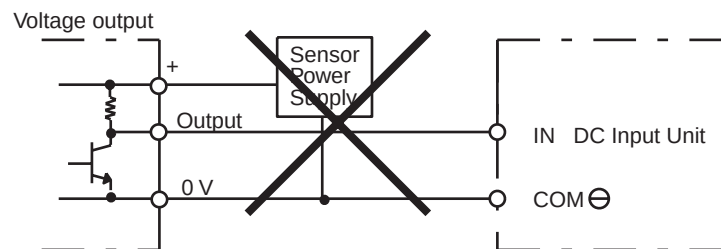
PNP current output



Voltage current output



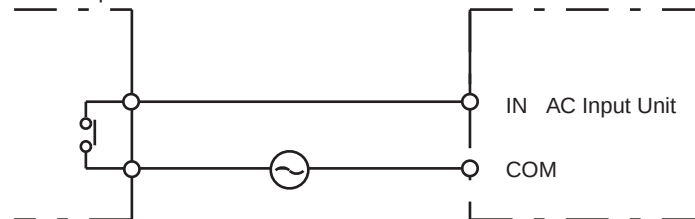
The circuit below should **NOT** be used for I/O devices having a voltage output.



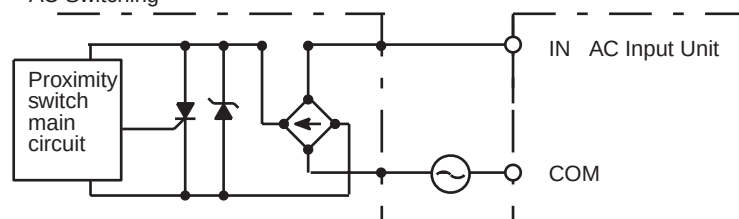
## AC Input Units

The following types of AC input devices can be connected.

Contact output



AC Switching



**Note** When using a reed switch as the input contact for an AC Input Unit, use a switch with an allowable current of 1 A or greater. If Reed switches with smaller allowable currents are used, the contacts may fuse due to surge currents.

#### Precautions when Connecting a Two-wire DC Sensor

When using a two-wire sensor with a 12-V DC or 24-V DC input device, check that the following conditions have been met. Failure to meet these conditions may result in operating errors.

1,2,3...

1. Relation between voltage when the PLC is ON and the sensor residual voltage:

$$V_{ON} \leq V_{CC} - V_R$$

2. Relation between voltage when the PLC is ON and sensor control output (load current):

$$I_{OUT} (\text{min.}) \leq I_{ON} \leq I_{OUT} (\text{max.})$$

$$I_{ON} = (V_{CC} - V_R - 1.5 \text{ [PLC internal residual voltage]}) / R_{IN}$$

When  $I_{ON}$  is smaller than  $I_{OUT} (\text{min.})$ , connect a bleeder resistor R. The bleeder resistor constant can be calculated as follows:

$$R \leq (V_{CC} - V_R) / (I_{OUT} (\text{min.}) - I_{ON})$$

$$\text{Power } W \geq (V_{CC} - V_R)^2 / R \times 4 \text{ [allowable margin]}$$

**Note** The residual voltage in the PLC is 4.0 V for the following Units:

C200H-ID211/ID212/IM211/IM212/INT01

The residual voltage is 1.5 V for all other Units.

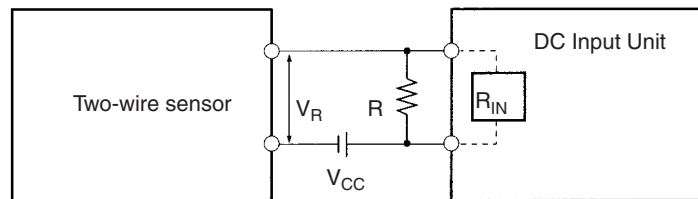
3. Relation between current when the PLC is OFF and sensor leakage current:

$$I_{OFF} \geq I_{leak}$$

If  $I_{leak}$  is larger than  $I_{OFF}$ , connect a breeder resistor. The breeder resistor constant can be calculated as follows:

$$R \leq R_{IN} \times V_{OFF} / (I_{leak} \times R_{IN} - V_{OFF})$$

$$\text{Power } W \geq (V_{CC} - V_R)^2 / R \times 4 \text{ [allowable margin]}$$



$V_{CC}$ : Power voltage  
 $V_{ON}$ : PLC ON voltage  
 $I_{ON}$ : PLC ON current  
 $I_{OFF}$ : PLC OFF current  
 $R_{IN}$ : PLC input impedance

$V_R$ : Sensor output residual current  
 $I_{OUT}$ : Sensor control current (load current)  
 $I_{leak}$ : Sensor leakage current  
 $R$ : Bleeder resistance

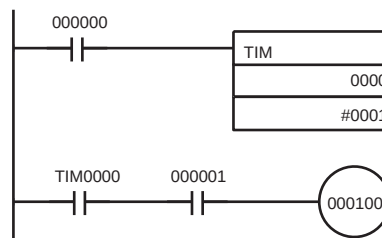
4. Precautions on Sensor Surge Current

An incorrect input may occur if a sensor is turned ON after the PLC has started up to the point where inputs are possible. Determine the time required for sensor operation to stabilize after the sensor is turned ON and take appropriate measures, such as inserting into the program a timer delay after turning ON the sensor.

#### Example

In this example, the sensor's power supply voltage is used as the input to

CIO 000000 and a 100-ms timer delay (the time required for an OMRON Proximity Sensor to stabilize) is created in the program. After the Completion Flag for the timer turns ON, the sensor input on CIO 000001 will cause output bit CIO 000100 to turn ON.



## Output Wiring Precautions

### Output Short-circuit Protection

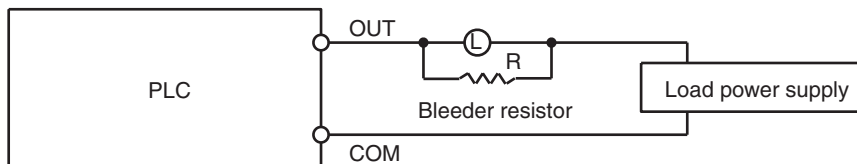
If a load connected to the output terminals is short-circuited, output components and the printed circuit boards may be damaged. To guard against this, incorporate a fuse in the external circuit. Use a fuse with a capacity of about twice the rated output.

### Transistor Output Residual Voltage

A TTL circuit cannot be connected directly to a transistor output because of the transistor's residual voltage. It is necessary to connect a pull-up resistor and a CMOS IC between the two.

### Output Leakage Current

If a Triac Output Unit is used to drive a low-current load, the leakage current may prevent the output device from turning OFF. To prevent this, connect a bleeder resistor in parallel with the load as shown in the following diagram.



Use the following formula to determine the resistance and rating for the bleeder resistor.

$$R < \frac{V_{ON}}{I}$$

$V_{ON}$ : ON voltage of the load (V)

$I$ : Leakage current (mA)

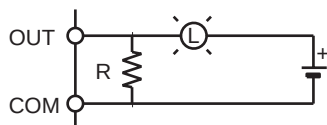
$R$ : Bleeder resistance (K $\Omega$ )

### Output Surge Current

When connecting a transistor or triac output to an output device having a high surge current (such as an incandescent lamp), steps must be taken to avoid damage to the transistor or triac. Use either of the following methods to reduce the surge current.

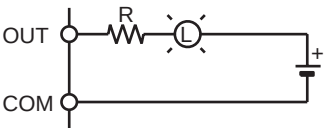
#### Method 1

Add a resistor that draws about 1/3 of the current consumed by the bulb.



#### Method 2

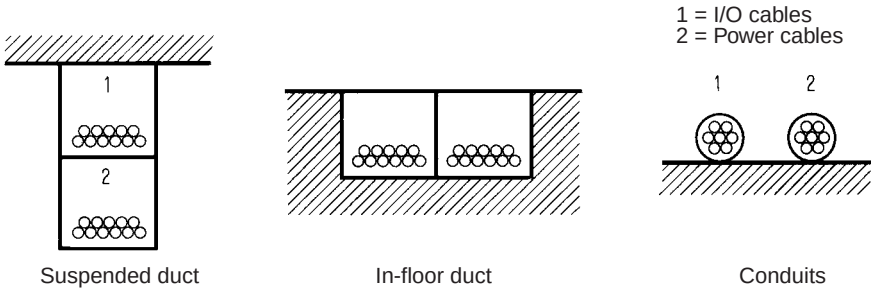
Add a control resistor as shown in the following diagram.



5-3-5 Reducing Electrical Noise

I/O Signal Wiring

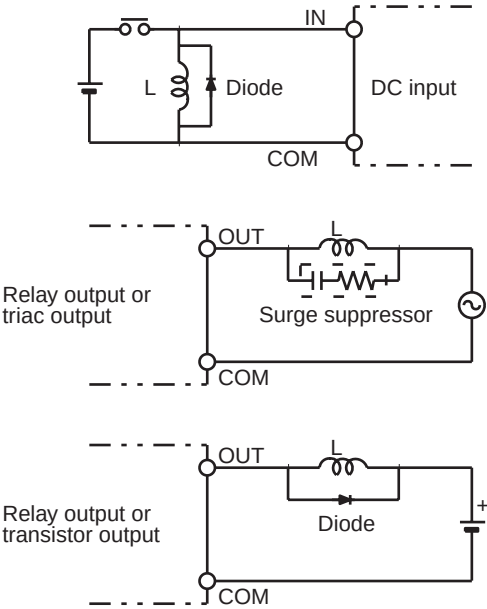
Whenever possible, place I/O signal lines and power lines in separate ducts or raceways both inside and outside of the control panel.



If the I/O wiring and power wiring must be routed in the same duct, use shielded cable and connect the shield to the GR terminal to reduce noise.

Inductive Loads

When an inductive load is connected to an I/O Unit, connect a surge suppressor or diode in parallel with the load as shown below.



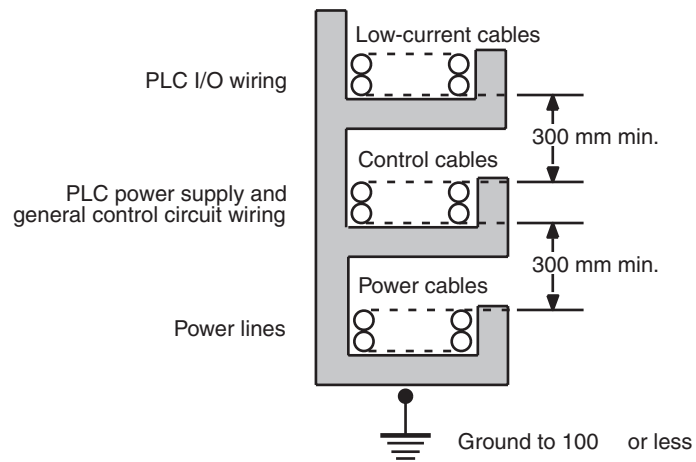
**Note** Use surge suppressors and diodes with the following specifications.

| Surge suppressor specifications                                       | Diode specifications                                                            |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Resistor:50 $\Omega$<br>Capacitor:0.47 $\mu\text{F}$<br>Voltage:200 V | Breakdown voltage: 3 times load voltage min.<br>Mean rectification current: 1 A |

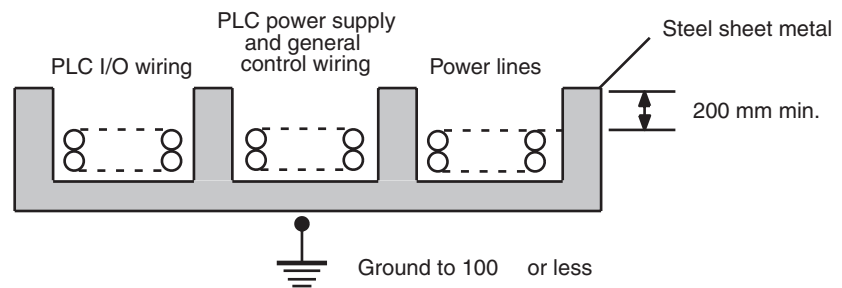
External Wiring

Observe the following precautions for external wiring.

- When multi-conductor signal cable is being used, avoid combining I/O wires and other control wires in the same cable.
- If wiring racks are parallel, allow at least 300 mm (12 inches) between the racks.



If the I/O wiring and power cables must be placed in the same duct, they must be shielded from each other using grounded steel sheet metal.



## SECTION 6

# DIP Switch Settings

This section describes the settings of the DIP switch and how they affect operation.

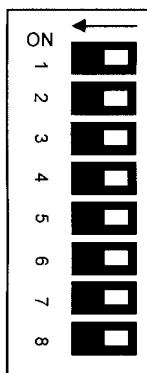
|     |                           |     |
|-----|---------------------------|-----|
| 6-1 | DIP Switch Settings ..... | 250 |
|-----|---------------------------|-----|

## 6-1 DIP Switch Settings

There are two kinds of initial settings for a CS-series PLC: hardware settings and software settings. Hardware settings are made with the CPU Unit's DIP switch and software settings are made in the PLC Setup (using a Programming Device).

The DIP switch can be reached by opening the battery compartment cover on the front of the CPU Unit.

**Note** Always turn off the PLC before changing any DIP switch settings. The PLC may malfunction due to static discharge if the settings are changed while the PLC is ON.



| Pin | Function                                                    | Setting       |                                              | Description                                                                                                                                                                                                                                                                                                                                                                            |
|-----|-------------------------------------------------------------|---------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Write-protection for user program memory (UM) (See note 1.) | ON            | Write-protected                              | User program memory is write-protected when this pin is ON. Turn ON to prevent the program from being changed accidentally.                                                                                                                                                                                                                                                            |
|     |                                                             | OFF           | Read/write                                   |                                                                                                                                                                                                                                                                                                                                                                                        |
| 2   | Automatic transfer of the program at start-up               | ON            | Yes                                          | The program (AUTOEXEC.OBJ) and PLC Setup (AUTOEXEC.STD) will be transferred from the Memory Card to the CPU Unit automatically at start-up when this pin is ON. (See note 4.)                                                                                                                                                                                                          |
|     |                                                             | OFF           | No                                           | A PLC's software (program and PLC Setup) can be completely initialized just by inserting a new Memory Card and turning on the power. This can be used to switch the system to a new arrangement very quickly.<br><b>Note</b> When pin 7 is ON, reading from the Memory Card for easy backup is given priority; even if pin 2 is ON, the program will not be automatically transferred. |
| 3   | CS1 CPU Unit: Programming Console language                  | ON            | English                                      | Programming Console messages are displayed in English when this pin is ON. Turn OFF to display messages in the language stored in system ROM.                                                                                                                                                                                                                                          |
|     |                                                             | OFF           | Other                                        |                                                                                                                                                                                                                                                                                                                                                                                        |
|     | CS1-H CPU Unit                                              | Not used.     |                                              |                                                                                                                                                                                                                                                                                                                                                                                        |
| 4   | Peripheral port communications parameters                   | ON            | Use parameters set in the PLC Setup.         | <ul style="list-style-type: none"><li>• Leave this pin OFF when using a Programming Console or CX-Programmer (peripheral bus setting) connected to the peripheral port.</li><li>• Turn this pin ON when the peripheral port is being used for a device other than a Programming Console or CX-Programmer (peripheral bus setting).</li></ul>                                           |
|     |                                                             | OFF (default) | Auto-detect Programming Device (See note 2.) |                                                                                                                                                                                                                                                                                                                                                                                        |
| 5   | RS-232C port communications parameters                      | ON            | Auto-detect Programming Device (See note 3.) | <ul style="list-style-type: none"><li>• Leave this pin OFF when the RS-232C port is being used for a device other CX-Programmer (peripheral bus setting) such as a Programmable Terminal or host computer.</li><li>• Turn this pin ON when using CX-Programmer (peripheral bus setting) connected to the RS-232C port.</li></ul>                                                       |
|     |                                                             | OFF (default) | Use parameters set in the PLC Setup.         |                                                                                                                                                                                                                                                                                                                                                                                        |
| 6   | User-defined pin                                            | ON            | A39512 ON                                    | The ON/OFF status of this pin is reflected in A39512. Use this function when you want to create an Always-ON or Always-OFF condition in the program without using an Input Unit.                                                                                                                                                                                                       |
|     |                                                             | OFF (default) | A39512 OFF                                   |                                                                                                                                                                                                                                                                                                                                                                                        |

| Pin | Function            | Setting       |                                                 | Description                                                                                                                                                                    |
|-----|---------------------|---------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7   | Easy backup setting | ON            | Writing from the CPU Unit to the Memory Card    | Press and hold the Memory Card Power Supply Switch for three seconds.                                                                                                          |
|     |                     |               | Restoring from the Memory Card to the CPU Unit. | To read from the Memory Card to the CPU Unit, turn ON the PLC power.<br>This operation is given priority over automatic transfer (pin 2 is ON) when power is ON. (See note 5.) |
|     |                     | OFF (default) | Verifying contents of Memory Card.              | Press and hold the Memory Card Power Supply Switch for three seconds.                                                                                                          |
| 8   | Not used            | OFF (default) | Always OFF.                                     |                                                                                                                                                                                |

- Note**
1. The following data is write-protected when pin 1 is ON: the user program and all data in the parameter area such as the PLC Setup and registered I/O table. Furthermore when pin 1 is ON, the user program and parameter area won't be cleared even when the memory clear operation is performed from a Programming Device.
  2. The auto-detect goes through baud rates in the following order: Programming Console → Peripheral bus at 9,600 bps, 19,200 bps, 38,400 bps, and 115,200 bps. Programming Devices that aren't in peripheral bus mode and devices in peripheral bus mode operating at 51,200 bps will not be detected.
  3. The auto-detect operation goes through baud rates in the following order: Peripheral bus at 9,600 bps, 19,200 bps, 38,400 bps, and 115,200 bps. Programming Devices that aren't in peripheral bus mode and devices in peripheral bus mode operating at any other speeds will not be detected.
  4. When pin 2 is ON and the power is turned ON, any I/O Memory file (AUTOEXEC.IOM, ATEXEC□□.IOM) (prefer to the *CS/CJ Series Programming Manual*) will also be transferred automatically. Both the program (AUTOEXEC.OBJ) and the parameter area (AUTOEXEC.STD) must exist in the Memory Card. I/O Memory files (AUTOEXEC.IOM, ATEXEC□□.IOM) are optional.
  5. A CS1-H or CJ1-H CPU Unit will remain in PROGRAM mode after the simple backup operation has been performed and cannot be changed to MONITOR or RUN mode until the power supply has been cycled. After completing the backup operation, turn OFF the power supply to the CPU Unit, change the settings of pin 7, and then turn the power supply back ON.

| DIP switch settings |     | PLC Setup settings                                                                                        |                |                                      |                                                  |                                                     |                |                    |                       |                 |
|---------------------|-----|-----------------------------------------------------------------------------------------------------------|----------------|--------------------------------------|--------------------------------------------------|-----------------------------------------------------|----------------|--------------------|-----------------------|-----------------|
|                     |     | Peripheral port settings<br>(Address 144 bits 8 to 11)                                                    |                |                                      |                                                  | RS-232C port settings<br>(Address 160 bits 8 to 11) |                |                    |                       |                 |
|                     |     | Default<br>(0)                                                                                            | NT Link<br>(2) | Peripheral<br>bus (4)                | HostLink<br>(5)                                  | Default<br>(0)                                      | NT Link<br>(2) | No-protocol<br>(3) | Peripheral<br>bus (4) | HostLink<br>(5) |
| Pin 4               | OFF | Programming Console or CX-Programmer in peripheral bus mode<br>(Auto-detect connected device's baud rate) |                |                                      |                                                  | ---                                                 |                |                    |                       |                 |
|                     | ON  | Host computer or CX-Programmer in host link mode                                                          | PT (NT Link)   | CX-Programmer in peripheral bus mode | Host computer or CX-Programmer in host link mode | ---                                                 |                |                    |                       |                 |



| DIP switch settings |     | PLC Setup settings                                     |                |                       |                  |                                                                                    |                |                          |                                      |                                                  |
|---------------------|-----|--------------------------------------------------------|----------------|-----------------------|------------------|------------------------------------------------------------------------------------|----------------|--------------------------|--------------------------------------|--------------------------------------------------|
|                     |     | Peripheral port settings<br>(Address 144 bits 8 to 11) |                |                       |                  | RS-232C port settings<br>(Address 160 bits 8 to 11)                                |                |                          |                                      |                                                  |
|                     |     | Default<br>(0)                                         | NT Link<br>(2) | Peripheral<br>bus (4) | Host Link<br>(5) | Default<br>(0)                                                                     | NT Link<br>(2) | No-protocol<br>(3)       | Peripheral<br>bus (4)                | Host Link<br>(5)                                 |
| Pin 5               | OFF | ---                                                    |                |                       |                  | Host computer or CX-Programmer in host link mode                                   | PT (NT Link)   | Standard external device | CX-Programmer in peripheral bus mode | Host computer or CX-Programmer in host link mode |
|                     | ON  | ---                                                    |                |                       |                  | CX-Programmer in peripheral bus mode<br>(Auto-detect connected device's baud rate) |                |                          |                                      |                                                  |

**Note** Use the following settings for the network on the CX-Programmer and pin 4 on the DIP switch when connecting the CX-Programmer via the peripheral or RS-232C port.

| CX-Programmer network setting | Peripheral port connections | RS-232C port connection | PLC Setup         |
|-------------------------------|-----------------------------|-------------------------|-------------------|
| Toolbus (peripheral bus)      | Turn OFF pin 4.             | Turn OFF pin 4.         | None              |
| SYSMAC WAY (Host Link)        | Turn OFF bit 4.             | Turn OFF pin 4.         | Set to Host Link. |

When CX-Programmer is set to host link mode, it won't be possible to communicate (go online) in the following cases:

- The computer is connected to the CPU Unit's peripheral port and pin 4 is OFF.
- The computer is connected to the CPU Unit's RS-232C port and pin 5 is ON.

To go online, set CX-Programmer to peripheral bus mode, turn pin 4 ON (turn pin 5 OFF for the RS-232C port), and set the communications mode to host link mode in the PLC Setup.

## SECTION 7

### PLC Setup

This section describes the settings in the PLC Setup and how they are used to control CPU Unit operation.

|       |                                              |     |
|-------|----------------------------------------------|-----|
| 7-1   | PLC Setup . . . . .                          | 254 |
| 7-1-1 | Overview of the PLC Setup . . . . .          | 254 |
| 7-1-2 | PLC Setup Settings . . . . .                 | 255 |
| 7-2   | Explanations of PLC Setup Settings . . . . . | 271 |

## 7-1 PLC Setup

### 7-1-1 Overview of the PLC Setup

The PLC Setup contains basic CPU Unit software settings that the user can change to customize PLC operation. These settings can be changed from a Programming Console or other Programming Device. The various settings for the CPU Unit are made in the PLC Setup.

The following table lists cases in which the PLC Setup must be changed. In other cases, the PLC can be operated with the default settings.

| Cases when settings must be changed                                                                                                                                                                                                                                                                                                                                             | Setting(s) to be changed                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| The input response time settings for Basic I/O Units must be changed in the following cases: <ul style="list-style-type: none"> <li>Chattering or noise occur in CS-series Basic I/O Units.</li> <li>Short pulse inputs are being received for intervals longer than the cycle time.</li> </ul>                                                                                 | Basic I/O Unit Input Response Time                                                                 |
| Data in all regions of I/O Memory (including the CIO Area, Work Areas, Timer Flags and PVs, Task Flags, Index Registers, and Data Registers) must be retained when the PLC's power is turned on.                                                                                                                                                                                | IOM Hold Bit Status at Startup                                                                     |
| The status of bits force-set or force-reset from a Programming Device (including Programming Consoles) must be retained when the PLC's power is turned on.                                                                                                                                                                                                                      | Forced Status Hold Bit Status at Startup                                                           |
| <ul style="list-style-type: none"> <li>You do not want the operating mode to be determined by the Programming Console's mode switch setting at startup.</li> <li>You want the PLC to go into RUN mode or MONITOR mode and start operating immediately after startup.</li> <li>You want the operating mode to be other than PROGRAM mode when the power is turned ON.</li> </ul> | Startup Mode                                                                                       |
| Disabling detection of low-battery errors when it is not required.                                                                                                                                                                                                                                                                                                              | Detect Low Battery                                                                                 |
| Detecting interrupt-task errors is not required.                                                                                                                                                                                                                                                                                                                                | Detect Interrupt Task Error                                                                        |
| Data files are required but a Memory Card cannot be used or the files are written frequently. (Part of the EM Area will be used as file memory.)                                                                                                                                                                                                                                | EM File Memory                                                                                     |
| The peripheral port will not be used with the Programming Console or CX-Programmer (peripheral bus) communications speed auto-detection and will not use the default host link communications settings such as 9,600 bps.<br><b>Note</b> Pin 4 of the DIP switch on the front of the CPU Unit must be OFF to change the PLC Setup settings.                                     | Peripheral Port Settings                                                                           |
| The RS-232C port will not be used with the Programming Console or CX-Programmer (peripheral bus) communications speed auto-detection and will not use the default host link communications settings such as 9,600 bps.<br><b>Note</b> Pin 5 of the DIP switch on the front of the CPU Unit must be OFF to change the PLC Setup settings.                                        | RS-232C Port Settings                                                                              |
| You want to speed up communications with a PT via an NT Link.                                                                                                                                                                                                                                                                                                                   | Set the peripheral port or the RS-232C port communications port baud rate to "high-speed NT Link." |
| You want the intervals for scheduled interrupts to be set in units of 1 ms rather than 10 ms.                                                                                                                                                                                                                                                                                   | Scheduled Interrupt Time Units                                                                     |
| You want CPU Unit operation to be stopped for instruction errors, i.e., when the ER Flag or AER Flag is turned ON. (You want instruction errors to be fatal errors.)<br>You want to find the instructions where instruction errors are occurring (where the ER Flag is turning ON.                                                                                              | Instruction Error Operation                                                                        |
| You want a minimum cycle time setting to create a consistent I/O refresh cycle.                                                                                                                                                                                                                                                                                                 | Minimum Cycle Time                                                                                 |
| You want to set a maximum cycle time other than 1 second (10 ms to 40,000 ms).                                                                                                                                                                                                                                                                                                  | Watch Cycle Time                                                                                   |
| You want to delay peripheral servicing so that it is executed over several cycles.                                                                                                                                                                                                                                                                                              | Fixed Peripheral Servicing Time                                                                    |

| Cases when settings must be changed                                                                                                                                                                        | Setting(s) to be changed                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| You want to give priority to servicing peripherals over program execution. Here, "peripherals" include CPU Bus Units, Special I/O Units, Inner Boards, the built-in RS-232C port, and the peripheral port. | Peripheral Servicing Priority Mode                                                                   |
| A power OFF interrupt task will be used.                                                                                                                                                                   | Power OFF Interrupt Task                                                                             |
| You want to extend the detection of a power interruption to 10 to 20 ms.                                                                                                                                   | Power OFF Detection Delay Time                                                                       |
| You want to shorten the average cycle time when a lot of Special I/O Units are being used.                                                                                                                 | Special I/O Unit Cyclic Refreshing                                                                   |
| You want to extend the I/O refreshing interval for Special I/O Units.                                                                                                                                      |                                                                                                      |
| You want to improve both program execution and peripheral servicing response.                                                                                                                              | CPU Processing Mode (CS1-H CPU Units only)                                                           |
| You do not want to record user-defined errors for FAL(006) and FPD(269) in the error log.                                                                                                                  | FAL Error Log Registration (CS1-H CPU Units only)                                                    |
| You want to reduce fluctuation in the cycle time caused by text string processing                                                                                                                          | Background Execution for Table Data, Text String, and Data Shift Instructions (CS1-H CPU Units only) |
| You do not want to wait for Units and Boards to complete startup processing to start CPU Unit operation.                                                                                                   | Startup Condition (CS1-H CPU Units only)                                                             |

## 7-1-2 PLC Setup Settings

All non-binary settings in the following tables are hexadecimal unless otherwise specified.

### 7-1-2-1 Startup Tab (on CX-Programmer)

#### Startup Hold Settings

##### Forced Status Hold Bit

| Address in Programming Console |        | Settings                                | Function                                                                                                                                                                                                                                                                                                                    | Related flags and words         | New setting's effectiveness |
|--------------------------------|--------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------|
| Word                           | Bit(s) |                                         |                                                                                                                                                                                                                                                                                                                             |                                 |                             |
| 80                             | 14     | 0: Cleared<br>1: Retained<br>Default: 0 | This setting determines whether or not the status of the Forced Status Hold Bit (A50013) is retained at startup.<br><br>When you want all of the bits that have been force-set or force-reset to retain their forced status when the power is turned on, turn ON the Forced Status Hold Bit and set this setting to 1 (ON). | A50013 (Forced Status Hold Bit) | Takes effect at startup     |

##### IOM Hold Bit

| Address in Programming Console |        | Settings                                | Function                                                                                                                                                                                                                                                       | Related flags and words | New setting's effectiveness |
|--------------------------------|--------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------|
| Word                           | Bit(s) |                                         |                                                                                                                                                                                                                                                                |                         |                             |
| 80                             | 15     | 0: Cleared<br>1: Retained<br>Default: 0 | This setting determines whether or not the status of the IOM Hold Bit (A50012) is retained at startup.<br><br>When you want all of the data in I/O Memory to be retained when the power is turned on, turn ON the IOM Hold Bit and set this setting to 1 (ON). | A50012 (IOM Hold Bit)   | Takes effect at startup     |

**Mode Setting**

| Address in Programming Console |        | Settings                                                                                                                                             | Function                                                                                                                                                                                                                                                                                                                                           | Related flags and words | New setting's effectiveness |
|--------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------|
| Word                           | Bit(s) |                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                    |                         |                             |
| 81                             | ---    | Program: PROGRAM mode<br>Monitor: MONITOR mode<br>Run: RUN mode<br>Use programming console:<br>Programming Console's mode switch<br>Default: Program | This setting determines whether the Startup Mode will be the mode set on the Programming Console's mode switch or the mode set here in the PLC Setup.<br><br>If this setting is PRCN and a Programming Console isn't connected, startup mode will depend on the CPU Unit being used.<br><br>CS1 CPU Unit: PROGRAM mode<br>CS1-H CPU Unit: RUN mode | ---                     | Takes effect at startup     |

**Execution Settings****Startup Condition (CS1-H CPU Units Only)**

| Address in Programming Console |        | Settings                                                      | Function                                                                                                                                                                                                                                                                                                                                                                                                | Related flags and words | New setting's effectiveness |
|--------------------------------|--------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------|
| Word                           | Bit(s) |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                         |                         |                             |
| 83                             | 15     | 0: Wait for Units and Boards.<br>1: Don't wait.<br>Default: 0 | To start the CPU Unit in MONITOR or PROGRAM mode even if there is one or more Boards or Units that has not completed startup processing, set this setting to 1 (Don't wait for Units and Boards). (The operation for Inner Boards, however, also depends on the next setting.)<br><br>To wait for all Units and Boards to finish startup processing, set this setting to 0 (Wait for Units and Boards). | ---                     | Takes effect at startup     |

**Note** This setting applies only to specific Units and Boards.

**Specific Units**

This setting applies to the ITNC-EIS01-CST and ITNC-EIX01-CST Open Network Controller-CS1 Bus Interface Units.

**Specific Boards**

There are currently no Inner Boards that are applicable as of October 2001.

**Inner Board Setting (CS1-H CPU Units Only)**

| Address in Programming Console |        | Settings                                            | Function                                                                                                                                                                                                                                                                                                                                                                                         | Related flags and words | New setting's effectiveness |
|--------------------------------|--------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------|
| Word                           | Bit(s) |                                                     |                                                                                                                                                                                                                                                                                                                                                                                                  |                         |                             |
| 84                             | 15     | 0: Wait for Boards.<br>1: Don't wait.<br>Default: 0 | To start the CPU Unit in MONITOR or PROGRAM mode even if there is one or more of Boards that has not completed startup processing, set this setting to 1 (Don't wait for Boards).<br><br>To wait for all Boards to finish startup processing, set this setting to 0 (Wait for Boards).<br><br>This setting is valid only if the Startup Condition is set to 1 (Don't wait for Units and Boards). | ---                     | Takes effect at startup     |

**Note** There are currently no Inner Boards that are applicable as "Specific Boards" as of October 2001.

## 7-1-2-2 CPU Settings Tab (on CX-Programmer)

Execute Process

## Detect Low Battery

| Address in Programming Console |        | Settings                                    | Function                                                                                                                                                                                                                                                                         | Related flags and words     | New setting's effectiveness |
|--------------------------------|--------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------|
| Word                           | Bit(s) |                                             |                                                                                                                                                                                                                                                                                  |                             |                             |
| 128                            | 15     | 0: Detect<br>1: Do not detect<br>Default: 0 | This setting determines whether CPU Unit battery errors are detected. If this setting is set to 0 and a battery error is detected, the ERR/ALM indicator on the CPU Unit will flash and the Battery Error Flag (A40204) will be turned ON, but CPU Unit operation will continue. | A40204 (Battery Error Flag) | Takes effect the next cycle |

## Detect Interrupt Task Error

| Address in Programming Console |        | Settings                                    | Function                                                                                                                                                                                                                                                                                      | Related flags and words            | New setting's effectiveness |
|--------------------------------|--------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------|
| Word                           | Bit(s) |                                             |                                                                                                                                                                                                                                                                                               |                                    |                             |
| 128                            | 14     | 0: Detect<br>1: Do not detect<br>Default: 0 | This setting determines whether interrupt task errors are detected. If this setting is set to 0 and an interrupt task error is detected, the ERR/ALM indicator on the CPU Unit will flash and the Interrupt Task Error Flag (A40213) will be turned ON, but CPU Unit operation will continue. | A40213 (Interrupt Task Error Flag) | Takes effect the next cycle |

## Stop CPU on Instruction Error (Instruction Error Operation)

| Address in Programming Console |        | Settings                             | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Related flags and words                                                                                                          | New setting's effectiveness            |
|--------------------------------|--------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Word                           | Bit(s) |                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                  |                                        |
| 197                            | 15     | 0: Continue<br>1: Stop<br>Default: 0 | This setting determines whether instruction errors (instruction processing errors (ER) and illegal access errors (AER)) are treated as non-fatal or fatal errors. When this setting is set to 1, CPU Unit operation will be stopped if the ER or AER Flags is turned ON (even when the AER Flag is turned ON for an indirect DM/EM BCD error).<br><br>Related Flags: A29508 (Instruction Processing Error Flag)<br>A29509 (Indirect DM/EM BCD Error Flag)<br>A29510 (Illegal Access Error Flag) | A29508, A29509, A29510<br><br>(If this setting is set to 0, these flags won't be turned ON even if an instruction error occurs.) | Takes effect at the start of operation |

## Don't Register FAL to Error Log (User-defined FAL Error Storage, CS1-H CPU Units Only)

| Address in Programming Console |        | Settings                                                                                                               | Function                                                                                                                                                                                                             | Related flags and words | New setting's effectiveness                 |
|--------------------------------|--------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------------|
| Word                           | Bit(s) |                                                                                                                        |                                                                                                                                                                                                                      |                         |                                             |
| 129                            | 15     | 0: Record user-defined FAL errors in error log.<br>1: Don't record user-defined FAL errors in error log.<br>Default: 0 | This setting determines if user-defined FAL errors created with FAL(006) and time monitoring for FPD(269) will be recorded in the error log (A100 to A199). Set it to 1 so prevent these errors from being recorded. | ---                     | Whenever FAL(006) is executed (every cycle) |

**Memory Allocation Settings****EM File Setting Enabled**

| Address in Programming Console |        | Settings                                           | Function                                                                          | Related flags and words | New setting's effectiveness                                       |
|--------------------------------|--------|----------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------|
| Word                           | Bit(s) |                                                    |                                                                                   |                         |                                                                   |
| 136                            | 7      | 0: None<br>1: EM File Memory Enabled<br>Default: 0 | This setting determines whether part of the EM Area will be used for file memory. | ---                     | After initialization from Programming Device or via FINS command. |

**EM Start File No. (Starting Memory Starting Bank)**

| Address in Programming Console |        | Settings                       | Function                                                                                                                                                                                                                       | Related flags and words             | New setting's effectiveness                                       |
|--------------------------------|--------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------|
| Word                           | Bit(s) |                                |                                                                                                                                                                                                                                |                                     |                                                                   |
| 136                            | 0 to 3 | 0 to C (0 to 12)<br>Default: 0 | If bit 7 (above) is set to 1, the setting here specifies the EM bank where file memory begins. The specified EM bank and all subsequent banks will be used as file memory. This setting will be disabled if bit 7 is set to 0. | A344 (EM File Memory Starting Bank) | After initialization from Programming Device or via FINS command. |

**Background Execution Settings****Table Data Process Instructions (CS1-H CPU Units Only)**

| Address in Programming Console |        | Settings                                                                 | Function                                                                                                                            | Related flags and words | New setting's effectiveness |
|--------------------------------|--------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------|
| Word                           | Bit(s) |                                                                          |                                                                                                                                     |                         |                             |
| 198                            | 15     | 0: Not executed in background<br>1: Executed in background<br>Default: 0 | This setting determines if Table Data Instructions will be processed over multiple cycle times (i.e., processed in the background). | ---                     | Start of operation          |

**String Data Process Instructions (CS1-H CPU Units Only)**

| Address in Programming Console |        | Settings                                                                 | Function                                                                                                                                  | Related flags and words | New setting's effectiveness |
|--------------------------------|--------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------|
| Word                           | Bit(s) |                                                                          |                                                                                                                                           |                         |                             |
| 198                            | 14     | 0: Not executed in background<br>1: Executed in background<br>Default: 0 | This setting determines if Text String Data Instructions will be processed over multiple cycle times (i.e., processed in the background). | ---                     | Start of operation          |

**Data Shift Process Instructions (CS1-H CPU Units Only)**

| Address in Programming Console |        | Settings                                                                 | Function                                                                                                                            | Related flags and words | New setting's effectiveness |
|--------------------------------|--------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------|
| Word                           | Bit(s) |                                                                          |                                                                                                                                     |                         |                             |
| 198                            | 13     | 0: Not executed in background<br>1: Executed in background<br>Default: 0 | This setting determines if Data Shift Instructions will be processed over multiple cycle times (i.e., processed in the background). | ---                     | Start of operation          |

**Communications Port Number for Background Execution (CS1-H CPU Units Only)**

| Address in Programming Console |        | Settings                                                     | Function                                                                                           | Related flags and words | New setting's effectiveness |
|--------------------------------|--------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------|-----------------------------|
| Word                           | Bit(s) |                                                              |                                                                                                    |                         |                             |
| 198                            | 0 to 3 | 0 to 7: Communications ports 0 to 7 (internal logical ports) | The communications port number (internal logical port) that will be used for background execution. | ---                     | Start of operation          |

**7-1-2-3 Timings Tab (on CX-Programmer)****Enable Watch Cycle Time Setting**

| Address in Programming Console |        | Settings                                    | Function                                                                                                                  | Related flags and words           | New setting's effectiveness                                                 |
|--------------------------------|--------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------|
| Word                           | Bit(s) |                                             |                                                                                                                           |                                   |                                                                             |
| 209                            | 15     | 0: Default<br>1: Bits 0 to 14<br>Default: 0 | Set to 1 to enable the Watch Cycle Time Setting in bits 0 to 14. Leave this setting at 0 for a maximum cycle time of 1 s. | A40108 (Cycle Time Too Long Flag) | Takes effect at the start of operation (Can't be changed during operation.) |



## Watch Cycle Time

| Address in Programming Console |         | Settings                                                        | Function                                                                                                                                                   | Related flags and words            | New setting's effectiveness                                                 |
|--------------------------------|---------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------------------|
| Word                           | Bit(s)  |                                                                 |                                                                                                                                                            |                                    |                                                                             |
| 209                            | 0 to 14 | 001 to FA0: 10 to 40,000 ms (10-ms units)<br>Default: 001 (1 s) | This setting is valid only when bit 15 of 209 is set to 1. The Cycle Time Too Long Flag (A40108) will be turned ON if the cycle time exceeds this setting. | A264 and A265 (Present Cycle Time) | Takes effect at the start of operation (Can't be changed during operation.) |

## Cycle Time (Minimum Cycle Time)

| Address in Programming Console |         | Settings                                                                | Function                                                                                                                                                                                                                                                                                                                                           | Related flags and words | New setting's effectiveness            |
|--------------------------------|---------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------------------|
| Word                           | Bit(s)  |                                                                         |                                                                                                                                                                                                                                                                                                                                                    |                         |                                        |
| 208                            | 0 to 15 | 0001 to 7D00: 1 to 32,000 ms (1-ms units)<br>Default: 0000 (No minimum) | Set to 0001 to 7D00 to specify a minimum cycle time. If the cycle time is less than this setting, it will be extended until this time passes. Leave this setting at 0000 for a variable cycle time. (Can't be changed during operation.)<br><br>This cycle time will apply to the program execution cycle when a parallel processing mode is used. | ---                     | Takes effect at the start of operation |

## Power OFF Detection Time (Power OFF Detection Delay Time)

| Address in Programming Console |        | Settings                                         | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Related flags and words | New setting's effectiveness                                                                |
|--------------------------------|--------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |                                                                                            |
| 225                            | 0 to 7 | 00 to 0A: 0 to 10 ms (1-ms units)<br>Default: 00 | This setting determines how much of a delay there will be from the detection of a power interruption (approximately 10 to 25 ms after the power supply voltage drops below 85% of the rated value) to the confirmation of a power interruption. The default setting is 0 ms.<br>When the power OFF interrupt task is enabled, it will be executed when the power interruption is confirmed. If the power OFF interrupt task is disabled, the CPU will be reset and operation will be stopped. | ---                     | Takes effect at startup or at the start of operation. (Can't be changed during operation.) |

## Power OFF Interrupt Disable

| Address in Programming Console |        | Settings                                | Function                                                                                                | Related flags and words | New setting's effectiveness                                                                |
|--------------------------------|--------|-----------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------------------|
| Word                           | Bit(s) |                                         |                                                                                                         |                         |                                                                                            |
| 225                            | 15     | 0: Disabled<br>1: Enabled<br>Default: 0 | When this setting is set to 1, the power OFF interrupt task will be executed when power is interrupted. | ---                     | Takes effect at startup or at the start of operation. (Can't be changed during operation.) |

### 7-1-2-4 SIOU Refresh Tab (on CX-Programmer)

#### Special I/O Unit Cyclic Refreshing

| Item                                | Address in Programming Console |         | Settings                                | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Related flags and words | New setting's effectiveness            |
|-------------------------------------|--------------------------------|---------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------------------------|
|                                     | Word                           | Bit(s)  |                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                         |                                        |
| Cyclic Refreshing of Units 0 to 15  | 226                            | 0 to 15 | 0: Enabled<br>1: Disabled<br>Default: 0 | <p>These settings determine whether data will be exchanged between the specified Unit and the Special I/O Unit's allocated words (10 words/Unit) during cyclic refreshing for Special I/O Units.</p> <p>Turn ON the corresponding bit to disable cyclic refreshing when the Unit will be refreshed in an interrupt task by IORF(097), several Special I/O Units are being used and you don't want to extend the cycle time, or the cycle time is so short that the Special I/O Unit's internal processing can't keep up.</p> <p>(Special I/O Units can be refreshed from the program with IORF(097).)</p> | ---                     | Takes effect at the start of operation |
| Cyclic Refreshing of Units 16 to 31 | 227                            | 0 to 15 | 0: Enabled<br>1: Disabled<br>Default: 0 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                         |                                        |
| Cyclic Refreshing of Units 32 to 47 | 228                            | 0 to 15 | 0: Enabled<br>1: Disabled<br>Default: 0 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                         |                                        |
| Cyclic Refreshing of Units 48 to 63 | 229                            | 0 to 15 | 0: Enabled<br>1: Disabled<br>Default: 0 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                         |                                        |
| Cyclic Refreshing of Units 64 to 79 | 230                            | 0 to 15 | 0: Enabled<br>1: Disabled<br>Default: 0 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                         |                                        |
| Cyclic Refreshing of Units 80 to 95 | 231                            | 0 to 15 | 0: Enabled<br>1: Disabled<br>Default: 0 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                         |                                        |

### 7-1-2-5 Unit Settings Tab (on CX-Programmer)

#### Basic I/O Unit Input (Rack) Response Times

| Item                 | Address in Programming Console |             | Settings           | Function                                                                                                                                                                                                                                                                                                                    | Related flags and words                                       | New setting's effectiveness |  |  |  |
|----------------------|--------------------------------|-------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------|--|--|--|
|                      | Word                           | Bit(s)      |                    |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 0, Slot 0       | 10                             | 0 to 7      | 00: 8 ms           | Sets the input response time (ON response time = OFF response time) for CS-series Basic I/O Units. The default setting is 8 ms and the setting range is 0.5 ms to 32 ms.<br><br>This value can be increased to reduce the effects of chattering and noise, or it can be reduced to allow reception of shorter input pulses. | A220 to A259: Actual input response times for Basic I/O Units | Takes effect at startup     |  |  |  |
| Rack 0, Slot 1       |                                | 8 to 15     | 10: 0 ms           |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 0, Slot 2       | 11                             | 0 to 7      | 11: 0.5 ms         |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 0, Slot 3       |                                | 8 to 15     | 12: 1 ms           |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 0, Slot 4       | 12                             | 0 to 7      | 13: 2 ms           |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 0, Slot 5       |                                | 8 to 15     | 14: 4 ms           |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 0, Slot6        | 13                             | 0 to 7      | 15: 8 ms           |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 0, Slot 7       |                                | 8 to 15     | 16: 16 ms          |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 0, Slot 8       | 14                             | 0 to 7      | 17: 32 ms          |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 0, Slot 9       |                                | 8 to 15     | Default: 00 (8 ms) |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 1, Slots 0 to 9 | 15 to 19                       | See Rack 0. |                    |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 2, Slots 0 to 9 | 20 to 24                       |             |                    |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 3, Slots 0 to 9 | 25 to 29                       |             |                    |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 4, Slots 0 to 9 | 30 to 34                       |             |                    |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 5, Slots 0 to 9 | 35 to 39                       |             |                    |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 6, Slots 0 to 9 | 40 to 44                       |             |                    |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |
| Rack 7, Slots 0 to 9 | 45 to 49                       |             |                    |                                                                                                                                                                                                                                                                                                                             |                                                               |                             |  |  |  |

### 7-1-2-6 Host Link Port Tab (on CX-Programmer)

The following settings are valid when pin 5 on the DIP switch on the CPU Unit is ON.

#### Host Link Settings

##### Communications Settings

| Address in Programming Console |        | Settings                                                      | Function                                                                                                        | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                               |                                                                                                                 |                                              |                                                                        |
| 160                            | 15     | 0: Default (standard)*<br>1: PLC Setup (custom)<br>Default: 0 | *The default settings are for 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

##### Baud Rate (bps)

| Address in Programming Console |        | Settings                                                                                                                                                    | Function                                                                                                                                                                                                  | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                                                                                                                             |                                                                                                                                                                                                           |                                              |                                                                        |
| 161                            | 0 to 7 | 00: 9,600<br>01: 300<br>02: 600<br>03: 1,200<br>04: 2,400<br>05: 4,800<br>06: 9,600<br>07: 19,200<br>08: 38,400<br>09: 57,600<br>0A: 115,200<br>Default: 00 | These settings are valid only when the communications mode is set to host link or no-protocol.<br><br>These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

##### Format: Data Bits

| Address in Programming Console |        | Settings                             | Function                                                                                                                                                                                                  | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                      |                                                                                                                                                                                                           |                                              |                                                                        |
| 160                            | 3      | 0: 7 bits<br>1: 8 bits<br>Default: 0 | These settings are valid only when the communications mode is set to host link or no-protocol.<br><br>These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

##### Format: Stop Bits

| Address in Programming Console |        | Settings                            | Function                                                                                                                                                                                                  | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                     |                                                                                                                                                                                                           |                                              |                                                                        |
| 160                            | 2      | 0: 2 bits<br>1: 1 bit<br>Default: 0 | These settings are valid only when the communications mode is set to host link or no-protocol.<br><br>These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Format: Parity**

| Address in Programming Console |        | Settings                                       | Function                                                                                                                                                                                                  | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                |                                                                                                                                                                                                           |                                              |                                                                        |
| 160                            | 0 to 1 | 00: Even<br>01: Odd<br>10: None<br>Default: 00 | These settings are valid only when the communications mode is set to host link or no-protocol.<br><br>These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Mode: Communications Mode**

| Address in Programming Console |         | Settings                                     | Function                                                                                                                                                                                                                                                                             | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|---------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s)  |                                              |                                                                                                                                                                                                                                                                                      |                                              |                                                                        |
| 160                            | 8 to 11 | 00: Host link<br>05: Host link<br>Default: 0 | This setting determines whether the RS-232C port will operate in host link mode or another serial communications mode. (Host link can be specified with 00 or 05.)<br><br>The Peripheral bus mode is for communications with Programming Devices other than the Programming Console. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Unit Number (for CPU Unit in Host Link Mode)**

| Address in Programming Console |        | Settings                              | Function                                                                                                   | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|---------------------------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                       |                                                                                                            |                                              |                                                                        |
| 163                            | 0 to 7 | 00 to 1F:<br>(0 to 31)<br>Default: 00 | This setting determines the CPU Unit's unit number when it is connected in a 1-to-N (N=2 to 32) Host Link. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**NT Link Settings****Mode: Communications Mode**

| Address in Programming Console |         | Settings                      | Function                                                                                                                                                                                                     | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|---------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s)  |                               |                                                                                                                                                                                                              |                                              |                                                                        |
| 160                            | 8 to 11 | 02: 1:N NT Link<br>Default: 0 | This setting determines whether the RS-232C port will operate in host link mode or another serial communications mode.<br><br><b>Note</b> Communications will not be possible with PTs set for 1:1 NT Links. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Baud Rate (bps)**

| Address in Programming Console |        | Settings                                               | Function                                                                                                                                                                     | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                        |                                                                                                                                                                              |                                              |                                                                        |
| 161                            | 0 to 7 | 00: Standard<br>0A: High-speed NT Link*<br>Default: 00 | * Set to 115,200 when setting this value from the CX-Programmer. To return to the standard setting, leave the setting set to "PLC Setup" and set the baud rate to 9,600 bps. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**NT Link Max. (Maximum Unit Number in NT Link Mode)**

| Address in Programming Console |        | Settings             | Function                                                                                | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|----------------------|-----------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                      |                                                                                         |                                              |                                                                        |
| 166                            | 0 to 3 | 0 to 7<br>Default: 0 | This setting determines the highest unit number of PT that can be connected to the PLC. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Peripheral Bus Settings****Communications Settings**

| Address in Programming Console |        | Settings                                                      | Function                                                | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|---------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                               |                                                         |                                              |                                                                        |
| 160                            | 15     | 0: Default (standard)*<br>1: PLC Setup (custom)<br>Default: 0 | *The default settings are for a baud rate of 9,600 bps. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Mode: Communications Mode**

| Address in Programming Console |         | Settings                         | Function                                                                                                                                                                                                                                                                         | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|---------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s)  |                                  |                                                                                                                                                                                                                                                                                  |                                              |                                                                        |
| 160                            | 8 to 11 | 04: Peripheral bus<br>Default: 0 | This setting determines whether the RS-232C port will operate in host link mode or another serial communications mode. (Host link can be specified with 00 or 05.)<br>The Peripheral Bus mode is for communications with Programming Devices other than the Programming Console. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Baud Rate (bps)**

| Address in Programming Console |        | Settings                                                                                       | Function                                                                                       | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|--------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                                                                |                                                                                                |                                              |                                                                        |
| 161                            | 0 to 7 | 00: 9,600<br>06: 9,600<br>07: 19,200<br>08: 38,400<br>09: 57,600<br>0A: 115,200<br>Default: 00 | Settings 00 and 06 through 0A are valid when the communications mode is set to peripheral bus. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**No-protocol Settings****Start Code/End Code**

| Address in Programming Console |         | Settings                                                 | Function                                                                                                                                                                                                                                                                                                                                                                                                             | Related flags and words               | New setting's effectiveness                                            |
|--------------------------------|---------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s)  |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                                                                        |
| 164                            | 8 to 15 | 00 to FF<br>Default: 00                                  | Start code: Set this start code only when the start code is enabled (1) in bits 12 to 15 of 165.                                                                                                                                                                                                                                                                                                                     | (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |
|                                | 0 to 7  | 00 to FF<br>Default: 00                                  | End code: Set this end code only when the end code is enabled (1) in bits 8 to 11 of 165.                                                                                                                                                                                                                                                                                                                            |                                       |                                                                        |
| 165                            | 12      | 0: None<br>1: Code in 164<br>Default: 0                  | Start code setting:<br>A setting of 1 enables the start code in 164 bits 8 to 15.                                                                                                                                                                                                                                                                                                                                    |                                       |                                                                        |
|                                | 8 to 9  | 0: None<br>1: Code in 164<br>2: CR+LF<br>Default: 0      | End code setting:<br>With a setting of 0, the amount of data being received must be specified. A setting of 1 enables the end code in bits 0 to 7 of 164. A setting of 2 enables an end code of CR+LF.                                                                                                                                                                                                               |                                       |                                                                        |
|                                | 0 to 7  | 00: 256 bytes<br>01 to FF: 1 to 255 bytes<br>Default: 00 | Set the data length to be sent and received with no-protocol communications. The end code and start code are not included in the data length.<br><br>Set this value only when the end code setting in bits 8 to 11 of 165 is "0: None."<br>This setting can be used to change the amount of data that can be transferred at one time by TXD(236) or RXD(235). The default setting is the maximum value of 256 bytes. |                                       |                                                                        |

**Delay**

| Address in Programming Console |         | Settings                                                   | Function                                                                                                                     | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|---------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s)  |                                                            |                                                                                                                              |                                              |                                                                        |
| 162                            | 0 to 15 | 0000 to 270F: 0 to 99990 ms (10-ms units)<br>Default: 0000 | This setting determines the delay from execution of TXD(236) until the data is actually transmitted from the specified port. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

### 7-1-2-7 Peripheral Port Tab (on CX-Programmer)

The following settings are valid when pin 4 on the DIP switch on the CPU Unit is ON.

#### Host Link Settings

##### Communications Settings

| Address in Programming Console |        | Settings                                                      | Function                                                                                                        | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|--------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                               |                                                                                                                 |                                                 |                                                                        |
| 144                            | 15     | 0: Default (standard)*<br>1: PLC Setup (Custom)<br>Default: 0 | *The default settings are for 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

##### Baud Rate (bps)

| Address in Programming Console |        | Settings                                                                                                                                                    | Function                                                                                                                                                                                        | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                                                                                                                             |                                                                                                                                                                                                 |                                                 |                                                                        |
| 145                            | 0 to 7 | 00: 9,600<br>01: 300<br>02: 600<br>03: 1,200<br>04: 2,400<br>05: 4,800<br>06: 9,600<br>07: 19,200<br>08: 38,400<br>09: 57,600<br>0A: 115,200<br>Default: 00 | This setting is valid only when the communications mode is set to the Host Link mode.<br>These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

##### Format: Data Bits

| Address in Programming Console |        | Settings                             | Function                                                                                                                                                                                  | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|--------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                      |                                                                                                                                                                                           |                                                 |                                                                        |
| 144                            | 3      | 0: 7 bits<br>1: 8 bits<br>Default: 0 | These settings are valid only when the communications mode is set to Host link.<br>These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

##### Format: Stop Bits

| Address in Programming Console |        | Settings                            | Function                                                                                                                                                                                  | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|--------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                     |                                                                                                                                                                                           |                                                 |                                                                        |
| 144                            | 2      | 0: 2 bits<br>1: 1 bit<br>Default: 0 | These settings are valid only when the communications mode is set to Host link.<br>These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Format: Parity**

| Address in Programming Console |         | Settings                                       | Function                                                                                                                                                                                    | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|---------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s)  |                                                |                                                                                                                                                                                             |                                                 |                                                                        |
| 144                            | 0 and 1 | 00: Even<br>01: Odd<br>10: None<br>Default: 00 | These setting is valid only when the communications mode is set to Host link.<br><br>These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Mode: Communications Mode**

| Address in Programming Console |         | Settings                                                                               | Function                                                                                                                                                                                                                                                                            | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|---------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s)  |                                                                                        |                                                                                                                                                                                                                                                                                     |                                                 |                                                                        |
| 144                            | 8 to 11 | 00: Host Link<br>02: 1:N NT Links<br>04: Peripheral bus<br>05: Host link<br>Default: 0 | This setting determines whether the peripheral port will operate in host link mode or another serial communications mode. (Host link can be specified with 00 or 05.)<br>The peripheral bus mode is for communications with Programming Devices other than the Programming Console. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Unit Number (for CPU Unit in Host Link Mode)**

| Address in Programming Console |        | Settings                             | Function                                                                                                   | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|--------|--------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                      |                                                                                                            |                                                 |                                                                        |
| 147                            | 0 to 7 | 00 to 1F<br>(0 to 31)<br>Default: 00 | This setting determines the CPU Unit's unit number when it is connected in a 1-to-N (N=2 to 32) Host Link. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**NT Link Settings****Mode: Communications Mode**

| Address in Programming Console |         | Settings                      | Function                                                                                                                                                                                                     | Related flags and words                      | New setting's effectiveness                                            |
|--------------------------------|---------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s)  |                               |                                                                                                                                                                                                              |                                              |                                                                        |
| 160                            | 8 to 11 | 02: 1:N NT Link<br>Default: 0 | This setting determines whether the RS-232C port will operate in host link mode or another serial communications mode.<br><br><b>Note</b> Communications will not be possible with PTs set for 1:1 NT Links. | A61902 (RS-232C Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |



**Baud Rate (bps)**

| Address in Programming Console |        | Settings                                               | Function                                                         | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|--------|--------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                        |                                                                  |                                                 |                                                                        |
| 145                            | 0 to 7 | 00: Standard<br>0A: High-speed NT Link*<br>Default: 00 | * Set to 115,200 when setting this value from the CX-Programmer. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**NT Link Max. (Maximum Unit Number in NT Link Mode)**

| Address in Programming Console |        | Settings             | Function                                                                                                | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|--------|----------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                      |                                                                                                         |                                                 |                                                                        |
| 150                            | 0 to 3 | 0 to 7<br>Default: 0 | This setting determines the highest unit number of PT that can be connected to the PLC in NT Link mode. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Peripheral Bus Settings****Communications Setting**

| Address in Programming Console |        | Settings                                                      | Function                                               | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|--------|---------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                               |                                                        |                                                 |                                                                        |
| 144                            | 15     | 0: Default (standard)*<br>1: PLC Setup (custom)<br>Default: 0 | *The default settings are for a baud rate of 9,600 bps | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Mode: Communications Mode**

| Address in Programming Console |         | Settings                        | Function                                                                                                                                                                      | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|---------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s)  |                                 |                                                                                                                                                                               |                                                 |                                                                        |
| 144                            | 8 to 11 | 4: Peripheral bus<br>Default: 0 | This setting determines whether the communications mode for the peripheral port. The peripheral bus mode is used for all Programming Devices except for Programming Consoles. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**Baud Rate (bps)**

| Address in Programming Console |        | Settings                                                                                       | Function                                                                           | Related flags and words                         | New setting's effectiveness                                            |
|--------------------------------|--------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                                                                |                                                                                    |                                                 |                                                                        |
| 144                            | 0 to 7 | 00: 9,600<br>06: 9,600<br>07: 19,200<br>08: 38,400<br>09: 57,600<br>0A: 115,200<br>Default: 00 | The following settings are valid for the peripheral bus mode: 00 and 06 to 0A Hex. | A61901 (Peripheral Port Settings Changing Flag) | Takes effect the next cycle.<br>(Also can be changed with STUP (237).) |

**7-1-2-8 Peripheral Service Tab (CPU Processing Mode Settings)****Peripheral Service Mode (Peripheral Servicing Priority Mode)**

The following settings are supported only by CS1 CPU Units of version 1 or later or CS1-H CPU Units.

**Instruction Execution Time**

| Address in Programming Console |          | Settings                                  | Function                                                                                                          | Related flags and words | New setting's effectiveness                                                    |
|--------------------------------|----------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------|
| Word                           | Bit(s)   |                                           |                                                                                                                   |                         |                                                                                |
| 219                            | 08 to 15 | 00<br>05 to FF (Hex)<br>Default: 00 (Hex) | 00: Disable priority servicing<br>05 to FF: Time slice for instruction execution (5 to 255 ms in 1-ms increments) | A266 and A267           | Takes effect at the start of operation<br>(Can't be changed during operation.) |

**Peripheral Service Execution Time**

| Address in Programming Console |          | Settings                            | Function                                                                                                              | Related flags and words | New setting's effectiveness                                                    |
|--------------------------------|----------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------------------------------------------------------|
| Word                           | Bit(s)   |                                     |                                                                                                                       |                         |                                                                                |
| 219                            | 00 to 07 | 00 to FF (Hex)<br>Default: 00 (Hex) | 00: Disable priority servicing<br>01 to FF: Time slice for peripheral servicing (0.1 to 25.5 ms in 0.1-ms increments) | A266 and A267           | Takes effect at the start of operation<br>(Can't be changed during operation.) |

**Target Units (Units/Boards for Priority Servicing)**

| Address in Programming Console |          | Settings                                                    | Function                                                                                                                                                                                                                                                                                                         | Related flags and words | New setting's effectiveness                                                        |
|--------------------------------|----------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------|
| Word                           | Bit(s)   |                                                             |                                                                                                                                                                                                                                                                                                                  |                         |                                                                                    |
| 220                            | 08 to 15 | 00<br>10 to 1F<br>20 to 2F<br>E1<br>FC<br>FD<br>Default: 00 | Up to five Units and/or Boards can be specified for priority servicing.<br><br>00: Disable priority servicing<br><br>10 to 1F: CPU Bus Unit unit number + 10 (Hex)<br><br>20 to 2F: CS-series Special I/O Unit unit number + 20 (Hex)<br><br>E1: Inner Boards<br><br>FC: RS-232C port<br><br>FD: Peripheral port | ---                     | Takes effect at the start of operation<br><br>(Can't be changed during operation.) |
|                                | 00 to 07 |                                                             |                                                                                                                                                                                                                                                                                                                  |                         |                                                                                    |
| 221                            | 08 to 15 |                                                             |                                                                                                                                                                                                                                                                                                                  |                         |                                                                                    |
|                                | 00 to 07 |                                                             |                                                                                                                                                                                                                                                                                                                  |                         |                                                                                    |
| 222                            | 08 to 15 |                                                             |                                                                                                                                                                                                                                                                                                                  |                         |                                                                                    |

**Sync/Async Comms (Parallel Processing Modes)**

The following setting is supported only by the CS1-H CPU Units

**Execution Mode (Parallel Processing Mode)**

| Address in Programming Console |          | Settings                      | Function                                                                                                                                                | Related flags and words | New setting's effectiveness                                                        |
|--------------------------------|----------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------|
| Word                           | Bit(s)   |                               |                                                                                                                                                         |                         |                                                                                    |
| 219                            | 08 to 15 | 00<br>01<br>02<br>Default: 00 | 00: Not specified (disable parallel processing)<br><br>01: Synchronous (Synchronous Memory Access)<br><br>02: Asynchronous (Asynchronous Memory Access) | ---                     | Takes effect at the start of operation<br><br>(Can't be changed during operation.) |

**Set Time to All Events (Fixed Peripheral Servicing Time)****Enable Fixed Servicing Time**

| Address in Programming Console |        | Settings                                    | Function                                                                                                     | Related flags and words | New setting's effectiveness                                                        |
|--------------------------------|--------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------|
| Word                           | Bit(s) |                                             |                                                                                                              |                         |                                                                                    |
| 218                            | 15     | 0: Default*<br>1: Bits 0 to 7<br>Default: 0 | Set to 1 to enable the fixed peripheral servicing time in bits 0 to 7.<br><br>*Default: 4% of the cycle time | ---                     | Takes effect at the start of operation<br><br>(Can't be changed during operation.) |

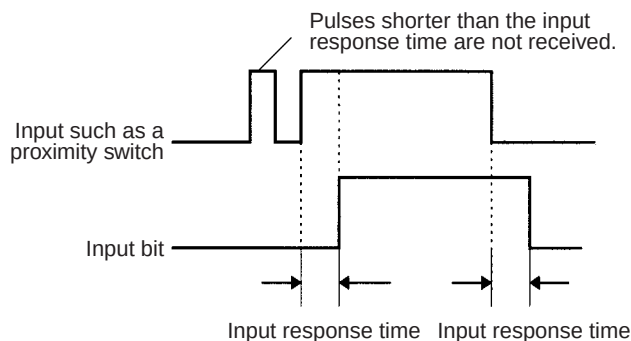
**Fixed Servicing Time**

| Address in Programming Console |        | Settings                                                     | Function                                                                                             | Related flags and words | New setting's effectiveness                                                        |
|--------------------------------|--------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------|
| Word                           | Bit(s) |                                                              |                                                                                                      |                         |                                                                                    |
| 218                            | 0 to 7 | 00 to FF:<br>0.0 to 25.5 ms<br>(0.1-ms units)<br>Default: 00 | Set the peripheral servicing time.<br><br>This setting is valid only when bit 15 of 218 is set to 1. | ---                     | Takes effect at the start of operation<br><br>(Can't be changed during operation.) |

## 7-2 Explanations of PLC Setup Settings

### Basic I/O Unit Input Response Time

The input response time can be set for CS-series Basic I/O Units by Rack and Slot number. Increasing this value reduces the effects of chattering and noise. Decreasing this value allows reception of shorter input pulses, (but do not set the ON response time or OFF response time to less than the cycle time).



The default setting for the input response time is 8 ms and the setting range is 0 to 32 ms. When the input response time is set to 0 ms, the only delay will be the delays in the Unit's internal elements. For information on the Unit's internal elements, refer to *Appendix A Specifications of Basic I/O Units and High-density I/O Units* and check the input response time for the Unit that you are using.

The input response time settings are transferred to the CS-series Basic I/O Units when the PLC is turned on.

When the Unit's settings are changed, they are stored in A220 to A259 (Actual Input Response Times for Basic I/O Units). When the settings in the PLC Setup have been changed with the PLC in PROGRAM mode, the PLC Setup settings will differ from the actual settings in the Units. In this case, the values in A220 to A259 can be checked to see the input response times actually set in the Units.

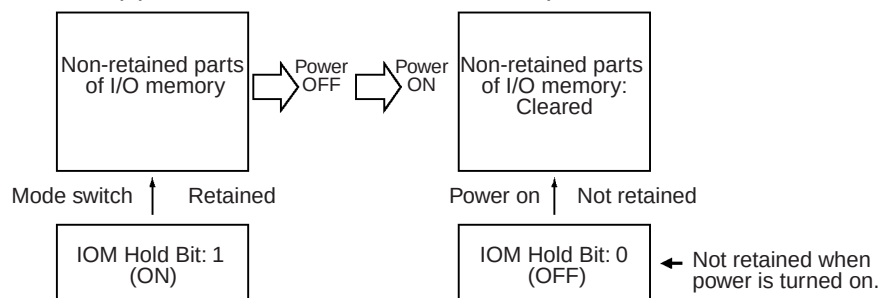
### IOM Hold Bit Status at Startup

The IOM Hold Bit (A50012) can be turned ON to retain all of the data in I/O Memory when the CPU Unit's operating mode is switched between PROGRAM mode and RUN/MONITOR mode. When the PLC is turned on, the IOM Hold Bit itself will be cleared (OFF) unless it is protected with this PLC Setup setting.

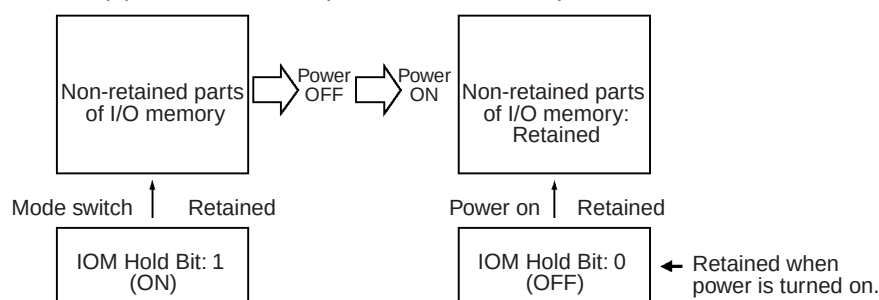
If the IOM Hold Bit Status at Startup setting is ON, the status of the IOM Hold Bit will be protected when the PLC is turned on. If this setting is ON and the IOM Hold Bit itself is ON, all data in I/O memory will be retained when the PLC is turned on.

**Note** If the backup battery fails or is disconnected, the IOM Hold Bit will be cleared whether this setting is ON or OFF.

OFF (0): IOM Hold Bit cleared at start-up



ON (1): IOM Hold Bit protected at start-up

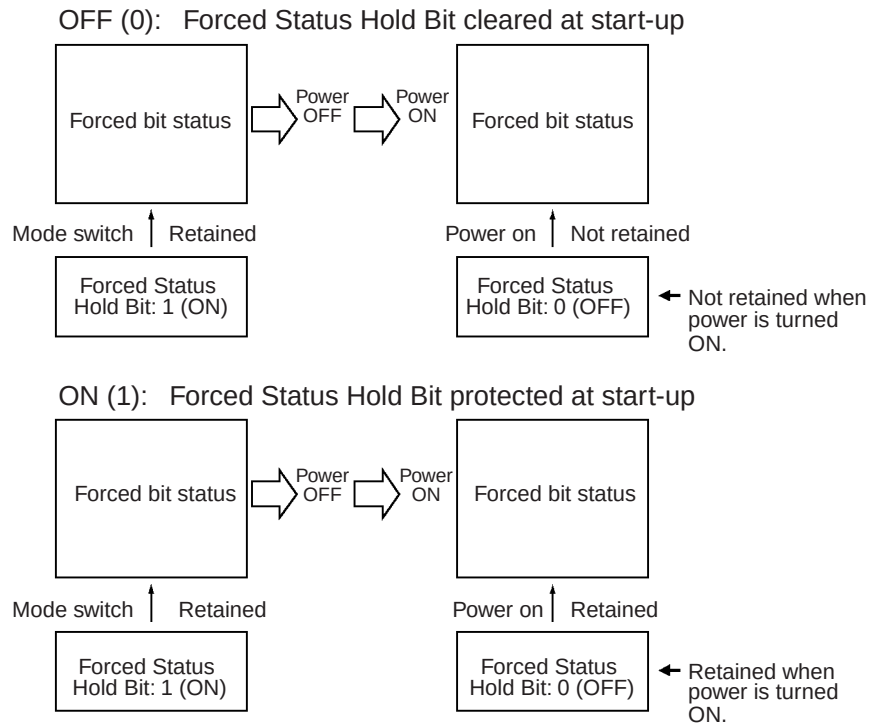


### Forced Status Hold Bit at Startup

The Forced Status Hold Bit (A50013) can be turned ON to retain the forced status of all bits that have been force-set or force-reset when the CPU Unit's operating mode is switched between PROGRAM mode and RUN/MONITOR mode. When the PLC is turned on, the Forced Status Hold Bit itself will be cleared (OFF) unless it is protected with this PLC Setup setting.

If the Forced Status Hold Bit at Startup setting is ON, the status of the Forced Status Hold Bit will be protected when the PLC is turned on. If this setting is ON and the Forced Status Hold Bit itself is ON, all force-set and force-reset bits will retain their forced status when the PLC is turned on.

**Note** If the backup battery fails or is disconnected, the Forced Status Hold Bit will be cleared whether this setting is ON or OFF.

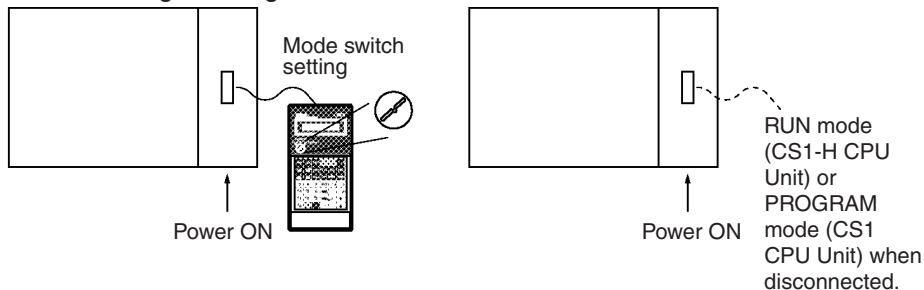


## Startup Mode Setting

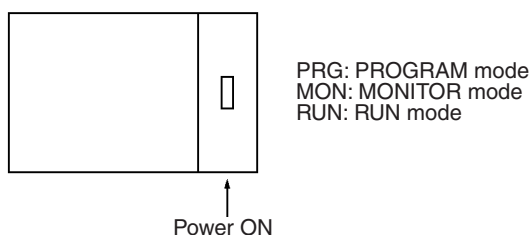
This setting determines whether the startup mode will be the mode set on the Programming Console's mode switch or the mode set here in the PLC Setup.

**Caution** If the Startup Mode setting specifies the mode set on the Programming Console's mode switch (0) but a Programming Console isn't connected, a CS1 CPU Unit will automatically enter PROGRAM mode at startup, and a CS1-H CPU Unit will automatically enter RUN mode at startup.

PRCN: Programming Console's mode switch



Other: PLC Setup's Startup Mode setting

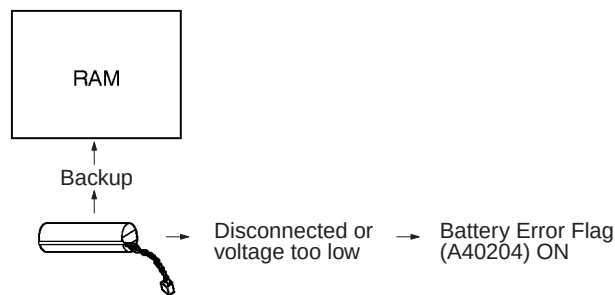


## Detect Low Battery

This setting determines whether CPU Unit battery errors are detected. Set the PLC Setup so that battery errors are not detected when using battery-free operation. Refer to information on battery-free operation in the *CS/CJ Series Programming Manual* for details.

If this setting is set to detect errors (0) and a battery error is detected, the Battery Error Flag (A40204) will be turned ON.

- Note**
1. The contents of the DM, EM, and HR Areas in the CPU Unit are not backed up to flash memory; they are backed up only by a Battery. If the Battery voltage drops, this data may be lost. Provide countermeasures in the program using the Battery Error Flag (A40204) to re-initialize data or take other actions if the Battery voltage drops
  2. A battery error will be detected when the battery is disconnected or its voltage drops below the minimum allowed.



## Detect Interrupt Task Error

If this setting is set to detect errors (0), an interrupt task error will be detected in the following cases:

- An interrupt task is executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or SYSMAC BUS Remote I/O.
- IORF(097) is executed in an interrupt task to refresh a Special I/O Unit's I/O while that Unit's I/O is being refreshed during cyclic refreshing.

## EM File Memory Settings

These settings are used to specify converting not converting part of the EM Area to file memory.

### Programming Console

The specified EM bank and all subsequent banks will be set aside as file memory. Changing these settings using the Programming Console does not format the specified EM banks; the EM banks must be formatted with a Programming Device after changing these PLC Setup settings. When formatting the EM banks with a Programming Console, refer to 7-2 *Memory Card Format* in the *Programming Console Operation Manual* (W341-E1-1).

### CX-Programmer

With the CX-Programmer, file memory will be formatted when file memory conversion and the number of banks to be converted is specified when transferring the PLC Setup. (EM banks cannot be formatted as file memory unless they have been specified as file memory in the PLC Setup.)

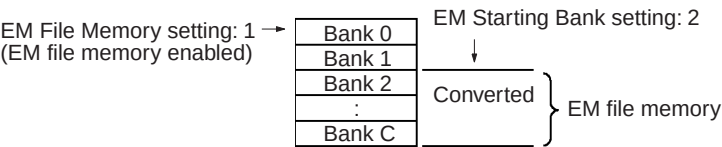
Once part of the EM Area has been formatted for use as file memory, it can be converted back to normal EM Area usage by changing these PLC Setup settings back to their previous value and "un-formatting" the EM banks with a Programming Device.

- The actual starting file memory bank is stored in A344 (EM File Memory Starting Bank). When the settings in the PLC Setup have been changed but the EM Area hasn't been formatted, the PLC Setup setting will differ

from the actual file memory setting in the EM Area. In this case, the values in A344 can be checked to see the actual file memory setting.

- The EM Area cannot be formatted if the current EM bank is one of the banks that is being converted to file memory.

The following example shows EM banks 2 to C (12) converted to file memory.

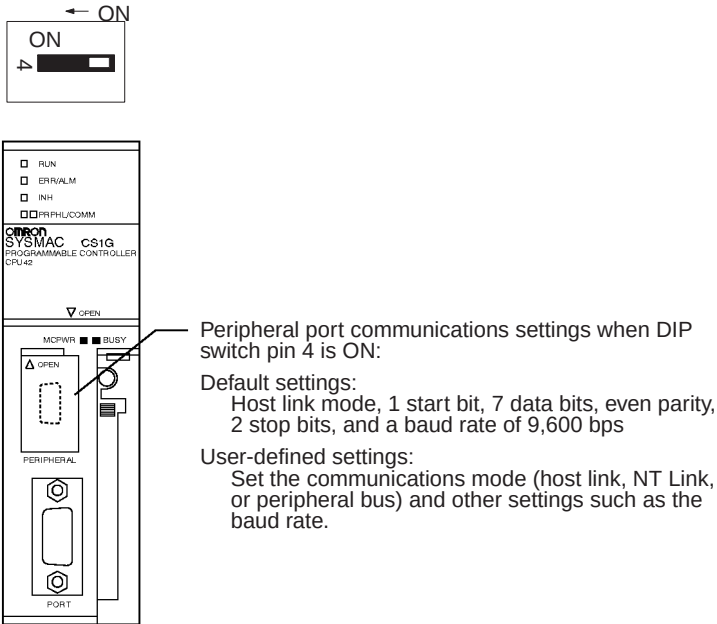


Peripheral Port Settings

These settings are effective only when pin 4 of the DIP switch on the front of the CPU Unit is ON.

The default settings for the peripheral port are: host link mode, 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps. Set the peripheral port settings in the PLC Setup when you need to change these settings.

**Note** When pin 4 of the DIP switch on the front of the CPU Unit is OFF, the CPU Unit automatically detects the communications parameters of a connected Programming Device (including Programming Consoles). Those automatically detected parameters are not stored in the PLC Setup.



RS-232C Port Settings

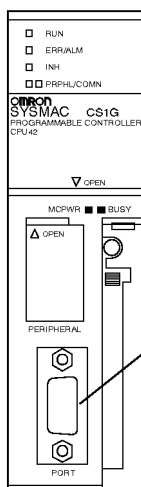
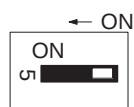
These settings are effective only when pin 5 of the DIP switch on the front of the CPU Unit is OFF.

The default settings for the RS-232C port are: host link mode, 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps. Set the RS-232C port settings in the PLC Setup when you need to change these settings. Specify the frame format when no-protocol mode is selected.

The RS-232C port settings can also be changed with STUP(237). The RS-232C Port Settings Changing Flag (A61902) is turned ON when STUP(237) is executed and it is turned OFF when the RS-232C port settings have been changed.



**Note** When pin 5 of the DIP switch on the front of the CPU Unit is ON, the CPU Unit automatically detects the communications parameters of a Programming Device (including Programming Consoles) connected to the RS-232C port. Those automatically detected parameters are not stored in the PLC Setup.



RS-232C port communications settings when DIP switch pin 5 is OFF:

Default settings:

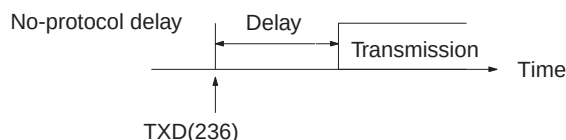
Host link mode, 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps

User-defined settings:

Set the communications mode (host link, NT Link, no-protocol\*, or peripheral bus) and other settings such as the baud rate.

\*See notes 1 and 2 for details on no-protocol mode.

**Note** 1. A no-protocol transmission delay (address 162) can be set in no-protocol mode. The operation of this delay is shown in the following diagram.



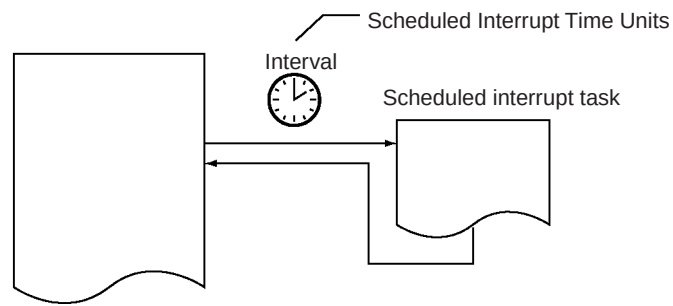
2. The following table shows the message formats that can be set for transmissions and receptions in no-protocol mode. The format is determined by the start code (ST) and end code (ED) settings. (From 1 to 256 bytes can be received in no-protocol mode.)

| Start code setting | End code setting |            |               |
|--------------------|------------------|------------|---------------|
|                    | None             | Yes        | CR+LF         |
| None               | DATA             | DATA+ED    | DATA+CR+LF    |
| Yes                | ST+DATA          | ST+DATA+ED | ST+DATA+CR+LF |

## Scheduled Interrupt Time Units

This setting determines the time units for the scheduled interrupt interval settings. Set the scheduled interrupt interval from the program with MSKS(690).

**Note** This setting cannot be changed while the CPU Unit is in RUN or MONITOR mode.



### Instruction Error Operation

This setting determines whether instruction execution errors are treated as non-fatal (0) or fatal errors (1). A program error will be generated as an instruction error if any of the following flags is turned ON.

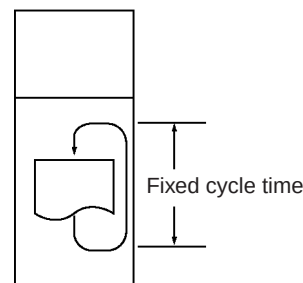
| Instruction error flag            | Address | Cause                                                                                  |
|-----------------------------------|---------|----------------------------------------------------------------------------------------|
| Instruction Processing Error Flag | A29508  | The ER Flag was turned ON.                                                             |
| Indirect DM/EM BCD Error Flag     | A29509  | The contents of a DM/EM word wasn't BCD when BCD was required for indirect addressing. |
| Illegal Access Error Flag         | A29510  | Attempted to access part of memory that is off-limits from the program.                |

If this setting is OFF (0), PLC operation will continue after one of these errors. If this setting is ON (1), PLC operation will stop after one of these errors.

### Minimum Cycle Time

Set the minimum cycle time to a non-zero value to eliminate inconsistencies in I/O responses. This setting is effective only when the actual cycle time is shorter than the minimum cycle time setting. If the actual cycle time is longer than the minimum cycle time setting, the actual cycle time will remain unchanged.

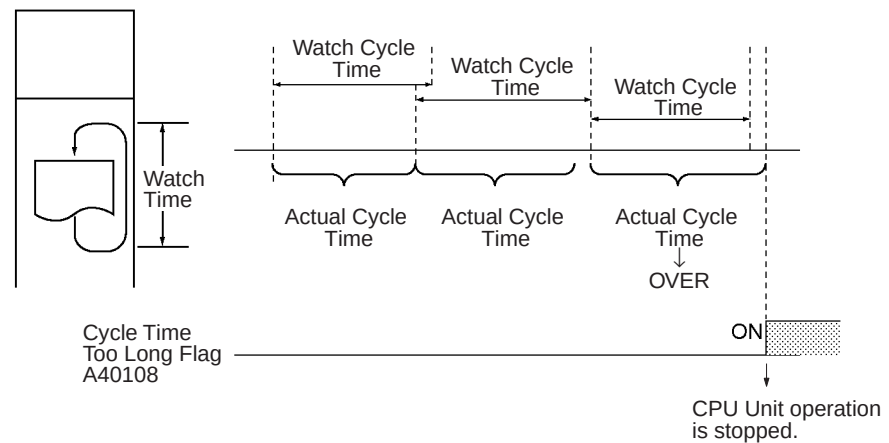
**Note** The minimum cycle time setting cannot be changed while the CPU Unit is in RUN or MONITOR mode.



### Watch Cycle Time

If the cycle time exceeds the watch (maximum) cycle time setting, the Cycle Time Too Long Flag (A40108) will be turned ON and PLC operation will be stopped. This setting must be changed if the normal cycle time exceeds the default watch cycle time setting of 1 s.

**Note** The watch cycle time setting cannot be changed while the CPU Unit is in RUN or MONITOR mode.



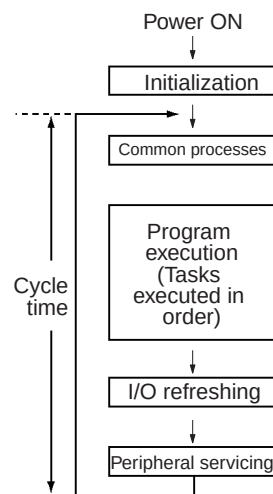
**Note** The default value for the watch cycle time is 1 s (1,000 ms).

### Fixed Peripheral Servicing Time

This setting determines whether the peripheral servicing for the following processes is performed with the default settings (4% of the cycle time) or all together in a fixed servicing time.

- Exchange data with CS-series Special I/O Units when necessary
- Exchange data with CS-series CPU Bus Units when necessary
- Exchange data with peripheral port
- Exchange data with serial communications ports
- Exchange data with Inner Board
- Service file access operations (Memory Card)

Peripheral servicing is performed at the end of the cycle, just after I/O refreshing.



The following table shows a breakdown of the peripheral servicing time.

| Peripheral servicing time                          | Default value                         | Setting range                                                |
|----------------------------------------------------|---------------------------------------|--------------------------------------------------------------|
| Event service time for CS-series Special I/O Units | 4% of the previous cycle's cycle time | Uniform servicing time in ms: 0.0 to 25.5 ms in 0.1-ms units |
| Event service time for CS-series CPU Bus Units     | Same as above.                        |                                                              |
| Event service time for peripheral port             | Same as above.                        |                                                              |
| Event service time for RS-232C port                | Same as above.                        |                                                              |
| Event service time for serial communication ports  | Same as above.                        |                                                              |
| File access service time for Memory Card           | Same as above.                        |                                                              |

The default value for each servicing process is 4% of the last cycle's cycle time.

In general, we recommend using the default value. Set a uniform servicing time only when peripheral servicing is being delayed because each service process is being spread over several cycles.

- Note**
1. When the peripheral servicing time is set to a time longer than the default value, the cycle time will also be longer.
  2. The fixed peripheral servicing time setting cannot be changed while the CPU Unit is in RUN mode or MONITOR mode.
  3. Use the Peripheral Servicing Priority Mode to give priority to servicing peripheral over program execution. Refer to the *CS Series Programming Manual* for details.

## Power OFF Interrupt Task

This setting determines whether or not a power OFF interrupt task will be executed when a power interruption is detected. (When this setting is set to 0, the regular program will just stop when a power interruption is detected.)

The power OFF interrupt task will be stopped when the power hold time (processing time after power interrupt + power OFF detection delay time) has elapsed. The maximum power hold time is 10 ms.

When a power OFF detection delay time has to be set, be sure that the power OFF interrupt task can be executed in the available time (10 ms – power OFF detection delay time).

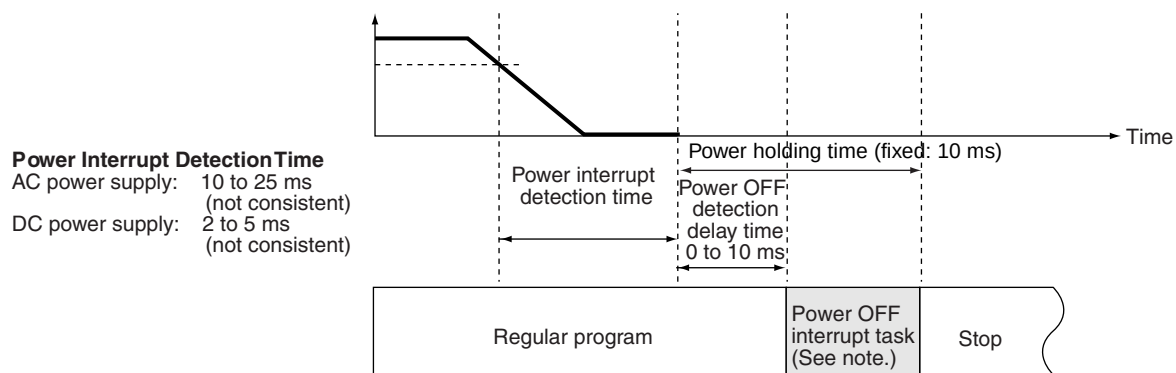
- Note** The power OFF interrupt task setting cannot be changed while the CPU Unit is in RUN mode or MONITOR mode.

## Power OFF Detection Delay Time

This setting determines how much of a delay there will be from the detection of a power interruption (approximately after the power supply voltage drops below 85% of the rated value) until a power interruption is established and the regular program is stopped. The setting can be between 0 and 10 ms.

It takes a maximum of 10 ms for the internal 5 V DC power supply to drop to 0 V DC after the initial power interrupt detection time. Extend the time until detection of a power interruption when momentary interruptions in a bad power supply are causing PLC operation to stop.

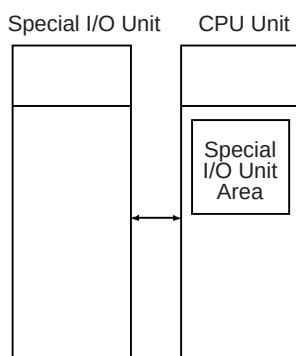
- Note** The power OFF detection delay time setting cannot be changed while the CPU Unit is in RUN mode or MONITOR mode.



**Note** The execution time for the power OFF interrupt task must be less than the maximum time available, namely: 10 ms – power OFF detection delay time. Refer to *CS Series Programming Manual* for details on the power interrupt task and on CPU Unit operation when power is turned OFF.

## Special I/O Unit Cyclic Refreshing

When a Special I/O Unit will be refreshed in an interrupt task by IORF(097), always disable cyclic refreshing for that Unit with this setting. The expected results will not be achieved and the Interrupt Task Error Flag (A40213) will be turned ON if IORF(097) is executed in an interrupt task during normal I/O refreshing.



These settings determine whether or not data will be exchanged with the 10 words allocated to each Special I/O Unit in the Special I/O Unit Area during cyclic I/O refreshing.

## SECTION 8

### I/O Allocations

This section describes I/O allocations to Basic I/O Units, Special I/O Units, and CPU Bus Units, and data exchange with Units.

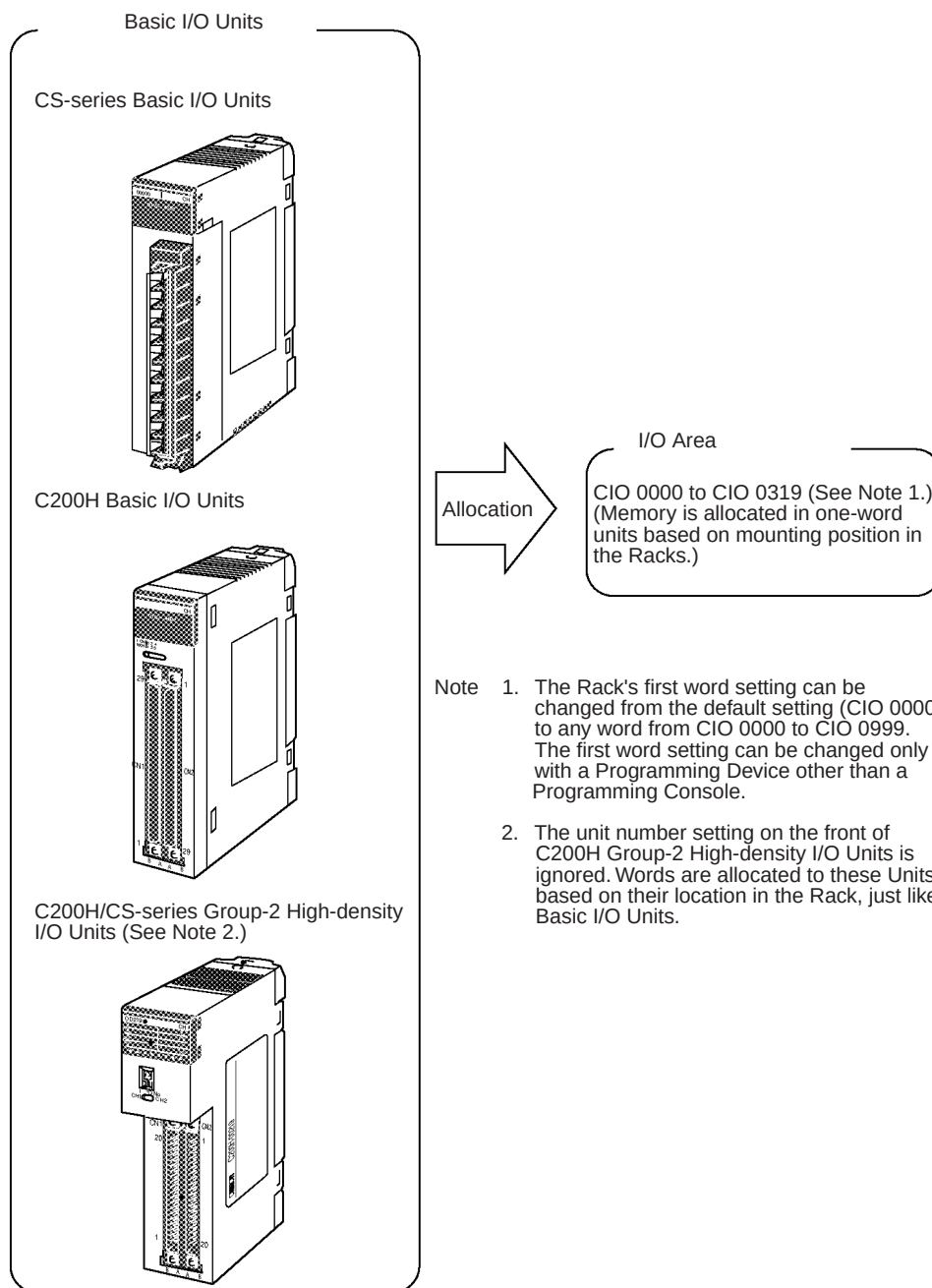
|       |                                                         |     |
|-------|---------------------------------------------------------|-----|
| 8-1   | I/O Allocations .....                                   | 282 |
| 8-1-1 | Unit Types.....                                         | 282 |
| 8-1-2 | I/O Allocation to Basic I/O Units.....                  | 284 |
| 8-1-3 | Allocating the First Word to Each Rack.....             | 289 |
| 8-1-4 | Reserving I/O Words for Expected Changes .....          | 291 |
| 8-1-5 | I/O Allocation to Special I/O Units .....               | 292 |
| 8-1-6 | I/O Allocation to CPU Bus Units.....                    | 293 |
| 8-1-7 | I/O Allocation to SYSMAC BUS Slave Racks .....          | 294 |
| 8-1-8 | I/O Table Registration.....                             | 295 |
| 8-1-9 | Detailed Information on I/O Table Creation Errors ..... | 296 |
| 8-2   | Data Exchange with CPU Bus Units.....                   | 296 |
| 8-2-1 | Special I/O Units.....                                  | 296 |
| 8-2-2 | Disabling Special I/O Unit Cyclic Refreshing .....      | 298 |
| 8-2-3 | CPU Bus Units .....                                     | 299 |

## 8-1 I/O Allocations

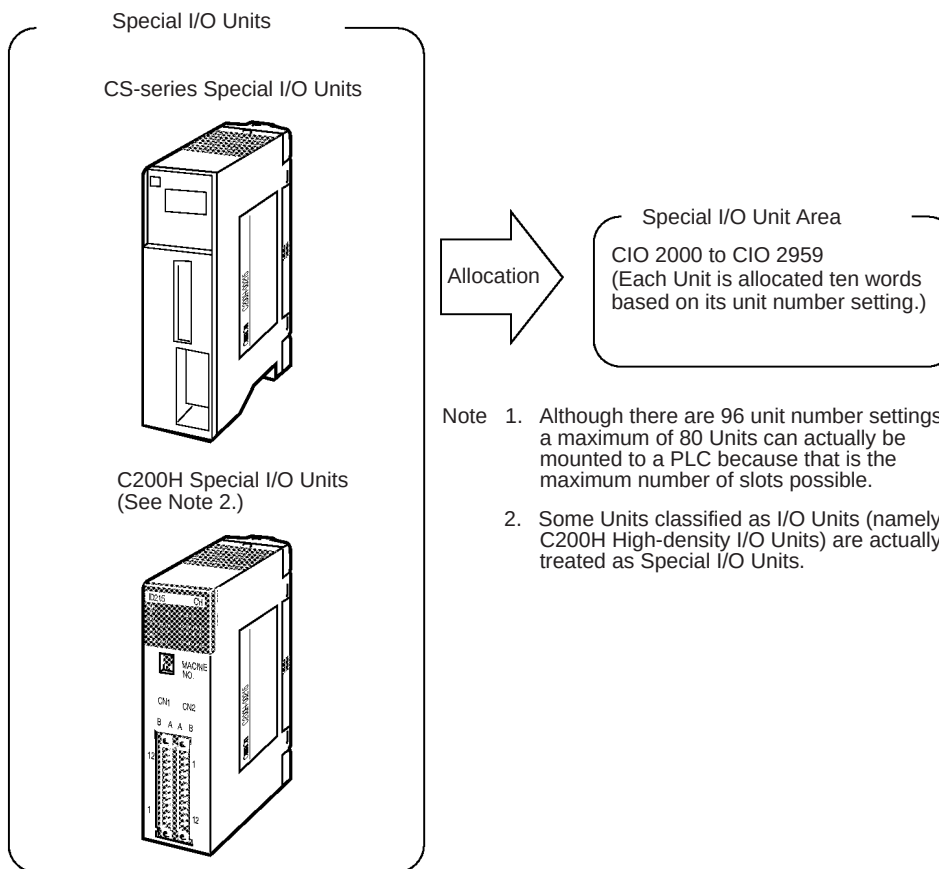
In CS-series PLCs, part of the I/O memory is allocated to each Unit. Memory is allocated differently to Basic I/O Units, Special I/O Units, and CS-series CPU Bus Units.

### 8-1-1 Unit Types

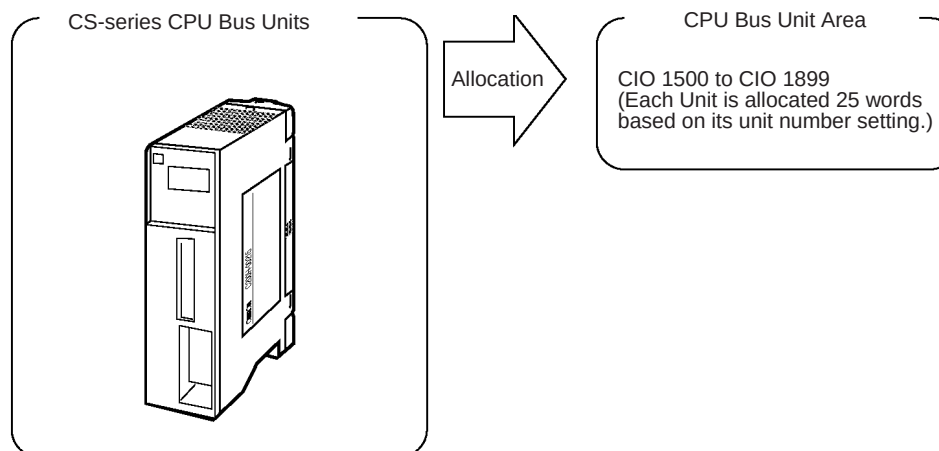
#### Basic I/O Units



## Special I/O Units



## CS-series CPU Bus Units





## 8-1-2 I/O Allocation to Basic I/O Units

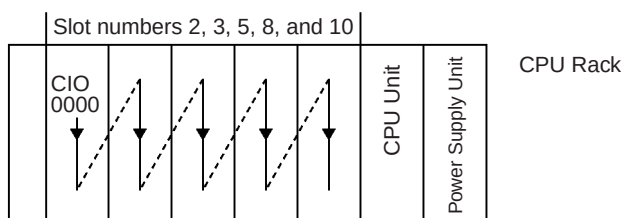
Basic I/O Units include CS-series Basic I/O Units, C200H Basic I/O Units, and C200H Group-2 High-density I/O Units. These Units are allocated words in the I/O Area (CIO 0000 to CIO 0319) and can be mounted to the CPU Rack, CS-series Expansion Racks, and C200H Expansion I/O Racks.

- Note**
1. Refer to 2-4 Units for list of specific Basic I/O Units.
  2. CS-series Basic I/O Units cannot be mounted to C200H Expansion I/O Racks.

### Basic I/O Units on the CPU Rack

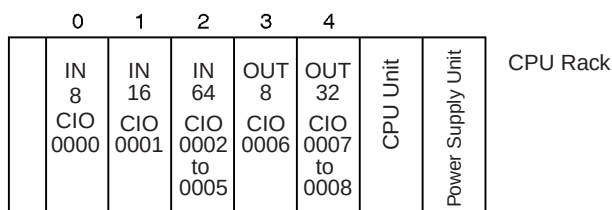
Basic I/O Units on the CPU Rack are allocated words from left to right and each Unit is allocated as many words as it requires.

- Note**
1. Units that have 1 to 16 I/O points are allocated 16 bits and Units that have 17 to 32 I/O points are allocated 32 bits. For example, an 8-point DC Input Unit is allocated 16 bits (1 word) and bits 00 to 07 of that word are allocated to the Unit's 8 points.
  2. I/O words are not allocated to empty slots. To allocate words to an empty slot, change the I/O table with a Programming Device.
  3. The unit number setting on the front of C200H Group-2 High-density I/O Units is ignored. Words are allocated to these Units based on their location on the Rack, just like Basic I/O Units.



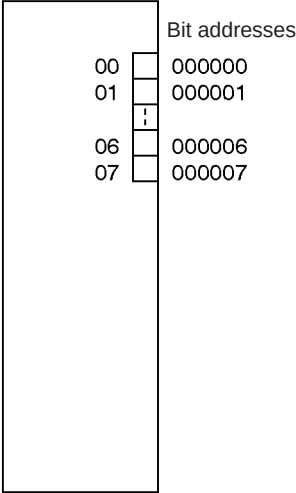
### Example 1

The following example shows the I/O allocation to 5 Basic I/O Units in the CPU Rack.

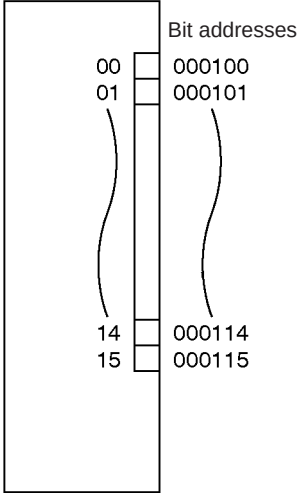


| Slot | Unit                                        | Words required | Words allocated      |
|------|---------------------------------------------|----------------|----------------------|
| 0    | C200H-ID211 8-point DC Input Unit           | 1              | CIO 0000             |
| 1    | C200H-ID212 16-point DC Input Unit          | 1              | CIO 0001             |
| 2    | C200H-ID217 64-point DC Input Unit          | 4              | CIO 0002 to CIO 0005 |
| 3    | C200H-OD411 8-point Transistor Output Unit  | 1              | CIO 0006             |
| 4    | C200H-OD218 32-point Transistor Output Unit | 2              | CIO 0007 to CIO 0008 |

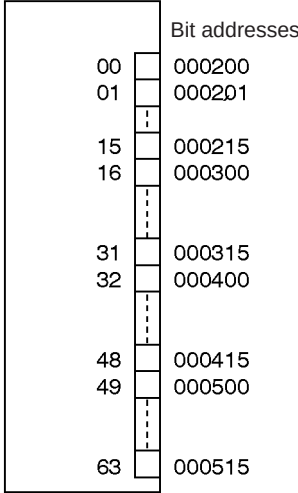
Slot 0  
8-point DC Input Unit



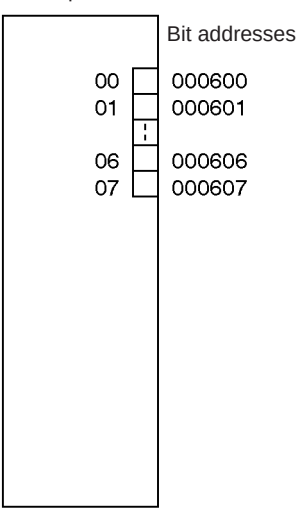
Slot 1  
16-point DC Input Unit



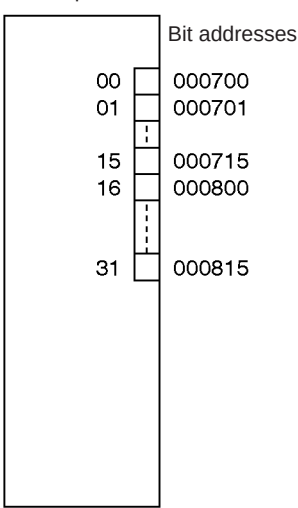
Slot 2  
64-point DC Input Unit



Slot 3  
8-point Transistor Output Unit



Slot 4  
32-point Transistor Output Unit



**Example 2**

The following example shows the I/O allocation to 4 Basic I/O Units in the CPU Rack with one empty slot.

| 0 | 1                           | 2                                         | 3                                         | 4     | CPU Rack                                   |          |                   |
|---|-----------------------------|-------------------------------------------|-------------------------------------------|-------|--------------------------------------------|----------|-------------------|
|   | IN<br>16<br><br>CIO<br>0000 | IN<br>32<br><br>CIO<br>0001<br>to<br>0002 | IN<br>96<br><br>CIO<br>0003<br>to<br>0008 | Empty | OUT<br>96<br><br>CIO<br>0009<br>to<br>0014 | CPU Unit | Power Supply Unit |

| Slot | Unit                                       | Words required | Words allocated      |
|------|--------------------------------------------|----------------|----------------------|
| 0    | C200H-ID212 16-point DC Input Unit         | 1              | CIO 0000             |
| 1    | C200H-ID216 32-point DC Input Unit         | 2              | CIO 0001 to CIO 0002 |
| 2    | CS1W-ID291 96-point DC Input Unit          | 6              | CIO 0003 to CIO 0008 |
| 3    | Empty                                      | 0              | None                 |
| 4    | CS1W-OD291 96-point Transistor Output Unit | 6              | CIO 0009 to CIO 0014 |

**Example 3**

The following example shows the I/O allocation to 5 Basic I/O Units in the CPU Rack. Two slots are filled with Dummy Units to reserve I/O words for those slots.

| 0 | 1                                         | 2                           | 3                                      | 4                                                    | CPU Rack                   |          |                   |
|---|-------------------------------------------|-----------------------------|----------------------------------------|------------------------------------------------------|----------------------------|----------|-------------------|
|   | IN<br>32<br><br>CIO<br>0000<br>to<br>0001 | OUT<br>8<br><br>CIO<br>0002 | Re-<br>served<br>16<br><br>CIO<br>0003 | Re-<br>served<br>32<br><br>CIO<br>0004<br>to<br>0005 | IN<br>8<br><br>CIO<br>0006 | CPU Unit | Power Supply Unit |

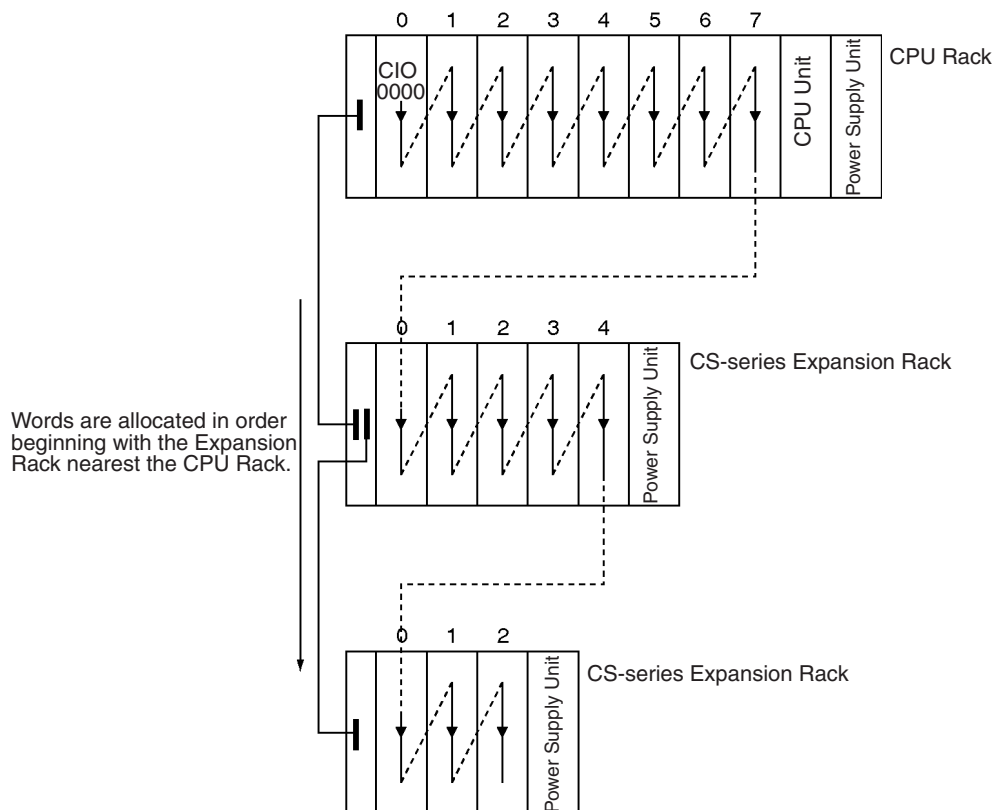
  

| Slot | Unit                                      | Words required | Words allocated      |
|------|-------------------------------------------|----------------|----------------------|
| 0    | C200H-ID216 32-point DC Input Unit        | 2              | CIO 0000 to CIO 0001 |
| 1    | C200H-OC221 8-point Relay Output Unit     | 1              | CIO 0002             |
| 2    | Reserve one word. (See note.)             | 1              | CIO 0003             |
| 3    | Reserve two words. (See note.)            | 2              | CIO 0004 to CIO 0005 |
| 4    | C200HS-INT01 8-point Interrupt Input Unit | 1              | CIO 0006             |

**Note** Use the CX-Programmer's I/O table change operation to reserve words for the empty slots.

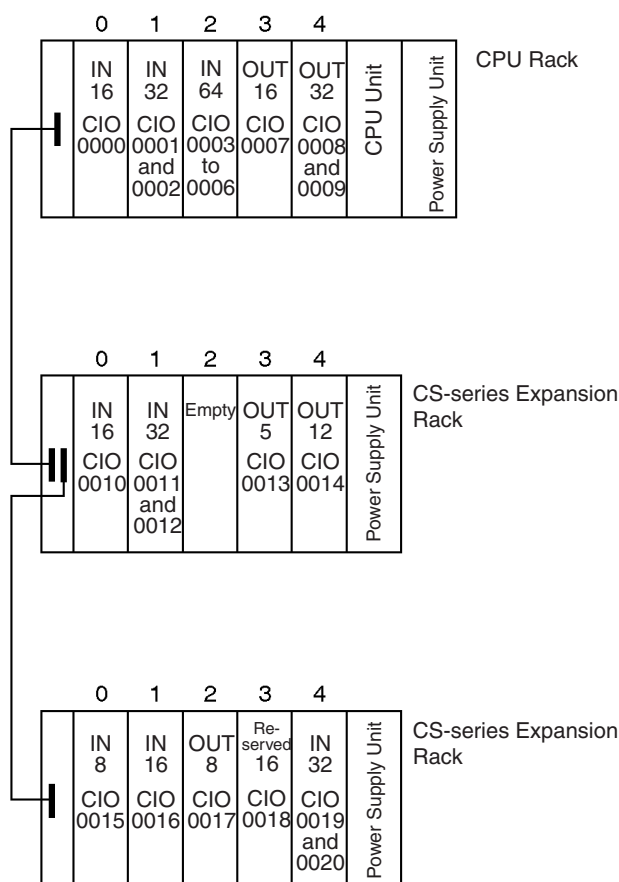
**Basic I/O Units in Expansion Racks**

I/O allocation to Basic I/O Units continues from the CPU Rack to the Expansion Rack (CS-series Expansion Rack or C200H Expansion I/O Rack) connected to the CPU Rack. Words are allocated from left to right and each Unit is allocated as many words as it requires, just like Units in the CPU Rack.



**Example**

The following example shows the I/O allocation to Basic I/O Units in the CPU Rack and two CS-series Expansion Racks.



| Rack                     | Slot | Unit                                        | Words required | Words allocated       |
|--------------------------|------|---------------------------------------------|----------------|-----------------------|
| CPU Rack                 | 0    | C200H-ID212 16-point DC Input Unit          | 1              | CIO 0000              |
|                          | 1    | C200H-ID216 32-point DC Input Unit          | 2              | CIO 0001 and CIO 0002 |
|                          | 2    | C200H-ID217 64-point DC Input Unit          | 4              | CIO 0003 to CIO 0006  |
|                          | 3    | C200H-OD212 16-point Transistor Output Unit | 1              | CIO 0007              |
|                          | 4    | C200H-OD218 32-point Transistor Output Unit | 2              | CIO 0008 and CIO 0009 |
| CS-series Expansion Rack | 0    | C200H-ID212 16-point DC Input Unit          | 1              | CIO 0010              |
|                          | 1    | C200H-ID216 32-point DC Input Unit          | 2              | CIO 0011 and CIO 0012 |
|                          | 2    | Empty                                       | 0              | None                  |
|                          | 3    | C200H-OC223 5-point Relay Output Unit       | 1              | CIO 0013              |
|                          | 4    | C200H-OA224 12-point Triac Output Unit      | 1              | CIO 0014              |
| CS-series Expansion Rack | 0    | C200H-IA121 8-point AC Input Unit           | 1              | CIO 0015              |
|                          | 1    | C200H-ID212 16-point DC Input Unit          | 1              | CIO 0016              |
|                          | 2    | C200H-OC222 12-point Relay Output Unit      | 1              | CIO 0017              |
|                          | 3    | Reserve one word. (See note.)               | 1              | CIO 0018              |
|                          | 4    | C200H-ID216 32-point DC Input Unit          | 2              | CIO 0019 and CIO 0020 |

**Note** Use the CX-Programmer's I/O table change operation to reserve a word for the empty slot.

**Allocations for Configurations with CS-series Long-distance Expansion Racks**

In configurations containing CS-series Long-distance Expansion Racks, up to two series of CS-series Long-distance Expansion Racks can be included. Words are automatically allocated to the Units mounted to the Racks in order of rack number and slot in the same way as for other configurations. The CPU Rack is rack 0, the CS-series Expansion Rack (if there is one) is rack 1. Rack numbers are then assigned in order to the Racks in series A of CS-series Long-distance Expansion Racks and finally to the Racks in series B of CS-series Long-distance Expansion Racks, to a maximum rack number of 7. Although words are automatically allocated, the first word on each Rack can be set in the PLC Setup.

- Note**
1. I/O words are not allocated to the I/O Control Unit or I/O Interface Units.
  2. No C200H Units can be mounted to CS-series Long-distance Expansion Racks.
  3. CS-series CPU Bus Units should always be placed on the CPU Rack or CS-series Expansion Rack. Although they can be placed on CS-series Long-distance Expansion Racks, doing so is not recommended because it will increase the cycle time.

### 8-1-3 Allocating the First Word to Each Rack

In the CS-series PLCs, the first word allocated to each Rack can be set with a Programming Device's I/O table write operation.

Rack numbers 0 to 7 are determined by the order in which the Racks are connected by the I/O Connecting Cables. (The CPU Rack is always rack 0 and the Expansion Racks are numbered in order from 1 to 7.) The rack numbers cannot be changed to an order different from the order in which the Racks are connected.

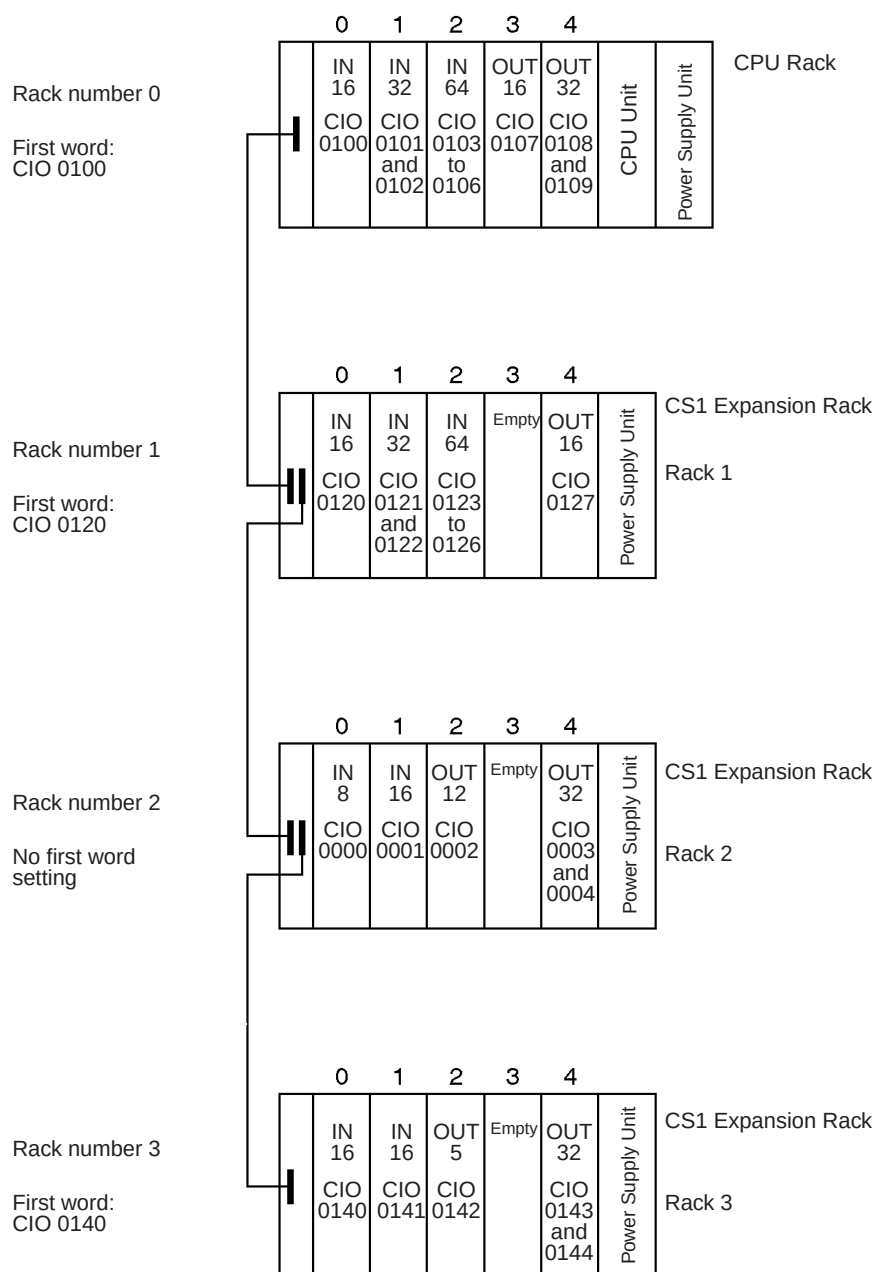
For Racks in which the first word address has been set, words are allocated to Units in the order that the Units are mounted (from left to right) beginning with CIO 0000. Words are not allocated to empty slots.

For Racks in which the first word address has not been set, words are allocated in rack-number order (lowest to highest) continuing from the last word allocated to the previous rack.

**Example: Setting the First Words for Racks**

In this example, the first words have been set for racks 0 (the CPU Rack), 2, and 3.

**Note** This example shows a system consisting of a CPU Rack and CS-series Expansion Racks, but I/O words are allocated in the same way in a system consisting of a CPU Rack and C200H Expansion I/O Racks or a CPU Rack, CS-series Expansion Racks, and C200H Expansion I/O Racks.



### Setting First Rack Words from the CX-Programmer

The first word allocated on each Rack can be set from the CX-Programmer. This setting is not possible from a Programming Console.

**Note** For CS1-H CPU Units, an indication of whether or not the first rack words have been set will be displayed on a Programming Console.

Use the following procedure to set the first rack words.

- 1,2,3...**
1. Select the **Rack Start Address** from the Option Menu on the I/O Table Window.

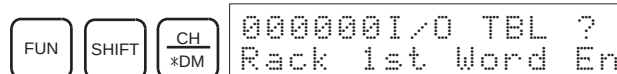
2. In the dialog box that will appear, remove the checkmarks from the settings disabling the first rack word settings and set the address of the first words for the CPU Rack and Expansion Racks (1 to 7).
3. Click the **OK** Button.

### Confirming First Rack Word Settings on a Programming Console

With a CS1-H CPU Unit, the Programming Console can be used to check whether or not the first word has been set on a Rack. Use the following procedure.

**1,2,3...**

1. Press the **FUN**, **SHIFT**, and **CH** Keys to start the I/O table creation operation. If the first work for a Rack has been set, a message saying so will appear on the second line of the display.



If nothing is displayed, then the first word has not been set.

2. Press the **CHG** Key, enter the password (9713), and then press the **WRITE** Key to continue creating the I/O tables, or press the **CLR** Key to cancel the operation and return to the initial display.

**Note**

1. Be sure to make first word settings so that allocated words do not overlap. The first word setting for a rack can be any address from CIO 0000 to CIO 0900. If a word is allocated to two Racks, the I/O tables cannot be created and the Duplication Error Flag (A26103) in the I/O Table Error Information will turn ON.
2. Always register the I/O table after installing an I/O Unit, after setting a rack number, or after setting the first word allocation for a Rack. The I/O Table Registration operation registers the I/O words allocated to the Racks.
3. I/O words will not be allocated to empty slots. If an I/O Unit will be installed later, reserve words for the empty slot by changing the I/O table with a Programming Device's I/O Table Change Operation.
4. If the actual system configuration is changed after registering the I/O table so that the number of words or I/O type does not match the I/O table, an I/O verification error (A40209) or I/O setting error (A40110) will occur. A CS-series CPU Bus Unit Setting Error (A40203) or Special I/O Unit Setting Error (A40202) may occur as well.
5. When a Unit is removed, words can be reserved for the missing Unit using the I/O Table Change Operation. If a Unit is changed or added, all of the words in the program following that Unit's allocated words will be changed and the I/O Table Registration Operation will have to be performed again.

### 8-1-4 Reserving I/O Words for Expected Changes

If the system configuration will be changed at a later date, changes to the program can be minimized by reserving I/O words in advance for future Unit changes or additions. To reserve I/O words, change the I/O table with CX-Programmer.

- After registering the I/O table, use CX-Programmer's I/O table change operation to reserve words for empty slots in which Units may be mounted later.
- If the I/O Table Registration operation is performed again after changing the I/O table, the I/O table will revert to its original status with no words allocated to the empty slot.



- Refer to the *CX-Programmer Operation Manual* for details on these operations.

The following High-density I/O Units are not Basic I/O Units, but Special I/O Units. These Units are allocated 10 words/Unit in the Special I/O Unit Area (CIO 2000 to CIO 2959) based on their unit number settings. Refer to 8-1-5 *I/O Allocation to Special I/O Units* for more details.

| Name                   | Specifications                                    | Model       |
|------------------------|---------------------------------------------------|-------------|
| High-density I/O Units | 32-point DC Input Unit                            | C200H-ID215 |
|                        | 32-point TTL Input Unit                           | C200H-ID501 |
|                        | 32-point Transistor Output Unit                   | C200H-OD215 |
|                        | 32-point TTL Output Unit                          | C200H-OD501 |
|                        | 16-point TTL Input/16-point TTL Output Unit       | C200H-MD501 |
|                        | 16-point DC Input/16-point Transistor Output Unit | C200H-MD215 |
|                        | 16-point DC Input/16-point Transistor Output Unit | C200H-MD115 |

### 8-1-5 I/O Allocation to Special I/O Units

Special I/O Units include CS-series Special I/O Units and C200H Special I/O Units. Each of these Units is allocated ten words in the Special I/O Unit Area (CIO 2000 to CIO 2959) according the unit number set on the Unit. Special I/O Units can be mounted to the CPU Rack, CS-series Expansion Racks, and C200H Expansion I/O Racks\*.

Refer to 2-4 *Units* for more details on the available Special I/O Units.

**Note** \*CS-series Special I/O Units cannot be mounted to C200H Expansion I/O Racks.

#### Word Allocation

The following table shows which words in the Special I/O Unit Area are allocated to each Unit.

| Unit number | Words allocated      |
|-------------|----------------------|
| 0           | CIO 2000 to CIO 2009 |
| 1           | CIO 2010 to CIO 2019 |
| 2           | CIO 2020 to CIO 2029 |
| :           | :                    |
| 15          | CIO 2150 to CIO 2159 |
| :           | :                    |
| :           | :                    |
| 95          | CIO 2950 to CIO 2959 |

Special I/O Units are ignored during I/O allocation to Basic I/O Units. Slots containing Special I/O Units are treated as empty slots and aren't allocated any words in the I/O Area.

**Example**

The following example shows the I/O word allocation to Basic I/O Units and Special I/O Units in the CPU Rack.

| 0                       | 1                                                   | 2                        | 3                                                   | 4                                       |          |                   |
|-------------------------|-----------------------------------------------------|--------------------------|-----------------------------------------------------|-----------------------------------------|----------|-------------------|
| IN<br>16<br>CIO<br>0000 | Special<br>I/O<br>Unit<br>CIO<br>2000<br>to<br>2009 | OUT<br>16<br>CIO<br>0001 | Special<br>I/O<br>Unit<br>CIO<br>2010<br>to<br>2019 | OUT<br>32<br>CIO<br>0002<br>and<br>0003 | CPU Unit | Power Supply Unit |

CPU Rack

| Slot | Unit                                        | Words required | Words allocated       | Unit number | Group            |
|------|---------------------------------------------|----------------|-----------------------|-------------|------------------|
| 0    | C200H-ID212 16-point DC Input Unit          | 1              | CIO 0000              | ---         | Basic I/O Unit   |
| 1    | C200H-AD002 Analog Input Unit               | 10             | CIO 2000 to CIO 2009  | 0           | Special I/O Unit |
| 2    | C200H-OD21A 16-point Transistor Output Unit | 1              | CIO 0001              | ---         | Basic I/O Unit   |
| 3    | C200H-NC211 Position Control Unit           | 20             | CIO 2010 to CIO 2029  | 1           | Special I/O Unit |
| 4    | C200H-OD218 32-point Transistor Output Unit | 2              | CIO 0002 and CIO 0003 | ---         | Basic I/O Unit   |

## 8-1-6 I/O Allocation to CPU Bus Units

Each CPU Bus Unit is allocated 25 words in the CPU Bus Unit Area (CIO 1500 to CIO 1899) according to the unit number set on the Unit. CPU Bus Units can be mounted to the CPU Rack or CS-series Expansion Racks.

**Word Allocation**

The following table shows which words in the CS-series CPU Bus Unit Area are allocated to each Unit.

| Unit number | Words allocated      |
|-------------|----------------------|
| 0           | CIO 1500 to CIO 1524 |
| 1           | CIO 1525 to CIO 1549 |
| 2           | CIO 1550 to CIO 1574 |
| :           | :                    |
| 15          | CIO 1875 to CIO 1899 |

CS-series CPU Bus Units are ignored during I/O allocation to Basic I/O Units. Slots containing CS-series CPU Bus Units are treated as empty slots and aren't allocated any words in the I/O Area.

**Example**

The following example shows the I/O word allocation to Basic I/O Units, Special I/O Units, and CS-series CPU Bus Units in the CPU Rack.

| 0                       | 1                                                   | 2                                               | 3                        | 4                                               |          |                   |
|-------------------------|-----------------------------------------------------|-------------------------------------------------|--------------------------|-------------------------------------------------|----------|-------------------|
| IN<br>16<br>CIO<br>0000 | Special<br>I/O<br>Unit<br>CIO<br>2000<br>to<br>2009 | CPU<br>Bus<br>Unit<br>CIO<br>1500<br>to<br>1521 | OUT<br>16<br>CIO<br>0001 | CPU<br>Bus<br>Unit<br>CIO<br>1525<br>to<br>1549 | CPU Unit | Power Supply Unit |

CPU Rack

| Slot | Unit                               | Words required | Words allocated      | Unit number | Group            |
|------|------------------------------------|----------------|----------------------|-------------|------------------|
| 0    | C200H-ID212 16-point DC Input Unit | 1              | CIO 0000             | ---         | Basic I/O Unit   |
| 1    | C200H-ASC02 ASCII Unit             | 10             | CIO 2000 to CIO 2009 | 0           | Special I/O Unit |

| Slot | Unit                                        | Words required | Words allocated      | Unit number | Group                  |
|------|---------------------------------------------|----------------|----------------------|-------------|------------------------|
| 2    | C200H-SCU21 Serial Communications Unit      | 25             | CIO 1500 to CIO 1524 | 0           | CS-series CPU Bus Unit |
| 3    | C200H-OD21A 16-point Transistor Output Unit | 1              | CIO 0001             | ---         | Basic I/O Unit         |
| 4    | C200H-SCU21 Serial Communications Unit      | 25             | CIO 1525 to CIO 1549 | 1           | CS-series CPU Bus Unit |

### 8-1-7 I/O Allocation to SYSMAC BUS Slave Racks

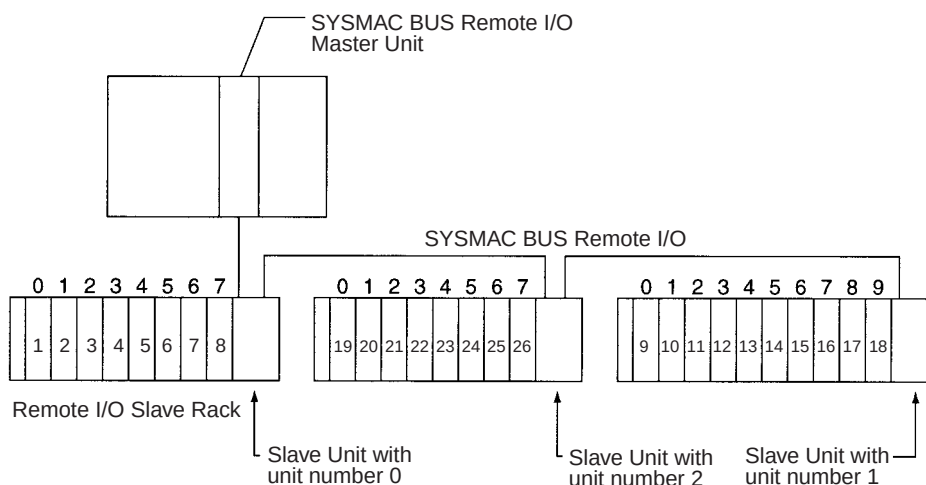
Each SYSMAC BUS Remote I/O Slave Rack is allocated 10 words in the SYSMAC BUS Area (CIO 3000 to CIO 3049) according to the unit number (0 to 4) set on the Slave Unit. No words in the I/O Area are allocated to Units in Slave Racks.

Each slot in the Slave Rack is allocated one of the Rack's 10 words. The words are allocated from left to right. One word is allocated to every slot even if the slot is empty and the last two words allocated to each Rack are not used because the Slave Racks have only 8 slots.

The Master and Slave Units themselves do not require any words.

#### Example

The following example shows the word allocation to 3 Slave Racks.



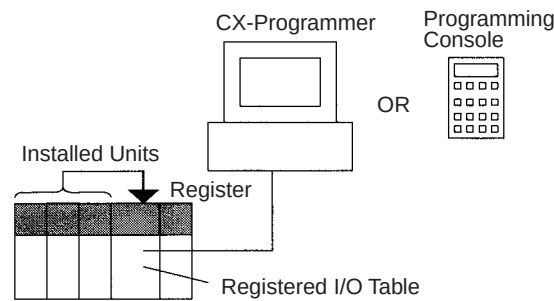
|      |           |                               |
|------|-----------|-------------------------------|
| 3000 | 1         | Slave Unit with unit number 0 |
| 3001 | 2         |                               |
| 3002 | 3         |                               |
|      | :         |                               |
| 3007 | 8         |                               |
| 3008 | Not used. | Slave Unit with unit number 1 |
| 3009 | Not used. |                               |
| 3010 | 9         |                               |
| 3011 | 10        |                               |
|      | :         |                               |
| 3017 | 16        | Slave Unit with unit number 2 |
| 3018 | 17        |                               |
| 3019 | 18        |                               |
| 3020 | 19        |                               |
| 3021 | 20        |                               |
|      | :         |                               |
| 3027 | 26        |                               |
| 3028 | Not used. |                               |
| 3029 | Not used. |                               |

8-1-8 I/O Table Registration

After installing the following Units, a Programming Device (Programming Console or CX-Programmer) must be used to register (write) the I/O table.

- Basic I/O Units
- Special I/O Units
- CPU Bus Units
- SYSMAC BUS Remote I/O Slave Racks

The I/O Table Registration operation registers the information about the type and location of the Units mounted in the CPU Rack and Expansion Racks.



The I/O Table Registration operation must be performed with a Programming Device. If the I/O table isn't registered, the CPU Unit won't be able to recognize the Basic I/O Units, Special I/O Units, CPU Bus Units, and Slave Racks that are connected to the PLC.

With the C200HX/HG/HE, C200H, and C200HS PLCs, word allocation is determined by each Unit's mounting location in the PLC, so these PLCs could be used without registering the I/O table. The I/O Table Registration operation was used just to prevent Units from being installed in the wrong slot. With CS-series PLCs, word allocation is not determined solely by slot location and empty slots are not allocated any I/O words. Words are allocated to the Units that are actually installed in the PLC. The I/O table must be registered before a CS-series PLC can be used.

I/O Table Registration with CX-Programmer

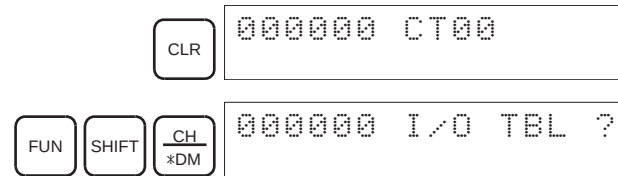
Use the following procedure to register the I/O table with the CX-Programmer.

1,2,3...

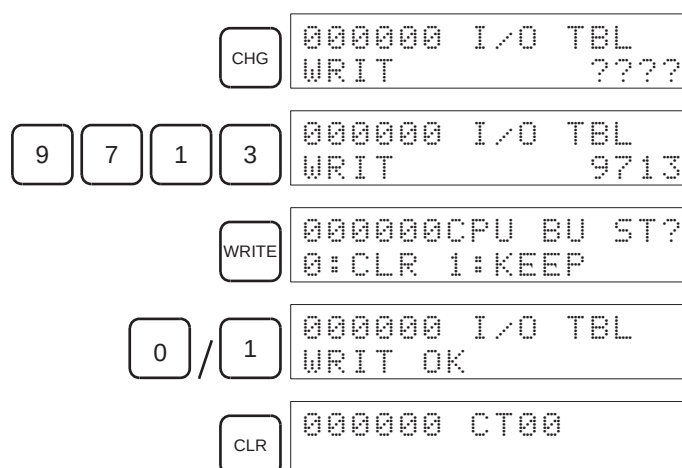
1. Double-click **I/O Table** in the project tree in the main window. The I/O Table Window will be displayed.
2. Select **Options**. The models and positions of the Units mounted to the Racks will be written to the CPU Unit as the registered I/O tables.

I/O Table Registration with a Programming Console

Use the following procedure to register the I/O table with a Programming Console.



**Note** If the Rack first words have already been set from the CX-Programmer, "Rack 1st Word En" will be displayed on the second line (CS1-H only).



### 8-1-9 Detailed Information on I/O Table Creation Errors

With a CS1-H CPU Unit, the contents of A261 will provide information on the Unit causing the error whenever one occurs when creating the I/O tables from the Programming Console or CX-Programmer. This information will make it easier to find the Unit causing the problem with troubleshooting I/O tables. Refer to *SECTION 11 Troubleshooting* for actual procedures.

| Name                                              | Address |     | Contents                                                                                               | When changing to RUN mode | At startup | Setting timing              |
|---------------------------------------------------|---------|-----|--------------------------------------------------------------------------------------------------------|---------------------------|------------|-----------------------------|
|                                                   | Word    | Bit |                                                                                                        |                           |            |                             |
| CPU Bus Unit Setup Area Initialization Error Flag | A261    | 00  | ON: Error in CPU Bus Unit Setup<br>Turns OFF when I/O tables are generated normally.                   | Held                      | Cleared    | When I/O tables are created |
| I/O Overflow Flag                                 |         | 02  | ON: Overflow in maximum number of I/O points.<br>Turns OFF when I/O tables are generated normally.     |                           |            |                             |
| Duplication Error Flag                            |         | 03  | ON: The same unit number was used more than once.<br>Turns OFF when I/O tables are generated normally. |                           |            |                             |
| I/O Bus Error Flag                                |         | 04  | ON: I/O bus error<br>Turns OFF when I/O tables are generated normally.                                 |                           |            |                             |
| SYSMAC BUS Recognition Error Flag                 |         | 06  | ON: SYSMAC BUS detection ended in an error.<br>Turns OFF when I/O tables are generated normally.       |                           |            |                             |
| Special I/O Unit Error Flag                       |         | 07  | ON: Error in a Special I/O Unit<br>Turns OFF when I/O tables are generated normally.                   |                           |            |                             |
| I/O Unconfirmed Error Flag                        |         | 09  | ON: I/O detection has not been completed.<br>Turns OFF when I/O tables are generated normally.         |                           |            |                             |

## 8-2 Data Exchange with CPU Bus Units

This section describes how data can be exchanged between Special I/O Units or CS-series CPU Bus Units, and the CPU Unit.

### 8-2-1 Special I/O Units

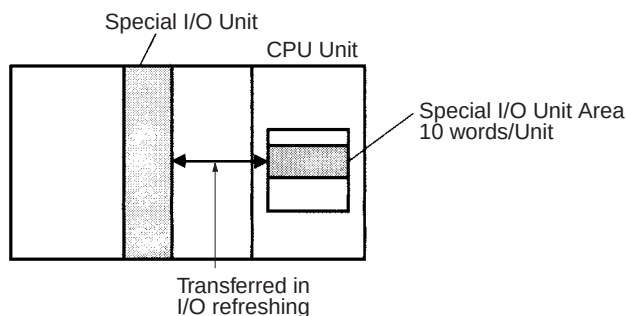
Special I/O Units include C200H Special I/O Units and CS-series Special I/O Units. Data can be exchanged between Special I/O Units and the CPU Unit through the Special I/O Unit Area, the DM Area, or FINS commands.

#### Special I/O Unit Area (I/O Refreshing)

Data is exchanged each cycle during I/O refreshing of the Special I/O Unit Area. Basically, 10 words are allocated to each Special I/O Unit based on its

unit number setting. The number of words actually used by the Special I/O Unit varies; there are models that require 2 words, 4 words, and 20 words.

The Special I/O Unit Area ranges from CIO 2000 to CIO 2959 (10 words × 96 Units).



### Transfer of Words Allocated in DM Area

#### **C200H Special I/O Units**

The 100 words allocated to each Unit are transferred from the DM Area to the Unit when the PLC is turned on or the Unit is restarted. Some C200H Special I/O Units do not use any of the allocated DM words and others use only a part of the allocated words.

#### **CS-series Special I/O Units**

There are three times that data may be transferred through the words allocated to each Unit. The timing of data transfers depends on the model being used.

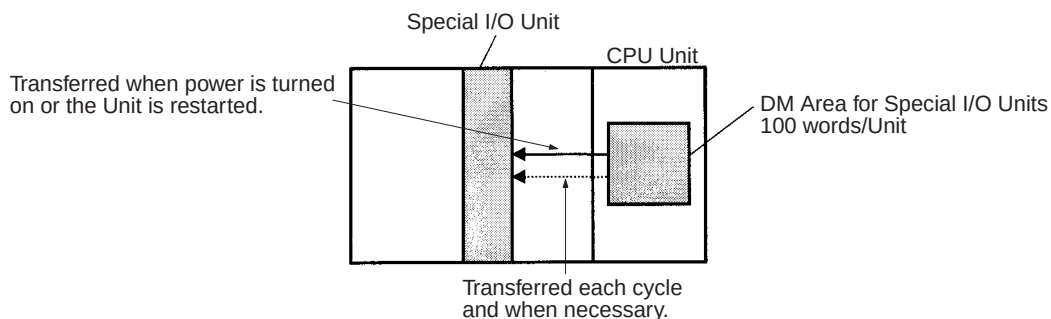
##### **1,2,3...**

1. Data transferred when the PLC is turned on.
2. Data transferred when the Unit is restarted.
3. Data transferred when necessary.

Some models transfer data in both directions, from the DM Area to the Unit and from the Unit to the DM Area. See the Unit's Operation Manual for details on data transfers.

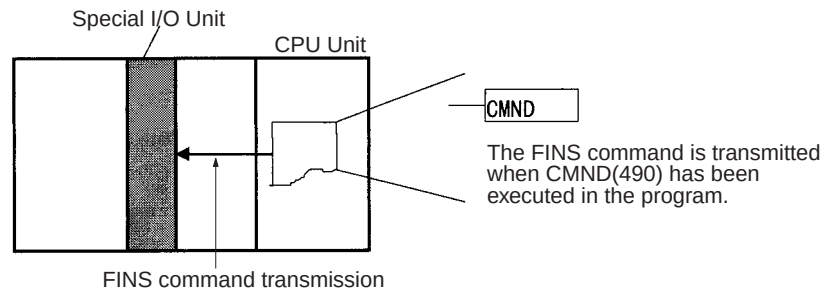
### Special I/O Unit Words in the DM Area: D20000 to D29599 (100 Words x 96 Units)

Each Special I/O Unit is allocated 100 words in the DM Area in the range of D20000 to D29599 (100 words × 96 Units). These 100 words are generally used to hold initial settings for the Special I/O Unit. When the contents of this area are changed from the program to reflect a change in the system, the Restart Bits for affected Units must be turned ON to restart the Units.

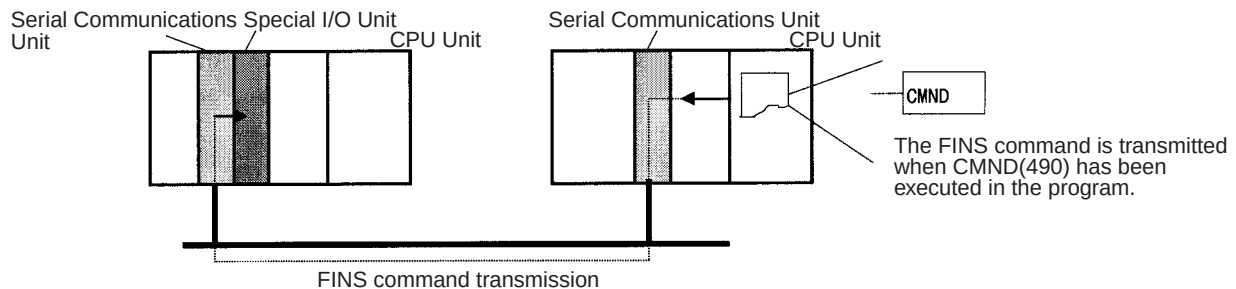


**FINS Commands**

The CMND(490) instruction can be added to the ladder program to issue a FINS command to the Special I/O Unit.



FINS commands can be transmitted to Special I/O Units in other PLCs in the network, not just the local PLC.

**Special I/O Unit Initialization**

Special I/O Units are initialized when the PLC's power is turned on or the Unit's Restart Bit is turned ON. The Unit's Special I/O Unit Initialization Flag (A33000 to A33515) will be ON while the Unit is initializing.

I/O refreshing (cyclic I/O refreshing or refreshing by IORF(097)) will not be performed for a Special I/O Unit while its Initialization Flag is ON.

**8-2-2 Disabling Special I/O Unit Cyclic Refreshing**

Ten words are allocated to each Special I/O Unit in the Special I/O Unit Area (CIO 2000 to CIO 2959) based on the unit number set on the front of each Unit. The data in the Special I/O Unit Area is refreshed in the CPU Unit every cycle during I/O refreshing (just after execution of the END(001) instruction).

I/O refreshing may take too long if too many Special I/O Units are installed. If I/O refreshing is taking too much time, the PLC Setup can be set to disable cyclic refreshing for particular Special I/O Units. (The Special I/O Unit Cyclic Refreshing Disable Bits are in PLC Setup addresses 226 to 231.)

If the I/O refreshing time is too short, the Unit's internal processing will not be able to keep pace, the Special I/O Unit Error Flag (A40206) will be turned ON, and the Special I/O Unit may not operate properly. In this case, the cycle time can be extended by setting a minimum cycle time in the PLC Setup or cyclic I/O refreshing with the Special I/O Unit can be disabled. When cyclic refreshing has been disabled, the Special I/O Unit's data can be refreshed during program execution with IORF(097).

- Note**
1. Always disable a Special I/O Unit's cyclic refreshing if the Unit's I/O will be refreshed in an interrupt task with IORF(097). An interrupt task error (A40213) will occur if cyclic refreshing and IORF(097) refreshing are performed simultaneously.
  2. Whenever disabling a Special I/O Unit's cyclic refreshing, be sure that the I/O for that Unit is refreshed with IORF(097) in the program at least every

11 seconds during operation. A CPU Unit service monitoring error will occur in the Special I/O Unit if it is not refreshed every 11 seconds.

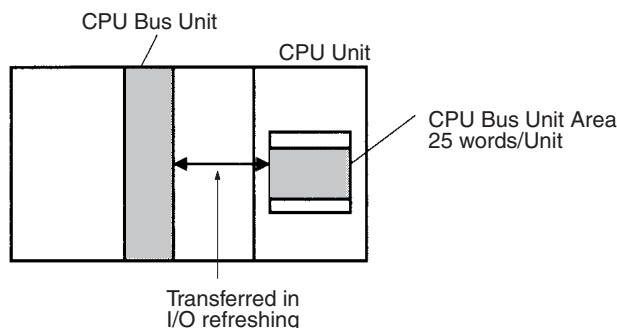
### 8-2-3 CPU Bus Units

Data can be exchanged between CPU Bus Units and the CPU Unit through the CPU Bus Unit Area, the DM Area, or FINS commands.

#### CPU Bus Unit Area (I/O Refreshing)

Data is exchanged each cycle during I/O refreshing of the CPU Bus Unit Area. Basically, 25 words are allocated to each CPU Bus Unit based on its unit number setting. The number of words actually used by the CPU Bus Unit varies.

The Special I/O Unit Area ranges from CIO 1500 to CIO 1899 (25 words  $\times$  16 Units).



Note With CS1-H CPU Units, the CPU BUS I/O REFRESH instruction (DLNK(226)) can be executed in the ladder program to refresh the CIO Area words allocated to the CPU Bus Unit of a specified unit number.

#### Transfer of Words Allocated in the DM Area

Each CPU Bus Unit is allocated 100 words in the DM Area in the range of D30000 to D31599 (100 words  $\times$  16 Units). There are three times that data may be transferred through the words allocated to each Unit. The timing of data transfers depends on the model being used.

**1,2,3...**

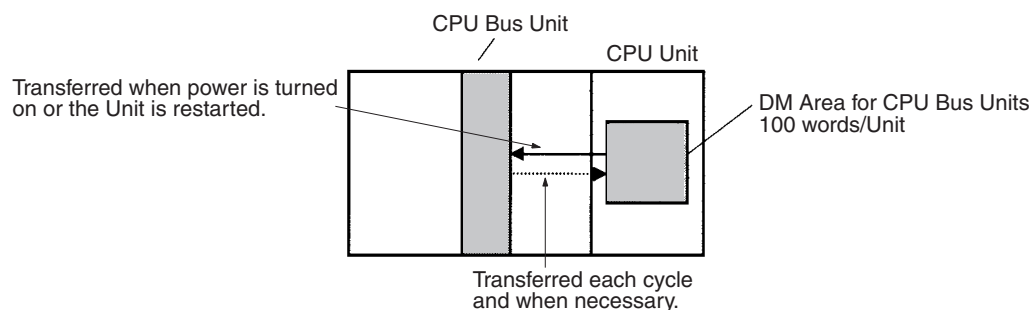
1. Data transferred when the PLC is turned ON.
2. Data transferred each cycle.
3. Data transferred when necessary.

Note With CS1-H CPU Units, the CPU BUS I/O REFRESH instruction (DLNK(226)) can be executed in the ladder program to refresh the DM Area words allocated to the CPU Bus Unit of a specified unit number.

Some models transfer data in both directions, from the DM Area to the Unit and from the Unit to the DM Area. See the Unit's Operation Manual for details on data transfers.

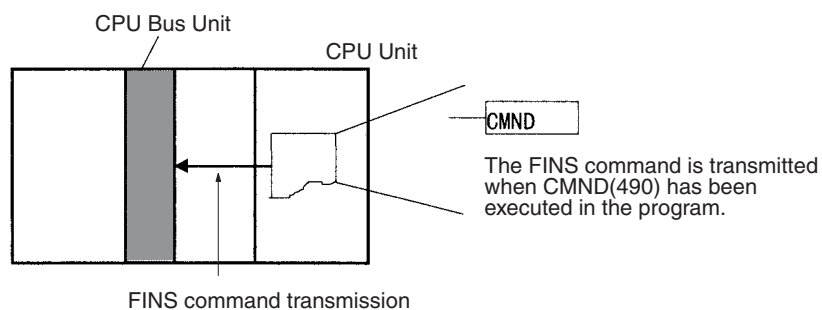
These 100 words are generally used to hold initial settings for the CPU Bus Unit. When the contents of this area are changed from the program to reflect a change in the system, the Restart Bits (A50100 to A50115) for affected Units must be turned ON to restart the Units.



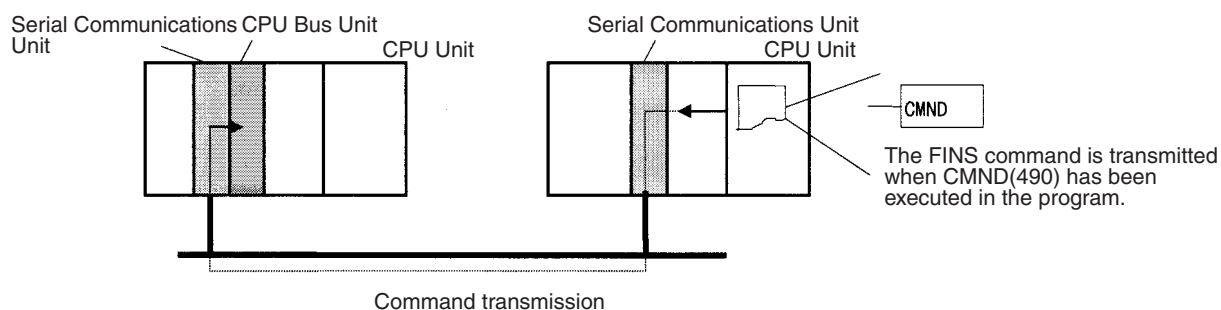


## FINS Commands

The CMND(490) instruction can be added to the ladder program to issue a FINS command to the CPU Bus Unit.



FINS commands can be transmitted to CPU Bus Units in other PLCs in the network, not just the local PLC.



## CPU Bus Unit Initialization

CPU Bus Units are initialized when the PLC's power is turned on or the Unit's Restart Bit is turned ON. The Unit's CPU Bus Unit Initialization Flag (A30200 to A30215) will be ON while the Unit is initializing. Cyclic I/O refreshing will not be performed for a CPU Bus Unit while its Initialization Flag is ON.

## SECTION 9

# Memory Areas

This section describes the structure and functions of the I/O Memory Areas and Parameter Areas.

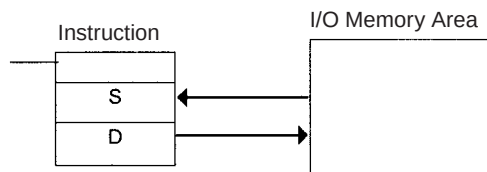
|        |                                                        |     |
|--------|--------------------------------------------------------|-----|
| 9-1    | Introduction . . . . .                                 | 302 |
| 9-2    | I/O Memory Areas . . . . .                             | 303 |
| 9-2-1  | I/O Memory Area Structure . . . . .                    | 303 |
| 9-2-2  | Overview of the Data Areas . . . . .                   | 305 |
| 9-2-3  | Data Area Properties . . . . .                         | 311 |
| 9-3    | Precautions in Using C200H Special I/O Units . . . . . | 312 |
| 9-4    | CIO Area . . . . .                                     | 313 |
| 9-5    | C200H DeviceNet Area . . . . .                         | 319 |
| 9-6    | CS-series DeviceNet Area . . . . .                     | 320 |
| 9-7    | PLC Link Area . . . . .                                | 322 |
| 9-8    | Data Link Area . . . . .                               | 324 |
| 9-9    | CPU Bus Unit Area . . . . .                            | 325 |
| 9-10   | Inner Board Area . . . . .                             | 326 |
| 9-11   | Special I/O Unit Area . . . . .                        | 327 |
| 9-12   | SYSMAC BUS Area . . . . .                              | 329 |
| 9-13   | I/O Terminal Area . . . . .                            | 330 |
| 9-14   | Work Area . . . . .                                    | 331 |
| 9-15   | Holding Area . . . . .                                 | 332 |
| 9-16   | Auxiliary Area . . . . .                               | 333 |
| 9-17   | TR (Temporary Relay) Area . . . . .                    | 349 |
| 9-18   | Timer Area . . . . .                                   | 350 |
| 9-19   | Counter Area . . . . .                                 | 351 |
| 9-20   | Data Memory (DM) Area . . . . .                        | 352 |
| 9-21   | Extended Data Memory (EM) Area . . . . .               | 354 |
| 9-22   | Index Registers . . . . .                              | 356 |
| 9-23   | Data Registers . . . . .                               | 361 |
| 9-24   | Task Flags . . . . .                                   | 362 |
| 9-25   | Condition Flags . . . . .                              | 363 |
| 9-26   | Clock Pulses . . . . .                                 | 366 |
| 9-27   | Parameter Areas . . . . .                              | 366 |
| 9-27-1 | PLC Setup . . . . .                                    | 367 |
| 9-27-2 | Registered I/O Table . . . . .                         | 367 |
| 9-27-3 | Routing Table . . . . .                                | 367 |
| 9-27-4 | CPU Bus Unit Settings . . . . .                        | 368 |

## 9-1 Introduction

The CPU Unit's memory (RAM with battery back-up) can be divided into three parts: the User Program Memory, I/O Memory Area, and Parameter Area. This section describes the I/O Memory Area and Parameter Area.

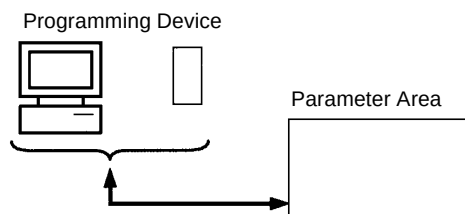
### I/O Memory Area

This region of memory contains the data areas which can be accessed by instruction operands. The data areas include the CIO Area, Work Area, Holding Area, Auxiliary Area, DM Area, EM Area, Timer Area, Counter Area, Task Flag Area, Data Registers, Index Registers, Condition Flag Area, and Clock Pulse Area.



### Parameter Area

This region of memory contains various settings that cannot be specified by instruction operands; they can be specified from a Programming Device only. The settings include the PLC Setup, I/O Table, Routing Table, and CPU Bus Unit settings.



## 9-2 I/O Memory Areas

### 9-2-1 I/O Memory Area Structure

The following table shows the basic structure of the I/O Memory Area.

| Area           |                          | Size                                                | Range                                        | External I/O allocation                                                     | Bit access        | Word access | Access |       | Change from Programming Device | Status at startup or mode change | Forcing bit status |    |
|----------------|--------------------------|-----------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------|-------------------|-------------|--------|-------|--------------------------------|----------------------------------|--------------------|----|
|                |                          |                                                     |                                              |                                                                             |                   |             | Read   | Write |                                |                                  |                    |    |
| CIO Area       | I/O Area                 | 5,120 bits (320 words)                              | CIO 0000 to CIO 0319 (See note 1.)           | Basic I/O Units                                                             | OK                | OK          | OK     | OK    | OK                             | Cleared                          | OK                 |    |
|                |                          | C200H DeviceNet Words                               | 1,600 bits (100 words)                       | Outputs: CIO 0050 to CIO 0099<br>Inputs: CIO 0350 to CIO 0399 (See note 2.) | Device-Net Slaves | OK          | OK     | OK    | OK                             | OK                               | Cleared            | OK |
|                |                          | PLC Link Words                                      | 32 bits (4 words)                            | CIO 0247 to CIO 0250 A442                                                   | ---               | OK          | OK     | OK    | OK                             | OK                               |                    | OK |
|                | Data Link Area           | 3,200 bits (200 words)                              | CIO 1000 to CIO 1199                         | Data link or PLC Link                                                       | OK                | OK          | OK     | OK    | OK                             | Cleared                          | OK                 |    |
|                | CPU Bus Unit Area        | 6,400 bits (400 words)                              | CIO 1500 to CIO 1899                         | CPU Bus Units                                                               | OK                | OK          | OK     | OK    | OK                             |                                  | OK                 |    |
|                | Special I/O Unit Area    | 15,360 bits (960 words)                             | CIO 2000 to CIO 2959                         | Special I/O Units                                                           | OK                | OK          | OK     | OK    | OK                             |                                  | OK                 |    |
|                | Inner Board Area         | 1,600 bits (100 words)                              | CIO 1900 to CIO 1999                         | Inner Boards                                                                | OK                | OK          | OK     | OK    | OK                             |                                  | OK                 |    |
|                | SYSMAC BUS Area          | 800 bits (50 words)                                 | CIO 3000 to CIO 3049                         | Slave Racks                                                                 | OK                | OK          | OK     | OK    | OK                             |                                  | OK                 |    |
|                | I/O Terminal Area        | 512 bits (32 words)                                 | CIO 3100 to CIO 3131                         | Slaves other than Racks                                                     | OK                | OK          | OK     | OK    | OK                             | Cleared                          | OK                 |    |
|                | CS-series DeviceNet Area | 9,600 bits (600 words)                              | CIO 3200 to CIO 3799                         | Device-Net Slaves                                                           | OK                | OK          | OK     | OK    | OK                             |                                  | OK                 |    |
|                | Internal I/O Areas       | 37,504 bits (2,344 words)<br>4,800 bits (300 words) | CIO 1200 to CIO 1499<br>CIO 3800 to CIO 6143 | ---                                                                         | OK                | OK          | OK     | OK    | OK                             |                                  | OK                 |    |
| Work Area      |                          | 8,192 bits (512 words)                              | W000 to W511                                 | ---                                                                         | OK                | OK          | OK     | OK    | OK                             | Cleared                          | OK                 |    |
| Holding Area   |                          | 8,192 bits (512 words)                              | H000 to H511                                 | ---                                                                         | OK                | OK          | OK     | OK    | OK                             | Maintained                       | OK                 |    |
| Auxiliary Area |                          | 15,360 bits (960 words)                             | A000 to A447                                 | ---                                                                         | OK                | OK          | OK     | No    | No                             | Varies from address to address.  | No                 |    |
|                |                          |                                                     | A448 to A959                                 |                                                                             |                   |             | OK     | OK    | OK                             |                                  |                    |    |
| TR Area        |                          | 16 bits                                             | TR0 to TR15                                  | ---                                                                         | OK                | ---         | OK     | OK    | No                             | Cleared                          | No                 |    |

| Area                          | Size                                    | Range                | External I/O allocation | Bit access       | Word access | Access                   |                            | Change from Programming Device | Status at startup or mode change | Forcing bit status |
|-------------------------------|-----------------------------------------|----------------------|-------------------------|------------------|-------------|--------------------------|----------------------------|--------------------------------|----------------------------------|--------------------|
|                               |                                         |                      |                         |                  |             | Read                     | Write                      |                                |                                  |                    |
| DM Area                       | 32,768 words                            | D00000 to D32767     | ---                     | No (See note 3.) | OK          | OK                       | OK                         | OK                             | Maintained                       | No                 |
| EM Area                       | 32,768 words per bank (0 to C, 13 max.) | E0_00000 to EC_32767 | ---                     | No (See note 3.) | OK          | OK                       | OK                         | OK                             | Maintained                       | No                 |
| Timer Completion Flags        | 4,096 bits                              | T0000 to T4095       | ---                     | OK               | ---         | OK                       | OK                         | OK                             | Cleared                          | OK                 |
| Counter Completion Flags      | 4,096 bits                              | C0000 to C4095       | ---                     | OK               | ---         | OK                       | OK                         | OK                             | Maintained                       | OK                 |
| Timer PVs                     | 4,096 words                             | T0000 to T4095       | ---                     | ---              | OK          | OK                       | OK                         | OK                             | Cleared                          | No (See note 5.)   |
| Counter PVs                   | 4,096 words                             | C0000 to C4095       | ---                     | ---              | OK          | OK                       | OK                         | OK                             | Maintained                       | No (See note 6.)   |
| Task Flag Area                | 32 bits                                 | TK00 to TK31         | ---                     | OK               | ---         | OK                       | No                         | No                             | Cleared                          | No                 |
| Index Registers (See note 4.) | 16 registers                            | IR0 to IR15          | ---                     | OK               | OK          | Indirect addressing only | Specific instructions only | No                             | Cleared                          | No                 |
| Data Registers (See note 4.)  | 16 registers                            | DR0 to DR15          | ---                     | No               | OK          | OK                       | OK                         | No                             | Cleared                          | No                 |

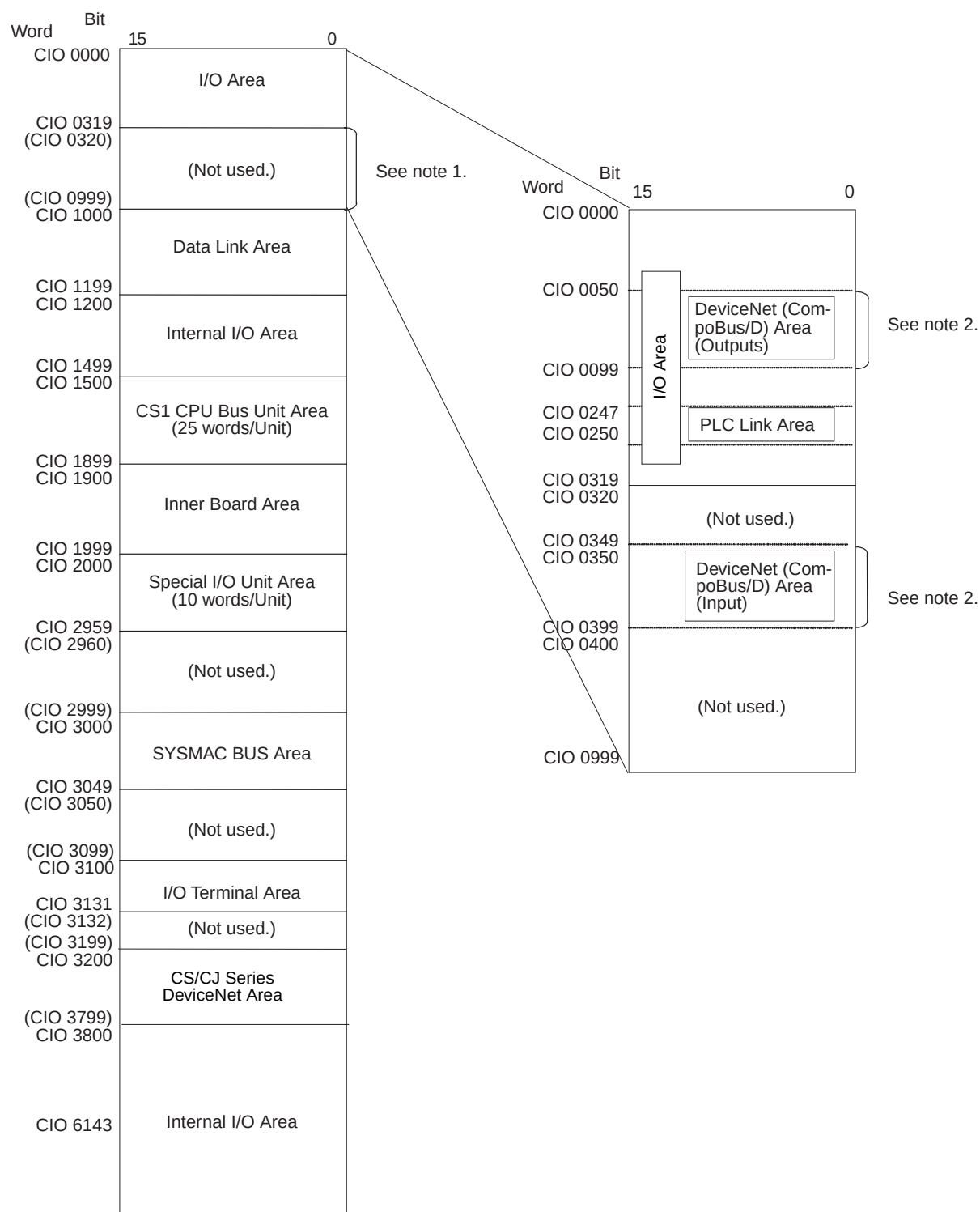
- Note**
1. The I/O Area can be expanded to CIO 0000 to CIO 0999 by changing the first words allocated to Racks.
  2. C200H DeviceNet Words are used for fixed allocations by the C200H DeviceNet Master Unit (C200HW-DRM21-V1). The CS-series DeviceNet Unit (CS1W-DRM21) does not use this same area for fixed allocations, but rather uses the CS-series DeviceNet Area (CIO 3200 to CIO 3799).
  3. Bits can be manipulated using TST(350), TSTN(351), SET, SETB(532), RSTB(533), OUTB(534).
  4. Index registers and data registers can be used either individually by task or they can be shared by all the tasks (CS1-H CPU Units only).
  5. Timer PVs can be refreshed indirectly by forced setting/resetting Timer Completion Flags.
  6. Counter PVs can be refreshed indirectly by forced setting/resetting Counter Completion Flags.

## **9-2-2 Overview of the Data Areas**

The data areas in the CS-series I/O Memory Area are described in detail below.

### **CIO Area**

It isn't necessary to input the "CIO" acronym when specifying an address in the CIO Area. The CIO Area is generally used for data exchanges such as I/O refreshing with various Units. Words that aren't allocated to Units may be used as work words and work bits in the program only.



- Note**
1. It is possible to use CIO 0320 to CIO 0999 for I/O words by making the appropriate settings for the first words on the Racks. Settings for the first words on the Racks can be made using the CX-Programmer to set the first Rack addresses in the I/O table. The settings range for the first Rack addresses is from CIO 0000 to CIO 0900.
  2. When using a C200H DeviceNet Master Unit (C200HW-DRM21-V1), be sure the same words are not allocated to both Basic I/O Units and DeviceNet I/O.

3. The parts of the CIO Area that are labelled “Not used” may be used in programming as work bits. In the future, however, unused CIO Area bits may be used when expanding functions. Always use Work Area bits first.

|                                 |                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>I/O Area</b>                 | These words are allocated to external I/O terminals on Basic I/O Units. Words that aren't allocated to external I/O terminals may be used only in the program.                                                                                                                                                                                                                           |
| <b>C200H DeviceNet Area</b>     | <p>These words are allocated to Slaves for DeviceNet Remote I/O Communications for C200H DeviceNet Master Units (C200HW-DRM21-V1). Allocations are fixed and cannot be changed. Be sure that allocations do not overlap with those used for other I/O points.</p> <p>The CS-series DeviceNet Unit (CS1W-DRM21) does not use this same area for fixed allocations.</p>                    |
| <b>PLC Link Area</b>            | When PLC Link Units are used to create a PLC Link system, the PLC Link Area contains flags that indicate PLC Link errors and the operating status of CPU Units in the PLC Link. CIO 247 to CIO 250 are equivalent to SR 247 to SR 250 in the C200HX/HG/HE PLCs. (The PLC Link Operating Level Flags, A44211 and A44212, are equivalent to AR 2411 and AR 2412 in the C200HX/HG/HE PLCs.) |
| <b>Link Area</b>                | These words are used for data links in Controller Link Networks. Words that aren't used in data links may be used only in the program.                                                                                                                                                                                                                                                   |
| <b>CPU Bus Unit Area</b>        | These words are allocated to CPU Bus Units to transfer status information. Each Unit is allocated 25 words and up to 16 Units (with unit numbers 0 to 15) can be used. Words that aren't used by CPU Bus Units may be used only in the program.                                                                                                                                          |
| <b>Special I/O Unit Area</b>    | <p>These words are allocated to CS-series Special I/O Units and C200H Special I/O Units. Each Unit is allocated 10 words and up to 96 Units (unit numbers 0 to 95) can be used. (C200H Special I/O Units are limited to unit numbers 0 to F (15).)</p> <p>Words that aren't used by Special I/O Units may be used only in the program.</p>                                               |
| <b>Inner Board Area</b>         | These words are allocated to Inner Boards such as Communications Boards. Up to 100 words can be allocated for input and output.                                                                                                                                                                                                                                                          |
| <b>SYSMAC BUS Area</b>          | These words are allocated to Slave Racks connected to SYSMAC BUS Remote I/O Master Units. Each Rack is allocated 10 words and up to 5 Racks (rack numbers 0 to 4) can be used.                                                                                                                                                                                                           |
| <b>I/O Terminal Area</b>        | These words are allocated to Units other than Slave Racks (such as I/O Interfaces and I/O Terminals) that are connected to SYSMAC BUS Remote I/O Master Units. Each Unit is allocated 1 word except for Optical I/O Units which take 2 words; up to 32 Units (unit numbers 0 to 31) can be used.                                                                                         |
| <b>CS-series DeviceNet Area</b> | <p>These words are allocated to Slaves for DeviceNet Remote I/O Communications for CS-series DeviceNet Units (CS1W-DRM21). Allocations are fixed and cannot be changed. Be sure that allocations do not overlap with those used for other I/O points.</p> <p>The C200H DeviceNet Master Unit (C200HW-DRM21-V1) does not use this same area for fixed allocations.</p>                    |
| <b>Internal I/O Area</b>        | These words can be used only in the program; they cannot be used for I/O exchange with external I/O terminals. Be sure to use the work words provided in the Work Area (WR) before allocating words in the Internal I/O Area or other unused words in the CIO Area. It is possible that these words will be                                                                              |

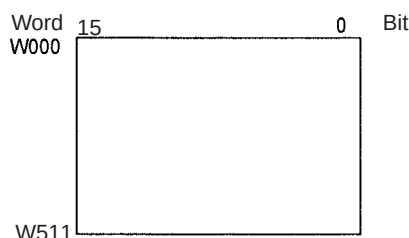


assigned to new functions in future versions of CS-series CPU Units, so the program may have to be changed before being used in a new CS-series PLC if CIO Area words are used as work words in the program.

**Note** CIO 25207 and CIO 25213 will be used for the Module (M-Net) Interface Network Restart Bits when a M-Net Interface Unit is connected to the CS-series PLC. Do not use these bits as work bits in programming. The M-Net Interface Unit is restarted by turning ON these bits.

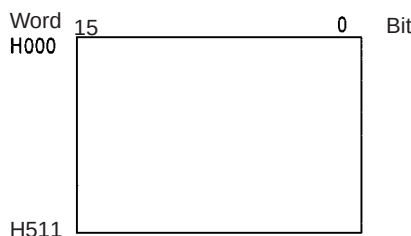
### Work Area (WR)

Words in the Work Area can be used only in the program; they cannot be used for I/O exchange with external I/O terminals. No new functions will be assigned to this area in future versions of CS-series PLCs, so use this area for work words and bits before any words in the CIO Area.



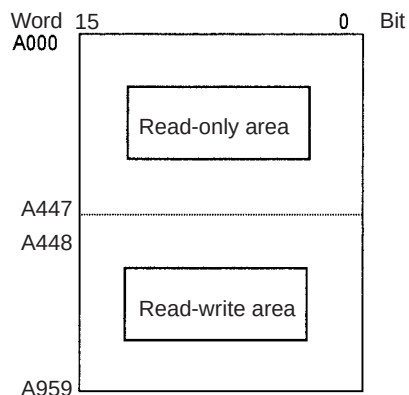
### Holding Area (HR)

Words in the Holding Area can be used only in the program. These words retain their content when the PLC is turned on or the operating mode is switched between PROGRAM mode and RUN or MONITOR mode.



### Auxiliary Area (AR)

The Auxiliary Area contains flags and control bits used to monitor and control PLC operation. This area is divided into two parts: A000 to A447 are read-only and A448 to A959 can be read or written. Refer to 9-16 Auxiliary Area for details on the Auxiliary Area.

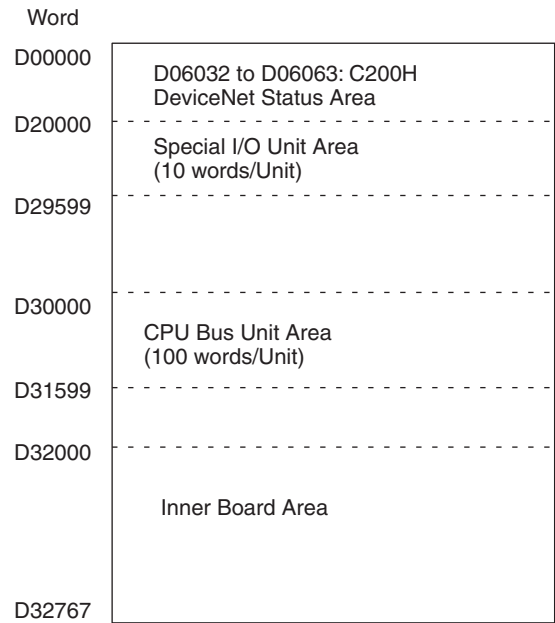


Temporary Relay Area (TR)

The TR Area contains bits that record the ON/OFF status of program branches. The TR bits are used with mnemonics only.

Data Memory Area (DM)

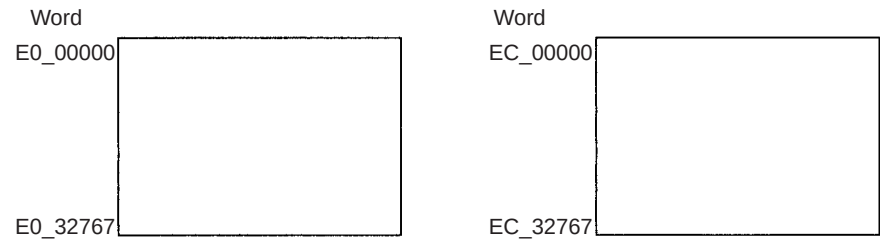
The DM Area is a multi-purpose data area that can be accessed in word-units only. These words retain their content when the PLC is turned on or the operating mode is switched between PROGRAM mode and RUN or MONITOR mode.



Extended Data Memory Area (EM)

The EM Area is a multi-purpose data area that can be accessed in word-units only. These words retain their content when the PLC is turned on or the operating mode is switched between PROGRAM mode and RUN or MONITOR mode.

The EM Area is divided into 32,767-word regions called banks. The number of EM banks depends upon the model of CPU Unit, with a maximum of 13 banks (0 to C). Refer to 2-1 *Specifications* for details on the number of EM banks provided in each model of CPU Unit.



Timer Area

There are two timer data areas, the Timer Completion Flags and the Timer Present Values (PVs). Up to 4,096 timers with timer numbers T0000 to T4095 can be used. The same number is used to access a timer's Completion Flag and PV.

**Timer Completion Flags**

These flags are read as bits. A Completion Flag is turned ON by the system when the corresponding timer times out (the set time elapses).

**Timer PVs**

The PVs are read and written as words (16 bits). The PVs count up or down as the timer operates.

**Counter Area**

There are two counter data areas, the Counter Completion Flags and the Counter Present Values (PVs). Up to 4,096 counters with counter numbers C0000 to C4095 can be used. The same number is used to access a counter's Completion Flag and PV.

**Counter Completion Flags**

These flags are read as bits. A Completion Flag is turned ON by the system when the corresponding counter counts out (the set value is reached).

**Counter PVs**

The PVs are read and written as words (16 bits). The PVs count up or down as the counter operates.

**Condition Flags**

These flags include the Arithmetic Flags such as the Error Flag and Equals Flag which indicate the results of instruction execution as well as the Always ON and Always OFF Flags. The Condition Flags are specified with labels (symbols) rather than addresses.

**Clock Pulses**

The Clock Pulses are turned ON and OFF by the CPU Unit's internal timer. These bits are specified with labels (symbols) rather than addresses.

**Task Flag Area (TK)**

Task Flags range from TK00 to TK31 and correspond to cyclic tasks 0 to 31. A Task Flag will be ON when the corresponding cyclic task is in executable (RUN) status and OFF when the cyclic task hasn't been executed (INI) or is in standby (WAIT) status.

**Index Registers (IR)**

These registers (IR0 to IR15) are used to store PLC memory addresses (absolute memory addresses in RAM) to indirectly address words in I/O memory. The Index Registers can be used separately in each task or, for CS1-H CPU Units, they can be shared by all tasks.

**Data Registers (DR)**

These registers (DR0 to DR15) are used together with the Index Registers. When a Data Register is input just before an Index Register, the content of the Data Register is added to the PLC memory address in the Index Register to offset that address. The Data Registers are used separately in each task or, for CS1-H CPU Units, they can be shared by all tasks.

### 9-2-3 Data Area Properties

#### Content After Fatal Errors, Forced Set/Reset Usage

| Area                          |                          | External allocation                    | Fatal Error Generated                  |                    |                     |                    | Forced Set/<br>Forced Reset<br>Functions<br>Usable? |
|-------------------------------|--------------------------|----------------------------------------|----------------------------------------|--------------------|---------------------|--------------------|-----------------------------------------------------|
|                               |                          |                                        | Execution of FALS(007)                 |                    | Other Fatal Error   |                    |                                                     |
|                               |                          |                                        | IOM Hold<br>Bit OFF                    | IOM Hold<br>Bit ON | IOM Hold<br>Bit OFF | IOM Hold<br>Bit ON |                                                     |
| CIO<br>Area                   | I/O Area                 | Basic I/O Units                        | Retained                               | Retained           | Cleared             | Retained           | Yes                                                 |
|                               | C200H DeviceNet Words    | DeviceNet Slaves                       |                                        |                    |                     |                    |                                                     |
|                               | PLC Link Words           | None                                   |                                        |                    |                     |                    |                                                     |
|                               | Data Link Area           | Controller Link or PLC Link data links |                                        |                    |                     |                    |                                                     |
|                               | CPU Bus Units            | CPU Bus Units                          |                                        |                    |                     |                    |                                                     |
|                               | Special I/O Unit Area    | Special I/O Units                      |                                        |                    |                     |                    |                                                     |
|                               | Inner Board Area         | Inner Boards                           |                                        |                    |                     |                    |                                                     |
|                               | SYSMAC BUS Area          | SYSMAC BUS Remote I/O Slaves           |                                        |                    |                     |                    |                                                     |
|                               | I/O Terminal Area        | SYSMAC BUS Remote I/O Terminals        |                                        |                    |                     |                    |                                                     |
|                               | CS-series DeviceNet Area | DeviceNet Slaves or Master             |                                        |                    |                     |                    |                                                     |
|                               | Internal I/O Area        | None                                   |                                        |                    |                     |                    |                                                     |
| Work Area (W)                 |                          | None                                   | Retained                               | Retained           | Cleared             | Retained           | Yes                                                 |
| Holding Area (H)              |                          |                                        | Retained                               | Retained           | Retained            | Retained           | Yes                                                 |
| Auxiliary Area (A)            |                          |                                        | Status varies from address to address. |                    |                     |                    | No                                                  |
| Data Memory Area (D)          |                          |                                        | Retained                               | Retained           | Retained            | Retained           | No                                                  |
| Extended Data Memory Area (E) |                          |                                        | Retained                               | Retained           | Retained            | Retained           | No                                                  |
| Timer Completion Flags (T)    |                          |                                        | Retained                               | Retained           | Cleared             | Retained           | Yes                                                 |
| Timer PVs (T)                 |                          |                                        | Retained                               | Retained           | Cleared             | Retained           | No                                                  |
| Counter Completion Flags (C)  |                          |                                        | Retained                               | Retained           | Retained            | Retained           | Yes                                                 |
| Counter PVs (C)               |                          |                                        | Retained                               | Retained           | Retained            | Retained           | No                                                  |
| Task Flags (TK)               |                          |                                        | Cleared                                | Cleared            | Retained            | Retained           | No                                                  |
| Index Registers (IR)          |                          |                                        | Retained                               | Retained           | Cleared             | Retained           | No                                                  |
| Data Registers (DR)           |                          | Retained                               | Retained                               | Cleared            | Retained            | No                 |                                                     |

**Content After Mode Change or Power Interruption**

| Area                          |                          | Mode Changed <sup>1</sup>              |                 | PLC Power OFF to ON               |                 |                                |                 |
|-------------------------------|--------------------------|----------------------------------------|-----------------|-----------------------------------|-----------------|--------------------------------|-----------------|
|                               |                          |                                        |                 | IOM Hold Bit Cleared <sup>2</sup> |                 | IOM Hold Bit Held <sup>2</sup> |                 |
|                               |                          | IOM Hold Bit OFF                       | IOM Hold Bit ON | IOM Hold Bit OFF                  | IOM Hold Bit ON | IOM Hold Bit OFF               | IOM Hold Bit ON |
| CIO Area                      | I/O Area                 | Cleared                                | Retained        | Cleared                           | Cleared         | Cleared                        | Retained        |
|                               | C200H DeviceNet Words    |                                        |                 |                                   |                 |                                |                 |
|                               | PLC Link Words           |                                        |                 |                                   |                 |                                |                 |
|                               | Data Link Area           |                                        |                 |                                   |                 |                                |                 |
|                               | CPU Bus Units            |                                        |                 |                                   |                 |                                |                 |
|                               | Special I/O Unit Area    |                                        |                 |                                   |                 |                                |                 |
|                               | Inner Board Area         |                                        |                 |                                   |                 |                                |                 |
|                               | SYSMAC BUS Area          |                                        |                 |                                   |                 |                                |                 |
|                               | I/O Terminal Area        |                                        |                 |                                   |                 |                                |                 |
|                               | CS-series DeviceNet Area |                                        |                 |                                   |                 |                                |                 |
|                               | Internal I/O Area        |                                        |                 |                                   |                 |                                |                 |
|                               |                          |                                        |                 |                                   |                 |                                |                 |
| Work Area (W)                 |                          | Cleared                                | Retained        | Cleared                           | Cleared         | Cleared                        | Retained        |
| Holding Area (H)              |                          | Retained                               | Retained        | Retained                          | Retained        | Retained                       | Retained        |
| Auxiliary Area (A)            |                          | Status varies from address to address. |                 |                                   |                 |                                |                 |
| Data Memory Area (D)          |                          | Retained                               | Retained        | Retained                          | Retained        | Retained                       | Retained        |
| Extended Data Memory Area (E) |                          | Retained                               | Retained        | Retained                          | Retained        | Retained                       | Retained        |
| Timer Completion Flags (T)    |                          | Cleared                                | Retained        | Cleared                           | Cleared         | Cleared                        | Retained        |
| Timer PVs (T)                 |                          | Cleared                                | Retained        | Cleared                           | Cleared         | Cleared                        | Retained        |
| Counter Completion Flags (C)  |                          | Retained                               | Retained        | Retained                          | Retained        | Retained                       | Retained        |
| Counter PVs (C)               |                          | Retained                               | Retained        | Retained                          | Retained        | Retained                       | Retained        |
| Task Flags (TK)               |                          | Cleared                                | Cleared         | Cleared                           | Cleared         | Cleared                        | Cleared         |
| Index Registers (IR)          |                          | Cleared                                | Retained        | Cleared                           | Cleared         | Cleared                        | Retained        |
| Data Registers (DR)           |                          | Cleared                                | Retained        | Cleared                           | Cleared         | Cleared                        | Retained        |

- Note**
1. Mode changed from PROGRAM to RUN/MONITOR or vice-versa.
  2. The PLC Setup's "IOM Hold Bit Status at Startup" setting determines whether the IOM Hold Bit's status is held or cleared when the PLC is turned on.

**9-3 Precautions in Using C200H Special I/O Units**

Observe the following precautions when using C200H Special I/O Units.

**Memory Areas**

There are differences between the words allocated to Special I/O Units in the PLC memory areas, as shown in the following table.

| PLC                            | C200H/C200HS       | C200HX/HG/HE                             | CS Series                                                                            |
|--------------------------------|--------------------|------------------------------------------|--------------------------------------------------------------------------------------|
| <b>IR/CIO Area allocations</b> | IR 100 to IR 199   | IR 100 to IR 199<br>IR 400 to IR 459     | CIO 2000 to CIO 2959<br>(allocated CIO 2000 to CIO 2159 for unit numbers 0 up to 15) |
| <b>DM Area allocations</b>     | DM 1000 to DM 1999 | DM 1000 to DM 1999<br>DM 2000 to DM 2599 | D20000 to D29599<br>(allocated D20000 to D21599 for unit numbers 0 up to 15)         |

**Restrictions**

There are special restrictions in programming, allocations, and data communications with the CPU Unit for the following C200H Special I/O Units. Refer to *Appendix G Restrictions in Using C200H Special I/O Units* for details.

| Unit                     | Model number                  |
|--------------------------|-------------------------------|
| ASCII Units              | C200H-ASC02/ASC11/ASC21/ASC31 |
| High-speed Counter Units | C200H-CT001-V1/CT002          |
| ID Sensor Units          | C200H-IDS01-V1/IDS21          |
| Position Control Units   | C200H-NC111/NC112/NC211       |
| Fuzzy Logic Units        | C200H-FZ001                   |
| High-speed Counter Units | C200H-CT021                   |
| Motion Control Units     | C200H-MC221                   |
| C200H I/O Link Units     | C200H-DRT21                   |

There are no special restrictions for other C200H Special I/O Units.

## 9-4 CIO Area

I/O Area addresses range from CIO 0000 to CIO 0319 (CIO bits 000000 to 031915), but the area can be expanded to CIO 0000 to CIO 0999 by changing the first Rack word with any Programming Device other than a Programming Console. The maximum number of bits that can be allocated for external I/O will still be 5,120 (320 words) even if the I/O Area is expanded.

**Note** The maximum number of external I/O points depends upon the CPU Unit being used.

Words in the I/O Area can be allocated to I/O terminals on Basic I/O Units (CS-series Basic I/O Units, C200H Basic I/O Units, and C200H Group-2 High-density I/O Units).

Words are allocated to Basic I/O Units based on the slot position (left to right) and number of words required. The words are allocated consecutively and empty slots are skipped. Words in the I/O Area that aren't allocated to Basic I/O Units can be used only in the program.

CIO 0000 to CIO 0319 include the C200H DeviceNet Output Area (CIO 0050 to CIO 0099) and the PLC Link Words CIO 0247 to CIO 0250. Be sure that word allocations do not overlap allocations for other I/O points when using a C200H DeviceNet Master Unit (C200HS-DRM1-V1) or when using a PLC Link Unit.

**I/O Area Initialization**

The contents of the I/O Area will be cleared in the following cases:

**1,2,3...**

1. The operating mode is changed from PROGRAM to RUN or MONITOR mode or vice-versa and the IOM Hold Bit is OFF.  
(See the following explanation of IOM Hold Bit Operation.)
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.  
(See the following explanation of IOM Hold Bit Operation.)
3. The I/O Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the I/O Area will be retained if FALS(007) is executed.)

**IOM Hold Bit Operation**

If the IOM Hold Bit (A50012) is ON, the contents of the I/O Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the I/O Area won't be cleared when the PLC's power supply is cycled. All I/O bits, including outputs, will retain the status that they had before the PLC was turned off.

**Note** If the I/O Hold Bit is turned ON, the outputs from the PLC will not be turned OFF and will maintain their previous status when the PLC is switched from RUN or MONITOR mode to PROGRAM mode. Make sure that the external loads will not produce dangerous conditions when this occurs. (When operation stops for a fatal error, including those produced with the FALS(007) instruction, all outputs from Output Unit will be turned OFF and only the internal output status will be maintained.)

### Forcing bit Status

Bits in the I/O Area can be force-set and force-reset.

**Note** When designating addresses in programming or allocations inside C200H Special I/O Units, "000" to "255" will specify CIO 0000 to CIO 0255 in the CPU Unit and "000" to "511" will specify CIO 0000 to CIO 0511 in the CPU Unit. Other addresses in this area cannot be specified inside the C200H Special I/O Units.

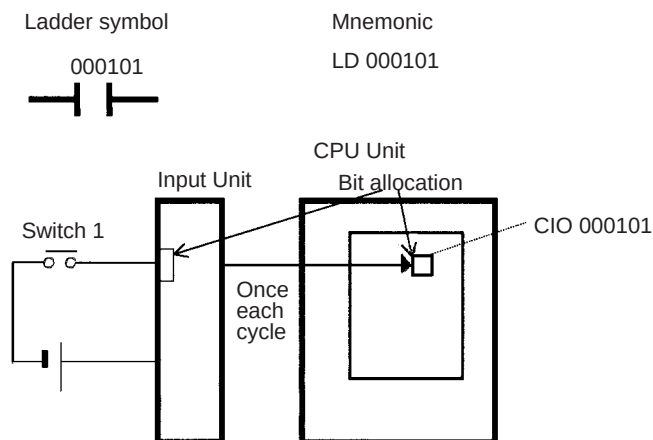
### Input Bits

A bit in the I/O Area is called an input bit when it is allocated to an Input Unit. Input bits reflect the ON/OFF status of devices such as push-button switches, limit switches, and photoelectric switches. There are three ways for the status of input points to be refreshed in the PLC: normal I/O refreshing, immediate refreshing, and IORF(097) refreshing.

### Normal I/O Refreshing

The status of I/O points on external devices is read once each cycle after program execution.

In the following example, CIO 000101 is allocated to switch 1, an external switch connected to the input terminal of an Input Unit. The ON/OFF status of switch 1 is reflected in CIO 000101 once each cycle.



### Immediate Refreshing

When the immediate refreshing variation of an instruction is specified by inputting an exclamation point just before the instruction, and the instruction's operand is an input bit or word, the word containing the bit or the word itself will be refreshed just before the instruction is executed. This immediate refreshing is performed in addition to the normal I/O refreshing performed once each cycle.

**Note** Immediate refreshing will be performed for input bits allocated to Basic I/O Units only (excluding C200H Group-2 High-density I/O Units and Basic I/O

Units mounted in Remote I/O Slave Racks), not High-density I/O Units which are Special I/O Units.

**1,2,3...**

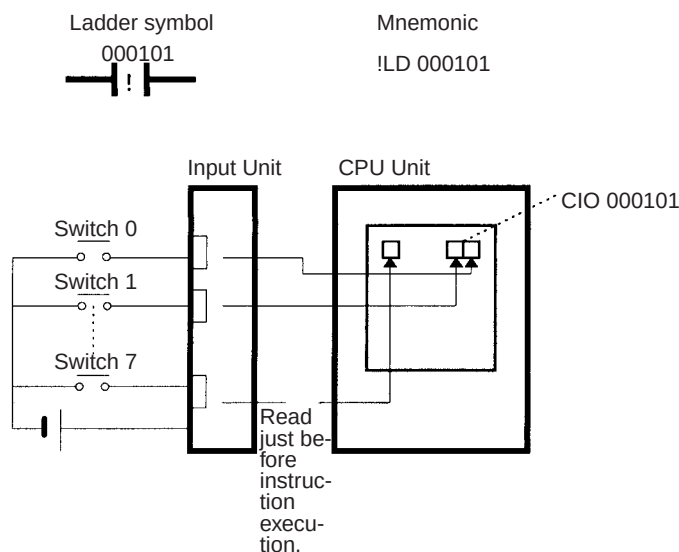
**1. Bit Operand**

Just before the instruction is executed, the ON/OFF status of the 16 I/O points allocated to the word containing the specified bit will be read to the PLC.

**2. Word Operand**

Just before the instruction is executed, the ON/OFF status of the 16 I/O points allocated to the specified word will be read to the PLC.

In the following example, CIO 000101 is allocated to switch 1, an external switch connected to the input terminal of an Input Unit. The ON/OFF status of switch 1 is read and reflected in CIO 000101 just before !LD 000101 is executed.

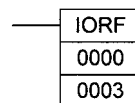


## IORF(097) Refreshing

When IORF(097) (I/O REFRESH) is executed, the input bits in the specified range of words are refreshed. This I/O refreshing is performed in addition to the normal I/O refreshing performed once each cycle.

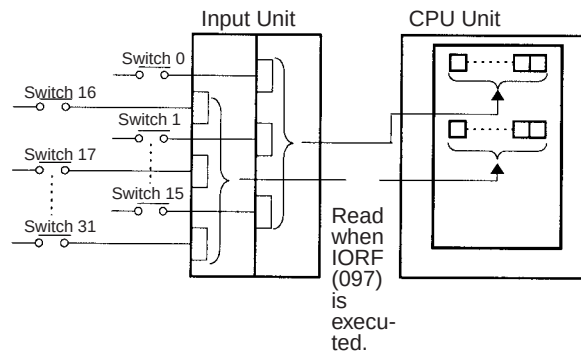
**Note** IORF(097) refreshes input bits allocated to Basic I/O Units (excluding Basic I/O Units mounted in Remote I/O Slave Racks), C200H Group-2 High-density I/O Units, and other High-density I/O Units which are Special I/O Units.

The following IORF(097) instruction refreshes the status of all I/O points in I/O Area words CIO 0000 to CIO 0003. The status of input points is read from the Input Units and the status of output bits is written to the Output Units.



In the following example, the status of input points allocated to CIO 0000 and CIO 0001 are read from the Input Unit. (CIO 0002 and CIO 0003 are allocated to Output Units.)

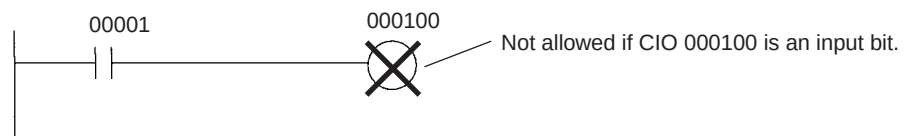




### Limitations on Input bits

There is no limit on the number of times that input bits can be used as normally open and normally closed conditions in the program and the addresses can be programmed in any order.

An input bit cannot be used as an operand in an Output instruction.

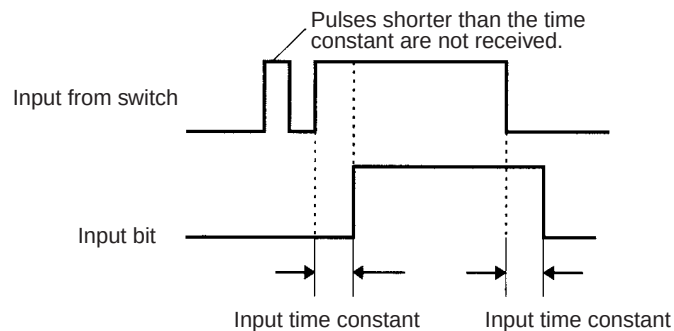


### Input Response Time Settings

The input response times for each CS-series Input Unit can be set in the PLC Setup. Increasing the input response time will reduce chattering and the effects of noise and decreasing the input response time allows higher speed input pulses to be received.

The default value for input response times is 8 ms and the setting range is 0 to 32 ms.

**Note** If the time is set to 0 ms, there will still be an ON delay time of 20  $\mu$ s max. and an OFF delay time of 300  $\mu$ s due to delays caused by internal elements.



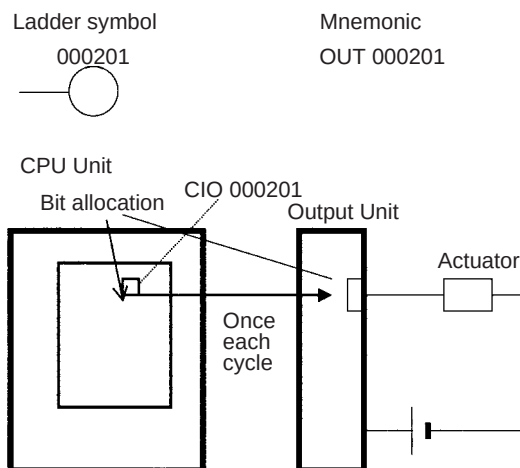
### Output Bits

A bit in the I/O Area is called an output bit when it is allocated to an Output Unit. The ON/OFF status of an output bits are output to devices such as actuators. There are three ways for the status of output bits to be refreshed to an Output Unit: normal I/O refreshing, immediate refreshing, and IORF(097) refreshing.

#### Normal I/O Refreshing

The status of output bits are output to external devices once each cycle after program execution.

In the following example, CIO 000201 is allocated to an actuator, an external device connected to an output terminal of an Output Unit. The ON/OFF status of CIO 000201 is output to that actuator once each cycle.



### Immediate Refreshing

When the immediate refreshing variation of an instruction is specified by inputting an exclamation point just before the instruction, and the instruction's operand is an output bit or word, the content of the word containing the bit or the word itself will be output just after the instruction is executed. This immediate refreshing is performed in addition to the normal I/O refreshing performed once each cycle.

**Note** Immediate refreshing will be performed for output bits allocated to Basic I/O Units only (excluding C200H Group-2 High-density I/O Units and Basic I/O Units mounted in Remote I/O Slave Racks), not High-density I/O Units which are Special I/O Units.

1,2,3...

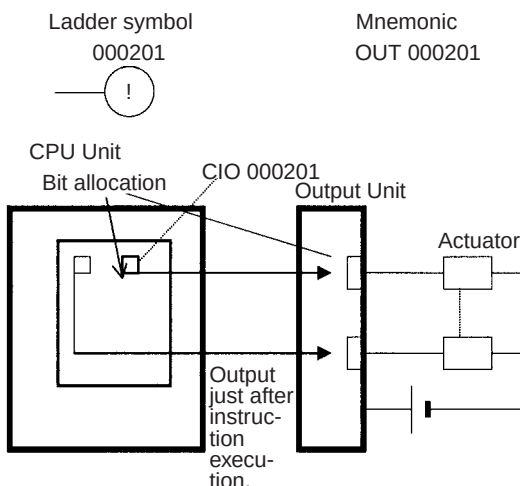
#### 1. Bit Operand

Just after the instruction is executed, the ON/OFF status of the 16 I/O points allocated to the word containing the specified bit will be output to the output device(s).

#### 2. Word Operand

Just after the instruction is executed, the ON/OFF status of the 16 I/O points allocated to the specified word will be output to the output device(s).

In the following example, CIO 000201 is allocated to an actuator, an external device connected to the output terminal of an Output Unit. The ON/OFF status of CIO 000201 is output to the actuator just after !OUT 000201 is executed.



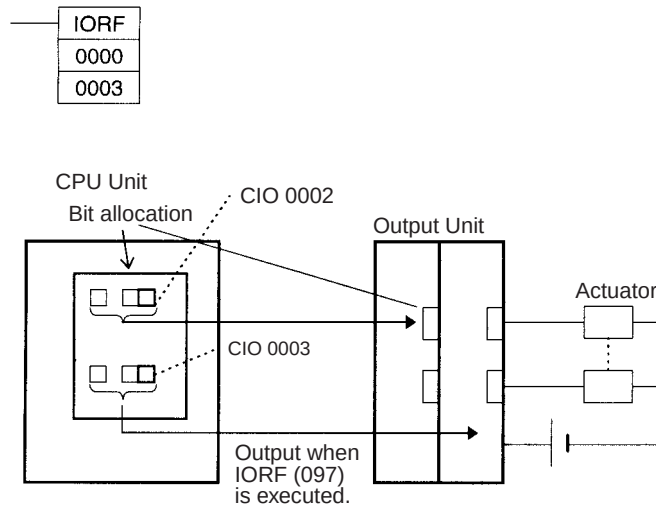
**IORF(097) Refreshing**

When IORF(097) (I/O REFRESH) is executed, the ON/OFF status of output bits in the specified range of words is output to their external devices. This I/O refreshing is performed in addition to the normal I/O refreshing performed once each cycle.

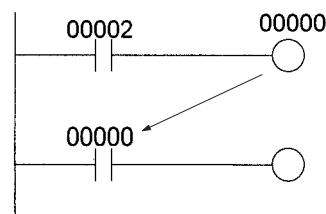
**Note** IORF(097) refreshes output bits allocated to Basic I/O Units (excluding Basic I/O Units mounted in Remote I/O Slave Racks), C200H Group-2 High-density I/O Units, and other High-density I/O Units which are Special I/O Units.

The following IORF(097) instruction refreshes the status of all I/O points in I/O Area words CIO 0000 to CIO 0003. The status of input points is read from the Input Units and the status of output bits is written to the Output Units.

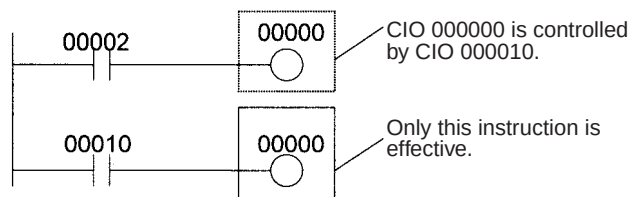
In this example, the status of input points allocated to CIO 0002 and CIO 0003 are output to the Output Unit. (CIO 0000 and CIO 0001 are allocated to Input Units.)

**Limitations on Output Bits**

Output bits can be programmed in any order. Output bits can be used as operands in Input instructions and there is no limit on the number of times that an output bit is used as a normally open and normally closed condition.



An output bit can be used in only one Output instruction that controls its status. If an output bit is used in two or more Output instructions, only the last instruction will be effective.



**Note** All outputs on Basic I/O Units and Special I/O Units can be turned OFF by turning ON the Output OFF Bit (A50015). The status of the output bits won't be affected even though the actual outputs are turned OFF.

## 9-5 C200H DeviceNet Area

The C200H DeviceNet Area is divided into two parts:

- 1,2,3...**
1. The DeviceNet Output Area contains 50 words with addresses ranging from CIO 0050 to CIO 0099.
  2. The DeviceNet Input Area contains 50 words with addresses ranging from CIO 0350 to CIO 0399.

Words in the C200H DeviceNet Area are used for fixed allocations to Slaves for DeviceNet remote I/O communications for the C200H DeviceNet Master Unit (C200HW-DRM21-V1).

**Note** The CS-series DeviceNet Unit (CS1W-DRM21) does not use this same area for fixed allocations, but rather uses the CS-series DeviceNet Area (CIO 3200 to CIO 3799).

Data is exchanged regularly to Slaves in the network (independent of the program) through the C200H DeviceNet Master Unit (C200HW-DRM21-V1) mounted in the CPU Rack.

Words can be allocated to Slaves in two ways: fixed allocation (words allocated by node number) or free allocation (user-set word allocation).

- With fixed allocations, words in the C200H DeviceNet Area are allocated automatically in node-number order.
- With user-set allocations, the user can allocate words to Slaves from the following words.

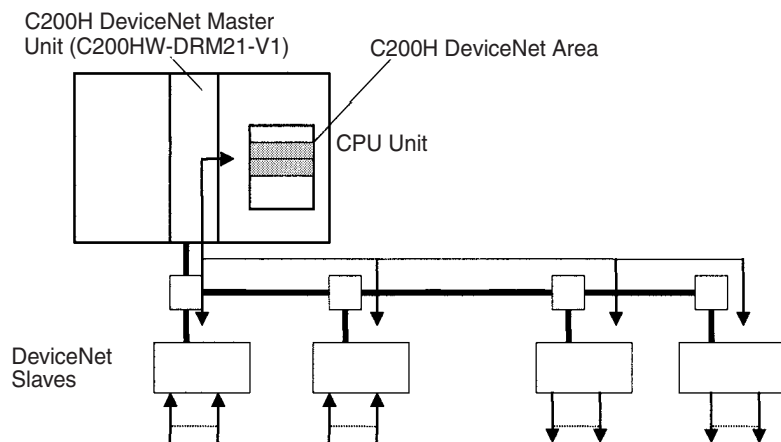
CIO 0000 to CIO 0235, CIO 0300 to CIO 0511, CIO 1000 to CIO 1063

H000 to H099

D00000 to D05999

The same ranges can be allocated for both CS-series and C200HX/G/E PLCs except that LR 00 to LR 63 in the C200HX/G/E PLCs correspond to CIO 1000 to CIO 1063 in the CS-series PLCs. (The entire Master Status Area is from D06032 to D06063.)

For details on word allocations, refer to the *C200H DeviceNet Operation Manual (W267)*.



With fixed allocation, words are assigned according to node numbers. (If a Slave requires two or more words, it will occupy as many node numbers as words required.)

**DeviceNet Area Initialization**

The contents of the DeviceNet Area will be cleared in the following cases:

- 1,2,3...**
1. The operating mode is changed between PROGRAM and RUN or MONITOR mode and the IOM Hold Bit is OFF.
  2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
  3. The DeviceNet Area is cleared from a Programming Device.
  4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the DeviceNet Area will be retained when FALS(007) is executed.)

**IOM Hold Bit Operation**

If the IOM Hold Bit (A50012) is ON, the contents of the DeviceNet Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the DeviceNet Area won't be cleared when the PLC's power supply is cycled.

**Forcing Bit Status**

Bits in the DeviceNet Area can be force-set and force-reset.

- Note**
1. The C200H DeviceNet Output Area overlaps the I/O Area. When using DeviceNet communications with the default allocations, be sure that words are not also allocated to other I/O points.
  2. With the CS-series CPU Units, words beginning at D06032 are allocated as follows for the C200H DeviceNet Master Status and the Communications Cycle Present Value:

DeviceNet Master Status: D06032 + unit number x 2

Communications Cycle Present Value: D06033 + unit number x 2

## 9-6 CS-series DeviceNet Area

The CS-series DeviceNet Area addresses run from CIO 3200 to CIO 3799 (600 words).

Words in the CS-series DeviceNet Area are used for fixed allocations to Slaves for DeviceNet remote I/O communications for the CS-series DeviceNet Unit (CS1W-DRM21).

Note The C200H DeviceNet Master Unit (C200HW-DRM21-V1) does not use this same area for fixed allocations, but rather uses the C200H DeviceNet Area (CIO 0050 to CIO0099 and CIO 0350 to CIO 0399).

The Fixed Allocation Setting Switches 1 to 3 (Software Switches) in the CIO Area words allocated to the DeviceNet Unit determine which fixed allocation words are used.

| Area                    | Master to Slave<br>(Output Words) | Slave to Master<br>(Input Words) |
|-------------------------|-----------------------------------|----------------------------------|
| Fixed Allocation Area 1 | CIO 3200 to CIO 3263              | CIO 3300 to CIO 3363             |
| Fixed Allocation Area 2 | CIO 3400 to CIO 3463              | CIO 3500 to CIO 3563             |
| Fixed Allocation Area 3 | CIO 3600 to CIO 3663              | CIO 3700 to CIO 3763             |

Note If the DeviceNet Unit is set to use the I/O slave function, the following words are also allocated.

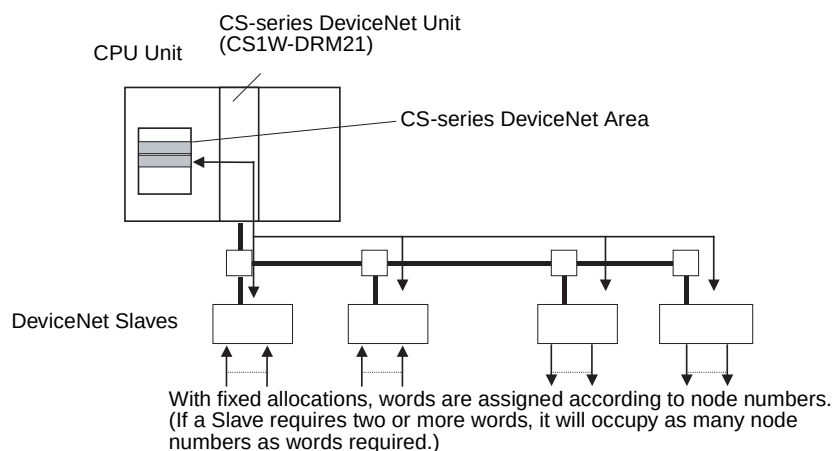
| Area                    | Master to Slave<br>(Output Word) | Slave to Master<br>(Input Word) |
|-------------------------|----------------------------------|---------------------------------|
| Fixed Allocation Area 1 | CIO 3370                         | CIO 3270                        |
| Fixed Allocation Area 2 | CIO 3570                         | CIO 3470                        |
| Fixed Allocation Area 3 | CIO 3770                         | CIO 3670                        |

Data is exchanged regularly to Slaves in the network (independent of the program) through the CS-series DeviceNet Unit (CS1W-DRM21) mounted in the CPU Rack.

Words can be allocated to Slaves in two ways: fixed allocation (words allocated by node number) or free allocation (user-set word allocation).

- With fixed allocations, words in the CS-series DeviceNet Area are allocated automatically in node-number order in one of the fixed allocation areas (1 to 3).
- With user-set allocations, the user can allocate words to Slaves from the following words.  
CIO 0000 to CIO 0235, CIO 0300 to CIO 0511, CIO 1000 to CIO 1063  
W000 to W511  
H000 to H511  
D00000 to D32767  
E00000 to E32767 (banks 0 to C)

For details on word allocations, refer to the *CS/CJ Series DeviceNet Unit Operation Manual (W380)*.



### Forcing Bit Status

Bits in the CS-series DeviceNet Area can be force-set and force-reset.

### DeviceNet Area Initialization

The contents of the DeviceNet Area will be cleared in the following cases:

#### 1,2,3...

1. The operating mode is changed between PROGRAM and RUN or MONITOR mode and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The DeviceNet Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the DeviceNet Area will be retained when FALS(007) is executed.)

**IOM Hold Bit Operation**

If the IOM Hold Bit (A50012) is ON, the contents of the DeviceNet Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the DeviceNet Area won't be cleared when the PLC's power supply is cycled.

## 9-7 PLC Link Area

The PLC Link Area contains 5 words with addresses ranging from CIO 0247 to CIO 0250. A442 is also used for PLC Links. Use these words to monitor PLC Link errors, monitor CPU Unit operating status, and detect PLC Link operating levels.

**Note** The Link Area (CIO 1000 to CIO 1199) is used to exchange data between PLCs in a PLC Link system, just as the LR Area is used in other OMRON PLCs. The flags in the PLC Link Area indicate the status of PLC Link operations.

### PLC Link Error Flags

When a transmission error occurs or there is a power interruption at another Unit after the PLC link is established, the flag corresponding to the other Unit's unit number will be turned ON. These flags are read-only, although the PLC Link Error Flag will be turned ON if the CPU Unit is stopped by a FALS(007) error.

### CPU Unit RUN Flags

The flag corresponding to the a CPU Unit's unit number will be ON when the CPU Unit is operating in RUN or MONITOR mode. The corresponding flag will be OFF when the CPU Unit is in PROGRAM mode. These flags can be used to determine another Unit's operating status. These flags are read-only.

### Operating Level Detection Flags

The flags in A442 can be used to determine whether a PLC Link Unit is mounted to the PLC as well as the Unit's operating level. A44211 will be ON if the PLC Link Unit is in operating level 1 and A44212 will be ON if the PLC Link Unit is in operating level 0.

**CIO Area Flags**

The following table shows the allocation of the CIO Area flags related to PLC Link operation. (The numbers in parentheses show the allocation for multilevel systems; operating level 0 is #0 and operating level 1 is #1.)

| Flag type               | Bit | CIO 0247              | CIO 0248             | CIO 0249              | CIO 0250            |
|-------------------------|-----|-----------------------|----------------------|-----------------------|---------------------|
| CPU Unit<br>RUN Flags   | 00  | Unit 24 (#1, Unit 8)  | Unit 16 (#1, Unit 0) | Unit 8 (#0, Unit 8)   | Unit 0 (#0, Unit 0) |
|                         | 01  | Unit 25 (#1, Unit 9)  | Unit 17 (#1, Unit 1) | Unit 9 (#0, Unit 9)   | Unit 1 (#0, Unit 1) |
|                         | 02  | Unit 26 (#1, Unit 10) | Unit 18 (#1, Unit 2) | Unit 10 (#0, Unit 10) | Unit 2 (#0, Unit 2) |
|                         | 03  | Unit 27 (#1, Unit 11) | Unit 19 (#1, Unit 3) | Unit 11 (#0, Unit 11) | Unit 3 (#0, Unit 3) |
|                         | 04  | Unit 28 (#1, Unit 12) | Unit 20 (#1, Unit 4) | Unit 12 (#0, Unit 12) | Unit 4 (#0, Unit 4) |
|                         | 05  | Unit 29 (#1, Unit 13) | Unit 21 (#1, Unit 5) | Unit 13 (#0, Unit 13) | Unit 5 (#0, Unit 5) |
|                         | 06  | Unit 30 (#1, Unit 14) | Unit 22 (#1, Unit 6) | Unit 14 (#0, Unit 14) | Unit 6 (#0, Unit 6) |
|                         | 07  | Unit 31 (#1, Unit 15) | Unit 23 (#1, Unit 7) | Unit 15 (#0, Unit 15) | Unit 7 (#0, Unit 7) |
| PLC Link<br>Error Flags | 08  | Unit 24 (#1, Unit 8)  | Unit 16 (#1, Unit 0) | Unit 8 (#0, Unit 8)   | Unit 0 (#0, Unit 0) |
|                         | 09  | Unit 25 (#1, Unit 9)  | Unit 17 (#1, Unit 1) | Unit 9 (#0, Unit 9)   | Unit 1 (#0, Unit 1) |
|                         | 10  | Unit 26 (#1, Unit 10) | Unit 18 (#1, Unit 2) | Unit 10 (#0, Unit 10) | Unit 2 (#0, Unit 2) |
|                         | 11  | Unit 27 (#1, Unit 11) | Unit 19 (#1, Unit 3) | Unit 11 (#0, Unit 11) | Unit 3 (#0, Unit 3) |
|                         | 12  | Unit 28 (#1, Unit 12) | Unit 20 (#1, Unit 4) | Unit 12 (#0, Unit 12) | Unit 4 (#0, Unit 4) |
|                         | 13  | Unit 29 (#1, Unit 13) | Unit 21 (#1, Unit 5) | Unit 13 (#0, Unit 13) | Unit 5 (#0, Unit 5) |
|                         | 14  | Unit 30 (#1, Unit 14) | Unit 22 (#1, Unit 6) | Unit 14 (#0, Unit 14) | Unit 6 (#0, Unit 6) |
|                         | 15  | Unit 31 (#1, Unit 15) | Unit 23 (#1, Unit 7) | Unit 15 (#0, Unit 15) | Unit 7 (#0, Unit 7) |

**PLC Link Area  
Initialization**

The contents of the PLC Link Area will be cleared in the following cases:

**1,2,3...**

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The PLC Link Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the PLC Link Area will be retained when FALS(007) is executed.)

**IOM Hold Bit Operation**

If the IOM Hold Bit (A50012) is ON, the contents of the PLC Link Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the PLC Link Area won't be cleared when the PLC's power supply is cycled.

**Forcing Bit Status**

Bits in the PLC Link Area can be force-set and force-reset.

**Auxiliary Area Flags**

A44211 will be ON when the PLC Link Unit is in operating level #1. A44212 will be ON when the Unit is in operating level #0 or a PLC Link Unit isn't mounted in the PLC. (The other bits in A442 are not used.)

Refer to 9-16 Auxiliary Area and to Appendix B Auxiliary Area for more details on A422.

**Note**

1. The PLC Link Area (CIO 0247 to CIO 0250) overlaps the I/O Area. When using PLC Link Units, be sure that words are not also allocated to other I/O points.
2. When designating addresses in programming or allocations inside C200H Special I/O Units, "247" to "250" will actually specify CIO 0247 to CIO 0250 in the CPU Unit. A422 cannot be specified inside a C200H Special I/O Unit.



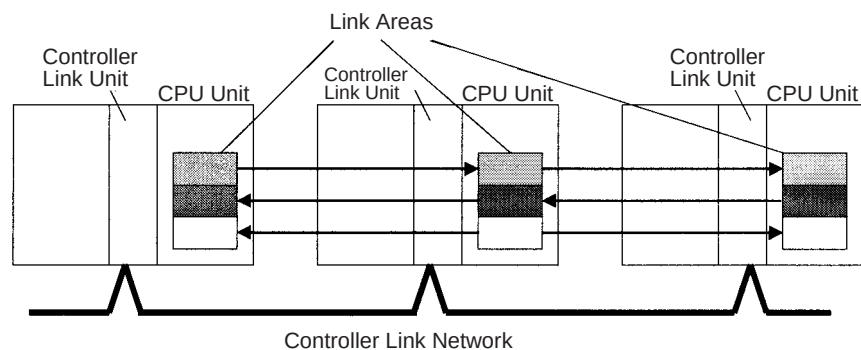
## 9-8 Data Link Area

Data Link Area addresses range from CIO 1000 to CIO 1199 (CIO bits 100000 to 119915). Words in the Link Area can be used for data links in Controller Link Networks or PLC Links in a PLC Link System.

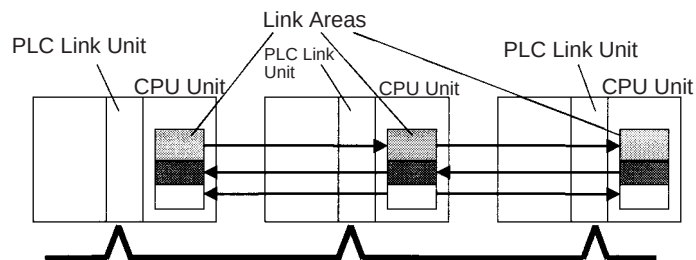
A data link automatically (independently of the program) shares data with Link Areas in other CS-series CPU Units in the network through a Controller Link Unit mounted to the PLC's CPU Rack.

Data links can be generated automatically (using the same number of words for each node) or manually. When a user defines the data link manually, he can assign any number of words to each node and make nodes receive-only or transmit-only. Refer to the *Controller Link Units Operation Manual (W309)* for more details.

Words in the Link Area that aren't used for data links in the Controller Links can be used only in the program.



Link Area words are also allocated to PLC Link Systems when a PLC Link is created by connecting PLC Link Units.



### Links to C200HX/HG/HE, C200HS, and C200H PLCs

Link Area words CIO 1000 to CIO 1063 in CS-series PLCs correspond to Link Relay Area words LR 00 to LR 63 for data links created in C200HX/HG/HE PLCs and PLC Links created in C200HX/HG/HE, C200HS, or C200H PLCs. When converting C200HX/HG/HE, C200HS, or C200H programs for use in CS-series PLCs, change addresses LR 00 through LR 63 to their equivalent Link Area addresses CIO 1000 through CIO 1063.

### Link Area Initialization

**1,2,3...**

The contents of the Link Area will be cleared in the following cases:

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The Link Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the Link Area will be retained if FALS(007) is executed.)

**IOM Hold Bit Operation**

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the Link Area won't be cleared when the PLC's power supply is cycled.

If the IOM Hold Bit (A50012) is ON, the contents of the Link Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

**Forcing Bit Status**

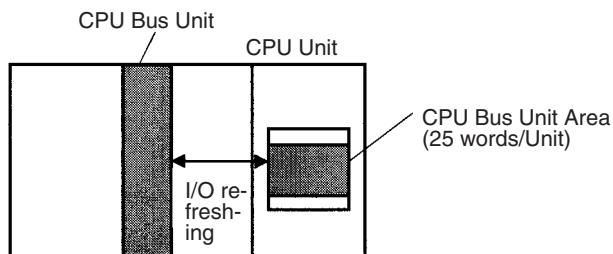
Bits in the Link Area can be force-set and force-reset.

**Note** When designating addresses in programming or allocations inside C200H Special I/O Units, "LR 00" to "LR63" will actually specify CIO 1000 to CIO1063 in the CPU Unit. CIO 1064 to CIO 1199 in the CPU Unit cannot be specified in the C200H Special I/O Unit.

## 9-9 CPU Bus Unit Area

The CPU Bus Unit Area contains 400 words with addresses ranging from CIO 1500 to CIO 1899. Words in the CPU Bus Unit Area can be allocated to CPU Bus Units to transfer data such as the operating status of the Unit. Each Unit is allocated 25 words based on the Unit's unit number setting.

Data is exchanged with CPU Bus Units once each cycle during I/O refreshing, which occurs after program execution. (Words in this data area cannot be refreshed with immediate-refreshing or IORF(097).)



Each CPU Bus Unit is allocated 25 words based on its unit number, as shown in the following table.

| Unit number | Allocated words      |
|-------------|----------------------|
| 0           | CIO 1500 to CIO 1524 |
| 1           | CIO 1525 to CIO 1549 |
| 2           | CIO 1550 to CIO 1574 |
| 3           | CIO 1575 to CIO 1599 |
| 4           | CIO 1600 to CIO 1624 |
| 5           | CIO 1625 to CIO 1649 |
| 6           | CIO 1650 to CIO 1674 |
| 7           | CIO 1675 to CIO 1699 |
| 8           | CIO 1700 to CIO 1724 |
| 9           | CIO 1725 to CIO 1749 |
| A           | CIO 1750 to CIO 1774 |
| B           | CIO 1775 to CIO 1799 |
| C           | CIO 1800 to CIO 1824 |
| D           | CIO 1825 to CIO 1849 |
| E           | CIO 1850 to CIO 1874 |
| F           | CIO 1875 to CIO 1899 |

The function of the 25 words depends upon the CPU Bus Unit being used. For details, refer to the Unit's operation manual.

Words in the CPU Bus Unit Area that aren't allocated to CPU Bus Units can be used only in the program.

**Note** The addresses in the CS-series CPU Bus Unit Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

#### CPU Bus Unit Area Initialization

The contents of the CPU Bus Unit Area will be cleared in the following cases:

- 1,2,3...**
1. The operating mode is changed from PROGRAM to RUN or MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
  2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
  3. The CPU Bus Unit Area is cleared from a Programming Device.
  4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the CPU Bus Unit Area will be retained when FALS(007) is executed.)

#### IOM Hold Bit Operation

If the IOM Hold Bit (A50012) is ON, the contents of the CS-series CPU Bus Unit Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the CS-series CPU Bus Unit Area won't be cleared when the PLC's power supply is cycled.

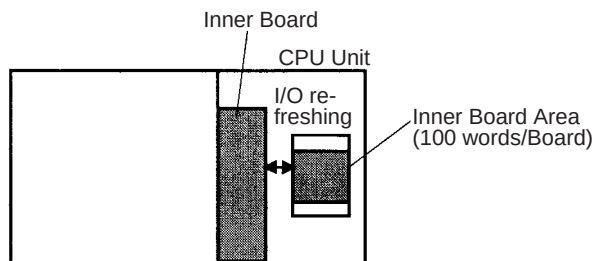
#### Forcing Bit Status

Bits in the CPU Bus Unit Area can be force-set and force-reset.

## 9-10 Inner Board Area

The Inner Board Area contains 100 words with addresses ranging from CIO 1900 to CIO 1999. Words in the Inner Board Area can be allocated to an Inner Board to transfer data such as the operating status of the Unit. All 100 words must be allocated to just one Inner Board.

Data is exchanged with the Inner Board once each cycle during normal I/O refreshing, which occurs after program execution. Depending on the type of Inner Board that is mounted, data can also be refreshed directly.



The function of the 100 words in the Inner Board Area depends upon the Inner Board being used. For details, refer to the Board's Operation Manual.

When the words in the Inner Board Area aren't allocated to an Inner Board, they can be used only in the program.

**Inner Board Area Initialization**

The contents of the Inner Board Area will be cleared in the following cases:

- 1,2,3...**
1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
  2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
  3. The Inner Board Area is cleared from a Programming Device.
  4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the Inner Board Area will be retained when FALS(007) is executed.)

**IOM Hold Bit Operation**

If the IOM Hold Bit (A50012) is ON, the contents of the Inner Board Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the Inner Board Area won't be cleared when the PLC's power supply is cycled.

**Forcing Bit Status**

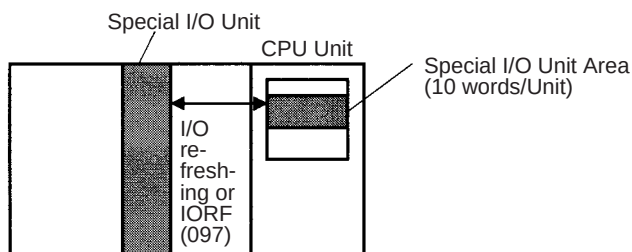
Bits in the Inner Board Area can be force-set and force-reset.

**Note** The addresses in the Inner Board Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

## 9-11 Special I/O Unit Area

The Special I/O Unit Area contains 960 words with addresses ranging from CIO 2000 to CIO 2959. Words in the Special I/O Unit Area are allocated to CS-series and C200H Special I/O Units to transfer data such as the operating status of the Unit. Each Unit is allocated 10 words based on its unit number setting.

Data is exchanged with Special I/O Units once each cycle during I/O refreshing, which occurs after program execution. The words can also be refreshed with IORF(097).



**Note** The addresses in the Special I/O Unit Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

Each Special I/O Unit is allocated 25 words based on its unit number, as shown in the following table.

| Unit number | Allocated words      | C200H<br>Special I/O Units      | CS-series<br>Special I/O Units |
|-------------|----------------------|---------------------------------|--------------------------------|
| 0           | CIO 2000 to CIO 2009 | Valid unit numbers              | Valid unit numbers             |
| 1           | CIO 2010 to CIO 2019 |                                 |                                |
| 2           | CIO 2020 to CIO 2029 |                                 |                                |
| 3           | CIO 2030 to CIO 2039 |                                 |                                |
| 4           | CIO 2040 to CIO 2049 |                                 |                                |
| 5           | CIO 2050 to CIO 2059 |                                 |                                |
| 6           | CIO 2060 to CIO 2069 |                                 |                                |
| 7           | CIO 2070 to CIO 2079 |                                 |                                |
| 8           | CIO 2080 to CIO 2089 |                                 |                                |
| 9           | CIO 2090 to CIO 2099 |                                 |                                |
| 10 (A)      | CIO 2100 to CIO 2109 |                                 |                                |
| 11 (B)      | CIO 2110 to CIO 2119 |                                 |                                |
| 12 (C)      | CIO 2120 to CIO 2129 |                                 |                                |
| 13 (D)      | CIO 2130 to CIO 2139 |                                 |                                |
| 14 (E)      | CIO 2140 to CIO 2149 |                                 |                                |
| 15 (F)      | CIO 2150 to CIO 2159 |                                 |                                |
| 16          | CIO 2160 to CIO 2169 | Not available on<br>C200H Units |                                |
| 17          | CIO 2170 to CIO 2179 |                                 |                                |
|             |                      |                                 |                                |
| 95          | CIO 2950 to CIO 2959 |                                 |                                |

The function of the 10 words allocated to a Unit depends upon the Special I/O Unit being used. For details, refer to the Unit's Operation Manual.

Words in the Special I/O Unit Area that aren't allocated to Special I/O Units can be used only in the program.

### Special I/O Unit Area Initialization

The contents of the Special I/O Unit Area will be cleared in the following cases:

**1,2,3...**

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The Special I/O Unit Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the Special I/O Unit Area will be retained when FALS(007) is executed.)

### IOM Hold Bit Operation

If the IOM Hold Bit (A50012) is ON, the contents of the Special I/O Unit Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the Special I/O Unit Area won't be cleared when the PLC's power supply is cycled.

### Forcing Bit Status

Bits in the Special I/O Unit Area can be force-set and force-reset.

## 9-12 SYSMAC BUS Area

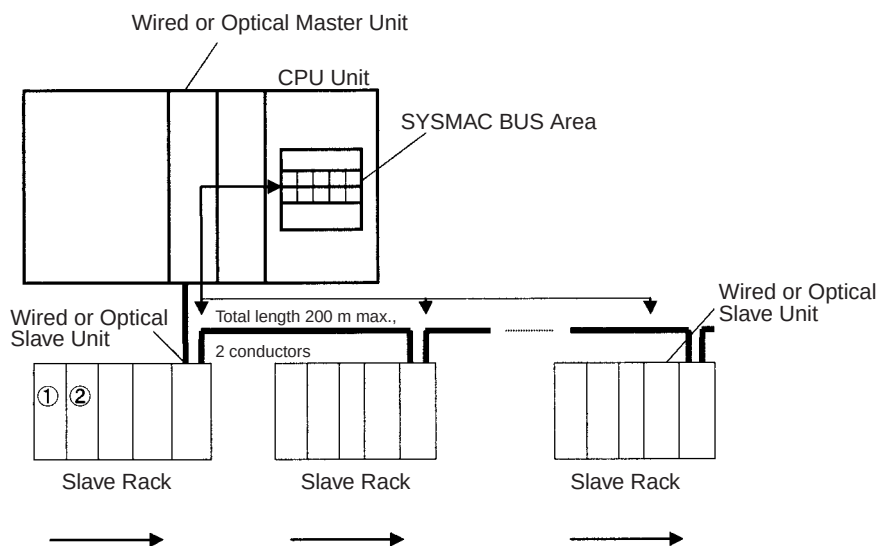
The SYSMAC BUS Area contains 50 words with addresses ranging from CIO 3000 to CIO 3049. Words in the SYSMAC BUS Area are allocated to Slave Racks connected to Wired or Optical SYSMAC BUS Remote I/O Master Units (C200H-RM201 or C200H-RM001-PV1). Up to two Masters can be mounted to the CPU Rack or a C200H Expansion I/O Rack. A maximum of 5 Slave Racks can be managed by one CPU Unit, whether one or two Masters are mounted.

Each Slave Rack is allocated 10 words based on the Rack's rack number setting (0 to 4).

| Rack number | Allocated words      |
|-------------|----------------------|
| 0           | CIO 3000 to CIO 3009 |
| 1           | CIO 3010 to CIO 3019 |
| 2           | CIO 3020 to CIO 3029 |
| 3           | CIO 3030 to CIO 3039 |
| 4           | CIO 3040 to CIO 3049 |

Up to 10 C200H Basic I/O Units can be mounted in a Slave Rack. One word (16 bits) is allocated to each slot in the Slave Rack from left to right. Allocations are fixed by slot, e.g., if there is no Unit in a slot, the word normally allocated to that slot will not be used.

- Note**
- Up to two Masters can be mounted for any one CPU Unit. A maximum of 5 Slave Racks can be managed by one CPU Unit, regardless of whether one or two Masters are mounted.
  - C200H Special I/O Units can also be mounted to Slave Racks, but they will be allocated words according to their unit number and will not be allocated SYSMAC BUS Area words.
  - SYSMAC BUS Units other than Slave Racks (such as I/O Terminals) can also be connected. These other Units are allocated words in the I/O Terminal Area. Refer to 9-13 *I/O Terminal Area* for details.



- 1,2,3...**
- Ten words are allocated to each Rack based on the rack number set on the Slave Unit.
  - The ten words in each Rack are allocated to the slots in the Rack from left to right (one word/slot).

**SYSMAC BUS Area Initialization**

The contents of the SYSMAC BUS Area will be cleared in the following cases:

- 1,2,3...**
1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
  2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
  3. The SYSMAC BUS Area is cleared from a Programming Device.
  4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the SYSMAC BUS Area will be retained when FALS(007) is executed.)

**IOM Hold Bit Operation**

If the IOM Hold Bit (A50012) is ON, the contents of the SYSMAC BUS Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the SYSMAC BUS Area won't be cleared when the PLC's power supply is cycled.

**Forcing Bit Status**

Bits in the SYSMAC BUS Area can be force-set and force-reset.

**Note** The addresses in the SYSMAC BUS Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

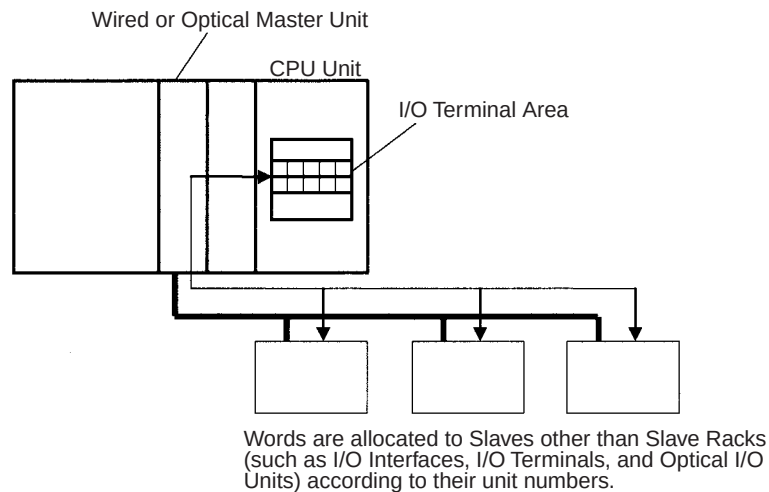
## 9-13 I/O Terminal Area

The I/O Terminal Area contains 32 words with addresses ranging from CIO 3100 to CIO 3131. Words in the I/O Terminal Area can be allocated to Slaves other than Slave Racks (such as I/O Interfaces, I/O Terminals, and Optical I/O Units) connected to a Wired or Optical SYSMAC BUS Remote I/O Master Units (C200H-RM201 or C200H-RM001-PV1). Up to two Masters can be mounted to the CPU Rack or a C200H Expansion I/O Rack. Up to 32 Slaves are allowed for each CPU Unit.

Each Slave is allocated 1 word based on its unit number setting (0 to 31) except for Optical I/O Units, which are allocated 2 words each. The words are allocated according to unit numbers even when two Master Units are being used.

| Unit number | Allocated word |
|-------------|----------------|
| 0           | CIO 3100       |
| 1           | CIO 3101       |
|             |                |
| 31          | CIO 3131       |

Both Slave Racks and SYSMAC BUS Slaves other than Slave Racks (such as I/O Terminals) can be connected. Slave Racks are allocated words in the SYSMAC BUS Area. Refer to 9-12 SYSMAC BUS Area for details.



**Note** The addresses in the I/O Terminal Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

### I/O Terminal Area Initialization

The contents of the I/O Terminal Area will be cleared in the following cases:

- 1,2,3...**
1. The operating mode is changed from PROGRAM to RUN or MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
  2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
  3. The I/O Terminal Area is cleared from a Programming Device.
  4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the I/O Terminal Area will be retained when FALS(007) is executed.)

### IOM Hold Bit Operation

If the IOM Hold Bit (A50012) is ON, the contents of the I/O Terminal Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the I/O Terminal Area won't be cleared when the PLC's power supply is cycled.

### Forcing Bit Status

Bits in the I/O Terminal Area can be force-set and force-reset.

## 9-14 Work Area

The Work Area contains 512 words with addresses ranging from W000 to W511. These words can be used only in the program as work words.

There are unused words in the CIO Area (CIO 1200 to CIO 1499 and CIO 3800 to CIO 6143) that can also be used in the program, but use any available words in the Work Area first because the unused words in the CIO Area may be allocated to new functions in future versions of CS-series CPU Units.

### Work Area Initialization

The contents of the Work Area will be cleared in the following cases:

- 1,2,3...**
1. The operating mode is changed from PROGRAM to RUN or MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
  2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.



3. The Work Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the Work Area will be retained when FALS(007) is executed.)

**IOM Hold Bit Operation**

If the IOM Hold Bit (A50012) is ON, the contents of the Work Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the Work Area won't be cleared when the PLC's power supply is cycled.

**Forcing Bit Status**

Bits in the Work Area can be force-set and force-reset.

**Note** The addresses in the Work Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

## 9-15 Holding Area

The Holding Area contains 512 words with addresses ranging from H000 to H511 (bits H00000 to H51115). These words can be used only in the program.

Holding Area bits can be used in any order in the program and can be used as normally open or normally closed conditions as often as necessary.

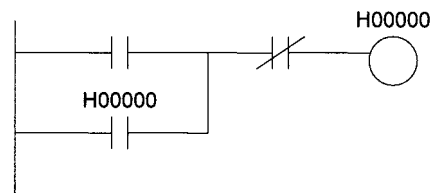
**Holding Area Initialization**

Data in the Holding Area is not cleared when the PLC's power supply is cycled or the PLC's operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa.

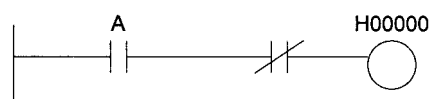
A Holding Area bit will be cleared if it is programmed between IL(002) and ILC(003) and the execution condition for IL(002) is OFF. To keep a bit ON even when the execution condition for IL(002) is OFF, turn ON the bit with the SET instruction just before IL(002).

**Self-maintaining Bits**

When a self-maintaining bit is programmed with a Holding Area bit, the self-maintaining bit won't be cleared even when the power is reset.

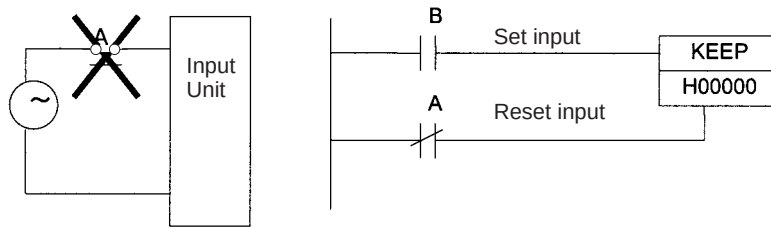


- Note**
1. If a Holding Area bit is not used for the self-maintaining bit, the bit will be turned OFF and the self-maintaining bit will be cleared when the power is reset.
  2. If a Holding Area bit is used but not programmed as a self-maintaining bit as in the following diagram, the bit will be turned OFF by execution condition A when the power is reset.

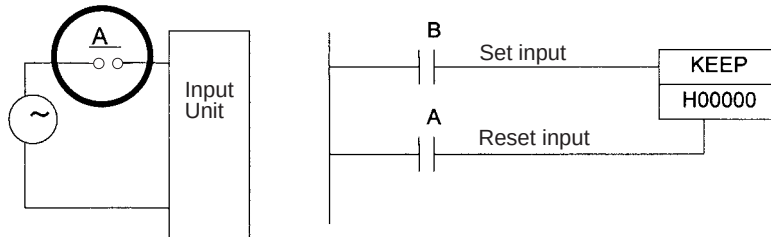
**Precautions**

When a Holding Area bit is used in a KEEP(011) instruction, never use a normally closed condition for the reset input if the input device uses an AC power supply. When the power supply goes OFF or is temporarily interrupted, the

input will go OFF before the PLC's internal power supply and the Holding Area bit will be reset.



Instead, use a configuration like the one shown below.



There are no restrictions in the order of using bit address or in the number of N.C. or N.O. conditions that can be programmed.

**Note** When designating addresses in programming or allocations inside C200H Special I/O Units, "HR 00" to "HR 99" will actually specify H000 to H099 in the CPU Unit and "AR 00" to "AR 27" will actually specify H100 to H127 in the CPU Unit. Other addresses in this area cannot be specified inside the C200H Special I/O Units.

## 9-16 Auxiliary Area

The Auxiliary Area contains 960 words with addresses ranging from A000 to A959). These words are preassigned as flags and control bits to monitor and control operation.

A000 through A447 are read-only, but A448 through A959 can be read or written from the program or a Programming Device.

**Note** The addresses in the Auxiliary Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

### Forcing Bit Status

Bits in the Auxiliary Area cannot be force-set and force-reset continuously.

### Writing Auxiliary Area Data

The following operations can be performed from a Programming Device to write data in the Auxiliary Area.

- Using the CX-Programmer: Online set/reset (not force-set/force-reset) (except pre-version-1 CS1 CPU Units), changing present values when monitoring programming addresses (set values dialog box), or transferring data to the PLC after editing the PLC data tables. Refer to the *CX-Programmer User Manual* (W361-E2).
- Using a Programming Console: Temporarily force-setting/force-resetting bits from the Bit/Word Monitor or the 3-word Monitor operation (see Programming Consoles Operation Manual).

## Functions

The following table lists the functions of Auxiliary Area flags and control bits. The table is organized according to the functions of the flags and bits. For more details or to look up a bit by its address, refer to *Appendix B Auxiliary Area*.

### Initial Settings

| Name                                                      | Address          | Description                                                                                                                                                                                                                                                                                                                                                                                         | Access     |
|-----------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| I/O Response Times in Basic I/O Units                     | A22000 to A25915 | Contains the current I/O response times for CS-series Basic I/O Units.                                                                                                                                                                                                                                                                                                                              | Read-only  |
| IOM Hold Bit                                              | A50012           | Determines whether the contents of I/O memory are retained when the PLC's power is reset or the PLC's operating mode is changed (from PROGRAM to RUN/MONITOR or vice-versa).<br><br>Turn ON this bit to maintain I/O memory when changing between PROGRAM and RUN or MONITOR mode.<br><br>Turn OFF this bit to clear I/O memory when changing the changing between PROGRAM and RUN or MONITOR mode. | Read/write |
| Forced Status Hold Bit                                    | A50013           | Determines whether the status of force-set and force-reset bits is maintained when the PLC's power is reset or the PLC's operating mode is changed (between PROGRAM and RUN or MONITOR mode).                                                                                                                                                                                                       | Read/write |
| Power Interruption Disable Setting (CS1-H CPU Units only) | A530             | Set to A5A5 Hex to disable power interrupts (except the Power OFF Interrupt task) between DI(693) and EI(694) instructions.                                                                                                                                                                                                                                                                         | Read/write |

### CPU Unit Settings

| Name                       | Address | Description                                                                             | Access    |
|----------------------------|---------|-----------------------------------------------------------------------------------------|-----------|
| Status of DIP Switch Pin 6 | A39512  | Contains the status set on pin 6 of the CPU Unit's DIP switch. (Refreshed every cycle.) | Read-only |

### Basic I/O Unit Settings

| Name                       | Address          | Description                                                                                                                    | Access    |
|----------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------|
| Basic I/O Unit Status Area | A05000 to A08915 | Indicates whether fuses in Basic I/O Units are intact or blown. The flags correspond to rack 0, slot 0 through rack 7, slot 9. | Read-only |

### CPU Bus Unit Flags/Bits

| Name                              | Address          | Description                                                                                                                                                                                    | Access     |
|-----------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| CPU Bus Unit Initialization Flags | A30200 to A30215 | These flags correspond to CPU Bus Units 0 to 15. A flag will be ON while the corresponding Unit is initializing after the power is turned ON or the Unit's Restart Bit (in A501) is turned ON. | Read-only  |
| CPU Bus Unit Restart Bits         | A50100 to A50115 | These bits correspond to CPU Bus Units 0 to 15. Turn a bit from OFF to ON to restart the corresponding Unit.                                                                                   | Read/write |

### Special I/O Unit Flags/Bits

| Name                                  | Address          | Description                                                                                                                                                                                                                                           | Access     |
|---------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Special I/O Unit Initialization Flags | A33000 to A33515 | These flags correspond to Special I/O Units 0 to 95. A flag will be ON while the corresponding Unit is initializing after the power is turned ON or the Unit's Restart Bit is turned ON. (Restart Bits A50200 to A50715 correspond to Units 0 to 95.) | Read-only  |
| Special I/O Unit Restart Bits         | A50200 to A50715 | These bits correspond to Special I/O Units 0 to 95. Turn a bit from OFF to ON to restart the corresponding Unit.                                                                                                                                      | Read/write |

**Inner Board Flags/Bits**

| Name                            | Address          | Description                                                                                                                                    | Access     |
|---------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Inner Board Monitoring Area     | A35500 to A35915 | The function of these words is defined in the Inner Board.                                                                                     | Read-only  |
| Inner Board Restart Bit         | A60800           | Turn the bit from OFF to ON to restart the corresponding Inner Board.                                                                          | Read/write |
| Inner Board User Interface Area | A60900 to A61315 | This interface area can be used to transfer data from the CPU Unit to the Inner Board. The function of the data is defined in the Inner Board. | Read/write |

**System Flags**

| Name                                                   | Address      | Description                                                                                                                                                                                                                                                                                                     | Access    |
|--------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| First Cycle Flag                                       | A20011       | This flag is turned ON for one cycle when program execution starts (the operating mode is switched from PROGRAM to RUN/MONITOR).                                                                                                                                                                                | Read-only |
| Initial Task Execution Flag                            | A20015       | When a task switches from INI to RUN status for the first time, this flag will be turned ON within the task for one cycle only.                                                                                                                                                                                 | Read-only |
| Task Started Flag (CS1-H CPU Units only)               | A20014       | When a task switches from WAIT or INI to RUN status, this flag will be turned ON within the task for one cycle only.<br>The only difference between this flag and A20015 is that this flag also turns ON when the task switches from WAIT to RUN status.                                                        | Read-only |
| Maximum Cycle Time                                     | A262 to A263 | These words contain the maximum cycle time in units of 0.1 ms. In a Parallel Processing Mode, the maximum cycle time of the program execution cycle will be given.<br>The time is updated every cycle and is recorded in 32-bit binary (0 to FFFF FFFF, or 0 to 429,496,729.5 ms). (A263 is the leftmost word.) | Read-only |
| Present Cycle Time                                     | A264 to A265 | These words contain the present cycle time in units of 0.1 ms. In a Parallel Processing Mode, the maximum cycle time of the program execution cycle will be given. The time is updated every cycle and is recorded in 32-bit binary (0 to FFFF FFFF, or 0 to 429,496,729.5 ms). (A265 is the leftmost word.)    | Read-only |
| Peripheral Servicing Cycle Time (CS1-H CPU Units only) | A268         | In Parallel Processing with Synchronous or Asynchronous Memory Access, this word contains the peripheral servicing cycle time in units of 0.1 ms. The time is updated every cycle and is recorded in 16-bit binary (0 to 4E20 Hex, or 0.0 to 2,000.0 ms).                                                       | Read-only |

**Task Information**

| Name                                                 | Address | Description                                                                                                                                                                                               | Access    |
|------------------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Task Number when Program Stopped                     | A294    | This word contains the task number of the task that was being executed when program execution was stopped because of a program error.                                                                     | Read-only |
| Maximum Interrupt Task Processing Time               | A440    | Contains the Maximum Interrupt Task Processing Time in units of 0.1 ms.                                                                                                                                   | Read-only |
| Interrupt Task with Max. Processing Time             | A441    | Contains the task number of the interrupt task with the maximum processing time. Hexadecimal values 8000 to 80FF correspond to task numbers 00 to FF. Bit 15 is turned ON when an interrupt has occurred. | Read-only |
| IR/DR Operation between Tasks (CS1-H CPU Units only) | A09914  | Turn ON this bit to share index and data registers between all tasks. Turn OFF this bit to use separate index and data registers between in each task.                                                    | Read-only |

## Debugging Information

### ■ Online Editing

| Name                                 | Address          | Description                                                                                                                  | Access     |
|--------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------|------------|
| Online Editing Wait Flag             | A20110           | ON when an online editing process is waiting.<br>(An online editing request was received while online editing was disabled.) | Read-only  |
| Online Editing Processing Flag       | A20111           | ON when an online editing process is being executed.                                                                         | Read-only  |
| Online Editing Disable Bit Validator | A52700 to A52707 | The Online Editing Disable Bit (A52709) is valid only when this byte contains 5A.                                            | Read/write |
| Online Editing Disable Bit           | A52709           | Turn this bit ON to disable online editing.<br>(A52700 to A52707 must be set to 5A.)                                         | Read/write |

### ■ Output Control

| Name           | Address | Description                                                                                         | Access     |
|----------------|---------|-----------------------------------------------------------------------------------------------------|------------|
| Output OFF Bit | A50015  | Turn this bit ON to turn OFF all outputs from Basic I/O Units, Output Units, and Special I/O Units. | Read/write |

### ■ Differentiate Monitor

| Name                                 | Address | Description                                                                                                      | Access     |
|--------------------------------------|---------|------------------------------------------------------------------------------------------------------------------|------------|
| Differentiate Monitor Completed Flag | A50809  | ON when the differentiate monitor condition has been established during execution of differentiation monitoring. | Read/write |

### ■ Data Tracing

| Name                       | Address | Description                                                                                                                                                                                                                                                                                                   | Access     |
|----------------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Sampling Start Bit         | A50815  | When a data trace is started by turning this bit from OFF to ON from a Programming Device, the PLC will begin storing data in Trace Memory by one of the three following methods:<br>1) Periodic sampling (10 to 2,550 ms)<br>2) Sampling at execution of TRSM(045)<br>3) Sampling at the end of every cycle. | Read/write |
| Trace Start Bit            | A50814  | Turn this bit from OFF to ON to establish the trigger condition. The offset indicated by the delay value (positive or negative) determines which data samples are valid.                                                                                                                                      | Read/write |
| Trace Busy Flag            | A50813  | ON when the Sampling Start Bit (A50815) is turned from OFF to ON. OFF when the trace is completed.                                                                                                                                                                                                            | Read/write |
| Trace Completed Flag       | A50812  | ON when sampling of a region of trace memory has been completed during execution of a Trace. OFF when the next time the Sampling Start Bit (A50815) is turned from OFF to ON.                                                                                                                                 | Read/write |
| Trace Trigger Monitor Flag | A50811  | ON when a trigger condition is established by the Trace Start Bit (A50814). OFF when the next Data Trace is started by the Sampling Start bit (A50815).                                                                                                                                                       | Read/write |

## File Memory Information

| Name                          | Address          | Description                                                                                                                      | Access    |
|-------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------|
| Memory Card Type              | A34300 to A34302 | Indicates the type of Memory Card, if any, installed.                                                                            | Read-only |
| Memory Card Format Error Flag | A34307           | ON when the Memory Card is not formatted or a formatting error has occurred.                                                     | Read-only |
| File Transfer Error Flag      | A34308           | ON when an error occurred while writing data to file memory.                                                                     | Read-only |
| File Write Error Flag         | A34309           | ON when data cannot be written to file memory because it is write-protected or the data exceeds the capacity of the file memory. | Read-only |
| File Read Error               | A34310           | ON when a file could not be read because of a malfunction (file is damaged or data is corrupted).                                | Read-only |

| Name                                                                  | Address      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Access    |
|-----------------------------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| File Missing Flag                                                     | A34311       | ON when an attempt is made to read a file that doesn't exist, or an attempt is made to write to a file in a directory that doesn't exist.                                                                                                                                                                                                                                                                                                                                                                                                                               | Read-only |
| File Memory Operation Flag                                            | A34313       | ON while any of the following operations is being executed.<br>OFF when none of them are being executed.<br>Memory Card detection started.<br>CMND instruction sending a FINS command to the local CPU Unit.<br>FREAD/FWRIT instructions.<br>Program replacement using the control bit in the Auxiliary Area.<br>Easy backup operation.<br>If this flag is ON, write and comparison operations to the Memory Card cannot be executed.                                                                                                                                   | Read-only |
| Memory Card Detected Flag<br>(Not supported by pre-V1 CS1 CPU Units.) | A34315       | ON when a Memory Card has been detected.<br>OFF when a Memory Card has not been detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Read-only |
| Number of Items to Transfer                                           | A346 to A347 | These words contain the number of words or fields remaining to be transferred (8-digit hexadecimal).<br>For binary files (.IOM), the value is decremented for each word that is read. For text (.TXT) or CSV (.CSV) data, the value is decremented for each field that is read.                                                                                                                                                                                                                                                                                         | Read-only |
| Accessing File Data Flag                                              | A34314       | ON while file data is being accessed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Read-only |
| EM File Memory Format Error Flag                                      | A34306       | Turns ON when a format error occurs in the first EM bank allocated for file memory.<br>Turns OFF when formatting is completed normally.                                                                                                                                                                                                                                                                                                                                                                                                                                 | Read-only |
| EM File Memory Starting Bank                                          | A344         | Contains the starting bank number of EM file memory (bank number of the first formatted bank).<br>This number is read when starting to write data from a Memory Card. If the largest bank number for which there is an EM file for simple backup (BACKUPE□.IOM, where represents consecutive bank numbers) is the same as the largest bank number supported by the CPU Unit, the EM Area will be formatted as file memory using the value in A344. If the maximum bank numbers are different, the EM Area will be returned to its unformatted (not file memory) status. | Read-only |
| File Deletion Flags                                                   | A39506       | The system automatically deleted the remainder of an EM file memory file that was being updated when a power interruption occurred.                                                                                                                                                                                                                                                                                                                                                                                                                                     | Read-only |
|                                                                       | A39507       | The system automatically deleted the remainder of a Memory Card file that was being updated when a power interruption occurred.                                                                                                                                                                                                                                                                                                                                                                                                                                         | Read-only |
| Simple Backup Write Capacity                                          | A397         | If a write for a simple backup operation fails, A397 will contain the Memory Card capacity that would have been required to complete the write operation. The value is in Kbytes. (This indicates that the Memory Card did not have the specified capacity when the write operation was started.)<br>0001 to FFFF Hex: Write error (value indicates required capacity from 1 to 65,535 Kbytes).<br>A397 will be cleared to 0000 Hex when the write is completed successfully for a simple backup operation.                                                             | Read-only |

| Name                                                                  | Address          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Access     |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |
|-----------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----|---|------|----|----|------|----|----|------|----|----|------|----|----|------------|
| Program Replacement End Code (Not supported by pre-V1 CS1 CPU Units.) | A65000 to A65007 | Normal End (i.e., when A65014 is OFF)<br>01 Hex: Program file (.OBJ) replaced.<br><br>Error End (i.e., when A65014 is ON)<br>00 Hex: Fatal error<br>01 Hex: Memory error<br>11 Hex: Write-protected<br>12 Hex: Program replacement password error<br>21 Hex: No Memory Card<br>22 Hex: No such file<br>23 Hex: Specified file exceeds capacity (memory error).<br>31 Hex: One of the following in progress:<br><br>File memory operation<br>User program write<br>Operating mode change                                                                                                                                                                                                                                                                                                                                              | Read-only  |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |
| Replacement Error Flag (Not supported by pre-V1 CS1 CPU Units.)       | A65014           | ON when the Replacement Start Bit (A65015) has been turned ON to replace the program, but there is an error. If the Replacement Start Bit is turned ON again, the Replacement Error Flag will be turned OFF.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Read/write |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |
| Replacement Start Bit (Not supported by pre-V1 CS1 CPU Units.)        | A65015           | Program replacement starts when the Replacement Start Bit is turned ON if the Program Password (A651) is valid (A5A5 Hex). Do not turn OFF the Replacement Start Bit during program replacement.<br><br>When the power is turned ON or program replacement is completed, the Replacement Start Bit will be turned OFF, regardless of whether replacement was completed normally or in error.<br><br>It is possible to confirm if program replacement is being executed by reading the Replacement Start Bit using a Programming Device, PT, or host computer.                                                                                                                                                                                                                                                                        | Read/write |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |
| Program Password (Not supported by pre-V1 CS1 CPU Units.)             | A651             | Store the password to replace a program.<br><br>A5A5 Hex: Replacement Start Bit (A65015) is enabled.<br>Any other value: Replacement Start Bit (A65015) is disabled.<br><br>When the power is turned ON or program replacement is completed, the Replacement Start Bit will be turned OFF, regardless of whether replacement was completed normally or in error.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Read/write |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |
| Program File Name (Not supported by pre-V1 CS1 CPU Units.)            | A654 to A657     | When program replacement starts, the program file name will be stored in ASCII. File names can be specified up to eight characters in length excluding the extension.<br><br>File names are stored in the following order: A654 to A657 (i.e., from the lowest word to the highest), and from the highest byte to the lowest. If a file name is less than eight characters, the lowest remaining bytes and the highest remaining word will be filled with spaces (20 Hex). Null characters and space characters cannot be used within file names.<br><br>Example: File name is ABC.OBJ<br><br><table><tr><td></td><td>15</td><td>0</td></tr><tr><td>A654</td><td>41</td><td>42</td></tr><tr><td>A655</td><td>43</td><td>20</td></tr><tr><td>A656</td><td>20</td><td>20</td></tr><tr><td>A657</td><td>20</td><td>20</td></tr></table> |            | 15 | 0 | A654 | 41 | 42 | A655 | 43 | 20 | A656 | 20 | 20 | A657 | 20 | 20 | Read/write |
|                                                                       | 15               | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |
| A654                                                                  | 41               | 42                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |
| A655                                                                  | 43               | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |
| A656                                                                  | 20               | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |
| A657                                                                  | 20               | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |    |   |      |    |    |      |    |    |      |    |    |      |    |    |            |

## Program Error Information

| Name                                  | Address       | Description                                                                                                                                                                             | Access    |
|---------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Program Error Flag (Fatal error)      | A40109        | ON when program contents are incorrect. CPU Unit operation will stop.                                                                                                                   | Read-only |
| Program Error Task                    | A294          | Provides the type and number of the task that was being executed when program execution stops as a result of a program error.                                                           | Read-only |
| Instruction Processing Error Flag     | A29508        | This flag and the Error Flag (ER) will be turned ON when an instruction processing error has occurred and the PLC Setup has been set to stop operation for an instruction error.        | Read-only |
| Indirect DM/EM BCD Error Flag         | A29509        | This flag and the Access Error Flag (AER) will be turned ON when an indirect DM/EM BCD error has occurred and the PLC Setup has been set to stop operation an indirect DM/EM BCD error. | Read-only |
| Illegal Access Error Flag             | A29510        | This flag and the Access Error Flag (AER) will be turned ON when an illegal access error has occurred and the PLC Setup has been set to stop operation an illegal access error.         | Read-only |
| No END Error Flag                     | A29511        | ON when there isn't an END(001) instruction in each program within a task.                                                                                                              | Read-only |
| Task Error Flag                       | A29512        | ON when a task error has occurred. The following conditions will generate a task error.<br>1) There isn't an executable cyclic task.<br>2) There isn't a program allocated to the task. | Read-only |
| Differentiation Overflow Error Flag   | A29513        | ON when the specified Differentiation Flag Number exceeds the allowed value.                                                                                                            | Read-only |
| Illegal Instruction Error Flag        | A29514        | ON when a program that cannot be executed has been stored.                                                                                                                              | Read-only |
| UM Overflow Error Flag                | A29515        | ON when the last address in UM (user program memory) has been exceeded.                                                                                                                 | Read-only |
| Program Address Where Program Stopped | A298 and A299 | These words contain the 8-digit hexadecimal program address of the instruction where program execution was stopped due to a program error. (A299 contains the leftmost digits.)         | Read-only |

## Error Information

## ■ Error Log, Error Code

| Name                        | Address      | Description                                                                                                                                                                                         | Access     |
|-----------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Error Log Area              | A100 to A199 | When an error has occurred, the error code, error contents, and error's time and date are stored in the Error Log Area.                                                                             | Read-only  |
| Error Log Pointer           | A300         | When an error occurs, the Error Log Pointer is incremented by 1 to indicate the location where the next error record will be recorded as an offset from the beginning of the Error Log Area (A100). | Read-only  |
| Error Log Pointer Reset Bit | A50014       | Turn this bit ON to reset the Error Log Pointer (A300) to 00.                                                                                                                                       | Read/write |
| Error Code                  | A400         | When a non-fatal error (user-defined FALS(006) or system error) or a fatal error (user-defined FALS(007) or system error) occurs, the 4-digit hexadecimal error code is written to this word.       | Read-only  |



## ■ FAL/FALS Error Information

| Name                                                               | Address      | Description                                                                                                                                                                                                                                            | Access     |
|--------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| FAL Error Flag (Non-fatal error)                                   | A40215       | ON when a non-fatal error is generated by executing FAL(006).                                                                                                                                                                                          | Read-only  |
| Executed FAL Number Flags                                          | A360 to A391 | The flag corresponding to the specified FAL number will be turned ON when FAL(006) is executed. Bits A36001 to A39115 correspond to FAL numbers 001 to 511.                                                                                            | Read-only  |
| FALS Error Flag (Fatal error)                                      | A40106       | ON when a fatal error is generated by the FALS(007) instruction.                                                                                                                                                                                       | Read-only  |
| FAL/FALS Number for System Error Simulation (CS1-H CPU Units only) | A529         | Set a dummy FAL/FALS number to use to simulate the system error using FAL(006) or FALS(007).<br>0001 to 01FF Hex: FAL/FALS numbers 1 to 511<br>0000 or 0200 to FFFF Hex: No FAL/FALS number for system error simulation. (No error will be generated.) | Read/write |

## ■ Memory Error Information

| Name                                      | Address          | Description                                                                                                                                                                                                                                                                                                                                                                                                                        | Access    |
|-------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Memory Error Flag (Fatal error)           | A40115           | ON when an error occurred in memory or there was an error in automatic transfer from the Memory Card when the power was turned ON.<br><br>The ERR/ALM indicator on the front of the CPU Unit will light and CPU Unit operation will stop when this flag turns ON.<br>If the automatic data transfer at startup fails, A40309 will be turned ON. If an error occurs in automatic transfer at startup, this error cannot be cleared. | Read-only |
| Memory Error Location                     | A40300 to A40308 | When a memory error occurs, the Memory Error Flag (A40115) is turned ON and one of the following flags is turned ON to indicate the memory area where the error occurred.<br>A40300: User program<br>A40304: PLC Setup<br>A40305: Registered I/O Table<br>A40307: Routing Table<br>A40308: CS-series CPU Bus Unit Settings                                                                                                         | Read-only |
| Startup Memory Card Transfer Error Flag   | A40309           | ON when an error occurs in automatically transferring a file from the Memory Card to the CPU Unit at startup, including when a file is missing or a Memory Card is not mounted.<br><br>The error can be cleared by turning OFF the power. (This error cannot be cleared while the power is ON.)                                                                                                                                    | Read-only |
| Flash Memory Error (CS1-H CPU Units only) | A40310           | Turns ON when the flash memory fails.                                                                                                                                                                                                                                                                                                                                                                                              | Read-only |

## ■ PLC Setup Error Information

| Name                                   | Address | Description                                                                                                                                                                                | Access    |
|----------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| PLC Setup Error Flag (Non-fatal error) | A40210  | ON when there is a setting error in the PLC Setup.                                                                                                                                         | Read-only |
| PLC Setup Error Location               | A406    | When there is a setting error in the PLC Setup, the location of that error is written to A406 in 4-digit hexadecimal. The location is given as the address set on the Programming Console. | Read-only |

## ■ Interrupt Task Error Information

| Name                                           | Address          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Access    |
|------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Interrupt Task Error Flag<br>(Non-fatal error) | A40213           | ON when the Detect Interrupt Task Errors setting in the PLC Setup is set to "Detect" and one of the following occurs.<br>IORD(222) or IOWR(223) in a cyclic task are competing with IORD(222) or IOWR(223) in an interrupt task.<br>An interrupt task is executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS I/O Unit.<br>IORD(222) or IOWR(223) was executed in an interrupt task when I/O was being refreshed.                                                                                                   | Read-only |
| Interrupt Task Error Cause Flag                | A42615           | Indicates the cause of an Interrupt Task Error.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Read-only |
| Interrupt Task Error, Task Number              | A42600 to A42611 | The function of these bits depends upon the status of A42615 (the Interrupt Task Error Cause Flag).<br>A42615 OFF:<br>Contains the interrupt task number when an interrupt task was executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS Remote I/O Unit.<br>A42615 ON:<br>Contains the Special I/O Unit's unit number when an attempt was made to refresh a Special I/O Unit's I/O from an interrupt task with IORF(097) while the Unit's I/O was being refreshed by cyclic I/O refreshing (duplicate refreshing). | Read-only |

## ■ I/O Information

| Name                                             | Address          | Description                                                                                                                                                                                                                                                            | Access    |
|--------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Basic I/O Unit Error Flag<br>(Non-fatal error)   | A40212           | ON when an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units).                                                                                                                                    | Read-only |
| Basic I/O Unit Error, Slot Number                | A40800 to A40807 | Contains the binary slot number where the error occurred when an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units).                                                                              | Read-only |
| Basic I/O Unit Error, Rack Number                | A40808 to A40815 | Contains the binary rack number where the error occurred when an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units).                                                                              | Read-only |
| I/O Setting Error Flag<br>(Fatal error)          | A40110           | ON when an Input Unit has been installed in an Output Unit's slot or vice-versa, so the Input and Output Units clash in the registered I/O table.                                                                                                                      | Read-only |
| I/O Verification Error Flag<br>(Non-fatal error) | A40209           | ON when a Basic I/O Unit registered in the I/O Table does not match the Basic I/O Unit actually installed in the PLC because a Unit was added or removed.                                                                                                              | Read-only |
| Expansion I/O Rack Number Duplication Flags      | A40900 to A40907 | The corresponding flag will be turned ON when an Expansion I/O Rack's starting word address was set from a Programming Device and two Racks have overlapping word allocations or a Rack's starting address exceeds CIO 0901. Bits 00 to 07 correspond to Racks 0 to 7. | Read-only |
| Too Many I/O Points Flag<br>(Fatal error)        | A40111           | ON when the number of I/O points being used in Basic I/O Units exceeds the maximum allowed for the PLC.                                                                                                                                                                | Read-only |

| Name                                              | Address          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Access    |
|---------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Too Many I/O Points, Details                      | A40700 to A40712 | <p>The 6 possible causes of the Too Many I/O Points Error are listed below. The 3-digit binary value in A40713 to A40715 indicates the cause of the error. (The causes corresponding to values 0 to 5 are listed below.)</p> <p>The 13-bit binary value in A40700 to A40712 indicates the details: the excessive value or the duplicated unit number.</p> <p>The number of I/O points will be written here when the total number of I/O points set in the I/O Table (excluding Slave Racks) exceed the maximum allowed for the CPU Unit.</p> <p>The number of interrupt inputs will be written here when there are more than 32 interrupt inputs.</p> <p>The unit number of the Slave Unit will be written here when a unit number is duplicated or the number of I/O points on a C500 Slave Unit exceeds 320.</p> <p>The unit number of the I/O Terminal (excluding Slave Racks) will be written here when a unit number is duplicated</p> <p>The unit number of the Master Unit will be written here when a unit number is duplicated or the unit number is outside of the allowed setting range.</p> <p>The number of Racks will be written here when the number of Expansion I/O Racks exceeds the maximum.</p> | Read-only |
| Too Many I/O Points, Cause                        | A40713 to A40715 | <p>These three bits indicate the cause of the Too Many I/O Points Error. (See A40700 to A40712.)</p> <p>000 (0): Too many I/O points.</p> <p>001 (1): Too many Interrupt Input points.</p> <p>010 (2): Slave Unit's unit number duplicated or the number of I/O points on a C500 Slave Unit exceeds 320.</p> <p>011 (3): I/O Terminal's unit number duplicated.</p> <p>100 (4): Master Unit's unit number duplicated or unit number is out-of-range (not 0 or 1).</p> <p>101 (5): Too many Expansion Racks connected.</p> <p>110 (6): The unit number of the Remote I/O Master Unit is 4, 6, or 7, or an Special I/O Unit's unit number cannot be detected.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Read-only |
| I/O Bus Error Flag (Fatal error)                  | A40114           | ON when an error occurs in a data transfer between the CPU Unit and a Unit mounted to a slot.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Read-only |
| I/O Bus Error Slot Number                         | A40400 to A40407 | Contains the 8-bit binary slot number (00 to 09) where an I/O Bus Error occurred.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Read-only |
| CPU Bus Unit Setup Area Initialization Error Flag | A26100           | ON: Error in CPU Bus Unit Setup<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Read-only |
| I/O Overflow Flag                                 | A26102           | ON: Overflow in maximum number of I/O points.<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Read-only |
| Duplication Error Flag                            | A26103           | ON: The same unit number was used more than once.<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Read-only |
| I/O Bus Error Flag                                | A26104           | ON: I/O bus error<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Read-only |
| SYSMAC BUS Recognition Error Flag                 | A26106           | ON: SYSMAC BUS detection ended in an error.<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Read-only |
| Special I/O Unit Error Flag                       | A26107           | ON: Error in a Special I/O Unit<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Read-only |
| I/O Unconfirmed Error Flag                        | A26109           | ON: I/O detection has not been completed.<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Read-only |

| Name                                 | Address          | Description                                                                                                                                                                                                                                                                                      | Access    |
|--------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| I/O Bus Error Rack Number            | A40408 to A40415 | Contains the 8-bit binary rack number (00 to 07) where an I/O Bus Error occurred.                                                                                                                                                                                                                | Read-only |
| Duplication Error Flag (Fatal error) | A40113           | ON in the following cases:<br>Two CPU Bus Units have been assigned the same unit number.<br>Two Special I/O Units have been assigned the same unit number.<br>Two Basic I/O Units have been allocated the same data area words.<br>The same rack number is set for more than one Expansion Rack. | Read-only |

#### ■ CPU Bus Unit Information

| Name                                              | Address | Description                                                                                                                                                                                                                 | Access    |
|---------------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| CPU Bus Unit Number Duplication Flags             | A410    | The Duplication Error Flag (A40113) and the corresponding flag in A410 will be turned ON when a CPU Bus Unit's unit number has been duplicated.<br>Bits 00 to 15 correspond to unit numbers 0 to F.                         | Read-only |
| CPU Bus Unit Error, Unit Number Flags             | A417    | When an error occurs in a data exchange between the CPU Unit and a CPU Bus Unit, the CPU Bus Unit Error Flag (A40207) and the corresponding flag in A417 are turned ON.<br>Bits 00 to 15 correspond to unit numbers 0 to F. | Read-only |
| CPU Bus Unit Setting Error, Unit Number Flags     | A427    | When a CPU Bus Unit Setting Error occurs, A40203 and the corresponding flag in A27 are turned ON.<br>Bits 00 to 15 correspond to unit numbers 0 to F.                                                                       | Read-only |
| CPU Bus Unit Setting Error Flag (Non-fatal error) | A40203  | ON when an installed CPU Bus Unit does not match the CPU Bus Unit registered in the I/O table.                                                                                                                              | Read-only |
| CPU Bus Unit Error Flag (Non-fatal error)         | A40207  | ON when an error occurs in a data exchange between the CPU Unit and a CPU Bus Unit (including an error in the CPU Bus Unit itself).                                                                                         | Read-only |

#### ■ Special I/O Unit Information

| Name                                                  | Address          | Description                                                                                                                                                                                                                                        | Access    |
|-------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Special I/O Unit Number Duplication Flags             | A41100 to A41615 | The Duplication Error Flag (A40113) and the corresponding flag in A411 through A416 will be turned ON when a Special I/O Unit's unit number has been duplicated. (Bits A41100 to A41615 correspond to unit numbers 0 to 95.)                       | Read-only |
| Special I/O Unit Setting Error Flag (Non-fatal error) | A40202           | ON when an installed Special I/O Unit does not match the Special I/O Unit registered in the I/O table.                                                                                                                                             | Read-only |
| Special I/O Unit Setting Error, Unit Number Flags     | A42800 to A43315 | When a Special I/O Unit Setting Error occurs, A40202 and the corresponding flag in these words are turned ON. (Bits A42800 to A43315 correspond to unit numbers 0 to 95.)                                                                          | Read-only |
| Special I/O Unit Error Flag (Non-fatal error)         | A40206           | ON when an error occurs in a data exchange between the CPU Unit and a Special I/O Unit (including an error in the Special I/O Unit itself).                                                                                                        | Read-only |
| Special I/O Unit Error, Unit Number Flags             | A41800 to A42315 | When an error occurs in a data exchange between the CPU Unit and a Special I/O Unit, the Special I/O Unit Error Flag (A40206) and the corresponding flag in these words are turned ON. (Bits A42800 to A43315 correspond to unit numbers 0 to 95.) | Read-only |

## ■ Inner Board Information

| Name                                         | Address | Description                                                                                                                                                                   | Access    |
|----------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Inner Board Error Flag (Non-fatal error)     | A40208  | ON when an error occurs in a data exchange between the CPU Unit and the Inner Board (including an error in the Inner Board itself).                                           | Read-only |
| Inner Board Error Information                | A424    | When an error occurs in a data exchange between the CPU Unit and the Inner Board, the Inner Board Error Flag (A40208) and the appropriate error code will be written to A424. | Read-only |
| Inner Board Stopped Error Flag (Fatal error) | A40112  | ON when there is an Inner Board Error (watchdog timer error).                                                                                                                 | Read-only |

## ■ SYSMAC BUS Remote I/O Information

| Name                                            | Address          | Description                                                                                                                                                                                       | Access     |
|-------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| SYSMAC BUS Error Flag (Non-fatal error)         | A40205           | ON when an error occurs in a data transfer in the SYSMAC BUS system. The number of the Master involved is indicated with bits A40500 and A40501.                                                  | Read-only  |
| SYSMAC BUS Master Error Flags                   | A40500 to A40501 | When a transmission error occurs in the SYSMAC BUS system, the flag for the affected Master Unit will be turned ON.<br>A40500: Flag for Master Unit #0<br>A40501: Flag for Master Unit #1         | Read-only  |
| Slave Number of SYSMAC BUS Error After Start-up | A42504 to A42506 | When there is an error in a Slave Rack, these bits contain the Slave's unit number.                                                                                                               | Read-only  |
|                                                 | A42504 only      | When there is an error in an Optical I/O Unit (excluding Slave Racks), the status of A42504 (0 or 1) indicates whether the Unit is low or high.                                                   | Read-only  |
|                                                 | A42508 to A42515 | When there is an error in a Slave Rack, this byte contains the 2-digit hexadecimal unit number of the Master to which the Slave is connected.<br>(0xB0 for Master Unit 0, 0xB1 for Master Unit 1) | Read-only  |
|                                                 |                  | When there is an error in an Optical I/O Unit, this byte contains its 2-digit hexadecimal unit number (00 to 1F, or 0 to 31 decimal).                                                             | Read-only  |
| SYSMAC BUS Slave Number Refresh Bit             | A50900           | Turn this bit ON to refresh the error information in A425 (unit number of Slave where error occurred after startup).                                                                              | Read/write |

## ■ PLC Link Information

| Name                           | Address | Description                                                                                                                                               | Access    |
|--------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| PLC Link Operating Level Flags | A44211  | These flags indicate whether a PLC Link Unit is mounted to the PLC and the PLC Link Unit's operating level.<br>ON when the Unit is in operating level #1. | Read-only |
|                                | A44212  | These flags indicate whether a PLC Link Unit is mounted to the PLC and the PLC Link Unit's operating level.<br>ON when the Unit is in operating level #0. | Read-only |

### ■ Other PLC Operating Information

| Name                                                                  | Address | Description                                                                                                                                                                                                                                                                          | Access     |
|-----------------------------------------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Battery Error Flag<br>(Non-fatal error)                               | A40204  | ON if the CPU Unit's battery is disconnected or its voltage is low and the PLC Setup has been set to detect this error. (Detect Low Battery)                                                                                                                                         | Read-only  |
| Cycle Time Too Long Flag<br>(Fatal error)                             | A40108  | ON if the cycle time exceeds the maximum cycle time set in the PLC Setup. In the Parallel Processing Modes, the program execution cycle time will be used. (Watch Cycle Time)                                                                                                        | Read-only  |
| Peripheral Servicing Too Long Flag (Fatal error, CS1-H CPU Unit only) | A40515  | Turns ON when the peripheral servicing time in a Parallel Processing Mode exceeds 2 s. This will also cause a cycle time error and operation will stop.                                                                                                                              | Read-only  |
| FPD Teaching Bit                                                      | A59800  | Turn this bit ON to set the monitoring time in FPD(269) automatically with the teaching function.                                                                                                                                                                                    | Read/write |
| Memory Backup Battery Failure Flag                                    | A39511  | Data from the I/O memory areas that are maintained when power is turned OFF (HR, DM, etc.) are backed up with a Battery. A39511 turns ON if the Battery voltage drops and the data can no longer be maintained. The data in the I/O memory will not be dependable when this happens. | Read-only  |

## Clock

### ■ Clock Information

| Name       | Address                                                                      | Description                                                                                                 | Access    |
|------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------|
| Clock Data | The clock data from the clock built into the CPU Unit is stored here in BCD. |                                                                                                             | Read-only |
|            | A35100 to A35107                                                             | Seconds: 00 to 59 (BCD)                                                                                     | Read-only |
|            | A35108 to A35115                                                             | Minutes: 00 to 59 (BCD)                                                                                     | Read-only |
|            | A35200 to A35207                                                             | Hour: 00 to 23 (BCD)                                                                                        | Read-only |
|            | A35208 to A35215                                                             | Day of the month: 01 to 31 (BCD)                                                                            | Read-only |
|            | A35300 to A35307                                                             | Month: 01 to 12 (BCD)                                                                                       | Read-only |
|            | A35308 to A35315                                                             | Year: 00 to 99 (BCD)                                                                                        | Read-only |
|            | A35400 to A35407                                                             | Day of the week: 00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday | Read-only |

## ■ Power Supply Information

| Name                          | Address       | Description                                                                                                                                                                                                                                                                                                    | Access     |
|-------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Startup Time                  | A510 and A511 | These words contain the time (in BCD) at which the power was turned ON. The contents are updated every time that the power is turned ON.<br>A51000 to A51007: Seconds (00 to 59)<br>A51008 to A51015: Minutes (00 to 59)<br>A51100 to A51107: Hour (00 to 23)<br>A51108 to A51115: Day of the month (00 to 31) | Read/write |
| Power Interruption Time       | A512 and A513 | These words contain the time (in BCD) at which the power was interrupted. The contents are updated every time that the power is interrupted.<br>A51200 to A51207: Seconds (00 to 59)<br>A51208 to A51215: Minutes (00 to 59)<br>A51300 to A51307: Hour (00 to 23)<br>A51308 to A51315: Day of month (00 to 31) | Read/write |
| Number of Power Interruptions | A514          | Contains the number of times (in binary) that power has been interrupted since the power was first turned on. To reset this value, overwrite the current value with 0000.                                                                                                                                      | Read/write |
| Total Power ON Time           | A523          | Contains the total time (in binary) that the PLC has been on in 10-hour units. The data is stored is updated every 10 hours. To reset this value, overwrite the current value with 0000.                                                                                                                       | Read/write |

## Flash Memory Backup Information

| Name                                     | Address       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Access    |
|------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| User Program Date (CS1-H CPU Units only) | A090 to A093  | These words contain in BCD the date and time that the user program was last overwritten.<br>A09000 to A09007: Seconds (00 to 59)<br>A09008 to A09015: Minutes (00 to 59)<br>A09100 to A09107: Hour (00 to 23)<br>A09108 to A09115: Day of month (00 to 31)<br>A09200 to A09207: Month (01 to 12)<br>A09208 to A09215: Year (00 to 99)<br>A09308 to A09307: Day of the week<br>(00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday) | Read-only |
| Parameter Date (CS1-H CPU Units only)    | A094 to A0947 | These words contain in BCD the date and time that the parameters were last overwritten.<br>A09400 to A09407: Seconds (00 to 59)<br>A09408 to A09415: Minutes (00 to 59)<br>A09500 to A09507: Hour (00 to 23)<br>A09508 to A09515: Day of month (00 to 31)<br>A09600 to A09607: Month (01 to 12)<br>A09608 to A09615: Year (00 to 99)<br>A09708 to A09707: Day of the week<br>(00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday)  | Read-only |

## Communications

### ■ Network Communications Information

| Name                                 | Address          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Access    |
|--------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Communications Port Enabled Flags    | A20200 to A20207 | ON when a network instruction (SEND, RECV, CMND, or PMCR) can be executed with the corresponding port number or background execution can be executed with the corresponding port number (CS1-H CPU Units only). Bits 00 to 07 correspond to communications ports 0 to 7.<br><br>When the simple backup operation is used to performed a write or compare operation for a Memory Card on a CS1-H CPU Unit, a communications port will be automatically allocated, and the corresponding flag will be turned ON during the operation and turned OFF when the operation has been completed. | Read-only |
| Communications Port Completion Codes | A203 to A210     | These words contain the completion codes for the corresponding port numbers when network instructions (SEND, RECV, CMND, or PMCR) have been executed. The contents will be cleared when background execution has been completed (for CS1-H CPU Unit only). Words A203 to A210 correspond to communications ports 0 to 7.<br><br>When the simple backup operation is used to performed a write or compare operation for a Memory Card on a CS1-H CPU Unit, a communications port will be automatically allocated, and a completion code will be stored in the corresponding word.         | Read-only |
| Communications Port Error Flags      | A21900 to A21907 | ON when an error occurred during execution of a network instruction (SEND, RECV, CMND, or PMCR). Turns OFF then execution has been finished normally. Bits 00 to 07 correspond to communications ports 0 to 7.<br><br>When the simple backup operation is used to performed a write or compare operation for a Memory Card on a CS1-H CPU Unit, a communications port will be automatically allocated. The corresponding flag will be turned ON if an error occurs and will be turned OFF if the simple backup operation ends normally.                                                  | Read-only |

### ■ SYSMAC BUS Communications Information

| Name                            | Address | Description                                                                                                                       | Access     |
|---------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------|------------|
| SYSMAC BUS Master 1 Restart Bit | A52614  | Turn this bit ON to restart SYSMAC BUS Remote I/O Master Unit 1. (Turned OFF automatically when restart processing is completed.) | Read/write |
| SYSMAC BUS Master 0 Restart Bit | A52615  | Turn this bit ON to restart SYSMAC BUS Remote I/O Master Unit 0. (Turned OFF automatically when restart processing is completed.) | Read/write |



■ Peripheral Port Communications Information

| Name                                         | Address          | Description                                                                                                                                                      | Access     |
|----------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Peripheral Port Communications Error Flag    | A39212           | ON when a communications error has occurred at the peripheral port.                                                                                              | Read-only  |
| Peripheral Port Restart Bit                  | A52601           | Turn this bit ON to restart the peripheral port.                                                                                                                 | Read/write |
| Peripheral Port Settings Change Bit          | A61901           | ON while the peripheral port's communications settings are being changed.                                                                                        | Read/write |
| Peripheral Port Error Flags                  | A52808 to A52815 | These flags indicate what kind of error has occurred at the peripheral port.                                                                                     | Read/write |
| Peripheral Port PT Communications Flags      | A39400 to A39407 | The corresponding bit will be ON when the peripheral port is communicating with a PT in NT link mode. Bits 0 to 7 correspond to units 0 to 7.                    | Read-only  |
| Peripheral Port PT Priority Registered Flags | A39408 to A39415 | The corresponding bit will be ON for the PT that has priority when the peripheral port is communicating in NT link mode. Bits 0 to 7 correspond to units 0 to 7. | Read-only  |

■ RS-232C Port Communications Information

| Name                                                     | Address          | Description                                                                                                                                                   | Access     |
|----------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| RS-232C Port Communications Error Flag                   | A39204           | ON when a communications error has occurred at the RS-232C port.                                                                                              | Read-only  |
| RS-232C Port Restart Bit                                 | A52600           | Turn this bit ON to restart the RS-232C port.                                                                                                                 | Read/write |
| RS-232C Port Settings Change Bit                         | A61902           | ON while the RS-232C port's communications settings are being changed.                                                                                        | Read/write |
| RS-232C Port Error Flags                                 | A52800 to A52807 | These flags indicate what kind of error has occurred at the RS-232C port.                                                                                     | Read/write |
| RS-232C Port Send Ready Flag (No-protocol mode)          | A39205           | ON when the RS-232C port is able to send data in no-protocol mode.                                                                                            | Read-only  |
| RS-232C Port Reception Completed Flag (No-protocol mode) | A39206           | ON when the RS-232C port has completed the reception in no-protocol mode.                                                                                     | Read-only  |
| RS-232C Port Reception Overflow Flag (No-protocol mode)  | A39207           | ON when a data overflow occurred during reception through the RS-232C port in no-protocol mode.                                                               | Read-only  |
| RS-232C Port PT Communications Flags                     | A39300 to A39307 | The corresponding bit will be ON when the RS-232C port is communicating with a PT in NT link mode. Bits 0 to 7 correspond to units 0 to 7.                    | Read-only  |
| RS-232C Port PT Priority Registered Flags                | A39308 to A39315 | The corresponding bit will be ON for the PT that has priority when the RS-232C port is communicating in NT link mode. Bits 0 to 7 correspond to units 0 to 7. | Read-only  |
| RS-232C Port Reception Counter (No-protocol mode)        | A39300 to A39315 | Indicates (in binary) the number of bytes of data received when the RS-232C port is in no-protocol mode.                                                      | Read-only  |

■ Serial Device Communications Information

| Name                                                            | Address          | Description                                                                                                                                                                    | Access     |
|-----------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Communications Units 0 to 15, Ports 1 to 4 Settings Change Bits | A62001 to A63504 | The corresponding flag will be ON when the settings for that port are being changed. (Bits 1 to 4 in A620 to A635 correspond to ports 1 to 4 in Communications Units 0 to 15.) | Read/write |
| Communications Board Ports 1 to 4 Settings Change Bits          | A63601 to A63604 | The corresponding flag will be ON when the settings for that port are being changed. (Bits 1 to 4 correspond to ports 1 to 4.)                                                 | Read/write |

## Instruction-related Information

| Name                    | Address      | Description                                                                                                                                                                                      | Access     |
|-------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Step Flag               | A20012       | ON for one cycle when step execution is started with STEP(008).                                                                                                                                  | Read-only  |
| Current EM Bank         | A301         | This word contains the current EM bank number in 4-digit hexadecimal.                                                                                                                            | Read-only  |
| Macro Area Input Words  | A600 to A603 | When MCRO(099) is executed, it copies the input data from the specified source words (input parameter words) to A600 through A603.                                                               | Read/write |
| Macro Area Output Words | A604 to A607 | After the subroutine specified in MCRO(099) has been executed, the results of the subroutine are transferred from A604 through A607 to the specified destination words (output parameter words). | Read/write |

## Background Execution Information

| Name                                                        | Address       | Description                                                                                                                                                                                                               | Access    |
|-------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| DR00 Output for Background Execution (CS1-H CPU Units only) | A597          | When a data register is specified as the output for an instruction processed in the background, A597 receives the output instead of DR00.<br>0000 to FFFF Hex                                                             | Read-only |
| IR00 Output for Background Execution (CS1-H CPU Units only) | A595 and A596 | When an index register is specified as the output for an instruction processed in the background, A595 and A596 receive the output instead of IR00.<br>0000 0000 to FFFF FFFF Hex<br>(A596 contains the leftmost digits.) | Read-only |
| Equals Flag for Background Execution (CS1-H CPU Units only) | A59801        | Turns ON if matching data is found for an SRCH(181) instruction executed in the background.                                                                                                                               | Read-only |
| ER/AER Flag for Background Execution (CS1-H CPU Units only) | A39510        | Turns ON if an error or illegal access occurs during background execution. Turns OFF when power is turned ON or operation is started.                                                                                     | Read-only |

## 9-17 TR (Temporary Relay) Area

The TR Area contains 16 bits with addresses ranging from TR0 to TR15. These temporarily store the ON/OFF status of an instruction block for branching. TR bits are useful when there are several output branches and interlocks cannot be used.

It is not necessary to consider TR bits when displaying ladder diagrams on the CX-Programmer.

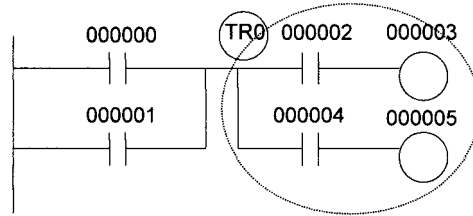
The TR bits can be used as many times as required and in any order required as long as the same TR bit is not used twice in the same instruction block.

TR bits can be used only with the OUT and LD instructions. OUT instructions (OUT TR0 to OUT TR15) store the ON OFF status of a branch point and LD instructions recall the stored ON OFF status of the branch point.

TR bits cannot be changed from a Programming Device.

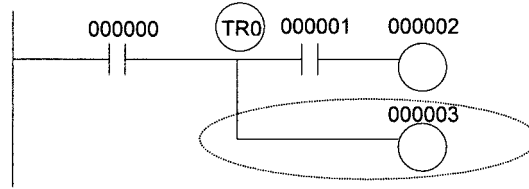
### Examples

In this example, a TR bit is used when two outputs have been directly connected to a branch point.



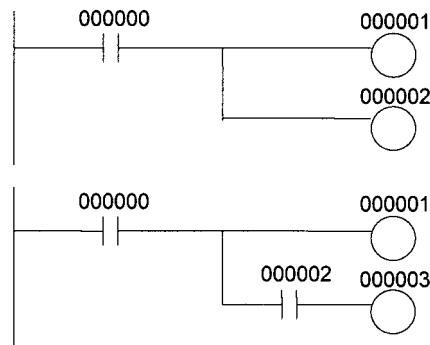
| Instruction | Operand |
|-------------|---------|
| LD          | 000000  |
| OR          | 000001  |
| OUT         | TR 0    |
| AND         | 000002  |
| OUT         | 000003  |
| LD          | TR 0    |
| AND         | 000004  |
| OUT         | 000005  |

In this example, a TR bit is used when an output is connected to a branch point without a separate execution condition.



| Instruction | Operand |
|-------------|---------|
| LD          | 000000  |
| OUT         | TR 0    |
| AND         | 000001  |
| OUT         | 000002  |
| LD          | TR 0    |
| OUT         | 000003  |

**Note** A TR bit is not required when there are no execution conditions after the branch point or there is an execution condition only in the last line of the instruction block.



| Instruction | Operand |
|-------------|---------|
| LD          | 000000  |
| OUT         | 000001  |
| OUT         | 000002  |

| Instruction | Operand |
|-------------|---------|
| LD          | 000000  |
| OUT         | 000001  |
| AND         | 000002  |
| OUT         | 000003  |

## 9-18 Timer Area

The 4,096 timer numbers (T0000 to T4095) are shared by the TIM, TIMX, TIMH(015), TIMHX(551), TMHH(540), TMHHX(552), TTIM(087), TTIMX(555), TIMW(813), TIMWX(816), TMHW(815), and TMHWX(817) instructions. Timer Completion Flags and present values (PVs) for these instructions are accessed with the timer numbers. (The TIML(542), TIMLX(553), MTIM(543), and MTIMX(554) instructions do not use timer numbers.)

When a timer number is used in an operand that requires bit data, the timer number accesses the Completion Flag of the timer. When a timer number is used in an operand that requires word data, the timer number accesses the PV of the timer. Timer Completion Flags can be used as often as necessary as normally open and normally closed conditions and the values of timer PVs can be read as normal word data.

With CS1-H CPU Units, the refresh method for timer PVs can be set from the CX-Programmer to either BCD or binary. With CS1 CPU Units, it can only be set to binary.

**Note** It is not recommended to use the same timer number in two timer instructions because the timers will not operate correctly if they are timing simultaneously. (If two or more timer instructions use the same timer number, an error will be generated during the program check, but the timers will operate as long as the instructions are not executed in the same cycle.)

The following table shows when timer PVs and Completion Flags will be reset.

| Instruction name                               | Effect on PV and Completion Flag |                           |                         | Operation in Jumps and Interlocks   |                                         |
|------------------------------------------------|----------------------------------|---------------------------|-------------------------|-------------------------------------|-----------------------------------------|
|                                                | Mode change <sup>1</sup>         | PLC start-up <sup>1</sup> | CNR(545) or CNRX(547)   | Jumps (JMP-JME) or Tasks on standby | Interlocks (IL-ILC)                     |
| TIMER: TIM or TIMX                             | PV → 0<br>Flag → OFF             | PV → 0<br>Flag → OFF      | PV → 9999<br>Flag → OFF | PVs refreshed in operating timers   | PV → SV<br>(Reset to SV.)<br>Flag → OFF |
| HIGH-SPEED TIMER: TIMH(015) or TIMHX(551)      |                                  |                           |                         |                                     |                                         |
| ONE-MS TIMER: TMHH(540) or TMHHX(552)          |                                  |                           |                         |                                     |                                         |
| ACCUMULATIVE TIMER: TTIM(087) or TTIMX(555)    |                                  |                           |                         | PV Maintained                       | PV Maintained                           |
| TIMER WAIT: TIMW(813) or TIMWX(816)            |                                  |                           |                         | PVs refreshed in operating timers   | ---                                     |
| HIGH-SPEED TIMER WAIT: TMHW(815) or TMHWX(817) |                                  |                           |                         |                                     |                                         |

- Note**
1. If the IOM Hold Bit (A50012) is ON, the PV and Completion Flag will be retained when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa. The PV and Completion Flag will be cleared when power is cycled.
  2. If the IOM Hold Bit (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the PV and Completion Flag will be retained when the PLC's power is cycled.
  3. Since the TIML(542), TIMLX(553), MTIM(543), and MTIMX(554) instructions do not use timer numbers, they are reset under different conditions. Refer to the descriptions of these instructions for details.
  4. The present value of TIM, TIMX, TIMH(015), TIMHX(551), TMHH(540), TMHHX(552), TIMW(813), TIMWX(816), TMHW(815), and TMHWX(817) timers programmed with timer numbers 0000 to 2047 will be updated even when jumped between JMP and JME instructions or when in a task that is on standby. The present value of timers programmed with timer numbers 2048 to 4095 will be held when jumped or when in a task that is on standby.

### Forcing Bit Status

Timer Completion Flags can be force-set and force-reset.

Timer PVs cannot be force-set or force-reset, although the PVs can be refreshed indirectly by force-setting/resetting the Completion Flag.

**Note** When designating addresses in programming or allocations inside C200H Special I/O Units, "T000" to "T511" will actually specify T0000 to T0511 in the CPU Unit. T0512 to T4095 cannot be specified inside the C200H Special I/O Units.

## 9-19 Counter Area

The 4,096 counter numbers (C0000 to C4095) are shared by the CNT, CNTX, CNTR(012), CNTRX(548), CNTW(814), and CNTWX(818) instructions. Counter Completion Flags and present values (PVs) for these instructions are accessed with the counter numbers.

When a counter number is used in an operand that requires bit data, the counter number accesses the Completion Flag of the counter. When a counter number is used in an operand that requires word data, the counter number accesses the PV of the counter.

With CS1-H CPU Units, the refresh method for counter PVs can be set from the CX-Programmer to either BCD or binary. With CS1 CPU Units, it can only be set to binary.

It is not recommended to use the same counter number in two counter instructions because the counters will not operate correctly if they are counting simultaneously. If two or more counter instructions use the same counter number, an error will be generated during the program check, but the counters will operate as long as the instructions are not executed in the same cycle.

The following table shows when counter PVs and Completion Flags will be reset.

| Instruction name                            | Effect on PV and Completion Flag |             |             |             |                       |                     |
|---------------------------------------------|----------------------------------|-------------|-------------|-------------|-----------------------|---------------------|
|                                             | Reset                            | Mode change | PLC startup | Reset Input | CNR(545) or CNRX(548) | Interlocks (IL-ILC) |
| COUNTER: CNT or CNTX                        | PV → 0000<br>Flag → OFF          | Maintained  | Maintained  | Reset       | Reset                 | Maintained          |
| REVERSIBLE COUNTER: CNTR(012) or CNTRX(548) |                                  |             |             |             |                       |                     |
| COUNTER WAIT: CNTW(814) or CNTWX(818)       |                                  |             |             |             |                       |                     |

**Note** When designating addresses in programming or allocations inside C200H Special I/O Units, "C000" to "C511" will actually specify T0000 to T0511 in the CPU Unit. C0512 to C4095 cannot be specified inside the C200H Special I/O Units.

## 9-20 Data Memory (DM) Area

The DM Area contains 32,768 words with addresses ranging from D00000 to D32767. This data area is used for general data storage and manipulation and is accessible only by word.

Data in the DM Area is retained when the PLC's power is cycled or the PLC's operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

Although bits in the DM Area cannot be accessed directly, the status of these bits can be accessed with the BIT TEST instructions, TST(350) and TSTN(351).

Bits in the DM Area cannot be force-set or force-reset.

**Note** 1. If using a C200H DeviceNet Master Unit (C200HW-DRM21-V1), use the following words as the status area. Data in this area is updated when the C200H DeviceNet Master Unit is used, so the area cannot be used for other applications.

- Master Status: D06032 + (2 x unit number)
- Current Communications Cycle Time: D06033 + (2 x unit number)

The CS-series DeviceNet Unit (CS1W-DRM21) does not use the above words.

2. When designating addresses in programming or allocations inside Group-I and Group-II C200H Special I/O Units, DM 0000 to DM 0999 will actually specify D00000 to D00999 in the CPU Unit and DM 1000 to DM1999 will

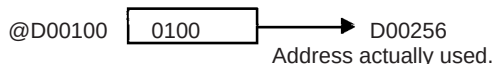
actually specify D20000 to D20999 (part of the Special I/O Unit Area) in the CPU Unit. Other addresses in this area cannot be specified. When designating addresses in programming or allocations inside Group-III and Group-IV C200H Special I/O Units, DM 0000 to DM 6655 will actually specify D00000 to D06655 in the CPU Unit. Other addresses in this area cannot be specified.

### Indirect Addressing

Words in the DM Area can be indirectly addressed in two ways: binary-mode and BCD-mode.

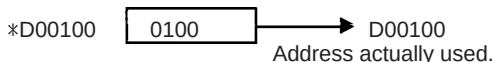
#### Binary-mode Addressing (@D)

When a "@" character is input before a DM address, the content of that DM word is treated as binary and the instruction will operate on the DM word at that binary address. The entire DM Area (D00000 to D32767) can be indirectly addressed with hexadecimal values 0000 to 7FFF.



#### BCD-mode Addressing (\*D)

When a "\*" character is input before a DM address, the content of that DM word is treated as BCD and the instruction will operate on the DM word at that BCD address. Only part of the DM Area (D00000 to D09999) can be indirectly addressed with BCD values 0000 to 9999.



### DM Area Allocation to Special Units Inner Board

Parts of the DM Area are allocated to Special I/O Units, CS-series CPU Bus Units, and Inner Boards for functions such as initial Unit settings. The timing for data transfers is different for these Units, but may occur at any of the three following times.

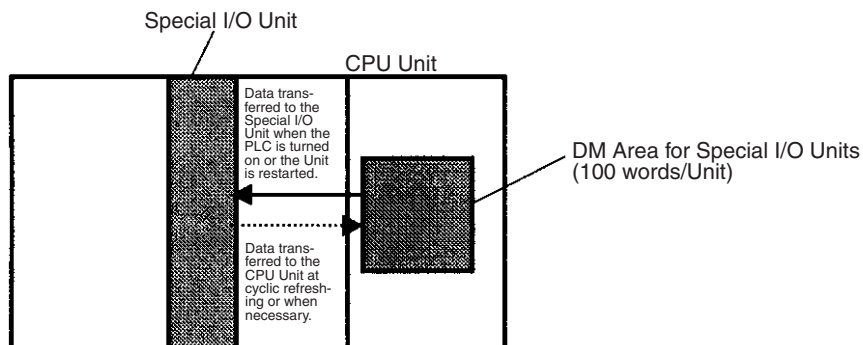
1,2,3...

1. Transfer data when the PLC's power is turned on or the Unit is restarted.
2. Transfer data once each cycle.
3. Transfer data when required.

Refer to the Unit's Operation Manual for details on data transfer timing.

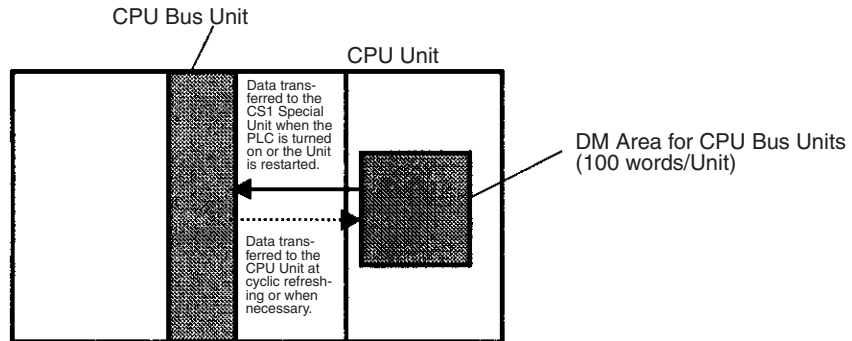
#### Special I/O Units (D20000 to D29599)

Each Special I/O Unit is allocated 100 words (based on unit numbers 0 to 95). Refer to the Unit's Operation Manual for details on the function of these words.

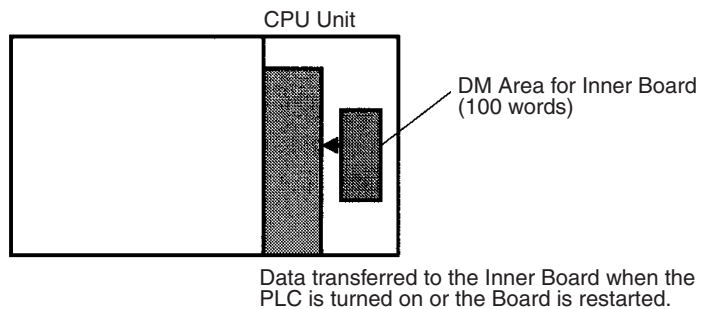


**CPU Bus Units (D30000 to D31599)**

Each CPU Bus Unit is allocated 100 words (based on unit numbers 0 to F). Refer to the Unit's Operation Manual for details on the function of these words. With some CPU Bus Units such as Ethernet Units, initial settings must be registered in the CPU Unit's Parameter Area; this data can be registered with a Programming Device other than a Programming Console.

**Inner Board (D32000 to D32099)**

The Inner Board is allocated 100 words. Refer to the Board's Operation Manual for details on the function of these words.



## 9-21 Extended Data Memory (EM) Area

The EM Area is divided into 13 banks (0 to C) that each contain 32,768 words. EM Area addresses range from E0\_00000 to EC\_32767. This data area is used for general data storage and manipulation and is accessible only by word.

Data in the EM Area is retained when the PLC's power is cycled or the PLC's operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

Although bits in the EM Area cannot be accessed directly, the status of these bits can be accessed with the BIT TEST instructions, TST(350) and TSTN(351).

Bits in the EM Area cannot be force-set or force-reset.

**Specifying EM Addresses**

There are two ways to specify an EM address: the bank and address can be specified at the same time or an address in the current bank can be specified (after changing the current bank, if necessary). In general, we recommend specifying the bank and address simultaneously.

**1,2,3...****1. Bank and Address Specification**

With this method, the bank number is specified just before the EM address. For example, E2\_00010 specifies EM address 00010 in bank 2.

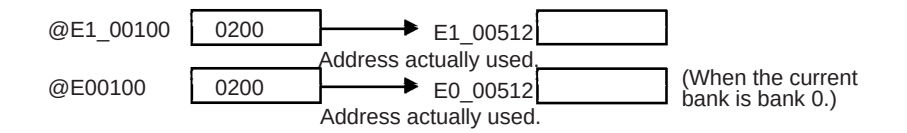
2. Current Bank Address Specification
- With this method, just the EM address is specified. For example, E00010 specifies EM address 00010 in the current bank. (The current bank must be changed with EMBC(281) to access data in another bank. A301 contains the current EM bank number.)
- The current bank will be reset to 0 when the operating mode is changed from PROGRAM mode to RUN/MONITOR mode, unless the IOM Hold Bit (A50012) is ON. The current bank is not changed as the program proceeds through cyclic tasks and the current bank will be returned to its original value (in the source cyclic task) if it has been changed in an interrupt task.

Indirect Addressing

Words in the EM Area can be indirectly addressed in two ways: binary-mode and BCD-mode.

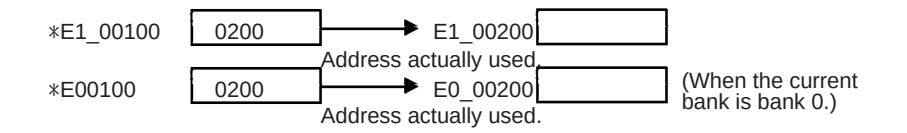
Binary-mode Addressing (@E)

When a “@” character is input before a EM address, the content of that EM word is treated as binary and the instruction will operate on the EM word in the same bank at that binary address. All of the words in the same EM bank (E00000 to E32767) can be indirectly addressed with hexadecimal values 0000 to 7FFF and words in the next EM bank (E00000 to E32767) can be addressed with hexadecimal values 8000 to FFFF.



BCD-mode Addressing (\*E)

When a “\*” character is input before a EM address, the content of that EM word is treated as BCD and the instruction will operate on the EM word in the same bank at that BCD address. Only part of the EM bank (E00000 to E09999) can be indirectly addressed with BCD values 0000 to 9999.

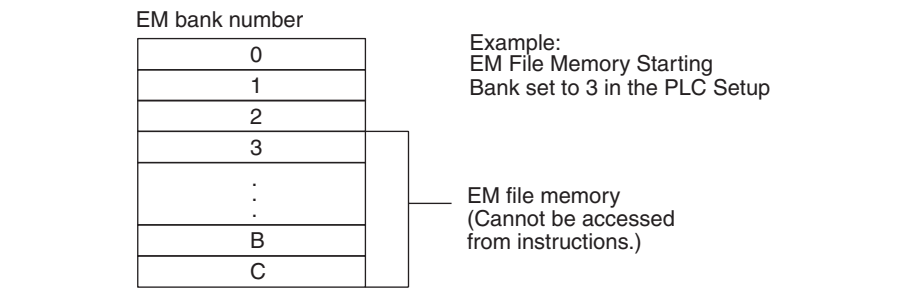


File Memory Conversion

Part of the EM Area can be converted for use as file memory with settings in the PLC Setup. All EM banks from the specified bank (EM File Memory Starting Bank) to the last EM bank will be converted to file memory.

Once EM banks have been converted to file memory, they cannot be accessed (read or written) by instructions. An Illegal Access Error will occur if a file-memory bank is specified as an operand in an instruction.

The following example shows EM file memory when the EM File Memory Starting Bank has been set to 3 in the PLC Setup.





**Note** When designating addresses in programming or allocations inside C200H Special I/O Units, “EM 0000” to “EM 6143” will actually specify E0\_00000 to E0\_06143 in the CPU Unit. Other addresses in this area cannot be specified.

## 9-22 Index Registers

The sixteen Index Registers (IR0 to IR15) are used for indirect addressing. Each Index Register can hold a single PLC memory address, which is the absolute memory address of a word in I/O memory. Use MOVR(560) to convert a regular data area address to its equivalent PLC memory address and write that value to the specified Index Register. (Use MOVRW(561) to set the PLC memory address of a timer/counter PV in an Index Register.)

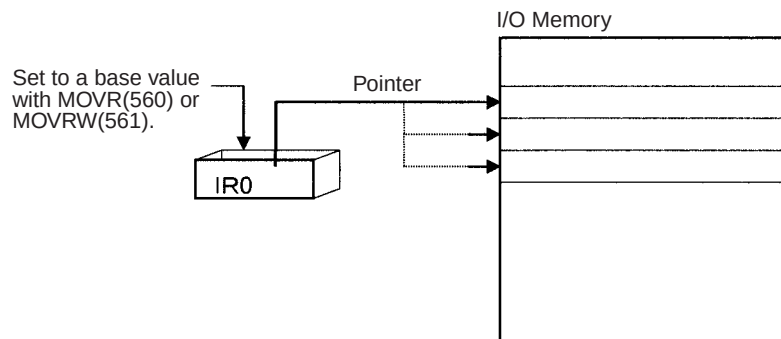
**Note** Refer to *Appendix E Memory Map* for more details on PLC memory addresses.

### Indirect Addressing

When an Index Register is used as an operand with a “,” prefix, the instruction will operate on the word indicated by the PLC memory address in the Index Register, not the Index Register itself. Basically, the Index Registers are I/O memory pointers.

- All addresses in I/O memory (except Index Registers, Data Registers, and Condition Flags) can be specified seamlessly with PLC memory addresses. It isn't necessary to specify the data area.
- In addition to basic indirect addressing, the PLC memory address in an Index Register can be offset with a constant or Data Register, auto-incremented, or auto-decremented. These functions can be used in loops to read or write data while incrementing or decrementing the address by one each time that the instruction is executed.

With the offset and increment/decrement variations, the Index Registers can be set to base values with MOVR(560) or MOVRW(561) and then modified as pointers in each instruction.



**Note** It is possible to specify regions outside of I/O memory and generate an Illegal Access Error when indirectly addressing memory with Index Registers. Refer to *Appendix E Memory Map* for details on the limits of PLC memory addresses.

The following table shows the variations available when indirectly addressing I/O memory with Index Registers. (IR□ represents an Index Register from IR0 to IR15.)

| Variation                                | Function                                                                                                                                                                          | Syntax                                                |            | Example                                                                                               |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------|
| Indirect addressing                      | The content of IR□ is treated as the PLC memory address of a bit or word.                                                                                                         | ,IR□                                                  | LD ,IR0    | Loads the bit at the PLC memory address contained in IR0.                                             |
| Indirect addressing with constant offset | The constant prefix is added to the content of IR□ and the result is treated as the PLC memory address of a bit or word.<br>The constant may be any integer from -2,048 to 2,047. | Constant ,IR□<br>(Include a + or - in the constant.)  | LD +5,IR0  | Adds 5 to the contents of IR0 and loads the bit at that PLC memory address.                           |
| Indirect addressing with DR offset       | The content of the Data Register is added to the content of IR□ and the result is treated as the PLC memory address of a bit or word.                                             | DR□,IR□                                               | LD DR0,IR0 | Adds the contents of DR0 to the contents of IR0 and loads the bit at that PLC memory address.         |
| Indirect addressing with auto-increment  | After referencing the content of IR□ as the PLC memory address of a bit or word, the content is incremented by 1 or 2.                                                            | Increment by 1:<br>,IR□+<br>Increment by 2:<br>,IR□++ | LD ,IR0++  | Loads the bit at the PLC memory address contained in IR0 and then increments the content of IR0 by 2. |
| Indirect addressing with auto-decrement  | The content of IR□ is decremented by 1 or 2 and the result is treated as the PLC memory address of a bit or word.                                                                 | Decrement by 1:<br>,-IR□<br>Decrement by 2:<br>,--IR□ | LD ,--IR0  | Decrement the content of IR0 by 2 and then loads the bit at that PLC memory address.                  |

### Example

This example shows how to store the PLC memory address of a word (CIO 0002) in an Index Register (IR0), use the Index Register in an instruction, and use the auto-increment variation.

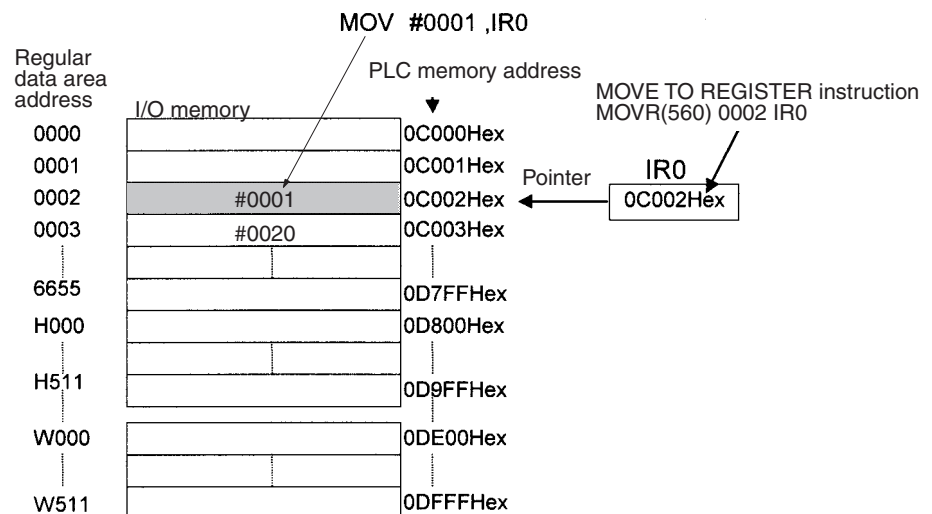
```

MOV(R560) 0002 IR0 Stores the PLC memory address of
CIO 0002 in IR0.

MOV(021) #0001 ,IR0 Writes #0001 to the PLC memory address
contained in IR0.

MOV(021) #0020 +1,IR0 Reads the content of IR0, adds 1,
and writes #0020 to that PLC memory address.

```



**Note** The PLC memory addresses are listed in the diagram above, but it isn't necessary to know the PLC memory addresses when using Index Registers.

Since some operands are treated as word data and others are treated as bit data, the meaning of the data in an Index Register will differ depending on the operand in which it is used.

**1,2,3...**

1. Word Operand:

```
MOVR(560)    0000      IR2
MOV(021)     D00000    , IR2
```

When the operand is treated as a word, the contents of the Index Register are used “as is” as the PLC memory address of a word.

In this example MOVR(560) sets the PLC memory address of CIO 0002 in IR2 and the MOV(021) instruction copies the contents of D00000 to CIO 0002.

2. Bit Operand:

```
MOVR(560)    000013    ,IR2
SET          +5 , IR2
```

When the operand is treated as a bit, the leftmost 7 digits of the Index Register specify the word address and the rightmost digit specifies the bit number. In this example, MOVR(560) sets the PLC memory address of CIO 000013 (0C000D Hex) in IR2. The SET instruction adds +5 from bit 13 to this PLC memory address, so it turns ON bit CIO 000102.

### Index Register Initialization

The Index Registers will be cleared in the following cases:

**1,2,3...**

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.

### IOM Hold Bit Operation

If the IOM Hold Bit (A50012) is ON, the Index Registers won't be cleared when a FALS error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON, and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, and if the Index Registers are not set to be shared between tasks (default setting), Index Registers will be held in the following way when power is interrupted. For tasks that were completed before power was interrupted, the values for the cycle during which power was interrupted will be held. For tasks that were not completed before power was interrupted, the values for the cycle before the cycle during which power was interrupted will be held. For example, in a program with three tasks, tasks 0, 1, and 2, if power is interrupted in the nth cycle during execution of task 1, then the execution result for the nth cycle of task 0 and the execution results for the (n-1)th cycle of tasks 1 and 2 will be held.

If the IOM Hold Bit (A50012) is ON, the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, and the Index Registers are set to be shared between tasks, Index Registers will not be held when the PLC's power supply is reset (ON → OFF → ON). The Index Registers may take undefined values. Be sure to set the values before continuing.

### Forcing Bit Status

Bits in Index Registers cannot be force-set and force-reset.

### Direct Addressing

When an Index Register is used as an operand without a “,” prefix, the instruction will operate on the contents of the Index Register itself (a two-word or “double” value). Index Registers can be directly addressed only in the instructions shown in the following table. Use these instructions to operate on the Index Registers as pointers.

The Index Registers cannot be directly addressed in any other instructions, although they can usually be used for indirect addressing.

| Instruction group                  | Instruction name                            | Mnemonic  |
|------------------------------------|---------------------------------------------|-----------|
| Data Movement Instructions         | MOVE TO REGISTER                            | MOVR(560) |
|                                    | MOVE TIMER/COUNTER PV TO REGISTER           | MOVW(561) |
|                                    | DOUBLE MOVE                                 | MOVL(498) |
|                                    | DOUBLE DATA EXCHANGE                        | XCGL(562) |
| Table Data Processing Instructions | SET RECORD LOCATION                         | SETR(635) |
|                                    | GET RECORD NUMBER                           | GETR(636) |
| Increment/Decrement Instructions   | DOUBLE INCREMENT BINARY                     | ++L(591)  |
|                                    | DOUBLE DECREMENT BINARY                     | --L(593)  |
| Comparison Instructions            | DOUBLE EQUAL                                | =L(301)   |
|                                    | DOUBLE NOT EQUAL                            | <>L(306)  |
|                                    | DOUBLE LESS THAN                            | <L(311)   |
|                                    | DOUBLE LESS THAN OR EQUAL                   | <=L(316)  |
|                                    | DOUBLE GREATER THAN                         | >L(321)   |
|                                    | DOUBLE GREATER THAN OR EQUAL                | >=L(326)  |
|                                    | DOUBLE COMPARE                              | CMPL(060) |
| Symbol Math Instructions           | DOUBLE SIGNED BINARY ADD WITHOUT CARRY      | +L(401)   |
|                                    | DOUBLE SIGNED BINARY SUBTRACT WITHOUT CARRY | -L(411)   |

The SRCH(181), MAX(182), and MIN(183) instructions can output the PLC memory address of the word with the desired value (search value, maximum, or minimum) to IR0. In this case, IR0 can be used in later instructions to access the contents of that word.

## Precautions

Do not use Index Registers until a PLC memory address has been set in the register. The pointer operation will be unreliable if the registers are used without setting their values.

The values in Index Registers are unpredictable at the start of an interrupt task. When an Index Register will be used in an interrupt task, always set a PLC memory address in the Index Register with MOVR(560) or MOVW(561) before using the register in that task.

Each Index Register task is processed independently, so they do not affect each other. For example, IR0 used in Task 1 and IR0 used in Task 2 are different. Consequently, each Index Register task has 16 Index Registers.

## Limitations when Using Index Registers

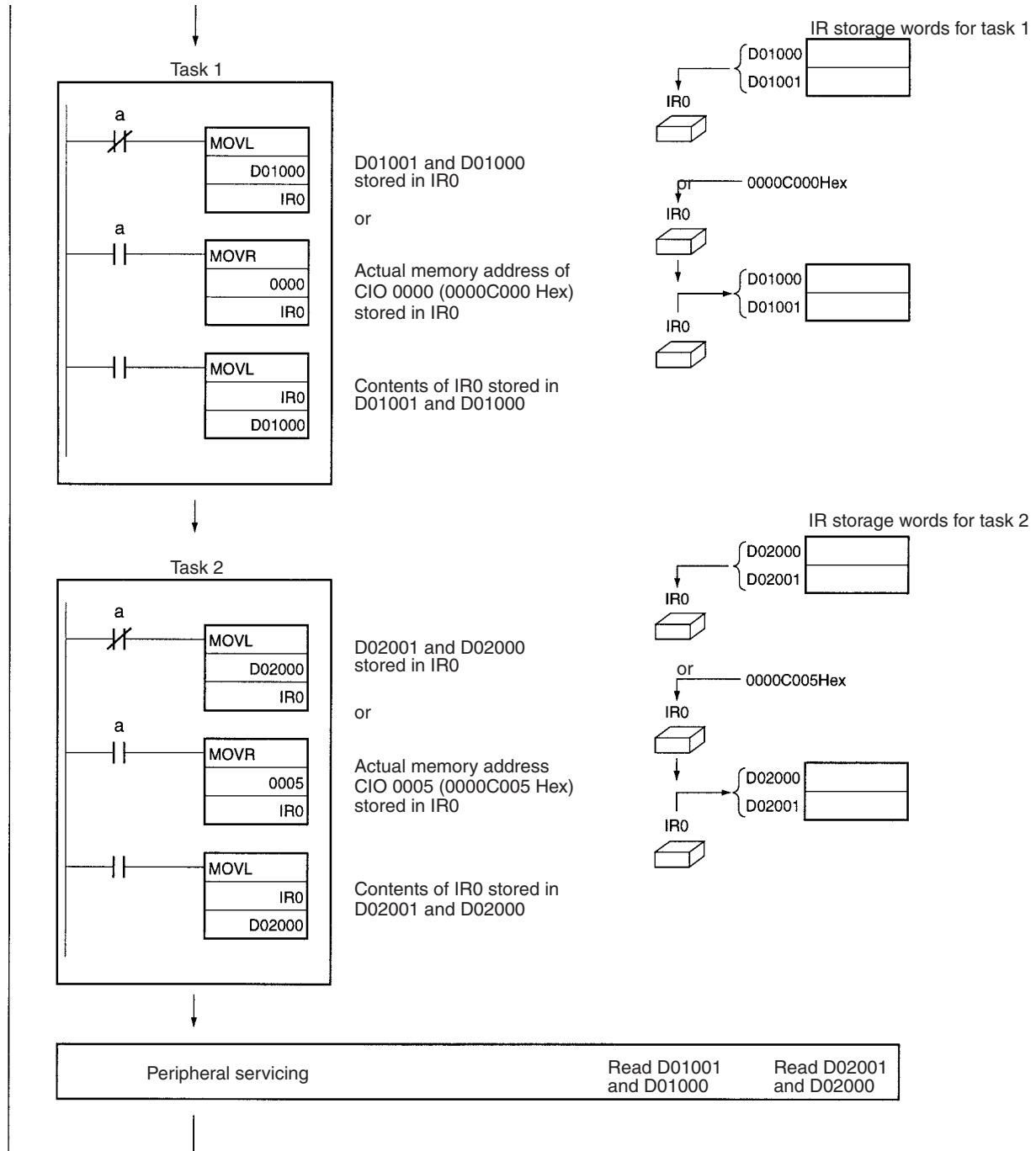
- 1,2,3...** 1. It is only possible to read the Index Register for the last task executed within the cycle from the Programming Devices. If using Index Registers with the same number to perform multiple tasks, it is only possible with the Programming Devices to read the Index Register value for the last task performed within the cycle from the multiple tasks. Nor is it possible to write the Index Register value from the Programming Devices.
2. It is not possible to either read or write to the Index Registers using Host Link commands or FINS commands.
3. The Index Registers cannot share tasks between them for CS1 CPU Units. (With CS1-H CPU Units, a PLC Setup setting can be made from the CX-Programmer to share Index Registers between tasks.)

### Monitoring and Sharing Index Registers

It is possible to monitor or share Index Registers as follows:

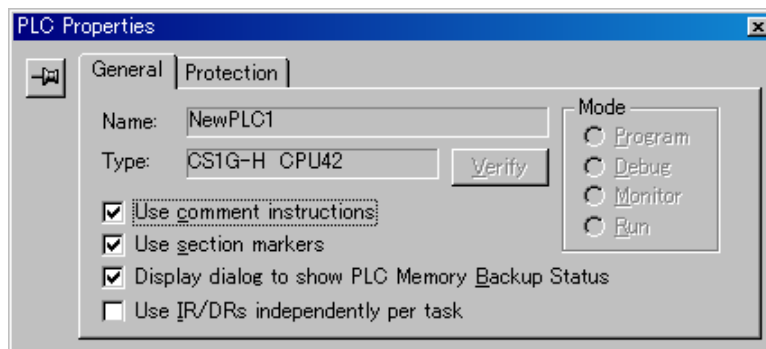
To use the Programming Devices to monitor the final Index Register values for each task, or to monitor the Index Register values using Host Link commands or FINS commands, write a program to store Index Register values from each task to another area (e.g., DM area) at the end of each task, and to read Index Register values from the storage words (e.g., DM area) at the beginning of each task. The values stored for each task in other areas (e.g., DM area) can then be edited using the Programming Devices, Host Link commands, or FINS commands.

**Note** Be sure to use PLC memory addresses in Index Registers.



### Sharing Index Registers with CS1-H CPU Units

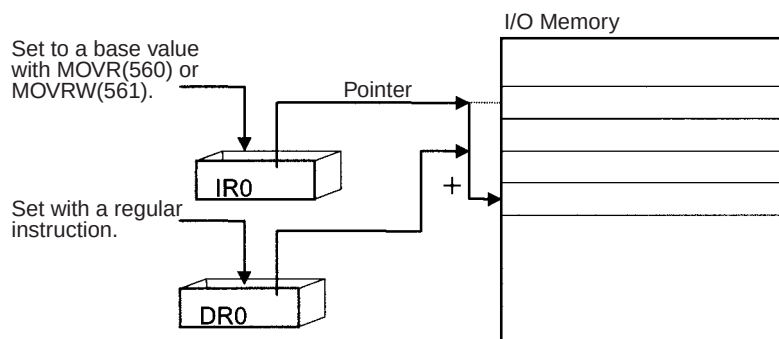
The following setting can be made from the PLC properties dialog box on the CX-Programmer to control sharing index and data registers between tasks.



## 9-23 Data Registers

The sixteen Data Registers (DR0 to DR15) are used to offset the PLC memory addresses in Index Registers when addressing words indirectly.

The value in a Data Register can be added to the PLC memory address in an Index Register to specify the absolute memory address of a bit or word in I/O memory. Data Registers contain signed binary data, so the content of an Index Register can be offset to a lower or higher address.



### Examples

The following examples show how Data Registers are used to offset the PLC memory addresses in Index Registers.

- |                         |                                                                                               |
|-------------------------|-----------------------------------------------------------------------------------------------|
| LD DR0 ,IR0             | Adds the contents of DR0 to the contents of IR0 and loads the bit at that PLC memory address. |
| MOV(021) #0001 DR0 ,IR1 | Adds the contents of DR0 to the contents of IR1 and writes #0001 to that PLC memory address.  |

### Range of Values

The contents of data registers are treated as signed binary data and thus have a range of -32,768 to 32,767.

| Hexadecimal content | Decimal equivalent |
|---------------------|--------------------|
| 8000 to FFFF        | -32,768 to -1      |
| 0000 to 7FFF        | 0 to 32,767        |

### Data Register Initialization

The Data Registers will be cleared in the following cases:

**1,2,3...**

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.

**IOM Hold Bit Operation**

If the IOM Hold Bit (A50012) is ON, the Data Registers won't be cleared when a FALS error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON, and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, and if the Data Registers are not set to be shared between tasks (default setting), Data Registers will be held in the following way when power is interrupted. For tasks that were completed before power was interrupted, the values for the cycle during which power was interrupted will be held. For tasks that were not completed before power was interrupted, the values for the cycle before the cycle during which power was interrupted will be held. For example, in a program with three tasks, tasks 0, 1, and 2, if power is interrupted in the *n*th cycle during execution of task 1, then the execution result for the *n*th cycle of task 0 and the execution results for the (*n*-1)th cycle of tasks 1 and 2 will be held.

If the IOM Hold Bit (A50012) is ON, the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, and the Data Registers are set to be shared between tasks, Data Registers will not be held when the PLC's power supply is reset (ON → OFF → ON). The Data Registers may take undefined values. Be sure to set the values before continuing.

**Forcing Bit Status**

Bits in Data Registers **cannot** be force-set and force-reset.

**Precautions**

Data Registers are normally local to each task. For example, DR0 used in task 1 is different from DR0 used in task 2. (With CS1-H CPU Units, a PLC Setup setting can be made from the CX-Programmer to share Data Registers between tasks.)

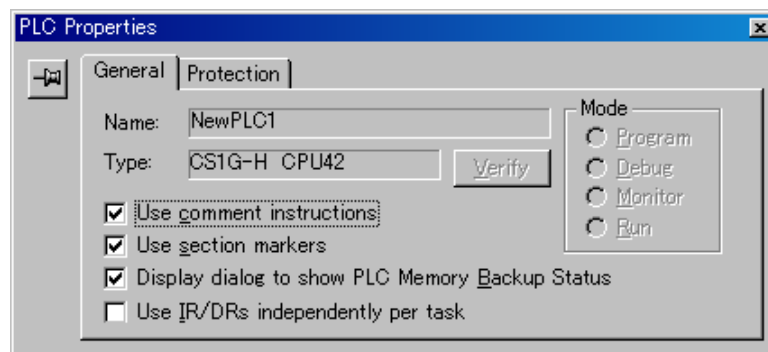
The content of Data Registers cannot be accessed (read or written) from a Programming Device.

Do not use Data Registers until a value has been set in the register. The register's operation will be unreliable if they are used without setting their values.

The values in Data Registers are unpredictable at the start of an interrupt task. When a Data Register will be used in an interrupt task, always set a value in the Data Register before using the register in that task.

**Sharing Data Registers with CS1-H CPU Units**

The following setting can be made from the PLC properties dialog box on the CX-Programmer to control sharing index and data registers between tasks.

**9-24 Task Flags**

Task Flags range from TK00 to TK31 and correspond to cyclic tasks 0 to 31. A Task Flag will be ON when the corresponding cyclic task is in executable (RUN) status and OFF when the cyclic task hasn't been executed (INI) or is in standby (WAIT) status.

|                                 |                                                                                                                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | <b>Note</b> These flags indicate the status of cyclic tasks only (including extra cyclic tasks), they do not reflect the status of interrupt tasks.                                                                                                                                                            |
| <b>Task Flag Initialization</b> | The Task Flags will be cleared in the following cases, regardless of the status of the IOM Hold Bit.<br><br><b>1,2,3...</b> <ol style="list-style-type: none"><li>1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.</li><li>2. The PLC's power supply is cycled.</li></ol> |
| <b>Forcing Bit Status</b>       | The Task Flags <b>cannot</b> be force-set and force-reset.                                                                                                                                                                                                                                                     |

9-25 Condition Flags

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | <p>These flags include the Arithmetic Flags such as the Error Flag and Equals Flag which indicate the results of instruction execution. In earlier PLCs, these flags were in the SR Area.</p> <p>The Condition Flags are specified with labels, such as CY and ER, or with symbols, such as P_Carry and P_Instr_Error, rather than addresses. The status of these flags reflects the results of instruction execution, but the flags are read-only; they cannot be written directly from instructions or Programming Devices.</p> <p><b>Note</b> The CX-Programmer treats condition flags as global symbols beginning with P_.</p> <p>All Condition Flags are cleared when the program switches tasks, so the status of the ER and AER flags are maintained only in the task in which the error occurred.</p> <p>The Condition Flags <b>cannot</b> be force-set and force-reset.</p> |
| <b>Summary of the Condition Flags</b> | The following table summarizes the functions of the Condition Flags, although the functions of these flags will vary slightly from instruction to instruction.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

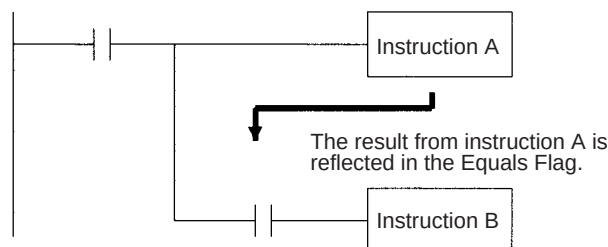


Refer to the description of the instruction for complete details on the operation of the Condition Flags for a particular instruction.

| Name                        | Symbol | Label | Function                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------|--------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Error Flag                  | P_ER   | ER    | Turned ON when the operand data in an instruction is incorrect (an instruction processing error) to indicate that an instruction ended because of an error.<br><br>When the PLC Setup is set to stop operation for an instruction error (Instruction Error Operation), program execution will be stopped and the Instruction Processing Error Flag (A29508) will be turned ON when the Error Flag is turned ON.                      |
| Access Error Flag           | P_AER  | AER   | Turned ON when an Illegal Access Error occurs. The Illegal Access Error indicates that an instruction attempted to access an area of memory that should not be accessed.<br><br>When the PLC Setup is set to stop operation for an instruction error (Instruction Error Operation), program execution will be stopped and the Instruction Processing Error Flag (A429510) will be turned ON when the Access Error Flag is turned ON. |
| Carry Flag                  | P_CY   | CY    | Turned ON when there is a carry in the result of an arithmetic operation or a "1" is shifted to the Carry Flag by a Data Shift instruction.<br><br>The Carry Flag is part of the result of some Data Shift and Symbol Math instructions.                                                                                                                                                                                             |
| Greater Than Flag           | P_GT   | >     | Turned ON when the first operand of a Comparison Instruction is greater than the second or a value exceeds a specified range.                                                                                                                                                                                                                                                                                                        |
| Equals Flag                 | P_EQ   | =     | Turned ON when the two operands of a Comparison Instruction are equal the result of a calculation is 0.                                                                                                                                                                                                                                                                                                                              |
| Less Than Flag              | P_LT   | <     | Turned ON when the first operand of a Comparison Instruction is less than the second or a value is below a specified range.                                                                                                                                                                                                                                                                                                          |
| Negative Flag               | P_N    | N     | Turned ON when the most significant bit (sign bit) of a result is ON.                                                                                                                                                                                                                                                                                                                                                                |
| Overflow Flag               | P_OF   | OF    | Turned ON when the result of calculation overflows the capacity of the result word(s).                                                                                                                                                                                                                                                                                                                                               |
| Underflow Flag              | P_UF   | UF    | Turned ON when the result of calculation underflows the capacity of the result word(s).                                                                                                                                                                                                                                                                                                                                              |
| Greater Than or Equals Flag | P_GE   | >=    | Turned ON when the first operand of a Comparison Instruction is greater than or equal to the second.                                                                                                                                                                                                                                                                                                                                 |
| Not Equal Flag              | P_NE   | < >   | Turned ON when the two operands of a Comparison Instruction are not equal.                                                                                                                                                                                                                                                                                                                                                           |
| Less Than or Equals Flag    | P_LE   | < =   | Turned ON when the first operand of a Comparison Instruction is less than or equal to the second.                                                                                                                                                                                                                                                                                                                                    |
| Always ON Flag              | P_On   | ON    | Always ON. (Always 1.)                                                                                                                                                                                                                                                                                                                                                                                                               |
| Always OFF Flag             | P_Off  | OFF   | Always OFF. (Always 0.)                                                                                                                                                                                                                                                                                                                                                                                                              |

### Using the Condition Flags

The Condition Flags are shared by all of the instructions, so their status may change often in a single cycle. Be sure to read the Condition Flags immediately after the execution of instruction, preferably in a branch from the same execution condition.



| Instruction   | Operand |
|---------------|---------|
| LD            |         |
| Instruction A |         |
| AND           | =       |
| Instruction B |         |

Since the Condition Flags are shared by all of the instructions, program operation can be changed from its expected course by interruption of a single task. Be sure to consider the effects of interrupts when writing the program. Refer

to *SECTION 2 Programming of CS/CJ Series Programmable Controllers (W394)* for more details.

The Condition Flags are cleared when the program switches tasks, so the status of a Condition Flag cannot be passed to another task. For example the status of a flag in task 1 cannot be read in task 2. (The flag's status must be transferred to a bit.)

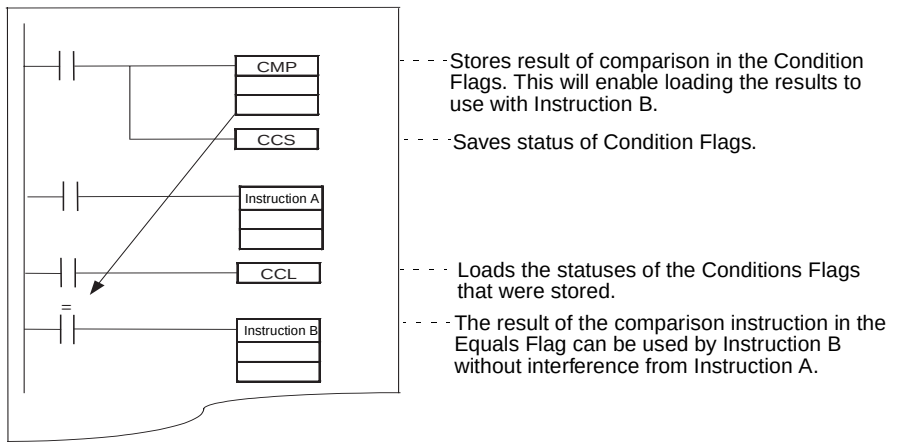
**Note** The condition flags cannot be designated directly in programming or allocations inside C200H Special I/O Units.

**Saving and Loading Condition Flag Status**

The CS1-H CPU Units support instructions to save and load the Condition Flag status (CCS(282) and CCL(283)). These can be used to access the status of the Condition Flags at other locations in a task or in a different task.

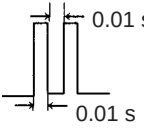
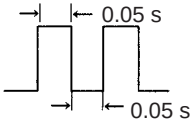
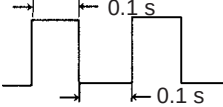
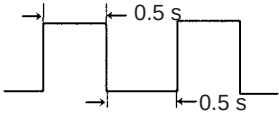
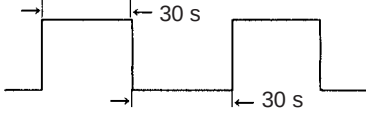
The following example shows how the Equals Flag is used at a different location in the same task.

Task



## 9-26 Clock Pulses

The Clock Pulses are flags that are turned ON and OFF at regular intervals by the system.

| Name               | Label | Symbol   | Operation                                                                           |                                 |
|--------------------|-------|----------|-------------------------------------------------------------------------------------|---------------------------------|
| 0.02 s Clock Pulse | 0.02s | P_0_02_s |    | ON for 0.01 s<br>OFF for 0.01 s |
| 0.1 s Clock Pulse  | 0.1s  | P_0_1s   |    | ON for 0.05 s<br>OFF for 0.05 s |
| 0.2 s Clock Pulse  | 0.2s  | P_0_2s   |    | ON for 0.1 s<br>OFF for 0.1 s   |
| 1 s Clock Pulse    | 1s    | P_1s     |   | ON for 0.5 s<br>OFF for 0.5 s   |
| 1 min Clock Pulse  | 1min  | P_1min   |  | ON for 30 s<br>OFF for 30 s     |

The Clock Pulses are specified with labels (or symbols) rather than addresses.

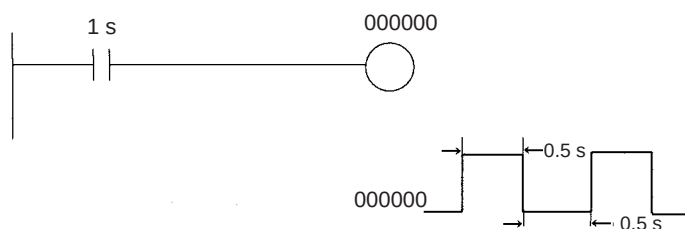
**Note** The CX-Programmer treats condition flags as global symbols beginning with P\_.

The Clock Pulses are read-only; they cannot be overwritten from instructions or Programming Devices.

The Clock Pulses are cleared at the start of operation.

### Using the Clock Pulses

The following example turns CIO 000000 ON and OFF at 0.5 s intervals.



| Instruction | Operand |
|-------------|---------|
| LD          | 1 s     |
| OUT         | 000000  |

**Note** The clock pulses cannot be designated directly in programming or allocations inside C200H Special I/O Units.

## 9-27 Parameter Areas

Unlike the data areas in I/O memory which can be used in instruction operands, the Parameter Area can be accessed only from a Programming Device. The Parameter Area is made up of the following parts.

- The PLC Setup
- The Registered I/O Table
- The Routing Table
- The CPU Bus Unit Settings

### 9-27-1 PLC Setup

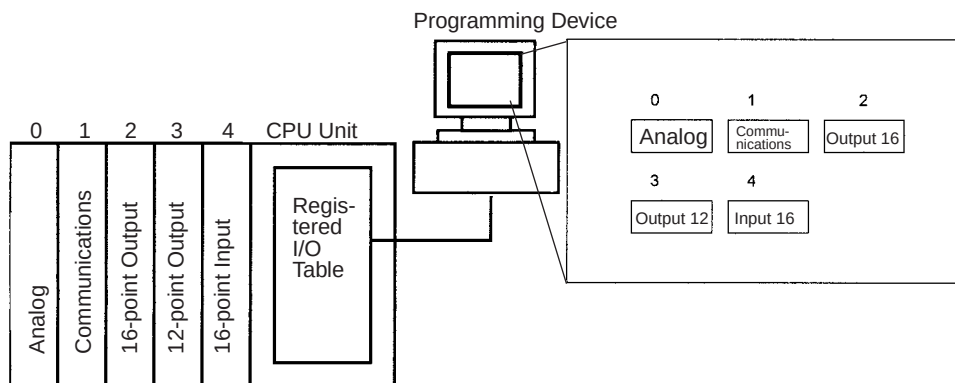
The user can customize the basic specifications of the CPU Unit with the settings in the PLC Setup. The PLC Setup contains settings such as the serial port communications settings and minimum cycle time setting.

Refer to *7-1 PLC Setup* for details on the PLC Setup settings and refer to the Programming Device's Operation Manual for details on changing these settings.

### 9-27-2 Registered I/O Table

The Registered I/O Table is a table in the CPU Unit that contains the information on the model and slot location of all of the Units mounted to the CPU Rack, Expansion I/O Racks, and Slave Racks. The I/O Table is written to the CPU Unit with a Programming Device operation.

The CPU Unit allocates I/O memory to actual I/O points (on Basic I/O Units or Remote I/O Units) and CPU Bus Units based on the information in the Registered I/O Table. Refer to the Programming Device's Operation Manual for details on registering the I/O Table.

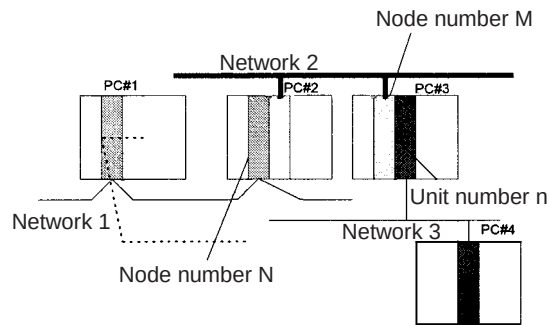


The I/O Verification Error Flag (A40209) will be turned ON if the models and locations of the Units actually mounted to the PLC (CPU Rack, Expansion I/O Racks, and Slave Racks) do not match the information in the Registered I/O Table.

### 9-27-3 Routing Table

When transferring data between networks, it is necessary to create a table in each CPU Unit that shows the communications route from the local PLC's Communications Unit to the other networks. These tables of communications routes are called "Routing Tables."

Create the Routing Tables with a Programming Device or the Controller Link Support Software and transfer the tables to each CPU Unit. The following diagram shows the Routing Tables used for a data transfer from PLC #1 to PLC #4.



1,2,3...

1. Relay Network Table of PLC #1:

| Destination network | Relay network | Relay node |
|---------------------|---------------|------------|
| 3                   | 1             | N          |

2. Relay Network Table of PLC #2:

| Destination network | Relay network | Relay node |
|---------------------|---------------|------------|
| 3                   | 2             | M          |

3. Local Network Table of PLC #3:

| Local network | Unit number |
|---------------|-------------|
| 3             | n           |

**Relay Network Table**

This table lists the network address and node number of the first relay node to contact in order to reach the destination network. The destination network is reached through these relay nodes.

**Local Network Table**

This table lists the network address and unit number of the Communications Unit connected to the local PLC.

These are settings for the CS-series CPU Bus Units which are controlled by the CPU Unit. The actual settings depend on the model of CS-series CPU Bus Unit being used; refer to the Unit's Operation Manual for details.

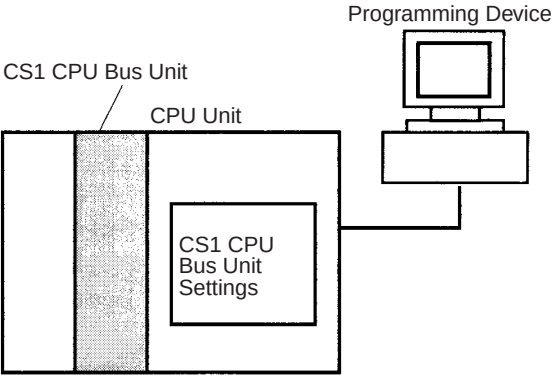
**9-27-4 CPU Bus Unit Settings**

These settings are not managed directly like the I/O memory's data areas, but are set from a Programming Device like the Registered I/O Tables.

Example 1: For Controller Link Units, user-set data link parameters and network parameters are managed as CPU Bus Unit settings.

Example 2: For Ethernet Units, the settings required to operate as an Ethernet node, such as the IP address table, are managed as CPU Bus Unit settings.

Refer to the Programming Device's Operation Manual for details on changing these settings.





## SECTION 10

# CPU Unit Operation and the Cycle Time

This section describes the internal operation of the CPU Unit and the cycle used to perform internal processing.

|         |                                                                 |     |
|---------|-----------------------------------------------------------------|-----|
| 10-1    | CPU Unit Operation . . . . .                                    | 373 |
| 10-1-1  | General Flow. . . . .                                           | 373 |
| 10-1-2  | I/O Refreshing and Peripheral Servicing . . . . .               | 375 |
| 10-1-3  | Initialization at Startup . . . . .                             | 377 |
| 10-2    | CPU Unit Operating Modes . . . . .                              | 378 |
| 10-2-1  | Operating Modes . . . . .                                       | 378 |
| 10-2-2  | Status and Operations in Each Operating Mode. . . . .           | 378 |
| 10-3    | Power OFF Operation . . . . .                                   | 381 |
| 10-3-1  | Overview. . . . .                                               | 381 |
| 10-3-2  | Instruction Execution for Power Interruptions . . . . .         | 383 |
| 10-4    | Computing the Cycle Time . . . . .                              | 385 |
| 10-4-1  | CPU Unit Operation Flowchart . . . . .                          | 385 |
| 10-4-2  | Cycle Time Overview. . . . .                                    | 386 |
| 10-4-3  | I/O Unit Refresh Times for Individual Units and Boards. . . . . | 392 |
| 10-4-4  | Cycle Time Calculation Example. . . . .                         | 398 |
| 10-4-5  | Online Editing Cycle Time Extension . . . . .                   | 399 |
| 10-4-6  | I/O Response Time . . . . .                                     | 399 |
| 10-4-7  | Interrupt Response Times . . . . .                              | 402 |
| 10-5    | Instruction Execution Times and Number of Steps . . . . .       | 403 |
| 10-5-1  | Sequence Input Instructions . . . . .                           | 404 |
| 10-5-2  | Sequence Output Instructions. . . . .                           | 405 |
| 10-5-3  | Sequence Control Instructions . . . . .                         | 406 |
| 10-5-4  | Timer and Counter Instructions . . . . .                        | 406 |
| 10-5-5  | Comparison Instructions. . . . .                                | 407 |
| 10-5-6  | Data Movement Instructions. . . . .                             | 409 |
| 10-5-7  | Data Shift Instructions . . . . .                               | 410 |
| 10-5-8  | Increment/Decrement Instructions . . . . .                      | 411 |
| 10-5-9  | Symbol Math Instructions. . . . .                               | 412 |
| 10-5-10 | Conversion Instructions . . . . .                               | 414 |
| 10-5-11 | Logic Instructions . . . . .                                    | 415 |
| 10-5-12 | Special Math Instructions . . . . .                             | 416 |
| 10-5-13 | Floating-point Math Instructions . . . . .                      | 416 |
| 10-5-14 | Double-precision Floating-point Instructions. . . . .           | 418 |
| 10-5-15 | Table Data Processing Instructions. . . . .                     | 419 |
| 10-5-16 | Data Control Instructions . . . . .                             | 420 |
| 10-5-17 | Subroutine Instructions. . . . .                                | 421 |
| 10-5-18 | Interrupt Control Instructions . . . . .                        | 421 |
| 10-5-19 | Step Instructions . . . . .                                     | 422 |
| 10-5-20 | Basic I/O Unit Instructions . . . . .                           | 422 |



|                                                      |     |
|------------------------------------------------------|-----|
| 10-5-21 Serial Communications Instructions . . . . . | 423 |
| 10-5-22 Network Instructions . . . . .               | 423 |
| 10-5-23 File Memory Instructions . . . . .           | 423 |
| 10-5-24 Display Instructions. . . . .                | 424 |
| 10-5-25 Clock Instructions . . . . .                 | 424 |
| 10-5-26 Debugging Instructions . . . . .             | 424 |
| 10-5-27 Failure Diagnosis Instructions. . . . .      | 424 |
| 10-5-28 Other Instructions . . . . .                 | 425 |
| 10-5-29 Block Programming Instructions . . . . .     | 426 |
| 10-5-30 Text String Processing Instructions. . . . . | 427 |
| 10-5-31 Task Control Instructions . . . . .          | 428 |

## 10-1 CPU Unit Operation

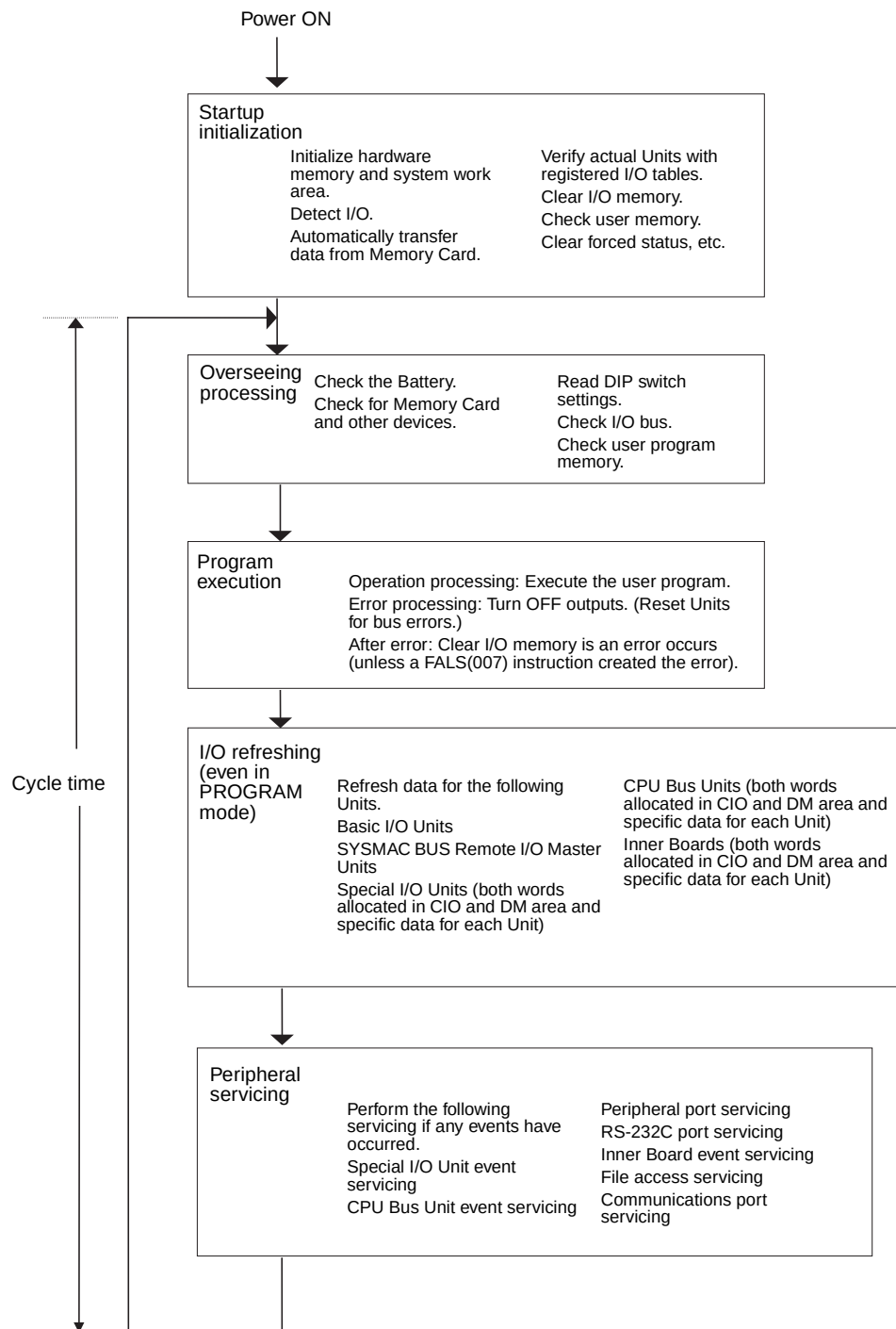
### 10-1-1 General Flow

The following flowchart shows the overall operation of the CPU Unit.

**Note** The CPU Unit's processing mode is set to Normal Mode, Parallel Processing with Synchronous Memory Access, or Parallel Processing with Asynchronous Memory Access in the PLC Setup (Programming Console address 219, bits 08 to 15). This setting is also possible from the CX-Programmer.

#### Normal Mode

In the normal mode, the program is executed before I/O is refreshed and peripherals are serviced. This cycle is executed repeatedly.



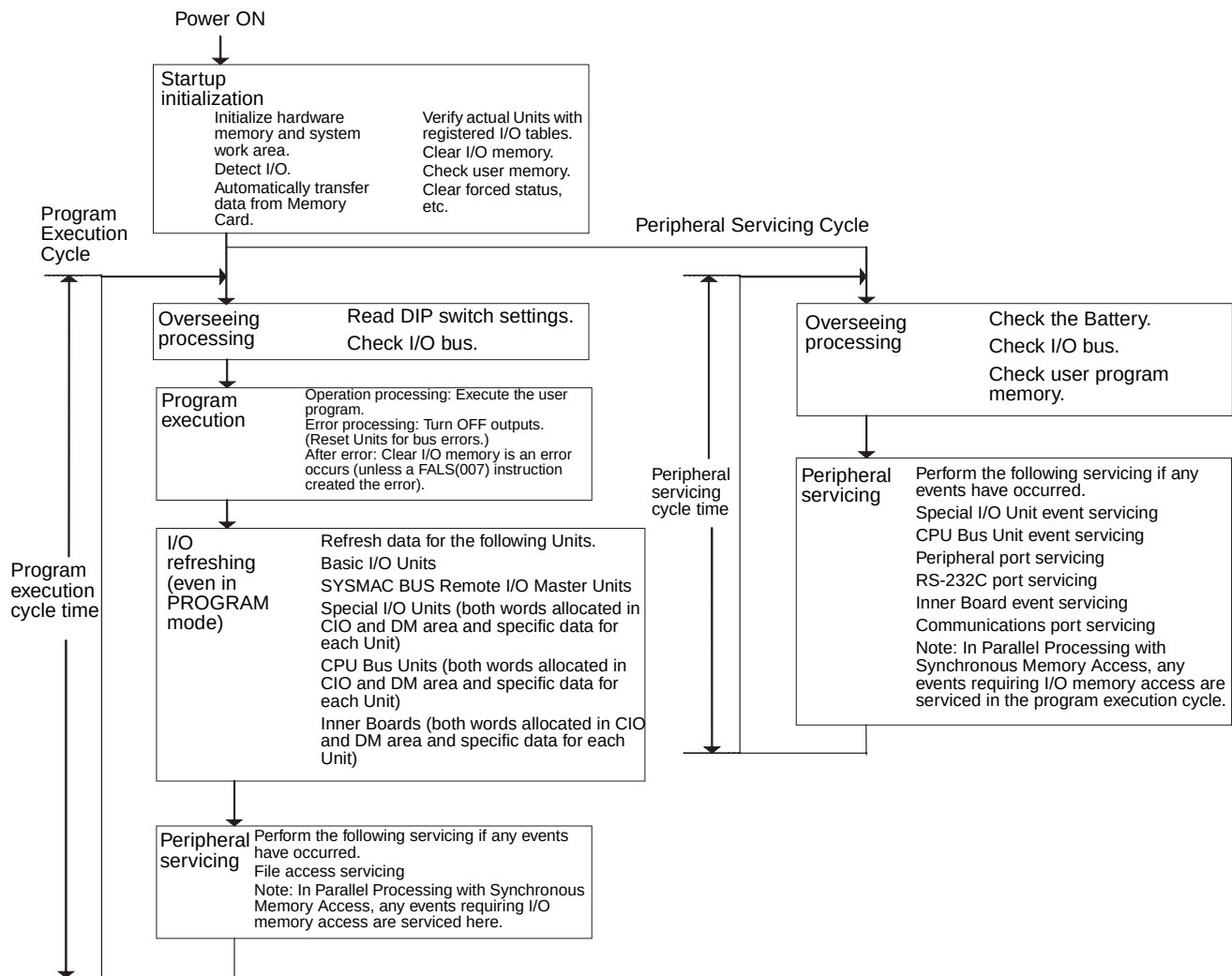
### **Parallel Processing (CS1-H CPU Units Only)**

The following two types of processing are performed in parallel in either of the Parallel Processing Modes.

- 1,2,3...**
1. Program execution: Includes user program execution and I/O refreshing. It is this cycle time that is monitored from a Programming Device.
  2. Peripheral servicing: Programming Devices and events from Special I/O Units and CPU Bus Units are serviced when they occur.

There are two different Parallel Processing Modes. Parallel Processing with Synchronous Memory Access refreshes I/O memory in the program execution

cycle and Parallel Processing with Asynchronous Memory Access refreshes I/O memory in the peripheral servicing cycle.



**Note** Always disconnect the Programming Console from the peripheral port during actual system operation in a Parallel Processing Mode. If the Programming Console is left attached, excess time will be allocated to increase key response for the Programming Console, adversely affecting performance.

## 10-1-2 I/O Refreshing and Peripheral Servicing

### I/O Refreshing

I/O refreshing involves cyclically transferring data with external devices using preset words in memory. I/O refreshing includes the following:

- Refreshing between Basic I/O Units and I/O words in the CIO Area and refreshing between SYSMAC BUS Remote I/O Master Units and SYSMAC BUS and I/O Terminal words in the CIO Area
- Refreshing between Special I/O Units, CPU Bus Units, and Inner Boards, and the words allocated to these in the CIO Area (and for CPU Bus Units, words allocated in the DM Area)
- Refreshing Unit-specific data for Special I/O Units, CPU Bus Units, and Inner Boards.

All I/O refreshing is performed in the same cycle (i.e., time slicing is not used). I/O refreshing is always performed after program execution (even in a Parallel Processing Mode for CS1-H CPU Units).

| Units                                               |                             |                                            | Max. data exchange                   | Data exchange area                                                                    |
|-----------------------------------------------------|-----------------------------|--------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------|
| Basic I/O Units (including C200H Group-2 I/O Units) |                             |                                            | Depends on the Unit.                 | I/O Bit Area                                                                          |
| SYSMAC BUS Remote I/O Master Unit                   |                             |                                            | Depends on the Unit.                 | SYSMAC BUS Area and I/O Terminal Area                                                 |
| Special I/O Units (CS-series and C200H)             | Words allocated in CIO Area |                                            | 10 words/Unit (Depends on the Unit.) | Special I/O Unit Area                                                                 |
|                                                     | Unit-specific data          | C200H DeviceNet Master Unit                | Depends on the Unit.                 | Words set for remote I/O communications (for either fixed or user-set allocations)    |
|                                                     |                             | CompoBus/S Master Unit                     | Depends on the Unit.                 | Special I/O Units Area                                                                |
| CS-series CPU Bus Units                             | Words allocated in CIO Area |                                            | 25 words/Unit                        | CS-series CPU Bus Unit Area                                                           |
|                                                     | Words allocated in DM Area  |                                            | 100 words/Unit                       | CS-series CPU Bus Unit Area                                                           |
|                                                     | Unit-specific data          | Controller Link Unit and SYS-MAC LINK Unit | Depends on the Unit.                 | Words set for data links (for either fixed or user-set allocations)                   |
|                                                     |                             | CS-series DeviceNet Unit                   | Depends on the Unit.                 | Words set for remote I/O communications (for either fixed or user-set allocations)    |
|                                                     |                             | Serial Communications Unit                 | Depends on the protocol macros.      | Communications data set for protocol macros                                           |
|                                                     |                             | Ethernet Unit                              | Depends on the Unit.                 | Communications data for socket services initiated by specific control bit operations. |
| Inner Boards                                        | Words allocated in CIO Area |                                            | 100 words/Unit                       | Inner Board Area                                                                      |
|                                                     | Unit-specific data          | Serial Communications Board                | Depends on the protocol macros.      | Communications data set for protocol macros                                           |

## Peripheral Servicing

Peripheral servicing involves servicing non-scheduled events for external devices. This includes both events from external devices and service requests to external devices.

Most peripheral servicing for CS-series PLCs involved FINS commands. The specific amount of time set in the system is allocated to each type of servicing and executed every cycle. If all servicing cannot be completed within the allocated time, the remaining servicing is performed the next cycle.

| Units                                           | Servicing                                                                                                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Event servicing for CS-series Special I/O Units | Non-scheduled servicing for FINS commands from CS-series Special I/O Units, CS-series CPU Bus Units, and Inner Boards (e.g., requests to start external interrupt tasks) |
| Event servicing for CS-series CPU Bus Units     |                                                                                                                                                                          |
| Event servicing for Inner Boards                |                                                                                                                                                                          |

| Units                         | Servicing                                                                                                                                                                                                                                                 |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Peripheral port servicing     | Non-scheduled servicing for FINS or Host Link commands received via the peripheral or RS-232C ports from Programming Devices, PTs, or host computers (e.g., requests to transfer programming, monitoring, forced-set/reset operations, or online editing) |
| RS-232C port servicing        |                                                                                                                                                                                                                                                           |
|                               | Non-scheduled servicing from the CPU Unit transmitted from the peripheral or RS-232C port (non-solicited communications)                                                                                                                                  |
| Communications port servicing | Servicing to execute network communications, serial communications, or file memory access for the SEND, RECV, CMND or PMCR instructions using communications ports 0 to 7 (internal logical ports)                                                        |
|                               | Servicing to execute background execution using communications ports 0 to 7 (internal logical ports) (CS1-H CPU Unit only)                                                                                                                                |
| File access servicing         | File read/write operations for Memory Cards or EM file memory.                                                                                                                                                                                            |

- Note**
1. CS-series Special I/O Units, CS-series CPU Bus Units, RS-232C communications ports, Inner Boards, and file servicing is allocated 4% of the cycle time by default (the default can be changed). If servicing is separated over many cycles, delaying completion of the servicing, set the same allocated time (same time for all services) rather than a percentage under execute time settings in the PLC Setup.
  2. In either of the Parallel Processing Modes for the CS1-H CPU Unit, all peripheral servicing except for file access is performed in the peripheral servicing cycle.

### 10-1-3 Initialization at Startup

The following initializing processes will be performed once each time the power is turned ON.

- Detect mounted Units.
- Compare the registered I/O tables and the actual Units.
- Clear the non-holding areas of I/O memory according to the status of the IOM Hold Bit. (See note 1.)
- Clear forced status according to the status of the Forced Status Hold Bit. (See note 2.)
- Autoboot using the autotransfer files in the Memory Card if one is inserted.
- Perform self-diagnosis (user memory check).

- Note**
1. The I/O memory is held or cleared according to the status of the IOM Host Bit and the setting for IOM Hold Bit Status at Startup in the PLC Setup (read only when power is turned ON).

| Auxiliary bit                                                                    |             | IOM Hold Bit (A50012)                       |                                            |
|----------------------------------------------------------------------------------|-------------|---------------------------------------------|--------------------------------------------|
| PLC Setup setting                                                                |             | Clear (OFF)                                 | Hold (ON)                                  |
| IOM Hold Bit Status at Startup<br>(Programming Console address: Word 80, bit 15) | Clear (OFF) | At power ON: Clear<br>At mode change: Clear | At power ON: Clear<br>At mode change: Hold |
|                                                                                  | Hold (ON)   |                                             | At power ON: Hold<br>At mode change: Hold  |

Mode Change: Between PROGRAMMING mode and RUN or MONITOR mode

2. The forced status held or cleared according to the status of the Force Status Hold Bit and the setting for Forced Status Hold Bit Status at Startup in the PLC Setup.

| Auxiliary bit                                                                           |             | Forced Status Hold Bit (A50013)             |                                            |
|-----------------------------------------------------------------------------------------|-------------|---------------------------------------------|--------------------------------------------|
| PLC Setup setting                                                                       |             | Clear (OFF)                                 | Hold (ON)                                  |
| Forced Status Hold Bit Status at Startup (Programming Console address: Word 80, bit 14) | Clear (OFF) | At power ON: Clear<br>At mode change: Clear | At power ON: Clear<br>At mode change: Hold |
|                                                                                         | Hold (ON)   |                                             | At power ON: Hold<br>At mode change: Hold  |

Mode Change: Between PROGRAMMING mode and RUN or MONITOR mode

## 10-2 CPU Unit Operating Modes

### 10-2-1 Operating Modes

The CPU Unit has three operating modes that control the entire user program and are common to all tasks.

**PROGRAM:** Programs are not executed and preparations, such as creating I/O tables, initializing the PLC Setup and other settings, transferring programs, checking programs, force-setting and force-resetting can be executed prior to program execution.

**MONITOR:** Programs are executed, but some operations, such as online editing, forced-set/reset, and changes to present values in I/O memory, are enabled for trial operation and other adjustments.

**RUN:** Programs are executed and some operations are disabled.

### 10-2-2 Status and Operations in Each Operating Mode

PROGRAM, RUN, and MONITOR are the three operating modes available in the CPU Unit. The following lists status and operations for each mode.

#### Overall Operation

| Mode    | Program (See note) | I/O refresh | External outputs      | I/O Memory            |               |
|---------|--------------------|-------------|-----------------------|-----------------------|---------------|
|         |                    |             |                       | Non-holding areas     | Holding areas |
| PROGRAM | Stopped            | Executed    | OFF                   | Clear                 | Hold          |
| RUN     | Executed           | Executed    | Controlled by program | Controlled by program |               |
| MONITOR | Executed           | Executed    | Controlled by program | Controlled by program |               |

## Programming Console Operations

| Mode    | Monitor I/O Memory | Monitor Program | Transfer Program          |                           | Check Program | Create I/O Table |
|---------|--------------------|-----------------|---------------------------|---------------------------|---------------|------------------|
|         |                    |                 | PLC to Programming Device | Programming Device to PLC |               |                  |
| PROGRAM | OK                 | OK              | OK                        | OK                        | OK            | OK               |
| MONITOR | OK                 | OK              | OK                        | X                         | X             | X                |
| RUN     | OK                 | OK              | OK                        | X                         | X             | X                |

| Mode    | PLC Setup | Modify Program | Force-set/reset | Changing Timer/Counter SV | Changing Timer/Counter PV | Changing I/O Memory PV |
|---------|-----------|----------------|-----------------|---------------------------|---------------------------|------------------------|
| PROGRAM | OK        | OK             | OK              | OK                        | OK                        | OK                     |
| RUN     | X         | X              | X               | X                         | X                         | X                      |
| MONITOR | X         | OK             | OK              | OK                        | OK                        | OK                     |

**Note** The following table shows the relationship of operating modes to tasks.

| Mode    | Cyclic task status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Interrupt task status                   |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| PROGRAM | Disabled status (INI)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Stopped                                 |
| RUN     | <ul style="list-style-type: none"> <li>Any task that has not yet been executed, will be in disabled status (INI).</li> <li>A task will go to READY status if the task is set to go to READY status at startup or the TASK ON (TKON) instruction has been executed for it.</li> <li>A task in READY status will be executed (RUN status) when it obtains the right to execute.</li> <li>A status will go to Standby status if a READY task is put into Standby status by a TASK OFF (TKOF) instruction.</li> </ul> | Executed if interrupt condition is met. |
| MONITOR |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                         |



## Operating Mode Changes and I/O Memory

| Mode Changes                     | Non-holding areas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Holding Areas                                                                                                                                                                                                             |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  | <ul style="list-style-type: none"> <li>I/O bits</li> <li>Data Link bits</li> <li>CPU Bus Unit bits</li> <li>Special I/O Unit bits</li> <li>Inner Board bits</li> <li>SYSMAC BUS bits</li> <li>I/O Terminal bits</li> <li>C200H Special I/O Unit bits</li> <li>DeviceNet bits</li> <li>Work bits</li> <li>Timer PV/Completion Flags</li> <li>Index Registers</li> <li>Data Registers</li> <li>Task Flags<br/>(Auxiliary Area bits/words are holding or non-holding depending on the address.)</li> </ul> | <ul style="list-style-type: none"> <li>HR Area</li> <li>DM Area</li> <li>EM Area</li> <li>Counter PV and Completion Flags<br/>(Auxiliary Area bits/words are holding or non-holding depending on the address.)</li> </ul> |
| RUN or MONITOR to PROGRAM        | Cleared (See note 1.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Held                                                                                                                                                                                                                      |
| PROGRAM to RUN or MONITOR        | Cleared (See note 1.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Held                                                                                                                                                                                                                      |
| RUN to MONITOR or MONITOR to RUN | Held (See note 2.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Held                                                                                                                                                                                                                      |

- Note**
1. The following processing is performed depending on the status of the I/O Memory Hold Bit. Output from Output Units will be turned OFF when operation stops even if I/O bit status is held in the CPU Unit.
  2. The cycle time will increase by approximately 10 ms when the operating mode is changed from MONITOR to RUN mode. This will not, however, cause an error for exceeding the maximum cycle time limit.

| I/O Memory Hold Bit status (A50012) | I/O Memory                                   |                             |               | Output bits allocated to Output Units        |                             |               |
|-------------------------------------|----------------------------------------------|-----------------------------|---------------|----------------------------------------------|-----------------------------|---------------|
|                                     | Mode changed between PROGRAM and RUN/MONITOR | Operation stopped           |               | Mode changed between PROGRAM and RUN/MONITOR | Operation stopped           |               |
|                                     |                                              | Fatal error other than FALS | FALS executed |                                              | Fatal error other than FALS | FALS executed |
| OFF                                 | Cleared                                      | Cleared                     | Held          | OFF                                          | OFF                         | OFF           |
| ON                                  | Held                                         | Held                        | Held          | Held                                         | OFF                         | OFF           |

**Note** Refer to 9-2 I/O Memory Areas for more details on I/O Memory.

## 10-3 Power OFF Operation

### 10-3-1 Overview

The following processing is performed if CPU Unit power is turned OFF. Power OFF processing will be performed if the power supply falls below 85% of the rated voltage while the CPU Unit is in RUN or MONITOR mode.

- 1,2,3...**
1. The CPU Unit will stop.
  2. Outputs from all Output Units will be turned OFF.

**Note** All output will turn OFF despite an I/O Memory Hold Bit or I/O Memory Hold Bit at power ON settings in the PLC Setup.

85% of the rated voltage:

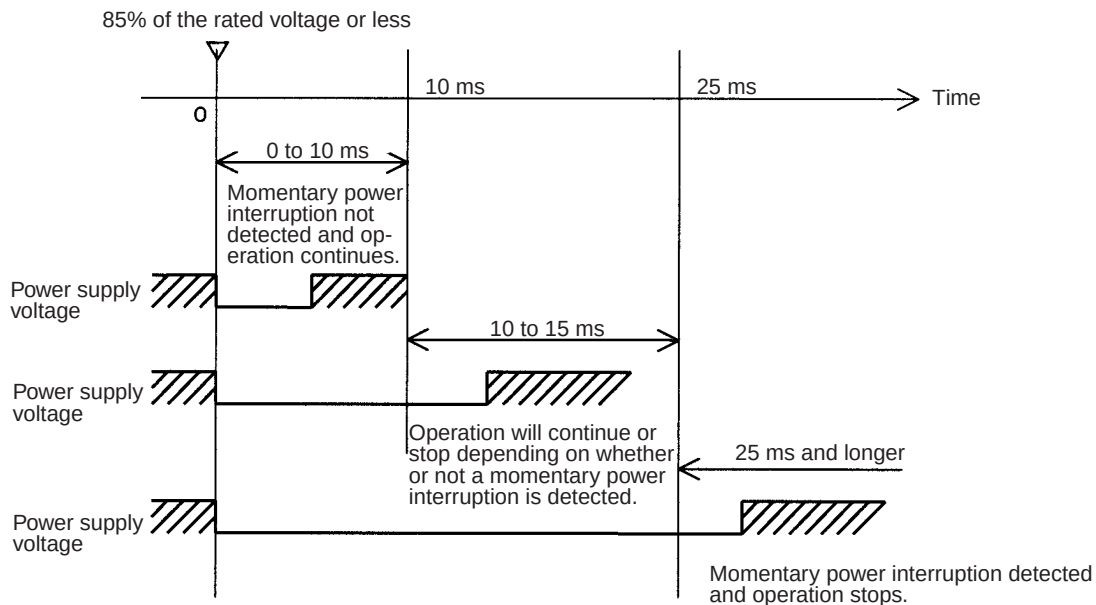
AC power: 85 V for a 100 V AC system and 170 V for a 200 V AC system

DC power: 19.2 V DC

The following processing will be performed if power drops only momentarily (momentary power interruption).

- 1,2,3...**
1. The system will continue to run unconditionally if the momentary power interruption lasts less than 10 ms, i.e., the time it takes the rated voltage at 85% or less to return to 85% or higher is less than 10 ms.
  2. A momentary power interruption that lasts more than 10 ms but less than 25 ms is difficult to determine and a power interruption may or may not be detected.
  3. The system will stop unconditionally if the momentary power interruption lasts more than 25 ms.

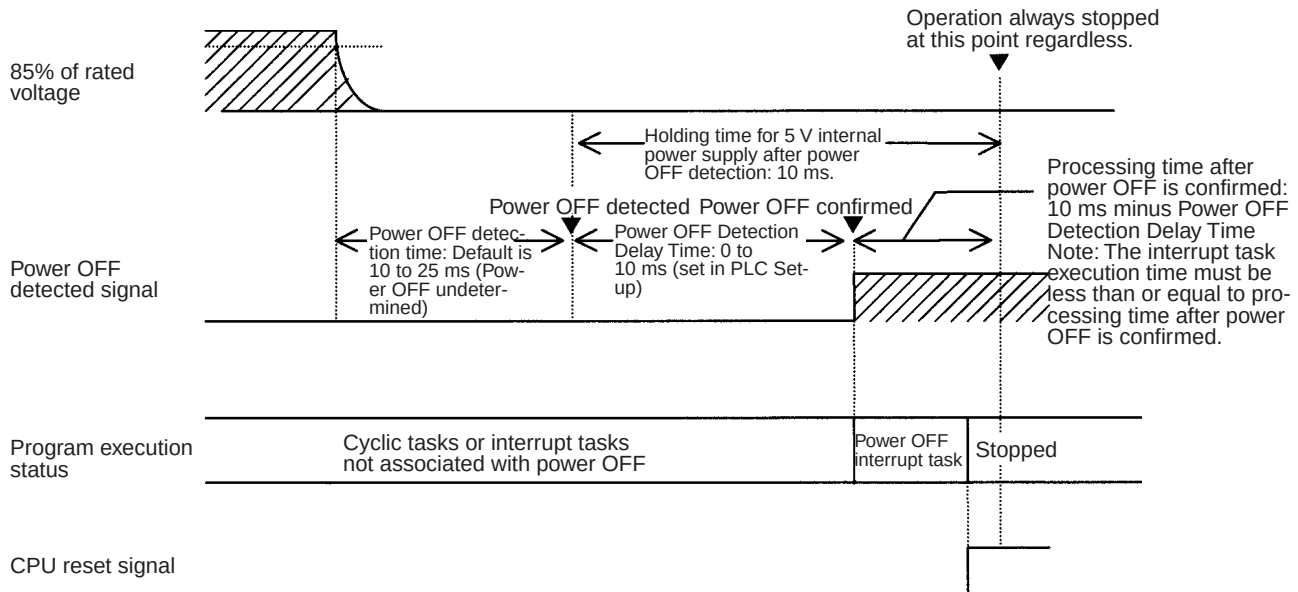
If operation stops under the conditions given in items 2 and 3 above, the timing used to stop operation (or the timing used to start execution of the Power OFF Interrupt Task) can be delayed by setting the Power OFF Detection Delay Time (0 to 10 ms) in the PLC Setup. Operation, however, will always be stopped 10 ms after detecting a momentary power interruption regardless of the setting in the PLC Setup.



**Note** The above timing chart shows an example when the power OFF detection time is set to 0 ms (the default value).

The following timing chart shows the CPU Unit power OFF operation in more detail.

**Power OFF Timing Chart**



#### Power OFF Detection Time

The time it takes to detect power OFF after the power supply falls below 85% of the rated voltage.

#### Power OFF Detection Delay Time

The delay time after power OFF is detected until it is confirmed. This can be set in the PLC Setup within a range from 0 to 10 ms. (The default is 0 ms.)

#### Power Holding Time

The amount of time (fixed at 10 ms) that 5 V will be held internally after power shuts OFF. The time that it takes for the power OFF interrupt task to execute must not exceed 10 ms minus the Power OFF Detection Delay Time (processing time after power OFF is confirmed). The power OFF interrupt task will be ended even if it has not been completely executed the moment this time expires.

### Description of Operation

- 1,2,3...**
  1. Power OFF will be detected if the 100 to 120 V AC, 200 to 240 V AC or 24 V DC power supply falls below 85% of the rated voltage for the power OFF detection time (somewhere between 10 to 25 ms).
  2. If the Power OFF Detection Delay Time is set (0 to 10 ms) in the PLC Set-up, then the following operations will be performed when the set time expires.
    - a) If the power OFF interrupt task is disabled (default PLC Setup setting) The CPU reset signal will turn ON and the CPU will be reset immediately.
    - b) If the power OFF interrupt task is enabled (in the PLC Setup), the CPU reset signal will turn ON and the CPU will be reset after the power OFF interrupt task has been executed. Make sure that the power OFF interrupt task will finish executing within 10 ms minus the Power OFF Detection Delay Time = processing time after power OFF. The 5-V internal power supply will be maintained only for 10 ms after power OFF is detected.

## 10-3-2 Instruction Execution for Power Interruptions

If power is interrupted and the interruption is confirmed when the CPU Unit is operating in RUN or MONITOR mode, the instruction currently being executed will be completed (see note) and the following power interruption processing will be performed.

- If the power OFF interrupt task has not been enabled, the CPU Unit will be reset immediately.
- If the power OFF interrupt task has been enabled, the task will be executed and then the CPU Unit will be reset immediately.

The power OFF interrupt task is enable and disabled in the PLC Setup.

**Note** The current instruction can be completed only when the time required to complete execution is less than or equal to the processing time after power interruption detection (10 ms – power interruption detection delay time). If the instruction is not completed within this time, it will be interrupted and the above processing will be performed.

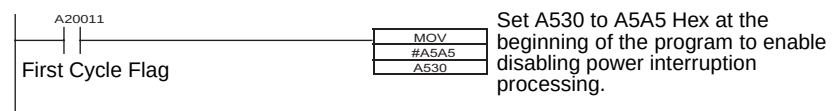
### Disabling Power Interruption Processing in the Program

With CS1-H CPU Units, if the power OFF interrupt task is enabled, areas of the program can be protected from power interruptions so that the instructions will be executed before the CPU Unit performs power OFF processing even if the power supply is interrupted. This is achieved by using the DISABLE INTERRUPTS (DI(693)) and ENABLE INTERRUPTS (EI(694)) instructions.

The following procedure is used.

- 1,2,3...**
1. Insert DI(693) before the program section to be protected to disable interrupts and then place EI(694) after the section to enable interrupts.
  2. Set the Disable Setting for Power OFF Interrupts in A530 to A5A5 Hex to enable disabling power interruption processing.

**Note** A530 is normally cleared when power is turned OFF. To prevent this, the IOM Hold Bit (A50012) must be turned ON and the PLC Setup must be set to maintain the setting of the IOM Hold Bit at Startup, or the following type of instruction must be included at the beginning of the program to set A530 to A5A5 Hex.

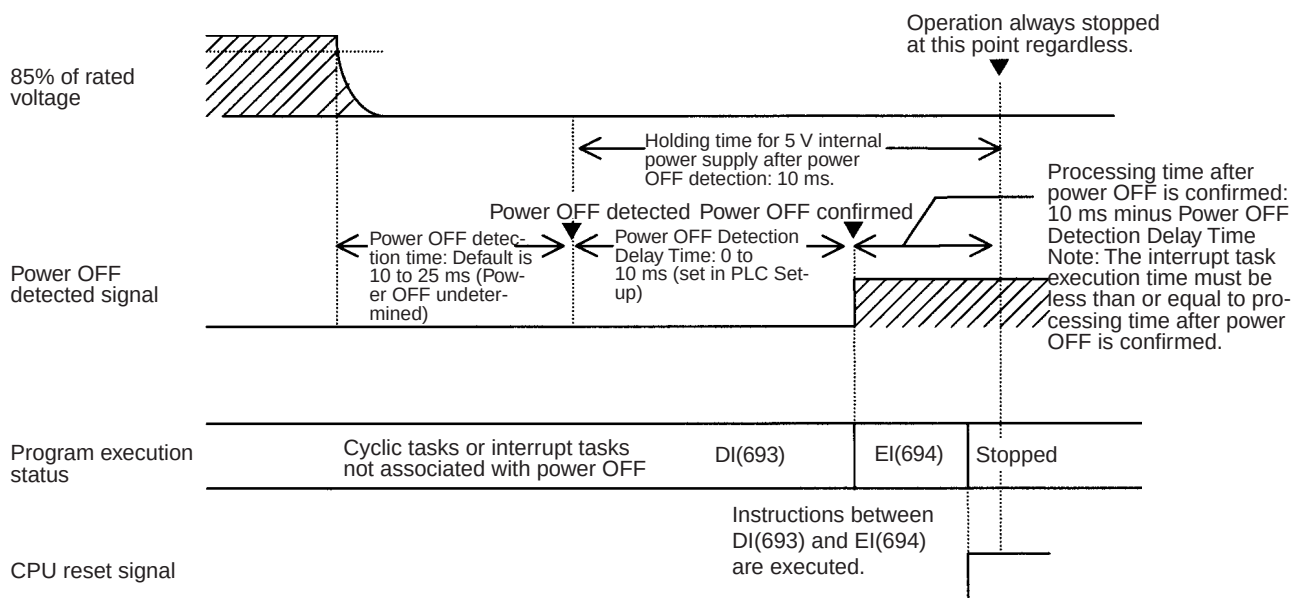


3. Disable the Power OFF Interrupt Task in the PLC Setup.

With the above procedure, all instructions between DI(693) and EI(694) (or END) will be completed (see note 1) before the Power OFF Interrupt is executed even if the power interruption occurs while executing the instructions between DI(693) and EI(694).

- Note**
1. The protected instructions can be completed only when the time required to complete execution is less than or equal to the processing time after power interruption detection (10 ms – power interruption detection delay time). If the instructions is not completed within this time, they will be interrupted and the above processing will be performed.
  2. If the Power OFF Interrupt Task is not disabled in the PLC Setup, the Power OFF Interrupt Task will be executed, and the CPU Unit will be reset without executing the protected instructions as soon as the power interruption is detected.

3. If a power interrupt is detected while DI(693) is being executed, the CPU Unit will be reset without executing the protected instructions.



Interrupt processing is performed according to the contents of A530 and the PLC Setup as shown below.

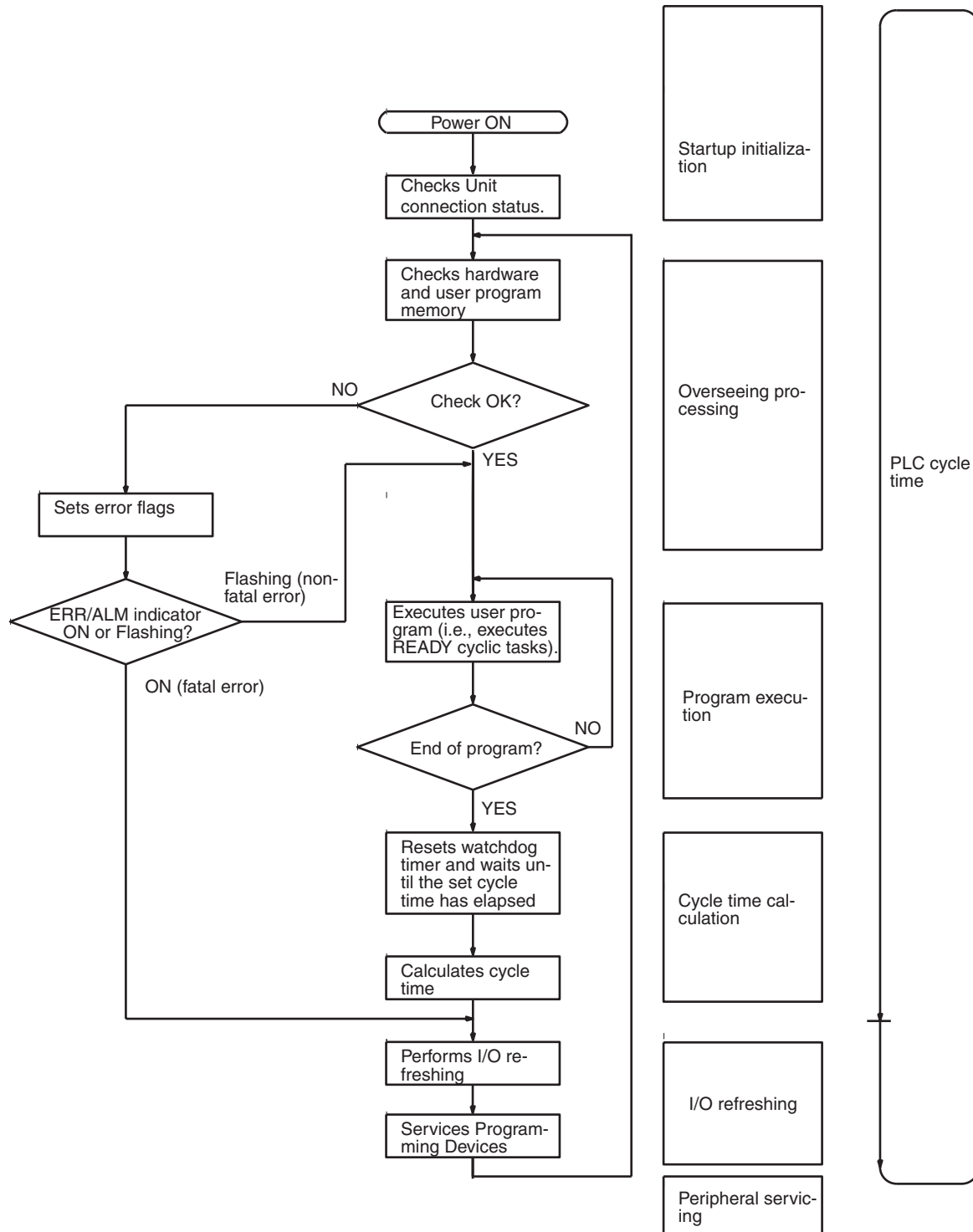
| A530                                 |          | A5A5 Hex (disabling power interrupt processing)                                                                         | Other                                                                        |
|--------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Power OFF Interrupt Task (PLC Setup) | Disabled | All instructions between DI(693) and EI(694) are executed and the CPU Unit is reset.                                    | Execution of the current instruction is completed and the CPU Unit is reset. |
|                                      | Enabled  | Execution of the current instruction is completed, the Power OFF Interrupt Task is executed, and the CPU Unit is reset. |                                                                              |

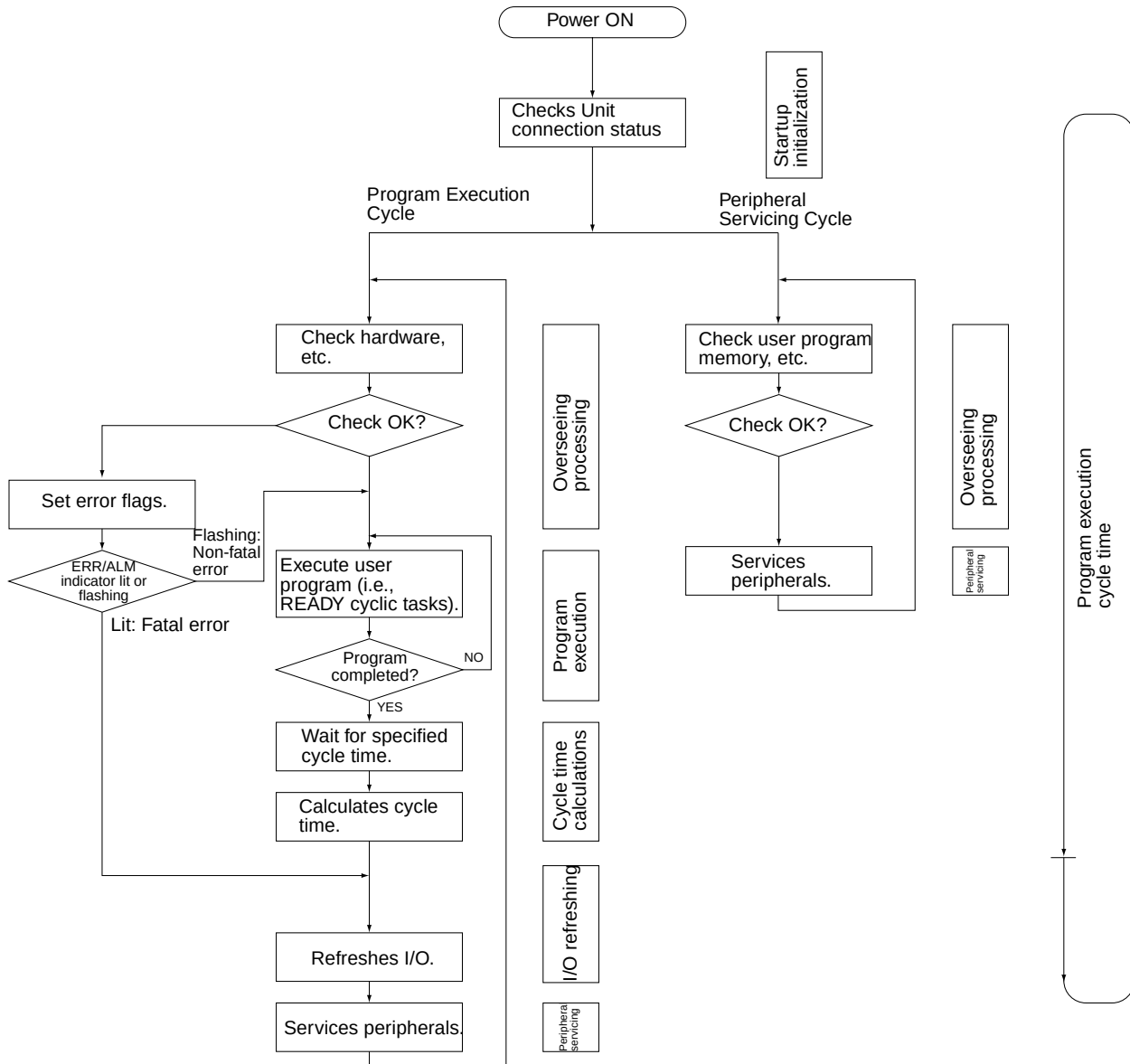
## 10-4 Computing the Cycle Time

### 10-4-1 CPU Unit Operation Flowchart

The CS-series CPU Units process data in repeating cycles from the overseeing processing up to peripheral servicing as shown in the following diagram.

#### Normal Processing Mode



**Parallel Processing Mode****10-4-2 Cycle Time Overview****Normal Processing Mode**

The cycle time depends on the following conditions.

- Type and number of instructions in the user program (in all cyclic tasks that are executed during a cycle, and within interrupt tasks for which the execution conditions have been satisfied).
- Type and number of Basic I/O Units
- Number of SYSMAC BUS Remote I/O Master Units and number of I/O points on the Slaves
- Type and number of Special I/O Units, CS-series CPU Bus Units, Inner Boards, and type of services being executed.
- Specific servicing for the following Units/Boards
  - Data link refreshing and the number of data link words for Controller Link and SYSMAC LINK Units

- Remote I/O for DeviceNet (Master) Units and the number of remote I/O words
- Use of protocol macros and the largest communications message
- Socket services for specific control bits for Ethernet Units and the number of send/receive words
- Fixed cycle time setting in the PLC Setup
- File access in file memory, and the amount of data transferred to/from file memory
- Event servicing for Special I/O Units, CPU Bus Units, Inner Boards, and communications ports
- Use of peripheral and RS-232C ports
- Fixed peripheral servicing time in the PLC Setup

- Note**
1. The cycle time is not affected by the number of tasks that are used in the user program. The tasks that affect the cycle time are those cyclic tasks that are READY in the cycle.
  2. When the mode is switched from MONITOR mode to RUN mode, the cycle time will be extended by 10 ms (this will not, however, take the cycle time over its limit).

The cycle time is the total time required for the PLC to perform the 5 operations shown in the following tables.

$$\text{Cycle time} = (1) + (2) + (3) + (4) + (5)$$

### 1: Overseeing

| Details                                                                                        | Processing time and fluctuation cause          |
|------------------------------------------------------------------------------------------------|------------------------------------------------|
| Checks the I/O bus and user program memory, checks for battery errors and refreshes the clock. | CS1-H CPU Unit: 0.3 ms<br>CS1 CPU Unit: 0.5 ms |

### 2: Program Execution

| Details                                                                                                     | Processing time and fluctuation cause |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Executes the user program, and calculates the total time taken for the instructions to execute the program. | Total instruction execution time      |

### 3: Cycle Time Calculation

| Details                                                                                                                                  | Processing time and fluctuation cause                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Waits for the specified cycle time to elapse when a minimum (fixed) cycle time has been set in the PLC Setup. Calculates the cycle time. | When the cycle time is not fixed, the time for step 3 is approximately 0.<br>When the cycle time is fixed, the time for step 3 is the preset fixed cycle time minus the actual cycle time ((1) + (2) + (4) + (5)). |

### 4: I/O Refreshing

| Details                                             |                                                                                                                                 | Processing time and fluctuation cause                                  |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Basic I/O Units (including C200H Group-2 I/O Units) | Basic I/O Units are refreshed. Outputs from the CPU Unit to the I/O Unit are refreshed first for each Unit, and then inputs.    | I/O refresh time for each Unit multiplied by the number of Units used. |
| SYSMAC BUS Remote I/O Master Unit                   | SYSMAC BUS remote I/O is refreshed. Outputs from the CPU Unit to remote I/O are refreshed first for each Unit, and then inputs. | I/O refresh time for SYSMAC BUS remote I/O system.                     |



| Details           |                                     |                                                                                                                                                                                                                   | Processing time and fluctuation cause                                  |
|-------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Special I/O Units | Words allocated in CIO Area         |                                                                                                                                                                                                                   | I/O refresh time for each Unit multiplied by the number of Units used. |
|                   | Unit- specific data                 | DeviceNet remote I/O for C200H DeviceNet Master Units and CompoBus/S remote I/O                                                                                                                                   |                                                                        |
| CPU Bus Units     | Words allocated in CIO and DM Areas |                                                                                                                                                                                                                   | I/O refresh time for each Unit multiplied by the number of Units used. |
|                   | Unit- specific data                 | Data links for Controller Link and SYSMAC LINK Units, DeviceNet remote I/O for CS-series DeviceNet Units, send/receive data for protocol macros, and socket services for specific control bits for Ethernet Units | I/O refresh time for each Unit multiplied by the number of Units used. |
| Inner Boards      | Words allocated in Inner Board Area |                                                                                                                                                                                                                   | I/O refresh time for each Unit multiplied by the number of Units used. |
|                   | Unit- specific data                 | Example: Send/receive data for protocol macros,                                                                                                                                                                   |                                                                        |

### 5: Peripheral Servicing

| Details                                                                                                               | Processing time and fluctuation cause                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Services events for CS-series Special I/O Units.<br><b>Note</b> Peripheral servicing does not include I/O refreshing, | If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing.<br>If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not.<br>If no Units are mounted, the servicing time is 0 ms.        |
| Services events for CS-series CPU Bus Units.<br><b>Note</b> Peripheral servicing does not include I/O refreshing.     | Same as above.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Services events for peripheral ports.                                                                                 | If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing.<br>If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not.<br>If the ports are not connected, the servicing time is 0 ms. |
| Services RS-232C ports.                                                                                               | Same as above.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Services Inner Board events.                                                                                          | If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing.<br>If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not.<br>If no Inner Boards are mounted, the servicing time is 0 ms. |

| Details                                               | Processing time and fluctuation cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Services file access (Memory Card or EM file memory). | <p>If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing.</p> <p>If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not.</p> <p>If there is no file access, the servicing time is 0 ms.</p>          |
| Services communications ports.                        | <p>If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing.</p> <p>If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not.</p> <p>If no communications ports are used, the servicing time is 0 ms.</p> |

### Parallel Processing with Asynchronous Memory Access

#### Program Execution Cycle

The program execution cycle time depends on the following conditions.

- Type and number of instructions in the user program (in all cyclic tasks that are executed during a cycle, and within interrupt tasks for which the execution conditions have been satisfied).
- Type and number of Basic I/O Units
- Number of SYSMAC BUS Remote I/O Master Units and number of I/O points on the Slaves
- Type and number of Special I/O Units, CS-series CPU Bus Units, Inner Boards, and type of services being executed.
- Specific servicing for the following Units/Boards
  - Data link refreshing and the number of data link words for Controller Link and SYSMAC LINK Units
  - Remote I/O for DeviceNet (Master) Units and the number of remote I/O words
  - Use of protocol macros and the largest communications message
  - Socket services for specific control bits for Ethernet Units and the number of send/receive words
- Fixed cycle time setting in the PLC Setup
- File access in file memory, and the amount of data transferred to/from file memory
- Fixed peripheral servicing time in the PLC Setup

The program execution cycle time is the total time required for the PLC to perform the 5 operations shown in the following tables.

Cycle time = (1) + (2) + (3) + (4) + (5)

| Details |                              |                                     | Processing time and fluctuation cause |
|---------|------------------------------|-------------------------------------|---------------------------------------|
| (1)     | Overseeing                   | I/O bus check, etc.                 | 0.3 ms                                |
| (2)     | Program execution            | Same as for Normal Mode.            | Same as for Normal Mode.              |
| (3)     | Cycle time calculation       | Waits for the specified cycle time. | Same as for Normal Mode.              |
| (4)     | I/O refreshing               | Same as for Normal Processing Mode. | Same as for Normal Processing Mode.   |
| (5)     | Partial peripheral servicing | Servicing file access               | Same as for Normal Processing Mode.   |

**Peripheral Servicing Cycle Time**

The peripheral servicing execution cycle time depends on the following conditions.

- Type and number of Special I/O Units, CS-series CPU Bus Units, Inner Boards, and type of services being executed.
- Type and frequency of event servicing requiring communications ports.
- Use of peripheral and RS-232C ports

The peripheral servicing cycle time is the total time required for the PLC to perform the 5 operations shown in the following tables.

Cycle time = (1) + (2)

| Name |                       | Processing                                                                       | Processing time and fluctuation cause                                                                                                                 |
|------|-----------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)  | Overseeing processing | Checks user program memory, checks for battery errors, etc.                      | 0.2 ms                                                                                                                                                |
| (2)  | Peripheral servicing  | Performs services for the events give at the right, including I/O memory access. | 1.0 ms for each type of service<br>If servicing ends before 1 ms has expired, the next type of servicing will be started immediately without waiting. |
|      |                       | Events with CS-series Special I/O Units (does not include I/O refreshing)        |                                                                                                                                                       |
|      |                       | Events with CS-series CPU Bus Units (does not include I/O refreshing)            |                                                                                                                                                       |
|      |                       | Peripheral port events                                                           |                                                                                                                                                       |
|      |                       | RS-232C port events                                                              |                                                                                                                                                       |
|      |                       | Events with Inner Boards                                                         |                                                                                                                                                       |
|      |                       | Events using communications ports                                                |                                                                                                                                                       |

- Note**
1. The cycle time display on a Programming Device is the Program Execution Cycle Time.
  2. The peripheral service cycle time varies with the event load and number of Units that are mounted. In a Parallel Processing Mode, however, this variation will not affect the program execution cycle time.

**Parallel Processing with Synchronous Memory Access****Program Execution Cycle**

The program execution cycle time depends on the same conditions as the Normal Mode. Partial peripheral servicing ((5) below), however, is restricted to servicing for file and I/O memory access.

The program execution cycle time is the total time required for the PLC to perform the 5 operations shown in the following tables.

Cycle time = (1) + (2) + (3) + (4) + (5)

| Details |                        |                                     | Processing time and fluctuation cause |
|---------|------------------------|-------------------------------------|---------------------------------------|
| (1)     | Overseeing             | I/O bus check, etc.                 | 0.3 ms                                |
| (2)     | Program execution      | Same as for Normal Mode.            | Same as for Normal Mode.              |
| (3)     | Cycle time calculation | Waits for the specified cycle time. | Same as for Normal Mode.              |
| (4)     | I/O refreshing         | Same as for Normal Processing Mode. | Same as for Normal Mode.              |

| Details |                              |                                                                                    |                                                                           | Processing time and fluctuation cause |
|---------|------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------|
| (5)     | Partial peripheral servicing | Servicing file access (Memory Card or EM file memory)                              |                                                                           | Same as for Normal Mode.              |
|         |                              | Performs services for the events give at the right that requires I/O memory access | Events with CS-series Special I/O Units (does not include I/O refreshing) |                                       |
|         |                              |                                                                                    | Events with CS-series CPU Bus Units (does not include I/O refreshing)     |                                       |
|         |                              |                                                                                    | Peripheral port events                                                    |                                       |
|         |                              |                                                                                    | RS-232C port events                                                       |                                       |
|         |                              |                                                                                    | Events with Inner Boards                                                  |                                       |
|         |                              |                                                                                    | Events using communications ports                                         |                                       |

### Peripheral Servicing Cycle Time

The peripheral servicing execution cycle time depends on the same conditions as the Parallel Processing with Asynchronous Memory Access. Peripheral servicing ((2) below), however, is restricted to servicing that does not access I/O memory.

The peripheral servicing cycle time is the total time required for the PLC to perform the 2 operations shown in the following tables.

Cycle time = (1) + (2)

| Name |                       | Processing                                                                                          |                                                                           | Processing time and fluctuation cause                                                                                                                 |
|------|-----------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)  | Overseeing processing | Checks user program memory, checks for battery errors, etc.                                         |                                                                           | 0.2 ms                                                                                                                                                |
| (2)  | Peripheral servicing  | Performs services for the events give at the right, excluding those that require I/O memory access. | Events with CS-series Special I/O Units (does not include I/O refreshing) | 1.0 ms for each type of service<br>If servicing ends before 1 ms has expired, the next type of servicing will be started immediately without waiting. |
|      |                       |                                                                                                     | Events with CS-series CPU Bus Units (does not include I/O refreshing)     |                                                                                                                                                       |
|      |                       |                                                                                                     | Peripheral port events                                                    |                                                                                                                                                       |
|      |                       |                                                                                                     | RS-232C port events                                                       |                                                                                                                                                       |
|      |                       |                                                                                                     | Events with Inner Boards                                                  |                                                                                                                                                       |
|      |                       |                                                                                                     | Events using communications ports                                         |                                                                                                                                                       |

#### Note

1. The cycle time display on a Programming Device is the Program Execution Cycle Time.
2. The peripheral service cycle time varies with the event load and number of Units that are mounted. In a Parallel Processing Mode, however, this variation will not affect the program execution cycle time.

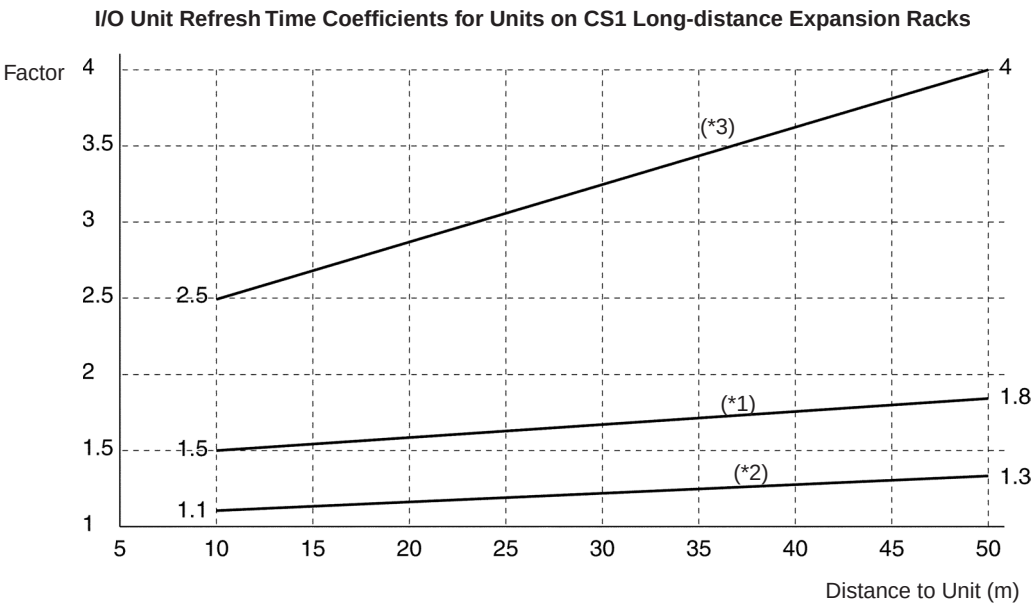
### 10-4-3 I/O Unit Refresh Times for Individual Units and Boards

#### Basic I/O Unit Refresh

| Unit                                                                | Name                      | Model        | I/O refresh time per Unit |
|---------------------------------------------------------------------|---------------------------|--------------|---------------------------|
| C200H Basic I/O Units                                               | 8-point Input Unit        | C200H-ID211  | 0.03 ms                   |
|                                                                     | 8-point Output Unit       | C200H-OC221  | 0.03 ms                   |
|                                                                     | 12-point Output Unit      | C200H-OA224  | 0.03 ms                   |
|                                                                     | 16-point Input Unit       | C200H-ID212  | 0.02 ms                   |
|                                                                     | 16-point Output Unit      | C200H-OD212  | 0.03 ms                   |
|                                                                     | Interrupt Input Unit      | C200HS-INT01 | 0.10 ms                   |
| C200H Group-2 High-density I/O Unit (classified as Basic I/O Units) | 32-point Input Unit       | C200H-ID216  | 0.10 ms                   |
|                                                                     | 32-point Output Unit      | C200H-OD218  | 0.10 ms                   |
|                                                                     | 64-point Input Unit       | C200H-ID217  | 0.20 ms                   |
|                                                                     | 64-point Output Unit      | C200H-OD219  | 0.13 ms                   |
|                                                                     | 32-point B7A Input Units  | C200H-B7A12  | 0.1 ms                    |
|                                                                     | 32-point B7A Output Units | C200H-B7A02  | 0.1 ms                    |
|                                                                     | 16/16-point B7A I/O Units | C200H-B7A21  | 0.1 ms                    |
|                                                                     | 32/32-point B7A I/O Units | C200H-B7A22  | 0.2 ms                    |

| Unit                      | Name                                                                | Model          | I/O refresh time per Unit |
|---------------------------|---------------------------------------------------------------------|----------------|---------------------------|
| CS-series Basic I/O Units | 16-point DC Input Unit                                              | CS1W-ID211     | 0.004 ms (See note.)      |
|                           | 16-point AC Input Unit                                              | CS1W-IA111/211 | 0.004 ms (See note.)      |
|                           | 8/16-point Relay Output Unit                                        | CS1W-OC201/211 | 0.004 ms (See note.)      |
|                           | 8/16-point Triac Output Unit                                        | CS1W-OA201/211 | 0.004 ms (See note.)      |
|                           | 16-point Transistor Output Unit, sinking outputs                    | CS1W-OD211     | 0.004 ms (See note.)      |
|                           | 16-point Transistor Output Unit, sourcing outputs                   | CS1W-OD212     | 0.004 ms (See note.)      |
|                           | 16-point Interrupt Input Unit                                       | CS1W-INT01     | 0.004 ms (See note.)      |
|                           | 16-point High-speed Input Unit                                      | CS1W-IDP01     | 0.004 ms (See note.)      |
|                           | 32-point DC Input Unit                                              | CS1W-ID231     | 0.007 ms (See note.)      |
|                           | 64-point DC Input Unit                                              | CS1W-ID261     | 0.014 ms (See note.)      |
|                           | 96-point DC Input Unit                                              | CS1W-ID291     | 0.02 ms (See note.)       |
|                           | 32-point Transistor Output Unit, sinking outputs                    | CS1W-OD231     | 0.008 ms (See note.)      |
|                           | 32-point Transistor Output Unit, sourcing outputs                   | CS1W-OD232     | 0.008 ms (See note.)      |
|                           | 64-point Transistor Output Unit, sinking outputs                    | CS1W-OD261     | 0.016 ms (See note.)      |
|                           | 64-point Transistor Output Unit, sourcing outputs                   | CS1W-OD262     | 0.016 ms (See note.)      |
|                           | 96-point Transistor Output Unit, sinking outputs                    | CS1W-OD291     | 0.02 ms (See note.)       |
|                           | 96-point Transistor Output Unit, sourcing outputs                   | CS1W-OD292     | 0.02 ms (See note.)       |
|                           | 32-point DC Input/32-point Transistor Output Unit, sourcing outputs | CS1W-MD261     | 0.015 ms (See note.)      |
|                           | 32-point DC Input/32-point Transistor Output Unit, sinking outputs  | CS1W-MD262     | 0.015 ms (See note.)      |
|                           | 48-point DC Input/48-point Transistor Output Unit, sinking outputs  | CS1W-MD291     | 0.02 ms (See note.)       |
|                           | 48-point DC Input/48-point Transistor Output Unit, sourcing outputs | CS1W-MD292     | 0.02 ms (See note.)       |

**Note** Longer I/O refresh times will be required according to the distance from the CPU Rack to the Unit when these Units are mounted to CS-series Long-distance Expansion Racks. Multiply the values given in the table by the factors on line \*1 in the following graph.



Special I/O Unit Refresh

| Unit                    | Name                               | Model                | I/O refresh time per Unit |
|-------------------------|------------------------------------|----------------------|---------------------------|
| C200H Special I/O Units | High-density I/O Units             | C200H-MD215          | 0.5 ms                    |
|                         |                                    | C200H-MD501          | 1.5 ms                    |
|                         | Temperature Control Unit           | C200H-TC□□□□         | 2.6 ms                    |
|                         | Heat/Cool Temperature Control Unit | C200H-TV□□□□         | 2.6 ms                    |
|                         | Temperature Sensor Unit            | C200H-TS□□□□         | 1.0 ms                    |
|                         | PID Control Unit                   | C200H-PID□□□         | 2.6 ms                    |
|                         | ASCII Unit                         | C200H-ASC02          | 1.8 ms                    |
|                         |                                    | C200H-ASC11/21/31    | 0.4 ms                    |
|                         | Analog Input Unit                  | C200H-AD001          | 1.0 ms                    |
|                         |                                    | C200H-AD002          | 1.4 ms                    |
|                         |                                    | C200H-AD003          | 0.7 ms                    |
|                         | Analog Output Unit                 | C200H-DA001/002      | 0.9 ms                    |
|                         |                                    | C200H-DA003/004      | 0.6 ms                    |
|                         | Analog I/O Unit                    | C200H-MAD01          | 0.6 ms                    |
|                         | High-speed Counter Unit            | C200H-CT001-V1/CT002 | 2.4 ms                    |
|                         |                                    | C200H-CT021          | 0.5 ms                    |
|                         | Position Control Unit              | C200H-NC111/112      | 2.2 ms (4.0 ms for read)  |

| Unit                               | Name                              | Model             | I/O refresh time per Unit                                                         |
|------------------------------------|-----------------------------------|-------------------|-----------------------------------------------------------------------------------|
| C200H Special I/O Units, continued | Position Control Unit, continued  | C200H-NC211       | 5.1 ms<br>(6.7 ms for read)                                                       |
|                                    |                                   | C200HW-NC113      | 2.0 ms<br>(2.9 ms for read or write)                                              |
|                                    |                                   | C200HW-NC213      | 2.3 ms<br>(3.2 ms for read or write)                                              |
|                                    |                                   | C200HW-NC413      | 4.3 ms<br>(5.5 ms for read or write)                                              |
|                                    | Motion Control Unit               | C200H-MC221       | 1.2 ms<br>(2.1 ms for read)                                                       |
|                                    | ID Sensor Unit                    | C200H-IDS01-V1/21 | 1.8 ms                                                                            |
|                                    | Cam Positioner Unit               | C200H-CP114       | 2.0 ms                                                                            |
|                                    | Voice Unit                        | C200H-OV001       | 3.4 ms                                                                            |
|                                    | Fuzzy Logic Unit                  | C200H-FZ001       | 1.8 ms                                                                            |
|                                    | PC Link Unit                      | C200H-LK401       | 0.3 ms (connected without data links operating)                                   |
|                                    |                                   |                   | 4.1 ms (for 256 data link points)                                                 |
|                                    |                                   |                   | 7.4 ms (for 512 data link points)                                                 |
|                                    | SYSMAC BUS Remote I/O Master Unit | C200H-RM201       | 1.1 ms x No. of Units + 0.17 x N, where N is the No. of words allocated to slaves |
|                                    |                                   | C200H-RM001-V1    |                                                                                   |
|                                    | C200H DeviceNet Master Unit       | C200HW-DRM21-V1   | 1.72 ms + 0.0022 x number of allocated words                                      |
|                                    | C200H DeviceNet I/O Link Unit     | C200HW-DRT21-V1   | 1.72 ms + 0.0022 x number of allocated words                                      |
|                                    | CompoBus/S Master Unit            | C200HW-SRM21      | 0.4 ms (for the maximum of 16 slaves)                                             |
|                                    |                                   |                   | 0.9 ms (for the maximum of 32 slaves)                                             |



| Unit                        | Name                                              | Model              | I/O refresh time per Unit                                                          |         |
|-----------------------------|---------------------------------------------------|--------------------|------------------------------------------------------------------------------------|---------|
|                             |                                                   |                    | CS1                                                                                | CS1-H   |
| CS-series Special I/O Units | Analog I/O Unit                                   | CS1W-MAD44         | 0.2 ms (See note.)                                                                 | 0.12 ms |
|                             | Analog Input Unit                                 | CS1W-AD041/081     | 0.2 ms (See note.)                                                                 | 0.12 ms |
|                             | Analog Output Unit                                | CS1W-DA041/08V/08C | 0.2 ms (See note.)                                                                 | 0.12 ms |
|                             | Isolated Thermocouple Input Unit                  | CS1W-PTS01         | 0.3 ms                                                                             | 0.16 ms |
|                             | Isolated Resistance Thermometer Input Unit        | CS1W-PTS02         | 0.3 ms                                                                             | 0.16 ms |
|                             | Isolated Ni508Ω Resistance Thermometer Input Unit | CS1W-PTS03         | 0.3 ms                                                                             | 0.16 ms |
|                             | Isolated 2-wire Transmission Device Input Unit    | CS1W-PTW01         | 0.3 ms                                                                             | 0.16 ms |
|                             | Isolated DC Input Unit                            | CS1W-PDC01         | 0.3 ms                                                                             | 0.16 ms |
|                             | Isolated Control Output Unit (Analog Output Unit) | CS1W-PMV01         | 0.3 ms                                                                             | 0.16 ms |
|                             | Power Transducer Input Unit                       | CS1W-PTR01         | 0.3 ms                                                                             | 0.16 ms |
|                             | DC Input Unit (100 mA)                            | CS1W-PTR02         | 0.3 ms                                                                             | 0.16 ms |
|                             | Isolated Pulse Input Unit                         | CS1W-PPS01         | 0.3 ms                                                                             | 0.16 ms |
|                             | Position Control Unit                             | CS1W-NC113/133     | 0.29 ms (+ 0.7 ms for each instruction (IOWR/ IORD) used to transfer data)         |         |
|                             |                                                   | CS1W-NC213/233     | 0.32 ms (+ 0.7 ms for each instruction (IOWR/ IORD) used to transfer data)         |         |
|                             |                                                   | CS1W-NC413/433     | 0.41 ms (+ 0.6 ms for each instruction (IOWR/ IORD) used to transfer data)         |         |
|                             | High-speed Counter Unit                           | CS1W-CT021/041     | 0.2 ms                                                                             | 0.14 ms |
|                             | Motion Control Unit                               | CS1W-MC221         | 0.8 ms (See note.)                                                                 | 0.32 ms |
|                             |                                                   | CS1W-MC421         | 0.85 ms (See note.)                                                                | 0.42 ms |
|                             | Customizable Counter Unit                         | CS1W-HIO01         | 0.2 ms (+ 0.3 ms if if DM Area or LR Area is used for data exchange with CPU Unit) |         |
|                             |                                                   | CS1W-HCP22         |                                                                                    |         |
|                             |                                                   | CS1W-HCA22         |                                                                                    |         |

**Note** Longer increases in the cycle time will occur according to the distance from the CPU Rack to the Unit when these Units are mounted to CS-series Long-distance Expansion Racks. Multiply the values given in the table by the factors on line \*2 in the graph on page 393 for the increases and by the factors

on line \*3 for the additional increases for data link words and send/receive words.

### Increase in Cycle Time Caused by CPU Bus Units

| Name                       | Model         | Increase                                                                                                                | Remarks                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Controller Link Unit       | CS1W-CLK11/21 | CS1: 0.2 ms<br>CS1-H: 0.1 ms<br>(See note 1.)                                                                           | There will be an increase of 1.5 ms + 1 $\mu$ s x number of data link words for CS1 CPU Units and of 0.1 ms + 0.7 $\mu$ s x number of data link words for CS1-H CPU Units. (See note 2.)<br>There will be an additional increase of the event execution times when message services are used.                                                                                                                     |
|                            | CS1W-CLK12/52 | CS1: 0.2 ms<br>CS1-H: 0.1 ms<br>(See note 1.)                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                   |
| SYSMAC LINK                | CS1W-SLK11/21 | CS1: 0.2 ms<br>CS1-H: 0.1 ms<br>(See note 1.)                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Serial Communications Unit | CS1W-SCU21    | CS1: 0.25 ms<br>CS1-H: 0.22 ms<br>(See note 1.)                                                                         | There will be an increase of up to the following time when a protocol macro is executed:<br>CS1 CPU Units: 1.3 ms + 1 $\mu$ s x maximum number of data words sent or received (0 to 500 words)<br>CS1-H CPU Units: 0.1 ms + 0.7 $\mu$ s x maximum number of data words sent or received (0 to 500 words)<br>There will be an increase of the event execution times when Host Links or 1:N NT Links are used.      |
| DeviceNet Unit             | CS1W-DRM21    | CS1: 0.7 ms + 1 $\mu$ s for each allocated word<br>CS1-H: 0.4 ms + 0.7 $\mu$ s for each allocated word<br>(See note 1.) | ---                                                                                                                                                                                                                                                                                                                                                                                                               |
| Ethernet Unit              | CS1W-ETN01/11 | CS1: 0.25 ms<br>CS1-H: 0.1 ms<br>(See note 1.)                                                                          | If socket services are executed with software switches, there will be an increase of 2 $\mu$ s x the number of bytes sent/received for CS1 CPU Units and of 1.4 $\mu$ s x the number of bytes sent/received for CS1-H CPU Units. (See note 2.)<br>There will be an increase of the event execution times when FINS communications services, socket services for CMND instructions, or FTP services are performed. |
| Loop Control Unit          | CS1W-LC001    | CS1: 0.2 ms<br>CS1-H: 0.1 ms<br>(See note 1.)                                                                           | ---                                                                                                                                                                                                                                                                                                                                                                                                               |

#### Note

1. The times given show the performance of the CPU6□H.
2. Longer increases in the cycle time will occur according to the distance from the CPU Rack to the Unit when these Units are mounted to CS-series Long-distance Expansion Racks. Multiply the values given in the table by the factors on line \*2 in the graph on page 393 for the increases and by the factors on line \*3 for the additional increases for data link words and send/receive words

### Increase in Cycle Time Caused by Inner Board

| Name                        | Model         | Increase                       | Remarks                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------|---------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial Communications Board | CS1W-SCB21/41 | CS1: 0.25 ms<br>CS1-H: 0.22 ms | There will be an increase of up to the following time when a protocol macro is executed:<br>CS1 CPU Units: $1 \mu\text{s} \times \text{maximum number of data words sent or received (0 to 500 words)} + 1.3 \text{ ms}$<br>CS1-H CPU Units: $0.7 \mu\text{s} \times \text{maximum number of data words sent or received (0 to 500 words)} + 0.1 \text{ ms}$<br>There will be an increase of the event execution times when Host Links or 1:N NT Links are used. |

### 10-4-4 Cycle Time Calculation Example

The following example shows the method used to calculate the cycle time when Basic I/O Units only are mounted to the PLC with a CS1G-CPU4□H.

#### Conditions

| Item                                                                                                                | Details                          |                                                         |
|---------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------|
| CPU Rack (8 slots)                                                                                                  | CS1W-ID291 96-point Input Units  | 4 Units                                                 |
|                                                                                                                     | CS1W-OD291 96-point Output Units | 4 Units                                                 |
| CS-series Expansion Rack (8 slots) x 1 Unit                                                                         | CS1W-ID291 96-point Input Units  | 4 Units                                                 |
|                                                                                                                     | CS1W-OD291 96-point Output Units | 4 Units                                                 |
| User program                                                                                                        | 5 K steps                        | LD instruction 2.5 K steps, OUT instruction 2.5 K steps |
| Peripheral port connection                                                                                          | Yes and no                       |                                                         |
| Fixed cycle time processing                                                                                         | No                               |                                                         |
| RS-232C port connection                                                                                             | No                               |                                                         |
| Peripheral servicing with other devices (Special I/O Units, CS-series CPU Bus Units, Inner Boards, and file access) | No                               |                                                         |

#### Calculation Example

| Process name               | Calculation                                                     | Processing time         |                            |
|----------------------------|-----------------------------------------------------------------|-------------------------|----------------------------|
|                            |                                                                 | With Programming Device | Without Programming Device |
| (1) Overseeing             | ---                                                             | 0.3 ms                  | 0.3 ms                     |
| (2) Program execution      | $0.04 \mu\text{s} \times 2,500 + 0.04 \mu\text{s} \times 2,500$ | 0.2 ms                  | 0.2 ms                     |
| (3) Cycle time calculation | (Fixed cycle time not set)                                      | 0 ms                    | 0 ms                       |
| (4) I/O refreshing         | $0.02 \text{ ms} \times 8 + 0.02 \text{ ms} \times 8$           | 0.32 ms                 | 0.32 ms                    |
| (5) Peripheral servicing   | (Peripheral port connected only)                                | 0.1 ms                  | 0 ms                       |
| Cycle time                 | (1) + (2) + (3) + (4) + (5)                                     | 0.92 ms                 | 0.82 ms                    |

### 10-4-5 Online Editing Cycle Time Extension

When online editing is executed from a Programming Device (such as Programming Console or CX-Programmer) while the CPU Unit is operating in MONITOR mode to change the program, the CPU Unit will momentarily suspend operation while the program is being changed. The period of time that the cycle time is extended is determined by the following conditions.

- Number of steps changed
- Editing operations (insert/delete/overwrite)
- Types of instructions used

For pre-V1 CS1 CPU Units, the cycle time extension for online editing depends mainly on the size of the program in the largest task. Ideally, tasks should be separated so that one task is 64 Ksteps max.

For CS1 CPU Units of version 1 or later, the cycle time extension for online editing will be negligibly affected by the size of task programs.

If the maximum program size for each task is 64 Ksteps, the online editing cycle time extension will be as follows:

| CPU Unit                  | Increase in cycle time for online editing |
|---------------------------|-------------------------------------------|
| Pre-V1 CS1 CPU Units      | Maximum: 350 ms, Normal: 90 ms            |
| V1 CS1 CPU Units or later | Maximum: 80 ms, Normal: 12 ms             |
| CPU4□H CS1-H CPU Units    | Maximum: 75 ms, Normal: 11 ms             |
| CPU6□H CS1-H CPU Units    | Maximum: 55 ms, Normal: 8 ms              |

When editing online, the cycle time will be extended by the time that operation is stopped.

**Note** When there is one task, online editing is processed all in the cycle time following the cycle in which online editing is executed (written). When there are multiple tasks (cyclic tasks and interrupt tasks), online editing is separated, so that for n tasks, processing is executed over n to n ×2 cycles max.

### 10-4-6 I/O Response Time

The I/O response time is the time it takes from when an Input Unit's input turns ON, the data is recognized by the CS-series CPU Unit, and the user program is executed, up to the time for the result to be output to an Output Unit's output terminals.

The length of the I/O response time depends on the following conditions.

- Timing of Input Bit turning ON.
- Cycle time.
- Type of Rack to which Input and Output Units are mounted (CPU Rack, CPU Expansion Rack, Expansion Rack).

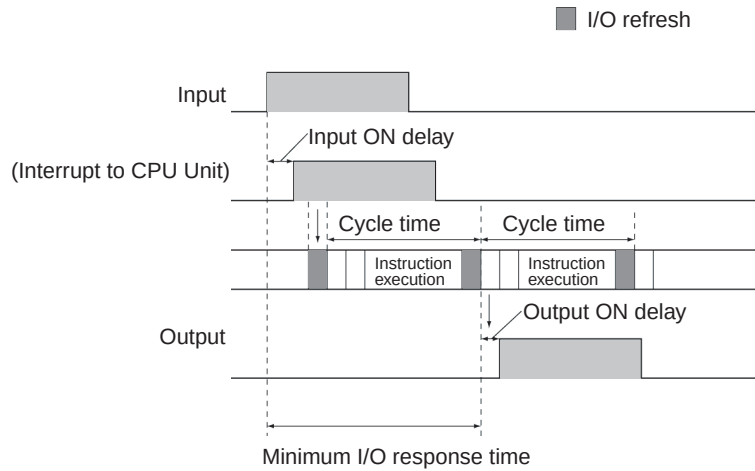
#### Basic I/O Units

##### Minimum I/O Response Time

The I/O response time is shortest when data is retrieved immediately before I/O refresh of the CPU Unit.

The minimum I/O response time is the total of the Input ON delay, the cycle time, and the Output ON delay.

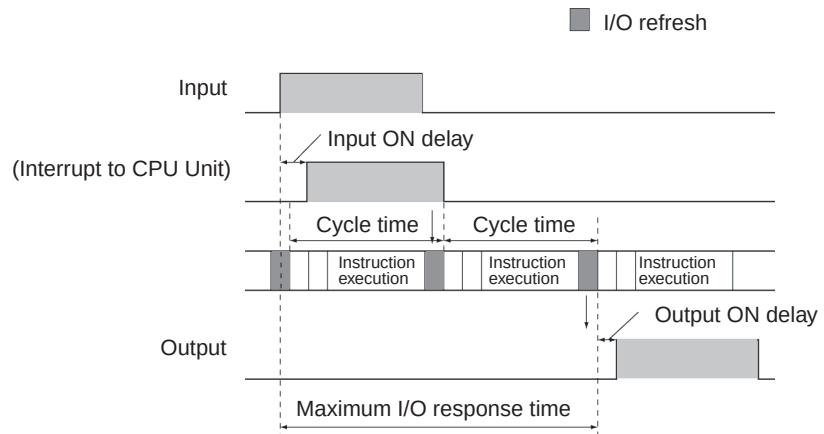
**Note** The Input and Output ON delay differs according to the Unit used.



### Maximum I/O Response Time

The I/O response time is longest when data is retrieved immediately after I/O refresh of the Input Unit.

The maximum I/O response time is the total of the Input ON delay, (the cycle time  $\times 2$ ), and the Output ON delay.



### Calculation Example

|             |                 |         |
|-------------|-----------------|---------|
| Conditions: | Input ON delay  | 1.5 ms  |
|             | Output ON delay | 0.2 ms  |
|             | Cycle time      | 20.0 ms |

Minimum I/O response time = 1.5 ms + 20 ms + 0.2 ms = 21.7 ms

Maximum I/O response time = 1.5 ms + (20 ms  $\times 2$ ) + 0.2 ms = 41.7 ms

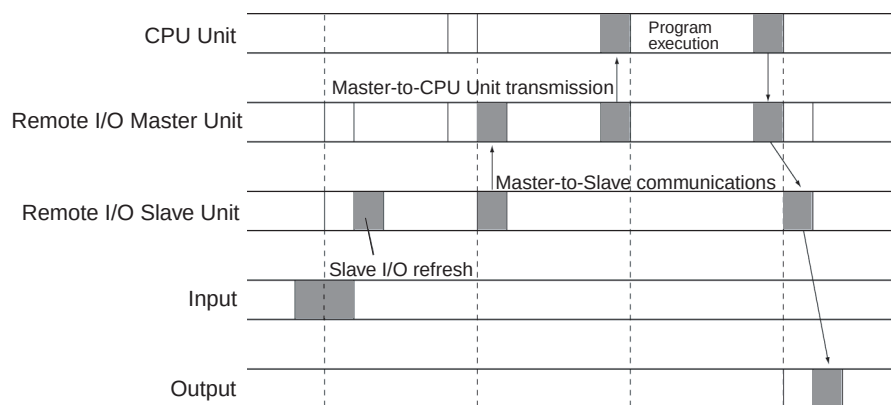
### SYSMAC BUS Remote I/O

The response times for both inputs and outputs are shown here for when Slave Racks are used.

### Minimum Remote I/O Response Time

The minimum I/O response time is the sum of the Input ON delay, (the cycle time  $\times 3$ ), and the Output ON delay.

**Note** The cycle time is longer than the remote I/O transmission time.



Remote I/O transmission time = (Remote I/O Slave transmission time per Slave + I/O Terminal transmission time)  $\times$  2

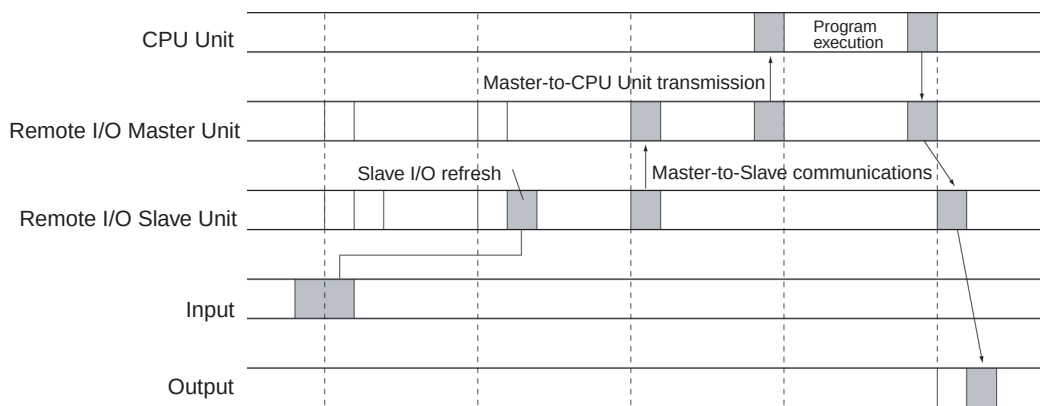
Remote I/O Slave transmission time per Slave = 1.4 ms + 0.2 ms  $\times$  (total number of I/O words on Slave Rack)

I/O Terminal transmission time = 2.0 ms  $\times$  (number of I/O Terminals)

### Maximum Remote I/O Response Time

The maximum I/O response time is the sum of the Input ON delay, (the cycle time  $\times$  4), and the Output ON delay.

**Note** The cycle time is longer than the remote I/O transmission time.



### Calculation Example

Conditions:    Input ON delay            1.5 ms  
                      Output ON delay        0.2 ms  
                      Cycle time                20.0 ms

Minimum I/O response time = 1.5 ms + (20 ms  $\times$  3) + 0.2 ms = 61.7 ms

Maximum I/O response time = 1.5 ms + (20 ms  $\times$  4) + 0.2 ms = 81.7 ms

- When Special I/O Units are mounted to Slave Racks, the cycle time may be less than or equal to the remote I/O transmission time. In this case, I/O refresh may not occur between the CPU Unit and the Remote I/O Master Unit in some cycles.
- Refreshing will be performed for Remote I/O Masters only once in each cycle, and then only after confirming completion of the remote cycle.
- The short duration of ON/OFF status produced by differentiated instructions can cause inaccurate signals.

## 10-4-7 Interrupt Response Times

### I/O Interrupt Tasks

The interrupt response time for I/O interrupt tasks is the time taken from when an input from a CS1W-INT01 or C200HS-INT01 Interrupt Input Unit has turned ON (or OFF) until the I/O interrupt task has actually been executed.

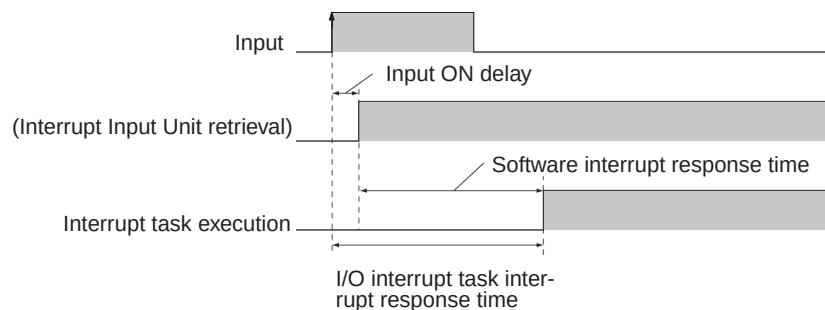
The length of the interrupt response time for I/O interrupt tasks depends on the following conditions.

| Item                        | CPU Unit        | Time                                                                |
|-----------------------------|-----------------|---------------------------------------------------------------------|
| Hardware response           | CS1 CPU Unit    | Upward differentiation: 0.1 ms,<br>Downward differentiation: 0.5 ms |
|                             | CS1-H CPU Units |                                                                     |
| Software interrupt response | CS1 CPU Unit    | 320 $\mu$ s                                                         |
|                             | CS1-H CPU Units |                                                                     |

- Note**
- The software interrupt response time will be 1 ms if there is a C200H Special I/O Unit in the PLC.
    - The C200HS-INT01 Interrupt Input Unit's input ON delay is 0.2 ms maximum.
    - The C200HS-INT01 Interrupt Input Unit's software interrupt response time is 1 ms maximum.
  - I/O interrupt tasks can be executed (while an instruction is being executed, or by stopping the execution of an instruction) during execution of the user program, I/O refresh, peripheral servicing, or overseeing. The interrupt response time is not affected by the Input of the Interrupt Input Unit turning ON during any of the above processing operations.

Some I/O interrupts, however, are not executed during interrupt tasks even if the I/O interrupt conditions are satisfied. Instead, the I/O interrupts are executed in order of priority after the other interrupt task has completed execution and the software interrupt response time (1 ms max.) has elapsed.

The interrupt response time of I/O interrupt tasks is the sum of the Input ON delay (0.2 ms max.) and the software interrupt response time (1 ms max.).



### Scheduled Interrupt Tasks

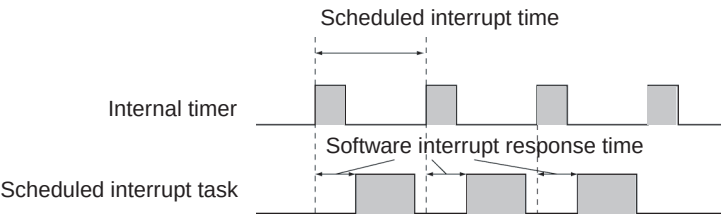
The interrupt response time of scheduled interrupt tasks is the time taken from after the scheduled time specified by the MSKS(690) instruction has elapsed until the interrupt task has actually been executed.

The length of the interrupt response time for scheduled interrupt tasks is 1 ms max.

- Note** Scheduled interrupt tasks can be executed (while an instruction is being executed, or by stopping the execution of an instruction) during execution of the user program, I/O refresh, peripheral servicing, or overseeing. The interrupt response time is not affected by the scheduled time elapsing during any of the above processing operations.

Some scheduled interrupts, however, are not executed during other interrupt tasks even if the scheduled interrupt conditions are satisfied. Instead, the

scheduled interrupts are executed in order of priority after the other interrupt task has completed execution and the software interrupt response time (1 ms max.) has elapsed.



**External Interrupt Tasks** The interrupt response time for external interrupt tasks differs depending on the Unit or Board (Special I/O Unit, CS-series CPU Bus Unit, or Inner Board) that is requesting the external interrupt task of the CPU Unit and the type of service requested by the interrupt. For details, refer to the appropriate operation manual for the Unit or Board being used.

**Power OFF Interrupt Tasks** Power OFF interrupt tasks are executed within 0.1 ms of the power being confirmed as OFF.

10-5 Instruction Execution Times and Number of Steps

The following table lists the execution times for all instructions that are available for CS-series PLCs.

The total execution time of instructions within one whole user program is the process time for program execution when calculating the cycle time (See note.).

**Note** User programs are allocated tasks that can be executed within cyclic tasks and interrupt tasks that satisfy interrupt conditions.

Execution times for most instructions differ depending on the CPU Unit used (CS1□-CPU6□H, CS1□-CPU6□, CS1□-CPU4□H, CS1□-CPU4□) and the conditions when the instruction is executed. The top line for each instruction in the following table shows the minimum time required to process the instruction and the necessary execution conditions, and the bottom line shows the maximum time and execution conditions required to process the instruction.

The execution time can also vary when the execution condition is OFF.

The following table also lists the length of each instruction in the *Length (steps)* column. The number of steps required in the user program area for each of the CS-series instructions varies from 1 to 7 steps, depending upon the instruction and the operands used with it. The number of steps in a program is not the same as the number of instructions.

**Note** 1. Program capacity for CS-series PLCs is measured in steps, whereas program capacity for previous OMRON PLCs, such as the C-series and CV-series PLCs, was measured in words. Basically speaking, 1 step is equivalent to 1 word. The amount of memory required for each instruction, however, is different for some of the CS-series instructions, and inaccuracies will occur if the capacity of a user program for another PLC is converted for a CS-series PLC based on the assumption that 1 word is 1 step. Refer to the information at the end of 10-5 *Instruction Execution Times and Number of Steps* for guidelines on converting program capacities from previous OMRON PLCs.



Most instructions are supported in differentiated form (indicated with ↑, ↓, @, and %). Specifying differentiation will increase the execution times by the following amounts.

| Symbol | CS1-H CPU Units |        | CS1 CPU Units |       |
|--------|-----------------|--------|---------------|-------|
|        | CPU6□H          | CPU4□H | CPU6□         | CPU4□ |
| ↑ or ↓ | +0.24           | +0.32  | +0.41         | +0.45 |
| @ or % | +0.24           | +0.32  | +0.29         | +0.33 |

- Use the following times as guidelines when instructions are not executed.

| CS1-H CPU Units |             | CS1 CPU Units      |                    |
|-----------------|-------------|--------------------|--------------------|
| CPU6□H          | CPU4□H      | CPU6□              | CPU4□              |
| Approx. 0.1     | Approx. 0.2 | Approx. 0.1 to 0.3 | Approx. 0.2 to 0.4 |

## 10-5-1 Sequence Input Instructions

| Instruction   | Mnemonic | Code | Length (steps) | ON execution time (μs) |        |        |        | Conditions             |
|---------------|----------|------|----------------|------------------------|--------|--------|--------|------------------------|
|               |          |      |                | CPU6□H                 | CPU4□H | CPU6□  | CPU4□  |                        |
| LOAD          | LD       | ---  | 1              | 0.02                   | 0.04   | 0.04   | 0.08   | ---                    |
|               | !LD      | ---  | 2              | +21.14                 | +21.16 | +21.16 | +21.16 | Increase for CS Series |
|               |          |      |                | +45.1                  | +45.1  | +45.1  | +45.1  | Increase for C200H     |
| LOAD NOT      | LD NOT   | ---  | 1              | 0.02                   | 0.04   | 0.04   | 0.08   | ---                    |
|               | !LD NOT  | ---  | 2              | +21.14                 | +21.16 | +21.16 | +21.16 | Increase for CS Series |
|               |          |      |                | +45.1                  | +45.1  | +45.1  | +45.1  | Increase for C200H     |
| AND           | AND      | ---  | 1              | 0.02                   | 0.04   | 0.04   | 0.08   | ---                    |
|               | !AND     | ---  | 2              | +21.14                 | +21.16 | +21.16 | +21.16 | Increase for CS Series |
|               |          |      |                | +45.1                  | +45.1  | +45.1  | +45.1  | Increase for C200H     |
| AND NOT       | AND NOT  | ---  | 1              | 0.02                   | 0.04   | 0.04   | 0.08   | ---                    |
|               | !AND NOT | ---  | 2              | +21.14                 | +21.16 | +21.16 | +21.16 | Increase for CS Series |
|               |          |      |                | +45.1                  | +45.1  | +45.1  | +45.1  | Increase for C200H     |
| OR            | OR       | ---  | 1              | 0.02                   | 0.04   | 0.04   | 0.08   | ---                    |
|               | !OR      | ---  | 2              | +21.14                 | +21.16 | +21.16 | +21.16 | Increase for CS Series |
|               |          |      |                | +45.1                  | +45.1  | +45.1  | +45.1  | Increase for C200H     |
| OR NOT        | OR NOT   | ---  | 1              | 0.02                   | 0.04   | 0.04   | 0.08   | ---                    |
|               | !OR NOT  | ---  | 2              | +21.14                 | +21.16 | +21.16 | +21.16 | Increase for CS Series |
|               |          |      |                | +45.1                  | +45.1  | +45.1  | +45.1  | Increase for C200H     |
| AND LOAD      | AND LD   | ---  | 1              | 0.02                   | 0.04   | 0.04   | 0.08   | ---                    |
| OR LOAD       | OR LD    | ---  | 1              | 0.02                   | 0.04   | 0.04   | 0.08   | ---                    |
| NOT           | NOT      | 520  | 1              | 0.02                   | 0.04   | 0.04   | 0.08   | ---                    |
| CONDITION ON  | UP       | 521  | 3              | 0.3                    | 0.42   | 0.46   | 0.54   | ---                    |
| CONDITION OFF | DOWN     | 522  | 4              | 0.3                    | 0.42   | 0.46   | 0.54   | ---                    |

| Instruction       | Mnemonic | Code | Length<br>(steps) | ON execution time (μs) |        |       |       | Conditions |
|-------------------|----------|------|-------------------|------------------------|--------|-------|-------|------------|
|                   |          |      |                   | CPU6□H                 | CPU4□H | CPU6□ | CPU4□ |            |
| LOAD BIT TEST     | LD TST   | 350  | 4                 | 0.14                   | 0.24   | 0.25  | 0.37  | ---        |
| LOAD BIT TEST NOT | LD TSTN  | 351  | 4                 | 0.14                   | 0.24   | 0.25  | 0.37  | ---        |
| AND BIT TEST NOT  | AND TSTN | 351  | 4                 | 0.14                   | 0.24   | 0.25  | 0.37  | ---        |
| OR BIT TEST       | OR TST   | 350  | 4                 | 0.14                   | 0.24   | 0.25  | 0.37  | ---        |
| OR BIT TEST NOT   | OR TSTN  | 351  | 4                 | 0.14                   | 0.24   | 0.25  | 0.37  | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-2 Sequence Output Instructions

| Instruction        | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions             |
|--------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------------------|
|                    |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                        |
| OUTPUT             | OUT      | ---  | 1                                | 0.02                   | 0.04    | 0.17   | 0.21   | ---                    |
|                    | !OUT     | ---  | 2                                | +21.37                 | +21.37  | +21.37 | +21.37 | Increase for CS Series |
|                    |          |      |                                  | +49.3                  | +49.3   | +49.3  | +49.3  | Increase for C200H     |
| OUTPUT NOT         | OUT NOT  | ---  | 1                                | 0.02                   | 0.04    | 0.17   | 0.21   | ---                    |
|                    | !OUT NOT | ---  | 2                                | +21.37                 | +21.37  | +21.37 | +21.37 | Increase for CS Series |
|                    |          |      |                                  | +49.3                  | +49.3   | +49.3  | +49.3  | Increase for C200H     |
| KEEP               | KEEP     | 011  | 1                                | 0.06                   | 0.08    | 0.25   | 0.29   | ---                    |
| DIFFERENTIATE UP   | DIFU     | 013  | 2                                | 0.24                   | 0.40    | 0.46   | 0.54   | ---                    |
| DIFFERENTIATE DOWN | DIFD     | 014  | 2                                | 0.24                   | 0.40    | 0.46   | 0.54   | ---                    |
| SET                | SET      | ---  | 1                                | 0.02                   | 0.06    | 0.17   | 0.21   | ---                    |
|                    | !SET     | ---  | 2                                | +21.37                 | +21.37  | +21.37 | +21.37 | Increase for CS Series |
|                    |          |      |                                  | +49.3                  | +49.3   | +49.3  | +49.3  | Increase for C200H     |
| RESET              | RSET     | ---  | 1                                | 0.02                   | 0.06    | 0.17   | 0.21   | Word specified         |
|                    | !RSET    | ---  | 2                                | +21.37                 | +21.37  | +21.37 | +21.37 | Increase for CS Series |
|                    |          |      |                                  | +49.3                  | +49.3   | +49.3  | +49.3  | Increase for C200H     |
| MULTIPLE BIT SET   | SETA     | 530  | 4                                | 5.8                    | 6.1     | 7.8    | 7.8    | With 1-bit set         |
|                    |          |      |                                  | 25.7                   | 27.2    | 38.8   | 38.8   | With 1,000-bit set     |
| MULTIPLE BIT RESET | RSTA     | 531  | 4                                | 5.7                    | 6.1     | 7.8    | 7.8    | With 1-bit reset       |
|                    |          |      |                                  | 25.8                   | 27.1    | 38.8   | 38.8   | With 1,000-bit reset   |
| SINGLE BIT SET     | SETB     | 532  | 2                                | 0.24                   | 0.34    | ---    | ---    | ---                    |
|                    | !SETB    |      | 3                                | +21.44                 | +21.54  | ---    | ---    | ---                    |
| SINGLE BIT RESET   | RSTB     | 534  | 2                                | 0.24                   | 0.34    | ---    | ---    | ---                    |
|                    | !RSTB    |      | 3                                | +21.44                 | +21.54  | ---    | ---    | ---                    |

| Instruction          | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|----------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                      |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| SINGLE BIT<br>OUTPUT | OUTB     | 534  | 2                                | 0.22                   | 0.32    | ---    | ---    | ---        |
|                      | !OUTB    |      | 3                                | +21.42                 | +21.52  | ---    | ---    | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-3 Sequence Control Instructions

| Instruction                  | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                           |
|------------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|--------------------------------------|
|                              |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                                      |
| END                          | END      | 001  | 1                                | 5.5                    | 6.0     | 4.0    | 4.0    | ---                                  |
| NO OPERA-<br>TION            | NOP      | 000  | 1                                | 0.02                   | 0.04    | 0.08   | 0.12   | ---                                  |
| INTERLOCK                    | IL       | 002  | 1                                | 0.06                   | 0.06    | 0.12   | 0.12   | ---                                  |
| INTERLOCK<br>CLEAR           | ILC      | 003  | 1                                | 0.06                   | 0.06    | 0.12   | 0.12   | ---                                  |
| JUMP                         | JMP      | 004  | 2                                | 0.38                   | 0.48    | 8.1    | 8.1    | ---                                  |
| JUMP END                     | JME      | 005  | 2                                | ---                    | ---     | ---    | ---    | ---                                  |
| CONDI-<br>TIONAL<br>JUMP     | CJP      | 510  | 2                                | 0.38                   | 0.48    | 7.4    | 7.4    | When JMP con-<br>dition is satisfied |
| CONDI-<br>TIONAL<br>JUMP NOT | CJPN     | 511  | 2                                | 0.38                   | 0.48    | 8.5    | 8.5    | When JMP con-<br>dition is satisfied |
| MULTIPLE<br>JUMP             | JMP0     | 515  | 1                                | 0.06                   | 0.06    | 0.12   | 0.12   | ---                                  |
| MULTIPLE<br>JUMP END         | JME0     | 516  | 1                                | 0.06                   | 0.06    | 0.12   | 0.12   | ---                                  |
| FOR LOOP                     | FOR      | 512  | 2                                | 0.52                   | 0.54    | 0.12   | 0.21   | Designating a<br>constant            |
| BREAK<br>LOOP                | BREAK    | 514  | 1                                | 0.06                   | 0.06    | 0.12   | 0.12   | ---                                  |
| NEXT LOOP                    | NEXT     | 513  | 1                                | 0.18                   | 0.16    | 0.17   | 0.17   | When loop is<br>continued            |
|                              |          |      |                                  | 0.22                   | 0.40    | 0.12   | 0.12   | When loop is<br>ended                |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-4 Timer and Counter Instructions

| Instruction         | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|---------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                     |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| TIMER               | TIM      | ---  | 3                                | 0.56                   | 0.88    | 0.37   | 0.42   | ---        |
|                     | TIMX     | 550  | 3                                | 0.56                   | 0.88    | ---    | ---    | ---        |
| COUNTER             | CNT      | ---  | 3                                | 0.56                   | 0.88    | 0.37   | 0.42   | ---        |
|                     | CNTX     | 546  | 3                                | 0.56                   | 0.88    | ---    | ---    | ---        |
| HIGH-SPEED<br>TIMER | TIMH     | 015  | 3                                | 0.88                   | 1.14    | 0.37   | 0.42   | ---        |
|                     | TIMHX    | 551  | 3                                | 0.88                   | 1.14    | ---    | ---    | ---        |
| ONE-MS<br>TIMER     | TMHH     | 540  | 3                                | 0.86                   | 1.12    | 0.37   | 0.42   | ---        |
|                     | TMHHX    | 552  | 3                                | 0.86                   | 1.12    | ---    | ---    | ---        |

| Instruction         | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |         |         | Conditions                 |
|---------------------|----------|------|----------------------------------|------------------------|---------|---------|---------|----------------------------|
|                     |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□  | CPU-4□  |                            |
| ACCUMULATIVE TIMER  | TTIM     | 087  | 3                                | 16.1                   | 17.0    | 21.4    | 21.4    | ---                        |
|                     |          |      |                                  | 10.9                   | 11.4    | 14.8    | 14.8    | When resetting             |
|                     |          |      |                                  | 8.5                    | 8.7     | 10.7    | 10.7    | When interlocking          |
|                     | TTIMX    | 555  | 3                                | 16.1                   | 17.0    | ---     | ---     | ---                        |
|                     |          |      |                                  | 10.9                   | 11.4    | ---     | ---     | When resetting             |
|                     |          |      |                                  | 8.5                    | 8.7     | ---     | ---     | When interlocking          |
| LONG TIMER          | TIML     | 542  | 4                                | 7.6                    | 10.0    | 12.8    | 12.8    | ---                        |
|                     |          |      |                                  | 6.2                    | 6.5     | 7.8     | 7.8     | When interlocking          |
|                     | TIMLX    | 553  | 4                                | 7.6                    | 10.0    | ---     | ---     | ---                        |
|                     |          |      |                                  | 6.2                    | 6.5     | ---     | ---     | When interlocking          |
| MULTI-OUTPUT TIMER  | MTIM     | 543  | 4                                | 20.9                   | 23.3    | 26.0    | 26.0    | ---                        |
|                     |          |      |                                  | 5.6                    | 5.8     | 7.8     | 7.8     | When resetting             |
|                     | MTIMX    | 554  | 4                                | 20.9                   | 23.3    | ---     | ---     | ---                        |
|                     |          |      |                                  | 5.6                    | 5.8     | ---     | ---     | When resetting             |
| REVERSIBLE COUNTER  | CNTR     | 012  | 3                                | 16.9                   | 19.0    | 20.9    | 20.9    | ---                        |
|                     | CNTRX    | 548  | 3                                | 16.9                   | 19.0    | ---     | ---     | ---                        |
| RESET TIMER/COUNTER | CNR      | 545  | 3                                | 9.9                    | 10.6    | 13.9    | 13.9    | When resetting 1 word      |
|                     |          |      |                                  | 4.16 ms                | 4.16 ms | 5.42 ms | 5.42 ms | When resetting 1,000 words |
|                     | CNRX     | 547  | 3                                | 9.9                    | 10.6    | ---     | ---     | When resetting 1 word      |
|                     |          |      |                                  | 4.16 ms                | 4.16 ms | ---     | ---     | When resetting 1,000 words |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-5 Comparison Instructions

| Instruction                              | Mnemonic         | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|------------------------------------------|------------------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                                          |                  |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| Input Comparison Instructions (unsigned) | LD, AND, OR +=   | 300  | 4                                | 0.10                   | 0.16    | 0.21   | 0.37   | ---        |
|                                          | LD, AND, OR + <> | 305  |                                  |                        |         |        |        |            |
|                                          | LD, AND, OR + <  | 310  |                                  |                        |         |        |        |            |
|                                          | LD, AND, OR + <= | 315  |                                  |                        |         |        |        |            |
|                                          | LD, AND, OR + >  | 320  |                                  |                        |         |        |        |            |
|                                          | LD, AND, OR + >= | 325  |                                  |                        |         |        |        |            |

| Instruction                                      | Mnemonic           | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions             |
|--------------------------------------------------|--------------------|------|----------------------------------|------------------------|---------|--------|--------|------------------------|
|                                                  |                    |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                        |
| Input Comparison Instructions (double, unsigned) | LD, AND, OR +=+L   | 301  | 4                                | 0.10                   | 0.16    | 0.29   | 0.54   | ---                    |
|                                                  | LD, AND, OR +<>+L  | 306  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +<+L   | 311  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +<=+L  | 316  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +>+L   | 321  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +>=+L  | 326  |                                  |                        |         |        |        |                        |
| Input Comparison Instructions (signed)           | LD, AND, OR +=+S   | 302  | 4                                | 0.10                   | 0.16    | 6.50   | 6.50   | ---                    |
|                                                  | LD, AND, OR +<>+S  | 307  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +<+S   | 312  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +<=    | 317  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +>+S   | 322  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +>=+S  | 327  |                                  |                        |         |        |        |                        |
| Input Comparison Instructions (double, signed)   | LD, AND, OR +=+SL  | 303  | 4                                | 0.10                   | 0.16    | 6.50   | 6.50   | ---                    |
|                                                  | LD, AND, OR +<>+SL | 308  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +<+SL  | 313  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +<=+SL | 318  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +>+SL  | 323  |                                  |                        |         |        |        |                        |
|                                                  | LD, AND, OR +>=+SL | 328  |                                  |                        |         |        |        |                        |
| COMPARE                                          | CMP                | 020  | 3                                | 0.04                   | 0.04    | 0.17   | 0.29   | ---                    |
|                                                  | ICMP               | 020  | 7                                | +42.1                  | +42.1   | +42.4  | +42.4  | Increase for CS Series |
|                                                  |                    |      |                                  | +90.4                  | +90.4   | +90.5  | +90.5  | Increase for C200H     |
| DOUBLE COMPARE                                   | CMPL               | 060  | 3                                | 0.08                   | 0.08    | 0.25   | 0.46   | ---                    |
| SIGNED BINARY COMPARE                            | CPS                | 114  | 3                                | 0.08                   | 0.08    | 6.50   | 6.50   | ---                    |
|                                                  | ICPS               | 114  | 7                                | +35.9                  | +35.9   | +42.4  | +42.4  | Increase for CS Series |
|                                                  |                    |      |                                  | +84.1                  | +84.1   | +90.5  | +90.5  | Increase for C200H     |
| DOUBLE SIGNED BINARY COMPARE                     | CPSL               | 115  | 3                                | 0.08                   | 0.08    | 6.50   | 6.50   | ---                    |
| TABLE COMPARE                                    | TCMP               | 085  | 4                                | 14.0                   | 15.2    | 21.9   | 21.9   | ---                    |

| Instruction               | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|---------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                           |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| MULTIPLE COMPARE          | MCMP     | 019  | 4                                | 20.5                   | 22.8    | 31.2   | 31.2   | ---        |
| UNSIGNED BLOCK COMPARE    | BCMP     | 068  | 4                                | 21.5                   | 23.7    | 32.6   | 32.6   | ---        |
| AREA RANGE COMPARE        | ZCP      | 088  | 3                                | 5.3                    | 5.4     | ---    | ---    | ---        |
| DOUBLE AREA RANGE COMPARE | ZCPL     | 116  | 3                                | 5.5                    | 6.7     | ---    | ---    | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-6 Data Movement Instructions

| Instruction            | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions               |
|------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|--------------------------|
|                        |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                          |
| MOVE                   | MOV      | 021  | 3                                | 0.18                   | 0.20    | 0.25   | 0.29   | ---                      |
|                        | !MOV     | 021  | 7                                | +21.38                 | +21.40  | +42.36 | +42.36 | Increase for CS Series   |
|                        |          |      |                                  | +90.52                 | +90.52  | +90.52 | +90.52 | Increase for C200H       |
| DOUBLE MOVE            | MOVL     | 498  | 3                                | 0.32                   | 0.34    | 0.42   | 0.50   | ---                      |
| MOVE NOT               | MVN      | 022  | 3                                | 0.18                   | 0.20    | 0.25   | 0.29   | ---                      |
| DOUBLE MOVE NOT        | MVNL     | 499  | 3                                | 0.32                   | 0.34    | 0.42   | 0.50   | ---                      |
| MOVE BIT               | MOVB     | 082  | 4                                | 0.24                   | 0.34    | 7.5    | 7.5    | ---                      |
| MOVE DIGIT             | MOVD     | 083  | 4                                | 0.24                   | 0.34    | 7.3    | 7.3    | ---                      |
| MULTIPLE BIT TRANSFER  | XFRB     | 062  | 4                                | 10.1                   | 10.8    | 13.6   | 13.6   | Transferring 1 bit       |
|                        |          |      |                                  | 186.4                  | 189.8   | 269.2  | 269.2  | Transferring 255 bits    |
| BLOCK TRANSFER         | XFER     | 070  | 4                                | 0.36                   | 0.44    | 11.2   | 11.2   | Transferring 1 word      |
|                        |          |      |                                  | 300.1                  | 380.1   | 633.5  | 633.5  | Transferring 1,000 words |
| BLOCK SET              | BSET     | 071  | 4                                | 0.26                   | 0.28    | 8.5    | 8.5    | Setting 1 word           |
|                        |          |      |                                  | 200.1                  | 220.1   | 278.3  | 278.3  | Setting 1,000 words      |
| DATA EXCHANGE          | XCHG     | 073  | 3                                | 0.40                   | 0.56    | 0.5    | 0.7    | ---                      |
| DOUBLE DATA EXCHANGE   | XCGL     | 562  | 3                                | 0.76                   | 1.04    | 0.9    | 1.3    | ---                      |
| SINGLE WORD DISTRIBUTE | DIST     | 080  | 4                                | 5.1                    | 5.4     | 7.0    | 7.0    | ---                      |
| DATA COLLECT           | COLL     | 081  | 4                                | 5.1                    | 5.3     | 7.1    | 7.1    | ---                      |

| Instruction                       | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|-----------------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                                   |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| MOVE TO REGISTER                  | MOVR     | 560  | 3                                | 0.08                   | 0.08    | 0.42   | 0.50   | ---        |
| MOVE TIMER/COUNTER PV TO REGISTER | MOVRW    | 561  | 3                                | 0.42                   | 0.50    | 0.42   | 0.50   | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-7 Data Shift Instructions

| Instruction                      | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |         |         | Conditions           |
|----------------------------------|----------|------|----------------------------------|------------------------|---------|---------|---------|----------------------|
|                                  |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□  | CPU-4□  |                      |
| SHIFT REGISTER                   | SFT      | 010  | 3                                | 7.4                    | 10.4    | 10.4    | 10.4    | Shifting 1 word      |
|                                  |          |      |                                  | 433.2                  | 488.0   | 763.1   | 763.1   | Shifting 1,000 words |
| REVERSIBLE SHIFT REGISTER        | SFTR     | 084  | 4                                | 6.9                    | 7.2     | 9.6     | 9.6     | Shifting 1 word      |
|                                  |          |      |                                  | 615.3                  | 680.2   | 859.6   | 859.6   | Shifting 1,000 words |
| ASYNCHRONOUS SHIFT REGISTER      | ASFT     | 017  | 4                                | 6.2                    | 6.4     | 7.7     | 7.7     | Shifting 1 word      |
|                                  |          |      |                                  | 1.22 ms                | 1.22 ms | 2.01 ms | 2.01 ms | Shifting 1,000 words |
| WORD SHIFT                       | WSFT     | 016  | 4                                | 4.5                    | 4.7     | 7.8     | 7.8     | Shifting 1 word      |
|                                  |          |      |                                  | 171.5                  | 171.7   | 781.7   | 781.7   | Shifting 1,000 words |
| ARITHMETIC SHIFT LEFT            | ASL      | 025  | 2                                | 0.22                   | 0.32    | 0.29    | 0.37    | ---                  |
| DOUBLE SHIFT LEFT                | ASLL     | 570  | 2                                | 0.40                   | 0.56    | 0.50    | 0.67    | ---                  |
| ARITHMETIC SHIFT RIGHT           | ASR      | 026  | 2                                | 0.22                   | 0.32    | 0.29    | 0.37    | ---                  |
| DOUBLE SHIFT RIGHT               | ASRL     | 571  | 2                                | 0.40                   | 0.56    | 0.50    | 0.67    | ---                  |
| ROTATE LEFT                      | ROL      | 027  | 2                                | 0.22                   | 0.32    | 0.29    | 0.37    | ---                  |
| DOUBLE ROTATE LEFT               | ROLL     | 572  | 2                                | 0.40                   | 0.56    | 0.50    | 0.67    | ---                  |
| ROTATE LEFT WITHOUT CARRY        | RLNC     | 574  | 2                                | 0.22                   | 0.32    | 0.29    | 0.37    | ---                  |
| DOUBLE ROTATE LEFT WITHOUT CARRY | RLNL     | 576  | 2                                | 0.40                   | 0.56    | 0.50    | 0.67    | ---                  |
| ROTATE RIGHT                     | ROR      | 028  | 2                                | 0.22                   | 0.32    | 0.29    | 0.37    | ---                  |
| DOUBLE ROTATE RIGHT              | RORL     | 573  | 2                                | 0.40                   | 0.56    | 0.50    | 0.67    | ---                  |
| ROTATE RIGHT WITHOUT CARRY       | RRNC     | 575  | 2                                | 0.22                   | 0.32    | 0.29    | 0.37    | ---                  |

| Instruction                       | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |         |         | Conditions           |
|-----------------------------------|----------|------|----------------------------------|------------------------|---------|---------|---------|----------------------|
|                                   |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□  | CPU-4□  |                      |
| DOUBLE ROTATE RIGHT WITHOUT CARRY | RRNL     | 577  | 2                                | 0.40                   | 0.56    | 0.50    | 0.67    | ---                  |
| ONE DIGIT SHIFT LEFT              | SLD      | 074  | 3                                | 5.9                    | 6.1     | 8.2     | 8.2     | Shifting 1 word      |
|                                   |          |      |                                  | 561.1                  | 626.3   | 760.7   | 760.7   | Shifting 1,000 words |
| ONE DIGIT SHIFT RIGHT             | SRD      | 075  | 3                                | 6.9                    | 7.1     | 8.7     | 8.7     | Shifting 1 word      |
|                                   |          |      |                                  | 760.5                  | 895.5   | 1.07 ms | 1.07 ms | Shifting 1,000 words |
| SHIFT N-BIT DATA LEFT             | NSFL     | 578  | 4                                | 7.5                    | 8.3     | 10.5    | 10.5    | Shifting 1 bit       |
|                                   |          |      |                                  | 40.3                   | 45.4    | 55.5    | 55.5    | Shifting 1,000 bits  |
| SHIFT N-BIT DATA RIGHT            | NSFR     | 579  | 4                                | 7.5                    | 8.3     | 10.5    | 10.5    | Shifting 1 bit       |
|                                   |          |      |                                  | 50.5                   | 55.3    | 69.3    | 69.3    | Shifting 1,000 bits  |
| SHIFT N-BITS LEFT                 | NASL     | 580  | 3                                | 0.22                   | 0.32    | 0.29    | 0.37    | ---                  |
| DOUBLE SHIFT N-BITS LEFT          | NSLL     | 582  | 3                                | 0.40                   | 0.56    | 0.50    | 0.67    | ---                  |
| SHIFT N-BITS RIGHT                | NASR     | 581  | 3                                | 0.22                   | 0.32    | 0.29    | 0.37    | ---                  |
| DOUBLE SHIFT N-BITS RIGHT         | NSRL     | 583  | 3                                | 0.40                   | 0.56    | 0.50    | 0.67    | ---                  |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-8 Increment/Decrement Instructions

| Instruction             | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|-------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                         |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| INCREMENT BINARY        | ++       | 590  | 2                                | 0.22                   | 0.32    | 0.29   | 0.37   | ---        |
| DOUBLE INCREMENT BINARY | ++L      | 591  | 2                                | 0.40                   | 0.56    | 0.50   | 0.67   | ---        |
| DECREMENT BINARY        | --       | 592  | 2                                | 0.22                   | 0.32    | 0.29   | 0.37   | ---        |
| DOUBLE DECREMENT BINARY | --L      | 593  | 2                                | 0.40                   | 0.56    | 0.50   | 0.67   | ---        |
| INCREMENT BCD           | ++B      | 594  | 2                                | 6.4                    | 4.5     | 7.4    | 7.4    | ---        |
| DOUBLE INCREMENT BCD    | ++BL     | 595  | 2                                | 5.6                    | 4.9     | 6.1    | 6.1    | ---        |
| DECREMENT BCD           | --B      | 596  | 2                                | 6.3                    | 4.6     | 7.2    | 7.2    | ---        |
| DOUBLE DECREMENT BCD    | --BL     | 597  | 2                                | 5.3                    | 4.7     | 7.1    | 7.1    | ---        |



**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-9 Symbol Math Instructions

| Instruction                                 | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|---------------------------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                                             |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| SIGNED BINARY ADD WITHOUT CARRY             | +        | 400  | 4                                | 0.18                   | 0.20    | 0.25   | 0.37   | ---        |
| DOUBLE SIGNED BINARY ADD WITHOUT CARRY      | +L       | 401  | 4                                | 0.32                   | 0.34    | 0.42   | 0.54   | ---        |
| SIGNED BINARY ADD WITH CARRY                | +C       | 402  | 4                                | 0.18                   | 0.20    | 0.25   | 0.37   | ---        |
| DOUBLE SIGNED BINARY ADD WITH CARRY         | +CL      | 403  | 4                                | 0.32                   | 0.34    | 0.42   | 0.54   | ---        |
| BCD ADD WITHOUT CARRY                       | +B       | 404  | 4                                | 8.2                    | 8.4     | 14.0   | 14.0   | ---        |
| DOUBLE BCD ADD WITHOUT CARRY                | +BL      | 405  | 4                                | 13.3                   | 14.5    | 19.0   | 19.0   | ---        |
| BCD ADD WITH CARRY                          | +BC      | 406  | 4                                | 8.9                    | 9.1     | 14.5   | 14.5   | ---        |
| DOUBLE BCD ADD WITH CARRY                   | +BCL     | 407  | 4                                | 13.8                   | 15.0    | 19.6   | 19.6   | ---        |
| SIGNED BINARY SUBTRACT WITHOUT CARRY        | −        | 410  | 4                                | 0.18                   | 0.20    | 0.25   | 0.37   | ---        |
| DOUBLE SIGNED BINARY SUBTRACT WITHOUT CARRY | −L       | 411  | 4                                | 0.32                   | 0.34    | 0.42   | 0.54   | ---        |
| SIGNED BINARY SUBTRACT WITH CARRY           | −C       | 412  | 4                                | 0.18                   | 0.20    | 0.25   | 0.37   | ---        |

| Instruction                                             | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|---------------------------------------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                                                         |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| DOUBLE<br>SIGNED<br>BINARY<br>SUBTRACT<br>WITH<br>CARRY | −CL      | 413  | 4                                | 0.32                   | 0.34    | 0.42   | 0.54   | ---        |
| BCD SUB-<br>TRACT<br>WITHOUT<br>CARRY                   | −B       | 414  | 4                                | 8.0                    | 8.2     | 13.1   | 13.1   | ---        |
| DOUBLE<br>BCD SUB-<br>TRACT<br>WITHOUT<br>CARRY         | −BL      | 415  | 4                                | 12.8                   | 14.0    | 18.2   | 18.2   | ---        |
| BCD SUB-<br>TRACT<br>WITH<br>CARRY                      | −BC      | 416  | 4                                | 8.5                    | 8.6     | 13.8   | 13.8   | ---        |
| DOUBLE<br>BCD SUB-<br>TRACT<br>WITH<br>CARRY            | −BCL     | 417  | 4                                | 13.4                   | 14.7    | 18.8   | 18.8   | ---        |
| SIGNED<br>BINARY<br>MULTIPLY                            | *        | 420  | 4                                | 0.38                   | 0.40    | 0.50   | 0.58   | ---        |
| DOUBLE<br>SIGNED<br>BINARY<br>MULTIPLY                  | *L       | 421  | 4                                | 7.23                   | 8.45    | 11.19  | 11.19  | ---        |
| UNSIGNED<br>BINARY<br>MULTIPLY                          | *U       | 422  | 4                                | 0.38                   | 0.40    | 0.50   | 0.58   | ---        |
| DOUBLE<br>UNSIGNED<br>BINARY<br>MULTIPLY                | *UL      | 423  | 4                                | 7.1                    | 8.3     | 10.63  | 10.63  | ---        |
| BCD MULTI-<br>PLY                                       | *B       | 424  | 4                                | 9.0                    | 9.2     | 12.8   | 12.8   | ---        |
| DOUBLE<br>BCD MULTI-<br>PLY                             | *BL      | 425  | 4                                | 23.0                   | 24.2    | 35.2   | 35.2   | ---        |
| SIGNED<br>BINARY<br>DIVIDE                              | /        | 430  | 4                                | 0.40                   | 0.42    | 0.75   | 0.83   | ---        |
| DOUBLE<br>SIGNED<br>BINARY<br>DIVIDE                    | /L       | 431  | 4                                | 7.2                    | 8.4     | 9.8    | 9.8    | ---        |
| UNSIGNED<br>BINARY<br>DIVIDE                            | /U       | 432  | 4                                | 0.40                   | 0.42    | 0.75   | 0.83   | ---        |
| DOUBLE<br>UNSIGNED<br>BINARY<br>DIVIDE                  | /UL      | 433  | 4                                | 6.9                    | 8.1     | 9.1    | 9.1    | ---        |

| Instruction          | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|----------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                      |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| BCD DIVIDE           | /B       | 434  | 4                                | 8.6                    | 8.8     | 15.9   | 15.9   | ---        |
| DOUBLE<br>BCD DIVIDE | /BL      | 435  | 4                                | 17.7                   | 18.9    | 26.2   | 26.2   | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-10 Conversion Instructions

| Instruction                             | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                        |
|-----------------------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|-----------------------------------|
|                                         |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                                   |
| BCD-TO-BINARY                           | BIN      | 023  | 3                                | 0.22                   | 0.24    | 0.25   | 0.29   | ---                               |
| DOUBLE<br>BCD-TO-<br>DOUBLE<br>BINARY   | BINL     | 058  | 3                                | 6.5                    | 6.8     | 9.1    | 9.1    | ---                               |
| BINARY-TO-BCD                           | BCD      | 024  | 3                                | 0.24                   | 0.26    | 8.3    | 8.3    | ---                               |
| DOUBLE<br>BINARY-TO-<br>DOUBLE<br>BCD   | BCDL     | 059  | 3                                | 6.7                    | 7.0     | 9.2    | 9.2    | ---                               |
| 2'S COM-<br>PLEMENT                     | NEG      | 160  | 3                                | 0.18                   | 0.20    | 0.25   | 0.29   | ---                               |
| DOUBLE<br>2'S COM-<br>PLEMENT           | NEGL     | 161  | 3                                | 0.32                   | 0.34    | 0.42   | 0.5    | ---                               |
| 16-BIT TO<br>32-BIT<br>SIGNED<br>BINARY | SIGN     | 600  | 3                                | 0.32                   | 0.34    | 0.42   | 0.50   | ---                               |
| DATA<br>DECODER                         | MLPX     | 076  | 4                                | 0.32                   | 0.42    | 8.8    | 8.8    | Decoding 1 digit<br>(4 to 16)     |
|                                         |          |      |                                  | 0.98                   | 1.20    | 12.8   | 12.8   | Decoding 4 dig-<br>its (4 to 16)  |
|                                         |          |      |                                  | 3.30                   | 4.00    | 20.3   | 20.3   | Decoding 1 digit<br>8 to 256      |
|                                         |          |      |                                  | 6.50                   | 7.90    | 33.4   | 33.4   | Decoding 2 dig-<br>its (8 to 256) |
| DATA<br>ENCODER                         | DMPX     | 077  | 4                                | 7.5                    | 7.9     | 10.4   | 10.4   | Encoding 1 digit<br>(16 to 4)     |
|                                         |          |      |                                  | 49.6                   | 50.2    | 59.1   | 59.1   | Encoding 4 dig-<br>its (16 to 4)  |
|                                         |          |      |                                  | 18.2                   | 18.6    | 23.6   | 23.6   | Encoding 1 digit<br>(256 to 8)    |
|                                         |          |      |                                  | 55.1                   | 57.4    | 92.5   | 92.5   | Encoding 2 dig-<br>its (256 to 8) |
| ASCII CON-<br>VERT                      | ASC      | 086  | 4                                | 6.8                    | 7.1     | 9.7    | 9.7    | Converting 1<br>digit into ASCII  |
|                                         |          |      |                                  | 11.2                   | 11.7    | 15.1   | 15.1   | Converting 4<br>digits into ASCII |
| ASCII TO<br>HEX                         | HEX      | 162  | 4                                | 7.1                    | 7.4     | 10.1   | 10.1   | Converting 1<br>digit             |

| Instruction                 | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                |
|-----------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|---------------------------|
|                             |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                           |
| COLUMN TO LINE              | LINE     | 063  | 4                                | 19.0                   | 23.1    | 29.1   | 29.1   | ---                       |
| LINE TO COLUMN              | COLM     | 064  | 4                                | 23.2                   | 27.5    | 37.3   | 37.3   | ---                       |
| SIGNED BCD-TO-BINARY        | BINS     | 470  | 4                                | 8.0                    | 8.3     | 12.1   | 12.1   | Data format setting No. 0 |
|                             |          |      |                                  | 8.0                    | 8.3     | 12.1   | 12.1   | Data format setting No. 1 |
|                             |          |      |                                  | 8.3                    | 8.6     | 12.7   | 12.7   | Data format setting No. 2 |
|                             |          |      |                                  | 8.5                    | 8.8     | 13.0   | 13.0   | Data format setting No. 3 |
| DOUBLE SIGNED BCD-TO-BINARY | BISL     | 472  | 4                                | 9.2                    | 9.6     | 13.6   | 13.6   | Data format setting No. 0 |
|                             |          |      |                                  | 9.2                    | 9.6     | 13.7   | 13.7   | Data format setting No. 1 |
|                             |          |      |                                  | 9.5                    | 9.9     | 14.2   | 14.2   | Data format setting No. 2 |
|                             |          |      |                                  | 9.6                    | 10.0    | 14.4   | 14.4   | Data format setting No. 3 |
| SIGNED BINARY-TO-BCD        | BCDS     | 471  | 4                                | 6.6                    | 6.9     | 10.6   | 10.6   | Data format setting No. 0 |
|                             |          |      |                                  | 6.7                    | 7.0     | 10.8   | 10.8   | Data format setting No. 1 |
|                             |          |      |                                  | 6.8                    | 7.1     | 10.9   | 10.9   | Data format setting No. 2 |
|                             |          |      |                                  | 7.2                    | 7.5     | 11.5   | 11.5   | Data format setting No. 3 |
| DOUBLE SIGNED BINARY-TO-BCD | BDSL     | 473  | 4                                | 8.1                    | 8.4     | 11.6   | 11.6   | Data format setting No. 0 |
|                             |          |      |                                  | 8.2                    | 8.6     | 11.8   | 11.8   | Data format setting No. 1 |
|                             |          |      |                                  | 8.3                    | 8.7     | 12.0   | 12.0   | Data format setting No. 2 |
|                             |          |      |                                  | 8.8                    | 9.2     | 12.5   | 12.5   | Data format setting No. 3 |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-11 Logic Instructions

| Instruction        | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|--------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                    |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| LOGICAL AND        | ANDW     | 034  | 4                                | 0.18                   | 0.20    | 0.25   | 0.37   | ---        |
| DOUBLE LOGICAL AND | ANDL     | 610  | 4                                | 0.32                   | 0.34    | 0.42   | 0.54   | ---        |
| LOGICAL OR         | ORW      | 035  | 4                                | 0.22                   | 0.32    | 0.25   | 0.37   | ---        |
| DOUBLE LOGICAL OR  | ORWL     | 611  | 4                                | 0.32                   | 0.34    | 0.42   | 0.54   | ---        |
| EXCLUSIVE OR       | XORW     | 036  | 4                                | 0.22                   | 0.32    | 0.25   | 0.37   | ---        |

| Instruction          | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|----------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                      |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| DOUBLE EXCLUSIVE OR  | XORL     | 612  | 4                                | 0.32                   | 0.34    | 0.42   | 0.54   | ---        |
| EXCLUSIVE NOR        | XNRW     | 037  | 4                                | 0.22                   | 0.32    | 0.25   | 0.37   | ---        |
| DOUBLE EXCLUSIVE NOR | XNRL     | 613  | 4                                | 0.32                   | 0.34    | 0.42   | 0.54   | ---        |
| COMPLEMENT           | COM      | 029  | 2                                | 0.22                   | 0.32    | 0.29   | 0.37   | ---        |
| DOUBLE COMPLEMENT    | COML     | 614  | 2                                | 0.40                   | 0.56    | 0.50   | 0.67   | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-12 Special Math Instructions

| Instruction           | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                             |
|-----------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|----------------------------------------|
|                       |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                                        |
| BINARY ROOT           | ROTB     | 620  | 3                                | 49.6                   | 50.0    | 530.7  | 530.7  | ---                                    |
| BCD SQUARE ROOT       | ROOT     | 072  | 3                                | 13.7                   | 13.9    | 514.5  | 514.5  | ---                                    |
| ARITHMETIC PROCESS    | APR      | 069  | 4                                | 6.7                    | 6.9     | 32.3   | 32.3   | Designating SIN and COS                |
|                       |          |      |                                  | 17.2                   | 18.4    | 78.3   | 78.3   | Designating line-segment approximation |
| FLOATING POINT DIVIDE | FDIV     | 079  | 4                                | 116.6                  | 176.6   | 176.6  | 176.6  | ---                                    |
| BIT COUNTER           | BCNT     | 067  | 4                                | 0.3                    | 0.38    | 22.1   | 22.1   | Counting 1 word                        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-13 Floating-point Math Instructions

| Instruction        | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|--------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                    |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| FLOATING TO 16-BIT | FIX      | 450  | 3                                | 10.6                   | 10.8    | 14.5   | 14.5   | ---        |
| FLOATING TO 32-BIT | FIXL     | 451  | 3                                | 10.8                   | 11.0    | 14.6   | 14.6   | ---        |
| 16-BIT TO FLOATING | FLT      | 452  | 3                                | 8.3                    | 8.5     | 11.1   | 11.1   | ---        |
| 32-BIT TO FLOATING | FLTL     | 453  | 3                                | 8.3                    | 8.5     | 10.8   | 10.8   | ---        |
| FLOATING-POINT ADD | +F       | 454  | 4                                | 8.0                    | 9.2     | 10.2   | 10.2   | ---        |

| Instruction                | Mnemonic         | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|----------------------------|------------------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                            |                  |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| FLOATING-POINT SUBTRACT    | −F               | 455  | 4                                | 8.0                    | 9.2     | 10.3   | 10.3   | ---        |
| FLOATING-POINT DIVIDE      | /F               | 457  | 4                                | 8.7                    | 9.9     | 12.0   | 12.0   | ---        |
| FLOATING-POINT MULTIPLY    | *F               | 456  | 4                                | 8.0                    | 9.2     | 10.5   | 10.5   | ---        |
| DEGREES TO RADIANS         | RAD              | 458  | 3                                | 10.1                   | 10.2    | 14.9   | 14.9   | ---        |
| RADIANS TO DEGREES         | DEG              | 459  | 3                                | 9.9                    | 10.1    | 14.8   | 14.8   | ---        |
| SINE                       | SIN              | 460  | 3                                | 42.0                   | 42.2    | 61.1   | 61.1   | ---        |
| COSINE                     | COS              | 461  | 3                                | 31.5                   | 31.8    | 44.1   | 44.1   | ---        |
| TANGENT                    | TAN              | 462  | 3                                | 16.3                   | 16.6    | 22.6   | 22.6   | ---        |
| ARC SINE                   | ASIN             | 463  | 3                                | 17.6                   | 17.9    | 24.1   | 24.1   | ---        |
| ARC COSINE                 | ACOS             | 464  | 3                                | 20.4                   | 20.7    | 28.0   | 28.0   | ---        |
| ARC TANGENT                | ATAN             | 465  | 3                                | 16.1                   | 16.4    | 16.4   | 16.4   | ---        |
| SQUARE ROOT                | SQRT             | 466  | 3                                | 19.0                   | 19.3    | 28.1   | 28.1   | ---        |
| EXPONENT                   | EXP              | 467  | 3                                | 65.9                   | 66.2    | 96.7   | 96.7   | ---        |
| LOGARITHM                  | LOG              | 468  | 3                                | 12.8                   | 13.1    | 17.4   | 17.4   | ---        |
| EXPONENTIAL POWER          | PWR              | 840  | 4                                | 125.4                  | 126.0   | 181.7  | 181.7  | ---        |
| Floating Symbol Comparison | LD, AND, OR +=F  | 329  | 3                                | 6.6                    | 8.3     | ---    | ---    | ---        |
|                            | LD, AND, OR +<>F | 330  |                                  |                        |         |        |        |            |
|                            | LD, AND, OR +<F  | 331  |                                  |                        |         |        |        |            |
|                            | LD, AND, OR +<=F | 332  |                                  |                        |         |        |        |            |
|                            | LD, AND, OR +>F  | 333  |                                  |                        |         |        |        |            |
|                            | LD, AND, OR +>=F | 334  |                                  |                        |         |        |        |            |
| FLOATING-POINT TO ASCII    | FSTR             | 448  | 4                                | 48.5                   | 48.9    | ---    | ---    | ---        |
| ASCII TO FLOATING-POINT    | FVAL             | 449  | 3                                | 21.1                   | 21.3    | ---    | ---    | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-14 Double-precision Floating-point Instructions

| Instruction                                | Mnemonic            | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|--------------------------------------------|---------------------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                                            |                     |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| DOUBLE<br>SYMBOL<br>COMPARI-<br>SON        | LD, AND,<br>OR +=D  | 335  | 3                                | 8.5                    | 10.3    | ---    | ---    | ---        |
|                                            | LD, AND,<br>OR +<>D | 336  |                                  |                        |         |        |        |            |
|                                            | LD, AND,<br>OR +<D  | 337  |                                  |                        |         |        |        |            |
|                                            | LD, AND,<br>OR +<=D | 338  |                                  |                        |         |        |        |            |
|                                            | LD, AND,<br>OR +>D  | 339  |                                  |                        |         |        |        |            |
|                                            | LD, AND,<br>OR +>=D | 340  |                                  |                        |         |        |        |            |
| DOUBLE<br>FLOATING<br>TO 16-BIT<br>BINARY  | FIXD                | 841  | 3                                | 11.7                   | 12.1    | ---    | ---    | ---        |
| DOUBLE<br>FLOATING<br>TO 32-BIT<br>BINARY  | FIXLD               | 842  | 3                                | 11.6                   | 12.1    | ---    | ---    | ---        |
| 16-BIT<br>BINARY TO<br>DOUBLE<br>FLOATING  | DBL                 | 843  | 3                                | 9.9                    | 10.0    | ---    | ---    | ---        |
| 32-BIT<br>BINARY TO<br>DOUBLE<br>FLOATING  | DBLL                | 844  | 3                                | 9.8                    | 10.0    | ---    | ---    | ---        |
| DOUBLE<br>FLOATING-<br>POINT ADD           | +D                  | 845  | 4                                | 11.2                   | 11.9    | ---    | ---    | ---        |
| DOUBLE<br>FLOATING-<br>POINT SUB-<br>TRACT | -D                  | 846  | 4                                | 11.2                   | 11.9    | ---    | ---    | ---        |
| DOUBLE<br>FLOATING-<br>POINT MUL-<br>TIPLY | *D                  | 847  | 4                                | 12.0                   | 12.7    | ---    | ---    | ---        |
| DOUBLE<br>FLOATING-<br>POINT<br>DIVIDE     | /D                  | 848  | 4                                | 23.5                   | 24.2    | ---    | ---    | ---        |
| DOUBLE<br>DEGREES TO<br>RADIAN             | RADD                | 849  | 3                                | 27.4                   | 27.8    | ---    | ---    | ---        |
| DOUBLE<br>RADIAN TO<br>DEGREES             | DEGD                | 850  | 3                                | 11.2                   | 11.9    | ---    | ---    | ---        |
| DOUBLE<br>SINE                             | SIND                | 851  | 3                                | 45.4                   | 45.8    | ---    | ---    | ---        |
| DOUBLE<br>COSINE                           | COSD                | 852  | 3                                | 43.0                   | 43.4    | ---    | ---    | ---        |
| DOUBLE<br>TANGENT                          | TAND                | 853  | 3                                | 20.1                   | 20.5    | ---    | ---    | ---        |

| Instruction              | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|--------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                          |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| DOUBLE ARC SINE          | ASIND    | 854  | 3                                | 21.5                   | 21.9    | ---    | ---    | ---        |
| DOUBLE ARC COSINE        | ACOSD    | 855  | 3                                | 24.7                   | 25.1    | ---    | ---    | ---        |
| DOUBLE ARC TANGENT       | ATAND    | 856  | 3                                | 19.3                   | 19.7    | ---    | ---    | ---        |
| DOUBLE SQUARE ROOT       | SQRTD    | 857  | 3                                | 47.4                   | 47.9    | ---    | ---    | ---        |
| DOUBLE EXPONENT          | EXPD     | 858  | 3                                | 121.0                  | 121.4   | ---    | ---    | ---        |
| DOUBLE LOGARITHM         | LOGD     | 859  | 3                                | 16.0                   | 16.4    | ---    | ---    | ---        |
| DOUBLE EXPONENTIAL POWER | PWRD     | 860  | 4                                | 223.9                  | 224.2   | ---    | ---    | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-15 Table Data Processing Instructions

| Instruction            | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |         |         | Conditions                            |
|------------------------|----------|------|----------------------------------|------------------------|---------|---------|---------|---------------------------------------|
|                        |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□  | CPU-4□  |                                       |
| SET STACK              | SSET     | 630  | 3                                | 8.0                    | 8.3     | 8.5     | 8.5     | Designating 5 words in stack area     |
|                        |          |      |                                  | 231.6                  | 251.8   | 276.8   | 276.8   | Designating 1,000 words in stack area |
| PUSH ONTO STACK        | PUSH     | 632  | 3                                | 6.5                    | 8.6     | 9.1     | 9.1     | ---                                   |
| FIRST IN FIRST OUT     | FIFO     | 633  | 3                                | 6.9                    | 8.9     | 10.6    | 10.6    | Designating 5 words in stack area     |
|                        |          |      |                                  | 352.6                  | 434.3   | 1.13 ms | 1.13 ms | Designating 1,000 words in stack area |
| LAST IN FIRST OUT      | LIFO     | 634  | 3                                | 7.0                    | 9.0     | 9.9     | 9.9     | ---                                   |
| DIMENSION RECORD TABLE | DIM      | 631  | 5                                | 15.2                   | 21.6    | 142.1   | 142.1   | ---                                   |
| SET RECORD LOCATION    | SETR     | 635  | 4                                | 5.4                    | 5.9     | 7.0     | 7.0     | ---                                   |
| GET RECORD NUMBER      | GETR     | 636  | 4                                | 7.8                    | 8.4     | 11.0    | 11.0    | ---                                   |
| DATA SEARCH            | SRCH     | 181  | 4                                | 15.5                   | 19.5    | 19.5    | 19.5    | Searching for 1 word                  |
|                        |          |      |                                  | 2.42 ms                | 3.34 ms | 3.34 ms | 3.34 ms | Searching for 1,000 words             |



| Instruction          | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |         |         | Conditions                  |
|----------------------|----------|------|----------------------------------|------------------------|---------|---------|---------|-----------------------------|
|                      |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□  | CPU-4□  |                             |
| SWAP BYTES           | SWAP     | 637  | 3                                | 12.2                   | 13.6    | 13.6    | 13.6    | Swapping 1 word             |
|                      |          |      |                                  | 1.94 ms                | 2.82 ms | 2.82 ms | 2.82 ms | Swapping 1,000 words        |
| FIND MAXIMUM         | MAX      | 182  | 4                                | 19.2                   | 24.9    | 24.9    | 24.9    | Searching for 1 word        |
|                      |          |      |                                  | 2.39 ms                | 3.36 ms | 3.36 ms | 3.36 ms | Searching for 1,000 words   |
| FIND MINIMUM         | MIN      | 183  | 4                                | 19.2                   | 25.3    | 25.3    | 25.3    | Searching for 1 word        |
|                      |          |      |                                  | 2.39 ms                | 3.33 ms | 3.33 ms | 3.33 ms | Searching for 1,000 words   |
| SUM                  | SUM      | 184  | 4                                | 28.2                   | 38.5    | 38.5    | 38.3    | Adding 1 word               |
|                      |          |      |                                  | 1.42 ms                | 1.95 ms | 1.95 ms | 1.95 ms | Adding 1,000 words          |
| FRAME CHECKSUM       | FCS      | 180  | 4                                | 20.0                   | 28.3    | 28.3    | 28.3    | For 1-word table length     |
|                      |          |      |                                  | 1.65 ms                | 2.48 ms | 2.48 ms | 2.48 ms | For 1,000-word table length |
| STACK SIZE READ      | SNUM     | 638  | 3                                | 6.0                    | 6.3     | ---     | ---     | ---                         |
| STACK DATA READ      | SREAD    | 639  | 4                                | 8.0                    | 8.4     | ---     | ---     | ---                         |
| STACK DATA OVERWRITE | SWRIT    | 640  | 4                                | 7.2                    | 7.6     | ---     | ---     | ---                         |
| STACK DATA INSERT    | SINS     | 641  | 4                                | 7.8                    | 9.9     | ---     | ---     | ---                         |
|                      |          |      |                                  | 354.0                  | 434.8   | ---     | ---     | For 1,000-word table        |
| STACK DATA DELETE    | SDEL     | 642  | 4                                | 8.6                    | 10.6    | ---     | ---     | ---                         |
|                      |          |      |                                  | 354.0                  | 436.0   | ---     | ---     | For 1,000-word table        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-16 Data Control Instructions

| Instruction       | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions        |
|-------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|-------------------|
|                   |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                   |
| PID CONTROL       | PID      | 190  | 4                                | 436.2                  | 678.2   | 678.2  | 678.2  | Initial execution |
|                   |          |      |                                  | 332.3                  | 474.9   | 474.9  | 474.9  | Sampling          |
|                   |          |      |                                  | 97.3                   | 141.3   | 141.3  | 141.3  | Not sampling      |
| LIMIT CONTROL     | LMT      | 680  | 4                                | 16.1                   | 22.1    | 22.1   | 22.1   | ---               |
| DEAD BAND CONTROL | BAND     | 681  | 4                                | 17.0                   | 22.5    | 22.5   | 22.5   | ---               |
| DEAD ZONE CONTROL | ZONE     | 682  | 4                                | 15.4                   | 20.5    | 20.5   | 20.5   | ---               |
| SCALING           | SCL      | 194  | 4                                | 37.1                   | 53.0    | 56.8   | 56.8   | ---               |
| SCALING 2         | SCL2     | 486  | 4                                | 28.5                   | 40.2    | 50.7   | 50.7   | ---               |
| SCALING 3         | SCL3     | 487  | 4                                | 33.4                   | 47.0    | 57.7   | 57.7   | ---               |

| Instruction                 | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                      |
|-----------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|---------------------------------|
|                             |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                                 |
| AVERAGE                     | AVG      | 195  | 4                                | 36.3                   | 52.6    | 53.1   | 53.1   | Average of an operation         |
|                             |          |      |                                  | 291.0                  | 419.9   | 419.9  | 419.9  | Average of 64 operations        |
| PID CONTROL WITH AUTOTUNING | PIDAT    | 191  | 4                                | 446.3                  | 712.5   | ---    | ---    | Initial execution               |
|                             |          |      |                                  | 339.4                  | 533.9   | ---    | ---    | Sampling                        |
|                             |          |      |                                  | 100.7                  | 147.1   | ---    | ---    | Not sampling                    |
|                             |          |      |                                  | 189.2                  | 281.6   | ---    | ---    | Initial execution of autotuning |
|                             |          |      |                                  | 535.2                  | 709.8   | ---    | ---    | Autotuning when sampling        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-17 Subroutine Instructions

| Instruction              | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|--------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                          |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| SUBROUTINE CALL          | SBS      | 091  | 2                                | 1.26                   | 1.96    | 17.0   | 17.0   | ---        |
| SUBROUTINE ENTRY         | SBN      | 092  | 2                                | ---                    | ---     | ---    | ---    | ---        |
| SUBROUTINE RETURN        | RET      | 093  | 1                                | 0.86                   | 1.60    | 20.60  | 20.60  | ---        |
| MACRO                    | MCRO     | 099  | 4                                | 23.3                   | 23.3    | 23.3   | 23.3   | ---        |
| GLOBAL SUBROUTINE CALL   | GSDN     | 751  | 2                                | ---                    | ---     | ---    | ---    | ---        |
| GLOBAL SUBROUTINE ENTRY  | GRET     | 752  | 1                                | 1.26                   | 1.96    | ---    | ---    | ---        |
| GLOBAL SUBROUTINE RETURN | GSBS     | 750  | 2                                | 0.86                   | 1.60    | ---    | ---    | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-18 Interrupt Control Instructions

| Instruction         | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|---------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                     |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| SET INTERRUPT MASK  | MSKS     | 690  | 3                                | 25.6                   | 38.4    | 39.5   | 39.5   | ---        |
| READ INTERRUPT MASK | MSKR     | 692  | 3                                | 11.9                   | 11.9    | 11.9   | 11.9   | ---        |
| CLEAR INTERRUPT     | CLI      | 691  | 3                                | 27.4                   | 41.3    | 41.3   | 41.3   | ---        |
| DISABLE INTERRUPTS  | DI       | 693  | 1                                | 15.0                   | 16.8    | 16.8   | 16.8   | ---        |
| ENABLE INTERRUPTS   | EI       | 694  | 1                                | 19.5                   | 21.8    | 21.8   | 21.8   | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-19 Step Instructions

| Instruction    | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions              |
|----------------|----------|------|----------------------------------|------------------------|---------|--------|--------|-------------------------|
|                |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                         |
| STEP<br>DEFINE | STEP     | 008  | 2                                | 17.4                   | 20.7    | 27.1   | 27.1   | Step control bit<br>ON  |
|                |          |      |                                  | 11.8                   | 13.7    | 24.4   | 24.4   | Step control bit<br>OFF |
| STEP<br>START  | SNXT     | 009  | 2                                | 6.6                    | 7.3     | 10.0   | 10.0   | ---                     |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-20 Basic I/O Unit Instructions

| Instruction                   | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs)                                                                               |         |        |        | Conditions                                                    |
|-------------------------------|----------|------|----------------------------------|------------------------------------------------------------------------------------------------------|---------|--------|--------|---------------------------------------------------------------|
|                               |          |      |                                  | CPU-6□H                                                                                              | CPU-4□H | CPU-6□ | CPU-4□ |                                                               |
| I/O REFRESH                   | IORF     | 097  | 3                                | 58.5                                                                                                 | 63.2    | 81.7   | 81.7   | 1-word refresh (IN)<br>for C200H Basic<br>I/O Units           |
|                               |          |      |                                  | 62.6                                                                                                 | 67.0    | 86.7   | 86.7   | 1-word refresh<br>(OUT) for C200H<br>Basic I/O Units          |
|                               |          |      |                                  | 15.5                                                                                                 | 16.4    | 23.5   | 23.5   | 1-word refresh (IN)<br>for CS-series Basic<br>I/O Units       |
|                               |          |      |                                  | 17.20                                                                                                | 18.40   | 25.6   | 25.6   | 1-word refresh<br>(OUT) for CS-<br>series Basic I/O<br>Units  |
|                               |          |      |                                  | 303.3                                                                                                | 343.9   | 357.1  | 357.1  | 10-word refresh<br>(IN) for C200H<br>Basic I/O Units          |
|                               |          |      |                                  | 348.2                                                                                                | 376.6   | 407.5  | 407.5  | 10-word refresh<br>(OUT) for C200H<br>Basic I/O Units         |
|                               |          |      |                                  | 319.9                                                                                                | 320.7   | 377.5  | 377.6  | 60-word refresh<br>(IN) for CS-series<br>Basic I/O Units      |
|                               |          |      |                                  | 358.00                                                                                               | 354.40  | 460.1  | 460.1  | 60-word refresh<br>(OUT) for CS-<br>series Basic I/O<br>Units |
| 7-SEGMENT<br>DECODER          | SDEC     | 078  | 4                                | 6.5                                                                                                  | 6.9     | 14.1   | 14.1   | ---                                                           |
| INTELLI-<br>GENT I/O<br>READ  | IORD     | 222  | 4                                | Read/write times depend on the Special I/O<br>Unit for which the instruction is being exe-<br>cuted. |         |        |        | ---                                                           |
| INTELLI-<br>GENT I/O<br>WRITE | IOWR     | 223  | 4                                |                                                                                                      |         |        |        | ---                                                           |
| CPU BUS I/O<br>REFRESH        | DLNK     | 226  | 4                                | 287.8                                                                                                | 315.5   | ---    | ---    | Allocated 1 word                                              |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-21 Serial Communications Instructions

| Instruction                    | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |         |         | Conditions                             |
|--------------------------------|----------|------|----------------------------------|------------------------|---------|---------|---------|----------------------------------------|
|                                |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□  | CPU-4□  |                                        |
| PROTOCOL<br>MACRO              | PMCR     | 260  | 5                                | 100.1                  | 142.1   | 276.8   | 276.8   | Sending 0 words, receiving 0 words     |
|                                |          |      |                                  | 134.2                  | 189.6   | 305.9   | 305.9   | Sending 249 words, receiving 249 words |
| TRANSMIT                       | TXD      | 236  | 4                                | 68.5                   | 98.8    | 98.8    | 98.8    | Sending 1 byte                         |
|                                |          |      |                                  | 734.3                  | 1.10 ms | 1.10 ms | 1.10 ms | Sending 256 bytes                      |
| RECEIVE                        | RXD      | 235  | 4                                | 89.6                   | 131.1   | 131.1   | 131.1   | Storing 1 byte                         |
|                                |          |      |                                  | 724.2                  | 1.11 ms | 1.11 ms | 1.11 ms | Storing 256 bytes                      |
| CHANGE<br>SERIAL<br>PORT SETUP | STUP     | 237  | 3                                | 341.2                  | 400.0   | 440.4   | 440.4   | ---                                    |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-22 Network Instructions

| Instruction        | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|--------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                    |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| NETWORK<br>SEND    | SEND     | 090  | 4                                | 84.4                   | 123.9   | 123.9  | 123.9  | ---        |
| NETWORK<br>RECEIVE | RECV     | 098  | 4                                | 85.4                   | 124.7   | 124.7  | 124.7  | ---        |
| DELIVER<br>COMMAND | CMND     | 490  | 4                                | 106.8                  | 136.8   | 136.8  | 136.8  | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-23 File Memory Instructions

| Instruction        | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |         |         | Conditions                                   |
|--------------------|----------|------|----------------------------------|------------------------|---------|---------|---------|----------------------------------------------|
|                    |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□  | CPU-4□  |                                              |
| READ DATA<br>FILE  | FREAD    | 700  | 5                                | 391.4                  | 632.4   | 684.1   | 684.1   | 2-character directory + file name in binary  |
|                    |          |      |                                  | 836.1                  | 1.33 ms | 1.35 ms | 1.35 ms | 73-character directory + file name in binary |
| WRITE<br>DATA FILE | FWRITE   | 701  | 5                                | 387.8                  | 627.0   | 684.7   | 684.7   | 2-character directory + file name in binary  |
|                    |          |      |                                  | 833.3                  | 1.32 ms | 1.36 ms | 1.36 ms | 73-character directory + file name in binary |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-24 Display Instructions

| Instruction     | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                 |
|-----------------|----------|------|----------------------------------|------------------------|---------|--------|--------|----------------------------|
|                 |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                            |
| DISPLAY MESSAGE | MSG      | 046  | 3                                | 10.1                   | 14.2    | 14.3   | 14.3   | Displaying message         |
|                 |          |      |                                  | 8.4                    | 11.3    | 11.3   | 11.3   | Deleting displayed message |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-25 Clock Instructions

| Instruction       | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|-------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                   |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| CALENDAR ADD      | CADD     | 730  | 4                                | 38.3                   | 201.9   | 209.5  | 209.5  | ---        |
| CALENDAR SUBTRACT | CSUB     | 731  | 4                                | 38.6                   | 170.4   | 184.1  | 184.1  | ---        |
| HOURS TO SECONDS  | SEC      | 065  | 3                                | 21.4                   | 29.3    | 35.8   | 35.8   | ---        |
| SECONDS TO HOURS  | HMS      | 066  | 3                                | 22.2                   | 30.9    | 42.1   | 42.1   | ---        |
| CLOCK ADJUSTMENT  | DATE     | 735  | 2                                | 60.5                   | 87.4    | 95.9   | 95.9   | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-26 Debugging Instructions

| Instruction           | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |         |         | Conditions                   |
|-----------------------|----------|------|----------------------------------|------------------------|---------|---------|---------|------------------------------|
|                       |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□  | CPU-4□  |                              |
| Trace Memory Sampling | TRSM     | 045  | 1                                | 80.4                   | 120.0   | 120.0   | 120.0   | Sampling 1 bit and 0 words   |
|                       |          |      |                                  | 848.1                  | 1.06 ms | 1.06 ms | 1.06 ms | Sampling 31 bits and 6 words |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-27 Failure Diagnosis Instructions

| Instruction   | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                             |
|---------------|----------|------|----------------------------------|------------------------|---------|--------|--------|----------------------------------------|
|               |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                                        |
| FAILURE ALARM | FAL      | 006  | 3                                | 15.4                   | 16.7    | 16.7   | 16.7   | Recording errors                       |
|               |          |      |                                  | 179.8                  | 244.8   | 244.8  | 244.8  | Deleting errors (in order of priority) |
|               |          |      |                                  | 432.4                  | 657.1   | 657.1  | 657.1  | Deleting errors (all errors)           |
|               |          |      |                                  | 161.5                  | 219.4   | 219.4  | 219.4  | Deleting errors (individually)         |

| Instruction                   | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions    |
|-------------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|---------------|
|                               |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |               |
| SEVERE<br>FAILURE<br>ALARM    | FALS     | 007  | 3                                | ---                    | ---     | ---    | ---    | ---           |
| FAILURE<br>POINT<br>DETECTION | FPD      | 269  | 4                                | 140.9                  | 202.3   | 202.3  | 202.3  | When executed |
|                               |          |      |                                  | 163.4                  | 217.6   | 217.6  | 217.6  | First time    |
|                               |          |      |                                  | 185.2                  | 268.9   | 268.9  | 268.9  | When executed |
|                               |          |      |                                  | 207.5                  | 283.6   | 283.6  | 283.6  | First time    |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-28 Other Instructions

| Instruction                               | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|-------------------------------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|                                           |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| SET CARRY                                 | STC      | 040  | 1                                | 0.06                   | 0.06    | 0.12   | 0.12   | ---        |
| CLEAR<br>CARRY                            | CLC      | 041  | 1                                | 0.06                   | 0.06    | 0.12   | 0.12   | ---        |
| SELECT EM<br>BANK                         | EMBC     | 281  | 2                                | 14.0                   | 15.1    | 15.1   | 15.1   | ---        |
| EXTEND<br>MAXIMUM<br>CYCLE<br>TIME        | WDT      | 094  | 2                                | 15.0                   | 19.7    | 19.7   | 19.7   | ---        |
| SAVE CON-<br>DITION<br>FLAGS              | CCS      | 282  | 1                                | 8.6                    | 12.5    | ---    | ---    | ---        |
| LOAD CON-<br>DITION<br>FLAGS              | CCL      | 283  | 1                                | 9.8                    | 13.9    | ---    | ---    | ---        |
| CONVERT<br>ADDRESS<br>FROM CV             | FRMCV    | 284  | 3                                | 13.6                   | 19.9    | ---    | ---    | ---        |
| CONVERT<br>ADDRESS<br>TO CV               | TOCV     | 285  | 3                                | 11.9                   | 17.2    | ---    | ---    | ---        |
| DISABLE<br>PERIPH-<br>ERAL SER-<br>VICING | IOSP     | 287  | ---                              | 13.9                   | 19.8    | ---    | ---    | ---        |
| ENABLE<br>PERIPH-<br>ERAL SER-<br>VICING  | IORS     | 288  | ---                              | 63.6                   | 92.3    | ---    | ---    | ---        |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-29 Block Programming Instructions

| Instruction                  | Mnemonic                   | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                   |
|------------------------------|----------------------------|------|----------------------------------|------------------------|---------|--------|--------|------------------------------|
|                              |                            |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                              |
| BLOCK PROGRAM BEGIN          | BPRG                       | 096  | 2                                | 12.1                   | 13.0    | 13.0   | 13.0   | ---                          |
| BLOCK PROGRAM END            | BEND                       | 801  | 1                                | 9.6                    | 12.3    | 13.1   | 13.1   | ---                          |
| BLOCK PROGRAM PAUSE          | BPPS                       | 811  | 2                                | 10.6                   | 12.3    | 14.9   | 14.9   | ---                          |
| BLOCK PROGRAM RESTART        | BPRS                       | 812  | 2                                | 5.1                    | 5.6     | 8.3    | 8.3    | ---                          |
| CONDITIONAL BLOCK EXIT       | (Execution condition) EXIT | 806  | 1                                | 10.0                   | 11.3    | 12.9   | 12.9   | EXIT condition satisfied     |
|                              |                            |      |                                  | 4.0                    | 4.9     | 7.3    | 7.3    | EXIT condition not satisfied |
| CONDITIONAL BLOCK EXIT       | EXIT (bit address)         | 806  | 2                                | 6.8                    | 13.5    | 16.3   | 16.3   | EXIT condition satisfied     |
|                              |                            |      |                                  | 4.7                    | 7.2     | 10.7   | 10.7   | EXIT condition not satisfied |
| CONDITIONAL BLOCK EXIT (NOT) | EXIT NOT (bit address)     | 806  | 2                                | 12.4                   | 14.0    | 16.8   | 16.8   | EXIT condition satisfied     |
|                              |                            |      |                                  | 7.1                    | 7.6     | 11.2   | 11.2   | EXIT condition not satisfied |
| Branching                    | IF (execution condition)   | 802  | 1                                | 4.6                    | 4.8     | 7.2    | 7.2    | IF true                      |
|                              |                            |      |                                  | 6.7                    | 7.3     | 10.9   | 10.9   | IF false                     |
| Branching                    | IF (relay number)          | 802  | 2                                | 6.8                    | 7.2     | 10.4   | 10.4   | IF true                      |
|                              |                            |      |                                  | 9.0                    | 9.6     | 14.2   | 14.2   | IF false                     |
| Branching (NOT)              | IF NOT (relay number)      | 802  | 2                                | 7.1                    | 7.6     | 10.9   | 10.9   | IF true                      |
|                              |                            |      |                                  | 9.2                    | 10.1    | 14.7   | 14.7   | IF false                     |
| Branching                    | ELSE                       | 803  | 1                                | 6.2                    | 6.7     | 9.9    | 9.9    | IF true                      |
|                              |                            |      |                                  | 6.8                    | 7.7     | 11.2   | 11.2   | IF false                     |
| Branching                    | IEND                       | 804  | 1                                | 6.9                    | 7.7     | 11.0   | 11.0   | IF true                      |
|                              |                            |      |                                  | 4.4                    | 4.6     | 7.0    | 7.0    | IF false                     |
| ONE CYCLE AND WAIT           | WAIT (execution condition) | 805  | 1                                | 12.6                   | 13.7    | 16.7   | 16.7   | WAIT condition satisfied     |
|                              |                            |      |                                  | 3.9                    | 4.1     | 6.3    | 6.3    | WAIT condition not satisfied |
| ONE CYCLE AND WAIT           | WAIT (relay number)        | 805  | 2                                | 12.0                   | 13.4    | 16.5   | 16.5   | WAIT condition satisfied     |
|                              |                            |      |                                  | 6.1                    | 6.5     | 9.6    | 9.6    | WAIT condition not satisfied |
| ONE CYCLE AND WAIT (NOT)     | WAIT NOT (relay number)    | 805  | 2                                | 12.2                   | 13.8    | 17.0   | 17.0   | WAIT condition satisfied     |
|                              |                            |      |                                  | 6.4                    | 6.9     | 10.1   | 10.1   | WAIT condition not satisfied |

| Instruction                 | Mnemonic                   | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                   |
|-----------------------------|----------------------------|------|----------------------------------|------------------------|---------|--------|--------|------------------------------|
|                             |                            |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                              |
| COUNTER<br>WAIT             | CNTW                       | 814  | 4                                | 17.9                   | 22.6    | 27.4   | 27.4   | Default setting              |
|                             |                            |      |                                  | 19.1                   | 23.9    | 28.7   | 28.7   | Normal execution             |
|                             | CNTWX                      | 818  | 4                                | 17.9                   | 22.6    | ---    | ---    | Default setting              |
|                             |                            |      |                                  | 19.1                   | 23.9    | ---    | ---    | Normal execution             |
| HIGH-SPEED<br>TIMER<br>WAIT | TMHW                       | 815  | 3                                | 25.8                   | 27.9    | 34.1   | 34.1   | Default setting              |
|                             |                            |      |                                  | 20.6                   | 22.7    | 28.9   | 28.9   | Normal execution             |
|                             | TMHWX                      | 817  | 3                                | 25.8                   | 27.9    | ---    | ---    | Default setting              |
|                             |                            |      |                                  | 20.6                   | 22.7    | ---    | ---    | Normal execution             |
|                             |                            |      |                                  | 9.3                    | 10.8    | ---    | ---    | LEND condition not satisfied |
|                             |                            |      |                                  |                        |         |        |        |                              |
| Loop Control                | LOOP                       | 809  | 1                                | 7.9                    | 9.1     | 12.3   | 12.3   | ---                          |
| Loop Control                | LEND (execution condition) | 810  | 1                                | 7.7                    | 8.4     | 10.9   | 10.9   | LEND condition satisfied     |
|                             |                            |      |                                  | 6.8                    | 8.0     | 9.8    | 9.8    | LEND condition not satisfied |
| Loop Control                | LEND (relay number)        | 810  | 2                                | 9.9                    | 10.7    | 14.4   | 14.4   | LEND condition satisfied     |
|                             |                            |      |                                  | 8.9                    | 10.3    | 13.0   | 13.0   | LEND condition not satisfied |
| Loop Control                | LEND NOT (relay number)    | 810  | 2                                | 10.2                   | 11.2    | 14.8   | 14.8   | LEND condition satisfied     |
|                             |                            |      |                                  | 9.3                    | 10.8    | 13.5   | 13.5   | LEND condition not satisfied |
| TIMER<br>WAIT               | TIMW                       | 813  | 3                                | 22.3                   | 25.2    | 33.1   | 33.1   | Default setting              |
|                             |                            |      |                                  | 24.9                   | 27.8    | 35.7   | 35.7   | Normal execution             |
|                             | TIMWX                      | 816  | 3                                | 22.3                   | 25.2    | ---    | ---    | Default setting              |
|                             |                            |      |                                  | 24.9                   | 27.8    | ---    | ---    | Normal execution             |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

### 10-5-30 Text String Processing Instructions

| Instruction         | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                               |
|---------------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------------------------------------|
|                     |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                                          |
| MOV STRING          | MOV\$    | 664  | 3                                | 45.6                   | 66.0    | 84.3   | 84.3   | Transferring 1 character                 |
| CONCATE-NATE STRING | +\$      | 656  | 4                                | 86.5                   | 126.0   | 167.8  | 167.8  | 1 character + 1 character                |
| GET STRING LEFT     | LEFT\$   | 652  | 4                                | 53.0                   | 77.4    | 94.3   | 94.3   | Retrieving 1 character from 2 characters |
| GET STRING RIGHT    | RGHT\$   | 653  | 4                                | 52.2                   | 76.3    | 94.2   | 94.2   | Retrieving 1 character from 2 characters |



| Instruction                            | Mnemonic             | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions                                                         |
|----------------------------------------|----------------------|------|----------------------------------|------------------------|---------|--------|--------|--------------------------------------------------------------------|
|                                        |                      |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |                                                                    |
| GET STRING<br>MIDDLE                   | MID\$                | 654  | 5                                | 56.5                   | 84.6    | 230.2  | 230.2  | Retrieving 1<br>character from 3<br>characters                     |
| FIND IN<br>STRING                      | FIND\$               | 660  | 4                                | 51.4                   | 77.5    | 94.1   | 94.1   | Searching for 1<br>character from 2<br>characters                  |
| STRING<br>LENGTH                       | LEN\$                | 650  | 3                                | 19.8                   | 28.9    | 33.4   | 33.4   | Detecting 1<br>character                                           |
| REPLACE IN<br>STRING                   | RPLC\$               | 661  | 6                                | 175.1                  | 258.7   | 479.5  | 479.5  | Replacing the<br>first of 2 charac-<br>ters with 1 char-<br>acter  |
| DELETE<br>STRING                       | DEL\$                | 658  | 5                                | 63.4                   | 94.2    | 244.6  | 244.6  | Deleting the<br>leading charac-<br>ter of 2 charac-<br>ters        |
| EXCHANGE<br>STRING                     | XCHG\$               | 665  | 3                                | 60.6                   | 87.2    | 99.0   | 99.0   | Exchanging 1<br>character with 1<br>character                      |
| CLEAR<br>STRING                        | CLR\$                | 666  | 2                                | 23.8                   | 36.0    | 37.8   | 37.8   | Clearing 1 char-<br>acter                                          |
| INSERT INTO<br>STRING                  | INS\$                | 657  | 5                                | 136.5                  | 200.6   | 428.9  | 428.9  | Inserting 1 char-<br>acter after the<br>first of 2 charac-<br>ters |
| String Com-<br>parison<br>Instructions | LD, AND,<br>OR += \$ | 670  | 4                                | 48.5                   | 69.8    | 86.2   | 86.2   | Comparing 1<br>character with 1<br>character                       |
|                                        | LD, AND,<br>OR +<>\$ | 671  |                                  |                        |         |        |        |                                                                    |
|                                        | LD, AND,<br>OR +<\$  | 672  |                                  |                        |         |        |        |                                                                    |
|                                        | LD, AND,<br>OR +>\$  | 674  |                                  |                        |         |        |        |                                                                    |
|                                        | LD, AND,<br>OR +>=\$ | 675  |                                  |                        |         |        |        |                                                                    |

**Note** When a double-length operand is used, add 1 to the value shown in the length column in the following table.

## 10-5-31 Task Control Instructions

| Instruction | Mnemonic | Code | Length<br>(steps)<br>(See note.) | ON execution time (μs) |         |        |        | Conditions |
|-------------|----------|------|----------------------------------|------------------------|---------|--------|--------|------------|
|             |          |      |                                  | CPU-6□H                | CPU-4□H | CPU-6□ | CPU-4□ |            |
| TASK ON     | TKON     | 820  | 2                                | 19.5                   | 26.3    | 26.3   | 26.3   | ---        |
| TASK OFF    | TKOF     | 821  | 2                                | 13.3                   | 19.0    | 26.3   | 26.3   | ---        |

### Guidelines on Converting Program Capacities from Previous OMRON PLCs

Guidelines are provided in the following table for converting the program capacity (unit: words) of previous OMRON PLCs (SYSMAC C200HX/HG/HE, CVM1, or CV-series PLCs) to the program capacity (unit: steps) of the CS-series PLCs.

Add the following value (n) to the program capacity (unit: words) of the previous PLCs for each instruction to obtain the program capacity (unit: steps) of the CS-series PLCs.

| <b>CS-series steps = “a” (words) of previous PLC + n</b> |                                                 |                                                                  |                                                                           |
|----------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------------|
| <b>Instructions</b>                                      | <b>Variations</b>                               | <b>Value of n when converting from C200HX/HG/HE to CS Series</b> | <b>Value of n when converting from CV-series PLC or CVM1 to CS Series</b> |
| Basic instructions                                       | None                                            | OUT, SET, RSET, or KEEP(011): -1<br>Other instructions: 0        | 0                                                                         |
|                                                          | Upward Differentiation                          | None                                                             | +1                                                                        |
|                                                          | Immediate Refreshing                            | None                                                             | 0                                                                         |
|                                                          | Upward Differentiation and Immediate Refreshing | None                                                             | +2                                                                        |
| Special instructions                                     | None                                            | 0                                                                | -1                                                                        |
|                                                          | Upward Differentiation                          | +1                                                               | 0                                                                         |
|                                                          | Immediate Refreshing                            | None                                                             | +3                                                                        |
|                                                          | Upward Differentiation and Immediate Refreshing | None                                                             | +4                                                                        |

For example, if OUT is used with an address of CIO 000000 to CIO 25515, the program capacity of the previous PLC would be 2 words per instruction and that of the CS-series PLC would be 1 (2 – 1) step per instruction.

For example, if !MOV is used (MOVE instruction with immediate refreshing), the program capacity of a CV-series PLC would be 4 words per instruction and that of the CS-series PLC would be 7 (4 + 3) steps.



## SECTION 11

### Troubleshooting

This section provides information on hardware and software errors that occur during PLC operation.

|         |                                           |     |
|---------|-------------------------------------------|-----|
| 11-1    | Error Log . . . . .                       | 432 |
| 11-2    | Error Processing . . . . .                | 433 |
| 11-2-1  | Error Categories . . . . .                | 433 |
| 11-2-2  | Error Information . . . . .               | 433 |
| 11-2-3  | Error Codes and Error Flags . . . . .     | 434 |
| 11-2-4  | Error Processing Flowchart . . . . .      | 435 |
| 11-2-5  | Error Messages . . . . .                  | 437 |
| 11-2-6  | Power Supply Check . . . . .              | 447 |
| 11-2-7  | Memory Error Check . . . . .              | 448 |
| 11-2-8  | Program Error Check . . . . .             | 449 |
| 11-2-9  | Cycle Time Too Long Error Check . . . . . | 450 |
| 11-2-10 | PLC Setup Setting Error Check . . . . .   | 450 |
| 11-2-11 | Battery Error Check . . . . .             | 451 |
| 11-2-12 | Environmental Conditions Check . . . . .  | 451 |
| 11-2-13 | I/O Check . . . . .                       | 452 |
| 11-3    | Troubleshooting Racks and Units . . . . . | 453 |

## 11-1 Error Log

Each time that an error occurs, the CPU Unit stores error information in the Error Log Area. The error information includes the error code (stored in A400), error contents, and time that the error occurred. Up to 20 records can be stored in the Error Log.

### Errors Generated by FAL(006)/FALS(007)

In addition to system-generated errors, the PLC records user-defined FAL(006) and FALS(007) errors, making it easier to track the operating status of the system.

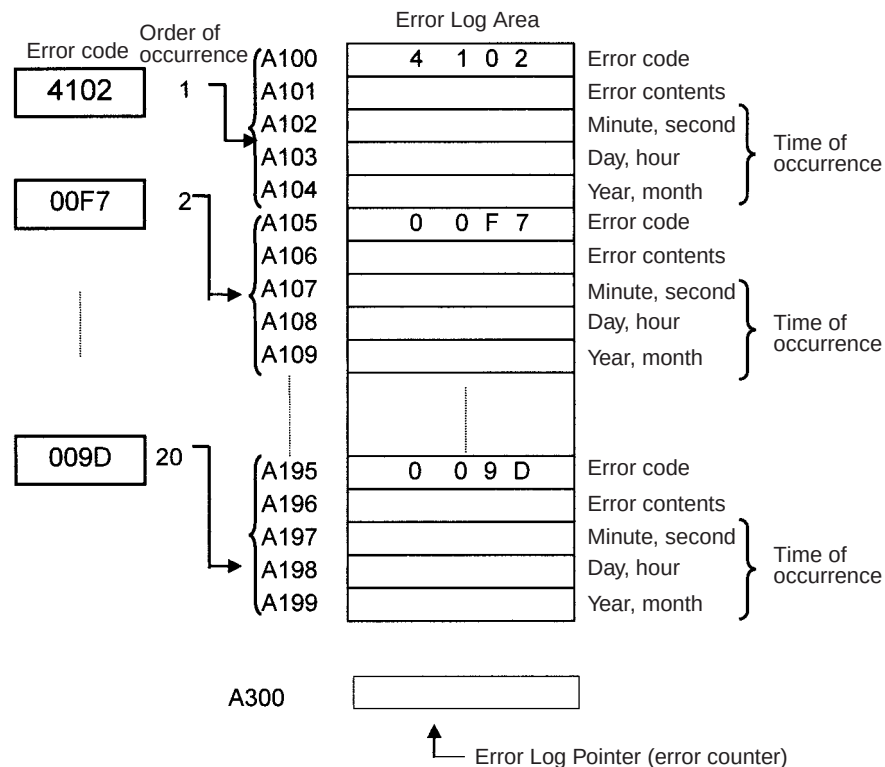
A user-defined error is generated when FAL(006) or FALS(007) is executed in the program. The execution conditions of these instructions constitute the user-defined error conditions. FAL(006) generates a non-fatal error and FALS(007) generates a fatal error that stops program execution.

The following table shows the error codes for FAL(006) and FALS(007).

| Instruction | FAL numbers                       | Error codes  |
|-------------|-----------------------------------|--------------|
| FAL(006)    | #0001 to #01FF (1 to 511 decimal) | 4101 to 42FF |
| FALS(007)   | #0001 to #01FF (1 to 511 decimal) | C101 to C2FF |

### Error Log Structure

When more than 20 errors occur, the oldest error data (in A195 to A199) is deleted, the newest record is stored in A100 to A104, and the other errors are shifted by one.



The number of records is stored in binary in the Error Log Pointer (A300). The data in the Error Log can be cleared from a Programming Device.

**Note** The Error Log Pointer can be reset by turning ON the Error Log Pointer Reset Bit (A50014), but this operation does not clear the data in the Error Log itself.

## 11-2 Error Processing

### 11-2-1 Error Categories

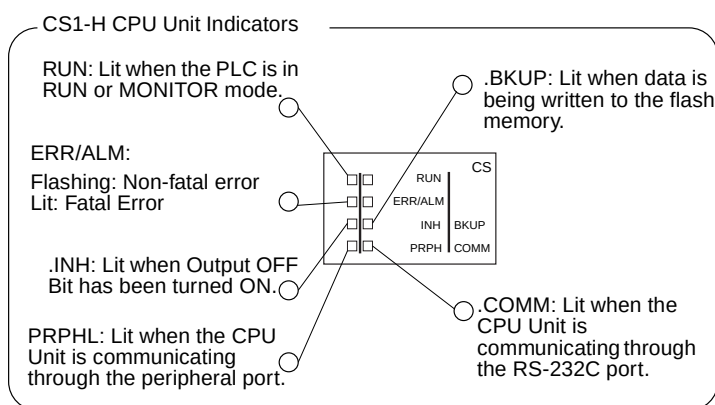
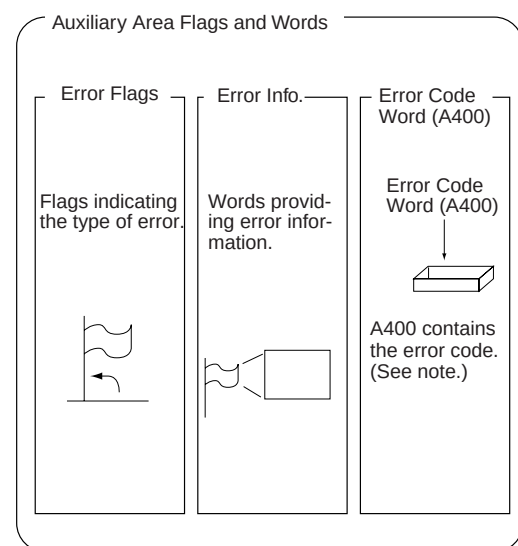
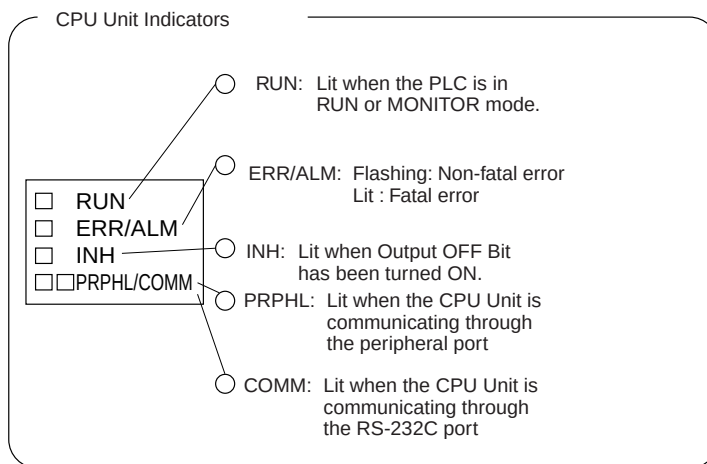
Errors in CS-series PLCs can be broadly divided into the following three categories.

| Category                                 | Result                                                        | Indicators    |                   | Comments                                                                                                 |
|------------------------------------------|---------------------------------------------------------------|---------------|-------------------|----------------------------------------------------------------------------------------------------------|
|                                          |                                                               | RUN           | ERR/ALM           |                                                                                                          |
| CPU Standby                              | The CPU Unit will not start operation in RUN or MONITOR mode. | OFF           | OFF               | ---                                                                                                      |
| Non-fatal Errors<br>(including FAL(006)) | The CPU Unit will continue operating in RUN or MONITOR mode.  | ON<br>(Green) | Flashing<br>(Red) | Other indicators will also operate when a communications error has occurred or the Output OFF Bit is ON. |
| Fatal Errors<br>(including FALS(007))    | The CPU Unit will stop operating in RUN or MONITOR mode.      | OFF           | ON<br>(Red)       | The indicators will all be OFF when there is a power interruption.                                       |

### 11-2-2 Error Information

There are basically four sources of information on errors that have occurred:

- 1,2,3...**
1. The CPU Unit's indicators
  2. The Auxiliary Area Error Flags
  3. The Auxiliary Area Error Information Words
  4. The Auxiliary Area Error Code Word



**Note** When two or more errors occur at the same time, the highest (most serious) error code will be stored in A400.

### Indicator Status and Error Conditions

The following table shows the status of the CPU Unit's indicators for errors that have occurred in RUN or MONITOR mode.

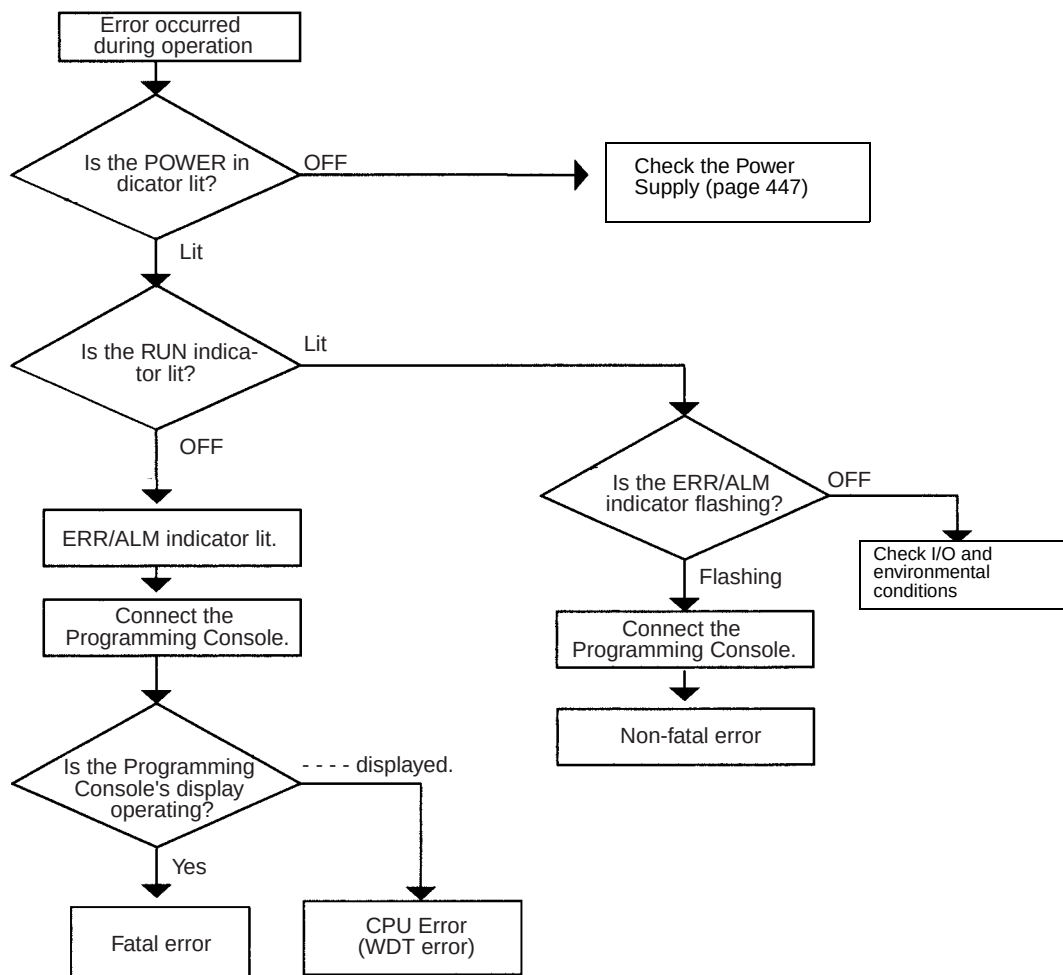
| Indicator* | CPU error | CPU standby | Fatal error | Non-fatal error | Communications error |         | Output OFF Bit ON |
|------------|-----------|-------------|-------------|-----------------|----------------------|---------|-------------------|
|            |           |             |             |                 | Peripheral           | RS-232C |                   |
| RUN        | OFF       | OFF         | OFF         | ON              | ON                   | ON      | ---               |
| ERR/ALM    | ON        | OFF         | ON          | Flashing        | ---                  | ---     | ---               |
| INH        | OFF       | ---         | ---         | ---             | ---                  | ---     | ON                |
| PRPHL      | ---       | ---         | ---         | ---             | OFF                  | ---     | ---               |
| COMM       | ---       | ---         | ---         | ---             | ---                  | OFF     | ---               |

### 11-2-3 Error Codes and Error Flags

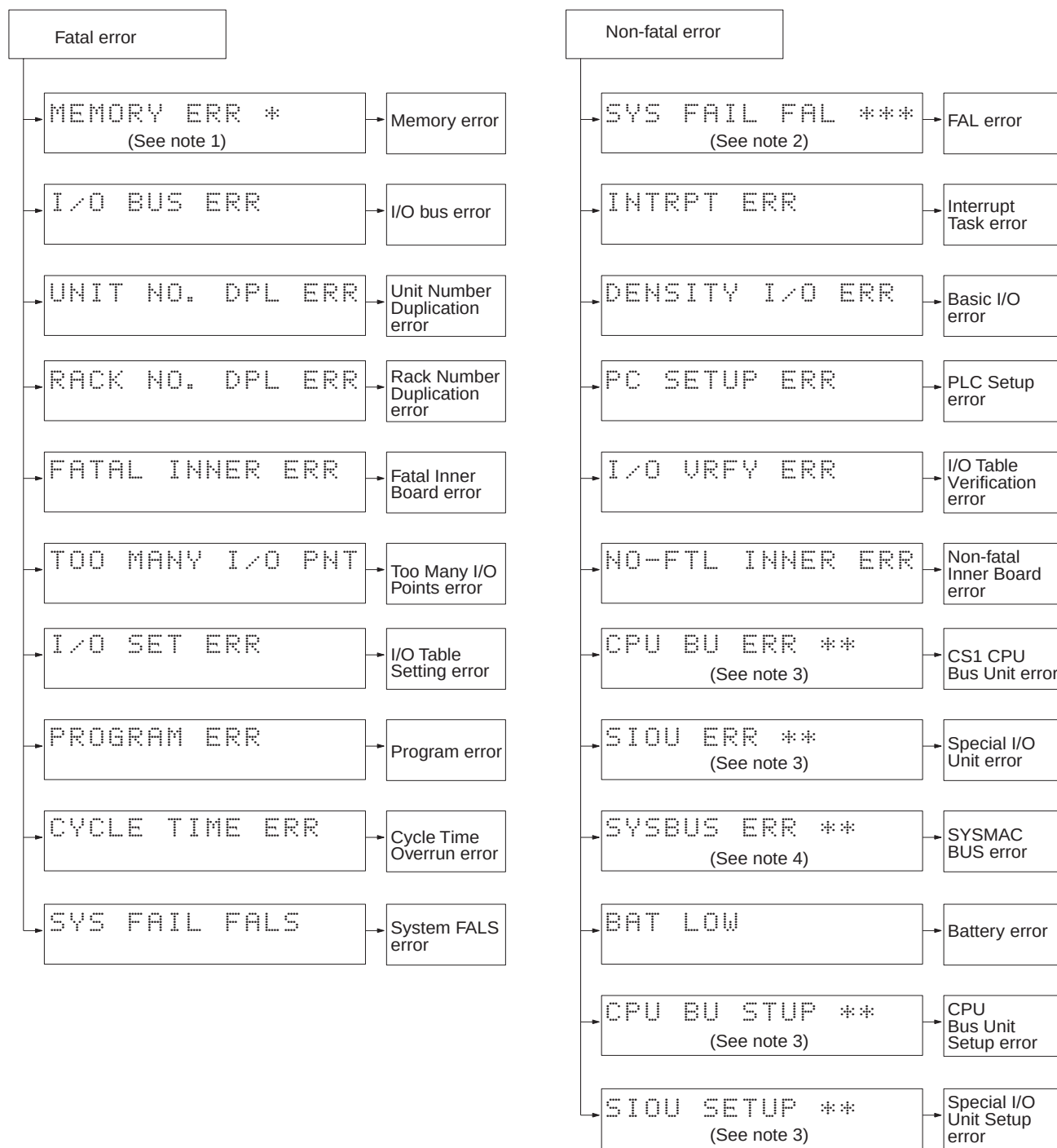
| Classification                | Error code         | Error name                                                               | Page |
|-------------------------------|--------------------|--------------------------------------------------------------------------|------|
| Fatal system errors           | 80F1               | Memory error                                                             | 439  |
|                               | 80C0 to 80C7, 80CF | I/O bus error                                                            | 439  |
|                               | 80E9               | Duplicated number error                                                  | 440  |
|                               | 80E1               | Too many I/O points                                                      | 441  |
|                               | 80E0               | I/O setting error                                                        | 441  |
|                               | 80F0               | Program error                                                            | 442  |
|                               | 809F               | Cycle time too long                                                      | 443  |
|                               | 80EA               | Expansion Rack number duplicated                                         | 440  |
|                               | 82F0               | Fatal Inner Board error                                                  | 440  |
| Non-fatal system errors       | 008B               | Interrupt task error                                                     | 444  |
|                               | 009A               | Basic I/O error                                                          | 444  |
|                               | 009B               | PLC Setup setting error                                                  | 445  |
|                               | 00E7               | I/O verification error                                                   | 445  |
|                               | 02F0               | Inner Board error                                                        | 445  |
|                               | 0200 to 020F       | CS1-series CPU Bus Unit error                                            | 445  |
|                               | 0300 to 035F       | Special I/O Unit error                                                   | 445  |
|                               | 00A0 to 00A1       | SYSMAC BUS error                                                         | 445  |
|                               | 00F7               | Battery error                                                            | 446  |
|                               | 0400 to 040F       | CS1-series CPU Bus Unit setting error                                    | 446  |
|                               | 0500 to 055F       | Special I/O Unit setting error                                           | 446  |
|                               |                    |                                                                          |      |
| User-defined fatal errors     | 4101 to 42FF       | FALS(007) error<br>(C101 to C2FF are stored for FALS numbers 001 to 511) | 444  |
| User-defined non-fatal errors | C101 to C2FF       | FAL(006) error<br>(4101 to 42FF are stored for FAL numbers 001 to 511)   | 443  |

### 11-2-4 Error Processing Flowchart

Use the following flowchart as a guide for error processing with a Programming Console.







- Note**
1. The rack number will be given at \*.
  2. The FAL./FALS number will be given at \*\*\*.
  3. The unit number will be given at \*\*.
  4. The master number will be given at \*.

## 11-2-5 Error Messages

The following tables show error messages for errors which can occur in CS-series PLCs and indicate the likely cause of the errors.

### CPU Errors

A CPU error has occurred if the indicators have the following conditions in RUN or MONITOR mode.

| Power Supply Unit Indicator | CPU Unit Indicators |         |     |       |      |
|-----------------------------|---------------------|---------|-----|-------|------|
| POWER                       | RUN                 | ERR/ALM | INH | PRPHL | COMM |
| ON                          | ---                 | ON      | --- | ---   | ---  |

| Status  | Error     | Program-<br>ming<br>Console<br>display | Error<br>flags in<br>Auxiliary<br>Area | Error<br>code (in<br>A400) | Flags<br>and<br>word<br>data | Probable cause                               | Possible remedy                                                 |
|---------|-----------|----------------------------------------|----------------------------------------|----------------------------|------------------------------|----------------------------------------------|-----------------------------------------------------------------|
| Stopped | CPU error | -----                                  | None                                   | None                       | None                         | Watchdog timer has exceeded maximum setting. | Switch the PLC to PROGRAM mode, turn the power OFF and restart. |

### Expansion Rack Power Interruption

The following indicators status indicates an Expansion Rack power interruption, not a CPU error. The Programming Console cannot be used in this status.

| Power Supply Unit Indicator | CPU Unit Indicators |         |     |       |      |
|-----------------------------|---------------------|---------|-----|-------|------|
| POWER                       | RUN                 | ERR/ALM | INH | PRPHL | COMM |
| ON                          | ---                 | ---     | --- | ---   | ---  |

| Status  | Error                             | Program-<br>ming<br>Console<br>display | Error<br>flags in<br>Auxiliary<br>Area | Error<br>code (in<br>A400) | Flags | Probable cause                                    | Possible remedy                                    |
|---------|-----------------------------------|----------------------------------------|----------------------------------------|----------------------------|-------|---------------------------------------------------|----------------------------------------------------|
| Stopped | Expansion Rack power interruption | -----                                  | None                                   | None                       | None  | Power is not being supplied to an Expansion Rack. | Switch to PROGRAM mode and cycle the power supply. |

**Note** When power supply is interrupted to an Expansion Rack, the CPU Unit will stop program execution and the same operations as are performed when the power supply to the CPU Unit is interrupted will be performed. For example, if the power OFF interrupt task is enabled, it will be executed. If power is then restored to the Expansion Rack, the CPU Unit will perform startup processing, i.e., the same operational status as existed before the power interrupt will not necessarily be continued.

**CPU Standby Errors**

A CPU standby error has occurred if the indicators have the following conditions in RUN or MONITOR mode.

| Power Supply Unit Indicator | CPU Unit Indicators |         |     |       |      |
|-----------------------------|---------------------|---------|-----|-------|------|
| POWER                       | RUN                 | ERR/ALM | INH | PRPHL | COMM |
| ON                          | OFF                 | OFF     | --- | ---   | ---  |

| Status  | Error                   | Program-<br>ing<br>Console<br>display | Error<br>flags in<br>Auxiliary<br>Area | Error<br>code (in<br>A400) | Flags | Probable cause                                                                                          | Possible remedy                                                                                                                                               |
|---------|-------------------------|---------------------------------------|----------------------------------------|----------------------------|-------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stopped | CPU<br>standby<br>error | CPU<br>WAIT'G                         | None                                   | None                       | None  | A CPU Bus Unit has not started properly.                                                                | Check the settings of the CPU Bus Unit.                                                                                                                       |
|         |                         |                                       |                                        |                            |       | A Special I/O Unit, High-density I/O Unit, Interrupt Input Unit, or Inner Board was not recognized.     | Read the I/O table and replace any Special I/O Unit, High-density I/O Unit, Interrupt Input Unit, or Inner Board for which only "\$" is displayed.            |
|         |                         |                                       |                                        |                            |       | Power is not being supplied to a Slave Rack or the terminator is not recognized in a Remote I/O System. | Check the power supply to the Slave Racks and terminating resistance settings for Remote I/O Systems. Also check cable connections in the Remote I/O Systems. |

**Startup Condition**

The CS1-H CPU Units support a Startup Condition setting.

To start the CPU Unit in MONITOR or PROGRAM mode even if there is one or more Boards or Units that has not completed startup processing, set the Startup Condition to 1.

**PLC Setup**

| Programming Con-<br>sole setting address |     | Name              | Settings                                        | Default                       |
|------------------------------------------|-----|-------------------|-------------------------------------------------|-------------------------------|
| Word                                     | Bit |                   |                                                 |                               |
| 83                                       | 15  | Startup Condition | 0: Wait for Units and Boards.<br>1: Don't wait. | 0: Wait for Units and Boards. |

**Note** The operation for Inner Boards, however, also depends on the next setting of the Inner Board Setting in word 84, but 15. This bit must also be turned ON to not wait for Inner Boards.

**Fatal Errors**

A fatal error has occurred if the indicators have the following conditions in RUN or MONITOR mode.

| Power Supply Unit Indicator | CPU Unit Indicators |         |     |       |      |
|-----------------------------|---------------------|---------|-----|-------|------|
| POWER                       | RUN                 | ERR/ALM | INH | PRPHL | COMM |
| ON                          | OFF                 | ON      | --- | ---   | ---  |

Connect the CX-Programmer or a Programming Console to display the error message (in the PLC Error Window on the CX-Programmer). The cause of the error can be determined from the error message and related Auxiliary Area flags and words.

Errors are listed in order of importance. When two or more errors occur at the same time, the more serious error's error code will be recorded in A400.

If the IOM Hold Bit hasn't been turned ON to protect I/O memory, all non-retained areas of I/O memory will be cleared when a fatal error other than FALS(007) occurs. If the IOM Hold Bit is ON, the contents of I/O memory will be retained but all outputs will be turned OFF.

If the IOM Hold Bit hasn't been turned ON to protect I/O memory, all non-retained areas of I/O memory will be cleared when a fatal error other than FALS(007) occurs. When the IOM Hold Bit is ON, the contents of I/O memory will be retained but all outputs will be turned OFF.

| Error            | Program-<br>ming<br>Console<br>display | Error<br>code (in<br>A400) | Flag and<br>word data                                                                    | Probable cause                                                                                                                                                                                                                                                                                                                     | Possible remedy                                                                                                                                                                                                                                                                                                      |
|------------------|----------------------------------------|----------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memory<br>error  | MEMORY<br>ERR                          | 80F1                       | A40115: Memory<br>Error Flag<br>A403: Memory<br>Error Loca-<br>tion                      | An error has occurred in memory. A bit in A403 will turn ON to show the location of the error as listed below.                                                                                                                                                                                                                     | See below.                                                                                                                                                                                                                                                                                                           |
|                  |                                        |                            |                                                                                          | A40300 ON:<br>A checksum error has occurred in the user program memory. An illegal instruction was detected.                                                                                                                                                                                                                       | Check the program and correct the error.                                                                                                                                                                                                                                                                             |
|                  |                                        |                            |                                                                                          | A40304 ON:<br>A checksum error has occurred in the PLC Setup.                                                                                                                                                                                                                                                                      | Clear the entire PLC Setup to 0000 and reenter the settings.                                                                                                                                                                                                                                                         |
|                  |                                        |                            |                                                                                          | A40305 ON:<br>A checksum error has occurred in the registered I/O table.                                                                                                                                                                                                                                                           | Initialize the registered I/O table and generate a new I/O table.                                                                                                                                                                                                                                                    |
|                  |                                        |                            |                                                                                          | A40307 ON:<br>A checksum error has occurred in the routing tables.                                                                                                                                                                                                                                                                 | Initialize the routing tables and reenter the tables.                                                                                                                                                                                                                                                                |
|                  |                                        |                            |                                                                                          | A40308 ON:<br>A checksum error has occurred in the CS-series CPU Bus Unit setup.                                                                                                                                                                                                                                                   | Initialize the CS-series CPU Bus Unit setup and reenter the settings.                                                                                                                                                                                                                                                |
|                  |                                        |                            |                                                                                          | A40309 ON:<br>An error occurred during automatic transfer from the Memory Card at startup.                                                                                                                                                                                                                                         | Make sure that the Memory Card is installed properly and that the correct file is on the Card.                                                                                                                                                                                                                       |
|                  |                                        |                            |                                                                                          | A40310 ON:<br>Flash memory has failed.                                                                                                                                                                                                                                                                                             | Retransfer the user program and parameter data.                                                                                                                                                                                                                                                                      |
| I/O Bus<br>error | I/O BUS<br>ERR                         | 80C0 to<br>80C7 or<br>80CF | A40114: I/O<br>Bus Error Flag<br>A404: I/O<br>Bus Error<br>Slot and<br>Rack Num-<br>bers | <p>Error has occurred in the bus line between the CPU and I/O Units.</p> <p>A40400 to A40407 contain the error slot number (00 to 09) in binary. 0F indicates that the slot cannot be determined.</p> <p>A40408 to A40415 contain the error rack number (00 to 07) in binary. 0F indicates that the rack cannot be determined.</p> | <p>Try turning the power OFF and ON again.</p> <p>If the error isn't corrected, turn the power OFF and check cable connections between the I/O Units and Racks.</p> <p>Check for damage to the cable or Units.</p> <p>Correct the cause of the error and then turn the Rack's power supply OFF and then ON again</p> |

| Error                                         | Program-<br>ming<br>Console<br>display | Error<br>code (in<br>A400) | Flag and<br>word data                                                                                          | Probable cause                                                                                                                              | Possible remedy                                                                                                                                                                                                                                      |
|-----------------------------------------------|----------------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unit/Rack<br>Number<br>Dupli-<br>cation error | UNIT No.<br>DPL ERR                    | 80E9                       | A40113:<br>Duplication<br>Error Flag<br>A410: CPU<br>Bus Unit<br>Duplicate<br>Number<br>Flags                  | The same number has been allocated to more than one CS-series CPU Bus Unit. Bits A41000 to A41015 correspond to unit numbers 0 to F.        | Check the unit numbers, eliminate the duplications, and turn the Rack's power supply OFF and then ON again.                                                                                                                                          |
|                                               |                                        |                            | A40113:<br>Duplication<br>Error Flag<br>A411 to<br>A416: Spe-<br>cial I/O Unit<br>Duplicate<br>Number<br>Flags | The same number has been allocated to more than one Special I/O Unit. Bits A41100 to A41615 correspond to unit numbers 0 to 95.             | Check the unit numbers, eliminate the duplications, and turn the Rack's power supply OFF and then ON again.                                                                                                                                          |
|                                               | RACK No.<br>DPL ERR                    | 80EA                       | A409:<br>Expansion<br>Rack Dupli-<br>cate Rack<br>Number                                                       | The same I/O word has been allocated to more than one Basic I/O Unit.                                                                       | Check allocations to Units on the rack number whose bit in ON in A40900 to A40907. Correct the allocations so that no words are allocated more than once, including to Units on other Racks, and turn the Rack's power supply OFF and then ON again. |
|                                               |                                        |                            |                                                                                                                | An Expansion I/O Rack's starting word address exceeds CIO 0901. The corresponding bit in A40900 to A40907 (Racks 0 to 7) will be turned ON. | Check the first word setting for the Rack indicated in A40900 to A40907 and change the setting to a valid word address below CIO 0901 with a Programming Device.                                                                                     |
| Fatal Inner<br>Board<br>error                 | FATAL<br>INNER<br>ERR                  | 82F0                       | A40112:<br>Inner Board<br>Stopped<br>Error Flag<br>A424: Inner<br>Board Error<br>Information                   | The Inner Board is faulty. An error occurred on the Inner bus.                                                                              | Check the indicators on the Inner Board and refer to the operation manual for the Inner Board.                                                                                                                                                       |

| Error                           | Program-<br>ming<br>Console<br>display | Error<br>code (in<br>A400) | Flag and<br>word data                                                                     | Probable cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Possible remedy                                                                                                              |
|---------------------------------|----------------------------------------|----------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Too Many<br>I/O Points<br>error | TOO<br>MANY I/O<br>PNT                 | 80E1                       | A40111:<br>Too Many I/<br>O Points<br>Flag<br>A407: Too<br>Many I/O<br>Points,<br>Details | <p>The probable causes are listed below. The 3-digit binary value (000 to 101) in A40713 to A40715 indicates the cause of the error. The value of these 3 bits is also output to A40700 to A40712.</p> <ol style="list-style-type: none"> <li>1) The total number of I/O points set in the I/O Table (excluding Slave Racks) exceeds the maximum allowed for the CPU Unit (bits: 000).</li> <li>2) There are more than 32 interrupt inputs (bits: 001).</li> <li>3) The unit number of a Slave Unit is duplicated or the number of I/O points on a C500 Slave Unit exceeds 320 (bits: 010).</li> <li>4) The unit number of an I/O Interface (excluding Slave Racks) is duplicated (bits: 011).</li> <li>5) The unit number of a Master Unit is duplicated or the unit number is outside of the allowed setting range (bits: 100).</li> <li>6) The number of Expansion Racks exceeds the maximum (bits: 101).</li> <li>7) C200H Special I/O Unit not detected or Remote I/O not detected (bits: 110)</li> </ol> | Correct the problem indicated by the content of A407 and turn the power OFF and ON again.                                    |
| I/O Table<br>Setting<br>error   | I/O SET<br>ERR                         | 80E0                       | A40110: I/O<br>Setting<br>Error Flag                                                      | Input and output word allocations do not agree with input/output words required by Units actually mounted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Check the I/O table with I/O Table Verification operation. When the system has been corrected, register the I/O table again. |

| Error            | Program-<br>ming<br>Console<br>display | Error<br>code (in<br>A400) | Flag and<br>word data                                                               | Probable cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Possible remedy                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------|----------------------------------------|----------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program<br>error | PRO-<br>GRAM<br>ERR                    | 80F0                       | A40109: Program<br>Error Flag<br>A294 to<br>A299: Pro-<br>gram error<br>information | The program is incorrect.<br>See the following rows of<br>this table for details.<br>The address at which the<br>program stopped will be out-<br>put to A298 and A299.                                                                                                                                                                                                                                                                                                            | Check A295 to determine the type of<br>error that occurred and check A298/<br>A299 to find the program address where<br>the error occurred.<br>Correct the program and then clear the<br>error.                                                                                                                                                                                                                                |
|                  |                                        |                            |                                                                                     | A29511: No END error                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Be sure that there is an END(001)<br>instruction at the end of the task speci-<br>fied in A294 (program stop task number).                                                                                                                                                                                                                                                                                                     |
|                  |                                        |                            |                                                                                     | A29512: Task error<br>A task error has occurred.<br>The following conditions will<br>generate a task error.<br>1) There isn't an executable<br>cyclic task.<br>2) There isn't a program allo-<br>cated to the task. Check<br>A294 for the number of the<br>task missing a program.<br>3) The task specified in a<br>TKON(820), TKOF(821), or<br>MSKS(690) instruction<br>doesn't exist.                                                                                           | Check the startup cyclic task attributes.<br>Check the execution status of each task<br>as controlled by TKON(820) and<br>TKOF(821).<br>Make sure that all of the task numbers<br>specified in TKON(820), TKOF(821), and<br>MSKS(690) instructions have corre-<br>sponding tasks.<br>Use MSKS(690) to mask any I/O or<br>scheduled interrupt tasks that are not<br>being used and that do not have pro-<br>grams set for them. |
|                  |                                        |                            |                                                                                     | A29510: Illegal access error<br>An illegal access error has<br>occurred and the PLC Setup<br>has been set to stop opera-<br>tion for an instruction error.<br>The following are illegal<br>access errors:<br>1. Reading/writing a param-<br>eter area.<br>2. Writing memory that is not<br>installed.<br>3. Writing an EM bank that is<br>EM file memory.<br>4. Writing to a read-only<br>area.<br>5. Indirect DM/EM address<br>that is not in BCD when BCD<br>mode is specified. | Find the program address where the<br>error occurred (A298/A299) and correct<br>the instruction.                                                                                                                                                                                                                                                                                                                               |
|                  |                                        |                            |                                                                                     | A29509: Indirect DM/EM<br>BCD error<br>An indirect DM/EM BCD<br>error has occurred and the<br>PLC Setup has been set to<br>stop operation for an instruc-<br>tion error.                                                                                                                                                                                                                                                                                                          | Find the program address where the<br>error occurred (A298/A299) and correct<br>the indirect addressing or change to<br>binary mode.                                                                                                                                                                                                                                                                                           |

| Error                             | Program-<br>ming<br>Console<br>display | Error<br>code (in<br>A400) | Flag and<br>word data                                                                       | Probable cause                                                                                                                                                                                                                                                                             | Possible remedy                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------|----------------------------------------|----------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Program<br>error<br>(contd.)      | PRO-<br>GRAM<br>ERR                    | 80F0                       | A40109:<br>Program<br>Error Flag<br>A294 to<br>A299: Pro-<br>gram error<br>information      | A29508: Instruction error<br>An instruction processing<br>error has occurred and the<br>PLC Setup has been set to<br>stop operation for an instruc-<br>tion error.                                                                                                                         | Find the program address where the<br>error occurred (A298/A299) and correct<br>the instruction.<br>Alternatively, set the PLC Setup to con-<br>tinue operation for an instruction error.                                                                                                                                                                                                                                                                       |
|                                   |                                        |                            |                                                                                             | A29513: Differentiation over-<br>flow error<br>Too many differentiated<br>instructions have been<br>inserted or deleted during<br>online editing.                                                                                                                                          | After writing any changes to the program,<br>switch to PROGRAM mode and then<br>return to MONITOR mode to continue<br>editing the program.                                                                                                                                                                                                                                                                                                                      |
|                                   |                                        |                            |                                                                                             | A29514: Illegal instruction<br>error<br>The program contains an<br>instruction that cannot be<br>executed.                                                                                                                                                                                 | Retransfer the program to the CPU Unit.                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                   |                                        |                            |                                                                                             | A29515: UM overflow error<br>The last address in UM (user<br>program memory) has been<br>exceeded.                                                                                                                                                                                         | Use a Programming Device to transfer<br>the program again.                                                                                                                                                                                                                                                                                                                                                                                                      |
| Cycle<br>Time<br>Overrun<br>error | CYCLE<br>TIME ERR                      | 809F                       | A40108:<br>Cycle Time<br>Too Long<br>Flag                                                   | The cycle time has<br>exceeded the maximum<br>cycle time (watch cycle time)<br>set in the PLC Setup.                                                                                                                                                                                       | Change the program to reduce the cycle<br>time or change the maximum cycle time<br>setting.<br>Check the Maximum Interrupt Task Pro-<br>cessing Time in A440 and see if the<br>Cycle Time Watch Time can be changed.<br>The cycle time can be reduced by divid-<br>ing unused parts of the program into<br>tasks, jumping unused instructions in<br>tasks, and disabling cyclic refreshing of<br>Special I/O Units that don't require fre-<br>quent refreshing. |
|                                   | CYCLE<br>TIME<br>OVER                  | 809F                       | A40515:<br>Peripheral<br>Servicing<br>Cycle Time<br>Too Long<br>(CS1-H<br>CPU Unit<br>only) | Turns ON when the periph-<br>eral servicing time in a Paral-<br>lel Processing Mode<br>exceeds 2 s.                                                                                                                                                                                        | Change the CPU Processing Mode in<br>the PLC Setup to Normal Mode or<br>Peripheral Servicing Priority Mode, or<br>review the system to reduce the event<br>load.<br>Parallel processing may not be possible<br>if the program execution time (given in<br>A66) is too short (e.g., less than 0.2 ms).                                                                                                                                                           |
| System<br>FALS error              | SYS FAIL<br>FALS                       | C101 to<br>C2FF            | A40106:<br>FALS Error<br>Flag                                                               | FALS(007) has been exe-<br>cuted in the program.<br>The error code in A400 will<br>indicate the FAL number.<br>The leftmost digit of the code<br>will be C and the rightmost 3<br>digits of the code will be from<br>100 to 2FF Hex and will cor-<br>respond to FAL numbers<br>001 to 511. | Correct according to cause indicated by<br>the FAL number (set by user).                                                                                                                                                                                                                                                                                                                                                                                        |



**Non-fatal Errors**

A non-fatal error has occurred if the indicators have the following conditions in RUN or MONITOR mode.

| Power Supply Unit Indicator | CPU Unit Indicators |          |     |       |      |
|-----------------------------|---------------------|----------|-----|-------|------|
| POWER                       | RUN                 | ERR/ALM  | INH | PRPHL | COMM |
| ON                          | ON                  | Flashing | --- | ---   | ---  |

Connect the CX-Programmer or a Programming Console to display the error message (in the PLC Error Window on the CX-Programmer). The cause of the error can be determined from the error message and related Auxiliary Area flags and words.

Errors are listed in order of importance. When two or more errors occur at the same time, the more serious error's error code will be recorded in A400.

| Error                   | Program-<br>ming<br>Console<br>display | Error<br>code (in<br>A400) | Flag and<br>word data                                                                            | Probable cause                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Possible remedy                                                                                                                                               |
|-------------------------|----------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System FAL<br>error     | SYS FAIL<br>FAL                        | 4101 to<br>42FF            | A40215:<br>FAL Error<br>Flag<br>A360 to<br>A391: Exe-<br>cuted FAL<br>Number<br>Flags            | FAL(006) has been exe-<br>cuted in program.<br>Executed FAL Number<br>Flags A36001 to A39115<br>correspond to FAL numbers<br>001 to 511.<br>The error code in A400 will<br>indicate the FAL number.<br>The leftmost digit of the<br>code will be 4 and the right-<br>most 3 digits of the code will<br>be from 100 to 2FF Hex and<br>will correspond to FAL num-<br>bers 001 to 511.                                                                                         | Correct according to cause indicated by<br>FAL number (set by user).                                                                                          |
| Interrupt<br>Task error | INTRPT<br>ERR                          | 008B                       | A40213:<br>Interrupt<br>Task Error<br>Flag<br>A426: Inter-<br>rupt Task<br>Error, Task<br>Number | PLC Setup Set to Detect<br>Interrupt Task Errors:<br>An interrupt task was exe-<br>cuted for more than 10 ms<br>during I/O refreshing of a<br>C200H Special I/O Unit or a<br>SYSMAC BUS Remote I/O<br>Unit.<br><br>PLC Setup Set to Detect<br>Interrupt Task Errors:<br>Attempted to refresh a Spe-<br>cial I/O Unit's I/O from an<br>interrupt task with<br>IORF(097) while the Unit's I/<br>O was being refreshed by<br>cyclic I/O refreshing (duplic-<br>ate refreshing). | Check the program. Either disable<br>detection of interrupt task errors in the<br>PLC Setup (address 128, bit 14) or cor-<br>rect the problem in the program. |
| Basic I/O<br>error      | DENSITY<br>I/O ERR                     | 009A                       | A40212:<br>Basic I/O<br>Unit Error<br>Flag<br>A408: Basic<br>I/O Unit<br>Error, Slot<br>Number   | An error has occurred in a<br>Basic I/O Unit (including<br>C200H High-density I/O<br>Units and C200H Interrupt<br>Input Units).<br>A408 contains the errant<br>rack/slot number.                                                                                                                                                                                                                                                                                             | Check the errant Unit for blown fuse, etc.                                                                                                                    |

| Error                              | Program-<br>ming<br>Console<br>display | Error<br>code (in<br>A400)  | Flag and<br>word data                                                                                                          | Probable cause                                                                                                                                                                                                                                     | Possible remedy                                                                                                                                                                                                                                   |
|------------------------------------|----------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PLC Setup<br>error                 | PLC Setup<br>ERR                       | 009B                        | A40210:<br>PLC Setup<br>Error Flag<br>A406: PLC<br>Setup Error<br>Location                                                     | There is a setting error in the PLC Setup. The location (binary offset) of the error is written to A406.                                                                                                                                           | Change the indicated setting to a valid setting.                                                                                                                                                                                                  |
| I/O Table<br>Verification<br>error | I/O VRFY<br>ERR                        | 00E7                        | A40209: I/O<br>Verification<br>Error Flag                                                                                      | A Unit has been added or removed, so the registered I/O tables don't agree with the actual Units in the PLC. The I/O Verification Error Flag goes OFF when the situation is corrected.                                                             | Execute the I/O Table Verify operation to find the problem location. Create new I/O tables or replace the Unit to match the registered I/O tables.                                                                                                |
| Non-fatal<br>Inner Board<br>error  | NO-FTL<br>INNER<br>ERR                 | 02F0                        | A40208:<br>Inner Board<br>Error Flag<br>A424: Inner<br>Board Error<br>Information                                              | An error occurred in the Inner Board                                                                                                                                                                                                               | Check the Inner Board indicators. Refer to the Inner Board's operation manual for details.                                                                                                                                                        |
| CS-series<br>CPU Bus<br>Unit error | CPU BU<br>ERR                          | 0200 to<br>020F             | A40207:<br>CS-series<br>CPU Bus<br>Unit Error<br>Flag<br>A417: CS-<br>series CPU<br>Bus Unit<br>Error, Unit<br>Number<br>Flags | An error occurred in a data exchange between the CPU Unit and a CS-series CPU Bus Unit.<br>The corresponding flag in A417 is turned ON to indicate the problem Unit. Bits A41700 to A41715 correspond to unit numbers 0 to F.                      | Check the Unit indicated in A417. Refer to the Unit's operation manual to find and correct the cause of the error. Restart the Unit by toggling its Restart Bit or turn the power OFF and ON again. Replace the Unit if it won't restart.         |
| Special I/O<br>Unit error          | SIOU ERR                               | 0300 to<br>035F, or<br>03FF | A40206:<br>Special I/O<br>Unit Error<br>Flag<br>A418 to<br>A423: Spe-<br>cial I/O Unit<br>Error, Unit<br>Number<br>Flags       | An error occurred in a data exchange between the CPU Unit and a Special I/O Unit.<br>The corresponding flag in A418 to A423 is turned ON to indicate the problem Unit. Bits A41800 to A42315 correspond to unit numbers 0 to 95.                   | Check the Unit indicated in A418 to A423. Refer to the Unit's operation manual to find and correct the cause of the error. Restart the Unit by toggling its Restart Bit or turn the power OFF and ON again. Replace the Unit if it won't restart. |
| SYSMAC<br>BUS error                | SYSBUS<br>ERR                          | 00A0 or<br>00A1             | A40205:<br>SYSMAC<br>BUS Error<br>Flag<br>A405: SYS-<br>MAC BUS<br>Master<br>Error Flags                                       | An error has occurred between a Master and Slave Rack.<br>A Unit has been removed from or added to a Slave Rack.<br>The flag for the affected Master Unit will be turned ON.<br>A40500: Flag for Master Unit #0<br>A40501: Flag for Master Unit #1 | Check the condition of the Slave Unit and the transmission line between the Master Unit and Slave Unit.                                                                                                                                           |

| Error                                       | Program-<br>ming<br>Console<br>display | Error<br>code (in<br>A400) | Flag and<br>word data                                                                                                                                  | Probable cause                                                                                                                                                                                                 | Possible remedy                                                                                               |
|---------------------------------------------|----------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Battery<br>error                            | BATT<br>LOW                            | 00F7                       | A40204:<br>Battery<br>Error Flag                                                                                                                       | This error occurs when the PLC Setup has been set to detect battery errors and the CPU Unit's backup battery is missing or its voltage has dropped.                                                            | Check battery and replace if necessary. Change the PLC Setup setting if battery-free operation is being used. |
| CS-series<br>CPU Bus<br>Unit Setup<br>error | CPU BU<br>ST ERR                       | 0400 to<br>040F            | A40203:<br>CS-series<br>CPU Bus<br>Unit Set-<br>ting Error<br>Flag<br>A427: CS-<br>series CPU<br>Bus Unit<br>Setting<br>Error, Unit<br>Number<br>Flags | An installed CS-series CPU Bus Unit does not match the CS-series CPU Bus Unit registered in the I/O table.<br>The corresponding flag in A427 will be ON. Bits 00 to 15 correspond to unit numbers 0 to F.      | Change the registered I/O tables.                                                                             |
| Special I/O<br>Unit Setup<br>error          | SIOU<br>SETUP<br>ERR                   | 0500 to<br>055F            | A40202:<br>Special I/O<br>Unit Set-<br>ting Error<br>Flag<br>A428 to<br>A433: Spe-<br>cial I/O Unit<br>Setting<br>Error, Unit<br>Number<br>Flags       | An installed Special I/O Unit does not match the Special I/O Unit registered in the I/O table.<br>The corresponding flag in A428 to A433 will be ON. Bits A42800 to A43315 correspond to unit numbers 0 to 95. |                                                                                                               |

## Other Errors

### Peripheral Port Communications Error

A communications error has occurred in communications with the device connected to the peripheral port if the indicators have the following conditions.

| Power Supply<br>Unit Indicator | CPU Unit Indicators |         |     |       |      |
|--------------------------------|---------------------|---------|-----|-------|------|
| POWER                          | RUN                 | ERR/ALM | INH | PRPHL | COMM |
| ON                             | ON                  | ---     | --- | OFF   | ---  |

Check the setting of pin 4 on the DIP switch and the peripheral port settings in the PLC Setup. Also check the cable connections.

### RS-232C Port Communications Error

A communications error has occurred in communications with the device connected to the RS-232C port if the indicators have the following conditions.

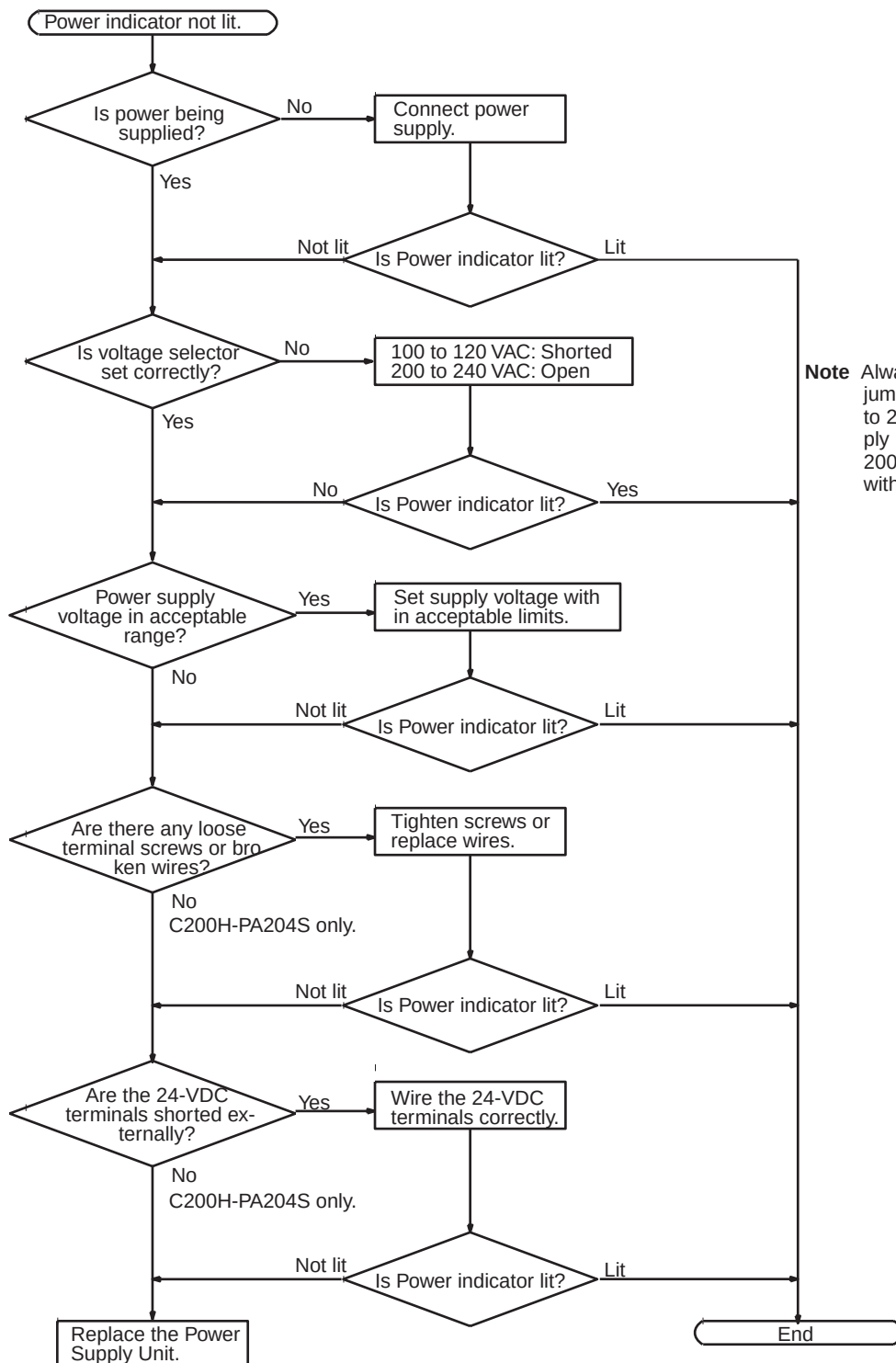
| Power Supply<br>Unit Indicator | CPU Unit Indicators |         |     |       |      |
|--------------------------------|---------------------|---------|-----|-------|------|
| POWER                          | RUN                 | ERR/ALM | INH | PRPHL | COMM |
| ON                             | ON                  | ---     | --- | ---   | OFF  |

Check the setting of pin 5 on the DIP switch and the RS-232C port settings in the PLC Setup. Also check the cable connections. If a host computer is connected, check the communications settings of the serial port on the host computer and the communications program in the host computer.

## 11-2-6 Power Supply Check

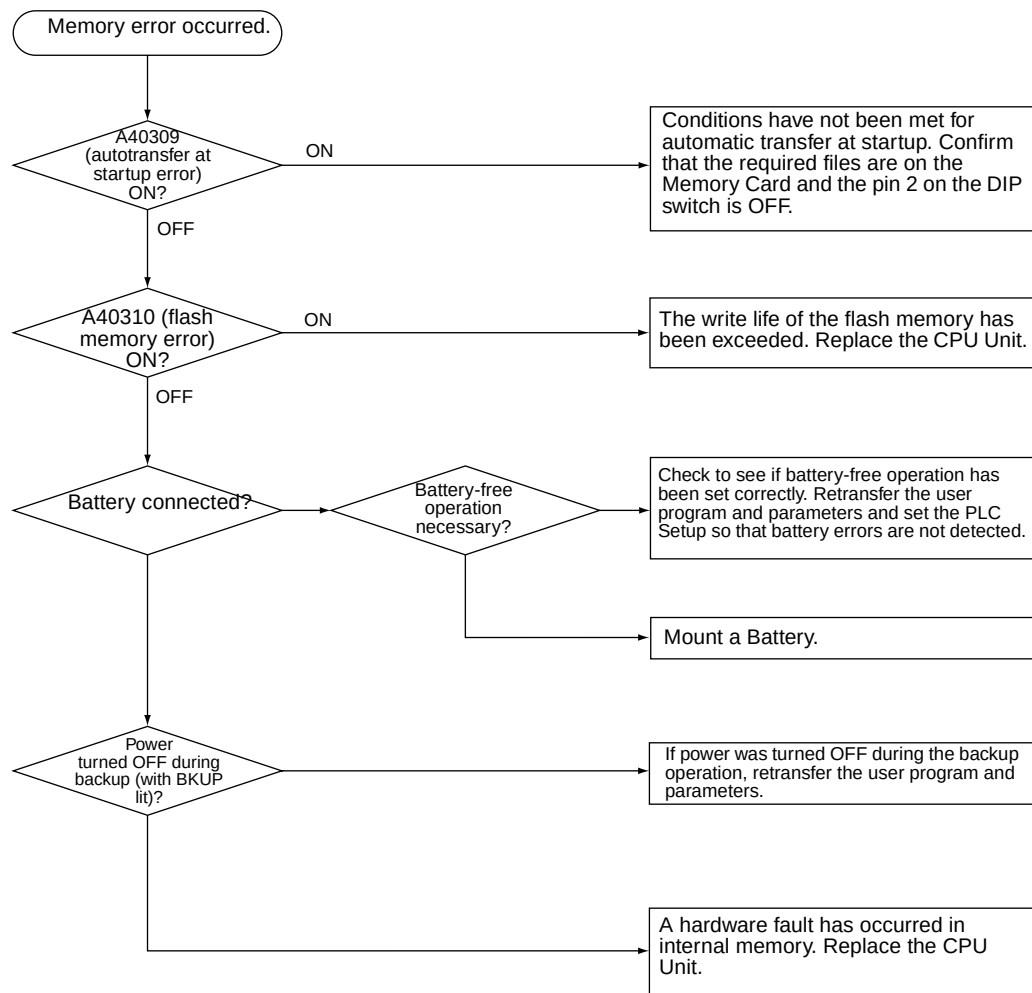
The allowable voltage ranges are shown in the following table.

| Power Supply Unit                                           | Power supply voltage | Allowable voltage range |
|-------------------------------------------------------------|----------------------|-------------------------|
| C200HW-PA204, C200HW-PA204S, C200HW-PA204R, or C200HW-P209R | 100 to 120 V AC      | 85 to 132 V AC          |
|                                                             | 200 to 240 V AC      | 170 to 264 V AC         |
| C200HW-PD024                                                | 24 V DC              | 20.4 to 28.8 V DC       |

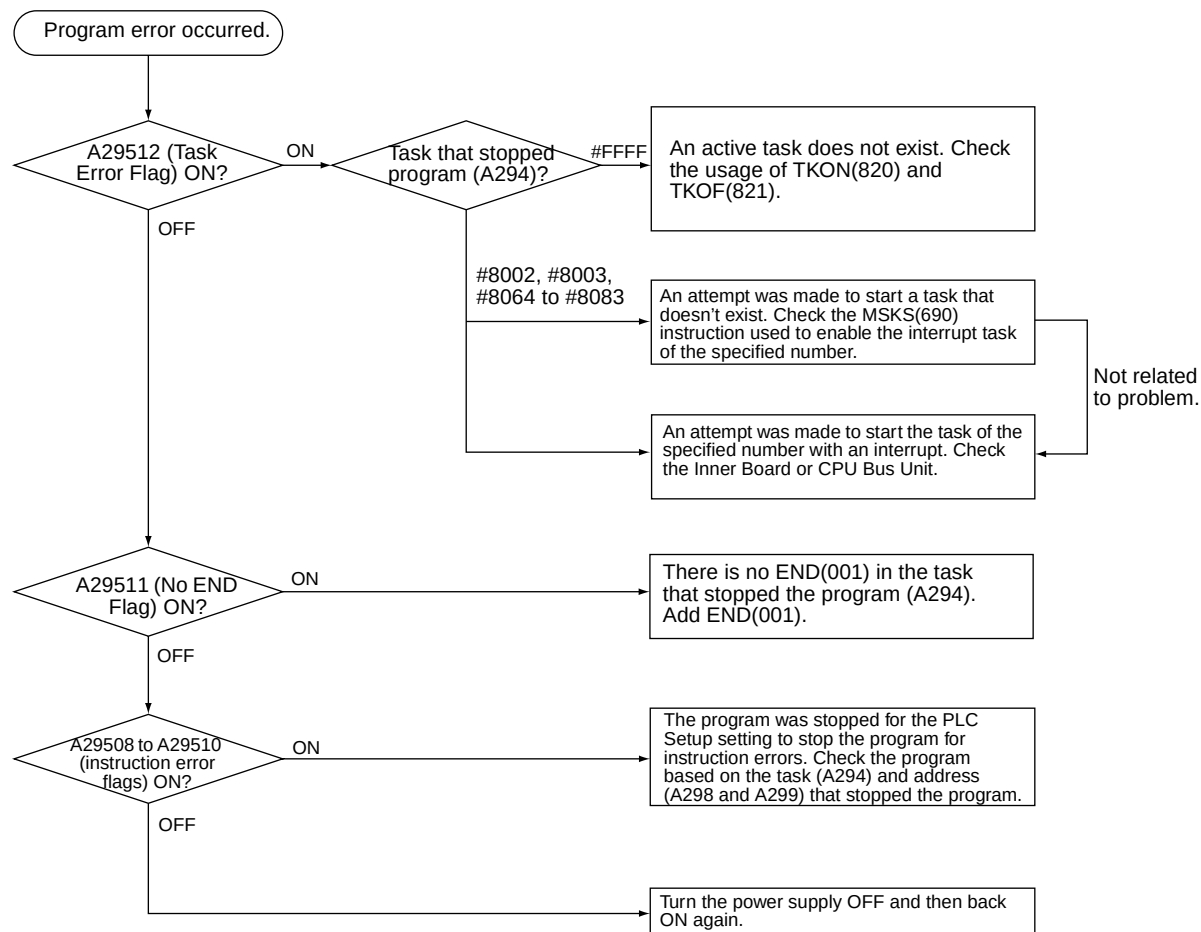


**Note** Always remove the short jumper before supplying 200 to 240 VAC. The Power Supply Unit will be destroyed if 200 to 240 VAC is supply with the jumper connected.

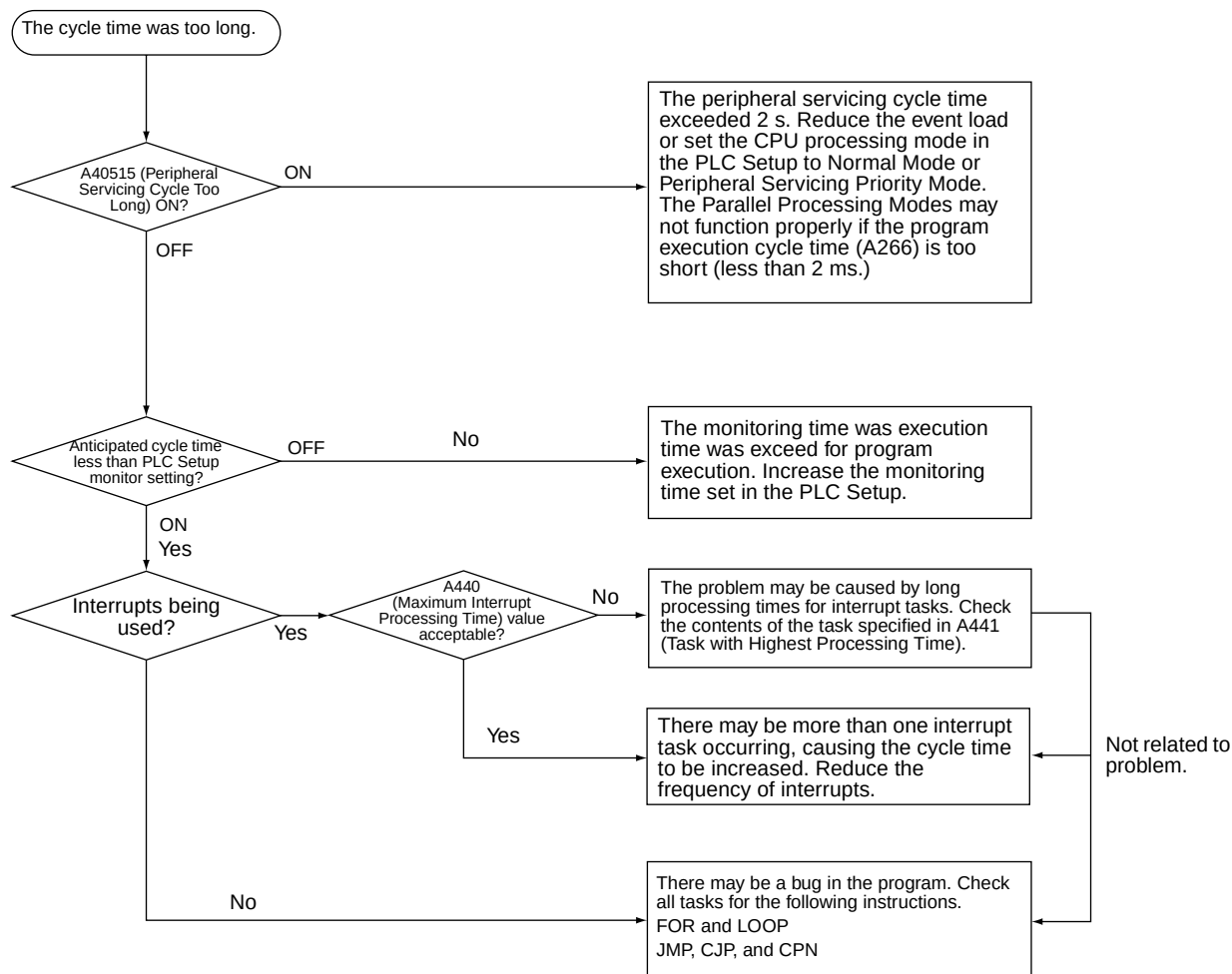
### 11-2-7 Memory Error Check



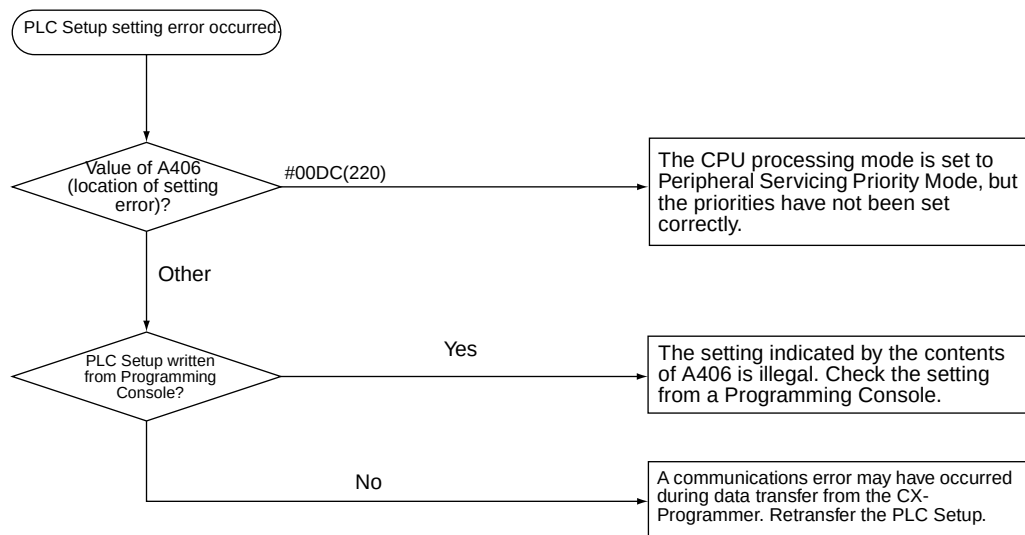
## 11-2-8 Program Error Check



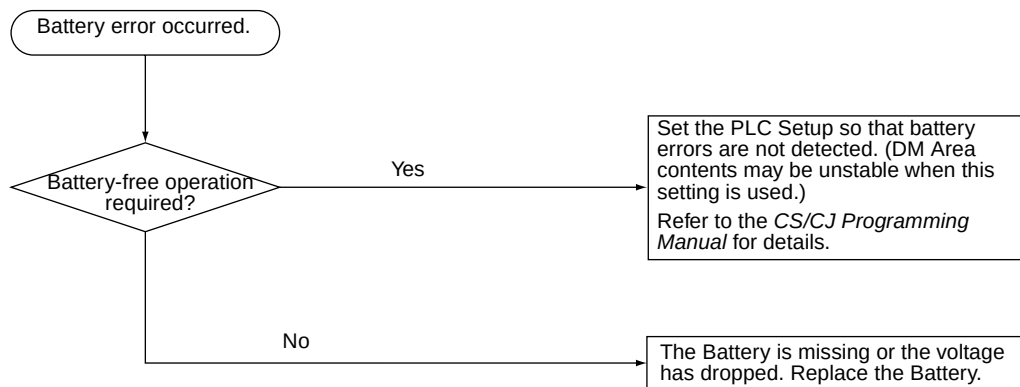
### 11-2-9 Cycle Time Too Long Error Check



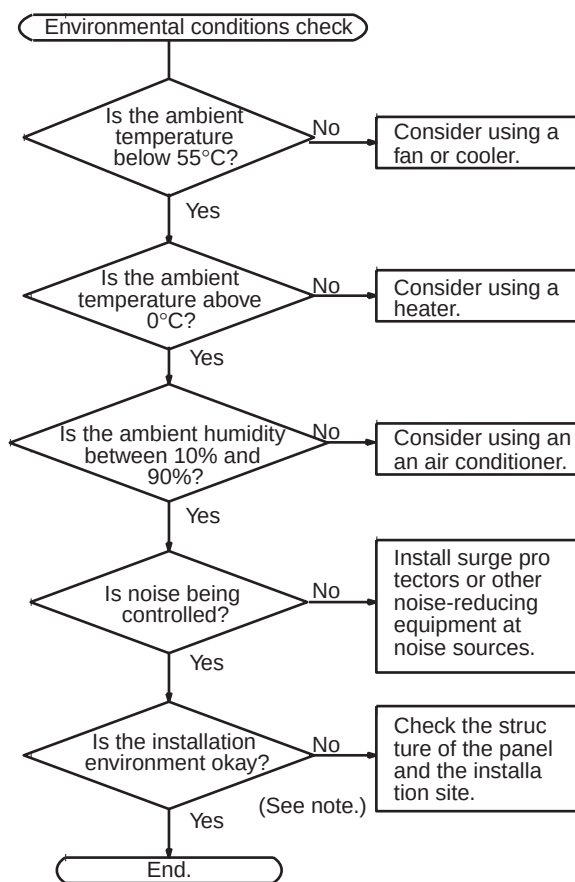
### 11-2-10 PLC Setup Setting Error Check



### 11-2-11 Battery Error Check



### 11-2-12 Environmental Conditions Check



**Note** Check for corrosive gases, flammable gases, dust, dirt, salts, metal dust, direct light, water, oils, and chemicals.



The I/O check flowchart is based on the following ladder diagram section assuming that SOL1 does not turn ON.



## 11-3 Troubleshooting Racks and Units

### CPU Racks and Standard Expansion Racks

| Symptom                                                                                | Cause                                                                 | Remedy                                                     |
|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------|
| POWER indicator is not lit.                                                            | PCB short-circuited or damaged.                                       | Replace Power Supply Unit or Backplane.                    |
|                                                                                        | (1) Error in program.                                                 | Correct program                                            |
|                                                                                        | (2) Power line is faulty.                                             | Replace Power Supply Unit.                                 |
| RUN output* does not turn ON.<br>RUN indicator lit.<br>(*C200HW-PS204R/209R)           | Internal circuitry of Power Supply Unit is faulty.                    | Replace Power Supply Unit.                                 |
| Serial Communications Unit or CS-series CPU Bus Unit does not operate or malfunctions. | (1) The I/O Connecting Cable is faulty.<br>(2) The I/O bus is faulty. | Replace the I/O Connecting Cable<br>Replace the Backplane. |
| Bits do not operate past a certain point.                                              |                                                                       |                                                            |
| Error occurs in units of 8 points.                                                     |                                                                       |                                                            |
| I/O bit turns ON                                                                       |                                                                       |                                                            |
| All bits in one Unit do not turn ON.                                                   |                                                                       |                                                            |

### Special I/O Units

Refer to the *Operation Manual* for the Special I/O Unit to troubleshoot any other errors.

| Symptom                                                     | Cause                                                                                                                                                                                                                                                                                                           | Remedy                                                                                                                                                                          |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The ERH and RUN indicators on the Special I/O Unit are lit. | I/O refreshing is not being performed for the Unit from the CPU Unit (CPU Unit monitoring error).<br>It's possible that cyclic refreshing has been disabled for the Special I/O Unit in the Cyclic Refresh Disable Setting in the PLC Setup (i.e., the bit corresponding to the unit number has been set to 1). | Change the bit corresponding to the unit number to 0 to enable cyclic refreshing, or make sure that the Unit is refreshed from the program using IORF at least once every 11 s. |

### CS-series Long-distance Expansion Racks

| Symptom                                                                                          | Cause                                               | Remedy                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPU Unit won't operate. (No response to Programming Devices and no CPU Unit indicators are lit.) | (1) Power is not turned ON to an Expansion Rack.    | Turn ON power to all Expansion Racks.                                                                                                                                                                                         |
|                                                                                                  | (2) An Expansion Rack is not connected correctly.   | Recheck the connections and configuration using information in 2-3-3 <i>Expansion Racks</i> , 3-5-4 <i>I/O Control Units</i> , <i>I/O Interface Units</i> , and <i>Terminators</i> , and 5-2-7 <i>I/O Connecting Cables</i> . |
|                                                                                                  | (3) An I/O Connecting Cable is not wired correctly. | Reconnect the I/O Connecting Cables in the correct order for output and input connectors.                                                                                                                                     |
|                                                                                                  | (4) A Unit is faulty.                               | Gradually remove/replace Units to determine the Unit that is faulty, including the Backplane, Power Supply Unit, I/O Units, I/O Control/Interface Unit, and I/O Connecting Cable.                                             |

| Symptom                                                                            | Cause                                                                                                                                | Remedy                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expansion Rack not detected.                                                       | (1) A Terminator is not connected.                                                                                                   | If the TERM indicator is lit, connect a Terminator.                                                                                                                                                                           |
|                                                                                    | (2) An Expansion Rack is not connected correctly.                                                                                    | Recheck the connections and configuration using information in 2-3-3 <i>Expansion Racks</i> , 3-5-4 <i>I/O Control Units</i> , <i>I/O Interface Units</i> , and <i>Terminators</i> , and 5-2-7 <i>I/O Connecting Cables</i> . |
|                                                                                    | (3) A Unit is faulty.                                                                                                                | Gradually remove/replace Units to determine the Unit that is faulty, including the Backplane, Power Supply Unit, I/O Units, I/O Control/Interface Unit, and I/O Connecting Cable.                                             |
| I/O bus error or I/O verification error occurs.                                    | (1) An I/O Connecting Cable or Terminator connection is faulty.                                                                      | Check that I/O Connecting Cables and Terminators are connected correctly.                                                                                                                                                     |
|                                                                                    | (2) Noise or other external factor.                                                                                                  | Separate all cables from possible sources of noise or place them in metal ducts.                                                                                                                                              |
|                                                                                    | (3) A Unit is faulty.                                                                                                                | Gradually remove/replace Units to determine the Unit that is faulty, including the Backplane, Power Supply Unit, I/O Units, I/O Control/Interface Unit, and I/O Connecting Cable.                                             |
| Cycle time is too long.                                                            | (1) A CPU Bus Unit that is allocated many words (e.g., Controller Link Unit) is mounted to a CS-series Long-distance Expansion Rack. | Move the CPU Bus Unit to the CPU Rack.                                                                                                                                                                                        |
|                                                                                    | (2) A Unit is faulty.                                                                                                                | Gradually remove/replace Units to determine the Unit that is faulty, including the Backplane, Power Supply Unit, I/O Units, I/O Control/Interface Unit, and I/O Connecting Cable.                                             |
| I/O Control Unit and I/O Interface Units do not appear on CX-Programmer I/O table. | This is not an error. These Units are not allocated I/O words and thus are not registered in the I/O tables.                         | ---                                                                                                                                                                                                                           |

## Input Units

| Symptom                                           | Cause                                                                                                          | Remedy                                       |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Not all inputs turn ON or indicators are not lit. | (1) Power is not supplied to Input Unit.                                                                       | Supply power                                 |
|                                                   | (2) Supply voltage is low.                                                                                     | Adjust supply voltage to within rated range. |
|                                                   | (3) Terminal block mounting screws are loose.                                                                  | Tighten screws.                              |
|                                                   | (4) Faulty contact of terminal block connector.                                                                | Replace terminal block connector.            |
| Not all inputs turn ON (indicator lit).           | Input circuit is faulty. (There is a short at the load or something else that caused an over-current to flow.) | Replace Unit.                                |
| Not all inputs turn OFF.                          | Input circuit is faulty.                                                                                       | Replace Unit.                                |
| Specific bit does not turn ON.                    | (1) Input device is faulty.                                                                                    | Replace input devices.                       |
|                                                   | (2) Input wiring disconnected.                                                                                 | Check input wiring                           |
|                                                   | (3) Terminal block screws are loose.                                                                           | Tighten screws                               |
|                                                   | (4) Faulty terminal block connector contact.                                                                   | Replace terminal block connector.            |
|                                                   | (5) Too short ON time of external input.                                                                       | Adjust input device                          |
|                                                   | (6) Faulty input circuit                                                                                       | Replace Unit.                                |
|                                                   | (7) Input bit number is used for output instruction.                                                           | Correct program.                             |
| Specific bit does not turn OFF.                   | (1) Input circuit is faulty.                                                                                   | Replace Unit.                                |
|                                                   | (2) Input bit number is used for output instruction.                                                           | Correct program.                             |

| Symptom                                                                    | Cause                                          | Remedy                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input irregularly turns ON/OFF.                                            | (1) External input voltage is low or unstable. | Adjust external input voltage to within rated range.                                                                                                                                                                                          |
|                                                                            | (2) Malfunction due to noise.                  | Take protective measures against noise, such as:<br>(1) Increase input response time (PLC Setup)<br>(2) Install surge suppressor.<br>(3) Install insulation transformer.<br>(4) Install shielded cables between the Input Unit and the loads. |
|                                                                            | (3) Terminal block screws are loose.           | Tighten screws                                                                                                                                                                                                                                |
|                                                                            | (4) Faulty terminal block connector contact.   | Replace terminal block connector.                                                                                                                                                                                                             |
| Error occurs in units of 8 points or 16 points, i.e., for the same common. | (1) Common terminal screws are loose.          | Tighten screws                                                                                                                                                                                                                                |
|                                                                            | (2) Faulty terminal block connector contact.   | Replace terminal block connector.                                                                                                                                                                                                             |
|                                                                            | (3) Faulty data bus                            | Replace Unit.                                                                                                                                                                                                                                 |
|                                                                            | (4) Faulty CPU                                 | Replace CPU.                                                                                                                                                                                                                                  |
| Input indicator is not lit in normal operation.                            | Faulty indicator or indicator circuit.         | Replace Unit.                                                                                                                                                                                                                                 |

## Output Units

| Symptom                                                                   | Cause                                                                                                                                                              | Remedy                                                                         |
|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Not all outputs turn ON                                                   | (1) Load is not supplied with power.                                                                                                                               | Supply power                                                                   |
|                                                                           | (2) Load voltage is low.                                                                                                                                           | Adjust voltage to within rated range.                                          |
|                                                                           | (3) Terminal block screws are loose.                                                                                                                               | Tighten screws                                                                 |
|                                                                           | (4) Faulty terminal block connector contact.                                                                                                                       | Replace terminal block connector.                                              |
|                                                                           | (5) An overcurrent (possibly caused by a short at the load) resulted in a blown fuse in the Output Unit. (Some Output Units provide an indicator for blown fuses.) | Replace fuse or Unit.                                                          |
|                                                                           | (6) Faulty I/O bus connector contact.                                                                                                                              | Replace Unit.                                                                  |
|                                                                           | (7) Output circuit is faulty.                                                                                                                                      | Replace Unit.                                                                  |
|                                                                           | (8) If the INH indicator is lit, the Output OFF Bit (A50015) is ON.                                                                                                | Turn A50015 OFF.                                                               |
| Not all outputs turn OFF                                                  | Output circuit is faulty.                                                                                                                                          | Replace Unit.                                                                  |
| Output of a specific bit number does not turn ON or indicator is not lit  | (1) Output ON time too short because of a mistake in programming.                                                                                                  | Correct program to increase the time that the output is ON.                    |
|                                                                           | (2) Bit status controlled by multiple instructions.                                                                                                                | Correct program so that each output bit is controlled by only one instruction. |
|                                                                           | (3) Faulty output circuit.                                                                                                                                         | Replace Unit.                                                                  |
| Output of a specific bit number does not turn ON (indicator lit).         | (1) Faulty output device.                                                                                                                                          | Replace output device.                                                         |
|                                                                           | (2) Break in output wiring.                                                                                                                                        | Check output wiring.                                                           |
|                                                                           | (3) Loose terminal block screws.                                                                                                                                   | Tighten screws.                                                                |
|                                                                           | (4) Faulty terminal block connector faulty.                                                                                                                        | Replace terminal block connector.                                              |
|                                                                           | (5) Faulty output bit.                                                                                                                                             | Replace relay or Unit.                                                         |
|                                                                           | (6) Faulty output circuit.                                                                                                                                         | Replace Unit.                                                                  |
| Output of a specific bit number does not turn OFF (indicator is not lit). | (1) Faulty output bit.                                                                                                                                             | Replace relay or Unit.                                                         |
|                                                                           | (2) Bit does not turn OFF due to leakage current or residual voltage.                                                                                              | Replace external load or add dummy resistor.                                   |
| Output of a specific bit number does not turn OFF (indicator lit).        | (1) Bit status controlled by multiple instructions.                                                                                                                | Correct program.                                                               |
|                                                                           | (2) Faulty output circuit.                                                                                                                                         | Replace Unit.                                                                  |

| Symptom                                                                    | Cause                                                                                                    | Remedy                                                                                                                                                                       |
|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output irregularly turns ON/OFF.                                           | (1) Low or unstable load voltage.                                                                        | Adjust load voltage to within rated range                                                                                                                                    |
|                                                                            | (2) Bit status controlled by multiple instructions.                                                      | Correct program so that each output bit is controlled by only one instruction.                                                                                               |
|                                                                            | (3) Malfunction due to noise.                                                                            | Protective measures against noise:<br>(1) Install surge suppressor.<br>(2) Install insulation transformer.<br>(3) Use shielded cables between the Output Unit and the loads. |
|                                                                            | (4) Terminal block screws are loose.                                                                     | Tighten screws.                                                                                                                                                              |
|                                                                            | (5) Faulty terminal block connector contact.                                                             | Replace terminal block connector.                                                                                                                                            |
| Error occurs in units of 8 points or 16 points, i.e., for the same common. | (1) Loose common terminal screw.                                                                         | Tighten screws.                                                                                                                                                              |
|                                                                            | (2) Faulty terminal block connector contact.                                                             | Replace terminal block connector.                                                                                                                                            |
|                                                                            | (3) An overcurrent (possibly caused by a short at the load) resulted in a blown fuse in the Output Unit. | Replace fuse or Unit.                                                                                                                                                        |
|                                                                            | (4) Faulty data bus.                                                                                     | Replace Unit.                                                                                                                                                                |
|                                                                            | (5) Faulty CPU.                                                                                          | Replace CPU.                                                                                                                                                                 |
| Output indicator is not lit (operation is normal).                         | Faulty indicator.                                                                                        | Replace Unit.                                                                                                                                                                |

# SECTION 12

## Inspection and Maintenance

This section provides inspection and maintenance information.

|        |                                        |     |
|--------|----------------------------------------|-----|
| 12-1   | Inspections .....                      | 458 |
| 12-1-1 | Inspection Points. ....                | 458 |
| 12-1-2 | Unit Replacement Precautions .....     | 459 |
| 12-2   | Replacing User-serviceable Parts ..... | 460 |
| 12-2-1 | Battery Replacement. ....              | 460 |
| 12-2-2 | Output Unit Fuse Replacement. ....     | 466 |
| 12-2-3 | Relay Replacement .....                | 468 |

## 12-1 Inspections

Daily or periodic inspections are required in order to maintain the PLC's functions in peak operating condition.

### 12-1-1 Inspection Points

Although the major electronic components in CS-series PLCs have an extremely long life time, they can deteriorate under improper environmental conditions. Periodic inspections are thus required to ensure that the required conditions are being kept.

Inspection is recommended at least once every six months to a year, but more frequent inspections will be necessary in adverse environments.

Take immediate steps to correct the situation if any of the conditions in the following table are not met.

#### Inspection Points

| No. | Item                    | Inspection                                                                                  | Criteria                                                                        | Action                                                                                                                             |
|-----|-------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Source Power Supply     | Check for voltage fluctuations at the power supply terminals.                               | The voltage must be within the allowable voltage fluctuation range. (See note.) | Use a voltage tester to check the power supply at the terminals. Take necessary steps to bring voltage fluctuations within limits. |
| 2   | I/O Power Supply        | Check for voltage fluctuations at the I/O terminals.                                        | Voltages must be within specifications for each Unit.                           | Use a voltage tester to check the power supply at the terminals. Take necessary steps to bring voltage fluctuations within limits. |
| 3   | Ambient environment     | Check the ambient temperature. (Inside the control panel if the PLC is in a control panel.) | 0 to 55°C                                                                       | Use a thermometer to check the temperature and ensure that the ambient temperature remains within the allowed range of 0 to 55°C.  |
|     |                         | Check the ambient humidity. (Inside the control panel if the PLC is in a control panel.)    | Relative humidity must be 10% to 90% with no condensation.                      | Use a hygrometer to check the humidity and ensure that the ambient humidity remains within the allowed range.                      |
|     |                         | Check that the PLC is not in direct sunlight.                                               | Not in direct sunlight                                                          | Protect the PLC if necessary.                                                                                                      |
|     |                         | Check for accumulation of dirt, dust, salt, metal filings, etc.                             | No accumulation                                                                 | Clean and protect the PLC if necessary.                                                                                            |
|     |                         | Check for water, oil, or chemical sprays hitting the PLC.                                   | No spray on the PLC                                                             | Clean and protect the PLC if necessary.                                                                                            |
|     |                         | Check for corrosive or flammable gases in the area of the PLC.                              | No corrosive or flammable gases                                                 | Check by smell or use a sensor.                                                                                                    |
|     |                         | Check the level of vibration or shock.                                                      | Vibration and shock must be within specifications.                              | Install cushioning or shock absorbing equipment if necessary.                                                                      |
| 4   | Installation and wiring | Check for noise sources near the PLC.                                                       | No significant noise sources                                                    | Either separate the PLC and noise source or protect the PLC.                                                                       |
|     |                         | Check that each Unit is installed securely.                                                 | No looseness                                                                    | Tighten loose screws with a Phillips-head screwdriver.                                                                             |
|     |                         | Check that cable connectors are fully inserted and locked.                                  | No looseness                                                                    | Correct any improperly installed connectors.                                                                                       |
|     |                         | Check for loose screws in external wiring.                                                  | No looseness                                                                    | Tighten loose screws with a Phillips-head screwdriver.                                                                             |
|     |                         | Check crimp connectors in external wiring.                                                  | Adequate spacing between connectors                                             | Check visually and adjust if necessary.                                                                                            |
|     |                         | Check for damaged external wiring cables.                                                   | No damage                                                                       | Check visually and replace cables if necessary.                                                                                    |

| No. | Item                    | Inspection                                                                           | Criteria                                                                                                                                                                                         | Action                                                                                                                                                                                              |
|-----|-------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5   | User-service-able parts | Check whether internal relays in Relay Output Units have reached their service life. | No open relay contacts, improper operation, or faulty contacts<br><i>Refer to Appendix A Specifications of Basic I/O Units and High-density I/O Units for information on relay service life.</i> | Replace the relay or Unit.                                                                                                                                                                          |
|     |                         | Check whether the CS1W-BAT01 Battery has reached its service life.                   | Life expectancy is 5 years at 25°C, less at higher temperatures.<br>(From 0.4 to 5 years depending on model, power supply rate, and ambient temperature.)                                        | Replace the battery when its service life has passed even if a battery error has not occurred.<br>(Battery life depends upon the model, the percentage of time in service, and ambient conditions.) |
|     |                         | Check for blown fuses.                                                               | Preventative maintenance                                                                                                                                                                         | Even if the fuses are not blown, they should be replaced periodically because they are weakened by inrush currents.                                                                                 |

**Note** The following table shows the allowable voltage fluctuation ranges for source power supplies.

| Supply voltage  | Allowable voltage range |
|-----------------|-------------------------|
| 100 to 120 V AC | 85 to 132 V AC          |
| 200 to 240 V AC | 170 to 264 V AC         |
| 24 V DC         | 19.2 to 28.8 V DC       |

## Tools Required for Inspections

### Required Tools

- Slotted and Phillips-head screwdrivers
- Voltage tester or digital voltmeter
- Industrial alcohol and clean cotton cloth

### Tools Required Occasionally

- Synchroscope
- Oscilloscope with pen plotter
- Thermometer and hygrometer (humidity meter)

## 12-1-2 Unit Replacement Precautions

Check the following after replacing any faulty Unit.

- Do not replace a Unit until the power is turned OFF.
- Check the new Unit to make sure that there are no errors.
- If a faulty Unit is being returned for repair, describe the problem in as much detail as possible, enclose this description with the Unit, and return the Unit to your OMRON representative.
- For poor contact, take a clean cotton cloth, soak the cloth in industrial alcohol, and carefully wipe the contacts clean. Be sure to remove any lint prior to remounting the Unit.

**Note** 1. When replacing a CPU Unit, be sure that not only the user program but also all other data required for operation is transferred to or set in the new CPU Unit before starting operation, including DM Area and HR Area settings. If data area and other data are not correct for the user program, un-



expected accidents may occur. Be sure to include the routing tables, Controller Link Unit data link tables, network parameters, and other CPU Bus Unit data, which are stored as parameters in the CPU Unit. Refer to the CPU Bus Unit and Special I/O Unit operation manuals for details on the data required by each Unit.

2. The simple backup operation can be used to store the user program and all parameters for the CS1-H CPU Unit, DeviceNet Units, Serial Communications Units, and other specific Units in a Memory Card as backup files. A Memory Card and the simple backup operation can be used to easily restore data after replacing any of these Units. Refer to the *CS/CJ Series Programming Manual (W394)* for details.

## 12-2 Replacing User-serviceable Parts

The following parts should be replaced periodically as preventative maintenance. The procedures for replacing these parts are described later in this section.

- Battery (the CPU Unit's RAM-backup battery)
- Output Unit fuses (in Transistor Output and Triac Output Units)
- Output Unit relays (in Relay Output Units)

### 12-2-1 Battery Replacement

#### Battery Functions

The battery retains the following data of the CPU Unit's RAM when the main power supply is OFF.

- The user program (CS1 CPU Units only)
- The PLC Setup (CS1 CPU Units only)
- Retained regions of I/O memory (such as the Holding Area and DM Area)

If the battery is not installed or battery voltage drops too low, the data in RAM will be lost when the main power supply goes OFF.

The battery is not installed in a CS1 CPU Unit when it is shipped. Be sure to install the provided battery in the CS1 CPU Unit's battery compartment before using the PLC.

#### Battery Service Life and Replacement Period

At 25°C, the maximum service life for batteries is 5 years whether or not power is supplied to the CPU Unit while the battery is installed. The battery's lifetime will be shorter when it is used at higher temperatures and when power is not supplied to the CPU Unit for long periods. In the worst case conditions, the battery will last for only 0.4 years.

The "time that CPU power is ON" in the following table (power supply rate) is calculated as follows:

Power supply rate =

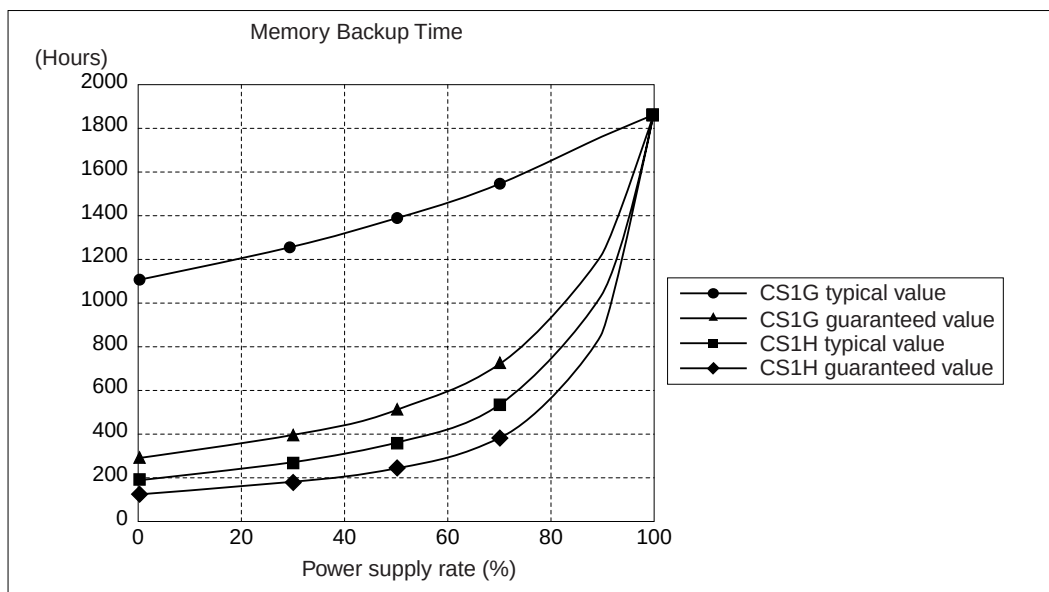
Total time power is ON/(total time power is ON + total time power is OFF)

The following table shows minimum lifetimes and typical lifetimes for the backup battery for CS1 CPU Units.

**CS1 CPU Units**

| Model       | Time that CPU Unit power is ON | Minimum lifetime | Typical lifetime | Min. time for battery error detection | Time from battery error detection to complete discharge |
|-------------|--------------------------------|------------------|------------------|---------------------------------------|---------------------------------------------------------|
| CS1H-CPU□□□ | 0%                             | 138 days         | 205 days         | 138 days                              | 5 days                                                  |
|             | 30%                            | 191 days         | 279 days         | 191 days                              | 5 days                                                  |
|             | 50%                            | 257 days         | 369 days         | 257 days                              | 5 days                                                  |
|             | 70%                            | 392 days         | 543 days         | 265 days                              | 133 days                                                |
|             | 100%                           | 1,855 days       | 1,855 days       | 844 days                              | 1,016 days                                              |
| CS1G-CPU□□□ | 0%                             | 304 days         | 1,109 days       | 304 days                              | 5 days                                                  |
|             | 30%                            | 406 days         | 1,261 days       | 406 days                              | 5 days                                                  |
|             | 50%                            | 522 days         | 1,388 days       | 522 days                              | 5 days                                                  |
|             | 70%                            | 733 days         | 1,543 days       | 733 days                              | 5 days                                                  |
|             | 100%                           | 1,855 days       | 1,855 days       | 844 days                              | 1,016 days                                              |

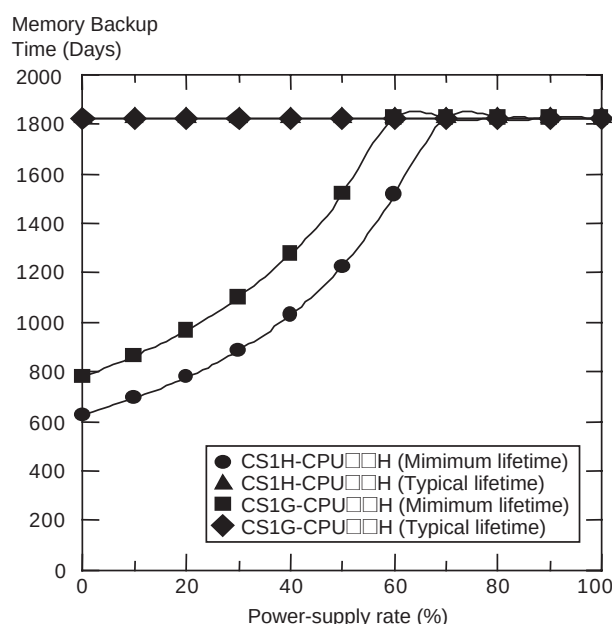
- Note**
1. The minimum lifetime is the memory backup time at an ambient temperature of 55°C. The typical lifetime is the memory backup time at an ambient temperature of 25°C.
  2. For CS1 CPU Units, actual battery lifetimes are given for the minimum and typical lifetimes. There may be some deviation between these times and the minimum times to battery error detection.
  3. The battery lifetime and low battery voltage detection will vary under application at high power-supply rates.

**CS1-H CPU Units**

| Model        | Time that CPU Unit power is ON | Minimum lifetime        | Typical lifetime  | Min. time for battery error detection | Time from battery error detection to complete discharge |
|--------------|--------------------------------|-------------------------|-------------------|---------------------------------------|---------------------------------------------------------|
| CS1H-CPU□□□H | 0%                             | 626 days (1 yr, 8 mo)   | 1,855 days (5 yr) | 626 days                              | 5 days                                                  |
|              | 30%                            | 886 days (2 yr, 5 mo)   | 1,855 days (5 yr) | 886 days                              | 5 days                                                  |
|              | 50%                            | 1,225 days (3 yr, 4 mo) | 1,855 days (5 yr) | 1,245 days                            | 5 days                                                  |
|              | 70%                            | 1,855 days (5 yr)       | 1,855 days (5 yr) | 1,855 days                            | 5 days                                                  |
|              | 100%                           | 1,855 days (5 yr)       | 1,855 days (5 yr) | 1,855 days                            | 5 days                                                  |

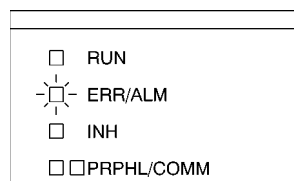
| Model       | Time that CPU Unit power is ON | Minimum lifetime        | Typical lifetime  | Min. time for battery error detection | Time from battery error detection to complete discharge |
|-------------|--------------------------------|-------------------------|-------------------|---------------------------------------|---------------------------------------------------------|
| CS1G-CPU□□H | 0%                             | 780 days (2 yr, 1 mo)   | 1,855 days (5 yr) | 780 days                              | 5 days                                                  |
|             | 30%                            | 1,101 days (3 yr)       | 1,855 days (5 yr) | 1,101 days                            | 5 days                                                  |
|             | 50%                            | 1,519 days (4 yr, 1 mo) | 1,855 days (5 yr) | 1,519 days                            | 5 days                                                  |
|             | 70%                            | 1,855 days (5 yr)       | 1,855 days (5 yr) | 1,855 days                            | 5 days                                                  |
|             | 100%                           | 1,855 days (5 yr)       | 1,855 days (5 yr) | 1,855 days                            | 5 days                                                  |

- Note**
1. The minimum lifetime is the memory backup time at an ambient temperature of 55°C. The typical lifetime is the memory backup time at an ambient temperature of 25°C.
  2. For CS1-H CPU Units, there is no difference between the minimum lifetimes and the minimum times to battery error detection.
  3. The battery lifetime and low battery voltage detection will vary under application at high power-supply rates.



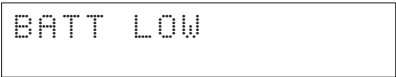
## Low Battery Indicators

If the PLC Setup has been set to detect a low-battery error, the ERR/ALM indicator on the front of the CPU Unit will flash when the CPU Unit detects that the battery is nearly discharged.



(CS1 CPU Unit indicators shown above.)

When the ERR/ALM indicator flashes, connect the CX-Programmer to the peripheral port and read the error message. If the message "BATT LOW" appears on the Programming Console\* and the Battery Error Flag (A40204) is ON\*, first check whether the battery is properly connected to the CPU Unit. If the battery is properly connected, replace the battery as soon as possible.



Once a low-battery error has been detected, it will take 5 days before the battery fails for the CS1-H CPU Units and it will take the time indicated in the previous table for the CS1 CPU Units before the battery fails. Battery failure can be delayed by ensuring that the CPU Unit power is not turned OFF until the battery has been replaced.

**Note** \*The PLC Setup must be set to detect a low-battery error (Detect Low Battery). If this setting has not been made, the BATT LOW error message will not appear on the Programming Console and the Battery Error Flag (A40204) will not go ON when the battery fails.

### Replacement Battery

The following diagram shows the CS1W-BAT01 Battery Set. Be sure to install a replacement battery within 2 years of the production date shown on the battery's label.

Production Date



Manufactured in October 1998.

### CS1-H CPU Unit Battery Replacement Procedure

Use the following procedure to replace a battery that has been completely discharged.

- 1,2,3...** 1. Turn OFF the power to the PLC. (If the power was already OFF, turn the power ON for at least one minute before turning the power OFF again.)

**Note** There is a capacitor in the CPU Unit that will back up memory while the battery is being replaced. If this capacitor is not completely charged by turning ON the power supply for one minute, data may be lost during battery replacement.

2. Insert a small flat-blade screwdriver into the notch at the bottom of the battery compartment cover and lift open the cover.
3. Remove the old battery from the compartment and replace it with a new one.

**Note** Complete the battery replacement procedure within three minutes of turning OFF the power supply. If more than three minutes elapse, data may be lost during battery replacement.

### CS1 CPU Unit Battery Replacement Procedure

Use the following procedure to replace a battery that has been completely discharged.

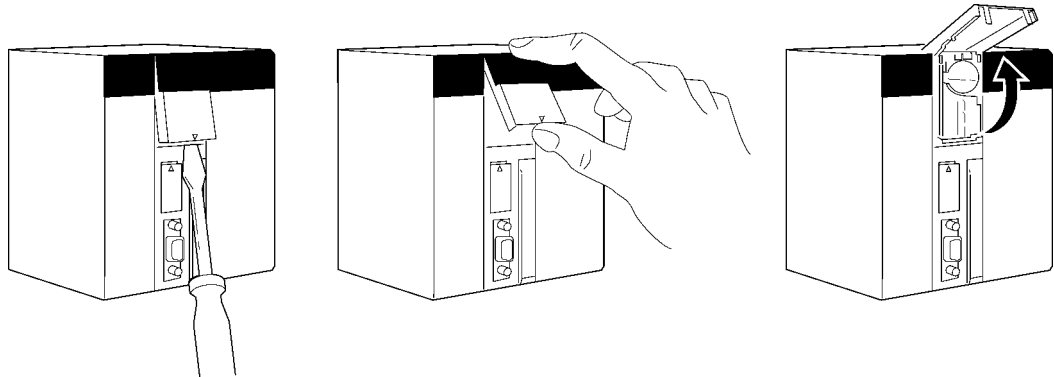
 **Caution** We recommend replacing the battery with the power OFF to prevent the CPU Unit's sensitive internal components from being damaged by static electricity.

When replacing a battery with the power OFF, connect the new battery while the old battery is in place. Remove the old battery after connecting the new battery. (There are two pairs of identical connectors for the battery. The old battery will not be charged even if the new battery is connected at the same time.)

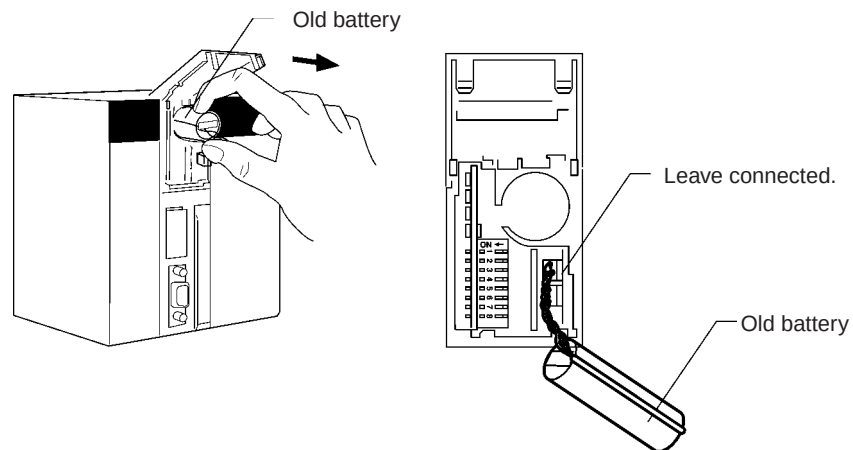
- 1,2,3... 1. Turn OFF the power to the PLC. (If the power was already OFF, turn the power ON for at least ten seconds before turning the power OFF again.)

**⚠ Caution** The battery can be replaced with the power ON, but be sure to touch a grounded metal object to discharge any static electricity before replacing the battery.

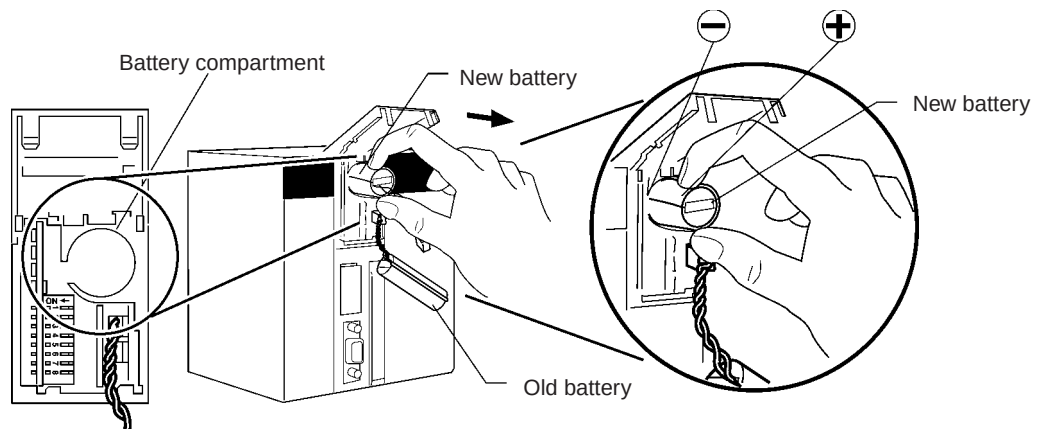
2. Insert a small flat-blade screwdriver into the notch at the bottom of the battery compartment cover and lift open the cover.



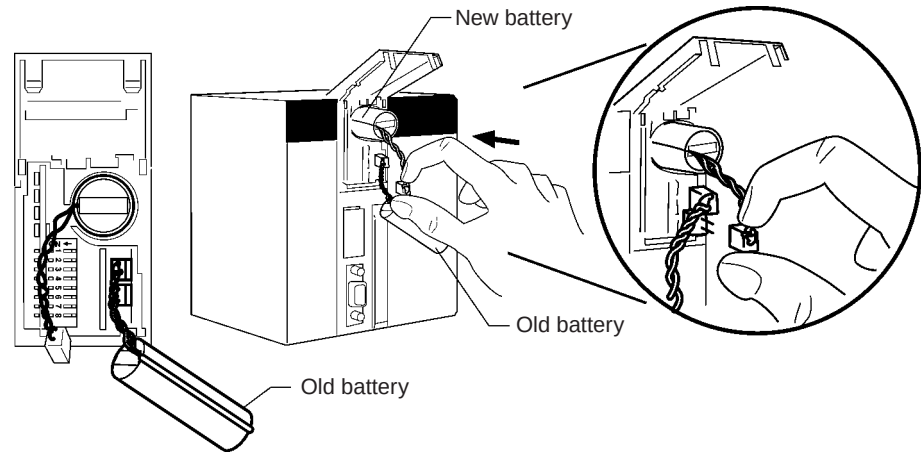
3. Remove the old battery from the compartment, but leave its connector connected.



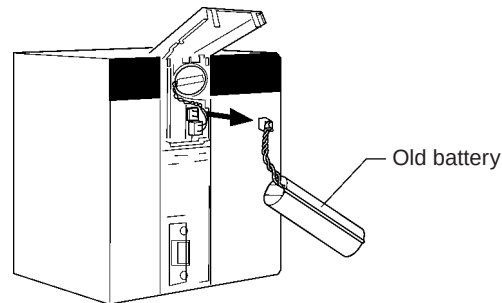
4. Insert the new battery into the battery compartment with the cable and connector facing outward.



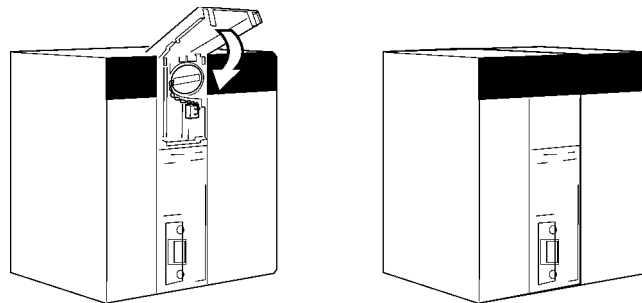
5. With the old battery connected, insert the new battery's connector in the open connector in the CPU Unit. Be sure that the connector is inserted so that its red wire is at the top and the white wire is at the bottom.



6. Remove the old battery's connector.



7. Push the new battery's wire into the battery compartment and close the cover.



8. Connect a Programming Device and verify that the Battery Error has been cleared.

### **Battery Replacement Precautions**

- Note**
1. With the CS1 CPU Units, even if this procedure is not used and the old battery is disconnected with the power OFF (power OFF and no battery connected), RAM data will be backed up for a short time by an internal capacitor. In this case, be sure to connect the new battery quickly, before the internal capacitor discharges.
  2. With the CS1 CPU Units, if this procedure is not used and the old battery is disconnected with the power ON (power ON and no battery connected), RAM data will still be backed up. However, be sure to touch a grounded metal object to discharge any static electricity before replacing the battery.

**⚠ Caution** With the either a CS1 or CS1-H CPU Unit, Do not short the battery terminals or charge, disassemble, heat, or incinerate the battery. Do not subject the battery to strong shocks. Doing any of these may result in leakage, rupture, heat generation, or ignition of the battery. Dispose of any battery that has been dropped on the floor or otherwise subjected to excessive shock. Batteries that have been subjected to shock may leak if they are used. Also, UL standards required that batteries be replaced only by experienced technicians. Do not allow unqualified persons to replace batteries.

## 12-2-2 Output Unit Fuse Replacement

The following Transistor and Triac Output Units contain one fuse for each common. For the C200H-OD411/OD213/OD221/OA223 Units which have a blown-fuse (F) indicator, replace the fuse if the fuse indicator lights. For the C200H-OD211/OD212/OA222V/OA224 Units which do not have blown-fuse indicators, check the fuses if outputs are not produced.

### Replacement Fuses

The Output Units are supplied with one spare fuse in the back of each Unit; if two or more fuses need to be replaced, use replacement fuses which meet the specifications shown in the following table.

| Unit type         | Model        | Unit specifications              | Blown-fuse indicators* | Fuse specifications            |
|-------------------|--------------|----------------------------------|------------------------|--------------------------------|
| Transistor Output | C200H-OD411  | 8 outputs, 1 A, 12 to 48 V DC    | Yes                    | 125 V, 5 A (5.2 mm × 20 mm)    |
|                   | C200H-OD211  | 12 outputs, 0.3 A, 24 V DC       | No                     |                                |
|                   | C200H-OD212  | 16 outputs, 0.3 A, 24 V DC       | No                     | 125 V, 8 A (5.2 mm × 20 mm)    |
|                   | C200H-OD213  | 8 outputs, 2.1 A, 24 V DC        | Yes                    |                                |
| Triac Output      | C200H-OA221  | 8 outputs, 1 A, 250 V AC max.    | Yes                    | 250 V, 5 A (5.2 mm × 20 mm)    |
|                   | C200H-OA222V | 12 outputs, 0.3 A, 250 V AC max. | No                     | 250 V, 3 A (5.2 mm × 20 mm)    |
|                   | C200H-OA223  | 8 outputs, 1.2 A, 250 V AC max.  | Yes                    | 250 V, 5 A (5.2 mm × 20 mm)    |
|                   | C200H-OA224  | 12 outputs, 0.5 A, 250 V AC max. | No                     | 250 V, 3.15 A (5.2 mm × 20 mm) |

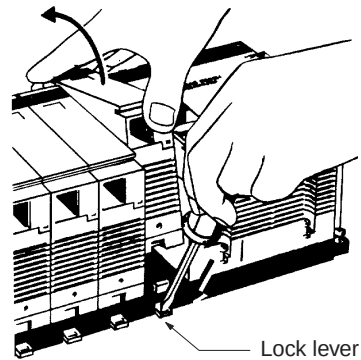
**Note** The C200H-OD411/OD213/OD221/OA223 Output Units have a blown-fuse (F) indicator at the location shown in the following diagram. When a fuse blows in one of these Units, the blown-fuse indicator will light and bit 8 of the word allocated to the Unit will be turned ON.



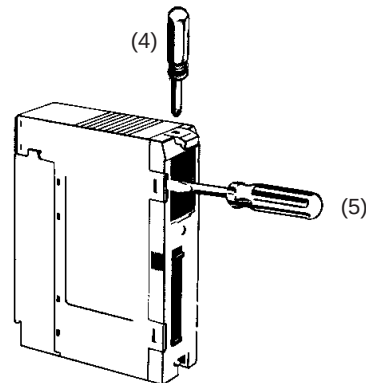
### Replacement Procedure

- 1,2,3...**
1. Turn OFF the power to the PLC.
  2. Remove the terminal block by unlocking the lock levers at the top and bottom of the terminal block. The terminal block can be removed without disconnecting the wiring.

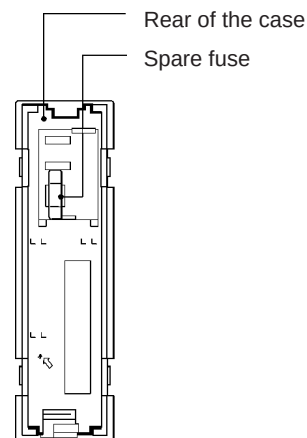
3. Remove the Output Unit. Push down the lock lever on the Backplane with a screwdriver and lift the Unit out as shown below.



4. Use a Phillips-head screwdriver to remove the screws from the top and bottom of the Unit.
5. Use a slotted screwdriver to detach the case from the Unit.



6. Pull out the printed circuit board.
7. Insert a new fuse. A spare fuse is provided inside the rear of the case when the Unit is delivered.



8. Reverse the steps above to reassemble the Unit.



## 12-2-3 Relay Replacement

A Relay Output Unit's relay is probably faulty if one of the Unit's outputs remains ON or OFF regardless of the execution of output instructions in the program. Replace a relay if it remains ON or OFF or if the Unit's contact is otherwise faulty.

### Replacement Relays

The following Output Units are equipped with relay sockets that allow the Relays to be replaced if they should go bad. Use the Relay listed in the following table.

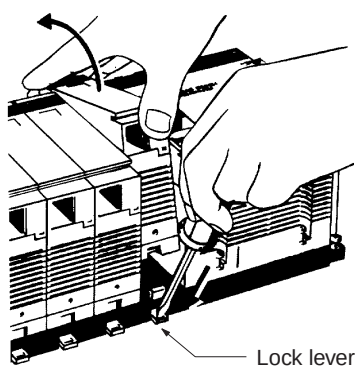
| Model        | Unit specifications                                            | Replacement Relay          |
|--------------|----------------------------------------------------------------|----------------------------|
| C200H-OC221  | 8 outputs, 2 A, 250 V AC/24 V DC max.                          | G6B-1174P-FD-US<br>24 V DC |
| C200H-OC222  | 12 outputs, 2 A, 250 V AC/24 V DC max.                         |                            |
| C200H-OC225  | 16 outputs, 2 A, 250 V AC/24 V DC max.                         |                            |
| C200H-OC223  | 5 outputs, 2 A, 250 V AC/24 V DC max.<br>(independent commons) |                            |
| C200H-OC224  | 8 outputs, 2 A, 250 V AC/24 V DC max.<br>(independent commons) |                            |
| C200H-OC222V | 12 outputs, 2 A, 250 V AC/24 V DC max.                         | G6R-1, 24 V DC             |
| C200H-OC226  | 16 outputs, 2 A, 250 V AC/24 V DC max.                         |                            |
| C200H-OC224V | 8 outputs, 2 A, 250 V AC/24 V DC max.                          |                            |

**Note** Relays cannot be replaced for the C200H-OC222N/OC226N/OC224N or the CS1W-OC201/OC211.

### Replacement Procedure

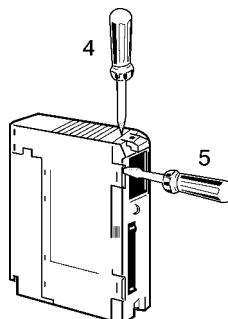
1,2,3...

1. Turn OFF the power to the PLC.
2. Remove the terminal block by unlocking the lock levers at the top and bottom of the terminal block. The terminal block can be removed without disconnecting the wiring.
3. Remove the Output Unit. Push down the lock lever on the Backplane with a screwdriver and lift the Unit out as shown below.

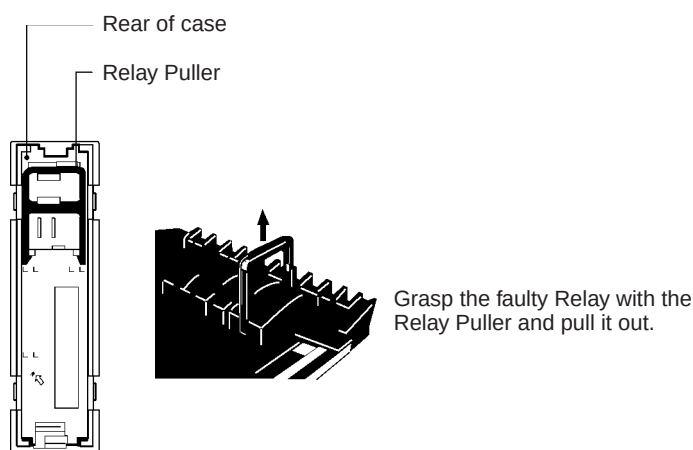


4. Use a Phillips-head screwdriver to remove the screws from the top and bottom of the Unit.

5. Use a slotted screwdriver to detach the case from the Unit.

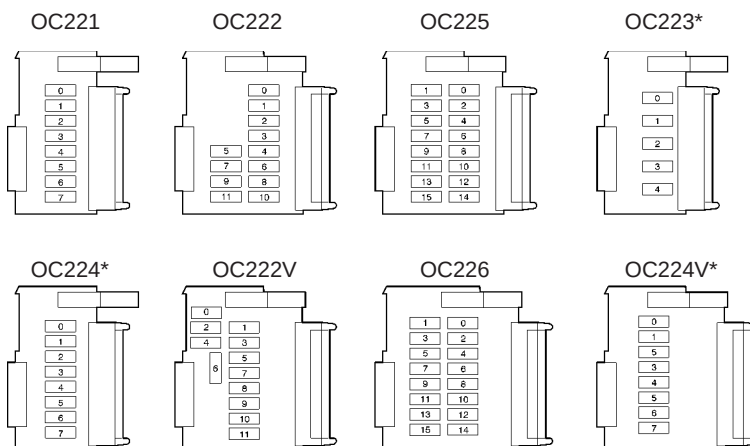


6. Pull out the printed circuit board.
7. Replace the faulty Relay with a new one. Use the Relay puller provided inside the rear of the case when the Unit is delivered. Relays for the C200H-OC222V/OC224V/OC226 can be replaced with the P6B-Y1 Relay Puller.



8. Reassemble the Unit by reversing the above procedure and mount it to the Backplane.

- Note**
1. Use the P6B-Y1 Relay Puller (sold separately) to remove Relays.
  2. Check the pin arrangement before inserting a new Relay into the socket. Pins can only be inserted one way, so do not try to force them if they do not go in easily. Applying too much force can bend the pins and render the Relay unusable.



\*The Relay Output Units marked with an asterisk have independent commons.



# Appendix A

## Specifications of Basic I/O Units and High-density I/O Units

### Input Units

| Category                                                                                          | Name                  | Specifications                                                 | Model        | Page |
|---------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------|--------------|------|
| C200H/CS-series<br>Basic Input Units<br>with Terminal<br>Blocks                                   | AC Input Units        | 100 to 120V AC/V DC, 16inputs,<br>50/60 Hz                     | CS1W-IA111   | 474  |
|                                                                                                   |                       | 100 to 120V AC, 8inputs, 50/60 Hz                              | C200H-IA121  | 475  |
|                                                                                                   |                       | 100 to 120V AC, 16inputs, 50/60 Hz                             | C200H-IA122  | 476  |
|                                                                                                   |                       |                                                                | C200H-IA122V |      |
|                                                                                                   |                       | 200 to 240V AC, 8inputs                                        | C200H-IA221  | 477  |
|                                                                                                   |                       | 200 to 240V AC, 16inputs                                       | C200H-IA222  | 479  |
|                                                                                                   |                       |                                                                | C200H-IA222V |      |
|                                                                                                   |                       |                                                                | CS1W-IA211   | 478  |
|                                                                                                   | AC/DC Input Units     | 12 to 24 V AC/V DC, 8inputs                                    | C200H-IM211  | 480  |
|                                                                                                   |                       | 24 V AC/V DC, 16inputs                                         | C200H-IM212  | 481  |
|                                                                                                   | DC Input Units        | 12 to 24 V DC, 8inputs                                         | C200H-ID211  | 482  |
|                                                                                                   |                       | 12 to 24 V DC, 16 inputs                                       | C200H-ID212  | 482  |
|                                                                                                   |                       | 24 V DC, 16 inputs                                             | CS1W-ID211   | 483  |
|                                                                                                   | Interrupt Input Units | 24 V DC, 16 inputs                                             | CS1W-INT01   | 484  |
|                                                                                                   |                       | 12 to 24 V DC, 8inputs                                         | C200HS-INT01 | 485  |
|                                                                                                   | High-speed Input Unit | 24 V DC, 16 inputs                                             | CS1W-IDP01   | 487  |
| CS-series Basic<br>Input Units with<br>Connectors<br>C200H Group-2<br>High-density Input<br>Units | DC Input Units        | 24 V DC, 32 inputs                                             | CS1W-ID231   | 488  |
|                                                                                                   |                       |                                                                | C200H-ID216  | 489  |
|                                                                                                   |                       |                                                                | C200H-ID218  | 490  |
|                                                                                                   |                       | 12 V DC, 64inputs                                              | C200H-ID111  | 492  |
|                                                                                                   |                       | 24 V DC, 64 inputs                                             | CS1W-ID261   | 493  |
|                                                                                                   |                       |                                                                | C200H-ID217  | 495  |
|                                                                                                   |                       |                                                                | C200H-ID219  | 496  |
|                                                                                                   |                       | 24 V DC, 96 inputs                                             | CS1W-ID291   | 498  |
|                                                                                                   |                       | Simultaneously ON 24-V DC inputs for<br>CS1W-ID291/MD291/MD292 |              | 500  |

## Output Units

| Category                                                 | Name                                        | Specifications                                                                  | Model             | Page |     |
|----------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------|-------------------|------|-----|
| C200H/CS-series Basic Outputs Units with Terminal Blocks | Relay Output Units                          | 250V AC/24V DC, 2 A; 120 V DC, 0.1 A; independent contacts, 8 outputs           | CS1W-OC201        | 502  |     |
|                                                          |                                             | 250V AC/24V DC, 2 A; 120 V DC, 0.1 A; 16 outputs                                | CS1W-OC211        | 501  |     |
|                                                          |                                             | 250V AC/24V DC, 2 A, independent contacts, 5 outputs                            | C200H-OC223       | 503  |     |
|                                                          |                                             | 250 V AC/24 V DC, 2 A, independent contacts, 8 outputs                          | C200H-OC224       | 505  |     |
|                                                          |                                             |                                                                                 | C200H-OC224V/224N | 506  |     |
|                                                          |                                             | 250V AC/24V DC, 2 A, 8 outputs                                                  | C200H-OC221       | 507  |     |
|                                                          |                                             | 250V AC/24V DC, 2 A, 12outputs                                                  | C200H-OC222       | 508  |     |
|                                                          |                                             |                                                                                 | C200H-OC222V/222N | 509  |     |
|                                                          |                                             | 250V AC/24V DC, 2 A, 16 outputs                                                 | C200H-OC225       | 510  |     |
|                                                          |                                             |                                                                                 | C200H-OC226/226N  | 511  |     |
|                                                          | Relay contact outputs                       |                                                                                 |                   | 513  |     |
|                                                          | Triac Output Units                          | 250 V AC, 1.2 A, with fuse burnout detection circuit, 8outputs                  | CS1W-OA201        | 520  |     |
|                                                          |                                             | 250 V AC, 1 A, with fuse burnout detection circuit, 8outputs                    | C200H-OA221       | 516  |     |
|                                                          |                                             | 250 V AC, 1.2 A, with fuse burnout detection circuit, 8outputs                  | C200H-OA223       | 517  |     |
|                                                          |                                             | 250 V AC, 0.3 A, 12outputs                                                      | C200H-OA222V      | 518  |     |
|                                                          |                                             | 250 V AC, 0.5 A, 12outputs                                                      | C200H-OA224       | 519  |     |
|                                                          |                                             | 250 V AC, 0.5 A, 16outputs                                                      | CS1W-OA211        | 515  |     |
|                                                          | Transistor Out-put Units, sink-ing outputs  | 24 V DC, 2.1 A, 8outputs                                                        | C200H-OD213       | 521  |     |
|                                                          |                                             | 12 to 48 V DC, 1A, 8 outputs                                                    | C200H-OD411       | 522  |     |
|                                                          |                                             | 24 V DC, 0.3 A, 12outputs                                                       | C200H-OD211       | 523  |     |
|                                                          |                                             | 24 V DC, 0.3 A, 16outputs                                                       | C200H-OD212       | 524  |     |
|                                                          |                                             | 12 to 24 V DC, 0.5 A, 16outputs                                                 | CS1W-OD211        | 525  |     |
|                                                          | Transistor Out-put Units, sink-ing          | 12 to 24 V DC, 0.5 A, 32outputs                                                 | CS1W-OD231        | 526  |     |
|                                                          |                                             | 4.5 V DC/16 mA to 26.4 V/100mA, with fuse burnout detection circuit, 32 outputs | C200H-OD218       | 527  |     |
|                                                          |                                             | 12 to 24 V DC, 0.3 A, 64outputs                                                 | CS1W-OD261        | 529  |     |
|                                                          |                                             | 4.5 V DC/16 mA to 26.4 V/100mA, 64outputs                                       | C200H-OD219       | 530  |     |
|                                                          |                                             | 12 to 24 V DC, 0.1 A, with fuse burnout detection circuit, 96outputs            | CS1W-OD291        | 533  |     |
|                                                          | Transistor Out-put Units, sourcing out-puts | 24 V DC, 0.8 A, load short-circuit protection, 8outputs.                        | C200H-OD214       | 534  |     |
|                                                          |                                             | 5 to 24 V DC, 0.3 A, 8outputs                                                   | C200H-OD216       | 537  |     |
|                                                          |                                             | 5 to 24 V DC, 0.3 A, 12outputs                                                  | C200H-OD217       | 538  |     |
|                                                          |                                             | 24 V DC, 0.5 A, load short-circuit protection, 16outputs                        | CS1W-OD212        | 539  |     |
|                                                          |                                             | Load short-circuit protection for CS1W-OD212/OD232/OD262/MD262 and C200H-OD21B  |                   |      | 540 |
|                                                          |                                             | 24 V DC, 1 A, load short-circuit protection, 16outputs.                         | C200H-OD21A       | 542  |     |
|                                                          |                                             | 24 V DC, 0.5 A, load short-circuit protection, 32outputs                        | CS1W-OD232        | 544  |     |
|                                                          |                                             | 24 V DC, 0.5 A, 32 outputs, sourcing outputs, load short-circuit protection     | C200H-OD21B       | 545  |     |
|                                                          |                                             | 24 V DC, 0.3 A, load short-circuit protection, 64outputs                        | CS1W-OD262        | 546  |     |
|                                                          |                                             | 24 V DC, with fuse burnout detection circuit, 0.1 A, 96outputs                  | CS1W-OD292        | 548  |     |

## Mixed I/O Units

| Category                                  | Name                             | Specifications                                                                                                  | Model      | Page |
|-------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------|------------|------|
| CS-series Basic I/O Units with Connectors | DC Input/Transistor Output Units | 24 V DC inputs; 12 to 24 V DC, 0.3-A, sinking outputs; 32 inputs, 32 outputs                                    | CS1W-MD261 | 550  |
|                                           |                                  | 24 V DC inputs; 12 to 24 V DC, 0.1A, sinking outputs with fuse burnout detection circuit; 48 inputs, 48 outputs | CS1W-MD291 | 552  |
|                                           |                                  | 24 V DC inputs 24 V DC, 0.3 A, sourcing outputs with load short-circuit protection; 32 inputs, 32 outputs       | CS1W-MD262 | 555  |
|                                           |                                  | 24 V DC inputs 24 V DC, 0.1 A, sourcing outputs with fuse burnout detection circuit; 48 inputs, 48 outputs      | CS1W-MD292 | 557  |
|                                           | TTL I/O Unit                     | 5 V DC, 3.5 mA inputs; 5 V DC, 35 mA, outputs; 32 inputs, 32 outputs                                            | CS1W-MD292 | 560  |

## Special I/O Units

### High-density Input Units

| Category        | Name           | Specifications                        | Model       | Page |
|-----------------|----------------|---------------------------------------|-------------|------|
| TTL Input Units | TTL Input Unit | 5 V DC, static input mode, 32 inputs  | C200H-ID501 | 561  |
| DC Input Units  | DC Input Unit  | 24 V DC, static input mode, 32 inputs | C200H-ID215 | 562  |

### High-density Output Units

| Category                | Name                    | Specifications                    |                                  | Model       | Page |
|-------------------------|-------------------------|-----------------------------------|----------------------------------|-------------|------|
| TTL Output Units        | TTL Output Units        | 5 V DC, 35 mA                     | Static output mode, 32 outputs   | C200H-OD501 | 564  |
|                         |                         |                                   | Dynamic output mode, 128 outputs |             | 566  |
| Transistor Output Units | Transistor Output Units | 4.5 V DC, 16 mA to 26.4 V, 100 mA | Static output mode, 32 outputs   | C200H-OD215 | 567  |
|                         |                         |                                   | Dynamic output mode, 128 outputs |             | 568  |

## Mixed I/O Units

| Category                         | Name                             | Specifications                                                                                     | Model       | Page |
|----------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------|-------------|------|
| TTL I/O Units                    | TTL I/O Units                    | Static input mode: 5 V DC inputs; 5 V DC, 35 mA out-puts; 16 inputs, 16 outputs                    | C200H-MD501 | 570  |
|                                  |                                  | Dynamic output mode: 5 V DC, 35 mA outputs; 128 outputs                                            |             | 572  |
| DC Input/Transistor Output Units | DC Input/Transistor Output Units | Static input mode: 12 V DC inputs; 4.5 V DC, 16 mA to 26.4 V 100 mA outputs, 16 inputs, 16 outputs | C200H-MD115 | 573  |
|                                  |                                  | Dynamic output mode: 12 V DC, 50 mA outputs; 128 outputs                                           |             | 575  |
|                                  |                                  | Static input mode: 24 V DC inputs, 24 V DC 16 mA to 26.4 V 100 mA outputs; 16 inputs, 16 outputs   | C200H-MD215 | 576  |
|                                  |                                  | Dynamic output mode: 24 V DC, 100 mA outputs; 128 outputs                                          |             | 578  |
|                                  |                                  | Maximum switching capacity of C200H-MD115/MD215                                                    |             |      |

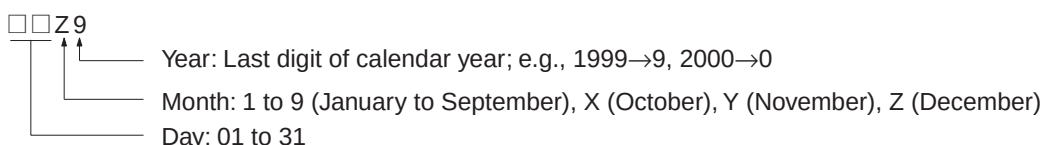
## Specifications Changes for Transistor Output Units

Some of the specifications of the following Units with transistor outputs have been improved.

Output elements have been changed from NPN to field-effect transistors (FET). Part of the circuit configuration has been changed. There are no changes in performance characteristics as a result of these improvements, but care is required in connecting the polarity of the load power supply. Outputs will not operate dependably if the polarity is reversed. Check the manufacturing number on your Unit before wiring.

| Name                            | Model       | Date of change                                | Manufacturing number<br>(See below.) |
|---------------------------------|-------------|-----------------------------------------------|--------------------------------------|
| Transistor Output Unit          | C200H-OD215 | Manufactured on or after<br>November 30, 1999 | 30Y9 or later                        |
| DC Input/Transistor Output Unit | C200H-MD215 |                                               |                                      |
| Transistor Output Units         | C200H-OD218 | Manufactured on or after<br>January 31, 2000  | 3110 or later                        |
|                                 | C200H-OD219 |                                               |                                      |

### Manufacturing Numbers



The following figures and tables provide specifications for Basic I/O Units and High-density I/O Units. Refer to *Section SECTION 3 Nomenclature, Functions, and Dimensions* for dimensions.

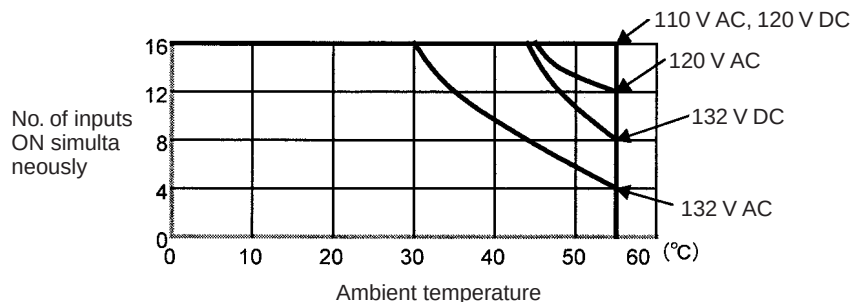
## Basic I/O Units

### CS1W-IA111 100-V AC Input Unit (16 Points)

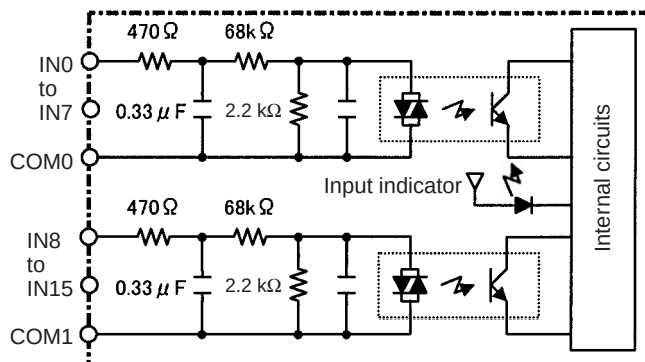
|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 100 to 120 V AC (50/60 Hz), 100 to 120 V DC                                                                   |
| Operating Input Voltage            | 85 to 132 V AC (50/60 Hz), 85 to 132 V DC                                                                     |
| Input Impedance                    | 10 k $\Omega$ (50 Hz), 8 k $\Omega$ (60 Hz), 69 k $\Omega$ (DC)                                               |
| Input Current                      | 10 mA typical (at 100 V AC), 1.5 mA typical (at 100 V DC)                                                     |
| ON Voltage                         | 65 V AC min., 75 V DC min.                                                                                    |
| OFF Voltage                        | 20 V AC max., 25 V DC max.                                                                                    |
| ON Response Time                   | 18 ms max. when PLC Setup on default setting (8 ms) (See note.)                                               |
| OFF Response Time                  | 63 ms max. when PLC Setup on default setting (8 ms) (See note.)                                               |
| Insulation Resistance              | 20 M $\Omega$ between external terminals and the GR terminal (100 V DC)                                       |
| Dielectric Strength                | 2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| No. of Circuits                    | 2 (each 8 points/common)                                                                                      |
| Number of Inputs ON Simultaneously | 100% simultaneously ON (for 110 V AC, 120 V DC) Refer to the diagram below.                                   |
| Internal Current Consumption       | 110 mA 5 V DC max.                                                                                            |
| Weight                             | 260 g max.                                                                                                    |

**Note** The Input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup. When the response times have been set to 0 ms, the ON response time will be 10 ms maximum and the OFF response time will be 40 ms maximum due to internal element delays.

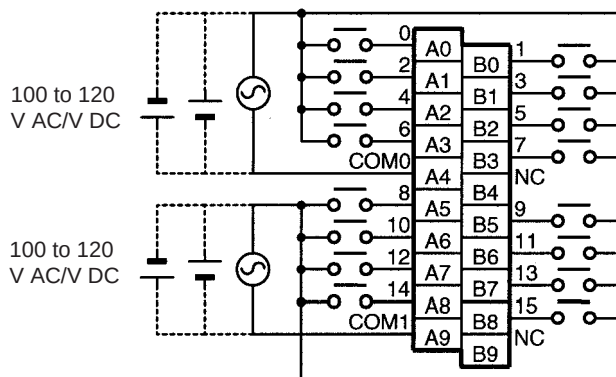
## Number of Inputs ON Simultaneously



## Circuit Layout



## Terminal Connections

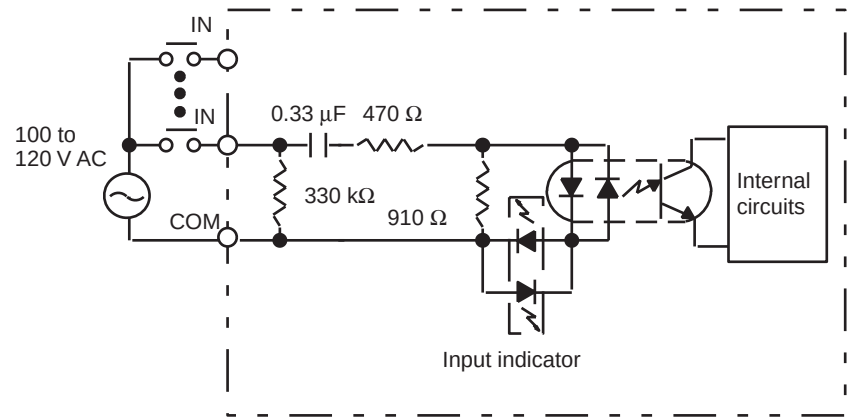


## C200H-IA121 AC Input Unit (8 Points)

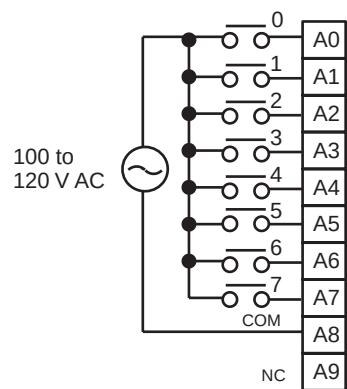
|                              |                                |
|------------------------------|--------------------------------|
| Rated Input Voltage          | 100 to 120 V AC (50/60 Hz)     |
| Operating Input Voltage      | 85 to 132 V AC (50/60 Hz)      |
| Input Impedance              | 9.7 kΩ (50 Hz), 8 kΩ (60 Hz)   |
| Input Current                | 10 mA typical (at 100 V AC)    |
| ON Voltage                   | 60 V AC min.                   |
| OFF Voltage                  | 20 V AC max.                   |
| ON Response Time             | 35 ms max. (at 100 V AC, 25°C) |
| OFF Response Time            | 55 ms max. (at 100 V AC, 25°C) |
| No. of Circuits              | 1 (8 points/common)            |
| Internal Current Consumption | 10 mA 5 V DC max.              |
| Weight                       | 250 g max.                     |



Circuit Configuration



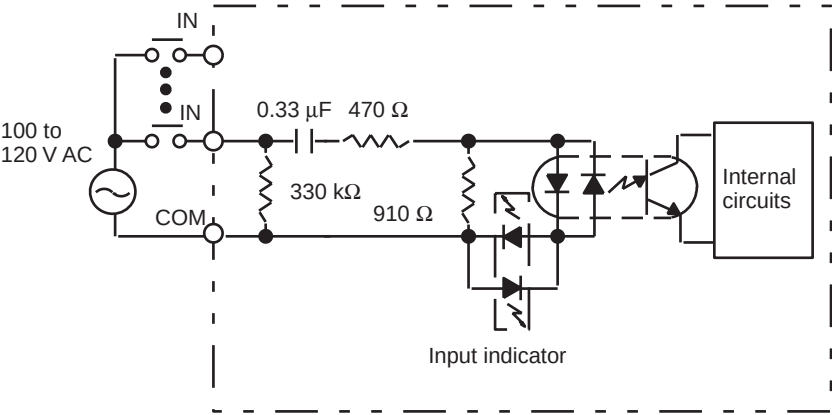
Terminal Connections



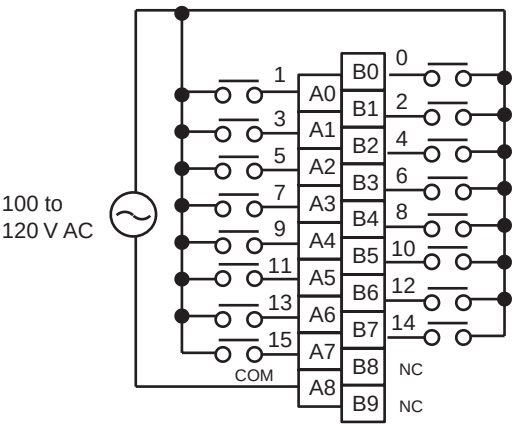
C200H-IA122/IA122V AC Input Unit (16 Points)

|                              |                                |
|------------------------------|--------------------------------|
| Rated Input Voltage          | 100 to 120 V AC (50/60 Hz)     |
| Operating Input Voltage      | 85 to 132 V AC (50/60 Hz)      |
| Input Impedance              | 9.7 kΩ (50 Hz), 8 kΩ (60 Hz)   |
| Input Current                | 10 mA typical (at 100 V AC)    |
| ON Voltage                   | 60 V AC min.                   |
| OFF Voltage                  | 20 V AC max.                   |
| ON Response Time             | 35 ms max. (at 100 V AC, 25°C) |
| OFF Response Time            | 55 ms max. (at 100 V AC, 25°C) |
| No. of Circuits              | 1 (16 points/common)           |
| Internal Current Consumption | 10 mA 5 V DC max.              |
| Weight                       | 300 g max./400 g max. (IA122V) |

Circuit Configuration



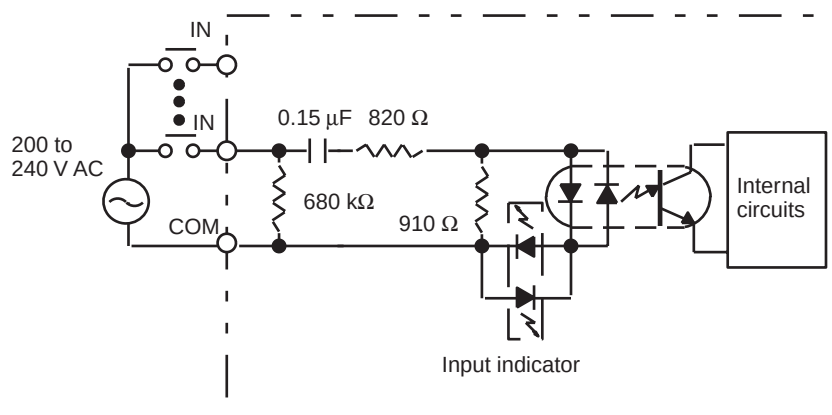
Terminal Connections



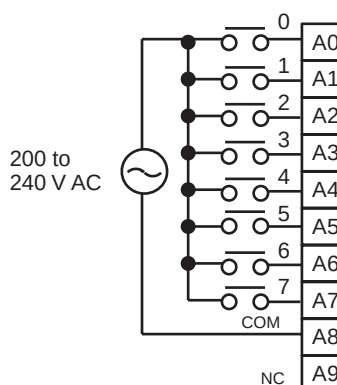
C200H-IA221 AC Input Unit (8 Points)

|                              |                                |
|------------------------------|--------------------------------|
| Rated Input Voltage          | 200 to 240 V AC (50/60 Hz)     |
| Operating Input Voltage      | 170 to 264 V AC (50/60 Hz)     |
| Input Impedance              | 21 kΩ (50 Hz), 18 kΩ (60 Hz)   |
| Input Current                | 10 mA typical (at 200 V AC)    |
| ON Voltage                   | 120 V AC min.                  |
| OFF Voltage                  | 40 V AC max.                   |
| ON Response Time             | 35 ms max. (at 200 V AC, 25°C) |
| OFF Response Time            | 55 ms max. (at 200 V AC, 25°C) |
| No. of Circuits              | 1 (8 points/common)            |
| Internal Current Consumption | 10 mA 5 V DC max.              |
| Weight                       | 250 g max.                     |

## Circuit Configuration



## Terminal Connections

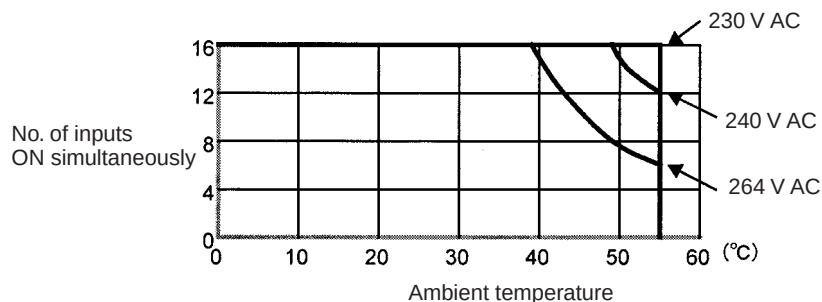


## CS1W-IA211 200-V AC Input Unit (16 Points)

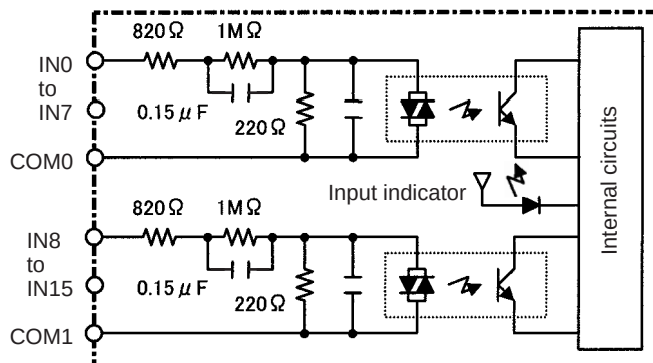
|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 200 to 240 V AC (50/60 Hz)                                                                                    |
| Operating Input Voltage            | 170 to 264 V AC (50/60 Hz)                                                                                    |
| Input Impedance                    | 21 k $\Omega$ (50 Hz), 18 k $\Omega$ (60 Hz)                                                                  |
| Input Current                      | 10 mA typical (at 200 V AC)                                                                                   |
| ON Voltage/ON current              | 120 V AC min.                                                                                                 |
| OFF Voltage/OFF current            | 40 V AC max.                                                                                                  |
| ON Response Time                   | 18 ms max. when PLC Setup on default setting (8 ms) (See note.)                                               |
| OFF Response Time                  | 48 ms max. when PLC Setup on default setting (8 ms) (See note.)                                               |
| No. of Circuits                    | 2 (each 8 points/common)                                                                                      |
| Number of Inputs ON Simultaneously | 100% simultaneously ON (for 230 V AC). Refer to the diagram below.                                            |
| Insulation Resistance              | 20 M $\Omega$ between external terminals and the GR terminal (100 V DC)                                       |
| Dielectric Strength                | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption       | 110 mA 5 V DC max.                                                                                            |
| Weight                             | 260 g max.                                                                                                    |

**Note** The Input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup. When the response times have been set to 0 ms, the ON response time will be 10 ms maximum and the OFF response time will be 40 ms maximum due to internal element delays.

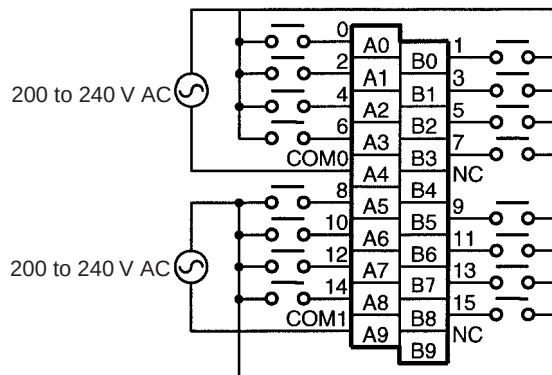
## Number of Inputs ON Simultaneously



## Circuit Configuration



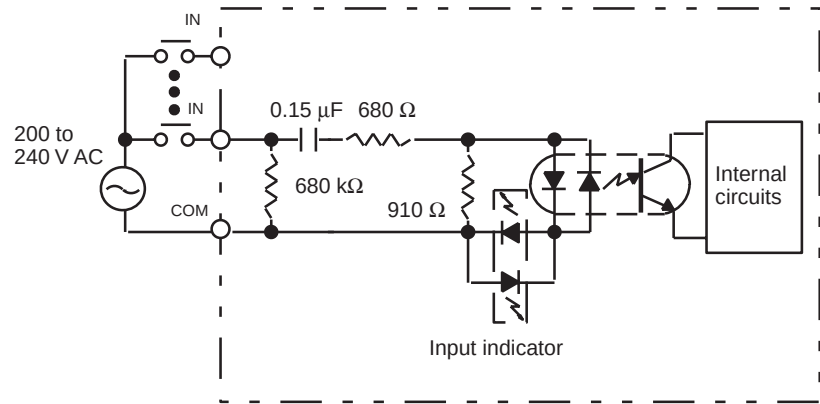
## Terminal Connections



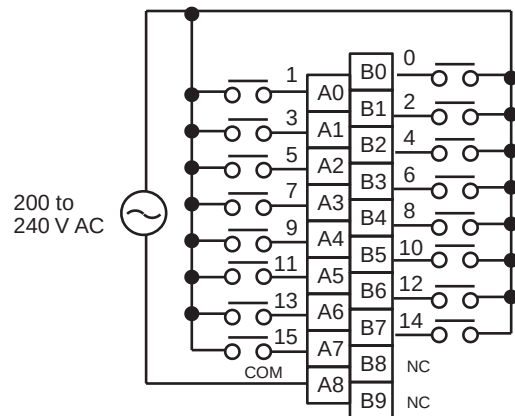
## C200H-IA222/IA222V AC Input Unit (16 Points)

|                              |                                |
|------------------------------|--------------------------------|
| Rated Input Voltage          | 200 to 240 V AC (50/60 Hz)     |
| Input Impedance              | 21 kΩ (50 Hz), 18 kΩ (60 Hz)   |
| Operating Input Voltage      | 170 to 264 V DC (50/60 Hz)     |
| Input Current                | 10 mA typical (at 200 V AC)    |
| ON Voltage                   | 120 V AC min.                  |
| OFF Voltage                  | 40 V AC max.                   |
| ON Response Time             | 35 ms max. (at 200 V AC, 25°C) |
| OFF Response Time            | 55 ms max. (at 200 V AC, 25°C) |
| No. of Circuits              | 1 (16 points/common)           |
| Internal Current Consumption | 10 mA 5 V DC max.              |
| Weight                       | 300 g max./400 g max. (IA222V) |

Circuit Configuration



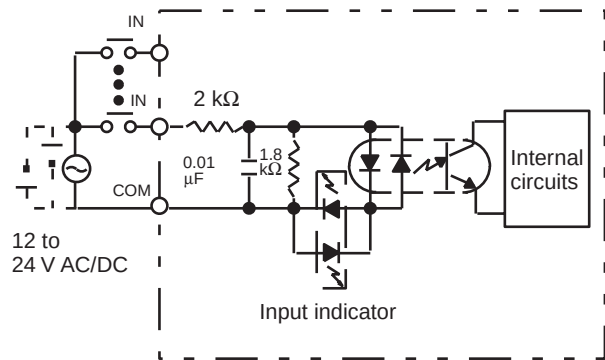
Terminal Connections

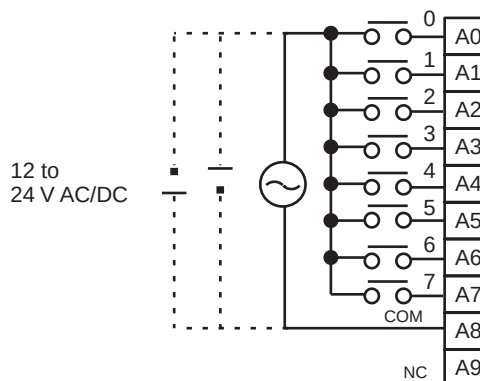


C200H-IM211 AC/DC Input Unit (8 Points)

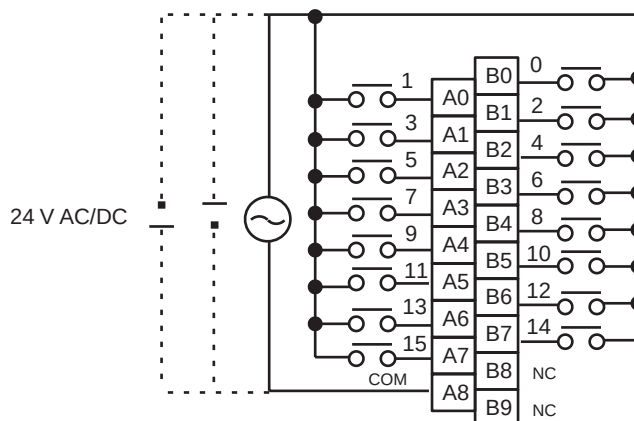
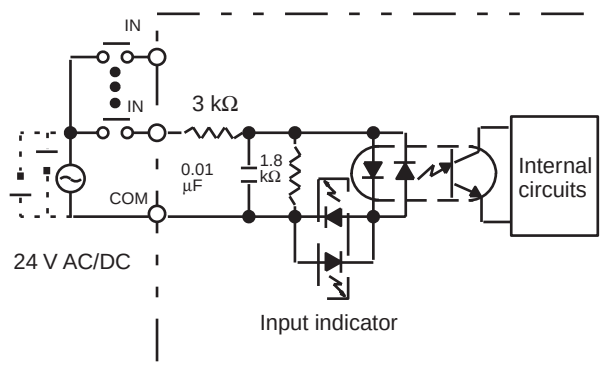
|                              |                                   |
|------------------------------|-----------------------------------|
| Rated Input Voltage          | 12 to 24 V DC/V AC (50/60 Hz)     |
| Operating Input Voltage      | 10.2 to 26.4 V AC/V DC (50/60 Hz) |
| Input Impedance              | 2 kΩ                              |
| Input Current                | 10 mA typical (at 24 V DC)        |
| ON Voltage                   | 10.2 V DC min.                    |
| OFF Voltage                  | 3.0 V DC max.                     |
| ON Response Time             | 15 ms max. (at 24 V DC, 25°C)     |
| OFF Response Time            | 15 ms max. (at 24 V DC, 25°C)     |
| No. of Circuits              | 1 (8 points/common)               |
| Internal Current Consumption | 10 mA 5 V DC max.                 |
| Weight                       | 200 g max.                        |

Circuit Configuration



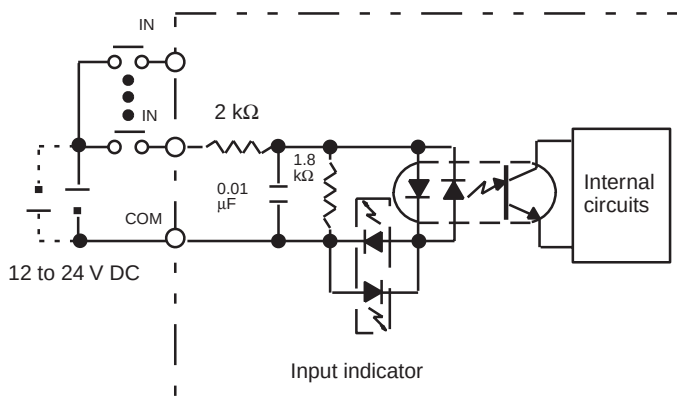
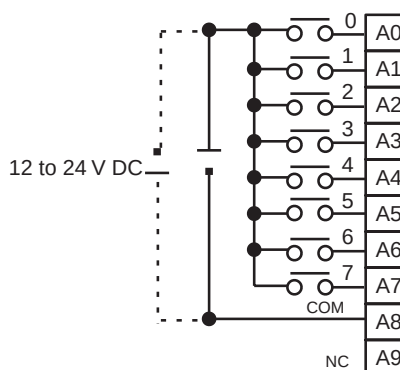


|                              |                                   |
|------------------------------|-----------------------------------|
| Rated Input Voltage          | 24 V DC/V AC (50/60 Hz)           |
| Operating Input Voltage      | 20.4 to 26.4 V AC/V DC (50/60 Hz) |
| Input Impedance              | 3 kΩ                              |
| Input Current                | 7 mA typical (at 24 V DC)         |
| ON Voltage                   | 14.4 V DC min.                    |
| OFF Voltage                  | 5.0 V DC max.                     |
| ON Response Time             | 15 ms max. (at 24 V DC, 25°C)     |
| OFF Response Time            | 15 ms max. (at 24 V DC, 25°C)     |
| No. of Circuits              | 1 (16 points/common)              |
| Internal Current Consumption | 10 mA 5 V DC max.                 |
| Weight                       | 250 g max.                        |



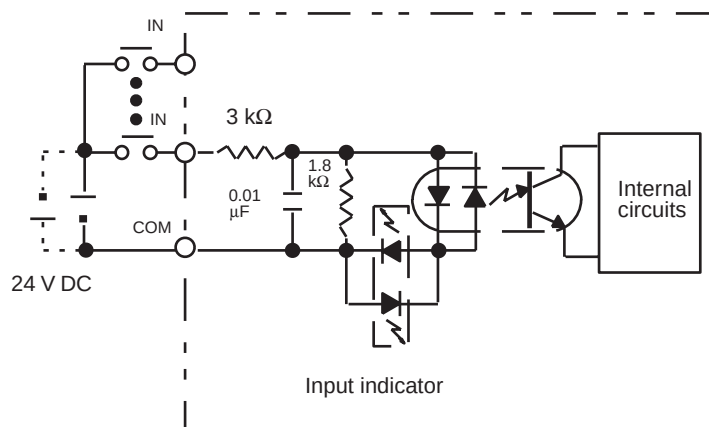
**C200H-ID211 DC Input Unit (8 Points)**

|                              |                                |
|------------------------------|--------------------------------|
| Rated Input Voltage          | 12 to 24 V DC                  |
| Operating Input Voltage      | 10.2 to 26.4 V DC              |
| Input Impedance              | 2 k $\Omega$                   |
| Input Current                | 10 mA typical (at 24 V DC)     |
| ON Voltage                   | 10.2 V DC min.                 |
| OFF Voltage                  | 3.0 V DC max.                  |
| ON Response Time             | 1.5 ms max. (at 24 V DC, 25°C) |
| OFF Response Time            | 1.5 ms max. (at 24 V DC, 25°C) |
| No. of Circuits              | 1 (8 point/common)             |
| Internal Current Consumption | 10 mA 5 V DC max.              |
| Weight                       | 200 g max.                     |

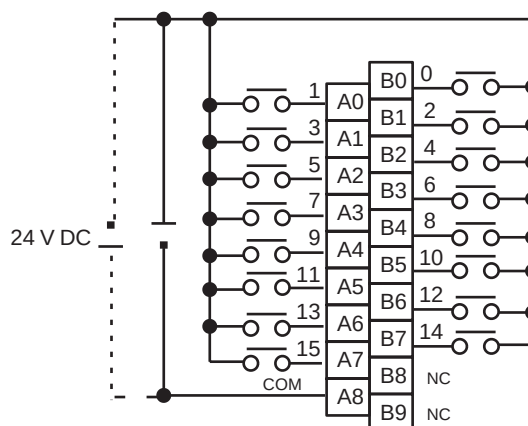
**Circuit Configuration****Terminal Connections****C200H-ID212 DC Input Unit (16 Points)**

|                              |                                |
|------------------------------|--------------------------------|
| Rated Input Voltage          | 24 V DC                        |
| Operating Input Voltage      | 20.4 to 26.4 V DC              |
| Input Impedance              | 3 k $\Omega$                   |
| Input Current                | 7 mA typical (at 24 V DC)      |
| ON Voltage                   | 14.4 V DC min.                 |
| OFF Voltage                  | 5.0 V DC max.                  |
| ON Response Time             | 1.5 ms max. (at 24 V DC, 25°C) |
| OFF Response Time            | 1.5 ms max. (at 24 V DC, 25°C) |
| No. of Circuits              | 1 (16 points/common)           |
| Internal Current Consumption | 10 mA 5 V DC max.              |
| Weight                       | 300 g max.                     |

## Circuit Configuration



## Terminal Connections

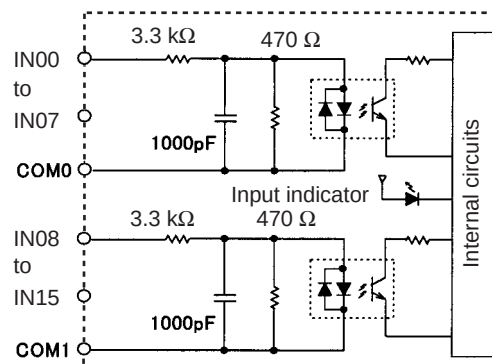


## CS1W-ID211 DC Input Unit (16 Points)

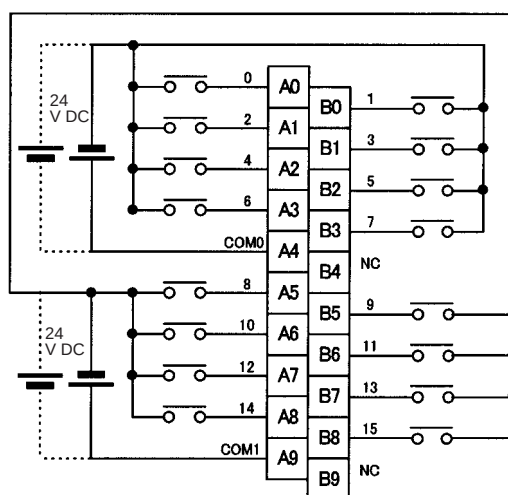
|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 24 V DC                                                                                                       |
| Operating Input Voltage            | 20.4 to 26.4 V DC                                                                                             |
| Input Impedance                    | 3.3 kΩ                                                                                                        |
| Input Current                      | 7 mA typical (at 24 V DC)                                                                                     |
| ON Voltage/ON Current              | 14.4 V DC min./3 mA min.                                                                                      |
| OFF Voltage/OFF Current            | 5 V DC max./1 mA max.                                                                                         |
| ON Response Time                   | 8.0 ms max. (Possible to set to between 0 and 32 ms in the PLC Setup.)                                        |
| OFF Response Time                  | 8.0 ms max. (Possible to set to between 0 and 32 ms using PLC)                                                |
| No. of Circuits                    | 16 (8 points/common, 2 circuits)                                                                              |
| Number of Simultaneously ON Points | 100% simultaneously ON                                                                                        |
| Insulation Resistance              | 20 MΩ between external terminals and the GR terminal (100 V DC)                                               |
| Dielectric Strength                | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption       | 100 mA max.                                                                                                   |
| Weight                             | 270 g max.                                                                                                    |



## Circuit Configuration



## Terminal Connections



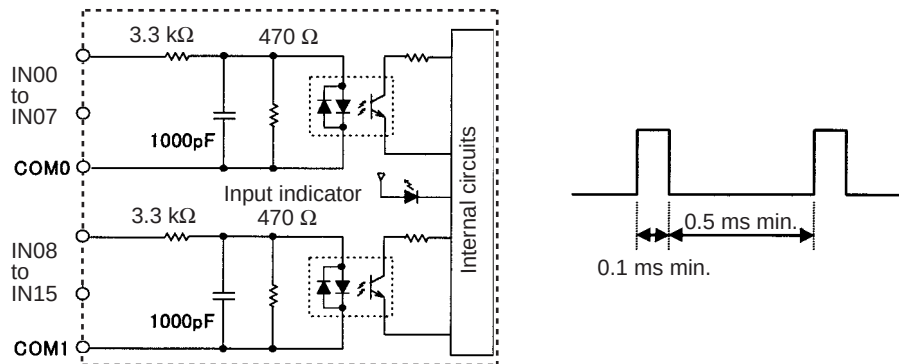
Polarity of the input power supply can be connected in either direction.

**Note** The ON response time will be 20  $\mu$ s maximum and OFF response time will be 300  $\mu$ s maximum even if the response times are set to 0 ms due to internal element delays.

## CS1W-INT01 Interrupt Input Unit (16 Points)

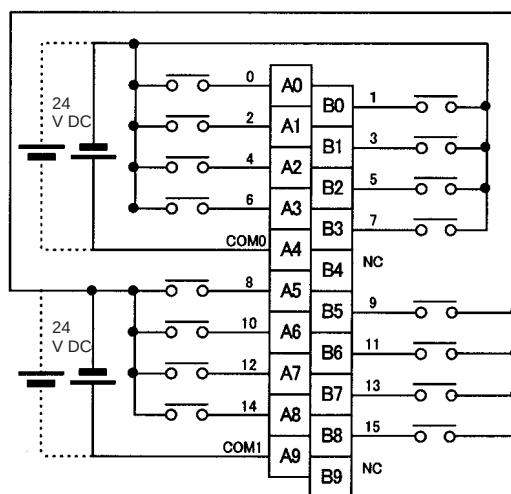
|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 24 V DC                                                                                                       |
| Operating Input Voltage            | 20.4 to 26.4 V DC                                                                                             |
| Input Impedance                    | 3.3 k $\Omega$                                                                                                |
| Input Current                      | 7 mA typical (at 24 V DC)                                                                                     |
| ON Voltage/ON Current              | 14.4 V DC min./3 mA min.                                                                                      |
| OFF Voltage/OFF Current            | 5 V DC max./1 mA max.                                                                                         |
| ON Response Time                   | 0.1 ms max.                                                                                                   |
| OFF Response Time                  | 0.5 ms max.                                                                                                   |
| No. of Circuits                    | 16 (8 points/common, 2 circuits)                                                                              |
| Number of Simultaneously ON Points | 100% simultaneously ON                                                                                        |
| Insulation Resistance              | 20 M $\Omega$ between external terminals and the GR terminal (100 V DC)                                       |
| Dielectric Strength                | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption       | 100 mA max.                                                                                                   |
| Weight                             | 270 g max.                                                                                                    |

## Circuit Configuration



- Up to two Interrupt Input Units can be mounted to the CPU Rack.
- Interrupts cannot be used when an Interrupt Input Unit is mounted to an Expansion I/O Rack, i.e., it will be treated as a 16-point Input Unit.
- Set the pulse width of signals input to the Interrupt Input Unit so they satisfy the above conditions.

## Terminal Connections

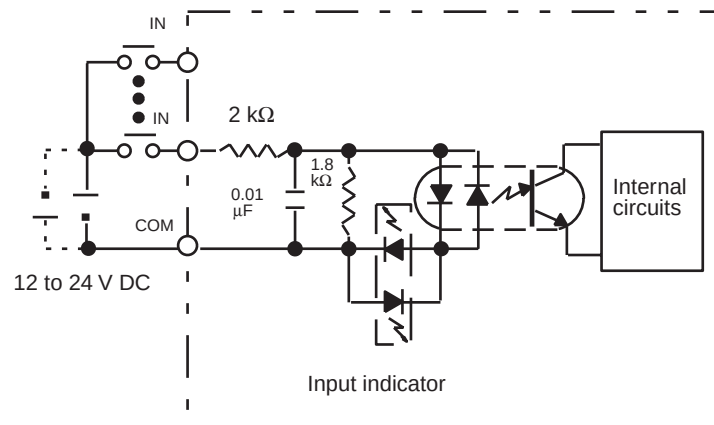


Polarity of the input power supply can be connected in either direction.

## C200HS-INT01 Interrupt Input Unit (8 Points)

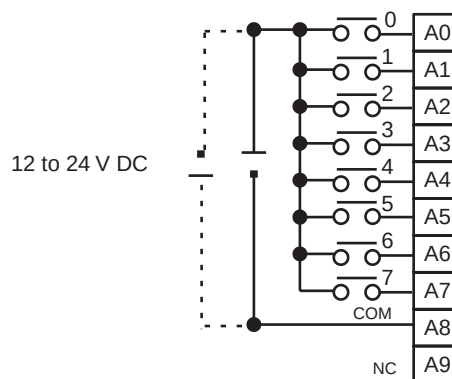
|                              |                         |
|------------------------------|-------------------------|
| Rated Input Voltage          | 12 to 24 V DC           |
| Operating Input Voltage      | 10.2 to 26.4 V DC       |
| Input Impedance              | 2 KΩ                    |
| Input Current                | 10 mA typical (24 V DC) |
| ON Voltage                   | 10.2 V DC min.          |
| OFF Voltage                  | 3.0 V DC max.           |
| ON Response Time             | 0.2 ms max.             |
| OFF Response Time            | 0.5 ms max.             |
| No. of Circuits              | 1 (8 points/common)     |
| Internal Current Consumption | 20 mA, 5 V DC max.      |
| Weight                       | 200 g max.              |

## Circuit Configuration



Either plus or minus can be used for the input power supply.

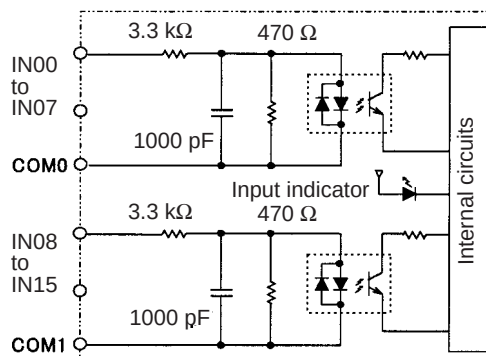
## Terminal Connections



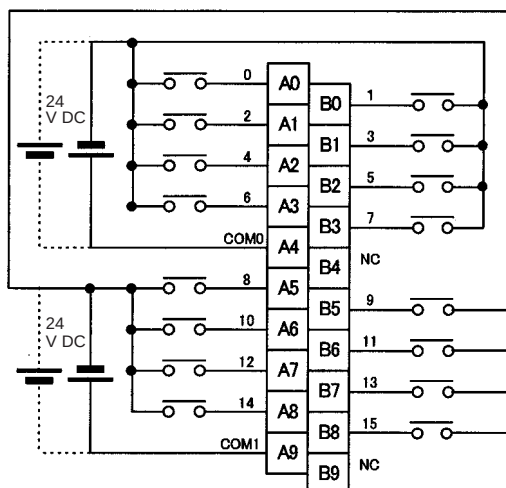
## CS1W-IDP01 High-speed Input Unit (16 Points)

|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 24 V DC                                                                                                       |
| Operating Input Voltage            | 20.4 to 26.4 V DC                                                                                             |
| Input Impedance                    | 3.3 k $\Omega$                                                                                                |
| Input Current                      | 7 mA typical (at 24 V DC)                                                                                     |
| ON Voltage/ON Current              | 14.4 V DC min./3 mA min.                                                                                      |
| OFF Voltage/OFF Current            | 5 V DC max./1 mA max.                                                                                         |
| ON Response Time                   | 0.1 ms max.                                                                                                   |
| OFF Response Time                  | 0.5 ms max.                                                                                                   |
| No. of Circuits                    | 16 (8 points/common, 2 circuits)                                                                              |
| Number of Simultaneously ON Points | 100% simultaneously ON                                                                                        |
| Insulation Resistance              | 20 M $\Omega$ between external terminals and the GR terminal (100 V DC)                                       |
| Dielectric Strength                | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption       | 100 mA max.                                                                                                   |
| Weight                             | 270 g max.                                                                                                    |

## Circuit Configuration



## Terminal Connections



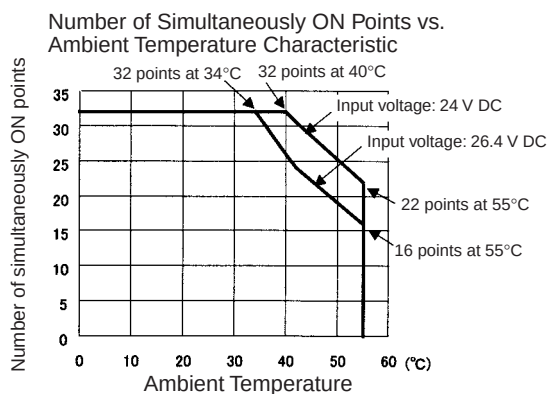
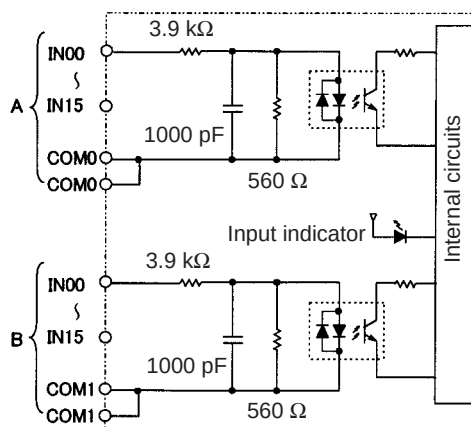
Polarity of the input power supply can be connected in either direction.

- With a High-speed Input Unit, pulse inputs shorter than the cycle time of the CPU Unit can be read.
- The minimum pulse width (ON time) that can be read by the High-speed Input Unit is 0.1 ms.
- Input data in the internal circuits is cleared during the input refresh period.

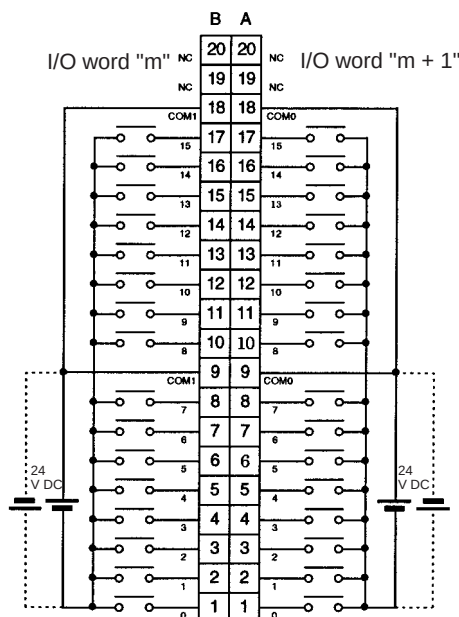
## CS1W-ID231 DC Input Unit (32 Points)

|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 24 V DC                                                                                                       |
| Operating Input Voltage            | 20.4 to 26.4 V DC                                                                                             |
| Input Impedance                    | 3.9 k $\Omega$                                                                                                |
| Input Current                      | 6 mA typical (at 24 V DC)                                                                                     |
| ON Voltage/ON Current              | 15.4 V DC min./3 mA min.                                                                                      |
| OFF Voltage/OFF Current            | 5 V DC max./1 mA max.                                                                                         |
| ON Response Time                   | 8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.)                                                |
| OFF Response Time                  | 8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup)                                                 |
| No. of Circuits                    | 32 (16 points/common, 2 circuits)                                                                             |
| Number of Simultaneously ON Points | 70% (11 points/common) (at 24 V DC) (Refer to the following illustrations.)                                   |
| Insulation Resistance              | 20 M $\Omega$ between external terminals and the GR terminal (100 V DC)                                       |
| Dielectric Strength                | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption       | 150 mA max.                                                                                                   |
| Weight                             | 200 g max.                                                                                                    |
| Accessories                        | One connector for external wiring (soldered)                                                                  |

## Circuit Configuration



## Terminal Connections



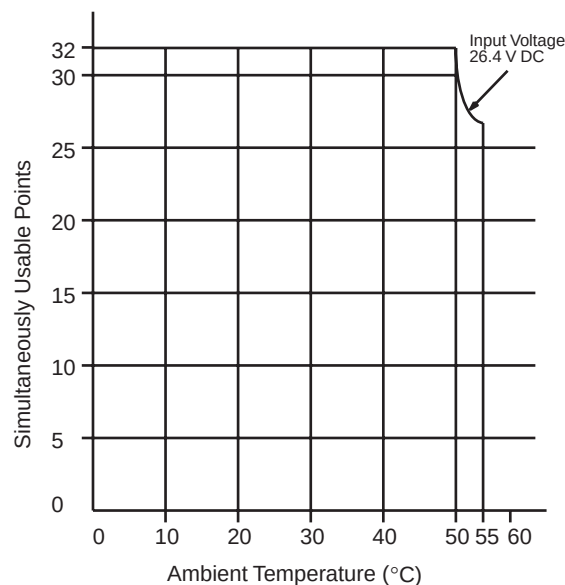
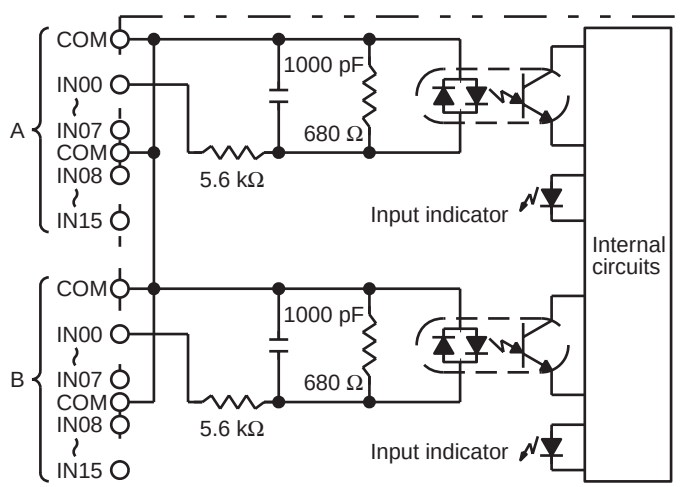
- The input power polarity can be connected in either direction provided that the same polarity is set for rows A and B.
- Both COM0 and COM1 have two pins each. Although they are internally connected, wire all points completely.

**Note** The ON response time will be 20  $\mu$ s maximum and OFF response time will be 300  $\mu$ s maximum even if the response times are set to 0 ms due to internal element delays.

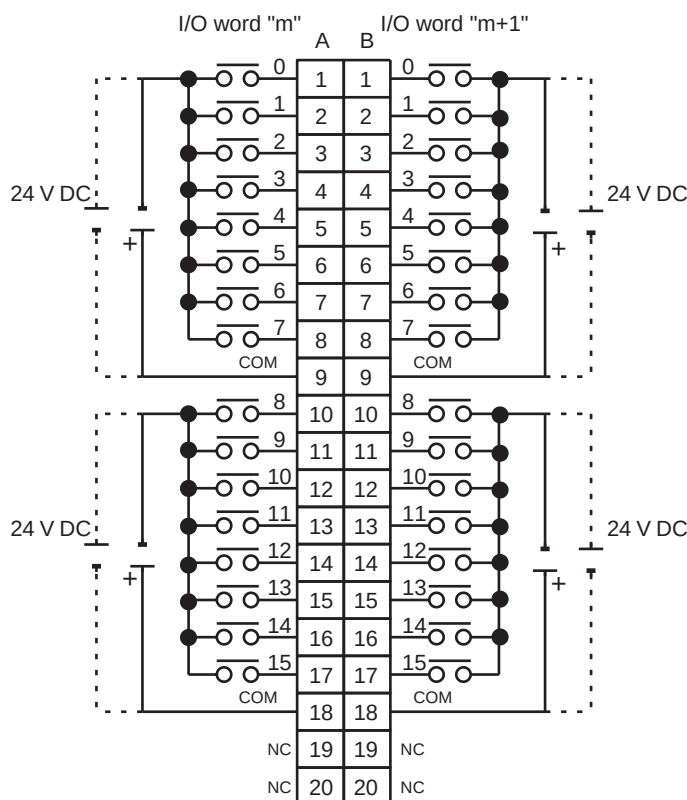
## C200H-ID216 DC Input Unit (32 Points)

|                              |                                                                                                                              |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage          | 24 V DC                                                                                                                      |
| Operating Input Voltage      | 20.4 to 26.4 V DC                                                                                                            |
| Input Impedance              | 5.6 k $\Omega$                                                                                                               |
| Input Current                | 4.1 mA (at 24 V DC)                                                                                                          |
| ON Voltage                   | 14.4 V DC min.                                                                                                               |
| OFF Voltage                  | 5.0 V DC max.                                                                                                                |
| ON Response Time             | 1.0 ms max.                                                                                                                  |
| OFF Response Time            | 1.0 ms max.                                                                                                                  |
| No. of Circuits              | 1 (32 points/common)<br>All 32 points cannot be turned ON simultaneously at high temperatures. Refer to the following graph. |
| Internal Current Consumption | 100 mA 5 V DC max.                                                                                                           |
| Weight                       | 180 g max.                                                                                                                   |

## Circuit Configuration and Simultaneously Usable Points



## Terminal Connections



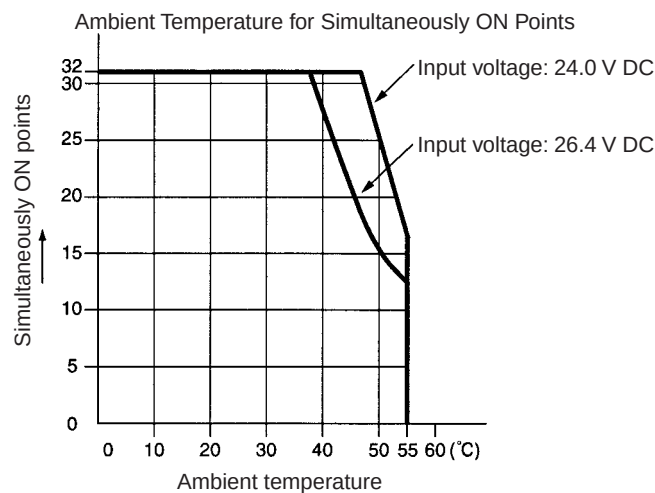
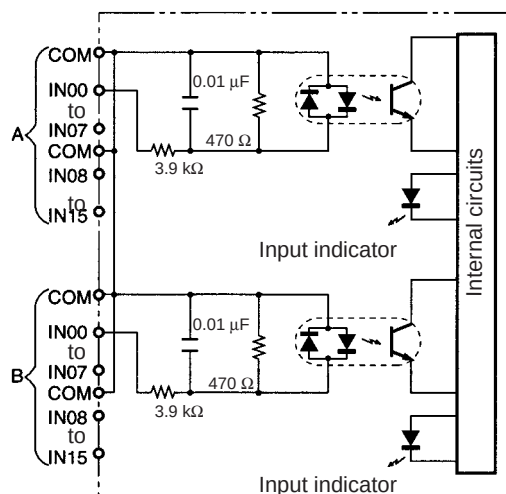
- Note**
1. I/O word "m" is determined by the I/O number setting.
  2. The power can be supplied in either polarity, but the same polarity must be used for all COM terminals. Connect power supply wiring to every COM terminal, even though the COM terminals are connected internally.

## C200H-ID218 DC Input Unit (32 Points)

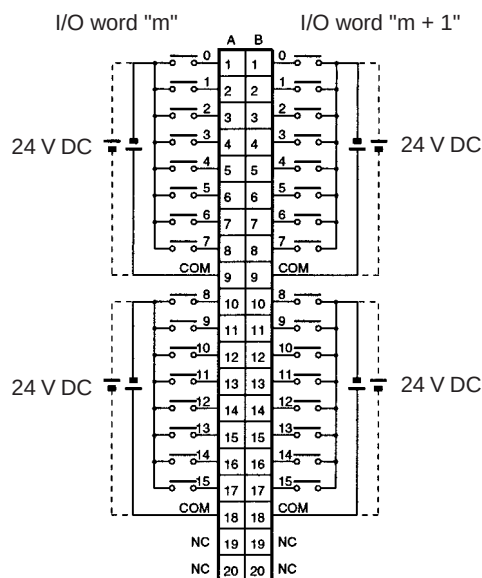
|                         |                   |
|-------------------------|-------------------|
| Rated Input Voltage     | 24 V DC           |
| Operating Input Voltage | 20.4 to 26.4 V DC |

|                              |                                                                                                                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Impedance              | 3.9 k $\Omega$                                                                                                                                                                       |
| Input Current                | 6 mA (at 24 V DC)                                                                                                                                                                    |
| ON Voltage/ON Current        | 15.4 V DC min./3.5 mA min.                                                                                                                                                           |
| OFF Voltage/OFF Current      | 5.0 V DC max./1 mA max.                                                                                                                                                              |
| ON Response Time             | 1.0 ms max.                                                                                                                                                                          |
| OFF Response Time            | 1.0 ms max.                                                                                                                                                                          |
| No. of Circuits              | 32 (32 points/common)<br><b>Note</b> The number of points that can be ON simultaneously is limited according to the ambient temperature. Refer to the following diagram for details. |
| Internal Current Consumption | 100 mA 5 V DC max.                                                                                                                                                                   |
| Weight                       | 180 g max.                                                                                                                                                                           |

### Circuit Configuration



### Terminal Connections

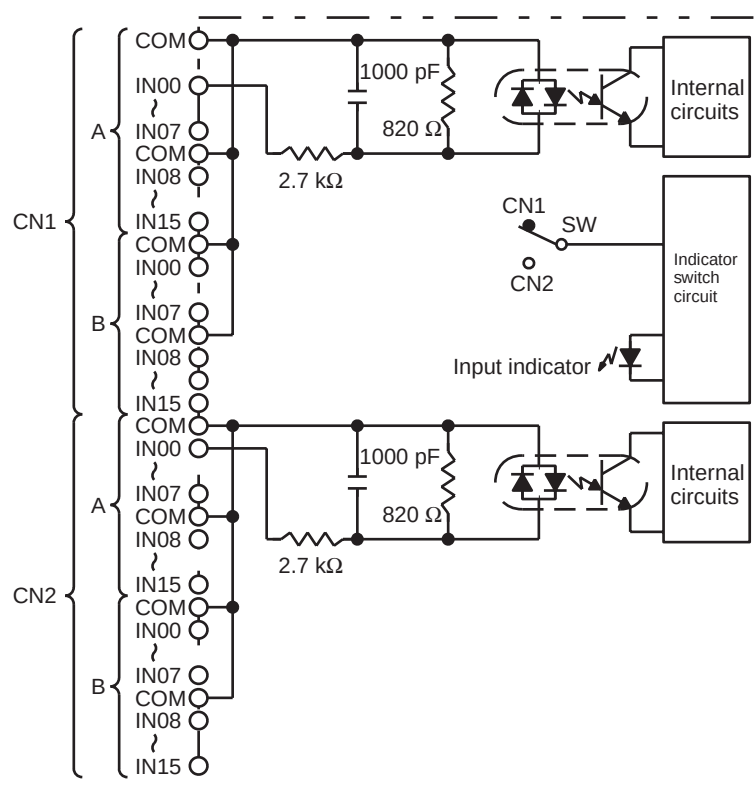


- Note**
1. The polarity of the input power supply can be either positive or negative. The polarity of all commons, however, must be the same.
  2. COM terminals must all be wired even though they are connected internally.

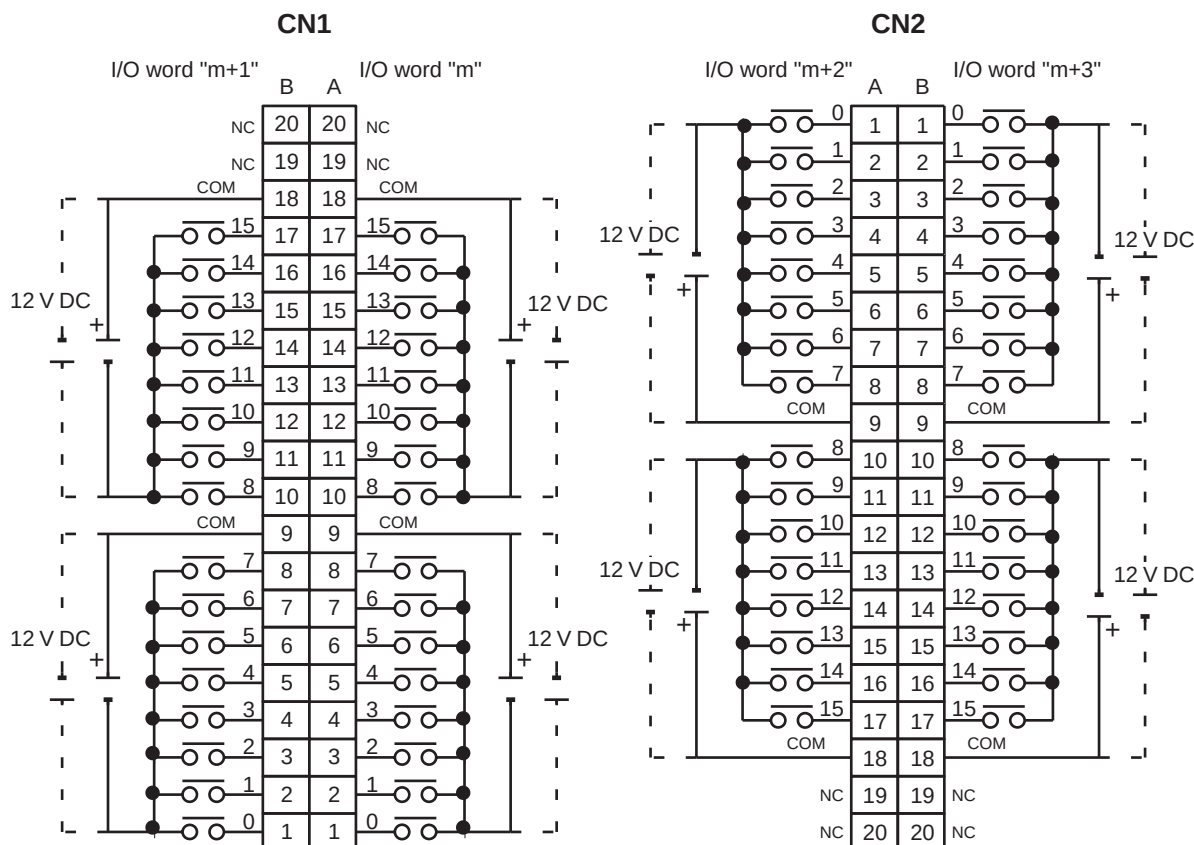


**C200H-ID111 DC Input Unit (64 Points)**

|                              |                             |
|------------------------------|-----------------------------|
| Rated Input Voltage          | 12 V DC                     |
| Operating Input Voltage      | 10.2 to 13.2 V DC           |
| Input Impedance              | 2.7 k $\Omega$              |
| Input Current                | 4.1 mA typical (at 12 V DC) |
| ON Voltage                   | 8.0 V DC min.               |
| OFF Voltage                  | 3.0 V DC max.               |
| ON Response Time             | 1.0 ms max.                 |
| OFF Response Time            | 1.0 ms max.                 |
| No. of Circuits              | 2 (32 points/common)        |
| Internal Current Consumption | 120 mA 5 V DC max.          |
| Weight                       | 250 g max.                  |

**Circuit Configuration**

## Terminal Connections

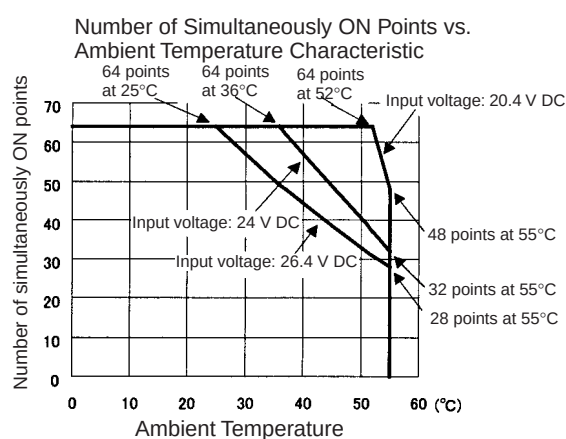
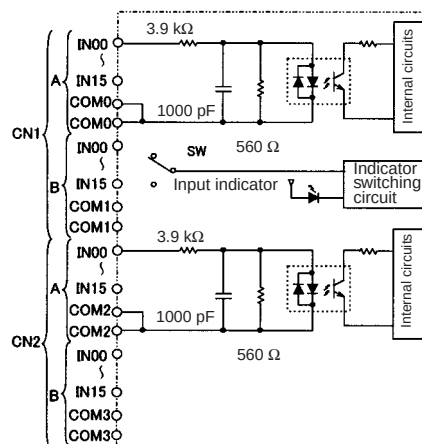


**Note** The power can be supplied in either polarity, but the same polarity must be used for all COM terminals in each connector. Connect power supply wiring to every COM terminal, even though the COM terminals in each connector are connected internally.

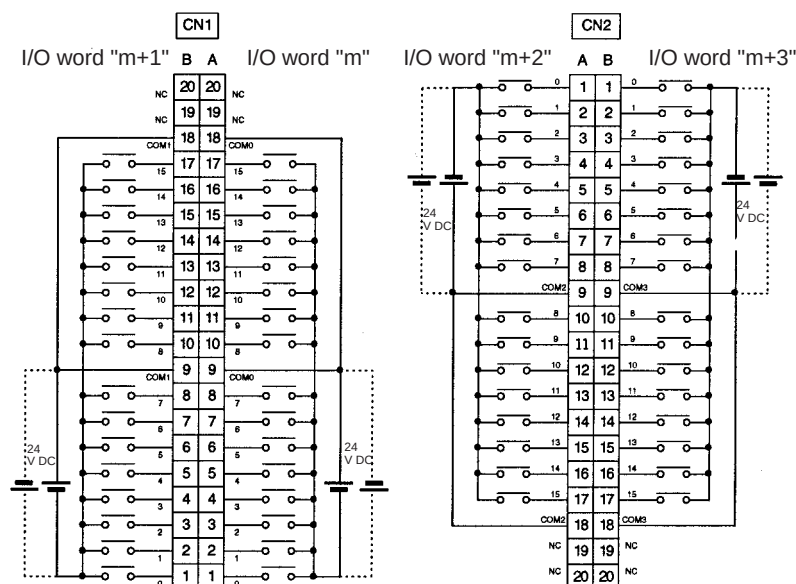
## CS1W-ID261 DC Input Unit (64 Points)

|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 24 V DC                                                                                                       |
| Operating Input Voltage            | 20.4 to 26.4 V DC                                                                                             |
| Input Impedance                    | 3.9 kΩ                                                                                                        |
| Input Current                      | 6 mA typical (at 24 V DC)                                                                                     |
| ON Voltage/ON Current              | 15.4 V DC min./3 mA min.                                                                                      |
| OFF Voltage/OFF Current            | 5 V DC max./1 mA max.                                                                                         |
| ON Response Time                   | 8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.)                                                |
| OFF Response Time                  | 8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.)                                                |
| No. of Circuits                    | 64 (16 points/common, 4 circuits)                                                                             |
| Number of Simultaneously ON Points | 50% (8 points/common) (at 24 V DC) (Refer to the following illustrations.)                                    |
| Insulation Resistance              | 20 MΩ between external terminals and the GR terminal (100 V DC)                                               |
| Dielectric Strength                | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption       | 150 mA max.                                                                                                   |
| Weight                             | 260 g max.                                                                                                    |
| Accessories                        | Two connectors for external wiring (soldered)                                                                 |

## Circuit Configuration



## Terminal Connections



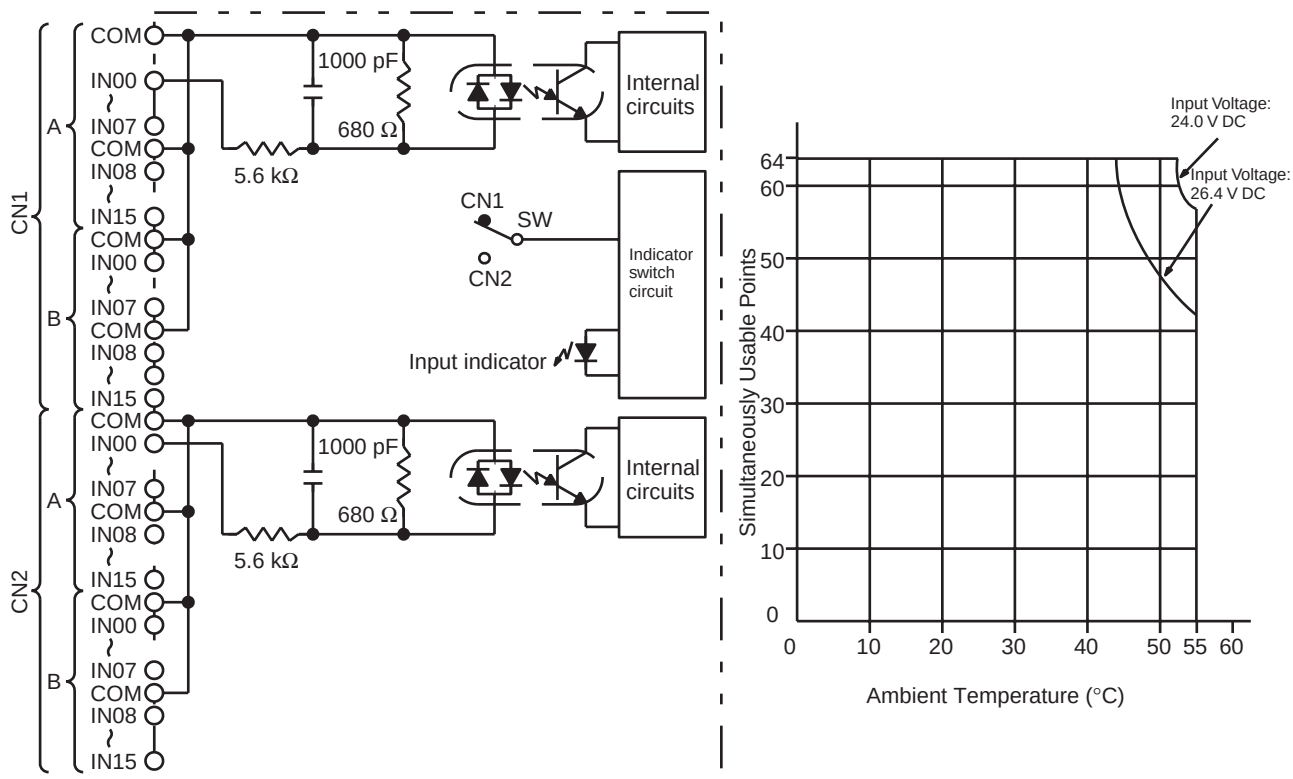
- The input power polarity can be connected in either direction provided that the same polarity be set for rows A and B.
- COM0, COM1, COM2, and COM3 have two pins each. Although they are internally connected, wire all points completely.

**Note** The ON response time will be 20  $\mu$ s maximum and OFF response time will be 300  $\mu$ s maximum even if the response times are set to 0 ms due to internal element delays.

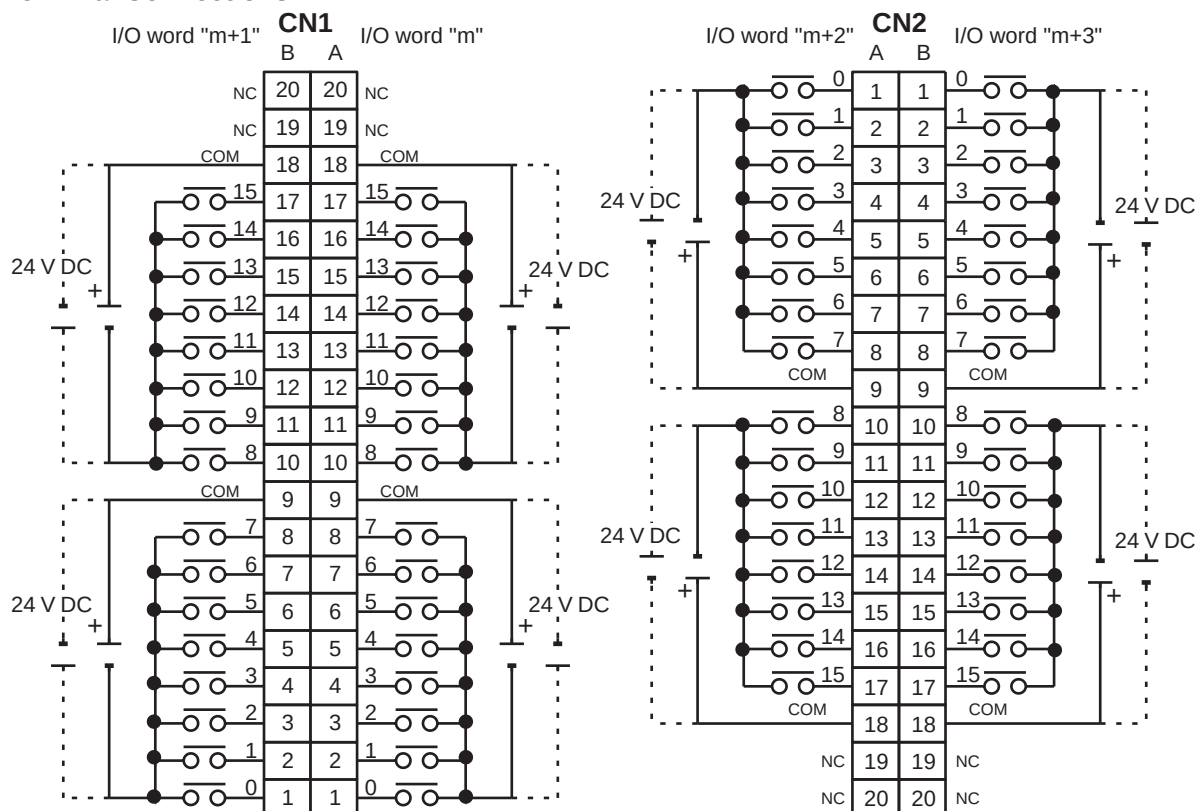
### C200H-ID217 DC Input Unit (64 Points)

|                              |                                                                                                                              |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage          | 24 V DC                                                                                                                      |
| Operating Input Voltage      | 20.4 to 26.4 V DC                                                                                                            |
| Input Impedance              | 5.6 k $\Omega$                                                                                                               |
| Input Current                | 4.1 mA typical (at 24 V DC)                                                                                                  |
| ON Voltage                   | 14.4 V DC min.                                                                                                               |
| OFF Voltage                  | 5.0 V DC max.                                                                                                                |
| ON Response Time             | 1.0 ms max.                                                                                                                  |
| OFF Response Time            | 1.0 ms max.                                                                                                                  |
| No. of Circuits              | 2 (32 points/common)<br>All 64 points cannot be turned ON simultaneously at high temperatures. Refer to the following graph. |
| Internal Current Consumption | 120 mA 5 V DC max.                                                                                                           |
| Weight                       | 250 g max.                                                                                                                   |

#### Circuit Configuration and Simultaneously Usable Points



## Terminal Connections

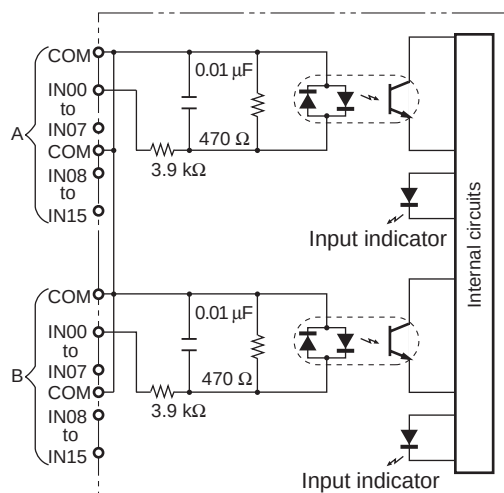


- Note**
1. I/O word "m" is determined by the I/O number setting.
  2. The power can be supplied in either polarity, but the same polarity must be used for all COM terminals in each connector. Connect power supply wiring to every COM terminal, even though the COM terminals in each connector are connected internally.

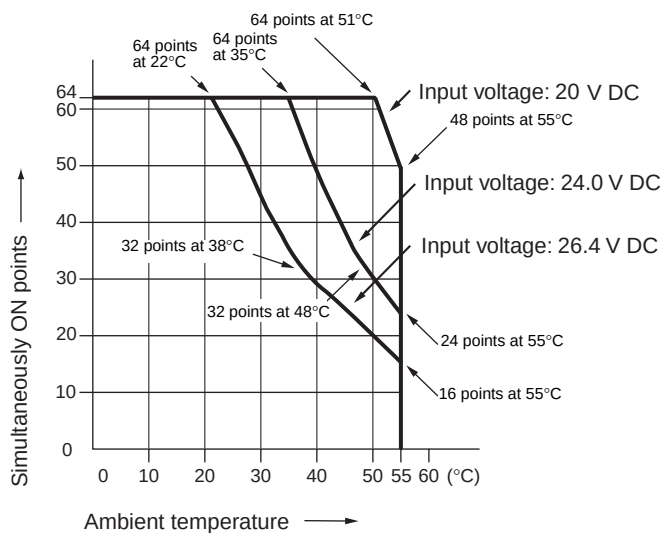
## C200H-ID219 DC Input Unit (64 Points)

|                              |                                                                                                                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage          | 24 V DC                                                                                                                                                                              |
| Operating Input Voltage      | 20.4 to 26.4 V DC                                                                                                                                                                    |
| Input Impedance              | 3.9 kΩ                                                                                                                                                                               |
| Input Current                | 6 mA (at 24 V DC)                                                                                                                                                                    |
| ON Voltage/ON Current        | 15.4 V DC min./3.5 mA min.                                                                                                                                                           |
| OFF Voltage/OFF Current      | 5.0 V DC max./1 mA max.                                                                                                                                                              |
| ON Response Time             | 1.0 ms max.                                                                                                                                                                          |
| OFF Response Time            | 1.0 ms max.                                                                                                                                                                          |
| No. of Circuits              | 64 (32 points/common)<br><b>Note</b> The number of points that can be ON simultaneously is limited according to the ambient temperature. Refer to the following diagram for details. |
| Internal Current Consumption | 120 mA 5 V DC max.                                                                                                                                                                   |
| Weight                       | 250 g max.                                                                                                                                                                           |

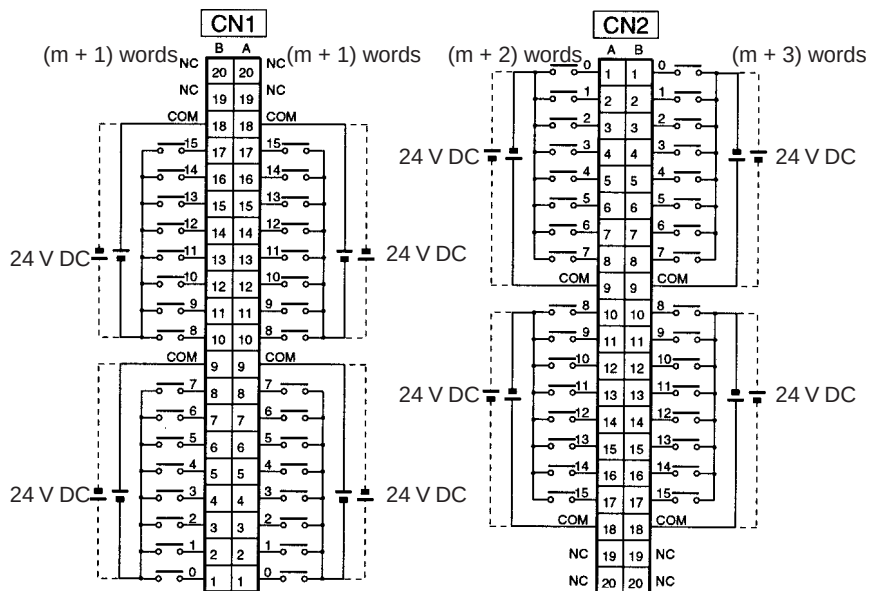
## Circuit Configuration



Ambient Temperature for Simultaneously ON Points



## Terminal Connections



- Note**
1. The polarity of the input power supply can be either positive or negative. The polarity of all commons for CN1 and CN2, however, must be the same.
  2. COM terminals for CN1 and CN2 must all be wired even though they are connected internally.

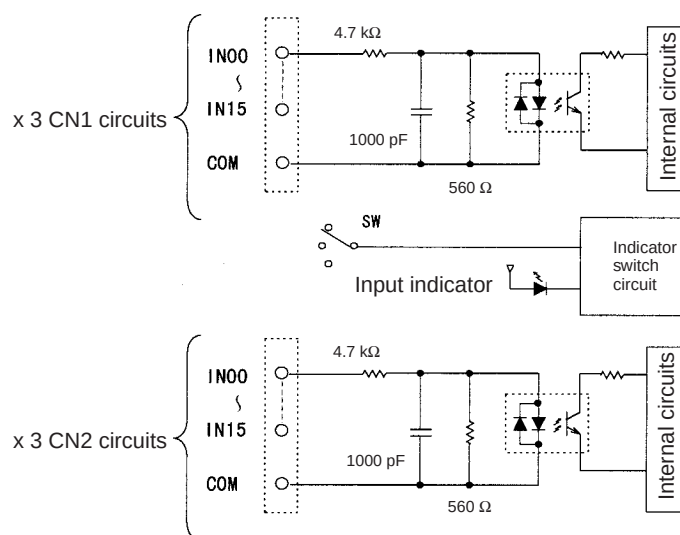
## CS-series High-density I/O Units

## CS1W-ID291 DC Input Unit (96 Points)

|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 24 V DC                                                                                                       |
| Operating Input Voltage            | 20.4 to 26.4 V DC                                                                                             |
| Input Impedance                    | 4.7 k $\Omega$                                                                                                |
| Input Current                      | Approx. 5 mA (at 24 V DC)                                                                                     |
| ON Voltage/ON Current              | 17 V DC min./3 mA min.                                                                                        |
| OFF Voltage/OFF Current            | 5 V DC max./1 mA max.                                                                                         |
| ON Response Time                   | 8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note.)         |
| OFF Response Time                  | 8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note.)         |
| No. of Circuits                    | 6 (16 points/common)                                                                                          |
| Number of Inputs ON Simultaneously | 50% (8 points/common) (at 24 V DC) (Depends on ambient temperature)                                           |
| Insulation Resistance              | 20 M $\Omega$ between the external terminals and the GR terminal (100 V DC)                                   |
| Dielectric Strength                | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption       | 200 mA max.                                                                                                   |
| Weight                             | 320 g max.                                                                                                    |
| Accessories                        | Two connectors for external wiring (soldered)                                                                 |

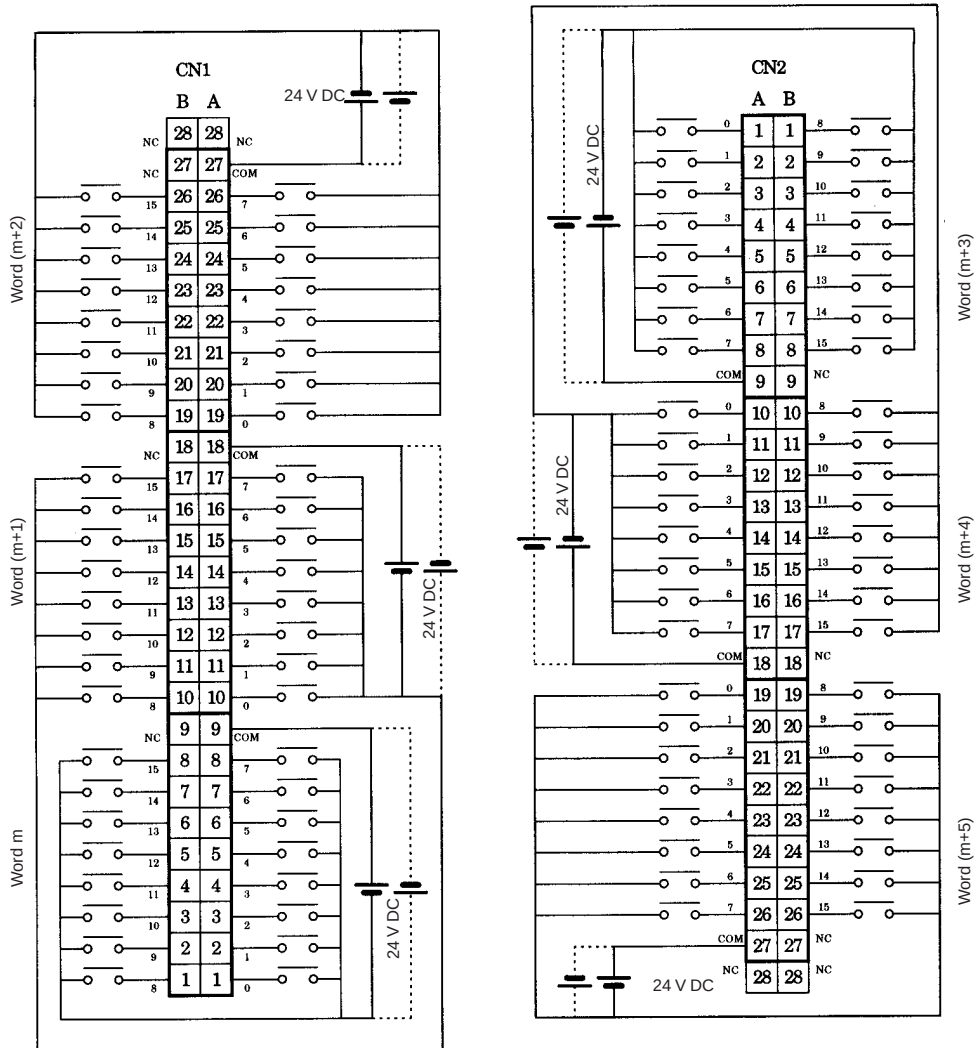
## Circuit Configuration

The ON response time will be 20  $\mu$ s maximum and OFF response time will be 300  $\mu$ s maximum even if the response times are set to 0 ms due to internal element delays (See note below.)



**Note** The Input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup.

Terminal Connections: CS1W-ID291 24-V DC 96-point Input Unit

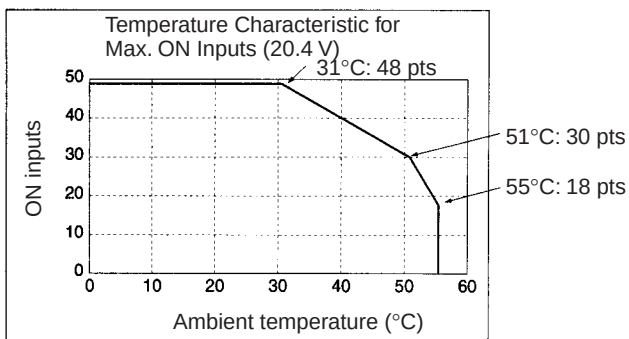
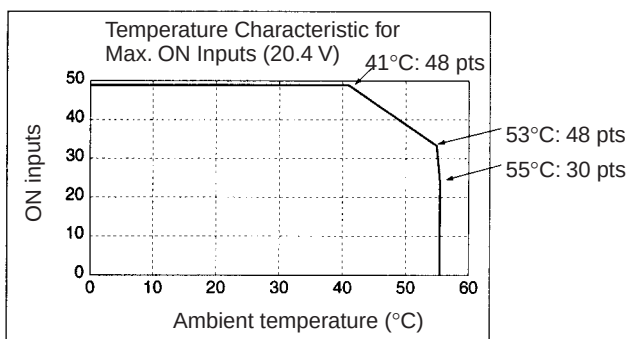
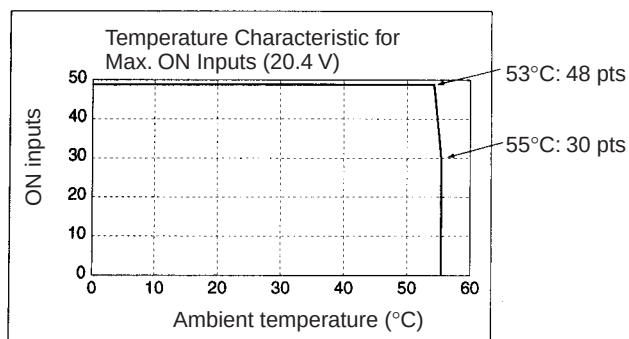
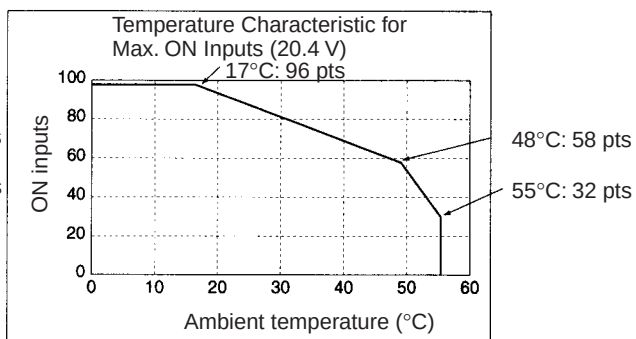
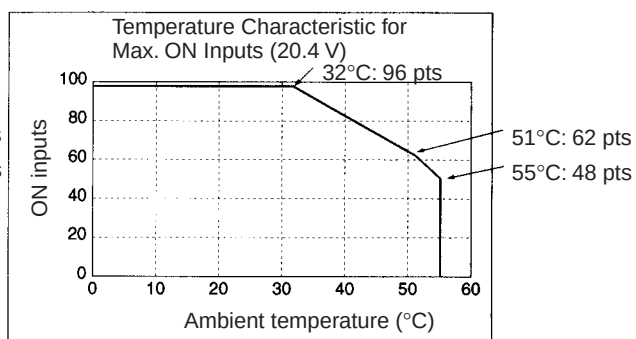
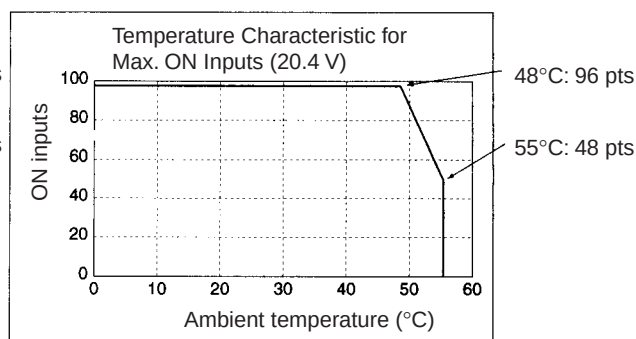


- The polarity of the input power supply can be in either direction, as indicated by the dotted lines.



**Maximum Number of ON Inputs**

The maximum number of 24-V DC inputs that can be ON simultaneously for the CS1W-ID291/MD291/MD292 depends on the ambient temperature, as shown in the following diagrams.

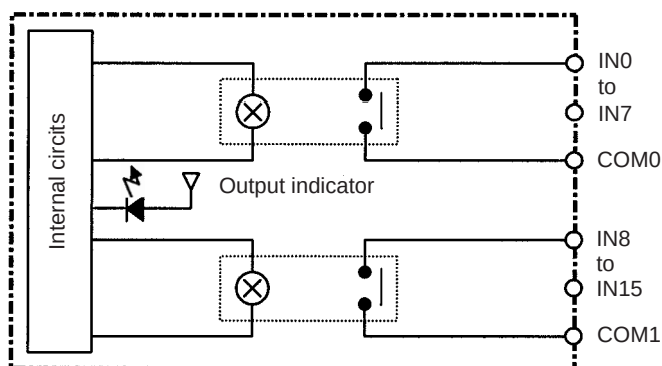
**CS1W-MD291/MD292 Inputs****CS1W-ID291 Inputs**

If the maximum number of ON points is exceeded for the CS1W-ID291/MD291/MD292, heat generated by electronic elements will increase the temperature of the electronic elements and the interior of the Unit. This will reduce the reliability and life of the electronic elements and cause Unit malfunctions. There will be a delay in the temperature increase, however, and there will be no problems if all inputs are ON for 10 minutes or less at the start of operations or any other time that all inputs have been off for at least 2 hours.

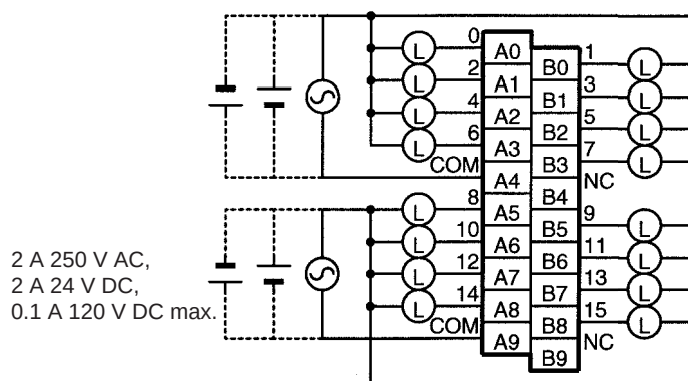
## CS1W-OC211 Contact Output Unit (16 points)

|                                    |                                                                                                                                                                                                                                                                  |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity            | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 24 V DC (8 A/common, 16 A/Unit), 0.1 A 120 V DC                                                                                                                                                                             |
| Min. Switching Capacity            | 1 mA 5 V DC                                                                                                                                                                                                                                                      |
| Service Life of Relay              | Electrical: 150,000 operations (resistive load)/<br>100,000 operations (inductive load)<br>Mechanical: 20,000,000 operations<br>Service life will vary depending on the connected load. Refer to page 513 for information on service life according to the load. |
| Relay replacement                  | NY-24W-K-IE (Fujitsu Takamizawa Component Ltd.)<br>Relays cannot be replaced by users.                                                                                                                                                                           |
| ON Response Time                   | 15 ms max.                                                                                                                                                                                                                                                       |
| OFF Response Time                  | 15 ms max.                                                                                                                                                                                                                                                       |
| No. of Circuits                    | 2 (each 8 points/common)                                                                                                                                                                                                                                         |
| Number of Inputs ON Simultaneously | 16                                                                                                                                                                                                                                                               |
| Surge Protector                    | None                                                                                                                                                                                                                                                             |
| Fuses                              | None                                                                                                                                                                                                                                                             |
| Insulation Resistance              | 20 M $\Omega$ between external terminals and the GR terminal (100 V DC)                                                                                                                                                                                          |
| Dielectric Strength                | 2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.                                                                                                                                                    |
| Internal Current Consumption       | 130 mA 5 V DC max. 96 mA 26 V DC (6 mA $\times$ No. points ON)                                                                                                                                                                                                   |
| Weight                             | 290 g max.                                                                                                                                                                                                                                                       |

## Circuit Configuration



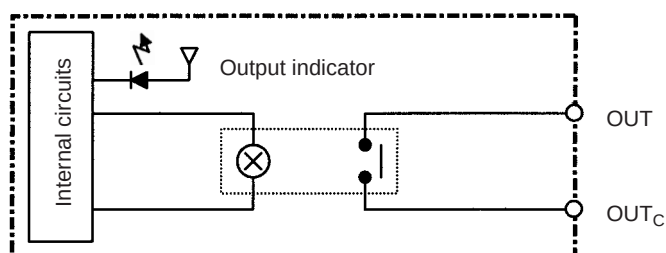
## Terminal Connections



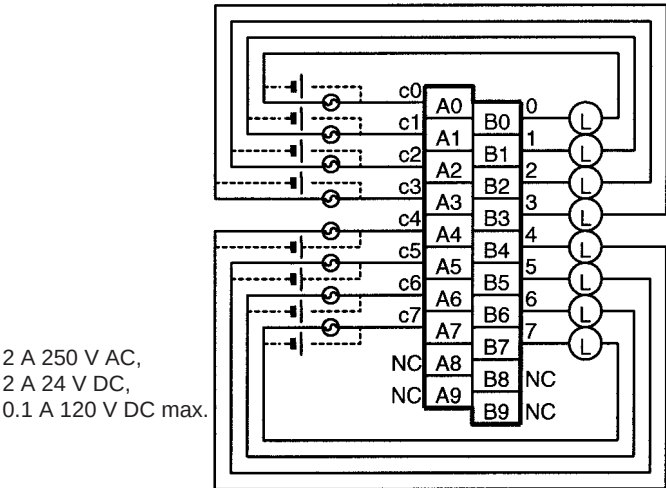
## CS1W-OC201 Contact Output Unit (8 points)

|                                    |                                                                                                                                                                                                                                                                      |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity            | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 24 V DC (16 A/Unit),<br>0.1 A 120 V DC                                                                                                                                                                                          |
| Min. Switching Capacity            | 1 mA 5 V DC                                                                                                                                                                                                                                                          |
| Service Life of Relay              | Electrical: 150,000 operations (resistive load)/<br>100,000 operations (inductive load)<br>Mechanical: 20,000,000 operations<br><br>Service life will vary depending on the connected load. Refer to page 513 for information on service life according to the load. |
| Relay replacement                  | NY-24W-K-IE (Fujitsu Takamizawa Component Ltd.)<br>Relays cannot be replaced by users.                                                                                                                                                                               |
| ON Response Time                   | 15 ms max.                                                                                                                                                                                                                                                           |
| OFF Response Time                  | 15 ms max.                                                                                                                                                                                                                                                           |
| No. of Circuits                    | 8 independent contacts                                                                                                                                                                                                                                               |
| Number of Inputs ON Simultaneously | 8                                                                                                                                                                                                                                                                    |
| Surge Protector                    | None                                                                                                                                                                                                                                                                 |
| Fuses                              | None                                                                                                                                                                                                                                                                 |
| Insulation Resistance              | 20 M $\Omega$ between external terminals and the GR terminal (100 V DC)                                                                                                                                                                                              |
| Dielectric Strength                | 2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.                                                                                                                                                        |
| Internal Current Consumption       | 100 mA 5 V DC max. 48 mA 26 V DC (6 mA $\times$ No. points ON)                                                                                                                                                                                                       |
| Weight                             | 270 g max.                                                                                                                                                                                                                                                           |

## Circuit Configuration



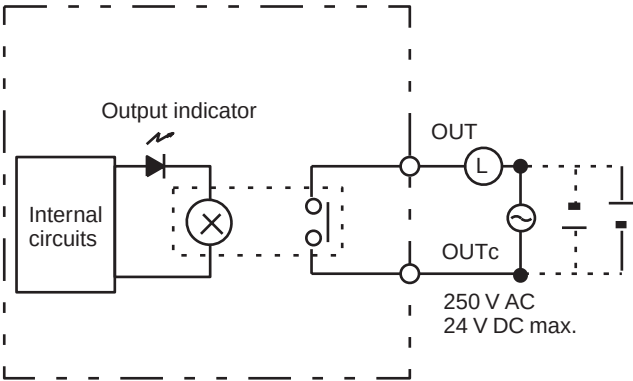
Terminal Connections



C200H-OC223 Contact Output Unit (5 Points)

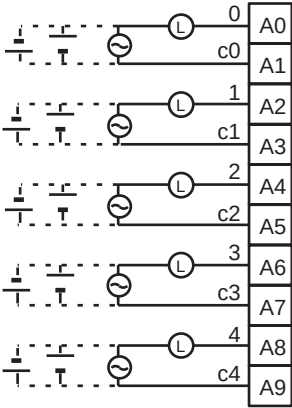
|                              |                                                                                                                                                                                                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity      | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 250 V AC ( $\cos\phi = 0.4$ ),<br>2 A 24 V DC (10 A/Unit)                                                                                                              |
| Min. Switching Capacity      | 10 mA 5 V DC                                                                                                                                                                                                |
| Relay                        | G6B-1174-P-FD-US (24 V DC) with socket                                                                                                                                                                      |
| Service Life of Relay        | Electrical: 500,000 operations (resistive load)/<br>100,000 operations (inductive load)<br>Mechanical: 50,000,000 operations<br>Service life will vary depending on the current and<br>ambient temperature. |
| ON Response Time             | 10 ms max.                                                                                                                                                                                                  |
| OFF Response Time            | 10 ms max.                                                                                                                                                                                                  |
| No. of Circuits              | 5 independent contacts                                                                                                                                                                                      |
| Internal Current Consumption | 10 mA 5 V DC max. 75 mA 26 V DC (8 points ON<br>simultaneously.)                                                                                                                                            |
| Weight                       | 250 g max.                                                                                                                                                                                                  |

Circuit Configuration



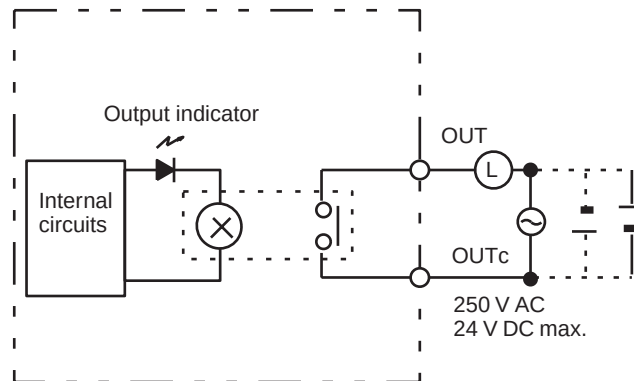
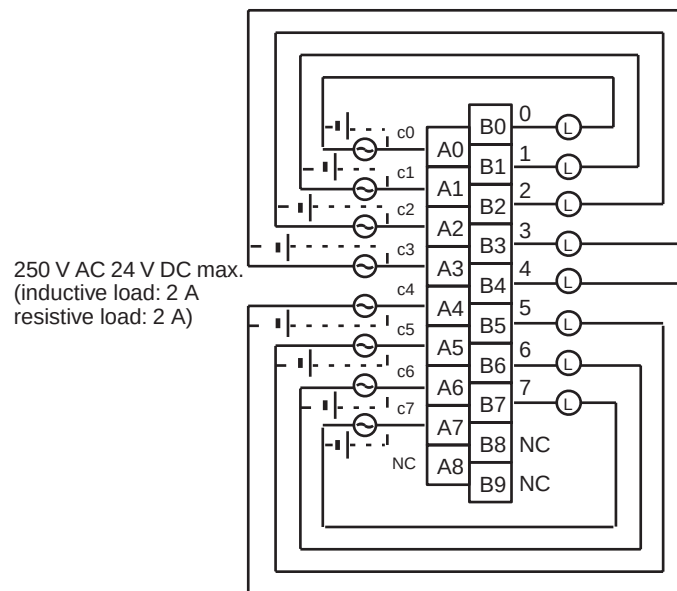
Terminal Connections

250 V AC 24 V DC max.  
(inductive load: 2 A  
resistive load: 2 A)  
(10 A/Unit)



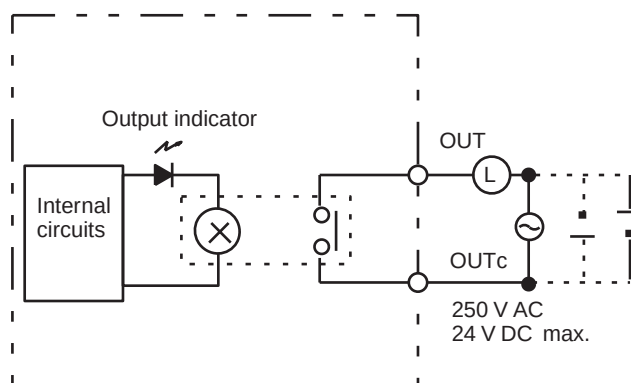
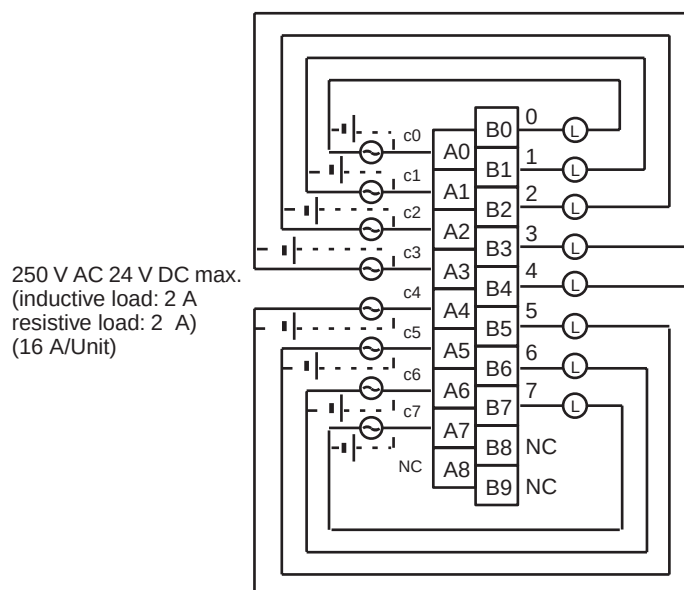
**C200H-OC224 Contact Output Unit (8 Points)**

|                              |                                                                                                                                                                                                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity      | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 250 V AC ( $\cos\phi = 0.4$ ),<br>2 A 24 V DC (16 A/Unit)                                                                                                              |
| Min. Switching Capacity      | 10 mA 5 V DC                                                                                                                                                                                                |
| Relay                        | G6B-1174-P-FD-US (24 V DC) with socket                                                                                                                                                                      |
| Service Life of Relay        | Electrical: 500,000 operations (resistive load)/<br>100,000 operations (inductive load)<br>Mechanical: 50,000,000 operations<br>Service life will vary depending on the current and<br>ambient temperature. |
| ON Response Time             | 10 ms max.                                                                                                                                                                                                  |
| OFF Response Time            | 10 ms max.                                                                                                                                                                                                  |
| No. of Circuits              | 8 independent contacts                                                                                                                                                                                      |
| Internal Current Consumption | 10 mA 5 V DC max. 75 mA 26 V DC (8 points ON<br>simultaneously.)                                                                                                                                            |
| Weight                       | 300 g max.                                                                                                                                                                                                  |

**Circuit Configuration****Terminal Connections**

**C200H-OC224V/OC224N Contact Output Unit (8 Points)**

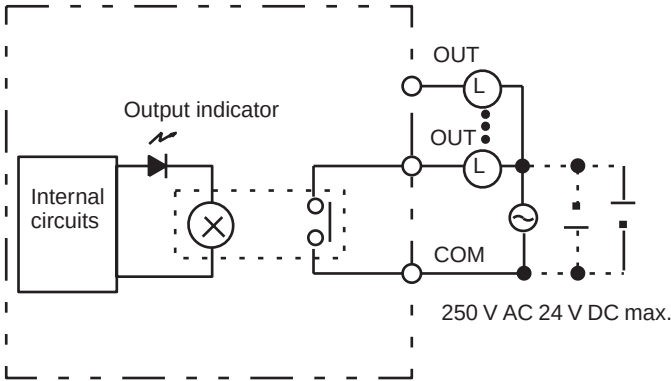
| Item                         | OC224V                                                                                                                                          | OC224N                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Max. Switching Capacity      | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 250 V AC ( $\cos\phi = 0.4$ ), 2 A 24 V DC (16 A/Unit)                                                     |                                    |
| Min. Switching Capacity      | 10 mA 5 V DC                                                                                                                                    |                                    |
| Relay                        | G6R-1 (24 V DC) with socket                                                                                                                     | G6RN-1-ACD (24 V DC) PCB soldering |
| Service Life of Relay        | Electrical: 300,000 operations<br>Mechanical: 10,000,000 operations<br>Service life will vary depending on the current and ambient temperature. |                                    |
| ON Response Time             | 15 ms max.                                                                                                                                      |                                    |
| OFF Response Time            | 15 ms max.                                                                                                                                      |                                    |
| No. of Circuits              | 8 independent contacts                                                                                                                          |                                    |
| Internal Current Consumption | 10 mA 5 V DC max. 90 mA 26 V DC (8 points ON simultaneously.)                                                                                   |                                    |
| Weight                       | 350 g max.                                                                                                                                      |                                    |

**Circuit Configuration****Terminal Connections**

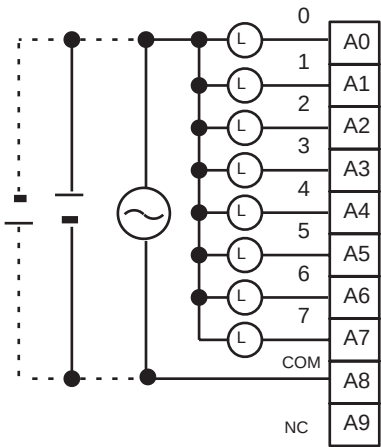
C200H-OC221 Contact Output Unit (8 Points)

|                              |                                                                                                                                                                                                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity      | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 250 V AC ( $\cos\phi = 0.4$ ),<br>2 A 24 V DC (8 A/Unit)                                                                                                               |
| Min. Switching Capacity      | 10 mA 5 V DC                                                                                                                                                                                                |
| Relay                        | G6B-1174P-FD-US (24 V DC) with socket                                                                                                                                                                       |
| Service Life of Relay        | Electrical: 500,000 operations (resistive load)/<br>100,000 operations (inductive load)<br>Mechanical: 50,000,000 operations<br>Service life will vary depending on the current and<br>ambient temperature. |
| ON Response Time             | 10 ms max.                                                                                                                                                                                                  |
| OFF Response Time            | 10 ms max.                                                                                                                                                                                                  |
| No. of Circuits              | 1 (8 points/common)                                                                                                                                                                                         |
| Internal Current Consumption | 10 mA 5 V DC max. 75 mA 26 V DC (8 points ON<br>simultaneously.)                                                                                                                                            |
| Weight                       | 250 g max.                                                                                                                                                                                                  |

Circuit Configuration



Terminal Connections

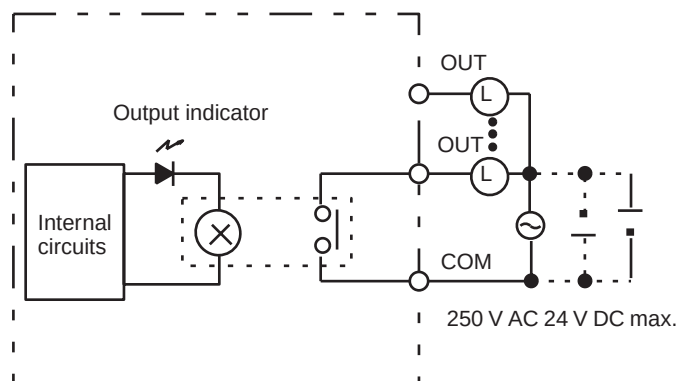
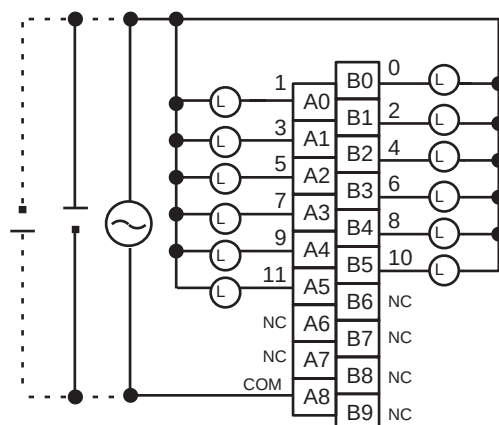


250 V AC 24 V DC max.  
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)



**C200H-OC222 Contact Output Unit (12 Points)**

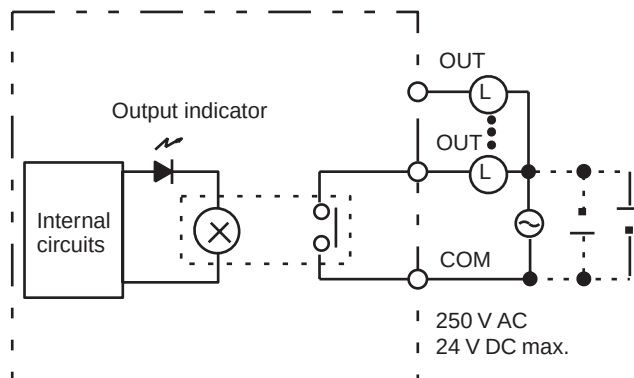
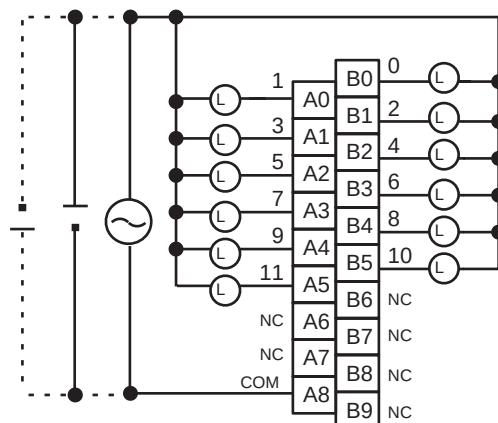
|                              |                                                                                                                                                                                                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity      | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 250 V AC ( $\cos\phi = 0.4$ ),<br>2 A 24 V DC (8 A/Unit)                                                                                                               |
| Min. Switching Capacity      | 10 mA 5 V DC                                                                                                                                                                                                |
| Relay                        | G6B-1174P-FD-US (24 V DC) with socket                                                                                                                                                                       |
| Service Life of Relay        | Electrical: 500,000 operations (resistive load)/<br>100,000 operations (inductive load)<br>Mechanical: 50,000,000 operations<br>Service life will vary depending on the current and<br>ambient temperature. |
| ON Response Time             | 10 ms max.                                                                                                                                                                                                  |
| OFF Response Time            | 10 ms max.                                                                                                                                                                                                  |
| No. of Circuits              | 1 (12 points/common) 8 points max. can be ON<br>simultaneously.                                                                                                                                             |
| Internal Current Consumption | 10 mA 5 V DC max. 75 mA 26 V DC (8 points ON<br>simultaneously.)                                                                                                                                            |
| Weight                       | 300 g max.                                                                                                                                                                                                  |

**Circuit Configuration****Terminal Connections**

250 V AC 24 V DC max.  
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)

**C200H-OC222V/OC222N Contact Output Unit (12 Points)**

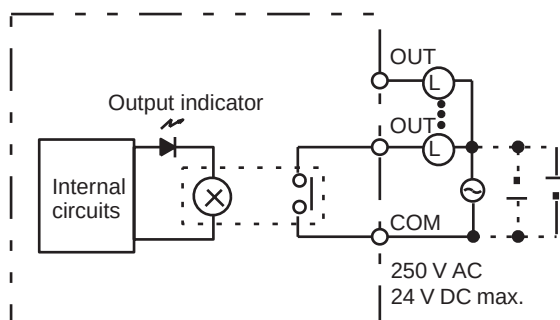
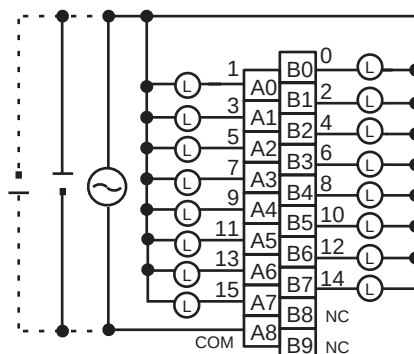
| Item                         | OC222V                                                                                                                                          | OC222N                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Max. Switching Capacity      | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 250 V AC ( $\cos\phi = 0.4$ ), 2 A 24 V DC (8 A/Unit)                                                      |                                    |
| Min. Switching Capacity      | 10 mA 5 V DC                                                                                                                                    |                                    |
| Relay                        | G6R-1 (24 V DC) with socket                                                                                                                     | G6RN-1-ACD (24 V DC) PCB soldering |
| Service Life of Relay        | Electrical: 300,000 operations<br>Mechanical: 10,000,000 operations<br>Service life will vary depending on the current and ambient temperature. |                                    |
| ON Response Time             | 15 ms max.                                                                                                                                      |                                    |
| OFF Response Time            | 15 ms max.                                                                                                                                      |                                    |
| No. of Circuits              | 1 (12 points/common) 8 points max. can be ON simultaneously.                                                                                    |                                    |
| Internal Current Consumption | 8 mA 5 V DC max. 90 mA 26 V DC (8 points ON simultaneously.)                                                                                    |                                    |
| Weight                       | 400 g max.                                                                                                                                      |                                    |

**Circuit Configuration****Terminal Connections**

250 V AC 24 V DC max.  
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)

**C200H-OC225 Contact Output Unit (16 Points)**

|                              |                                                                                                                                                                                                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity      | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 250 V AC ( $\cos\phi = 0.4$ ),<br>2 A 24 V DC (8 A/Unit)                                                                                                               |
| Min. Switching Capacity      | 10 mA 5 V DC                                                                                                                                                                                                |
| Relay                        | G6B-1174P-FD-US (24 V DC) with socket                                                                                                                                                                       |
| Service Life of Relay        | Electrical: 500,000 operations (resistive load)/<br>100,000 operations (inductive load)<br>Mechanical: 50,000,000 operations<br>Service life will vary depending on the current and<br>ambient temperature. |
| ON Response Time             | 10 ms max.                                                                                                                                                                                                  |
| OFF Response Time            | 10 ms max.                                                                                                                                                                                                  |
| No. of Circuits              | 1 (16 points/common) 8 points max. can be ON<br>simultaneously.                                                                                                                                             |
| Internal Current Consumption | 50 mA 5 V DC max. 75 mA 26 V DC (8 points ON<br>simultaneously.)                                                                                                                                            |
| Weight                       | 400 g max.                                                                                                                                                                                                  |

**Circuit Configuration****Terminal Connections**

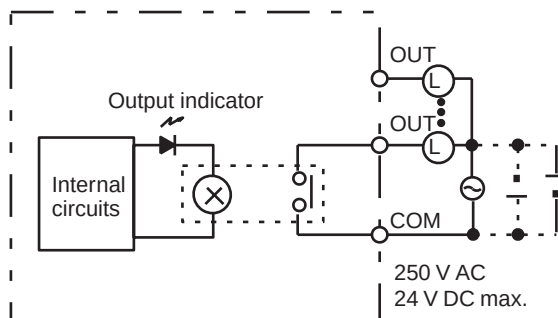
250 V AC 24 V DC max.  
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)

**Note** This Unit can overheat if more than 8 output points are turned ON simultaneously.

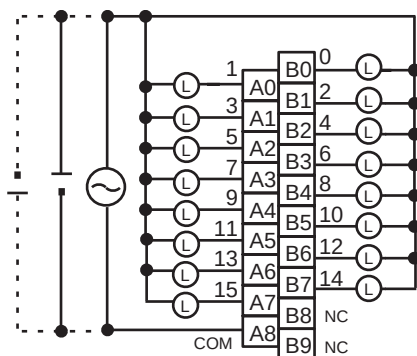
## C200H-OC226/OC226N Contact Output Unit (16 Points)

| Item                         | OC226                                                                                                                                           | OC226N                             |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Max. Switching Capacity      | 2 A 250 V AC ( $\cos\phi = 1$ ), 2 A 250 V AC ( $\cos\phi = 0.4$ ), 2 A 24 V DC (8 A/Unit)                                                      |                                    |
| Min. Switching Capacity      | 10 mA 5 V DC                                                                                                                                    |                                    |
| Relay                        | G6R-1 (24 V DC) with socket                                                                                                                     | G6RN-1-ACD (24 V DC) PCB soldering |
| Service Life of Relay        | Electrical: 300,000 operations<br>Mechanical: 10,000,000 operations<br>Service life will vary depending on the current and ambient temperature. |                                    |
| ON Response Time             | 15 ms max.                                                                                                                                      |                                    |
| OFF Response Time            | 15 ms max.                                                                                                                                      |                                    |
| No. of Circuits              | 1 (16 points/common) 8 points max. can be ON simultaneously.                                                                                    |                                    |
| Internal Current Consumption | 30 mA 5 V DC max. 90 mA 26 V DC (8 points ON simultaneously.)                                                                                   |                                    |
| Weight                       | 500 g max.                                                                                                                                      |                                    |

## Circuit Configuration



## Terminal Connections



250 V AC 24 V DC max.  
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)

- Note**
1. Mount to the C200H-BC□□1-V1/V2 Backplane.
  2. The number of simultaneously ON contact points must be eight or less to ensure proper heat resistance.

## About Contact Output Units

There are some differences in the relays used by the C200H and CS-series Contact Output Units. For this reason, when used in the ways shown below, there may be differences in the respective life expectancies of the relays.

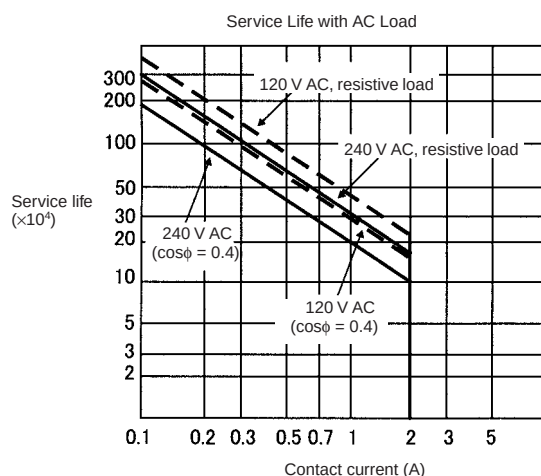
- When using in excess of rated values
- When appropriate surge countermeasures are not taken
- When connected to a load (e.g., relay, solenoid, or motor) that generates a high counterelectromotive force when power is interrupted
- When connected to a load (e.g., capacitor or lamp) that generates a high inrush current when power is turned ON

In the above cases, ensure the rated life expectancies of the relays by, for example, taking the appropriate surge countermeasures as explained in the manual, or using a switching device (as a relay) with ratings appropriate for the load.

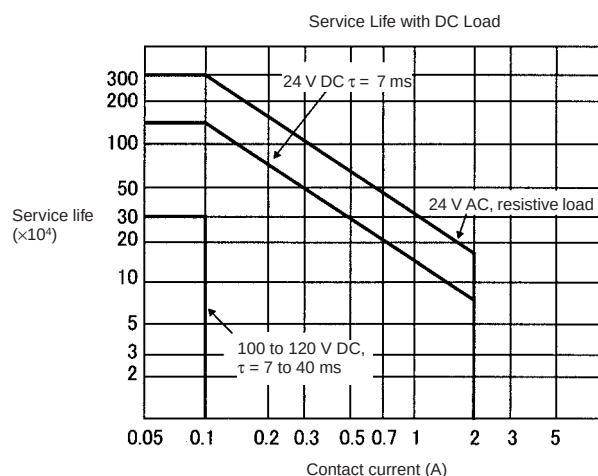
### Life Expectancy of CS1W-OC201/211 Relays

The life expectancy of the CS1W-OC201/211 Contact Output Unit is shown in the following diagrams. Use the diagrams to calculate the relay service life based on the operating conditions, and replace the relay before the end of its service life.

**Note** The diagrams show the life expectancy of the relay itself. Do not use a contact current, therefore, that exceeds the maximum switching capacity specified in the specifications for each Contact Output Unit. If a switching capacity exceeding the specifications is used, the reliability and life expectancy of other parts will be reduced and the Unit may malfunction.



Max. switching frequency: 1,800 times/h



## Life Expectancy of C200H-OC221/222/223/224/225 Contact Output Unit

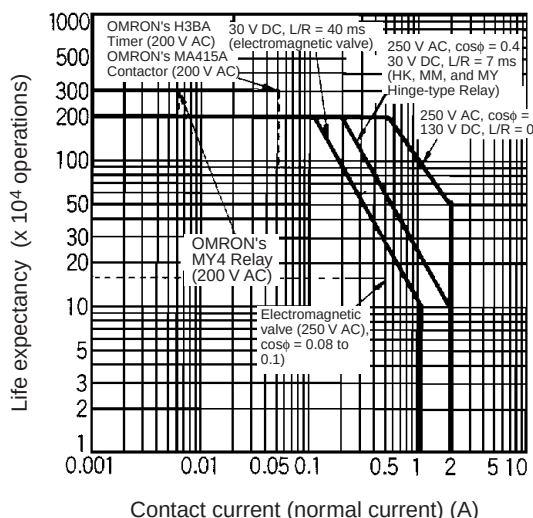
The C200H-OC221/222/223/224/225 Contact Output Unit uses OMRON's G6B-1174P-FD-US Relay. The life of the G6B-1174P-FD-US Relay varies with the contact current and ambient temperature. Refer to the following graphs to calculate this value, and be sure to replace the Relays before their service life expires.

### Contact Current vs. Life Expectancy

Conditions

Switching frequency: 1,800 times/hour max.

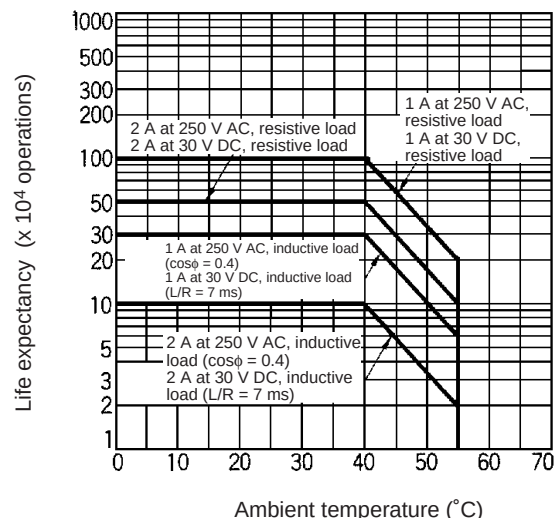
Ambient temperature: 23°C



### Ambient Temperature vs. Life Expectancy

Conditions

Switching frequency: 1,800 times/hour max.



- Note**
1. If the Contact Output Unit is panel-mounted, the temperature inside the panel represents the ambient temperature.
  2. The life of the Relay at an ambient temperature of 55°C is one-fifth the life of the Relay at room temperature (0° to 40°C).

### Inductive Load

The life of the Relay varies with the load inductance. If any inductive load is connected to the Contact Output Unit, use an arc killer with the Contact Output Unit using an inductive load.

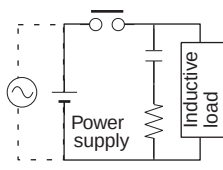
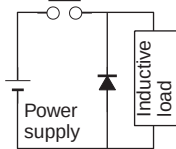
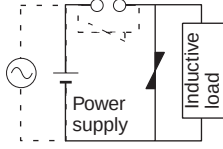
Be sure to connect a diode in parallel with every DC inductive load that is connected to the Contact Output Unit.

### Contact Protection Circuit

Arc killers are used with the Contact Output Unit in order to prolong the life of each Relay mounted to the Contact Output Unit, prevent noise, and reduce the generation of carbide and nitrate deposits. Arc killers can, however, reduce relay life if not used correctly.

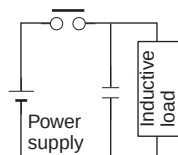
**Note** Arc killers used with the Contact Output Unit can delay the resetting time required by each Relay mounted to the Contact Output Unit.

Arc killer circuit examples are listed in the following table.

| Circuit                                                                                                       | Current |     | Characteristic                                                                                                                                                                                                                                                                                                                                                                                                                 | Required element                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------|---------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                               | AC      | DC  |                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>CR method</b><br>         | Yes     | Yes | <p>If the load is a relay or solenoid, there is a time lag between the moment the circuit is opened and the moment the load is reset.</p> <p>If the supply voltage is 24 or 48 V, insert the arc killer in parallel with the load. If the supply voltage is 100 to 200 V, insert the arc killer between the contacts.</p>                                                                                                      | <p>The capacitance of the capacitor must be 1 to 0.5 <math>\mu\text{F}</math> per contact current of 1 A and resistance of the resistor must be 0.5 to 1 <math>\Omega</math> per contact voltage of 1 V. These values, however, vary with the load and the characteristics of the relay. Decide these values from experiments, and take into consideration that the capacitance suppresses spark discharge when the contacts are separated and the resistance limits the current that flows into the load when the circuit is closed again.</p> <p>The dielectric strength of the capacitor must be 200 to 300 V. If the circuit is an AC circuit, use a capacitor with no polarity.</p> |
| <b>Diode method</b><br>      | No      | Yes | <p>The diode connected in parallel with the load changes energy accumulated by the coil into a current, which then flows into the coil so that the current will be converted into Joule heat by the resistance of the inductive load. This time lag, between the moment the circuit is opened and the moment the load is reset, caused by this method is longer than that caused by the CR method.</p>                         | <p>The reversed dielectric strength value of the diode must be at least 10 times as large as the circuit voltage value. The forward current of the diode must be the same as or larger than the load current.</p> <p>The reversed dielectric strength value of the diode may be two to three times larger than the supply voltage if the arc killer is applied to electronic circuits with low circuit voltages.</p>                                                                                                                                                                                                                                                                     |
| <b>Varistor method</b><br> | Yes     | Yes | <p>The varistor method prevents the imposition of high voltage between the contacts by using the constant voltage characteristic of the varistor. There is time lag between the moment the circuit is opened and the moment the load is reset.</p> <p>If the supply voltage is 24 or 48 V, insert the varistor in parallel with the load. If the supply voltage is 100 to 200 V, insert the varistor between the contacts.</p> | ---                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

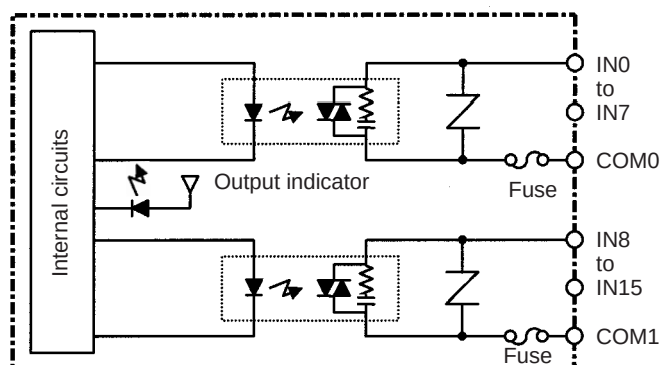
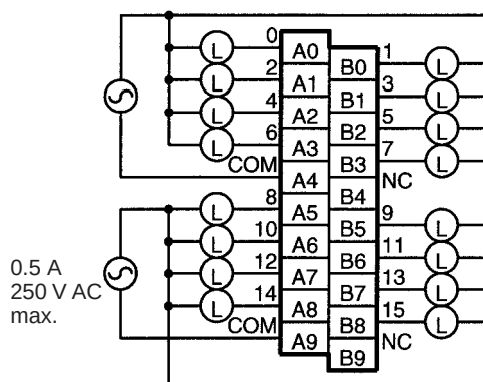
**Note** Do not connect a capacitor as an arc killer in parallel with an inductive load as shown in the following diagram. This arc killer is very effective for preventing spark discharge at the moment when the circuit is opened. However when the contacts are closed, the contacts may be welded due to the current charged in the capacitor.

DC inductive loads can be more difficult to switch than resistive loads. If appropriate arc killers are used, however, DC inductive loads will be as easy to switch as resistive loads.



**CS1W-OA211 Triac Output Unit (16 Points)**

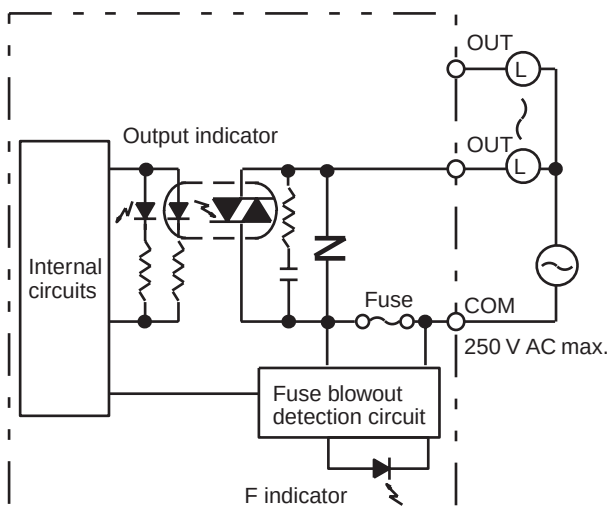
|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity      | 0.5 A 250 V AC, 50/60 Hz (2 A/common, 4 A/Unit)                                                               |
| Max. Inrush Current          | 15 A (pulse width: 10 ms)                                                                                     |
| Min. Switching Capacity      | 50 mA 75 V AC                                                                                                 |
| Leakage Current              | 1.5 mA (200 V AC) max.                                                                                        |
| Residual Voltage             | 1.6 V AC max.                                                                                                 |
| ON Response Time             | 1 ms max.                                                                                                     |
| OFF Response Time            | 1/2 of load frequency+1 ms or less.                                                                           |
| No. of Circuits              | 2 (8 points/common)                                                                                           |
| Surge Protector              | C.R Absorber + Surge Absorber                                                                                 |
| Fuses                        | 2 × 4 A (1 per common)<br>The fuse cannot be replaced by the user.                                            |
| Blown Fuse Detection Circuit | None                                                                                                          |
| Insulation Resistance        | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                           |
| Dielectric Strength          | 2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption | 406 mA 5 V DC max. (70 mA + 21 mA × No. of ON points)                                                         |
| Weight                       | 300 g max.                                                                                                    |

**Circuit Configuration****Terminal Connections**



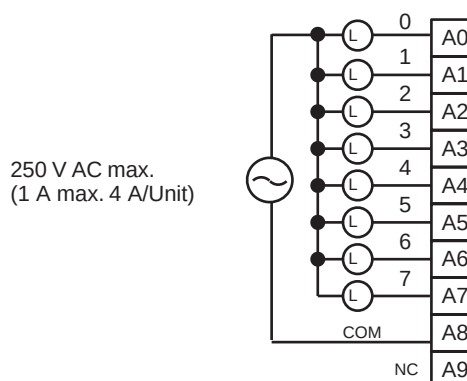
**C200H-OA221 Triac Output Unit (8 Points)**

|                              |                                                       |
|------------------------------|-------------------------------------------------------|
| Max. Switching Capacity      | 1 A 250 V AC, 50/60 Hz (4 A/Unit)                     |
| Min. Switching Capacity      | 10 mA (resistive load)/40 mA (inductive load) 10 V AC |
| Leakage Current              | 3 mA (100 V AC) max./6 mA (200 V AC) max.             |
| Residual Voltage             | 1.2 V max.                                            |
| ON Response Time             | 1 ms max.                                             |
| OFF Response Time            | 1/2 of load frequency or less.                        |
| No. of Circuits              | 1 (8 points/common)                                   |
| Internal Current Consumption | 140 mA 5 V DC max.                                    |
| Fuse Rating                  | 5 A 250 V (5.2-dia. x20)                              |
| Weight                       | 250 g max.                                            |

**Circuit Configuration**

Fuse: 5 A 250 V (5.2-dia. x20) MF51SH (JIS)

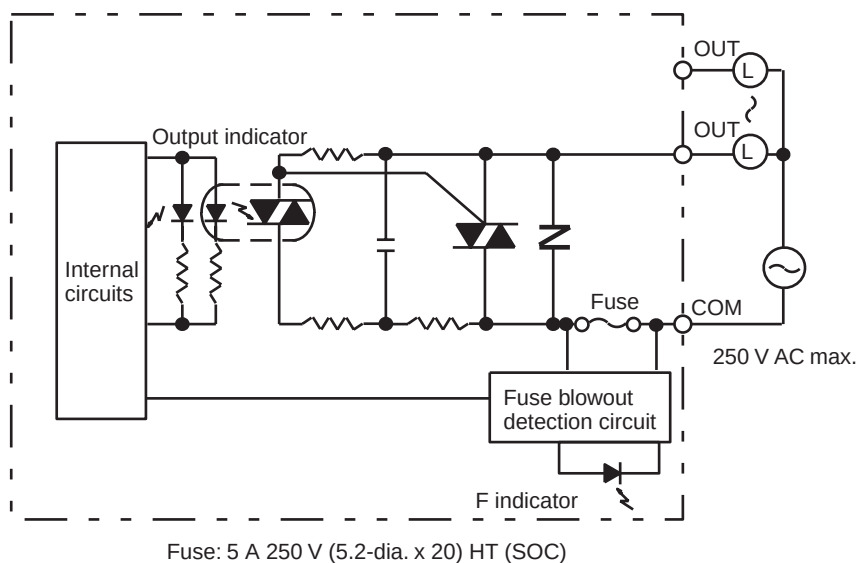
**Note** When the fuse blows, the F indicator lights and bit 08 turns ON. Bits 08 through 15 cannot be used as work bits.

**Terminal Connections**

## C200H-OA223 Triac Output Unit (8 Points)

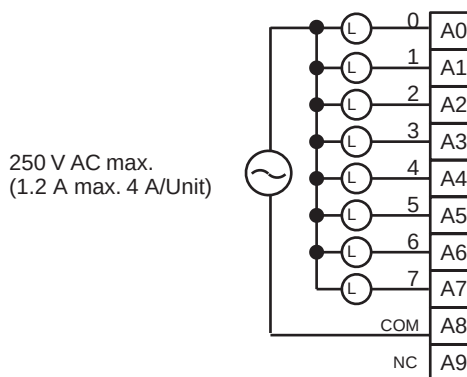
|                              |                                                           |
|------------------------------|-----------------------------------------------------------|
| Max. Switching Capacity      | 1.2 A 250 V AC, 50/60 Hz (4 A/Unit)                       |
| Max. Inrush Current          | 15 A (pulse width: 100 ms)<br>30 A (pulse width: 10 ms)   |
| Min. Switching Capacity      | 100 mA 10 V AC/50 mA 24 V AC/10 mA 100 V AC min.          |
| Leakage Current              | 1.5 mA (120 V AC) max./3 mA (240 V AC) max.               |
| Residual Voltage             | 1.5 V AC max. (50 to 1,200 mA)/ 5 V AC max. (10 to 50 mA) |
| ON Response Time             | 1 ms max.                                                 |
| OFF Response Time            | 1/2 of load frequency+1 ms or less.                       |
| No. of Circuits              | 1 (8 points/common)                                       |
| Internal Current Consumption | 180 mA 5 V DC max.                                        |
| Fuse Rating                  | 5 A 250 V (5.2-dia. x20)                                  |
| Power for External Supply    | N/A                                                       |
| Weight                       | 300 g max.                                                |

## Circuit Configuration



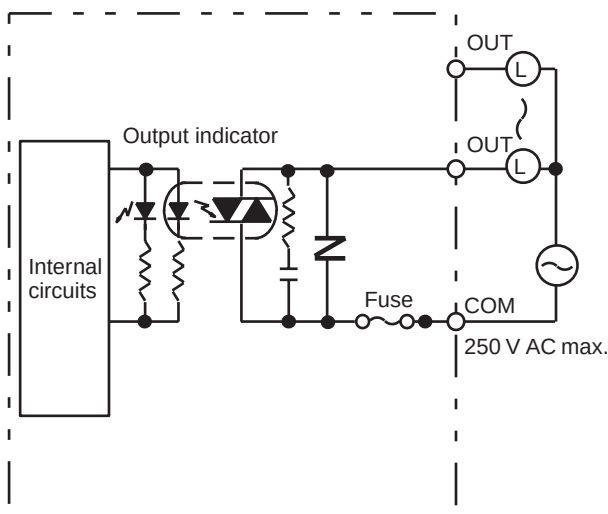
**Note** When the fuse blows, the F indicator lights and bit 08 turns ON. Bits 08 through 15 cannot be used as work bits.

## Terminal Connections



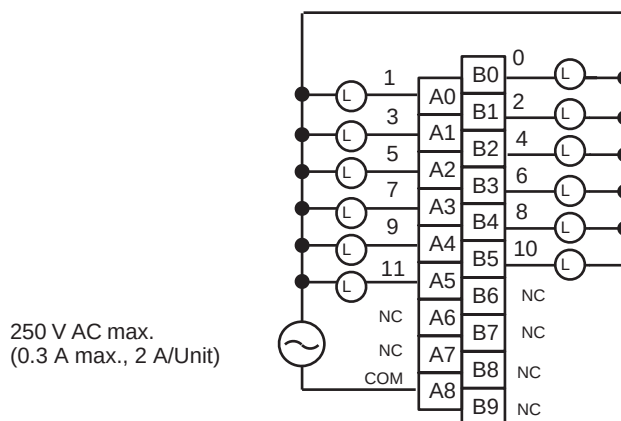
**C200H-OA222V Triac Output Unit (12 Points)**

|                              |                                                       |
|------------------------------|-------------------------------------------------------|
| Max. Switching Capacity      | 0.3 A 250 V AC, 50/60 Hz (2 A/Unit)                   |
| Min. Switching Capacity      | 10 mA (resistive load)/40 mA (inductive load) 10 V AC |
| Leakage Current              | 3 mA (100 V AC) max./6 mA (200 V AC) max.             |
| Residual Voltage             | 1.2 V max.                                            |
| ON Response Time             | 1/2 of load frequency or less                         |
| OFF Response Time            | 1/2 of load frequency or less.                        |
| No. of Circuits              | 1 (12 points/common)                                  |
| Internal Current Consumption | 200 mA 5 V DC max.                                    |
| Fuse Rating                  | 3 A 250 V (5.2-dia. x20)                              |
| Weight                       | 400 g max.                                            |

**Circuit Configuration**

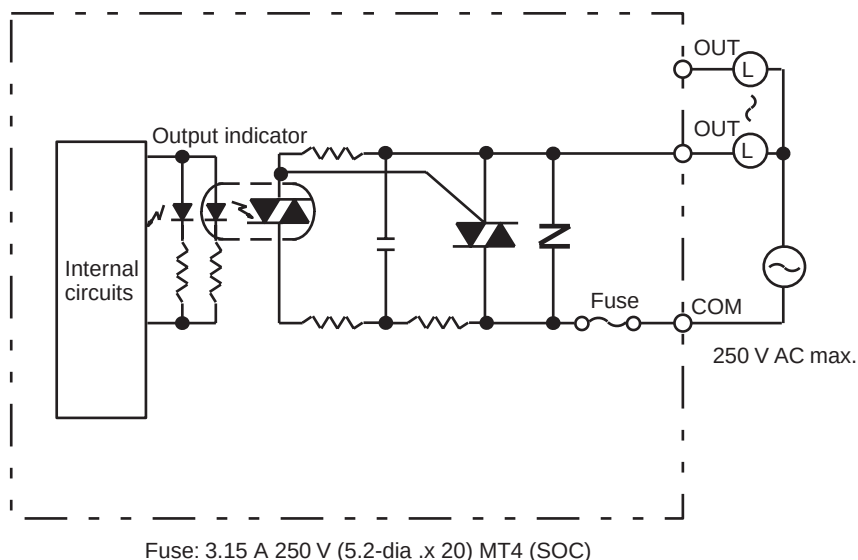
Fuse: 3 A 250 V (5.2-dia. x20) MQ4 (SOC)

- Note**
1. No blown fuse detector circuit is provided.
  2. Check the fuse when there is no output.

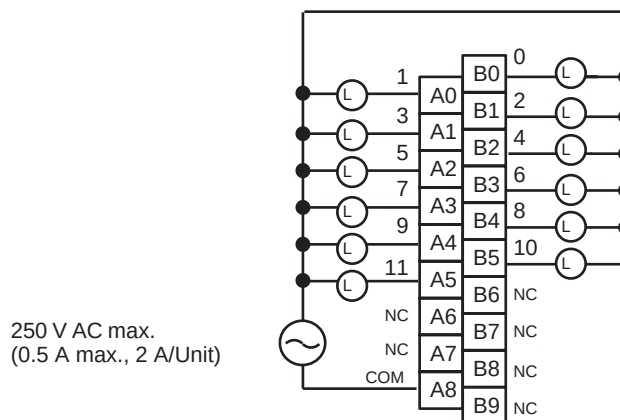
**Terminal Connections**

**C200H-OA224 Triac Output Unit (12 Points)**

|                              |                                                        |
|------------------------------|--------------------------------------------------------|
| Max. Switching Capacity      | 0.5 A 250 V AC, 50/60 Hz (2 A/Unit)                    |
| Max. inrush current          | 10 A (pulse width: 100ms)<br>20 A (pulse width: 10 ms) |
| Min. Switching Capacity      | 100 mA 10 V AC/50 mA 24 V AC/10 mA 100 V AC min.       |
| Leakage Current              | 1.5 mA (120 V AC) max./3 mA (240 V AC) max.            |
| Residual Voltage             | 1.5 V AC max. (50 to 500 mA)/5 V AC max. (10 to 50 mA) |
| ON Response Time             | 1 ms max.                                              |
| OFF Response Time            | 1/2 of load frequency + 1 ms or less.                  |
| No. of Circuits              | 1 (12 points/common)                                   |
| Internal Current Consumption | 270 mA 5 V DC max.                                     |
| Fuse Rating                  | 3.15 A 250 V (5.2-dia. x 20)                           |
| Weight                       | 300 g max.                                             |

**Circuit Configuration**

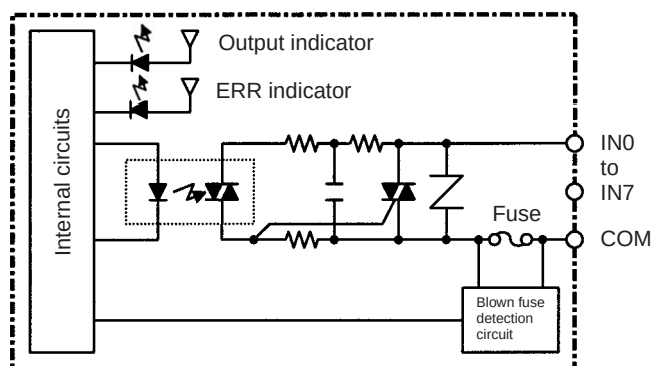
- Note**
1. No blown fuse detector circuit is provided.
  2. Check the fuse when there is no output.

**Terminal Connections**

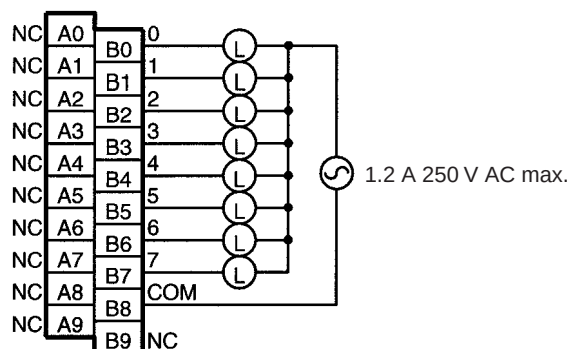
## CS1W-OA201 Triac Output Unit (8 Points)

|                              |                                                                                                                                     |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity      | 1.2 A 250 V AC, 50/60 Hz (4.8 A/Unit)                                                                                               |
| Max. Inrush Current          | 10 A (pulse width: 100 ms), 20 A (pulse width: 10 ms)                                                                               |
| Min. Switching Capacity      | 100 mA 10 V AC, 50 mA 24 V AC, 10 mA 100 V AC min.                                                                                  |
| Leakage Current              | 1.5 mA (120 V AC) max., 3.0 mA (240 V AC) max.                                                                                      |
| Residual Voltage             | 1.5 V AC max. (50 to 500 mA), 5.0 V AC max. (10 to 50 mA)                                                                           |
| ON Response Time             | 1 ms max.                                                                                                                           |
| OFF Response Time            | 1/2 of load frequency+1 ms or less.                                                                                                 |
| No. of Circuits              | 1 (8 points/common)                                                                                                                 |
| Surge Protector              | C.R Absorber + Surge Absorber                                                                                                       |
| Fuses                        | 8A<br>The fuse cannot be replaced by the user.                                                                                      |
| Blown Fuse Detection Circuit | ERR indicator lit when fuse blown. Also, the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON. |
| Insulation Resistance        | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                                                 |
| Dielectric Strength          | 2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.                       |
| Internal Current Consumption | 230 mA 5 V DC max. (70 mA + 20 mA × No. of ON points)                                                                               |
| Weight                       | 300 g max.                                                                                                                          |

## Circuit Configuration



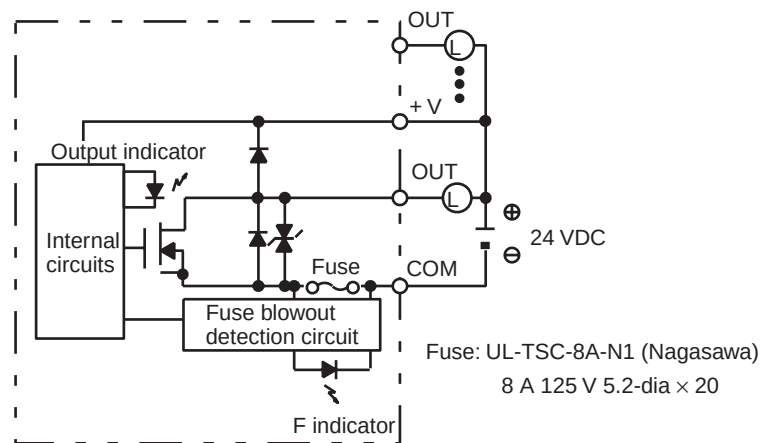
## Terminal Connections



## C200H-OD213 Transistor Output Unit (8 Points)

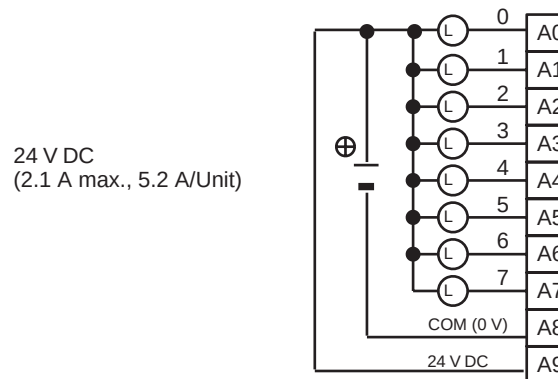
|                              |                                                           |
|------------------------------|-----------------------------------------------------------|
| Max. Switching Capacity      | 2.1 A 24 V DC (20.4 to 26.4 V DC) (5.2 A/Unit) NPN output |
| Leakage Current              | 0.1 mA max.                                               |
| Residual Voltage             | 1.4 V max.                                                |
| ON Response Time             | 0.2 ms max.                                               |
| OFF Response Time            | 0.3 ms max.                                               |
| No. of Circuits              | 1 (8 points/common)                                       |
| Internal Current Consumption | 140 mA 5 V DC max.                                        |
| Fuse Rating                  | 8 A 125 V (5.2-dia. x20)                                  |
| Power for External Supply    | 30 mA 20.4 to 26.4 V DC min.                              |
| Weight                       | 250 g max.                                                |

## Circuit Configuration



**Note** When the fuse blows, the F indicator lights and bit 08 turns ON. Bits 08 through 15 cannot be used as work bits.

## Terminal Connections

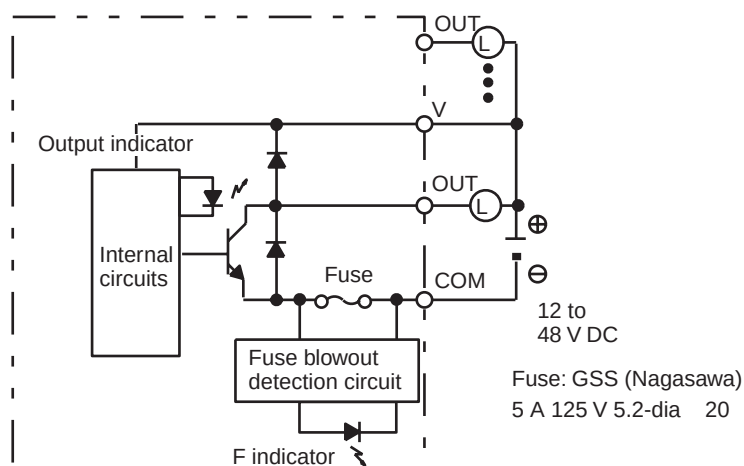


- Note**
1. Be sure to supply power to A9; otherwise current will leak through the load while the output is OFF.
  2. Incorrect load operation may result if polarity is not connected correctly.

## C200H-OD411 Transistor Output Unit (8 Points)

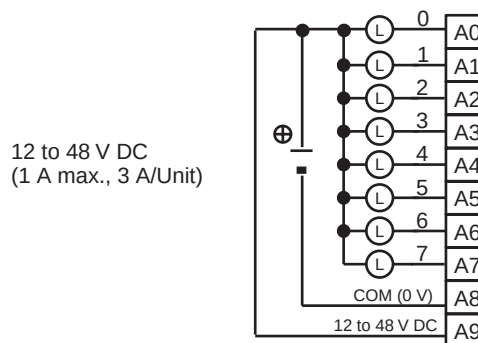
|                              |                                  |
|------------------------------|----------------------------------|
| Max. Switching Capacity      | 10.2 to 52.8 V DC 1 A (3 A/Unit) |
| Leakage Current              | 0.1 mA max.                      |
| Residual Voltage             | 1.4 V max.                       |
| ON Response Time             | 0.2 ms max.                      |
| OFF Response Time            | 0.3 ms max.                      |
| No. of Circuits              | 1 (8 points/common)              |
| Internal Current Consumption | 140 mA 5 V DC max.               |
| Fuse Rating                  | 5 A 125 V (5.2-dia. x20)         |
| Power for External Supply    | 30 mA 10.2 to 52.8 V DC min.     |
| Weight                       | 250 g max.                       |

## Circuit Configuration



**Note** When the fuse blows, the F indicator lights and bit 08 turns ON. Bits 08 through 15 cannot be used as work bits.

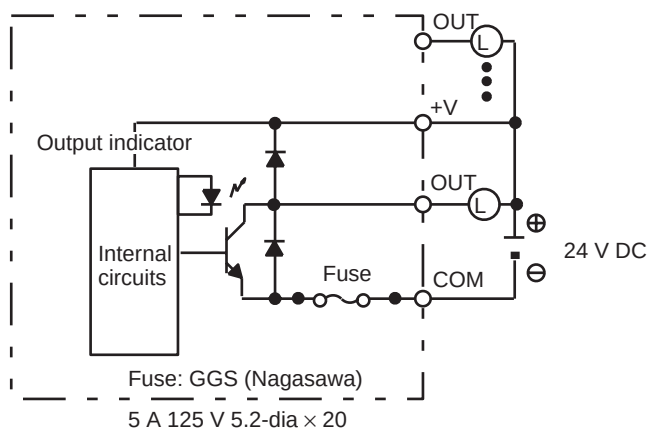
## Terminal Connections



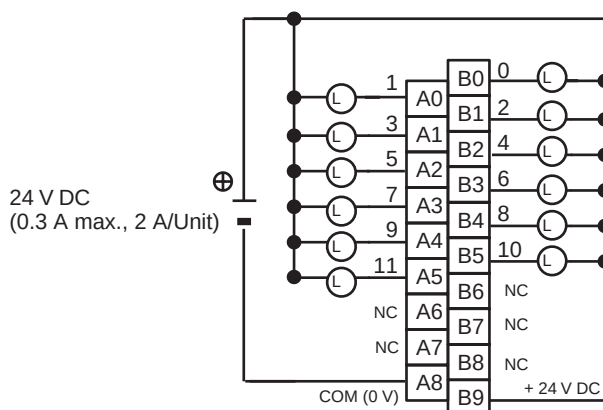
**Note** Be sure to supply power to A9; otherwise current will leak through the load while the output is OFF.

**C200H-OD211 Transistor Output Unit (12 Points)**

|                              |                                              |
|------------------------------|----------------------------------------------|
| Max. Switching Capacity      | 0.3 A 24 V DC (20.4 to 26.4 V DC) (2 A/Unit) |
| Leakage Current              | 0.1 mA max.                                  |
| Residual Voltage             | 1.4 V max.                                   |
| ON Response Time             | 0.2 ms max.                                  |
| OFF Response Time            | 0.3 ms max.                                  |
| No. of Circuits              | 1 (12 points/common)                         |
| Internal Current Consumption | 160 mA 5 V DC max.                           |
| Fuse Rating                  | 5 A 125 V (5.2-dia. x20)                     |
| Power for External Supply    | 25 mA 20.4 to 26.4 V DC min.                 |
| Weight                       | 300 g max.                                   |

**Circuit Configuration**

- Note**
1. No blown fuse detector circuit is provided.
  2. Check the fuse when there is no output.

**Terminal Connections**

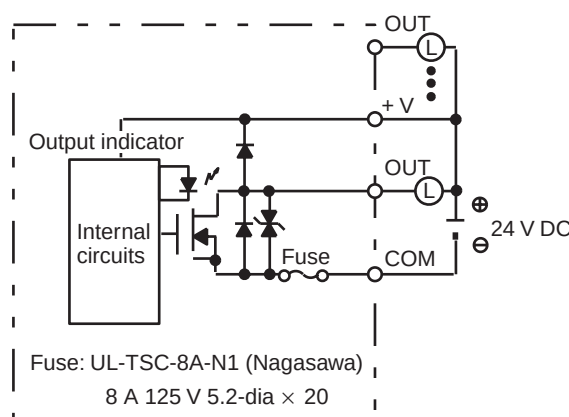
- Note** Be sure to supply power to B9; otherwise current will leak through the load while the output is OFF.



## C200H-OD212 Transistor Output Unit (16 Points)

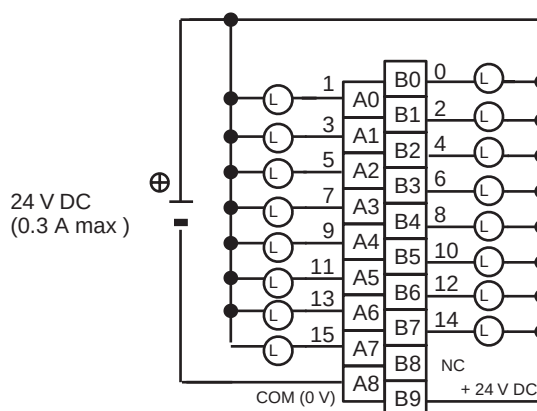
|                              |                                                |
|------------------------------|------------------------------------------------|
| Max. Switching Capacity      | 0.3 A 24 V DC (20.4 to 26.4 V DC) (4.8 A/Unit) |
| Leakage Current              | 0.1 mA max.                                    |
| Residual Voltage             | 1.4 V max.                                     |
| ON Response Time             | 0.2 ms max.                                    |
| OFF Response Time            | 0.3 ms max.                                    |
| No. of Circuits              | 1 (16 points/common)                           |
| Internal Current Consumption | 180 mA 5 V DC max.                             |
| Fuse Rating                  | 8 A 125 V (5.2-dia. x20)                       |
| Power for External Supply    | 35 mA 24 V DC (20.4 to 26.4 V DC) min.         |
| Weight                       | 350 g max.                                     |

## Circuit Configuration



- Note**
1. No blown fuse detector circuit is provided.
  2. Check the fuse when there is no output.

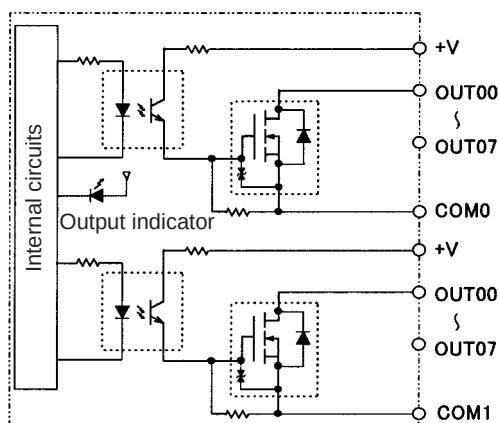
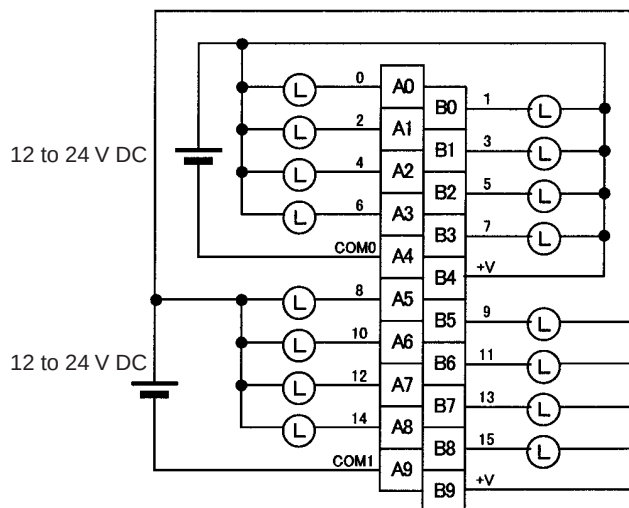
## Terminal Connections



- Note** Be sure to supply power to B9; otherwise current will leak through the load while the output is OFF.

**CS1W-OD211 Transistor Output Unit (16 Points, Sinking)**

|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Voltage                | 12 to 24 V DC                                                                                                 |
| Operating Load Voltage Range | 10.2 to 26.4 V DC                                                                                             |
| Maximum Load Current         | 0.5 A/point, 4.0 A/common, 8.0 A/Unit                                                                         |
| Maximum Inrush Current       | 4.0 A/point, 10 ms max.                                                                                       |
| Leakage Current              | 0.1 mA max.                                                                                                   |
| Residual Voltage             | 1.5 V max.                                                                                                    |
| ON Response Time             | 0.5 ms max.                                                                                                   |
| OFF Response Time            | 1.0 ms max.                                                                                                   |
| Insulation Resistance        | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                           |
| Dielectric Strength          | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| No. of Circuits              | 16 (8 points/common, 2 circuits)                                                                              |
| Internal Current Consumption | 5 V DC 170 mA max.                                                                                            |
| Fuse                         | None                                                                                                          |
| External Power Supply        | 10.2 to 26.4 V DC, 20 mA min.                                                                                 |
| Weight                       | 270 g max.                                                                                                    |

**Circuit Configuration****Terminal Connections**

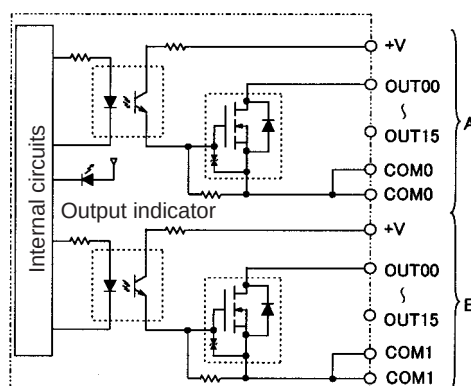
When wiring, pay careful attention to the polarity. The load may operate incorrectly if the polarity is reversed.

## CS1W-OD231 Transistor Output Unit (32 Points, Sinking)

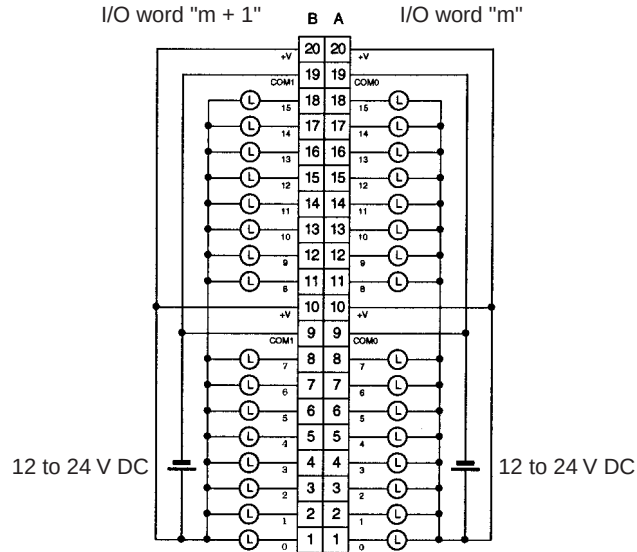
|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Voltage                | 12 to 24 V DC                                                                                                 |
| Operating Load Voltage Range | 10.2 to 26.4 V DC                                                                                             |
| Maximum Load Current         | 0.5 A/point, 2.5 A/common, 5.0 A/Unit (See note.)                                                             |
| Maximum Inrush Current       | 4.0 A/point, 10 ms max.                                                                                       |
| Leakage Current              | 0.1 mA max.                                                                                                   |
| Residual Voltage             | 1.5 V max.                                                                                                    |
| ON Response Time             | 0.5 ms max.                                                                                                   |
| OFF Response Time            | 1.0 ms max.                                                                                                   |
| Insulation Resistance        | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                           |
| Dielectric Strength          | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| No. of Circuits              | 32 (16 points/common, 2 circuits)                                                                             |
| Internal Current Consumption | 5 V DC 270 mA max.                                                                                            |
| Fuse                         | None                                                                                                          |
| External Power Supply        | 10.2 to 26.4 V DC, 30 mA min.                                                                                 |
| Weight                       | 200 g max.                                                                                                    |
| Accessories                  | One connector for external wiring (soldered)                                                                  |

**Note** The maximum load currents will be 2.0 A/common and 4.0 A/Unit if a pressure-welded connector is used.

## Circuit Configuration



## Terminal Connections



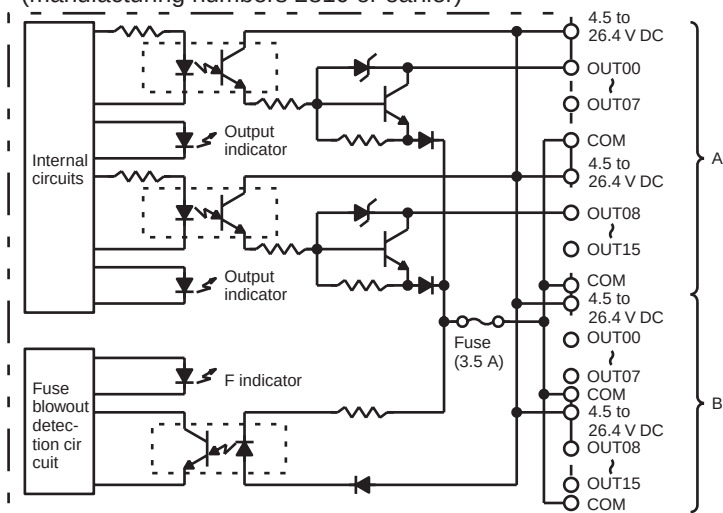
- When wiring, pay careful attention to the polarity. The load may operate if the polarity is reversed.
- Although the +V and COM terminals of rows A and B are internally connected, wire all points completely.

## C200H-OD218 Transistor Output Unit (32 Points)

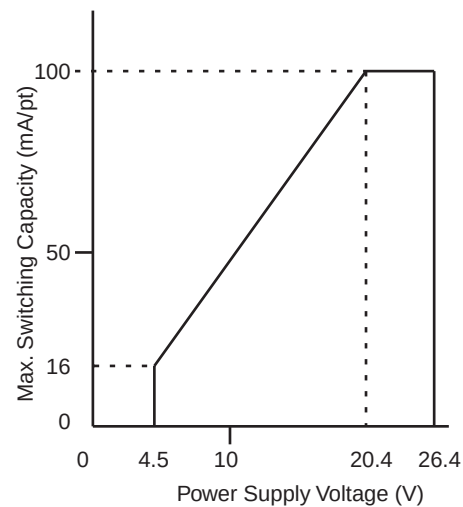
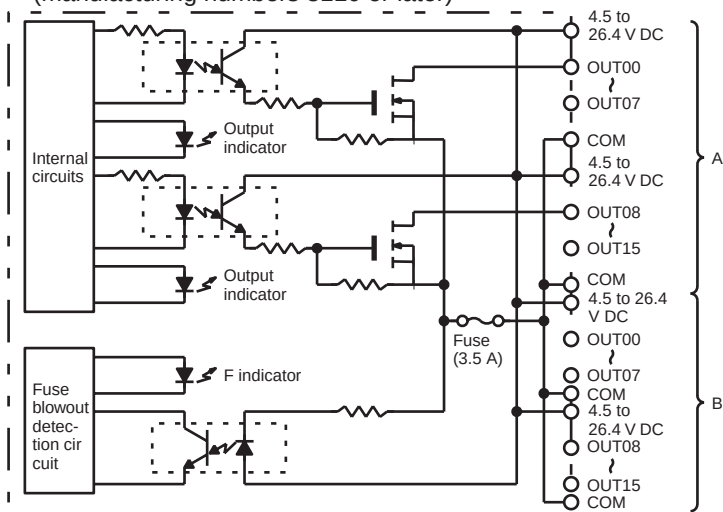
|                              |                                                                          |
|------------------------------|--------------------------------------------------------------------------|
| Max. Switching Capacity      | 16 mA 4.5 V DC to 100 mA 26.4 V DC (see below)                           |
| Leakage Current              | 0.1 mA max.                                                              |
| Residual Voltage             | 0.8 V max.                                                               |
| ON Response Time             | 0.1 ms max.                                                              |
| OFF Response Time            | 0.4 ms max.                                                              |
| No. of Circuits              | 1 (32 points/common)                                                     |
| Internal Current Consumption | 180 mA 5 V DC max.                                                       |
| Fuse Rating                  | 3.5 A (The fuse is not user-replaceable.)                                |
| Power for External Supply    | 110 mA 5 to 24 V DC $\pm$ 10% min.<br>(3.4 mA $\times$ number of ON pts) |
| Weight                       | 180 g max.                                                               |

## Circuit Configuration and Maximum Switching Capacity

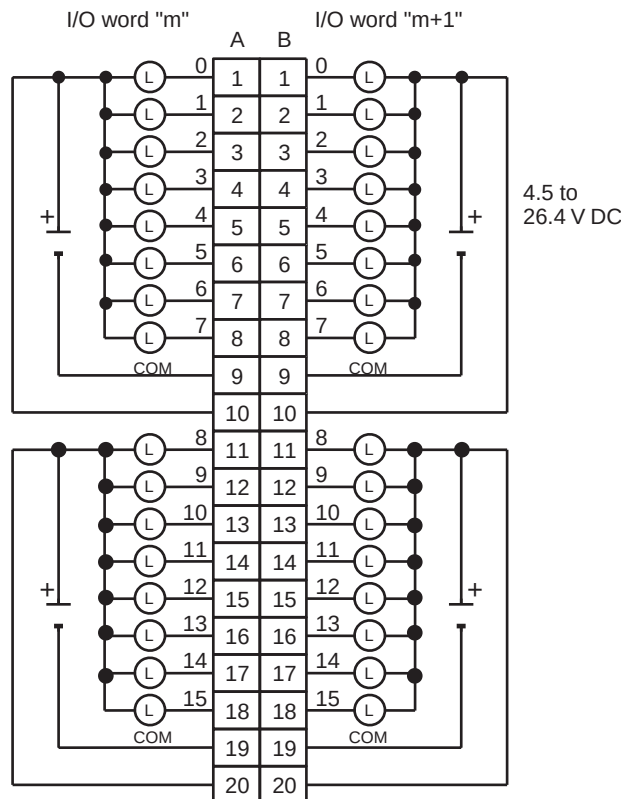
Units manufactured on or before January 28th, 2000  
(manufacturing numbers 2810 or earlier)



Units manufactured on or after January 31, 2000  
(manufacturing numbers 3110 or later)



## Terminal Connections

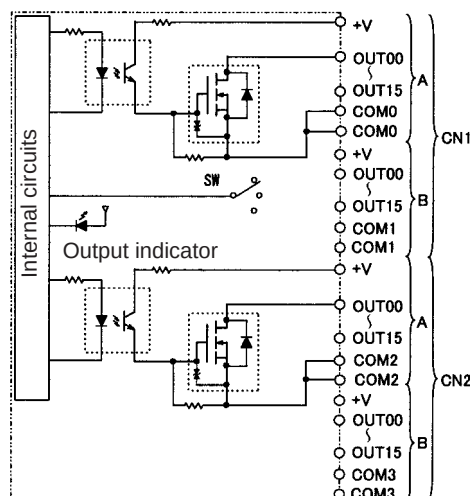


- Note**
1. When the fuse blows, the F indicator will light and the corresponding flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.
  2. The interruption of power from the external power supply is treated the same as a fuse blowout.
  3. Connect power supply wiring to every COM terminal, even though the COM terminals are connected internally.

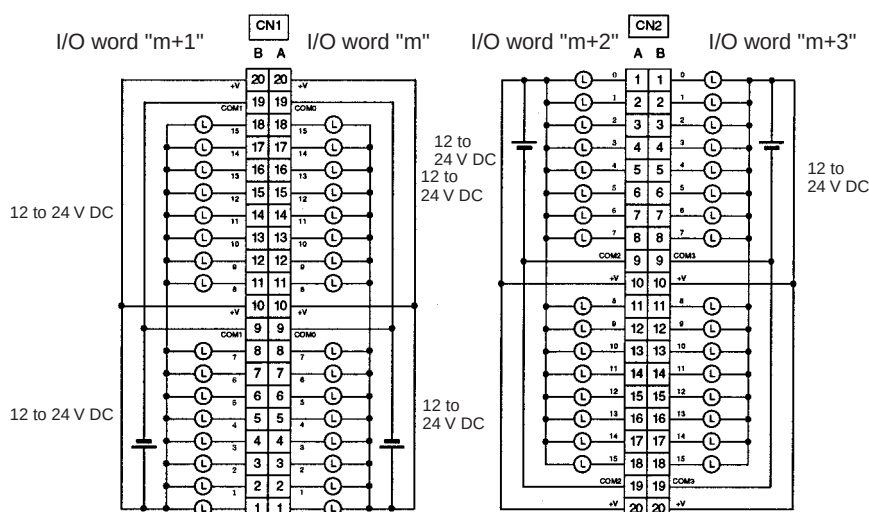
## CS1W-OD261 Transistor Output Unit (64 Points, Sinking)

|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Voltage                | 12 to 24 V DC                                                                                                 |
| Operating Load Voltage Range | 10.2 to 26.4 V DC                                                                                             |
| Maximum Load Current         | 0.3 A/point, 1.6 A/common, 6.4 A/Unit                                                                         |
| Maximum Inrush Current       | 3.0 A/point, 10 ms max.                                                                                       |
| Leakage Current              | 0.1 mA max.                                                                                                   |
| Residual Voltage             | 1.5 V max.                                                                                                    |
| ON Response Time             | 0.5 ms max.                                                                                                   |
| OFF Response Time            | 1.0 ms max.                                                                                                   |
| Insulation Resistance        | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                           |
| Dielectric Strength          | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| No. of Circuits              | 64 (16 points/common, 4 circuits)                                                                             |
| Internal Current Consumption | 5 V DC 390 mA max.                                                                                            |
| Fuse                         | None                                                                                                          |
| External Power Supply        | 10.2 to 26.4 V DC, 50 mA min.                                                                                 |
| Weight                       | 260 g max.                                                                                                    |
| Accessories                  | Two connectors for external wiring (soldered)                                                                 |

## Circuit Configuration



## Terminal Connections

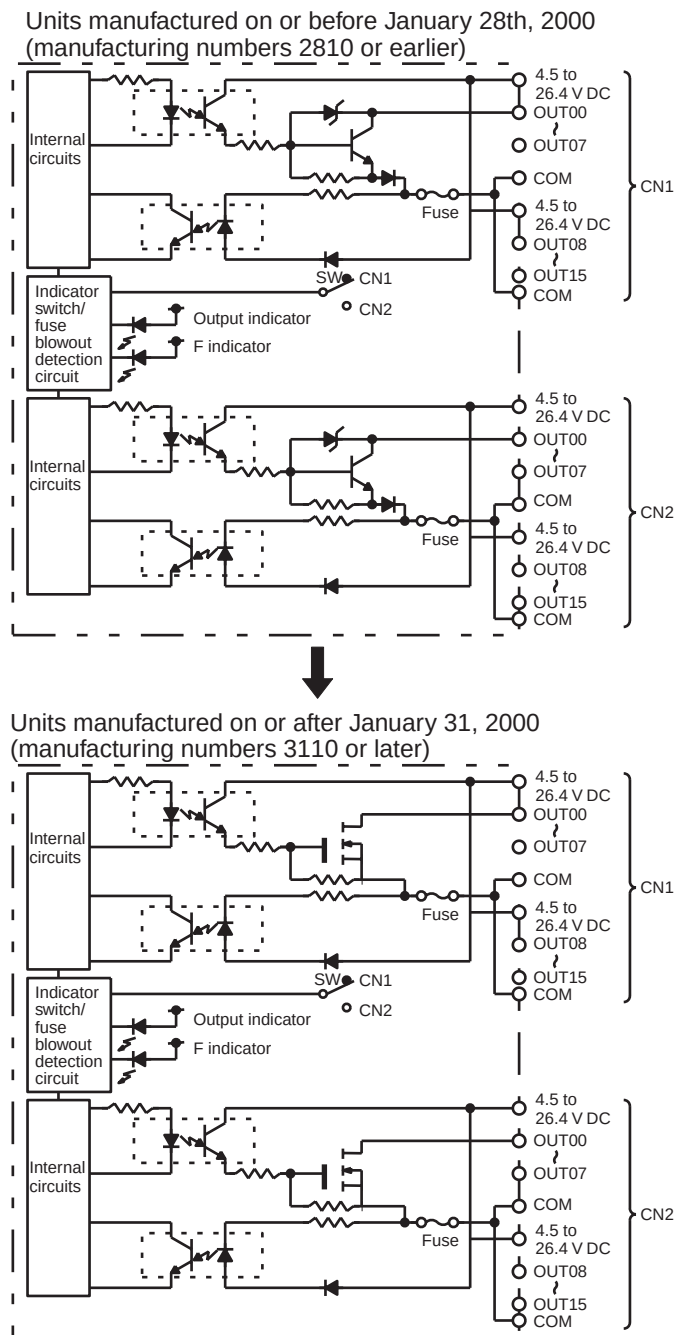


- When wiring, pay careful attention to the polarity. The load may operate if the polarity is reversed.
- Although the +V and COM terminals of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

## C200H-OD219 Transistor Output Unit (64 Points)

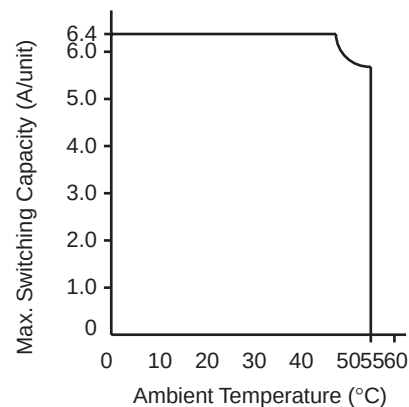
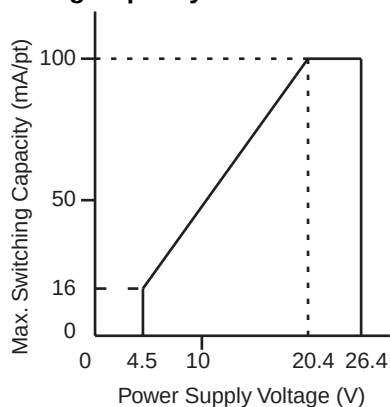
|                              |                                                                          |
|------------------------------|--------------------------------------------------------------------------|
| Max. Switching Capacity      | 16 mA 4.5 V DC to 100 mA 26.4 V DC (see below)                           |
| Leakage Current              | 0.1 mA max.                                                              |
| Residual Voltage             | 0.8 V max.                                                               |
| ON Response Time             | 0.1 ms max.                                                              |
| OFF Response Time            | 0.4 ms max.                                                              |
| No. of Circuits              | 2 (32 points/common)                                                     |
| Internal Current Consumption | 270 mA 5 V DC max.                                                       |
| Fuses                        | Two 3.5 A fuses (1 fuse/common)<br>The fuses are not user-replaceable.   |
| Power for External Supply    | 220 mA 5 to 24 V DC $\pm$ 10% min.<br>(3.4 mA $\times$ number of ON pts) |
| Weight                       | 250 g max.                                                               |

## Circuit Configuration

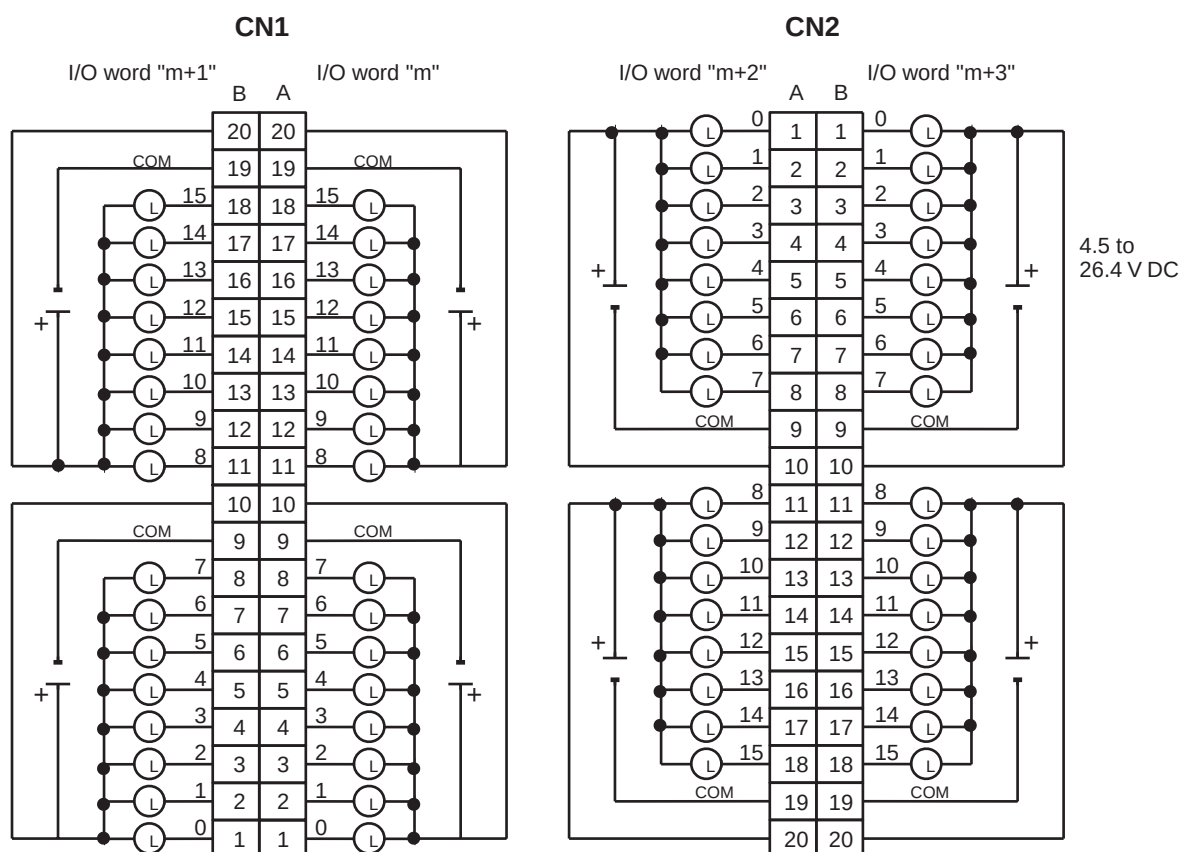




## Maximum Switching Capacity



## Terminal Connections

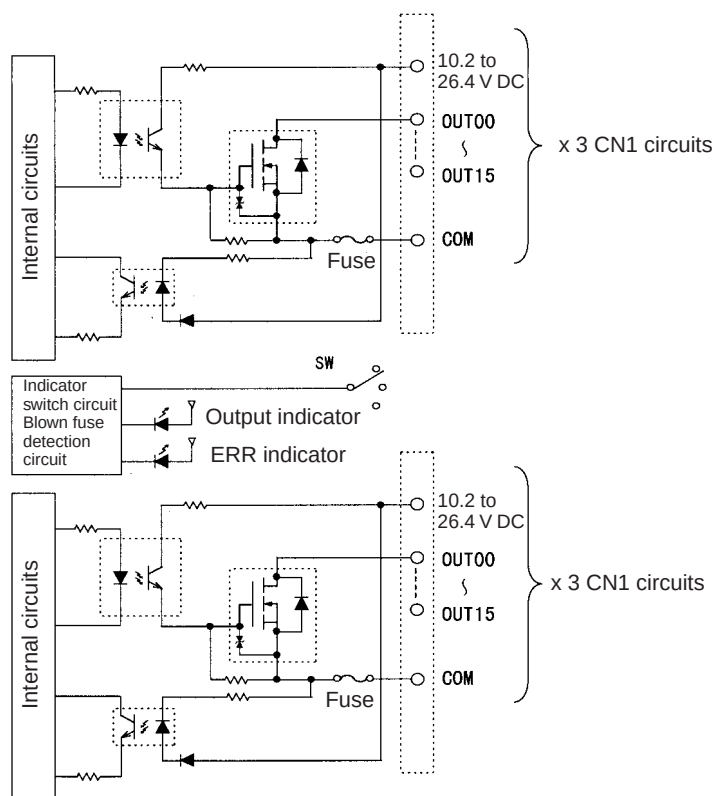


- Note**
1. When either fuse blows, the F indicator will light and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.
  2. The interruption of power from the external power supply is treated the same as a fuse blowout.
  3. Connect power supply wiring to every COM terminal, even though the COM terminals in each connector are connected internally.

## CS1W-OD291 Transistor Output Unit (96 Points, Sinking)

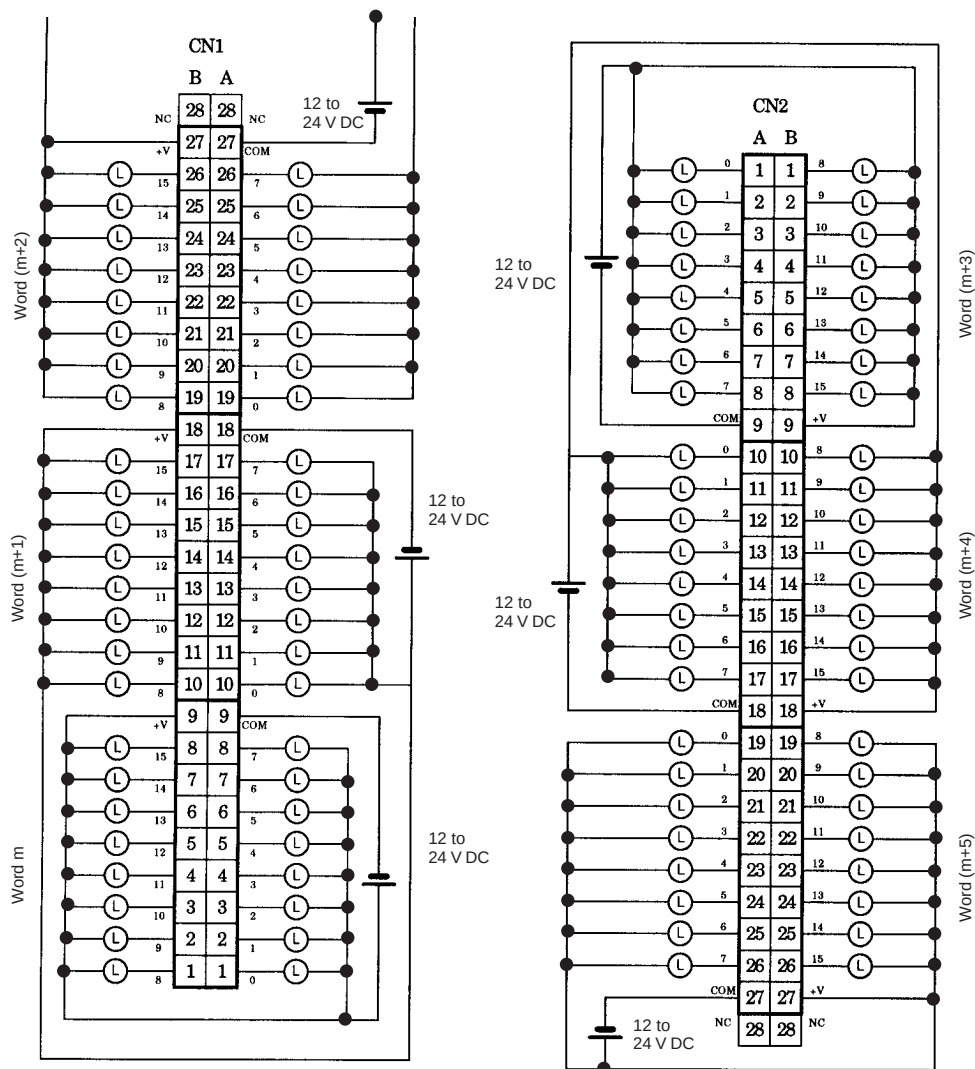
|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Voltage                | 12 to 24 V DC                                                                                                 |
| Operating Load Voltage       | 10.2 to 26.4 V DC                                                                                             |
| Maximum Load Current         | 0.1 A/point, 1.2 A/common, 7.2 A/Unit (See note 2.)                                                           |
| Maximum Inrush Current       | 1.0 A/point, 10 ms max.<br>8.0 A/common, 10 ms max.                                                           |
| Leakage Current              | 0.1 mA max.                                                                                                   |
| Residual Voltage             | 1.5 V max.                                                                                                    |
| ON Response Time             | 0.5 ms max.                                                                                                   |
| OFF Response Time            | 1.0 ms max.                                                                                                   |
| Insulation Resistance        | 20 M $\Omega$ between the external terminals and the GR terminal (100 V DC)                                   |
| Dielectric Strength          | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| No. of Circuits              | 6 (16 points/common)                                                                                          |
| Internal Current Consumption | 480 mA max. at 5 V DC                                                                                         |
| Fuse                         | 3 A (1 per common)<br>The fuse cannot be replaced by the user.                                                |
| External Power Supply        | 10.2 to 26.4 V DC, 100 mA min.                                                                                |
| Weight                       | 320 g max.                                                                                                    |
| Accessories                  | Two connectors for external wiring (soldered)                                                                 |

## Circuit Configuration



- Note**
1. The ERR indicator will light if a fuse blows or if the external power supply is turned OFF, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.
  2. The maximum load currents will be 1.0 A/common and 6.0 A/Unit if a pressure-welded connector is used.

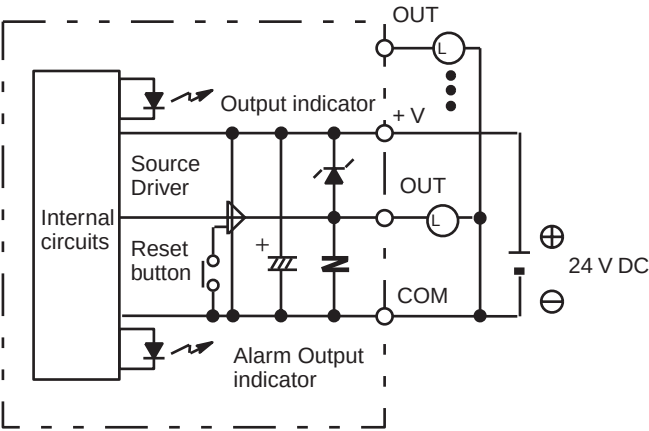
## Terminal Connections: CS1W-OD291 24-V DC 96-point Transistor Output Unit (Sinking Outputs)



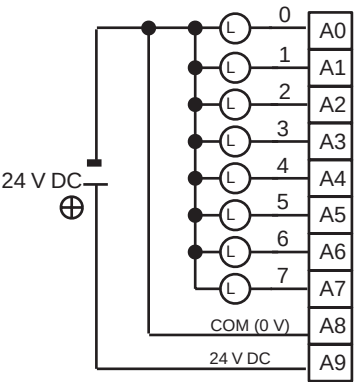
## C200H-OD214 Transistor Output Unit (8 Points, Sourcing)

|                              |                                                |
|------------------------------|------------------------------------------------|
| Max. Switching Capacity      | 24 V DC (20.4 to 26.4 V DC) 0.8 A (2.4 A/Unit) |
| Leakage Current              | 1 mA max.                                      |
| Residual Voltage             | 1.5 V max.                                     |
| ON Response Time             | 1 ms max.                                      |
| OFF Response Time            | 1 ms max.                                      |
| No. of Circuits              | 1 (8 points/common)                            |
| Internal Current Consumption | 140 mA 5 V DC max.                             |
| Short-circuit protection     | Overcurrent protection<br>Thermal protection   |
| Power for External Supply    | 150 mA 20.4 to 26.4 V DC min.                  |
| Weight                       | 250 g max.                                     |

Circuit Configuration



Terminal Connections



**Note** Be sure to supply power to A9; otherwise current will leak through the load while the output is OFF.

C200H-OD214 Short-circuit Protection

The C200H-OD214 Output Unit is equipped with two types of short-circuit protection: overcurrent protection and thermal protection. Any short-circuit must be eliminated immediately to protect the Unit.

Overcurrent Protection

When the output current reaches 2 A, the alarm output turns ON, and the alarm indicator lights. Make sure the surge current of the load does not exceed 2 A, or the alarm may be activated.

Thermal Protection

When the junction temperature of the output transistor reaches its upper limit, the output will turn OFF, the alarm output will turn ON, and the alarm indicator will flash protect to the transistor.

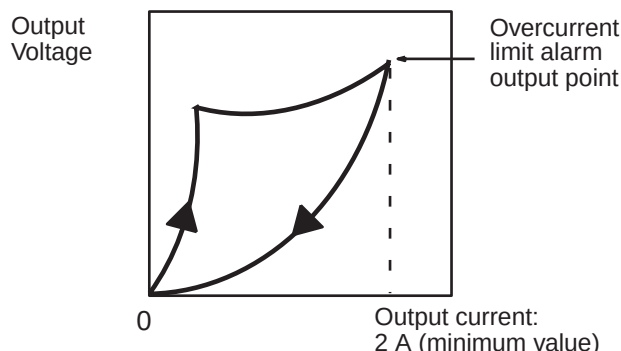
As shown in the alarm output table given below, there is one alarm indicator and alarm output bit for every two outputs. The alarm indicator and alarm output bit will function the same regardless of which output an alarm is detected for.

Thermal protection also works for two outputs at a time. If the thermal protection level is detected for one of the outputs, the other output will be turned OFF as well.

The output transistor is provided with a cooling plate. If only one of the outputs is short-circuited, heat generation will be balanced with heat radiation, and the transistor junction temperature may increase high enough to activate thermal protection. The alarm indicator and alarm output bit, however, will operate so that the alarm can be detected.

**How It Works**

When the short-circuit protection activates, the output displays the characteristic shown below.

**Clearing the Alarm**

When the short-circuit has been eliminated, reset the Unit by pressing the reset button. The alarm indicator will go out, the alarm output bit will turn OFF, and the output will be reset.

**Operating Restrictions**

Although the C200H-OD214 is provided with short-circuit protection, these are for protecting internal circuits against momentary short-circuiting in the load. Leaving short-circuits for any length of time will cause internal temperature rise, deterioration of elements, discoloration of the case or PCBs, etc. Therefore, observe the following restrictions.

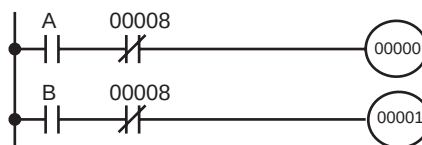
If a short-circuit occurs in an external load, immediately turn OFF the corresponding output. The C200H-OD214 turns ON an alarm output bit that corresponds with the external load output number. Each pair of outputs share one alarm indicator and one alarm output bit as shown below (bits 12 through 15 are not used and cannot be used as work bits)

| Output No.             | 0  | 1 | 2  | 3 | 4  | 5 | 6  | 7 |
|------------------------|----|---|----|---|----|---|----|---|
| Alarm indicator No.    | 0  |   | 2  |   | 4  |   | 6  |   |
| Alarm Output Point No. | 08 |   | 09 |   | 10 |   | 11 |   |

Both the alarm indicator and alarm output bit for the short-circuited output turn ON even if only one of the outputs is short-circuited. Both outputs should be disconnected until the short-circuit can be traced.

**Programming Example**

If there is a short-circuit in an output, we want the program to turn that output OFF. Assume that the Unit is mounted at CIO 000. A program to turn OFF output bits 00 and 01 is shown below.

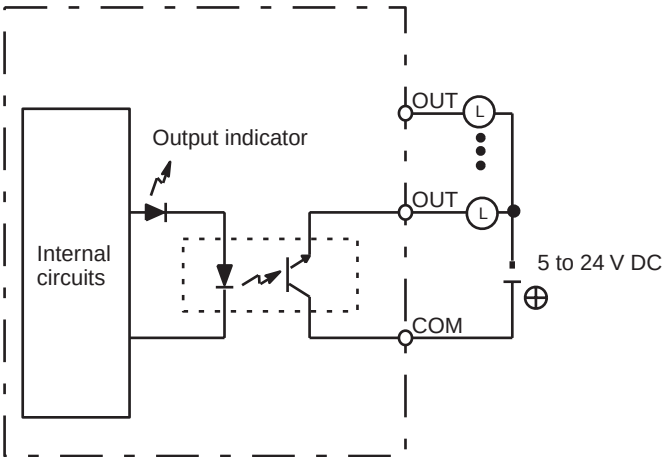


Since alarm output bit 08 covers both output bits 00 and 01, both these outputs are forced OFF as soon as output bit 08 turns ON (bits A and B can be any other bits required in the program).

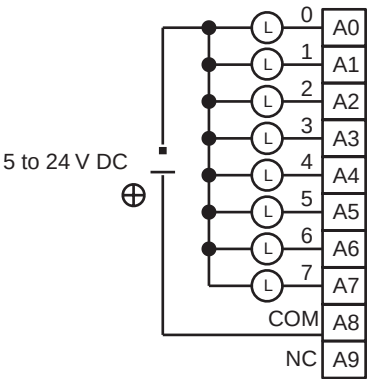
C200H-OD216 Transistor Output Unit (8 Points, Sourcing)

|                              |                                                               |
|------------------------------|---------------------------------------------------------------|
| Max. Switching Capacity      | 0.3 A 5 to 24 V DC                                            |
| Min. Switching Capacity      | 10 mA 5 V DC                                                  |
| Leakage Current              | 0.1 mA max.                                                   |
| Residual Voltage             | 1.5 V max.                                                    |
| ON Response Time             | 1.5 ms max.                                                   |
| OFF Response Time            | 2 ms max.                                                     |
| No. of Circuits              | 1 (8 points/common) positive common (source type)             |
| Internal Current Consumption | 10 mA 5 V DC max. 75 mA 26 V DC (8 points ON simultaneously.) |
| Fuse Rating                  | None                                                          |
| Weight                       | 250 g max.                                                    |

Circuit Configuration



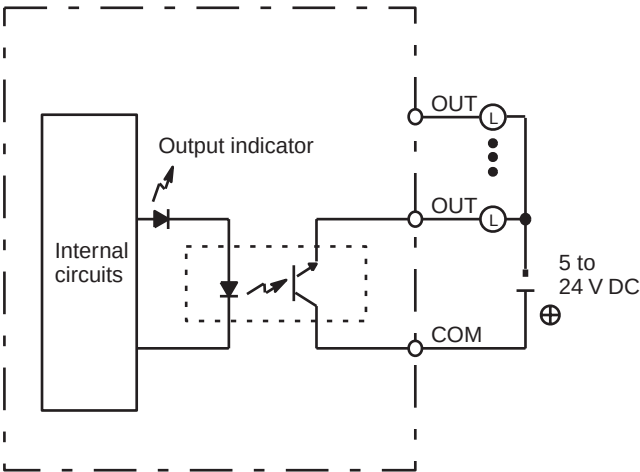
Terminal Connections



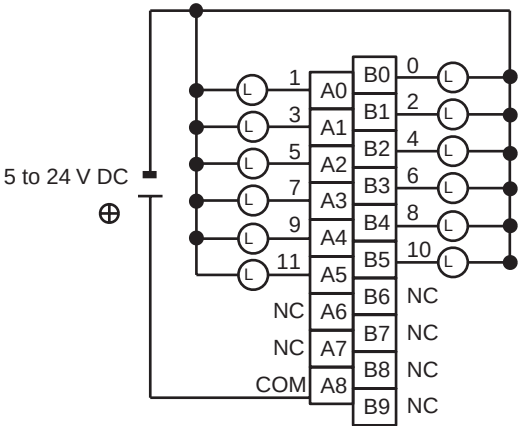
C200H-OD217 Transistor Output Unit (12 Points, Sourcing)

|                              |                                                               |
|------------------------------|---------------------------------------------------------------|
| Max. Switching Capacity      | 0.3 A 5 to 24 V DC                                            |
| Min. Switching Capacity      | 10 mA 5 V DC                                                  |
| Leakage Current              | 0.1 mA max.                                                   |
| Residual Voltage             | 1.5 V max.                                                    |
| ON Response Time             | 1.5 ms max.                                                   |
| OFF Response Time            | 2 ms max.                                                     |
| No. of Circuits              | 1 (12 points/common) positive common (source type)            |
| Internal Current Consumption | 10 mA 5 V DC max. 75 mA 26 V DC (8 points ON simultaneously.) |
| Fuse Rating                  | None                                                          |
| Weight                       | 300 g max.                                                    |

Circuit Configuration

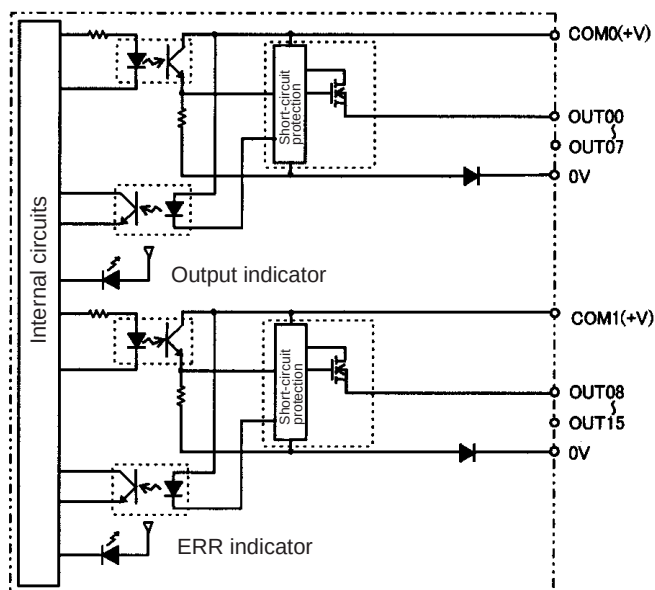


Terminal Connections



**CS1W-OD212 Transistor Output Unit (16 Points, Sourcing)**

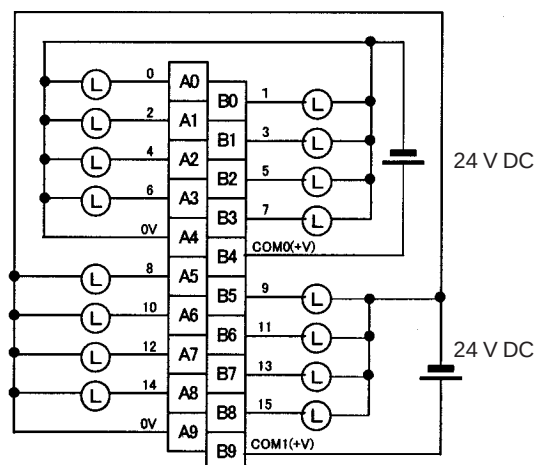
|                               |                                                                                                               |
|-------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Voltage                 | 24 V DC                                                                                                       |
| Operating Load Voltage Range  | 20.4 to 26.4 V DC                                                                                             |
| Maximum Load Current          | 0.5 A/point, 2.5 A/common, 5.0 A/Unit                                                                         |
| Maximum Inrush Current        | 0.1 mA max.                                                                                                   |
| Leakage Current               | 1.5 V max.                                                                                                    |
| ON Response Time              | 0.5 ms max.                                                                                                   |
| OFF Response Time             | 1.0 ms max.                                                                                                   |
| Load Short-circuit Prevention | Detection current: 0.7 to 2.5 A<br>Automatic restart after error clearance. (Refer to the following pages.)   |
| Insulation Resistance         | 20 M $\Omega$ between the external terminals and the GR terminal (100 V DC)                                   |
| Dielectric Strength           | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| No. of Circuits               | 16 (8 points/common, 2 circuits)                                                                              |
| Internal Current Consumption  | 5 V DC 170 mA max.                                                                                            |
| External Power Supply         | 20.4 to 26.4 V DC, 40 mA min.                                                                                 |
| Weight                        | 270 g max.                                                                                                    |

**Circuit Configuration**

When overcurrent is detected, the ERR indicator will light, and the corresponding flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.



## Terminal Connections



When wiring, pay careful attention to the polarity of the external power supply. The load may operate if the polarity is reversed.

## Load Short-circuit Protection

This section describes the load short-circuit protection of the CS1W-OD212/OD232/OD262/MD262, C200H-OD21B Output Units.

As shown below, normally when the output bit turns ON (OUT), the transistor will turn ON and then output current ( $I_{OUT}$ ) will flow. If the output ( $I_{OUT}$ ) is overloaded or short-circuited exceeding the detection current ( $I_{lim}$ ), the output current ( $I_{OUT}$ ) will be limited as shown in Figure 2 below. When the junction temperature ( $T_j$ ) of the output transistor reaches the thermal shutdown temperature ( $T_{std}$ ), the output will turn OFF to protect the transistor from being damaged, and the alarm output bit will turn ON to light the ERR indicator. When the junction temperature ( $T_j$ ) of the transistor drops down to the reset temperature ( $T_r$ ), the ERR indicator will be automatically reset and the output current will start flowing.

Figure 1: Normal Condition

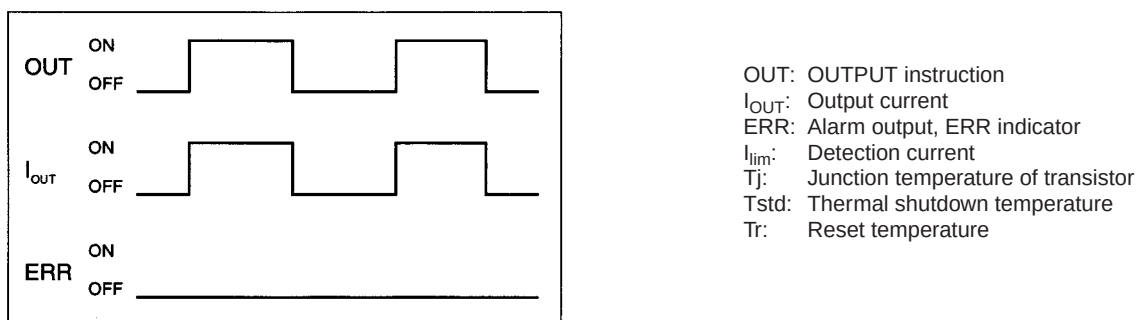
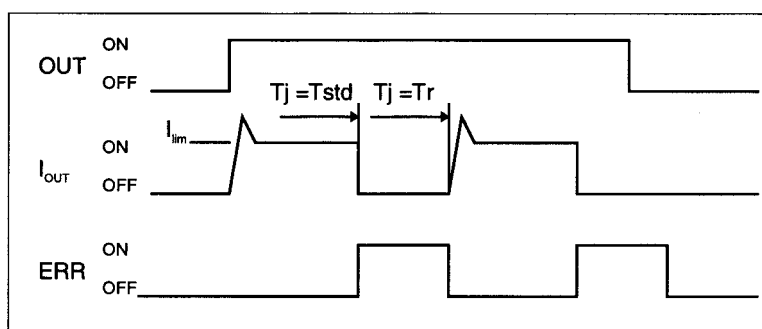


Figure 2: Overload or Short-circuit



### Operating Restrictions

Although the CS1W-OD212/OD232/OD262/MD262 and C200H-OD21B are provided with short-circuit protection, these are for protecting internal circuits against momentary short-circuiting in the load. As shown in *Figure 2* below, the short-circuit protection is automatically released when the  $T_j$  equals to  $T_r$ . Therefore, unless the cause of short-circuit is removed, ON/OFF operations will be repeated in the output. Leaving short-circuits for any length of time will cause internal temperature rise, deterioration of elements, discoloration of the case or PCBs, etc. Therefore, observe the following restrictions.

### Restrictions

If a short-circuit occurs in an external load, immediately turn OFF the corresponding output and remove the cause. The CS1W-OD212/OD232/OD262/MD262 and C200H-OD21B turn ON an alarm output bit that corresponds to the external load output number. There is an alarm output bit for every common.

When an alarm output bit turns ON, use a self-holding bit for the alarm in the user program and turn OFF the corresponding output.

The alarm output bit is allocated in the Basic I/O Unit Information Area (A050 to A089) for every Unit mounting slot.

The following table shows the correspondence between output bits and bits in the Basic I/O Unit Information Area.

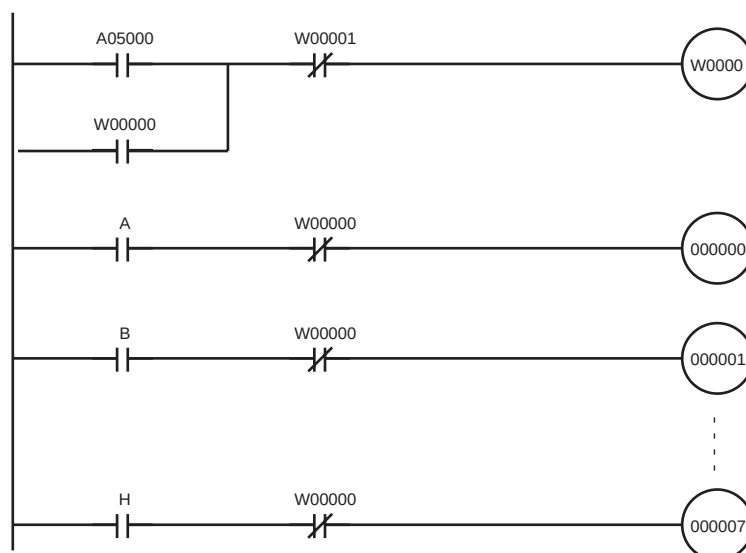
| Output bit  |                      | m      |         | m+1     | m+2     | m+3     |
|-------------|----------------------|--------|---------|---------|---------|---------|
|             |                      | 0 to 7 | 8 to 15 | 0 to 15 | 0 to 15 | 0 to 15 |
| CS1W-OD212  | Mounted in even slot | 0      | 1       | ---     | ---     | ---     |
|             | Mounted in odd slot  | 8      | 9       | ---     | ---     | ---     |
| CS1W-OD232  | Mounted in even slot | 0      |         | 1       | ---     | ---     |
|             | Mounted in odd slot  | 8      |         | 9       | ---     | ---     |
| CS1W-OD262  | Mounted in even slot | 0      |         | 1       | 2       | 3       |
|             | Mounted in odd slot  | 8      |         | 9       | 10      | 11      |
| CS1W-MD262  | Mounted in even slot | 0      |         | 1       | ---     | ---     |
|             | Mounted in odd slot  | 8      |         | 9       | ---     | ---     |
| C200H-OD21B | Mounted in even slot | 0      |         | ---     | ---     | ---     |
|             | Mounted in odd slot  | 8      |         | ---     | ---     | ---     |

For example, when the CS1W-OD212 is mounted in slot 0 on Rack 0, A05001 will turn ON if the output 8 is short-circuited. When the CS1W-OD262 is mounted in slot 1 of Rack 0, A05011 will turn ON if the output m+3 is short-circuited.

### Programming Example

In this example, CS1W-OD212 is mounted in slot 0 of the Rack 0.

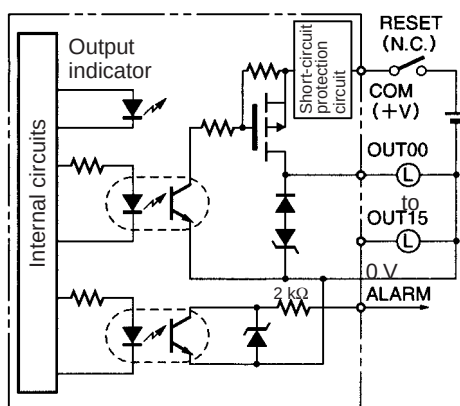
This example shows how to turn OFF output bits CIO 000000 to CIO 000007 immediately if the alarm output bit A05000 turns ON and how to keep the output bits OFF until the cause is removed and the bit is reset using work bit W000001.



### C200H-OD21A Transistor Output Unit (16 Points, Sourcing) (Load Circuit Protection Provided)

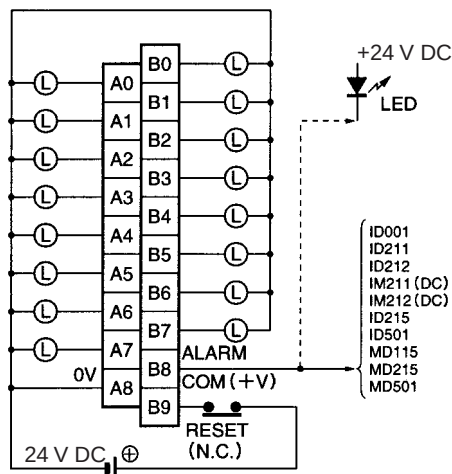
|                               |                                                                                                                                                                                                                      |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Switching Capacity       | 24 V DC (20.4 to 26.4 V DC), 1.0 A (4 A/Unit)                                                                                                                                                                        |
| Leakage Current               | 0.1 mA max.                                                                                                                                                                                                          |
| Residual Voltage              | 0.8 V max.                                                                                                                                                                                                           |
| ON Response Time              | 0.1 ms max.                                                                                                                                                                                                          |
| OFF Response Time             | 0.3 ms max.                                                                                                                                                                                                          |
| No. of Circuits               | 1 (16 points/common)                                                                                                                                                                                                 |
| Internal Current Consumption  | 160 mA 5 V DC max.                                                                                                                                                                                                   |
| Load Short-circuit Protection | Detection current: 1.2 A min (1.6 A typical)                                                                                                                                                                         |
| Power for External Supply     | 35 mA 20.4 to 26.4 V DC min.                                                                                                                                                                                         |
| Weight                        | 400 g max.                                                                                                                                                                                                           |
| Alarm Output (See note 1.)    | No. of outputs: 1 (2 k $\Omega$ internal resistor)<br>Connectable Units: Only the following DC Input Units can be connected:<br>C200H-ID001, ID211, ID212, IM211 (DC), IM212 (DC), ID215, ID501, MD115, MD215, MD501 |
| Reset Input                   | Used when alarm output turns ON. Value will depend on the external power supply. (See note 2.)                                                                                                                       |
| Load Short-circuit Protection | Detection current: 1.2 A min. (1.6 A typical)                                                                                                                                                                        |
| Dimensions                    | B-shape                                                                                                                                                                                                              |

### Circuit Configuration



**Note** When short-circuit/overload protection is activated, all 16 outputs will be switched OFF and the ALARM output becomes active (low level). The problem can be detected externally by connecting a DC Input Unit to the ALARM output or by connecting an alarm output indicator. It's not possible to connect both the Input Unit and the indicator at the same time.

### Terminal Connections

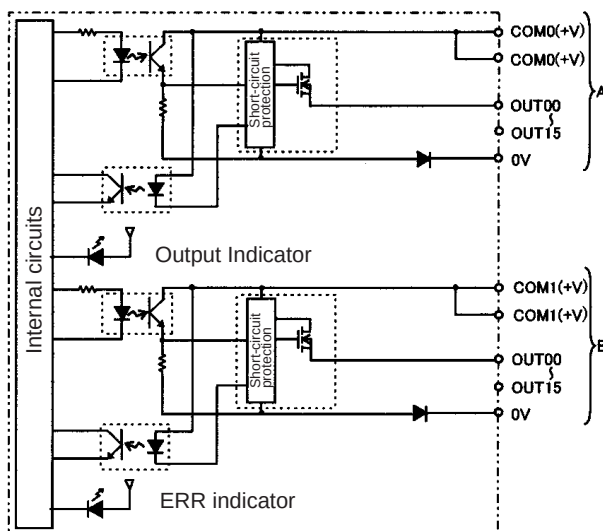


**Note** When the ALARM output turns ON, remove the cause of the high current and then shut off the external power supply for approx. 1 second. After confirming that the cause has been removed, turn ON the power supply again to reset the output. As shown in the diagram, it is recommended that a relay or switch that turns ON or OFF only the external power supply be connected right before the B9 (+V). Check that this relay or switch has a contact capacity higher than the external power supply current consumption (35 mA + load current minimum).

**CS1W-OD232 (32 Points, Sourcing)**

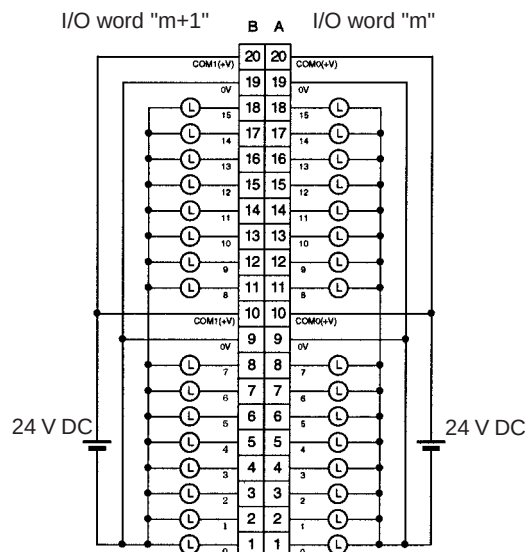
|                               |                                                                                                                                 |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Rated Voltage                 | 24 V DC                                                                                                                         |
| Operating Load Voltage Range  | 20.4 to 26.4 V DC                                                                                                               |
| Maximum Load Current          | 0.5 A/point, 2.5 A/common, 5.0 A/Unit (See note.)                                                                               |
| Leakage Current               | 0.1 mA max.                                                                                                                     |
| Residual Voltage              | 1.5 V max.                                                                                                                      |
| ON Response Time              | 0.5 ms max.                                                                                                                     |
| OFF Response Time             | 1.0 ms max.                                                                                                                     |
| Load Short-circuit Prevention | Detection current: 0.7 to 2.5 A<br>Automatic restart after error clearance. (Refer to the above Load Short-circuit Protection.) |
| Insulation Resistance         | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                                             |
| Dielectric Strength           | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.                   |
| No. of Circuits               | 32 (16 points/common, 2 circuits)                                                                                               |
| Internal Current Consumption  | 5 V DC 270 mA max.                                                                                                              |
| External Power Supply         | 20.4 to 26.4 V DC, 70 mA min.                                                                                                   |
| Weight                        | 210 g max.                                                                                                                      |
| Accessories                   | One connector for external wiring (soldered)                                                                                    |

**Note** The maximum load currents will be 2.0 A/common and 4.0 A/Unit if a pressure-welded connector is used.

**Circuit Configuration**

When the output current of any output exceeds the detection current, the output for that point will turn OFF. At the same time, the ERR indicator will light and the corresponding flag (one for each common) in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

## Terminal Connections



- When wiring, pay careful attention to the polarity of the external power supply. The load may operate if the polarity is reversed.
- Although the COM(+V) and 0V of rows A and B are internally connected, wire all points completely.

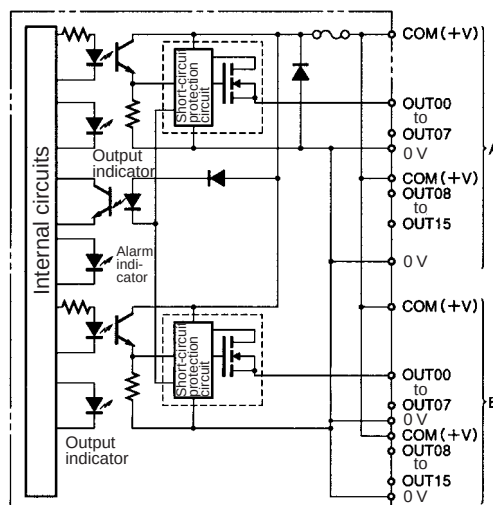
### Transistor Output Unit C200H-OD21B (32 Points) (Load Short-circuit Protection Provided)

|                                                |                                                                             |
|------------------------------------------------|-----------------------------------------------------------------------------|
| Max. Switching Current                         | 0.5 A 24 V DC (20.4 to 26.4 V DC) (5 A/Unit) (See note.)                    |
| Min. Switching Current                         | None                                                                        |
| Leakage Current                                | 0.1 mA max.                                                                 |
| Residual Voltage                               | 0.8 V max.                                                                  |
| ON Response Time                               | 0.1 ms max.                                                                 |
| OFF Response Time                              | 0.3 ms max.                                                                 |
| No. of Circuits                                | 32 (32 points/common)                                                       |
| Internal Current Consumption                   | 180 mA 5 V DC max.                                                          |
| Fuses                                          | One 7 A fuse (1 fuse/common)<br>The fuses are not user-replaceable.         |
| Power for External Supply                      | 160 mA 20.4 to 26.4 V DC min.<br>(5 mA × number of ON pts)                  |
| Weight                                         | 180 g max.                                                                  |
| Alarm Indicator                                | Lamp F lights (unless fuse is broken).                                      |
| Load Short-circuit Prevention<br>(See note 1.) | Detection current: 0.7 to 2.5 A<br>Automatic restart after error clearance. |
| Dimensions                                     | C-shape                                                                     |

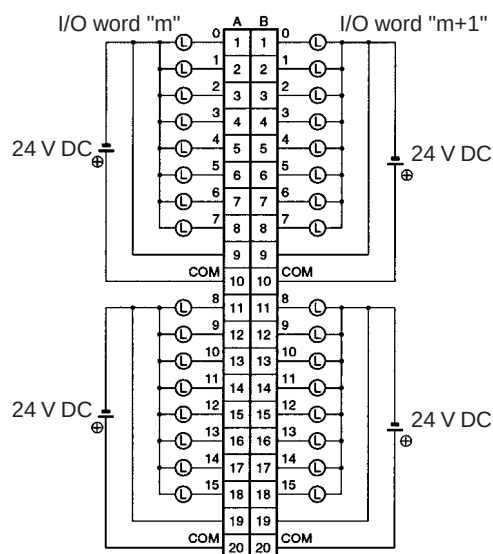
**Note** The maximum load currents will be 4.0 A/Unit if a pressure-welded connector is used.

**Note** When the short-circuit/overload protection is activated for a contact point, the output for that point is turned OFF. At the same time, lamp "F" lights, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON. After the cause of the error has been removed, the alarm will be cleared automatically when the internal temperature of the element drops.

## Circuit Configuration



## Terminal Connections

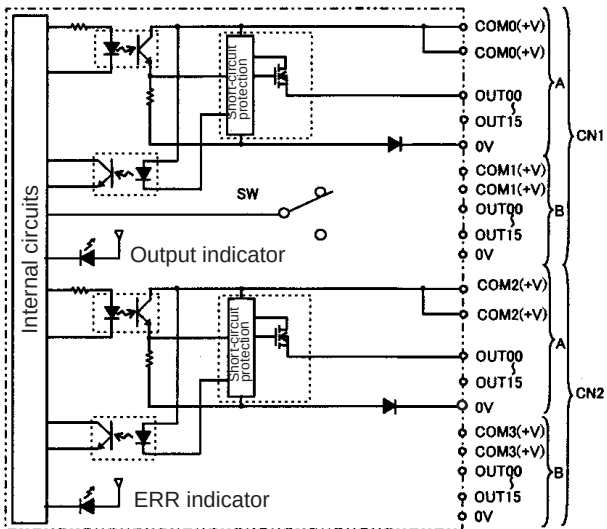


## CS1W-OD262 (64 Points, Sourcing)

|                               |                                                                                                                                 |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Rated Voltage                 | 24 V DC                                                                                                                         |
| Operating Load Voltage Range  | 20.4 to 26.4 V DC                                                                                                               |
| Maximum Load Current          | 0.3 A/point, 1.6 A/common, 6.4 A/Unit                                                                                           |
| Leakage Current               | 0.1 mA max.                                                                                                                     |
| Residual Voltage              | 1.5 V max.                                                                                                                      |
| ON Response Time              | 0.5 ms max.                                                                                                                     |
| OFF Response Time             | 1.0 ms max.                                                                                                                     |
| Load Short-circuit Prevention | Detection current: 0.7 to 2.5 A<br>Automatic restart after error clearance. (Refer to the above Load Short-circuit Protection.) |
| Insulation Resistance         | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                                             |
| Dielectric Strength           | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.                   |
| No. of Circuits               | 64 (16 points/common, 4 circuits)                                                                                               |
| Internal Current Consumption  | 5 V DC 390 mA max.                                                                                                              |

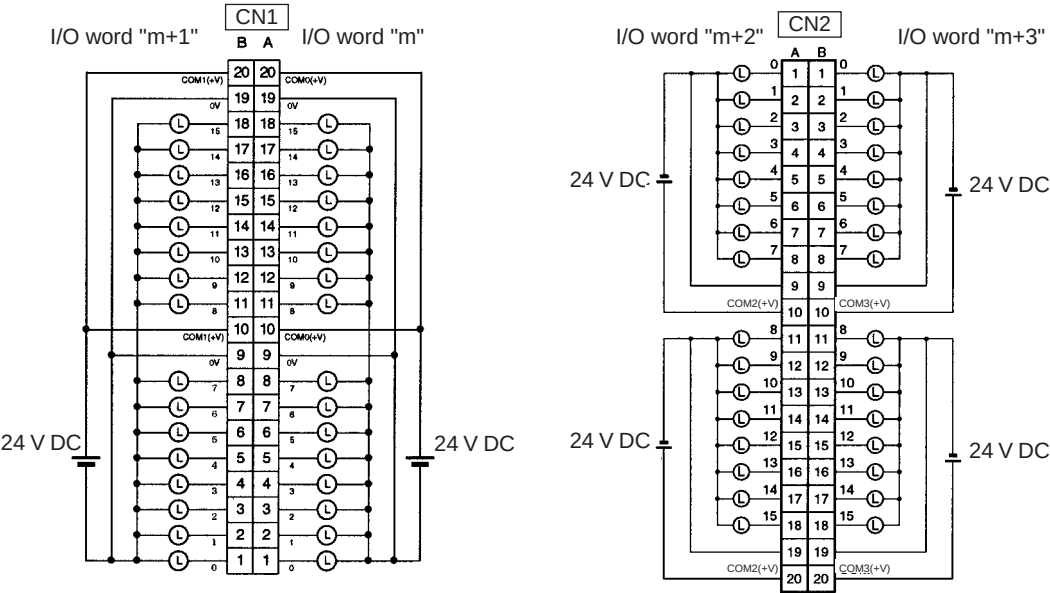
|                       |                                               |
|-----------------------|-----------------------------------------------|
| External Power Supply | 20.4 to 26.4 V DC, 130 mA min.                |
| Weight                | 270 g max.                                    |
| Accessories           | Two connectors for external wiring (soldered) |

Circuit Configuration



When overcurrent is detected, the ERR indicator will light. At the same time, the corresponding flag (one for each common) in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

Terminal Connections



- When wiring, pay careful attention to the polarity of the external power supply. The load may operate if the polarity is reversed.
- Although the COM(+V) and 0V of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

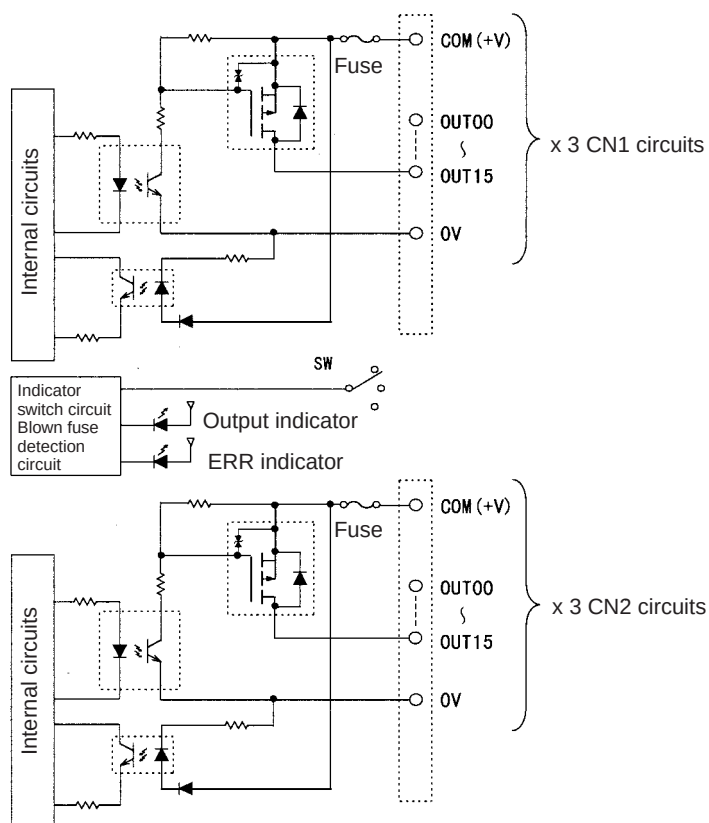


## CS1W-OD292 Transistor Output Unit (96 Points, Sourcing)

|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Voltage                | 12 to 24 V DC                                                                                                 |
| Operating Load Voltage Range | 10.2 to 26.4 V DC                                                                                             |
| Maximum Load Current         | 0.1 A/point, 1.2 A/common, 7.2 A/Unit (See note.)                                                             |
| Maximum Inrush Current       | 1.0 A/point, 10 ms max.<br>8.0 A/common, 10 ms max.                                                           |
| Leakage Current              | 0.1 mA max.                                                                                                   |
| Residual Voltage             | 1.5 V max.                                                                                                    |
| ON Response Time             | 0.5 ms max.                                                                                                   |
| OFF Response Time            | 1.0 ms max.                                                                                                   |
| Insulation Resistance        | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                           |
| Dielectric Strength          | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| No. of Circuits              | 6 (16 points/common)                                                                                          |
| Internal Current Consumption | 480 mA max. at 5 V DC                                                                                         |
| Fuse                         | 3 A (1 per common)<br>The fuse cannot be replaced by the user.                                                |
| External Power Supply        | 10.2 to 26.4 V DC, 100 mA min.                                                                                |
| Weight                       | 320 g max.                                                                                                    |
| Accessories                  | Two connectors for external wiring (soldered)                                                                 |

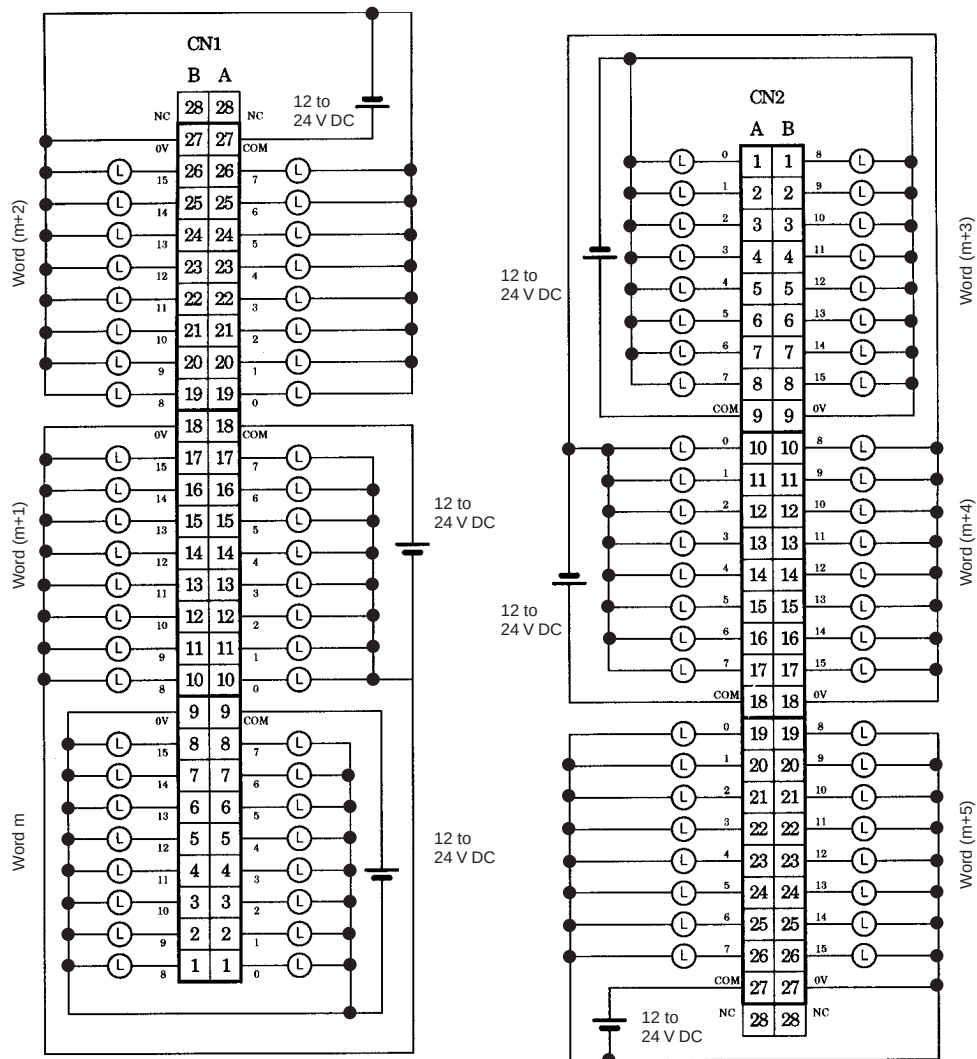
**Note** The maximum load currents will be 1.0 A/command and 6.0 A/Unit if a pressure-welded connector is used.

## Circuit Configuration



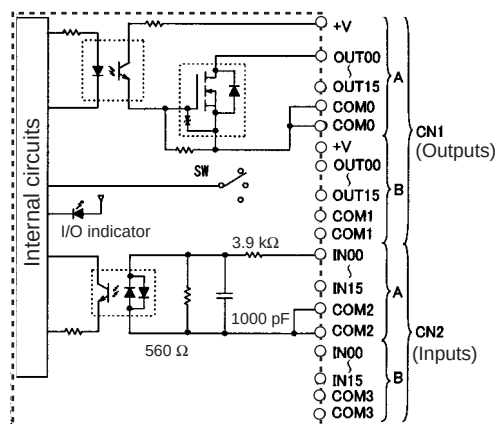
**Note** The ERR indicator will light if a fuse blows or if the external power supply is turned OFF, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

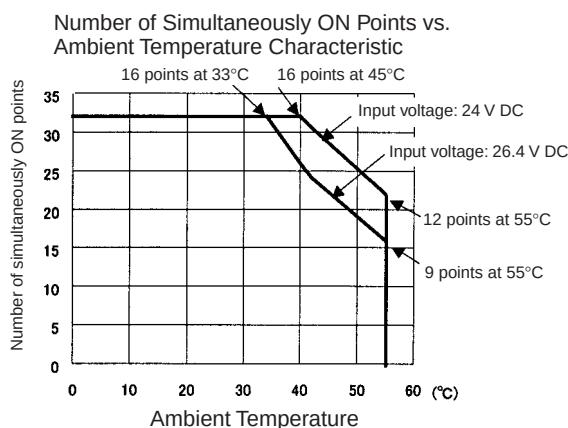
## Terminal Connections: CS1W-OD292 24-V DC 96-point Transistor Output Unit (Sourcing Outputs)



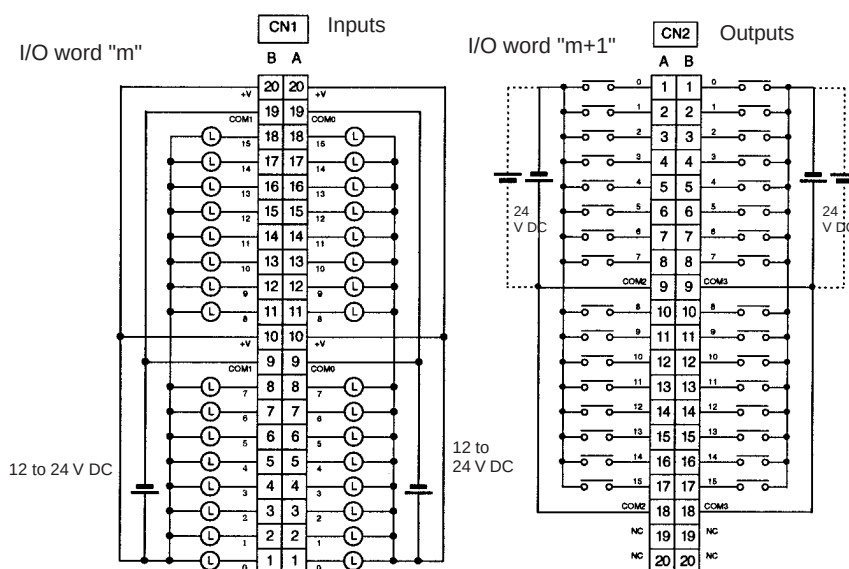
**CS1W-MD261 DC Input/Transistor Output Unit (32/32 Points, Sinking)**

| Output section (CN1)         |                                                                                                               | Input section (CN2)                |                                                                            |
|------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------|----------------------------------------------------------------------------|
| Rated Voltage                | 12 to 24 V DC                                                                                                 | Rated Input Voltage                | 24 V DC                                                                    |
|                              |                                                                                                               | Operating Input Voltage            | 20.4 to 26.4 V DC                                                          |
| Operating Load Voltage Range | 10.2 to 26.4 V DC                                                                                             | Input Impedance                    | 3.9 k $\Omega$                                                             |
| Maximum Load Current         | 0.3 A/point, 1.6 A/common, 3.2 A/Unit                                                                         | Input Current                      | 6 mA typical (at 24 V DC)                                                  |
| Maximum Inrush Current       | 3.0 A/point, 10 ms max.                                                                                       | ON Voltage/ON Current              | 15.4 V DC min./3 mA min.                                                   |
| Leakage Current              | 0.1 mA max.                                                                                                   | OFF Voltage/OFF Current            | 5 V DC min./1 mA min.                                                      |
| Residual Voltage             | 1.5 V max.                                                                                                    | ON Response Time                   | 8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.) (See note.) |
| ON Response Time             | 0.5 ms max.                                                                                                   |                                    |                                                                            |
| OFF Response Time            | 1.0 ms max.                                                                                                   | OFF Response Time                  | 8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.) (See note.) |
| No. of Circuits              | 32 (16 points/common, 2 circuits)                                                                             |                                    |                                                                            |
| Fuse                         | None                                                                                                          | No. of Circuits                    | 32 (16 points/common, 2 circuits)                                          |
| External Power Supply        | 10.2 to 26.4 V DC, 30 mA min.                                                                                 | Number of Simultaneously ON Points | 70% (11 points/common) (at 24 V DC)                                        |
| Insulation Resistance        | 20 M $\Omega$ between the external terminals and the GR terminal (100 V DC)                                   |                                    |                                                                            |
| Dielectric Strength          | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |                                    |                                                                            |
| Internal Current Consumption | 5 V DC 270 mA max.                                                                                            |                                    |                                                                            |
| Weight                       | 260 g max.                                                                                                    |                                    |                                                                            |
| Accessories                  | Two connectors for external wiring (soldered)                                                                 |                                    |                                                                            |

**Circuit Configuration**



## Terminal Connections



- When wiring, pay careful attention to the polarity. The load may operate is polarity is reversed.
- Although the +V and COM terminals of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

**Note** The ON response time will be 20  $\mu$ s maximum and OFF response time will be 300  $\mu$ s maximum even if the response times are set to 0 ms due to internal element delays.

**CS1W-MD291 DC Input/Transistor Output Unit (48/48 Points, Sinking)****Outputs (CN1)**

|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Voltage                | 12 to 24 V DC                                                                                                 |
| Operating Load Voltage Range | 10.2 to 26.4 V DC                                                                                             |
| Maximum Load Current         | 0.1 A/point, 1.2 A/common, 3.6 A/Unit (See note.)                                                             |
| Maximum Inrush Current       | 1.0 A/point, 10 ms max.<br>8.0 A/common, 10 ms max.                                                           |
| Leakage Current              | 0.1 mA max.                                                                                                   |
| Residual Voltage             | 1.5 V max.                                                                                                    |
| ON Response Time             | 0.5 ms max.                                                                                                   |
| OFF Response Time            | 1.0 ms max.                                                                                                   |
| No. of Circuits              | 48 points (16 points/common, 3 commons)                                                                       |
| Fuse                         | 3 A (1 per common)<br>The fuse cannot be replaced by the user.                                                |
| External Power Supply        | 10.2 to 26.4 V DC, 50 mA min.                                                                                 |
| Insulation Resistance        | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                           |
| Dielectric Strength          | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption | 350 mA max. at 5 V DC                                                                                         |
| Weight                       | 320 g max.                                                                                                    |
| Accessories                  | Two connectors for external wiring (soldered)                                                                 |

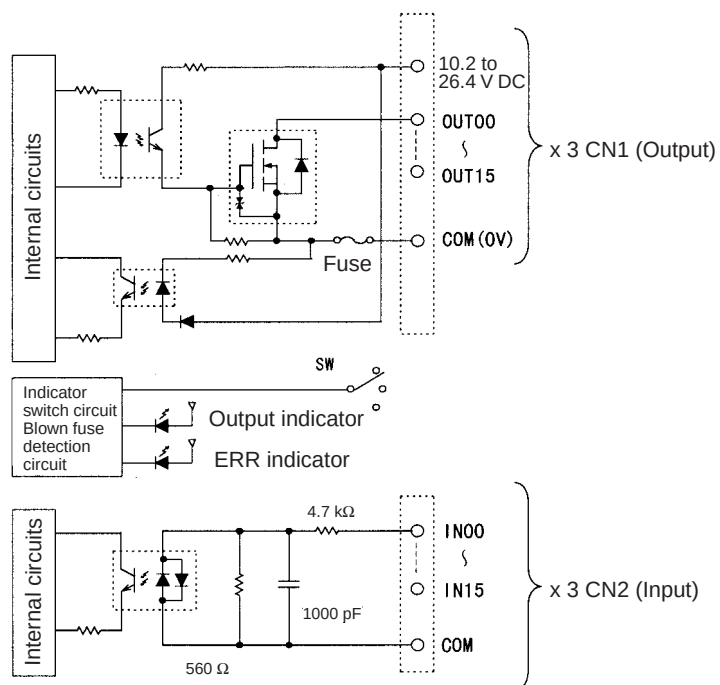
**Note** The maximum load currents will be 1.0 A/common and 3.0 A/Unit if a pressure-welded connector is used.

**Inputs (CN2)**

|                                  |                                                                                                               |
|----------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage              | 24 V DC                                                                                                       |
| Operating Input Voltage          | 20.4 to 26.4 V DC                                                                                             |
| Input Impedance                  | 4.7 kΩ                                                                                                        |
| Input Current                    | Approx. 5 mA (at 24 V DC)                                                                                     |
| ON Voltage/ON Current            | 17 V DC min./3 mA min.                                                                                        |
| OFF Voltage/OFF Current          | 5.0 V DC max./1 mA max.                                                                                       |
| ON Response Time                 | 8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note below.)   |
| OFF Response Time                | 8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note below.)   |
| No. of Circuits                  | 48 points (16 points/common, 3 commons)                                                                       |
| Number of Inputs Simultaneous ON | 50% (8 points/common) (at 24 V DC) (Depends on ambient temperature.)                                          |
| Insulation Resistance            | 20 MΩ between the external terminals and the GR terminal (100 V DC)                                           |
| Dielectric Strength              | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption     | 350 mA max. at 5 V DC                                                                                         |
| Weight                           | 320 g max.                                                                                                    |
| Accessories                      | Two connectors for external wiring (soldered)                                                                 |

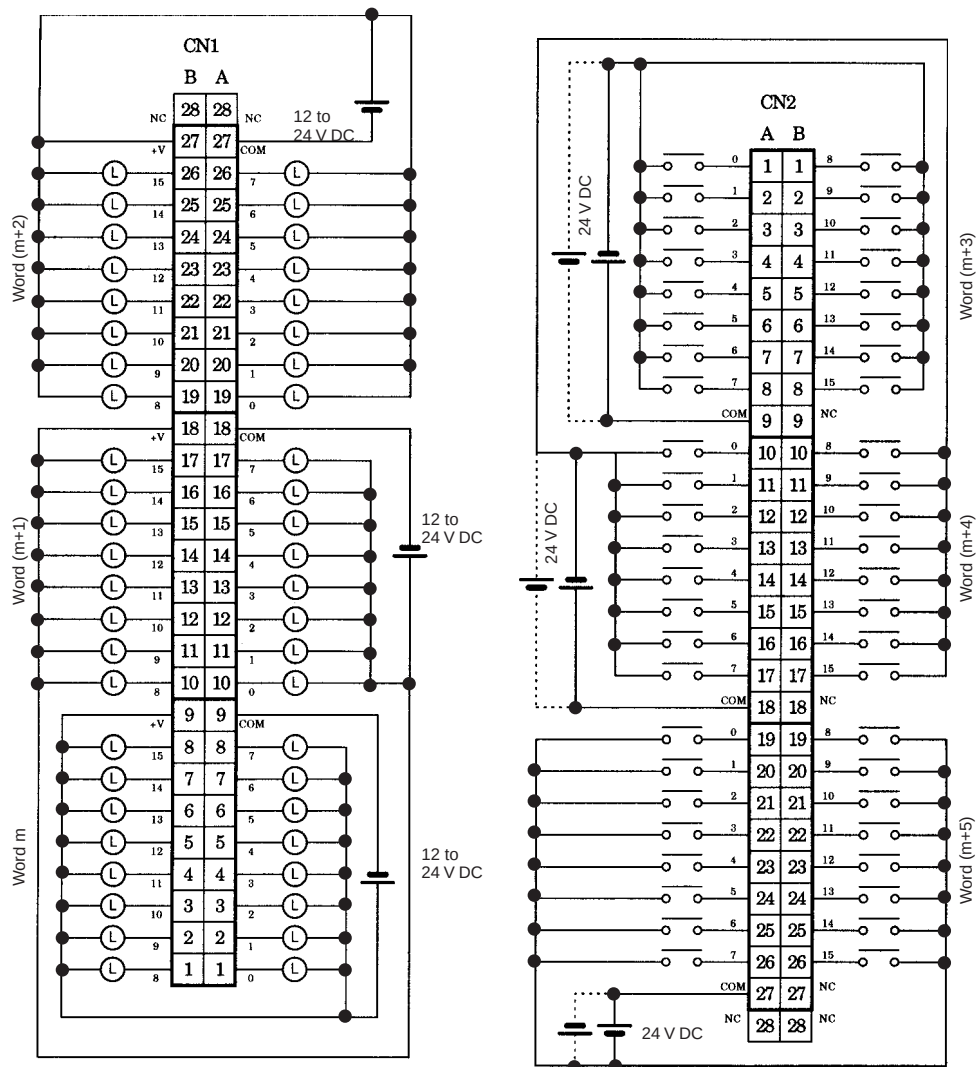
**Note** The input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup.

## Circuit Configuration



**Note** The ERR indicator will light if a fuse blows or if the external power supply is turned OFF, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

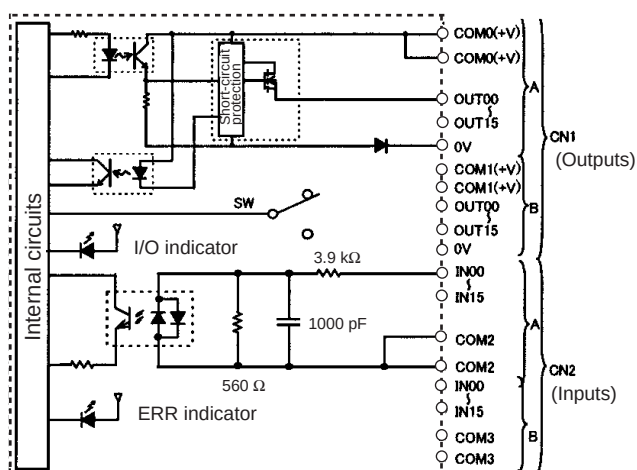
## Terminal Connections: CS1W-MD291 24-V DC 48-point Input/48-point Output Unit (Sinking Outputs)



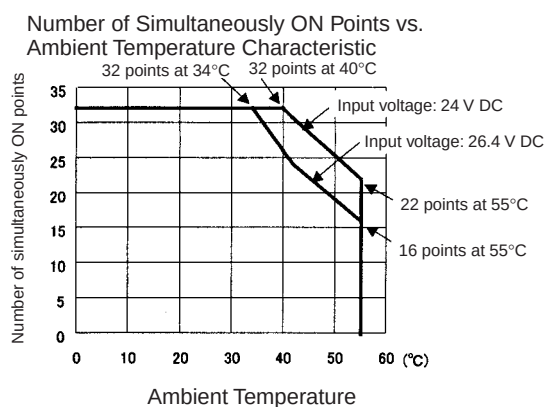
## CS1W-MD262 DC Input/Transistor Output Unit (32/32 Points, Sourcing)

| Output section (CN1)          |                                                                                                                                         | Input section (CN2)                |                                                                                                                            |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Rated Voltage                 | 24 V DC                                                                                                                                 | Rated Input Voltage                | 24 V DC                                                                                                                    |
|                               |                                                                                                                                         | Operating Input Voltage            | 20.4 to 26.4 V DC                                                                                                          |
| Operating Load Voltage Range  | 20.4 to 26.4 V DC                                                                                                                       | Input Impedance                    | 3.9 k $\Omega$                                                                                                             |
| Maximum Load Current          | 0.3 A/point, 1.6 A/common, 3.2 A/Unit                                                                                                   | Input Current                      | 6 mA typical (at 24 V DC)                                                                                                  |
| Leakage Current               | 0.1 mA max.                                                                                                                             | ON Voltage/ON Current              | 15.4 V DC min./3 mA min.                                                                                                   |
| Residual Voltage              | 1.5 V max.                                                                                                                              | OFF Voltage/OFF Current            | 5 V DC min./1 mA min.                                                                                                      |
| ON Response Time              | 0.5 ms max.                                                                                                                             | ON Response Time                   | 8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.) (Refer to the above Load Short-circuit Protection.)         |
| OFF Response Time             | 1.0 ms max.                                                                                                                             |                                    |                                                                                                                            |
| Load Short-circuit Prevention | Detection current: 0.7 to 2.5 A<br>Automatic restart after error clearance. (Refer to the above <i>Load Short-circuit Protection</i> .) | OFF Response Time                  | 8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.) (Refer to the above <i>Load Short-circuit Protection</i> .) |
| No. of Circuits               | 32 (16 points/common, 2 circuits)                                                                                                       |                                    |                                                                                                                            |
| External Power Supply         | 20.4 to 26.4 V DC, 70 mA min.                                                                                                           | Number of Simultaneously ON Points | 70% (11 points/common) (at 24 V DC)                                                                                        |
| Insulation Resistance         | 20 M $\Omega$ between the external terminals and the GR terminal (100 V DC)                                                             |                                    |                                                                                                                            |
| Dielectric Strength           | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.                           |                                    |                                                                                                                            |
| Internal Current Consumption  | 5 V DC 270 mA max.                                                                                                                      |                                    |                                                                                                                            |
| Weight                        | 270 g max.                                                                                                                              |                                    |                                                                                                                            |
| Accessories                   | Two connectors for external wiring (soldered)                                                                                           |                                    |                                                                                                                            |

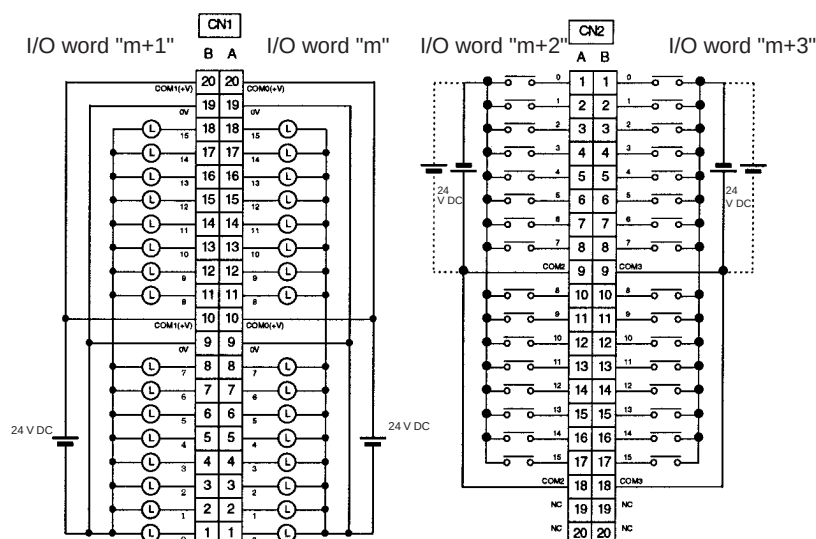
## Circuit Configuration







## Terminal Connections



- When wiring, pay careful attention to the polarity. The load may operate if the polarity is reversed.
- Although the +V and COM terminals of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

**Note** The ON response time will be 20  $\mu$ s maximum and OFF response time will be 300  $\mu$ s maximum even if the response times are set to 0 ms due to internal element delays.

**CS1W-MD292 DC Input/Transistor Output Unit (48/48 Points, Sourcing)****Outputs (CN1)**

|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Voltage                | 12 to 24 V DC                                                                                                 |
| Operating Load Voltage Range | 10.2 to 26.4 V DC                                                                                             |
| Maximum Load Current         | 0.1 A/point, 1.2 A/common, 3.6 A/Unit (See note.)                                                             |
| Maximum Inrush Current       | 1.0 A/point, 10 ms max.<br>8.0 A/common, 10 ms max.                                                           |
| Leakage Current              | 0.1 mA max.                                                                                                   |
| Residual Voltage             | 1.5 V max.                                                                                                    |
| ON Response Time             | 0.5 ms max.                                                                                                   |
| OFF Response Time            | 1.0 ms max.                                                                                                   |
| No. of Circuits              | 48 points (16 points/common, 3 commons)                                                                       |
| Fuse                         | 3 A (1 per common)<br>The fuse cannot be replaced by the user.                                                |
| External Power Supply        | 10.2 to 26.4 V DC, 50 mA min.                                                                                 |
| Insulation Resistance        | 20 M $\Omega$ between the external terminals and the GR terminal (100 V DC)                                   |
| Dielectric Strength          | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption | 350 mA max. at 5 V DC                                                                                         |
| Weight                       | 320 g max.                                                                                                    |
| Accessories                  | Two connectors for external wiring (soldered)                                                                 |

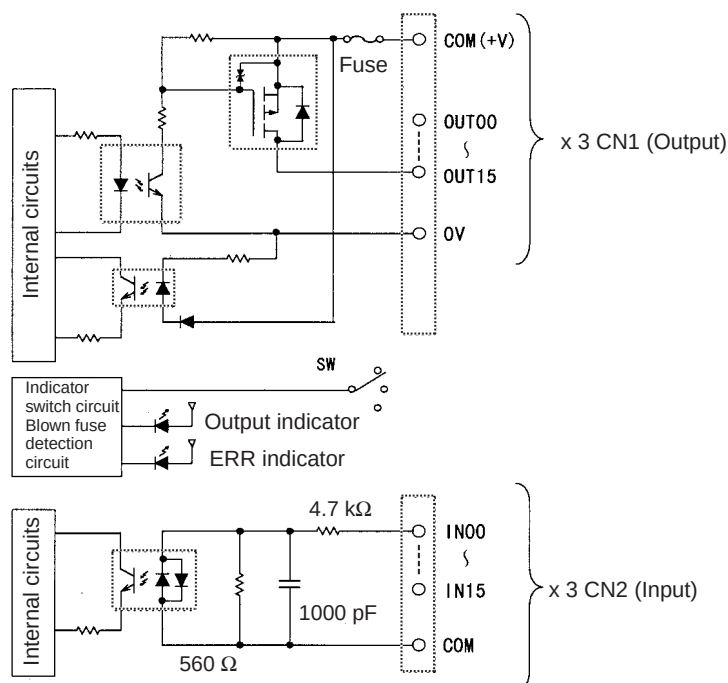
**Note** The maximum load currents will be 1.0 A/common and 3.0 A/Unit if a pressure-welded connector is used.

## Inputs (CN2)

|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 24 V DC                                                                                                       |
| Operating Input Voltage            | 20.4 to 26.4 V DC                                                                                             |
| Input Impedance                    | 4.7 k $\Omega$                                                                                                |
| Input Current                      | Approx. 5 mA (at 24 V DC)                                                                                     |
| ON Voltage/ON Current              | 17 V DC min./3 mA min.                                                                                        |
| OFF Voltage/OFF Current            | 5.0 V DC max./1 mA max.                                                                                       |
| ON Response Time                   | 8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note below.)   |
| OFF Response Time                  | 8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note below.)   |
| No. of Circuits                    | 48 points (16 points/common, 3 commons)                                                                       |
| Number of Simultaneously ON Points | 50% (8 points/common) (at 24 V DC) (Depends on ambient temperature.)                                          |
| Insulation Resistance              | 20 M $\Omega$ between the external terminals and the GR terminal (100 V DC)                                   |
| Dielectric Strength                | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption       | 350 mA max. at 5 V DC                                                                                         |
| Weight                             | 320 g max.                                                                                                    |
| Accessories                        | Two connectors for external wiring (soldered)                                                                 |

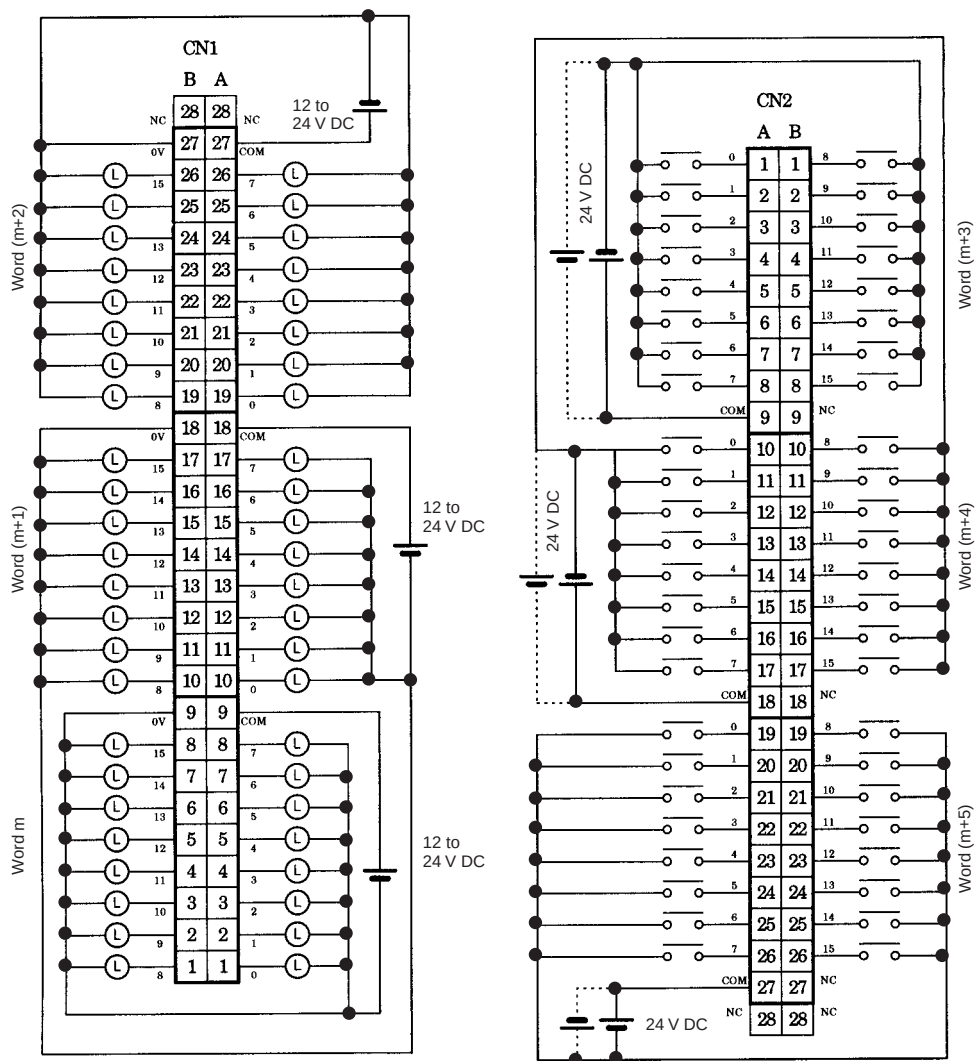
**Note** The input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup.

## Circuit Configuration



**Note** The ERR indicator will light if a fuse blows or if the external power supply is turned OFF, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

Terminal Connections: CS1W-MD292 24-V DC 48-point Input/48-point Transistor Output Unit (Sourcing Outputs)



## CS1W-MD561 TTL I/O Unit (32/32 Points)

## Outputs (CN1)

|                              |                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Voltage                | 5 V DC $\pm$ 10%                                                                                              |
| Operating Load Voltage Range | 4.5 to 5.5 V DC                                                                                               |
| Maximum Load Current         | 35 mA/point, 560 mA/common, 1.12 A/Unit (See note.)                                                           |
| Leakage Current              | 0.1 mA max.                                                                                                   |
| Residual Voltage             | 0.4 V max.                                                                                                    |
| ON Response Time             | 0.2 ms max.                                                                                                   |
| OFF Response Time            | 0.3 ms max.                                                                                                   |
| No. of Circuits              | 32 points (16 points/common, 2 commons)                                                                       |
| Fuse                         | None                                                                                                          |
| External Power Supply        | 5 V DC $\pm$ 10%, 40 mA min. (1.2 mA $\times$ No. of ON points)                                               |
| Insulation Resistance        | 20 M $\Omega$ between the external terminals and the GR terminal (100 V DC)                                   |
| Dielectric Strength          | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption | 270 mA max. at 5 V DC                                                                                         |
| Weight                       | 260 g max.                                                                                                    |
| Accessories                  | Two connectors for external wiring (soldered)                                                                 |

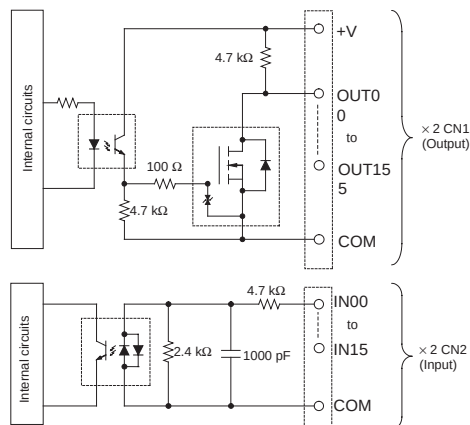
**Note** The maximum load currents will be 1.0 A/common and 3.0 A/Unit if a pressure-welded connector is used.

## Inputs (CN2)

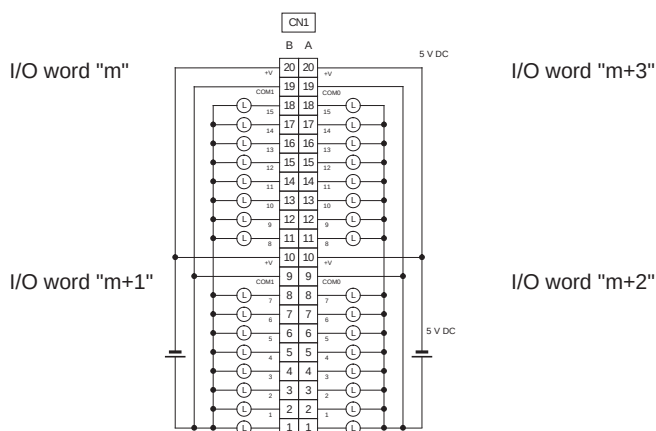
|                                    |                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Rated Input Voltage                | 5 V DC $\pm$ 10%                                                                                              |
| Input Impedance                    | 1.1 k $\Omega$                                                                                                |
| Input Current                      | Approx. 5 mA (at 24 V DC)                                                                                     |
| ON Voltage                         | 3.0 V DC min.                                                                                                 |
| OFF Voltage                        | 1.0 V DC max.                                                                                                 |
| ON Response Time                   | 8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note.)         |
| OFF Response Time                  | 8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note.)         |
| No. of Circuits                    | 32 points (16 points/common, 2 commons)                                                                       |
| Number of Simultaneously ON Points | No restrictions                                                                                               |
| Insulation Resistance              | 20 M $\Omega$ between the external terminals and the GR terminal (100 V DC)                                   |
| Dielectric Strength                | 1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Internal Current Consumption       | 270 mA max. at 5 V DC                                                                                         |
| Weight                             | 260 g max.                                                                                                    |
| Accessories                        | Two connectors for external wiring (soldered)                                                                 |

**Note** The input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup.

## Circuit Configuration



## Terminal Connections: CS1W-MD561 TTL 32-point Input/32-point Output Unit



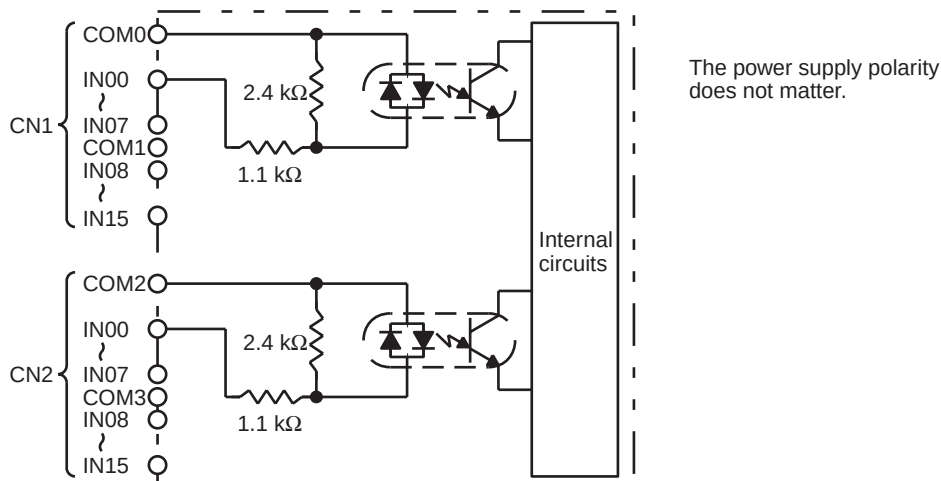
- When wiring, pay careful attention to the polarity. The load may operate if the polarity is reversed.
- Although the +V and COM terminals of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

## High-density I/O Units (Special I/O Units)

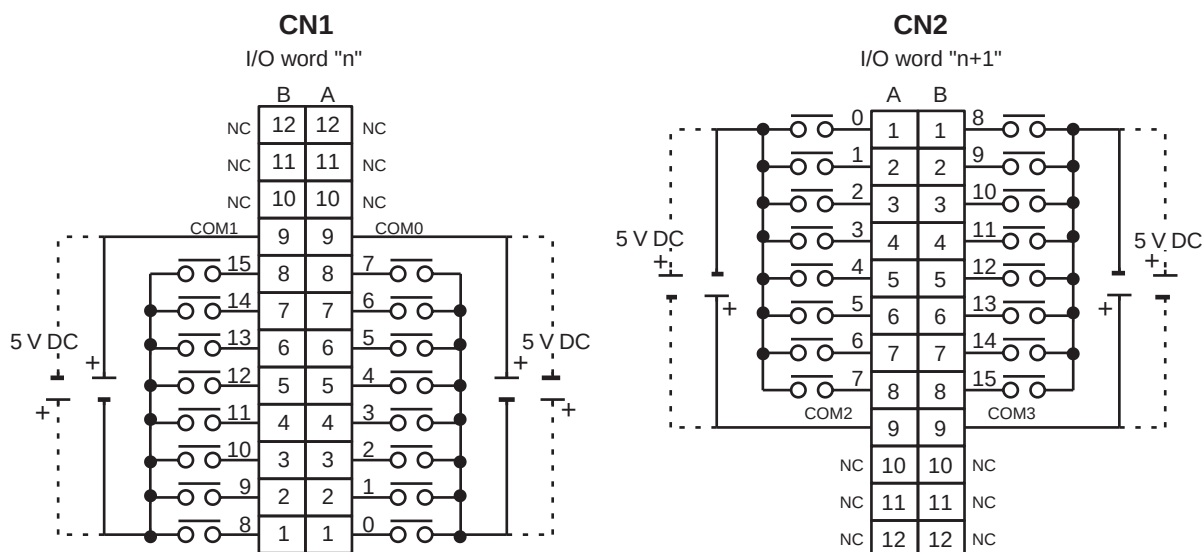
## C200H-ID501 TTL Input Unit Used for 32 Static Inputs

|                              |                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------|
| Rated Input Voltage          | 5 V DC $\pm 10\%$                                                                              |
| Input Impedance              | 1.1 k $\Omega$                                                                                 |
| Input Current                | 3.5 mA typical (at 5 V DC)                                                                     |
| ON Voltage                   | 3.0 V DC min.                                                                                  |
| OFF Voltage                  | 1.0 V DC max.                                                                                  |
| ON Response Time             | 2.5 ms/15 ms max.                                                                              |
| OFF Response Time            | 2.5 ms/15 ms max.                                                                              |
| No. of Circuits              | 4 (8 points/common)                                                                            |
| High-speed Inputs            | 8 points (connector 2 terminals 8 to 15, when set)<br>Pulse width: 1 ms/4 ms min. (switchable) |
| Internal Current Consumption | 130 mA 5 V DC max.                                                                             |
| Weight                       | 300 g max.                                                                                     |

## Circuit Configuration



## Terminal Connections

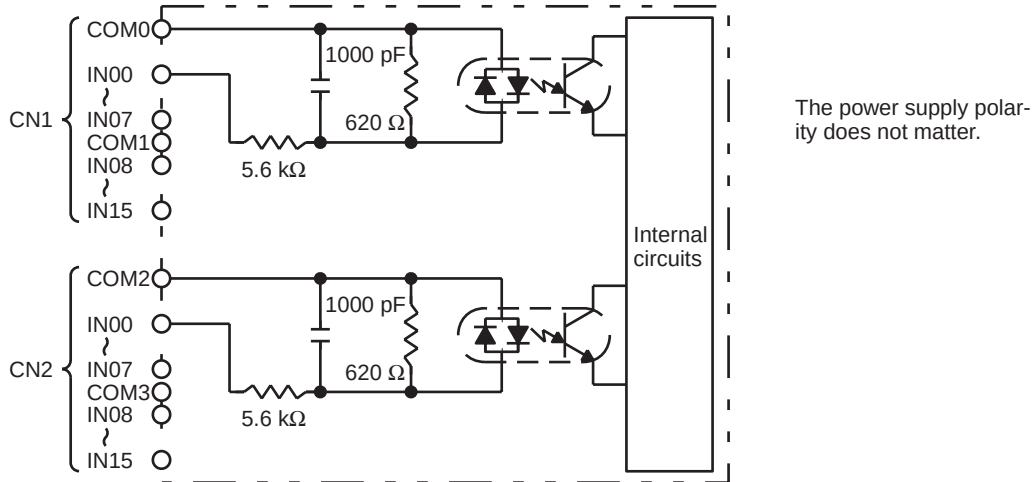


**Note** When pin 2 of the Unit's DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.

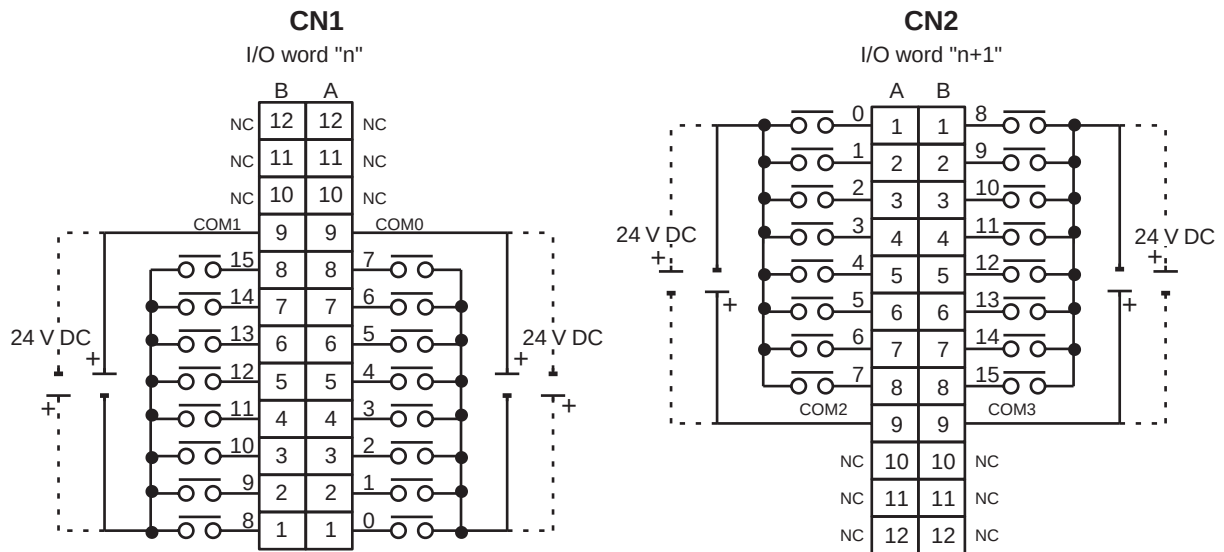
## C200H-ID215 DC Input Unit Used for 32 Static Inputs

|                              |                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------|
| Rated Input Voltage          | 24 V DC                                                                                        |
| Operating Input Voltage      | 20.4 to 26.4 V DC                                                                              |
| Input Impedance              | 5.6 kΩ                                                                                         |
| Input Current                | 4.1 mA (at 24 V DC)                                                                            |
| ON Voltage                   | 14.4 V DC min.                                                                                 |
| OFF Voltage                  | 5.0 V DC max.                                                                                  |
| ON Response Time             | 2.5 ms/15 ms max.                                                                              |
| OFF Response Time            | 2.5 ms/15 ms max.                                                                              |
| No. of Circuits              | 4 (8 points/common)                                                                            |
| High-speed Inputs            | 8 points (connector 2 terminals 8 to 15, when set)<br>Pulse width: 1 ms/4 ms min. (switchable) |
| Internal Current Consumption | 130 mA 5 V DC max.                                                                             |
| Weight                       | 300 g max.                                                                                     |

Circuit Configuration



Terminal Connections

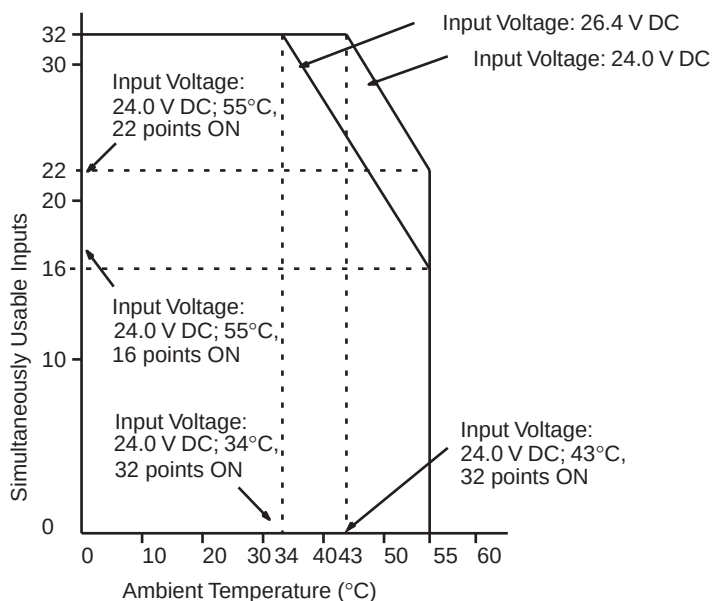


- Note**
1. When pin 2 of the Unit's DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.
  2. At high temperatures, the number of inputs that can be turned ON simultaneously is limited. Refer to the graphs on the following page for details.



## Number of Simultaneous Inputs

The number C200H-ID215 24-V DC inputs that can be ON simultaneously will vary with ambient temperature as shown in the figure below.

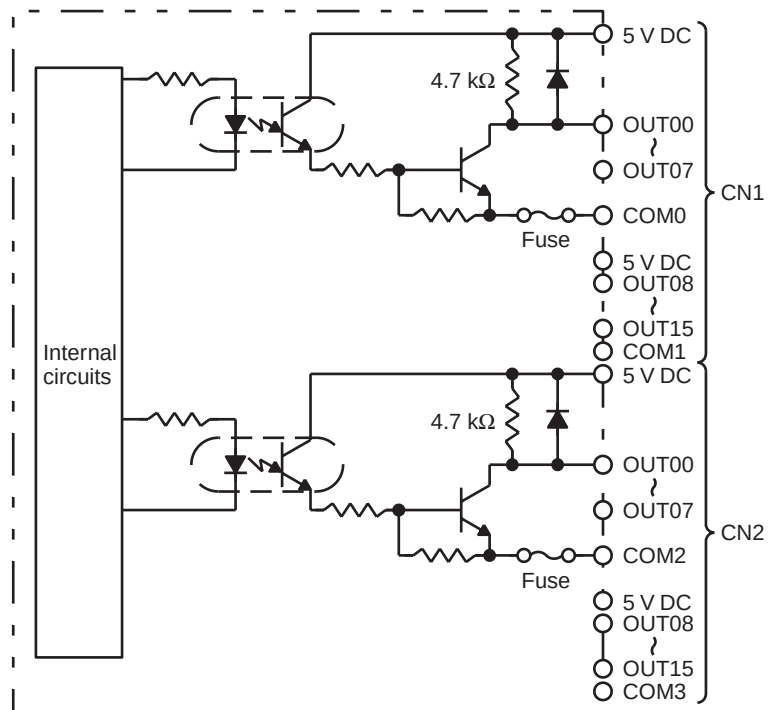


If the number of inputs that are ON exceeds the number that can be ON at the same time, then heat generated by electronic components will increase the temperature of the components and the case. Higher temperatures will lower the reliability and service life of the elements and will damage the Unit. Higher temperatures in electronic components and the case will also cause time delays. There is no particular problem if all input points are turned ON for less than 10 minutes (if all input points have been OFF for at least 2 hours) under special conditions, such as during startup work inspections.

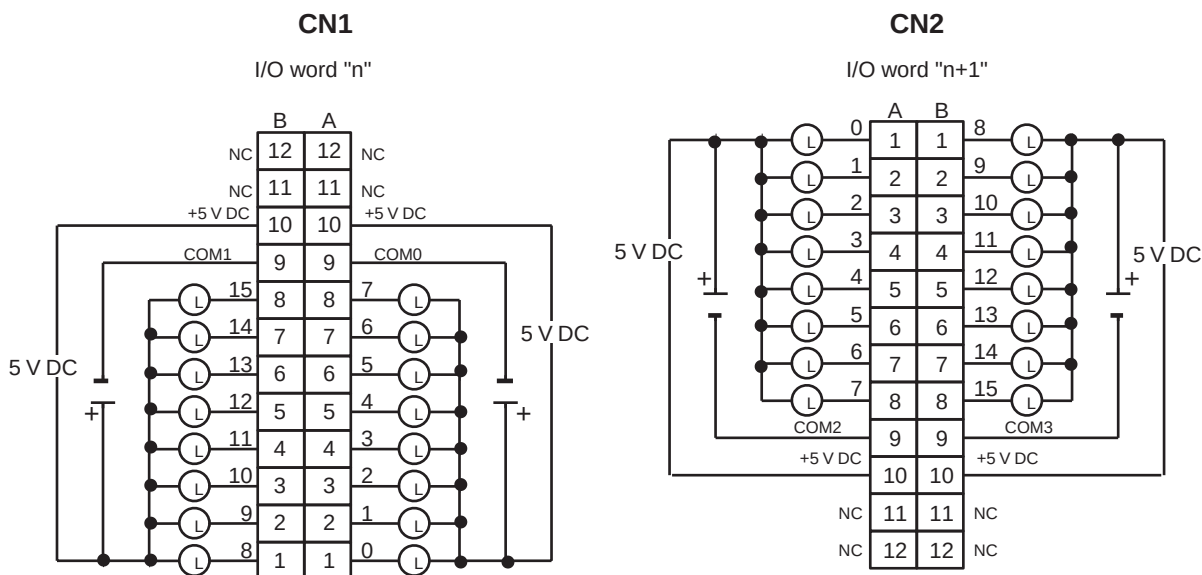
## C200H-OD501 TTL Output Unit Used for 32 Static Outputs

|                              |                                                                                        |
|------------------------------|----------------------------------------------------------------------------------------|
| Max. Switching Capacity      | 5 V DC $\pm$ 10% 35 mA (280 mA/common, 1.12 A/Unit; output resistance 4.7 k $\Omega$ ) |
| Min. Switching Capacity      | None                                                                                   |
| Leakage Current              | 0.1 mA max.                                                                            |
| Residual Voltage             | 0.4 V max.                                                                             |
| ON Response Time             | 0.2 ms max.                                                                            |
| OFF Response Time            | 0.3 ms max.                                                                            |
| No. of Circuits              | 4 (8 points/common)                                                                    |
| Internal Current Consumption | 220 mA 5 V DC max.                                                                     |
| Fuses                        | 4 (1 fuse/common; fuses are not user-replaceable.)                                     |
| Power for External Supply    | 39 mA 5 V DC $\pm$ 10% min. (1.2 mA $\times$ no. of outputs ON)                        |
| Weight                       | 300 g max.                                                                             |

## Circuit Configuration



## Terminal Connections

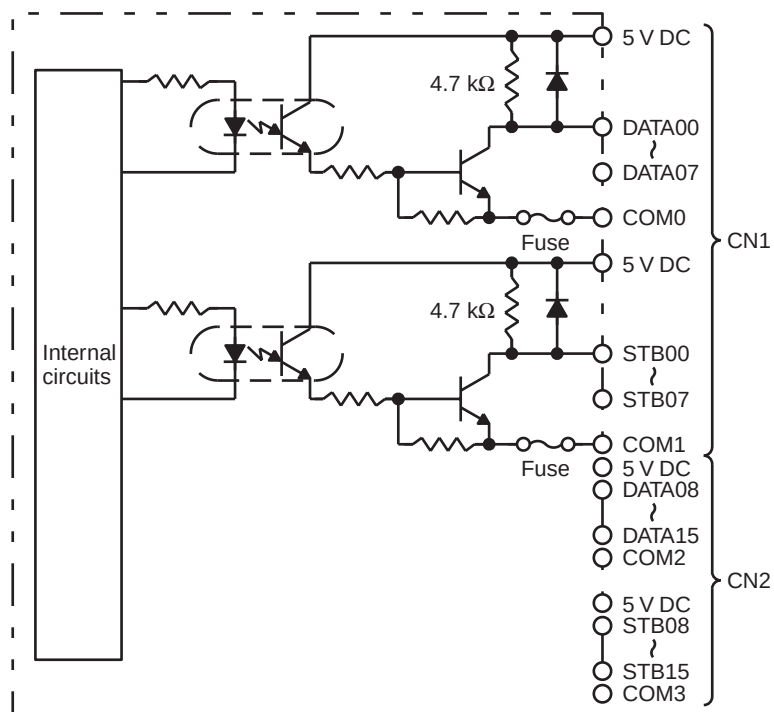


- Note**
1. I/O word "n" is determined by the unit number setting ( $n = \text{CIO 2000} + 10 \times \text{unit number}$ ).
  2. The Unit will have 32 static output points when pin 1 of its DIP switch is OFF.
  3. The outputs are negative logic outputs; when there is an output, the terminal has an "L" voltage level. Each output terminal has an output resistance of 4.7 kΩ.

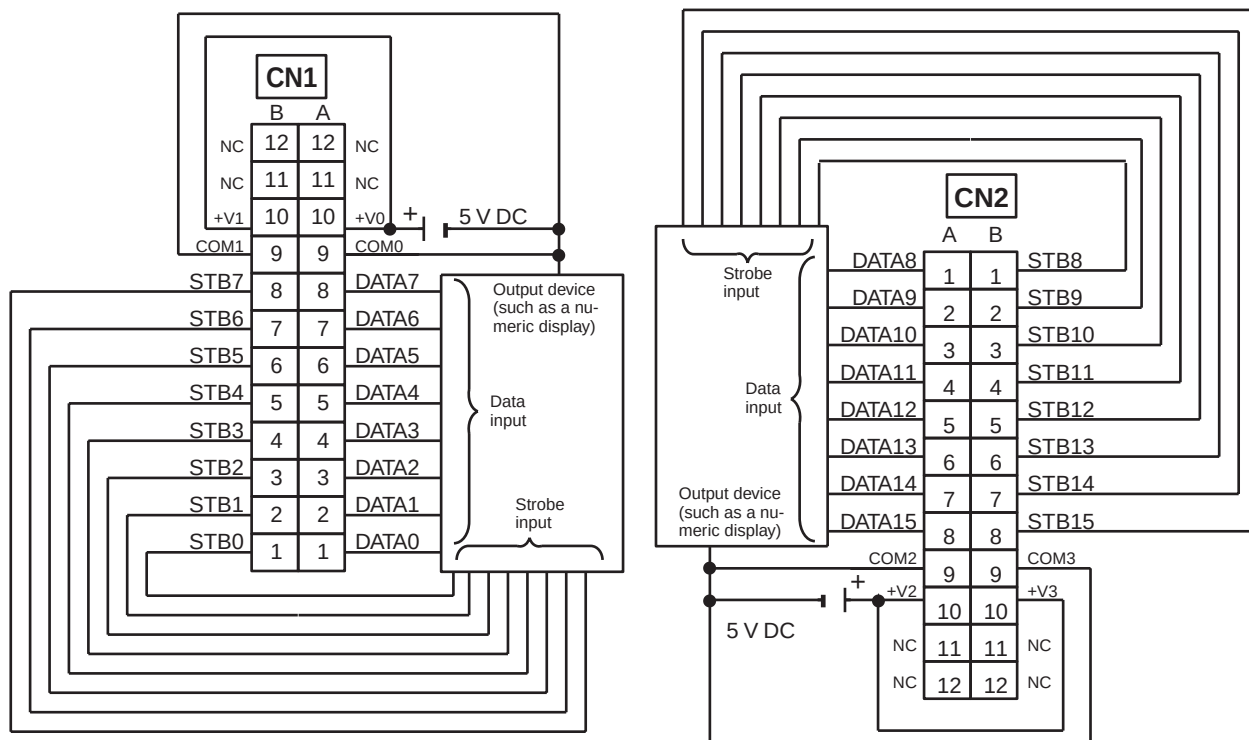
## C200H-OD501 TTL Output Unit Used for 128 Dynamic Inputs

|                              |                                                                                        |
|------------------------------|----------------------------------------------------------------------------------------|
| Max. Switching Capacity      | 5 V DC $\pm$ 10% 35 mA (280 mA/common, 1.12 A/Unit; output resistance 4.7 k $\Omega$ ) |
| Leakage Current              | 0.1 mA max.                                                                            |
| Residual Voltage             | 0.4 V max.                                                                             |
| ON Response Time             | 0.2 ms max.                                                                            |
| OFF Response Time            | 0.3 ms max.                                                                            |
| No. of Circuits              | 2 (dynamic, 64 points/circuit)                                                         |
| Internal Current Consumption | 220 mA 5 V DC max.                                                                     |
| Fuses                        | 4 (1 fuse/common; fuses are not user-replaceable.)                                     |
| Power for External Supply    | 39 mA 5 V DC min. (1.2 mA $\times$ no. of outputs ON)                                  |
| Weight                       | 300 g max.                                                                             |

## Circuit Configuration



## Terminal Connections



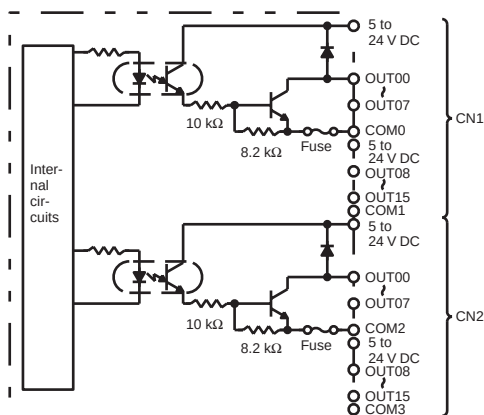
- Note**
1. Refer to the Unit's operation manual for details on I/O bit allocation.
  2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.
  3. Set pin 5 of the Unit's DIP switch ON for positive logic outputs, or OFF for negative logic outputs. When set for negative logic outputs, the terminal has an "L" voltage level when there is an output. When set for positive logic outputs, the terminal has an "H" voltage level when there is an output.
  4. The strobe signal has negative logic regardless of the setting of pin 5.
  5. Each output terminal has an output resistance of 4.7 kΩ.

## C200H-OD215 Transistor Output Unit Used for 32 Static Outputs

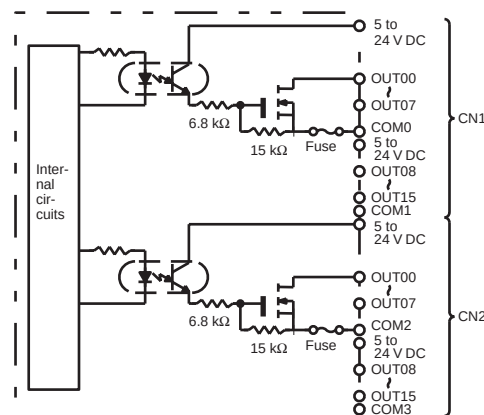
|                              |                                                                   |
|------------------------------|-------------------------------------------------------------------|
| Max. Switching Capacity      | 16 mA, 4.5 V DC to 100 mA, 26.4 V DC<br>800 mA/common, 3.2 A/Unit |
| Leakage Current              | 0.1 mA max.                                                       |
| Residual Voltage             | 0.7 V max.                                                        |
| ON Response Time             | 0.2 ms max.                                                       |
| OFF Response Time            | 0.6 ms max.                                                       |
| No. of Circuits              | 4 (8 points/common)                                               |
| Internal Current Consumption | 220 mA 5 V DC max.                                                |
| Fuses                        | 4 (1 fuse/common; fuses are not user-replaceable.)                |
| Power for External Supply    | 90 mA 5 to 24 V DC±10% min.<br>(2.8 mA × number of ON outputs)    |
| Weight                       | 300 g max.                                                        |

## Circuit Configuration

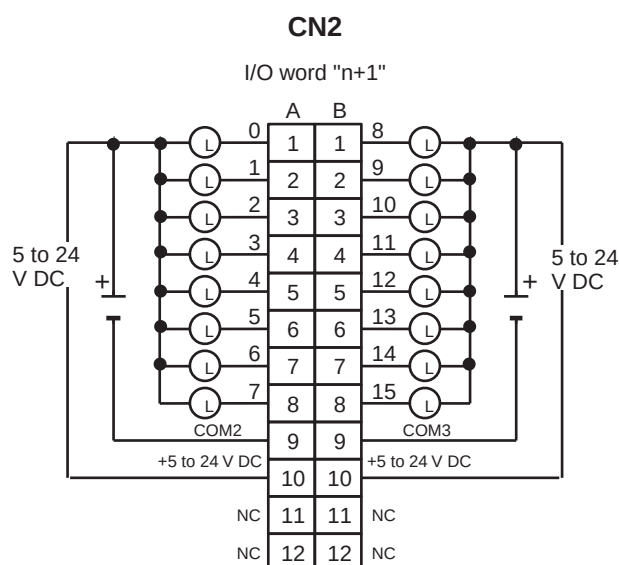
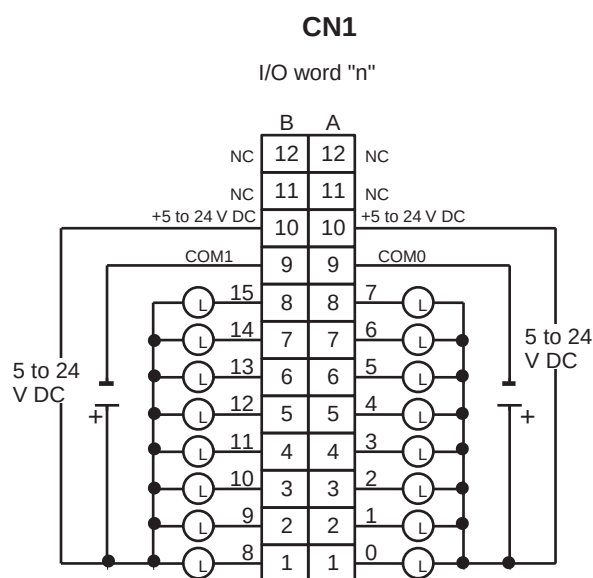
Units manufactured on or before November 29, 1999  
(manufacturing numbers 29Y9 or earlier)



Units manufactured on or after November 30, 1999  
(manufacturing numbers 30Y9 or later)



## Terminal Connections



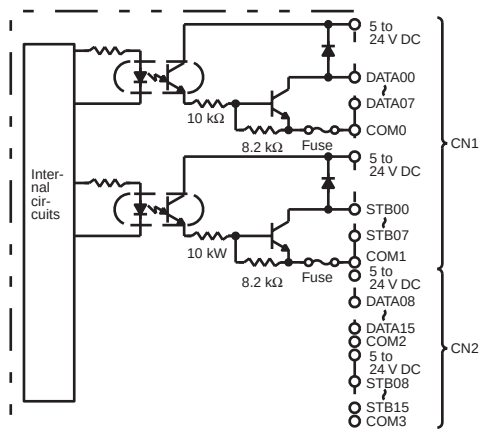
- Note**
1. I/O word "n" is determined by the unit number setting ( $n = \text{CIO } 2000 + 10 \times \text{unit number}$ ).
  2. The Unit will have 32 static output points when pin 1 of it's DIP switch is OFF.

## C200H-OD215 Transistor Output Unit Used for 128 Dynamic Outputs

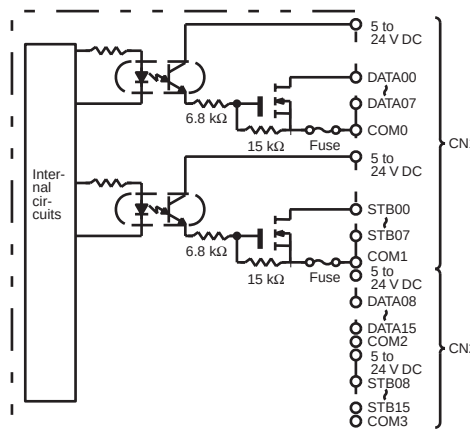
|                              |                                                                             |
|------------------------------|-----------------------------------------------------------------------------|
| Max. Switching Capacity      | 16 mA, 4.5 V DC to 100 mA, 26.4 V DC<br>800 mA/common, 3.2 A/Unit           |
| Leakage Current              | 0.1 mA max.                                                                 |
| Residual Voltage             | 0.7 V max.                                                                  |
| ON Response Time             | 0.2 ms max.                                                                 |
| OFF Response Time            | 0.6 ms max.                                                                 |
| No. of Circuits              | 2 (dynamic, 64 points/circuit)                                              |
| Internal Current Consumption | 220 mA 5 V DC max.                                                          |
| Fuses                        | 4 (1 fuse/common; fuses are not user-replaceable.)                          |
| Power for External Supply    | 90 mA 5 to 24 V DC $\pm$ 10% min.<br>(2.8 mA $\times$ number of ON outputs) |
| Weight                       | 300 g max.                                                                  |

## Circuit Configuration

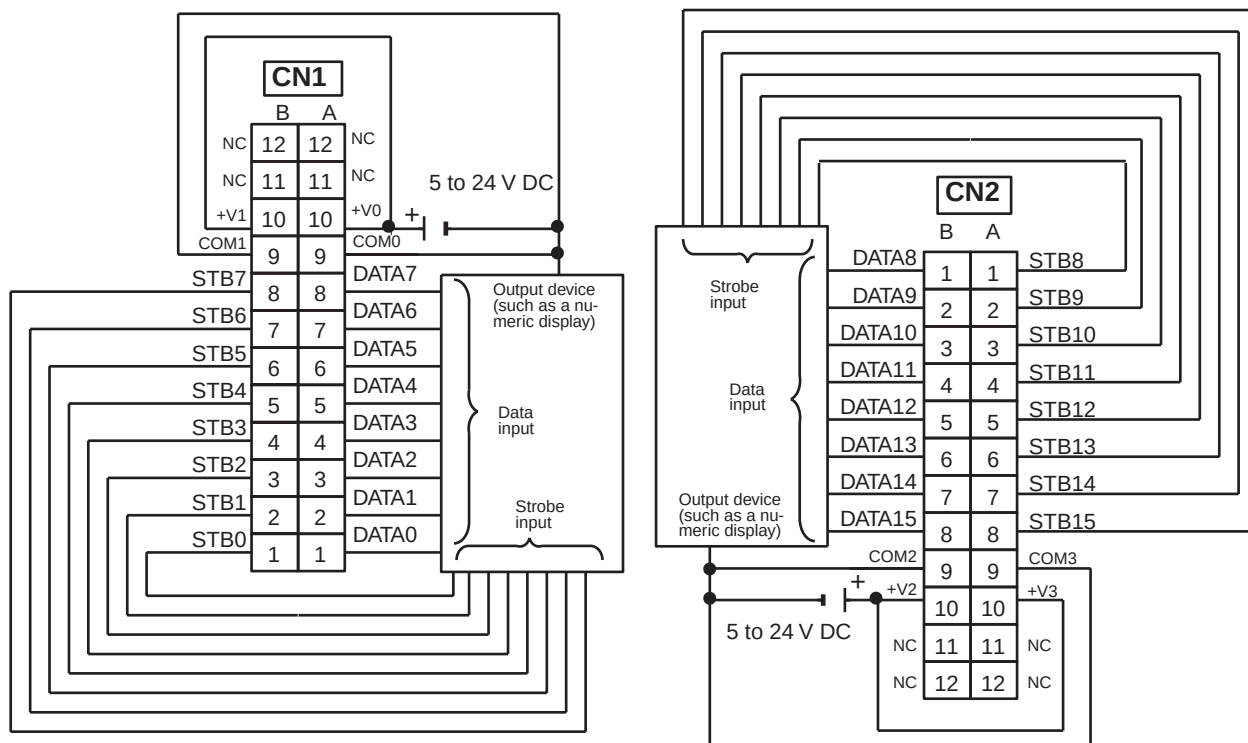
Units manufactured on or before November 29, 1999  
(manufacturing numbers 29Y9 or earlier)



Units manufactured on or after November 30, 1999  
(manufacturing numbers 30Y9 or later)



## Terminal Connections



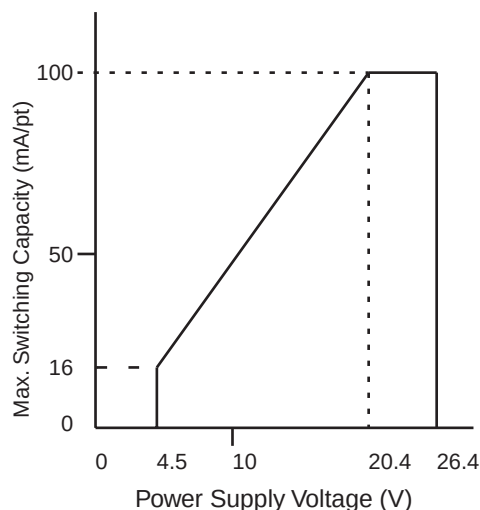
- Note**
1. Refer to the Unit's operation manual for details on I/O bit allocation.
  2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.
  3. Set pin 5 of the Unit's DIP switch ON for positive logic outputs, or OFF for negative logic outputs. When set for negative logic outputs, the terminal has an "L" voltage level when there is an output. When set for positive logic outputs, the terminal has an "H" voltage level when there is an output.
  4. The strobe signal has negative logic regardless of the setting of pin 5.
  5. When the output device (such as a numeric display) does not have a pull-up resistor, it is necessary to add a pull-up resistor between the + terminal of the power supply and each data (0 to 15) and strobe (0 to 15) terminal.

## High-density I/O Unit Limitations

Limitations on the switching capacity of C200H-OD215/MD115/MD215 Transistor Output Units and the usable number of I/O points in the C200H-ID215 and C200H-MD215 are shown below.

### Switching Capacity

The switching capacity of C200H-OD215/MD115/MD215 Transistor Output Units depends on the power supply voltage, as shown below.



## C200H-MD501 TTL I/O Unit Used for 16 Static Inputs and 16 Static Outputs

### Output Specifications (Connector 1)

|                           |                                                                                        |
|---------------------------|----------------------------------------------------------------------------------------|
| Max. Switching Capacity   | 5 V DC $\pm$ 10% 35 mA (280 mA/common, 560 mA/Unit; output resistance 4.7 k $\Omega$ ) |
| Leakage Current           | 0.1 mA max.                                                                            |
| Residual Voltage          | 0.4 V max.                                                                             |
| ON Response Time          | 0.2 ms max.                                                                            |
| OFF Response Time         | 0.3 ms max.                                                                            |
| No. of Circuits           | 2 (8 points/common)                                                                    |
| Fuses                     | 2 (1 fuse/common; fuses are not user-replaceable.)                                     |
| Power for External Supply | 20 mA 5 V DC $\pm$ 10% min. (1.2 mA $\times$ no. of outputs ON)                        |

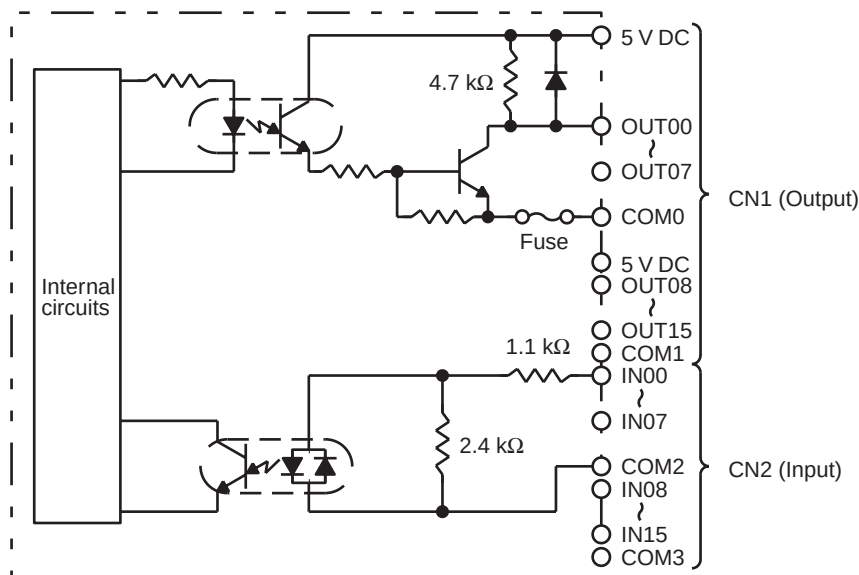
### Input Specifications (Connector 2)

|                     |                                                                                                |
|---------------------|------------------------------------------------------------------------------------------------|
| Rated Input Voltage | 5 V DC $\pm$ 10%                                                                               |
| Input Impedance     | 1.1 k $\Omega$                                                                                 |
| Input Current       | 3.5 mA typical (at 5 V DC)                                                                     |
| ON Voltage          | 3.0 V DC min.                                                                                  |
| OFF Voltage         | 1.0 V DC max.                                                                                  |
| ON Response Time    | 2.5 ms/15 ms max. (switchable)                                                                 |
| OFF Response Time   | 2.5 ms/15 ms max. (switchable)                                                                 |
| No. of Circuits     | 2 (8 points/common)                                                                            |
| High-speed Inputs   | 8 points (connector 2 terminals 8 to 15, when set)<br>Pulse width: 1 ms/4 ms min. (switchable) |

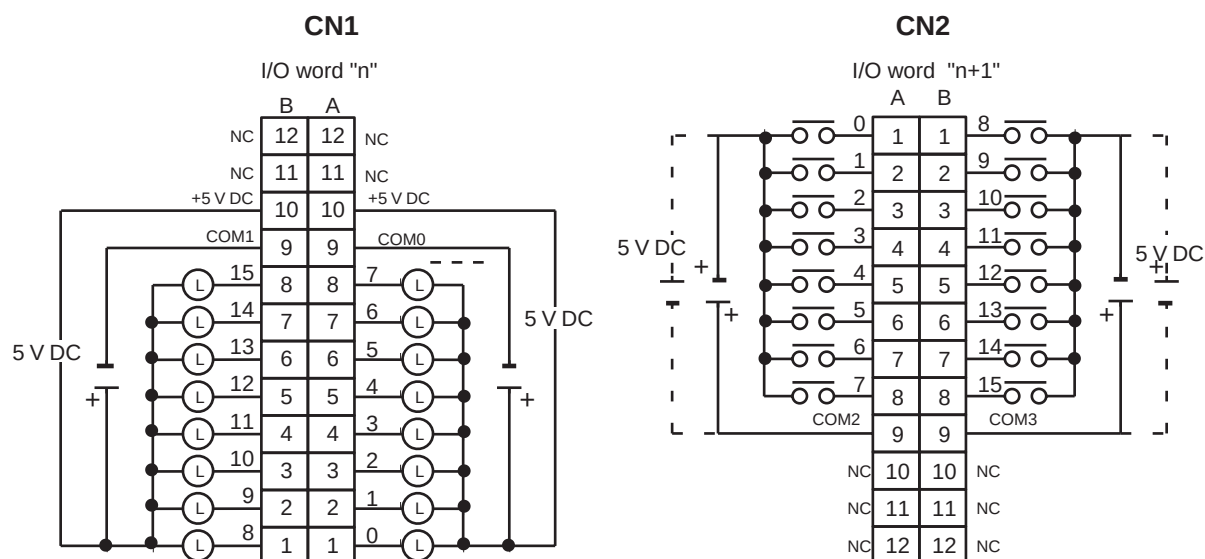
### General Specifications

|                              |                    |
|------------------------------|--------------------|
| Internal Current Consumption | 180 mA 5 V DC max. |
| Weight                       | 300 g max.         |

## Circuit Configuration



## Terminal Connections



- Note**
1. The Unit will have 16 static output and 16 static input points when pin 1 of its DIP switch is OFF.
  2. When pin 2 of the Unit's DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.
  3. The outputs are negative logic outputs; when there is an output, the terminal has an "L" voltage level. Each output terminal has an output resistance of 4.7 kΩ.
  4. The user is not authorized to change the fuse.



## C200H-MD501 TTL I/O Unit Used for 128 Dynamic Inputs

### Output Specifications (Connector 1)

|                           |                                                                                        |
|---------------------------|----------------------------------------------------------------------------------------|
| Max. Switching Capacity   | 5 V DC $\pm$ 10% 35 mA (280 mA/common, 560 mA/Unit; output resistance 4.7 k $\Omega$ ) |
| Min. Switching Capacity   | None                                                                                   |
| Leakage Current           | 0.1 mA max.                                                                            |
| Residual Voltage          | 0.4 V max.                                                                             |
| ON Response Time          | 0.2 ms max.                                                                            |
| OFF Response Time         | 0.3 ms max.                                                                            |
| Fuses                     | 2 (1 fuse/common; fuses are not user-replaceable.)                                     |
| Power for External Supply | 20 mA 5 V DC $\pm$ 10% min. (1.2 mA $\times$ no. of outputs ON)                        |

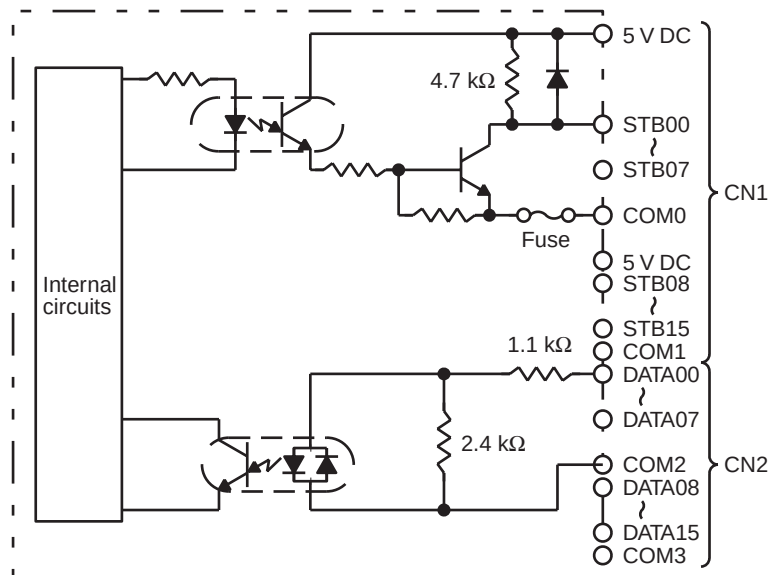
### Input Specifications (Connector 2)

|                     |                    |
|---------------------|--------------------|
| Rated Input Voltage | 5 V DC $\pm$ 10%   |
| Input Impedance     | 1.1 k $\Omega$     |
| Input Current       | 3.5 mA (at 5 V DC) |
| ON Voltage          | 3.0 V DC min.      |
| OFF Voltage         | 1.0 V DC max.      |

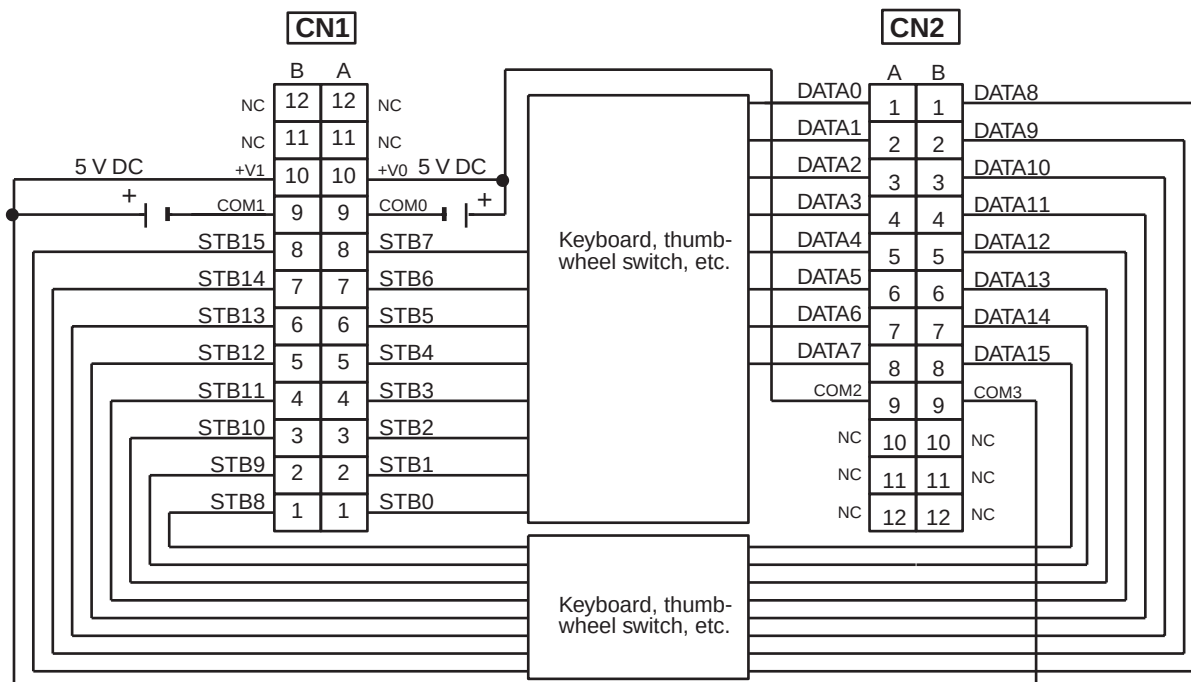
### General Specifications

|                              |                                |
|------------------------------|--------------------------------|
| No. of Circuits              | 2 (dynamic, 64 points/circuit) |
| Internal Current Consumption | 180 mA 5 V DC max.             |
| Weight                       | 300 g max.                     |

### Circuit Configuration



## Terminal Connections



- Note**
1. Refer to the Unit's operation manual for details on I/O bit allocation.
  2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.
  3. Each output terminal has an output resistance of 4.7 k $\Omega$ .

## C200H-MD115 12-V DC Input/Transistor Output Unit Used for 16 Static Inputs and 16 Static Outputs

### Output Specifications (Connector 1)

|                           |                                                                             |
|---------------------------|-----------------------------------------------------------------------------|
| Max. Switching Capacity   | 16 mA, 4.5 V DC to 100 mA, 26.4 V DC<br>800 mA/common, 1.6 A/Unit           |
| Leakage Current           | 0.1 mA max.                                                                 |
| Residual Voltage          | 0.7 V max.                                                                  |
| ON Response Time          | 0.2 ms max.                                                                 |
| OFF Response Time         | 0.6 ms max.                                                                 |
| No. of Circuits           | 2 (8 points/common)                                                         |
| Fuses                     | 2 (1 fuse/common; fuses are not user-replaceable.)                          |
| Power for External Supply | 45 mA 5 to 24 V DC $\pm$ 10% min.<br>(2.8 mA $\times$ number of ON outputs) |

### Input Specifications (Connector 2)

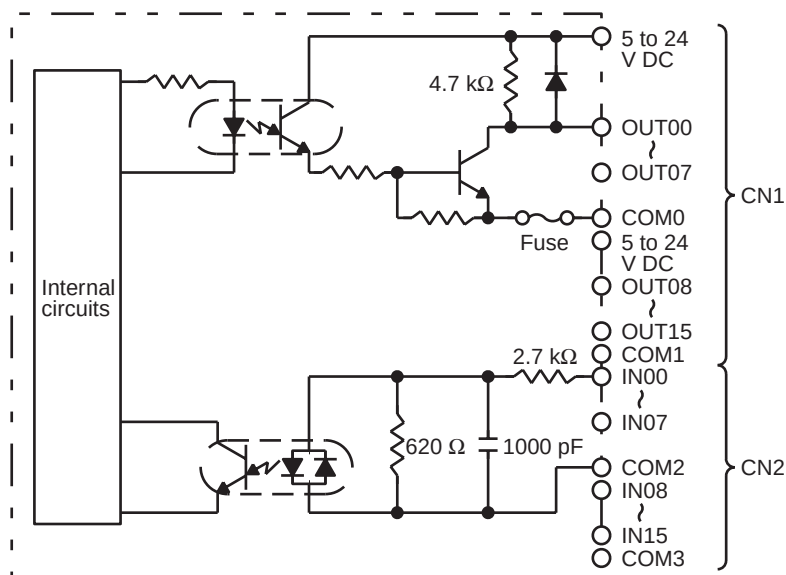
|                         |                                |
|-------------------------|--------------------------------|
| Rated Input Voltage     | 12 V DC                        |
| Operating Input Voltage | 10.2 to 13.2 V DC              |
| Input Impedance         | 2.7 k $\Omega$                 |
| Input Current           | 4.1 mA typical (at 12 V DC)    |
| ON Voltage              | 8.0 V DC min.                  |
| OFF Voltage             | 3.0 V DC max.                  |
| ON Response Time        | 2.5 ms/15 ms max. (switchable) |
| OFF Response Time       | 2.5 ms/15 ms max. (switchable) |

|                   |                                                                                                |
|-------------------|------------------------------------------------------------------------------------------------|
| No. of Circuits   | 2 (8 points/common)                                                                            |
| High-speed Inputs | 8 points (connector 2 terminals 8 to 15, when set)<br>Pulse width: 1 ms/4 ms min. (switchable) |

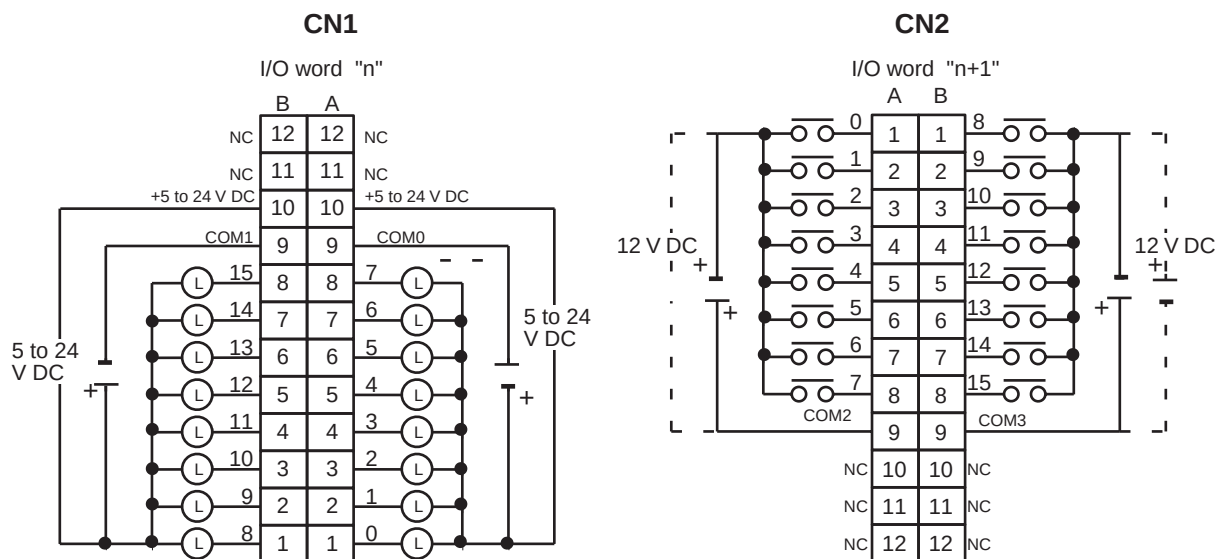
## General Specifications

|                              |                    |
|------------------------------|--------------------|
| Internal Current Consumption | 180 mA 5 V DC max. |
| Weight                       | 300 g max.         |

## Circuit Configuration



## Terminal Connections



- Note**
1. I/O word "n" is determined by the unit number setting ( $n = \text{CIO } 2000 + 10 \times \text{unit number}$ ).
  2. The Unit will have 16 static output and 16 static input points when pin 1 of it's DIP switch is OFF.
  3. When pin 2 of the Unit's DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.
  4. The user is not authorized to change the fuse.

## C200H-MD115 12-V DC Input/Transistor Output Unit Used for 128 Dynamic Inputs

### Output Specifications (Connector 1)

|                           |                                                                             |
|---------------------------|-----------------------------------------------------------------------------|
| Max. Switching Capacity   | 50 mA 12 V DC (10.2 to 13.2 V DC), 400 mA/common, 0.8 A/Unit                |
| Leakage Current           | 0.1 mA max.                                                                 |
| Residual Voltage          | 0.7 V max.                                                                  |
| ON Response Time          | 0.2 ms max.                                                                 |
| OFF Response Time         | 0.6 ms max.                                                                 |
| Fuses                     | 2 (1 fuse/common; fuses are not user-replaceable.)                          |
| Power for External Supply | 45 mA 5 to 24 V DC $\pm$ 10% min.<br>(2.8 mA $\times$ number of ON outputs) |

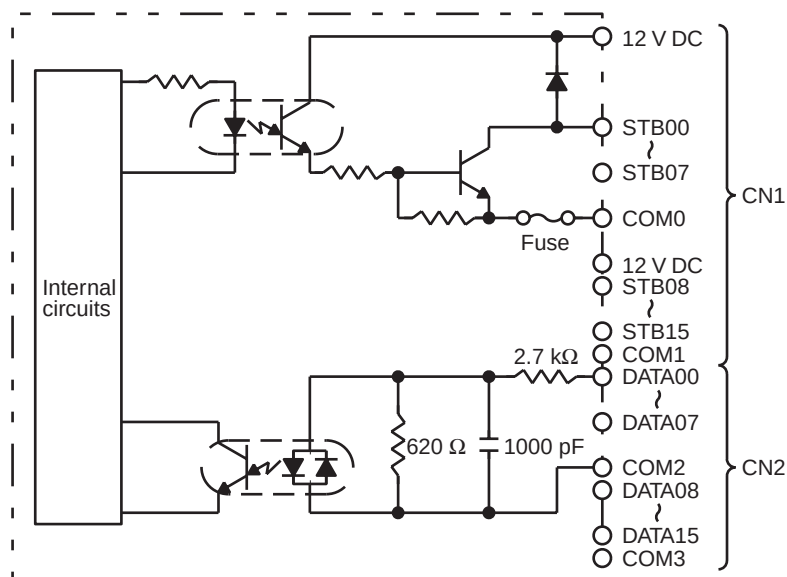
### Input Specifications (Connector 2)

|                         |                             |
|-------------------------|-----------------------------|
| Rated Input Voltage     | 12 V DC                     |
| Operating Input Voltage | 10.2 to 13.2 V DC           |
| Input Impedance         | 2.7 k $\Omega$              |
| Input Current           | 4.1 mA typical (at 12 V DC) |
| ON Voltage              | 8.0 V DC min.               |
| OFF Voltage             | 3.0 V DC max.               |

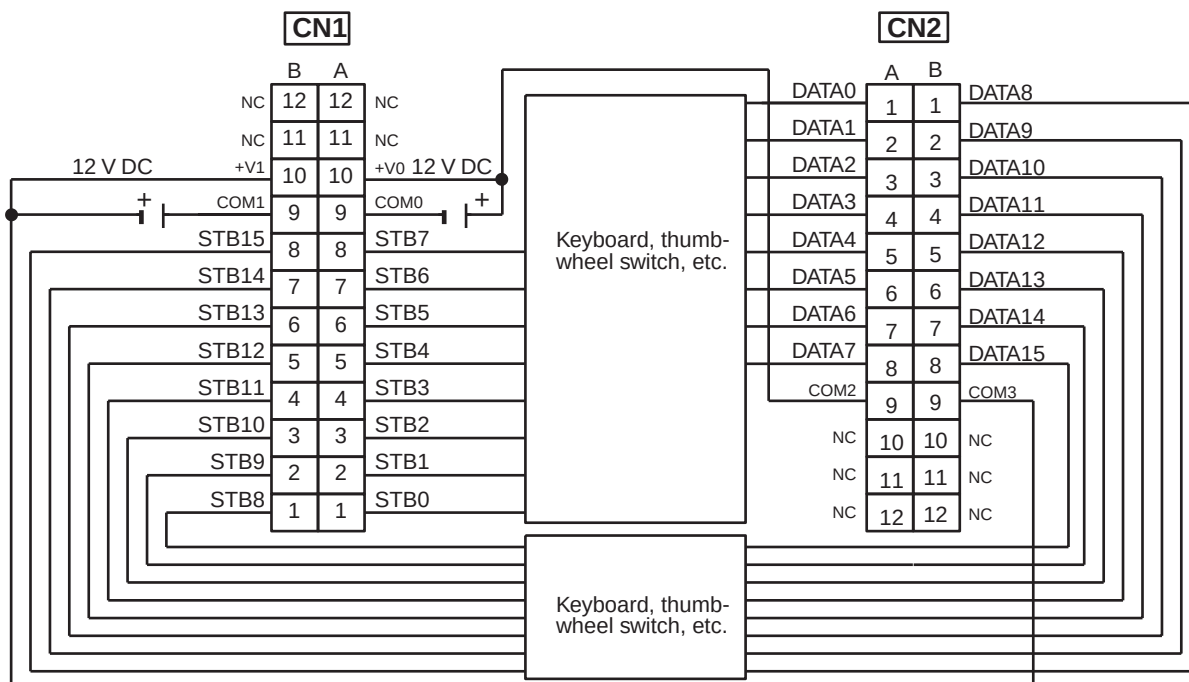
### General Specifications

|                              |                                |
|------------------------------|--------------------------------|
| No. of Circuits              | 2 (dynamic, 64 points/circuit) |
| Internal Current Consumption | 180 mA 5 V DC max.             |
| Weight                       | 300 g max.                     |

### Circuit Configuration



## Terminal Connections



- Note**
1. Refer to the Unit's operation manual for details on I/O bit allocation.
  2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.
  3. The user is not authorized to change the fuse.

## C200H-MD215 24-V DC Input/Transistor Output Unit Used for 16 Static Inputs and 16 Static Outputs

### Output Specifications (Connector 1)

|                           |                                                                             |
|---------------------------|-----------------------------------------------------------------------------|
| Max. Switching Capacity   | 16 mA, 4.5 V DC to 100 mA, 26.4 V DC<br>800 mA/common, 1.6 A/Unit           |
| Leakage Current           | 0.1 mA max.                                                                 |
| Residual Voltage          | 0.7 V max.                                                                  |
| ON Response Time          | 0.2 ms max.                                                                 |
| OFF Response Time         | 0.6 ms max.                                                                 |
| No. of Circuits           | 2 (8 points/common)                                                         |
| Fuses                     | 2 (1 fuse/common; fuses are not user-replaceable.)                          |
| Power for External Supply | 45 mA 5 to 24 V DC $\pm$ 10% min.<br>(2.8 mA $\times$ number of ON outputs) |

### Input Specifications (Connector 2)

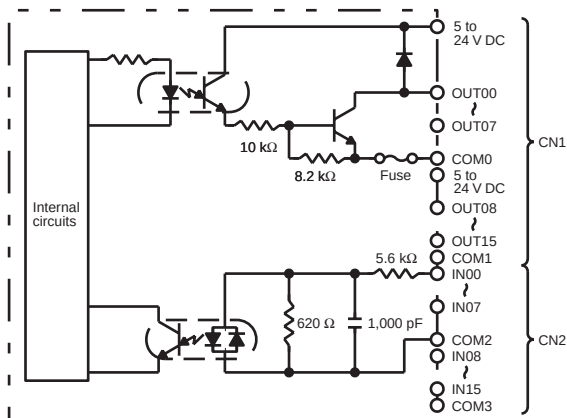
|                         |                                                                                                |
|-------------------------|------------------------------------------------------------------------------------------------|
| Rated Input Voltage     | 24 V DC                                                                                        |
| Operating Input Voltage | 20.4 to 26.4 V DC                                                                              |
| Input Impedance         | 5.6 k $\Omega$                                                                                 |
| Input Current           | 4.1 mA (at 24 V DC)                                                                            |
| ON Voltage              | 14.4 V DC min.                                                                                 |
| OFF Voltage             | 5.0 V DC max.                                                                                  |
| ON Response Time        | 2.5 ms/15 ms max. (switchable)                                                                 |
| OFF Response Time       | 2.5 ms/15 ms max. (switchable)                                                                 |
| No. of Circuits         | 2 (8 points/common)                                                                            |
| High-speed Inputs       | 8 points (connector 2 terminals 8 to 15, when set)<br>Pulse width: 1 ms/4 ms min. (switchable) |

## General Specifications

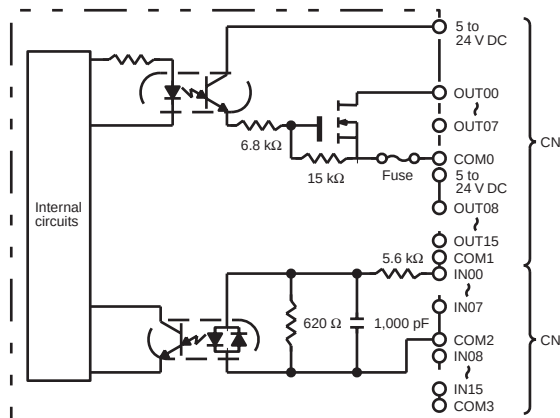
|                              |                    |
|------------------------------|--------------------|
| Internal Current Consumption | 180 mA 5 V DC max. |
| Weight                       | 300 g max.         |

## Circuit Configuration

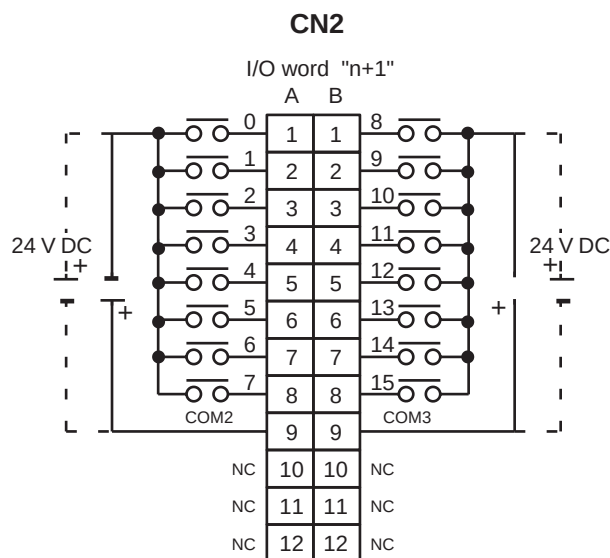
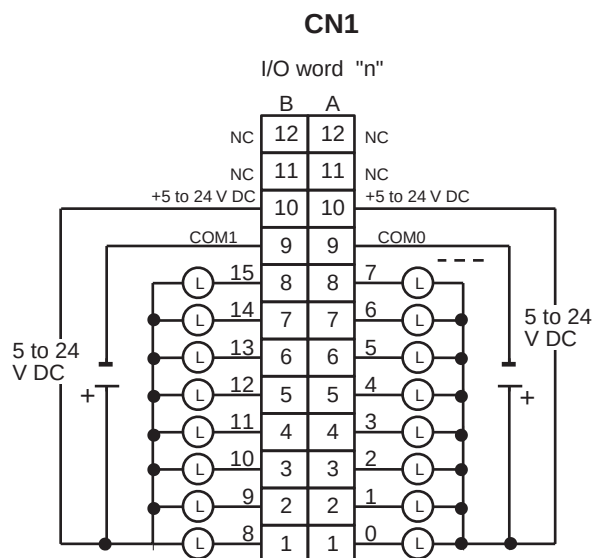
Units manufactured on or before November 29, 1999  
(manufacturing numbers 29Y9 or earlier)



Units manufactured on or after November 30, 1999  
(manufacturing numbers 30Y9 or later)



## Terminal Connections



- Note**
1. I/O word "n" is determined by the unit number setting ( $n = \text{CIO 2000} + 10 \times \text{unit number}$ ).
  2. The Unit will have 16 static output and 16 static input points when pin 1 of its DIP switch is OFF.
  3. At high temperatures, the number of inputs that can be turned ON simultaneously is limited. Refer to the graph page 579 for details.
  4. When pin 2 of the Unit's DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.
  5. The user is not authorized to change the fuse.

## C200H-MD215 24-V DC Input/Transistor Output Unit Used for 128 Dynamic Inputs/Dynamic Outputs

### Output Specifications (Connector 1)

|                           |                                                                             |
|---------------------------|-----------------------------------------------------------------------------|
| Max. Switching Capacity   | 100 mA 24 V DC (20.4 to 26.4 V DC), 800 mA/common, 1.6 A/Unit               |
| Leakage Current           | 0.1 mA max.                                                                 |
| Residual Voltage          | 0.7 V max.                                                                  |
| ON Response Time          | 0.2 ms max.                                                                 |
| OFF Response Time         | 0.6 ms max.                                                                 |
| Fuses                     | 2 (1 fuse/common; fuses are not user-replaceable.)                          |
| Power for External Supply | 45 mA 5 to 24 V DC $\pm$ 10% min.<br>(2.8 mA $\times$ number of ON outputs) |

### Input Specifications (Connector 2)

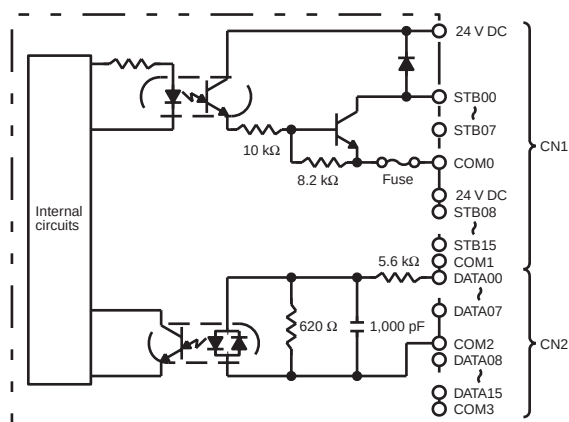
|                         |                     |
|-------------------------|---------------------|
| Rated Input Voltage     | 24 V DC             |
| Operating Input Voltage | 20.4 to 26.4 V DC   |
| Input Impedance         | 5.6 k $\Omega$      |
| Input Current           | 4.1 mA (at 24 V DC) |
| ON Voltage              | 14.4 V DC min.      |
| OFF Voltage             | 5.0 V DC max.       |

### General Specifications

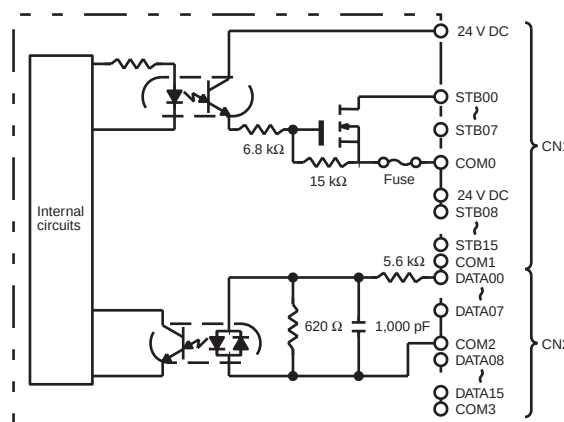
|                              |                                |
|------------------------------|--------------------------------|
| No. of Circuits              | 2 (dynamic, 64 points/circuit) |
| Internal Current Consumption | 180 mA 5 V DC max.             |
| Weight                       | 300 g max.                     |

### Circuit Configuration

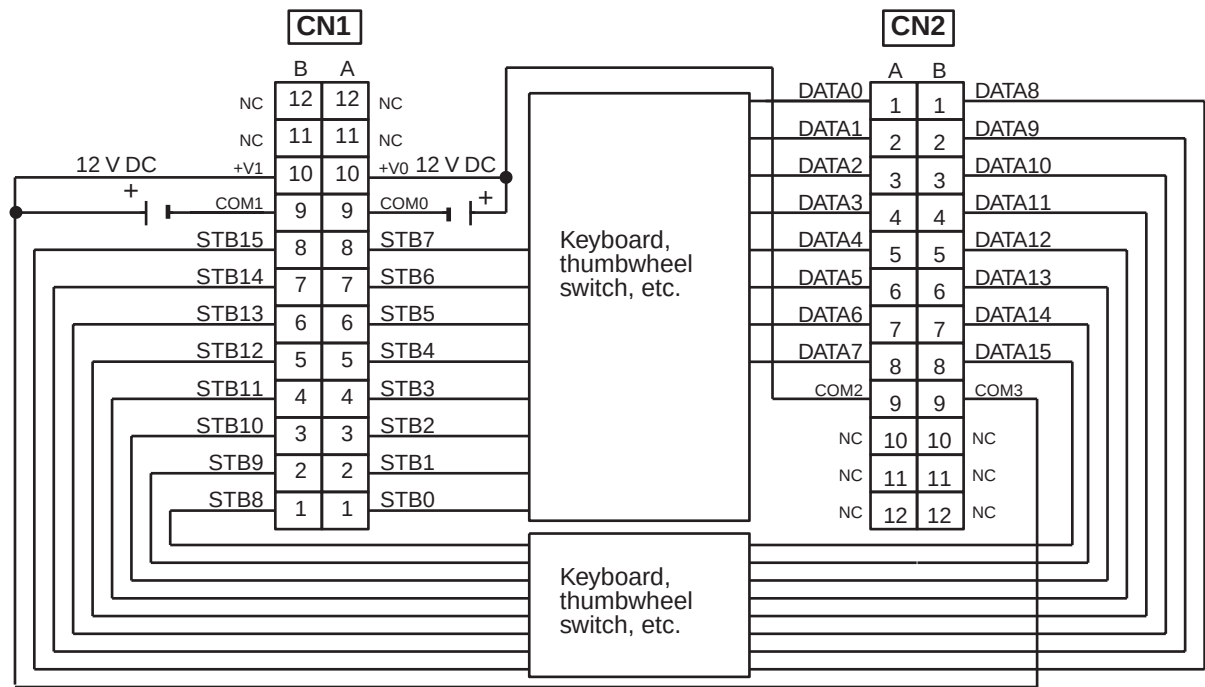
Units manufactured on or before November 29, 1999  
(manufacturing numbers 29Y9 or earlier)



Units manufactured on or after November 30, 1999  
(manufacturing numbers 30Y9 or later)



Terminal Connections



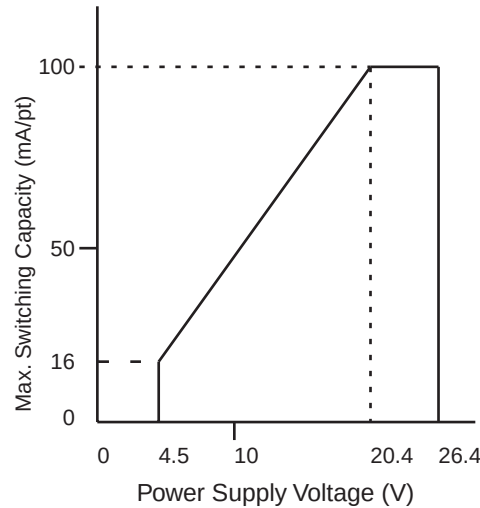
- Note**
1. Refer to the Unit's operation manual for details on I/O bit allocation.
  2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.
  3. Each output terminal has an output resistance of 4.7 kΩ.
  4. At high temperatures, the number of inputs that can be turned ON simultaneously is limited. Refer to the graph on the next page for details.
  5. The user is not authorized to change the fuse.

High-density I/O Unit Limitations

Limitations on the switching capacity of C200H-OD215/MD115/MD215 Transistor Output Units and the usable number of I/O points in the C200H-ID215 and C200H-MD215 are shown below.

Switching Capacity

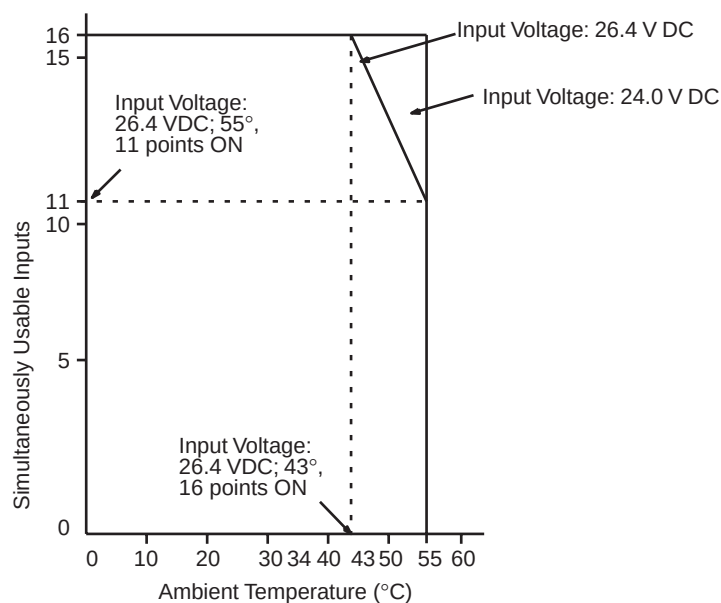
The switching capacity of C200H-OD215/MD115/MD215 Transistor Output Units depends on the power supply voltage, as shown below.





## Simultaneous Input and Outputs for the C200H-MD215

The number C200H-MD215 24-V DC inputs that can be ON simultaneously will depend on ambient temperature as shown in the figure below. There is no limit to the number of outputs that can be ON simultaneously.



**Note** If the number of C200H-MD215 inputs that are ON exceeds the number that can be ON at the same time, then heat generated by electronic components will raise the temperature of the components and the case. This will lower the reliability and service life of the components and will damage the Unit. Higher temperatures in electronic components and the case will also cause time delays. There is no problem if all input points are turned ON for less than 10 minutes (if all input points have been OFF for at least 2 hours) under special conditions, such as during startup work inspections.

# Appendix B

## Auxiliary Area

A000 to A447: Read-only Area, A448 to A959: Read/Write Area

### Read-only Area (Set by System)

| Address      |                  | Name                                                 | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Settings                              | Status after mode change | Status at startup | Write timing | Related flags, settings |
|--------------|------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------|-------------------|--------------|-------------------------|
| Words        | Bits             |                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                          |                   |              |                         |
| A050         | A05000 to A05007 | Basic I/O Unit Information, Rack 0 Slot 0            | <p>A bit will turn ON to indicate when a fuse has blows. The bit numbers correspond to the fuse number on the Unit.</p> <p>Only the right-most bit is used for C200H Basic I/O Units.</p>                                                                                                                                                                                                                                                                                                                  | 1: Fuse blown<br>0: Normal            | ---                      | ---               | Every cycle  | ---                     |
|              | A05008 to A05015 | Basic I/O Unit Information, Rack 0 Slot 1            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       | ---                      | ---               |              | ---                     |
|              | A05100 to A08915 | Basic I/O Unit Information, Racks 2 to 7             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       | ---                      | ---               |              | ---                     |
| A090 to A093 | ---              | User Program Date (CS1-H CPU Units only)             | <p>These words contain in BCD the date and time that the user program was last overwritten.</p> <p>A09000 to A09007: Seconds (00 to 59)</p> <p>A09008 to A09015: Minutes (00 to 59)</p> <p>A09100 to A09107: Hour (00 to 23)</p> <p>A09108 to A09115: Day of month (00 to 31)</p> <p>A09200 to A09207: Month (01 to 12)</p> <p>A09208 to A09215: Year (00 to 99)</p> <p>A09308 to A09307: Day of the week (00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday)</p> | ---                                   | Retained                 | Retained          | ---          | ---                     |
| A094 to A097 | ---              | Parameter Date (CS1-H CPU Units only)                | <p>These words contain in BCD the date and time that the parameters were last overwritten.</p> <p>The format is the same as above</p>                                                                                                                                                                                                                                                                                                                                                                      | ---                                   | Retained                 | Retained          | ---          | ---                     |
| A099         | A09914           | IR/DR Operation between Tasks (CS1-H CPU Units only) | <p>Turn ON this bit to share index and data registers between all tasks. Turn OFF this bit to use separate index and data registers between in each task.</p>                                                                                                                                                                                                                                                                                                                                              | 0: Independent<br>1: Shared (default) | Retained                 | Cleared           | ---          | ---                     |

| Address      |        | Name                                           | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Settings                                                                                                                                                                                                                                                                                 | Status after mode change | Status at startup | Write timing              | Related flags, settings |
|--------------|--------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------|---------------------------|-------------------------|
| Words        | Bits   |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                          |                          |                   |                           |                         |
| A100 to A199 | All    | Error Log Area                                 | <p>When an error has occurred, the error code, error contents, and error's time and date are stored in the Error Log Area. Information on the 20 most recent errors can be stored.</p> <p>Each error record occupies 5 words; the function of these 5 words is as follows:</p> <ol style="list-style-type: none"> <li>1) Error code (bits 0 to 15)</li> <li>2) Error contents (bits 0 to 15)</li> <li>3) Minutes (bits 8 to 15), Seconds (bits 0 to 7)</li> <li>4) Day of month (bits 8 to 15), Hours (bits 0 to 7)</li> <li>5) Year (bits 8 to 15), Month (bits 0 to 7)</li> </ol> <p>Errors generated by FAL(006) and FALS(007) will also be stored in this Error Log.</p> <p>The Error Log Area can be reset from a Programming Device.</p> <p>If the Error Log Area is full (20 records) and another error occurs, the oldest record in A100 to A104 will be cleared, the other 19 records are shifted down, and the new record is stored in A195 to A199.</p> | <p>Error code</p> <p>Error contents:</p> <p>Address of Aux. Area word with details or 0000.</p> <p>Seconds:</p> <p>00 to 59, BCD</p> <p>Minutes:</p> <p>00 to 59, BCD</p> <p>Hours:</p> <p>00 to 23, BCD</p> <p>Day of month:</p> <p>00 to 31, BCD</p> <p>Year:</p> <p>00 to 99, BCD</p> | Retained                 | Retained          | Written when error occurs | A50014<br>A300<br>A400  |
| A200         | A20011 | First Cycle Flag                               | ON for one cycle after PLC operation begins (after the mode is switched from PROGRAM to RUN or MONITOR, for example).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ON for the first cycle                                                                                                                                                                                                                                                                   | ---                      | ---               | ---                       | ---                     |
|              | A20012 | Step Flag                                      | ON for one cycle when step execution is started with STEP(008). This flag can be used for initialization processing at the beginning of a step.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ON for the first cycle after execution of STEP(008).                                                                                                                                                                                                                                     | Cleared                  | ---               | ---                       | ---                     |
|              | A20014 | Task Started Flag                              | <p>When a task switches from WAIT or INI to RUN status, this flag will be turned ON within the task for one cycle only.</p> <p>The only difference between this flag and A20015 is that this flag also turns ON when the task switches from WAIT to RUN status.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ON for first cycle (including transitions from WAIT and IN)                                                                                                                                                                                                                              |                          |                   |                           |                         |
| A200         | A20015 | First Task Startup Flag (CS1-H CPU Units only) | ON when a task is executed for the first time. This flag can be used to check whether the current task is being executed for the first time so that initialization processing can be performed if necessary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <p>1: First execution</p> <p>0: Not executable for the first time or not being executed.</p>                                                                                                                                                                                             | Cleared                  | ---               | ---                       | ---                     |
| A201         | A20110 | Online Editing Wait Flag                       | ON when an online editing process is waiting.<br>(If another online editing command is received while waiting, the other command won't be recorded and an error will occur.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <p>1: Waiting for online editing</p> <p>0: Not waiting for online editing</p>                                                                                                                                                                                                            | Cleared                  | Cleared           | ---                       | A527                    |
|              | A20111 | Online Editing Flag                            | ON when an online editing process is being executed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>1: Online editing in progress</p> <p>0: Online editing not in progress</p>                                                                                                                                                                                                            | Cleared                  | Cleared           | ---                       | A527                    |

| Address      |                  | Name                                 | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Settings                                                                                                        | Status after mode change | Status at startup    | Write timing | Related flags, settings                                 |
|--------------|------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------|----------------------|--------------|---------------------------------------------------------|
| Words        | Bits             |                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                 |                          |                      |              |                                                         |
| A202         | A20200 to A20207 | Communications Port Enabled Flags    | <p>ON when a network instruction (SEND, RECV, CMND, or PMCR) or background execution (CS1-H CPU Units only) can be executed with the corresponding port number. Bits 00 to 07 correspond to communications ports 0 to 7.</p> <p>When two or more network instructions are programmed with the same port number, use the corresponding flag as an execution condition to prevent the instructions from being executed simultaneously.</p> <p>(The flag for a given port is turned OFF while a network instruction with that port number is being executed.)</p> <p>(When the simple backup operation is used to performed a write or compare operation for a Memory Card on a CS1-H CPU Unit, a communications port will be automatically allocated, and the corresponding Flag will be turned OFF.)</p> | <p>1: Network instruction is not being executed</p> <p>0: Network instruction is being executed (port busy)</p> | Cleared                  | ---                  | ---          | ---                                                     |
| A203 to A210 | All              | Communications Port Completion Codes | <p>These words contain the completion codes for the corresponding port numbers when network instructions (SEND, RECV, CMND, or PMCR) or background execution (CS1-H CPU Units only) has been executed.</p> <p>Words A203 to A210 correspond to communications ports 0 to 7.</p> <p>(The completion code for a given port is cleared to 0000 when a network instruction with that port number is executed.)</p> <p>(When the simple backup operation is used to performed a write or compare operation for a Memory Card on a CS1-H CPU Unit, a communications port will be automatically allocated, and a completion code will be stored in the corresponding word.)</p>                                                                                                                                | <p>Non-zero: Error code</p> <p>0000: Normal condition</p>                                                       | Cleared                  | ---                  | ---          | ---                                                     |
| A219         | A21900 to A21907 | Communications Port Error Flags      | <p>ON when an error occurred during execution of a network instruction (SEND, RECV, CMND, or PMCR). Bits 00 to 07 correspond to communications ports 0 to 7.</p> <p>(All of these flags are turned OFF at the start of program execution and the flag for a given port is turned OFF when a network instruction with that port number is executed.)</p> <p>(When the simple backup operation is used to performed a write or compare operation for a Memory Card on a CS1-H CPU Unit, a communications port will be automatically allocated, and the corresponding Flag will be turned OFF if an error occurs.)</p>                                                                                                                                                                                     | <p>1: Error occurred</p> <p>0: Normal condition</p>                                                             | Cleared                  | ---                  | ---          | ---                                                     |
| A220 to A259 | A22000 to A25915 | Basic I/O Unit Input Response Times  | <p>These words contain the actual input response times for CS-series Basic I/O Units.</p> <p>When the Basic I/O Unit input response time setting is changed in the PLC Setup while the PLC is in PROGRAM mode, the setting in the PLC Setup will not match the actual value in the Basic I/O Unit unless the power is turned OFF and then ON again. In that case, the actual value can be monitored in these words.</p>                                                                                                                                                                                                                                                                                                                                                                                 | 0 to 17 hexadecimal                                                                                             | Retained                 | See function column. | ---          | PLC Setup (Basic I/O Unit Input response time settings) |

| Address       |        | Name                                                                     | Function                                                                                                                                                                                                                                                                | Settings                                                                                | Status after mode change | Status at startup | Write timing                  | Related flags, settings      |
|---------------|--------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------|-------------------|-------------------------------|------------------------------|
| Words         | Bits   |                                                                          |                                                                                                                                                                                                                                                                         |                                                                                         |                          |                   |                               |                              |
| A261          | A26100 | CPU Bus Unit Setup Area Initialization Error Flag (CS1-H CPU Units only) | ON: Error in CPU Bus Unit Setup<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                    | ON: Error in CPU Bus Unit Setup<br>OFF: I/O tables generated normally                   | Retained                 | Cleared           | When I/O tables are generated | ---                          |
|               | A26102 | I/O Overflow Flag (CS1-H CPU Units only)                                 | ON: Overflow in maximum number of I/O points<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                       | ON: Overflow in maximum number of I/O points<br>OFF: I/O tables generated normally      |                          |                   |                               | A40111 (Too many I/O points) |
|               | A26103 | Duplication Error Flag (CS1-H CPU Units only)                            | ON: The same unit number was used more than once.<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                  | ON: The same unit number was used more than once.<br>OFF: I/O tables generated normally |                          |                   |                               | A40113 (duplicated number)   |
|               | A26104 | I/O Bus Error Flag (CS1-H CPU Units only)                                | ON: I/O bus error<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                                  | ON: I/O bus error<br>OFF: I/O tables generated normally                                 |                          |                   |                               | A40114 (I/O but error)       |
|               | A26106 | SYSMAC BUS Recognition Error Flag (CS1-H CPU Units only)                 | ON: SYSMAC BUS detection ended in an error.<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                        | ON: SYSMAC BUS detection ended in an error.<br>OFF: I/O tables generated normally       |                          |                   |                               | ---                          |
|               | A26107 | Special I/O Unit Error Flag (CS1-H CPU Units only)                       | ON: Error in a Special I/O Unit<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                                    | ON: Error in a Special I/O Unit<br>OFF: I/O tables generated normally                   |                          |                   |                               | ---                          |
|               | A26109 | I/O Unconfirmed Error Flag (CS1-H CPU Units only)                        | ON: I/O detection has not been completed.<br>Turns OFF when I/O tables are generated normally.                                                                                                                                                                          | ON: I/O detection has not been completed.<br>OFF: I/O tables generated normally         |                          |                   |                               | ---                          |
| A262 and A263 | All    | Maximum Cycle Time                                                       | These words contain the maximum cycle time since the start of PLC operation (the program execution cycle time for a Parallel Processing Mode). The cycle time is recorded in 8-digit hexadecimal with the leftmost 4 digits in A263 and the rightmost 4 digits in A262. | 0 to FFFFFFFF:<br>0 to 429,496,729.5 ms<br>(0.1ms units)                                | ---                      | ---               | ---                           | ---                          |
| A264 and A265 | All    | Present Cycle Time                                                       | These words contain the present cycle time in 8-digit hexadecimal with the leftmost 4 digits in A265 and the rightmost 4 digits in A264 (the program execution cycle time for a Parallel Processing Mode).                                                              | 0 to FFFFFFFF:<br>0 to 429,496,729.5 ms                                                 | ---                      | ---               | ---                           | ---                          |
| A266 and A267 | All    | Program Execution Time+ Priority Peripheral Servicing Time               | Total of all slice times for program execution and all slice times for peripheral servicing.<br><br>A267 (Upper bytes)      A266 (Lower bytes)                                                                                                                          | 00000000 to FFFFFFFF Hex<br>0.0 to 429,496,729.5 ms (0.1-ms increments)                 | Cleared                  | Cleared           | Each cycle                    | ---                          |

| Address |        | Name                                                   | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Settings                                                                                   | Status after mode change | Status at startup | Write timing | Related flags, settings                                                      |
|---------|--------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------|-------------------|--------------|------------------------------------------------------------------------------|
| Words   | Bits   |                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                            |                          |                   |              |                                                                              |
| A268    | ---    | Peripheral Servicing Cycle Time (CS1-H CPU Units only) | In Parallel Processing with Synchronous or Asynchronous Memory Access, this word contains the peripheral servicing cycle time. The time is updated every cycle and is recorded in 16-bit binary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0 to 4E20 Hex, (0.0 to 2,000.0 ms in units of 0.1 ms)                                      | ---                      | ---               | Each cycle   | A40515                                                                       |
| A294    | All    | Task Number when Program Stopped                       | This word contains the task number of the task that was being executed when program execution was stopped because of a program error. (A298 and A299 contain the program address where program execution was stopped.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Normal tasks: 0000 to 001F (task 0 to 31)<br>Interrupt tasks: 8000 to 80FF (task 0 to 255) | Cleared                  | Cleared           | ---          | A298/A299                                                                    |
| A295    | A29508 | Instruction Processing Error Flag                      | This flag and the Error Flag (ER) will be turned ON when an instruction processing error has occurred and the PLC Setup has been set to stop operation for an instruction error. CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON.<br><br>(The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.)                                                                                                                                                                                                                                                                                                | 1: Error Flag ON<br>0: Error Flag OFF                                                      | Cleared                  | Cleared           | ---          | A294, A298/A299<br>PLC Setup (Operation when instruction error has occurred) |
|         | A29509 | Indirect DM/EM BCD Error Flag                          | This flag and the Access Error Flag (AER) will be turned ON when an indirect DM/EM BCD error has occurred and the PLC Setup has been set to stop operation an indirect DM/EM BCD error. (This error occurs when the content of an indirectly addressed DM or EM word is not BCD although BCD mode has been selected.) CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON.<br><br>(The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.)                                                                                                                                                           | 1: Not BCD<br>0: Normal                                                                    | Cleared                  | Cleared           | ---          | A294, A298/A299<br>PLC Setup (Operation when instruction error has occurred) |
|         | A29510 | Illegal Access Error Flag                              | This flag and the Access Error Flag (AER) will be turned ON when an illegal access error has occurred and the PLC Setup has been set to stop operation an illegal access error. (This error occurs when a region of memory is access illegally.) CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON.<br><br>The following operations are considered illegal access:<br>1) Reading/writing the system area<br>2) Reading/writing EM File Memory<br>3) Writing to a write-protected area<br>4) Indirect DM/EM BCD error (in BCD mode)<br><br>(The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.) | 1: Illegal access occurred<br>0: Normal condition                                          | Cleared                  | Cleared           | ---          | A294, A298/A299<br>PLC Setup (Operation when instruction error has occurred) |

| Address |        | Name                                                       | Function                                                                                                                                                                                                                                                                                                                                                                                                                                               | Settings                              | Status after mode change | Status at startup | Write timing              | Related flags, settings |
|---------|--------|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------|-------------------|---------------------------|-------------------------|
| Words   | Bits   |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |                          |                   |                           |                         |
| A295    | A29511 | No END Error Flag                                          | ON when there isn't an END(001) instruction in each program within a task.<br>CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON.<br>(The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.)                                                                                                                                                  | 1: No END<br>0: Normal condition      | Cleared                  | Cleared           | ---                       | A294, A298/A299         |
|         | A29512 | Task Error Flag                                            | ON when a task error has occurred. The following conditions generate a task error.<br>There isn't even one regular task that is executable (started).<br>•There isn't a program allocated to the task.<br>•(The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.)                                                                                                                  | 1: Error<br>0: Normal                 | Cleared                  | Cleared           | ---                       | A294, A298/A299         |
|         | A29513 | Differentiation Overflow Error Flag                        | The allowed value for Differentiation Flags which correspond to differentiation instructions has been exceeded. CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON.<br>(The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.)                                                                                                                | 1: Error<br>0: Normal                 | Cleared                  | Cleared           | ---                       | A294, A298/A299         |
|         | A29514 | Illegal Instruction Error Flag                             | ON when a program that cannot be executed has been stored. CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON.<br>(The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.)                                                                                                                                                                     | 1: Error<br>0: Normal                 | Cleared                  | Cleared           | ---                       | A294, A298/A299         |
|         | A29515 | UM Overflow Error Flag                                     | ON when the last address in UM (User Memory) has been exceeded. CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON.                                                                                                                                                                                                                                                                                              | 1: Error<br>0: Normal                 | Cleared                  | Cleared           | ---                       | A294, A298/A299         |
| A298    | All    | Program Address Where Program Stopped (Rightmost 4 digits) | These words contain the 8-digit binary program address of the instruction where program execution was stopped due to a program error.                                                                                                                                                                                                                                                                                                                  | Right 4 digits of the program address | Cleared                  | Cleared           | ---                       | A294                    |
| A299    |        | Program Address Where Program Stopped (Leftmost 4 digits)  | (A294 contains the task number of the task where program execution was stopped.)                                                                                                                                                                                                                                                                                                                                                                       | Left 4 digits of the program address  | Cleared                  | Cleared           | ---                       |                         |
| A300    | All    | Error Log Pointer                                          | When an error occurs, the Error Log Pointer is incremented by 1 to indicate the location where the next error record will be recorded as an offset from the beginning of the Error Log Area (A100 to A199).<br>The Error Log Pointer can be cleared to 00 by turning A50014 (the Error Log Reset Bit) from OFF to ON.<br>When the Error Log Pointer has reached 14 (20 decimal), the next record is stored in A195 to A199 when the next error occurs. | 00 to 14 hexadecimal                  | Retained                 | Retained          | Written when error occurs | A50014                  |

| Address       |                  | Name                                | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Settings                                                                                | Status after mode change | Status at startup    | Write timing                      | Related flags, settings |
|---------------|------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------|----------------------|-----------------------------------|-------------------------|
| Words         | Bits             |                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                         |                          |                      |                                   |                         |
| A301          | All              | Current EM Bank                     | This word contains the current EM bank number in 4-digit hexadecimal. The current bank number can be changed with the EMBC(281) instruction.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0000 to 000C hexadecimal                                                                | Cleared                  | Cleared              | ---                               | ---                     |
| A302          | A30200 to A30215 | CPU Bus Unit Initializing Flags     | These flags are ON while the corresponding CPU Bus Unit is initializing after its CPU Bus Unit Restart Bit (A50100 to A50115) is turned from OFF to ON or the power is turned ON.<br>Bits 00 to 15 correspond to unit numbers 0 to 15.<br>Use these flags in the program to prevent the CS-series CPU Bus Unit's refresh data from being used while the Unit is initializing. IORF(097) cannot be executed while an CS-series CPU Bus Unit is initializing.<br>These bits are turned OFF automatically when initialization is completed.                                                                                                                                          | 0: Not initializing<br>1: Initializing (Reset to 0 automatically after initialization.) | Retained                 | Cleared              | Written during initialization     | A50100 to A50115        |
| A330 to A335  | A33000 to A33515 | Special I/O Unit Initializing Flags | These flags are ON while the corresponding Special I/O Unit is initializing after its Special I/O Unit Restart Bit (A50200 to A50715) is turned from OFF to ON or the power is turned ON.<br>The bits in these words correspond to unit numbers 0 to 95 as follows:<br>A33000 to A33015: Units 0 to 15<br>A33100 to A33115: Units 16 to 31<br>----<br>A33500 to A33515: Units 80 to 95<br>Use these flags in the program to prevent the Special I/O Unit's refresh data from being used while the Unit is initializing. Also, IORF(097) cannot be executed while a Special I/O Unit is initializing.<br>These bits are turned OFF automatically when initialization is completed. | 0: Not initializing<br>1: Initializing (Reset to 0 automatically after initialization.) | Retained                 | Cleared              | ---                               | A50200 to A50715        |
| A339 and A340 | All              | Maximum Differentiation Flag Number | These words contain the maximum value of the differentiation flag numbers being used by differentiation instructions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                         | See Function column.     | Cleared              | Written at the start of operation | A29513                  |
| A343          | A34300 to A34302 | Memory Card Type                    | Indicates the type of Memory Card, if any, installed.<br>This information is recorded when the PLC power is turned ON or the Memory Card power switch is turned ON.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0: None<br>4: Flash ROM                                                                 | Retained                 | See Function column. | See Function column.              | ---                     |
|               | A34306           | EM File Memory Format Error Flag    | ON when a format error occurs in the first EM bank allocated for file memory.<br>(The flag is turned OFF when formatting is completed normally.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1: Format error<br>0: No format error                                                   | Retained                 | Cleared              | ---                               | ---                     |
|               | A34307           | Memory Card Format Error Flag       | ON when the Memory Card is not formatted or a formatting error has occurred. (The flag is turned OFF when formatting is completed normally.)<br>This flag is written when the PLC power is turned ON or the Memory Card power switch is turned ON.                                                                                                                                                                                                                                                                                                                                                                                                                                | 1: Format error<br>0: No format error                                                   | Retained                 | See Function column. | See Function column.              | ---                     |
|               | A34308           | File Transfer Error Flag            | ON when an error occurred while writing data to file memory. (The flag is turned OFF when PLC operation begins or data is written successfully.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1: Error<br>0: No error                                                                 | Retained                 | Cleared              | Written when file data is written | ---                     |



| Address |        | Name                                                           | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Settings                                                             | Status after mode change | Status at startup | Write timing                                                     | Related flags, settings                                                              |
|---------|--------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------|-------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Words   | Bits   |                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                      |                          |                   |                                                                  |                                                                                      |
| A343    | A34309 | File Write Error Flag                                          | ON when data cannot be written to file memory because it is write-protected or the data exceeds the capacity of the file memory.<br>(The flag is turned OFF when PLC operation begins or data is written successfully.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1: Write not possible<br>0: Normal condition                         | Retained                 | Cleared           | Written when file data is written                                | ---                                                                                  |
|         | A34310 | File Read Error                                                | ON when a file could not be read because of a malfunction (file is damaged or data is corrupted).<br>(The flag is turned OFF when PLC operation begins or data is read successfully.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1: Read not possible<br>0: Normal condition                          | Retained                 | Cleared           | Written when file data is read                                   | ---                                                                                  |
|         | A34311 | File Missing Flag                                              | ON when an attempt is made to read a file that doesn't exist, or an attempt is made to write to a file in a directory that doesn't exist.<br>(The flag is turned OFF when PLC operation begins or data is read successfully.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1: Specified file or directory is missing<br>0: Normal condition     | Retained                 | Cleared           | Written when file data is read                                   | ---                                                                                  |
|         | A34313 | File Memory Operation Flag                                     | ON while any of the following operations is being executed. OFF when none of them are being executed.<br>CMND instruction sending a FINS command to the local CPU Unit.<br>FREAD/FWRIT instructions.<br>Program replacement using the control bit in the Auxiliary Area.<br>Easy backup operation.<br>(The flag is turned OFF when PLC operation begins.)                                                                                                                                                                                                                                                                                                                                                | 1: Instruction being executed.<br>0: Instruction not being executed. | Retained                 | Cleared           | Written when file memory instruction is executed                 | ---                                                                                  |
|         | A34314 | Accessing File Data Flag                                       | ON while file data is being accessed. Use this flag to prevent two file memory instructions from being executed at the same time.<br>(The flag is turned OFF when PLC operation begins.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1: File being accessed<br>0: File not being accessed                 | Retained                 | Cleared           | ---                                                              | ---                                                                                  |
|         | A34315 | Memory Card Detected Flag (except pre-version-1 CS1 CPU Units) | ON when a Memory Card has been detected.<br>OFF when a Memory Card has not been detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1: Memory Card detected<br>0: Memory Card not detected               | Retained                 | Cleared           | Written when Memory Card is inserted, or the power is turned ON. |                                                                                      |
| A344    | All    | EM File Memory Starting Bank                                   | Contains the starting bank number of EM file memory (bank number of the first formatted bank). All EM banks from this starting bank to the last bank in EM are formatted for use as file memory.<br><br>To convert the EM Area for use as file memory, first set the PLC Setup's EM File Memory Function setting to 1, set the PLC Setup's EM File Memory Starting Bank setting (0 to C), and then format the EM Area from a Programming Device<br><br>The PLC Setup's EM file memory settings won't agree with the actual settings unless the EM Area is formatted after the PLC Setup's EM file memory settings have been changed. In that case, the actual settings can be determined with this word. | 0000 to 000C Hex<br>Bank 0 to C                                      | Retained                 | Retained          | Written when EM file formatting is performed                     | PLC Setup (EM File Memory Function setting and EM File Memory Starting Bank setting) |

| Address       |                  | Name                                  | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Settings                                                           | Status after mode change  | Status at startup         | Write timing                                                                           | Related flags, settings |
|---------------|------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------|---------------------------|----------------------------------------------------------------------------------------|-------------------------|
| Words         | Bits             |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                    |                           |                           |                                                                                        |                         |
| A346 and A347 | All              | Number of Remaining Words to Transfer | <p>These words contain the 8-digit hexadecimal number of words remaining to be transferred by FREAD(700) or FWRT(701). When one of these instructions is executed, the number of words to be transferred is written to A346 and A347.</p> <p>While the data is being transferred, the value in these words is decremented.</p> <p>A326 contains the rightmost 4-digits and A347 contains the leftmost 4-digits.</p> <p>Check the content of these words to determine whether or not the planned number of words have been transferred successfully.</p> | Data remaining in transfer                                         | Retained                  | Cleared                   | Written as FREAD or FWRT is being executed. Decrement as data is actually transferred. | ---                     |
| A351 to A354  | All              | Calendar/Clock Area                   | These words contain the CPU Unit's internal clock data in BCD. The clock can be set from a Programming Device such as a Programming Console, with the DATE(735) instruction, or with a FINS command (CLOCK WRITE, 0702).                                                                                                                                                                                                                                                                                                                                |                                                                    | Retained                  | Retained                  | Written every cycle                                                                    | ---                     |
|               | A35100 to A35107 |                                       | Seconds (00 to 59) (BCD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                    |                           |                           |                                                                                        |                         |
|               | A35108 to A35115 |                                       | Minutes (00 to 59) (BCD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                    |                           |                           |                                                                                        |                         |
|               | A35200 to A35207 |                                       | Hours (00 to 23) (BCD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                    |                           |                           |                                                                                        |                         |
|               | A35208 to A35215 |                                       | Day of the month (01 to 31) (BCD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                    |                           |                           |                                                                                        |                         |
|               | A35300 to A35307 |                                       | Month (01 to 12) (BCD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                    |                           |                           |                                                                                        |                         |
|               | A35308 to A35315 |                                       | Year (00 to 99) (BCD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                    |                           |                           |                                                                                        |                         |
|               | A35400 to A35407 |                                       | Day of the week (00 to 06) (BCD)<br>00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                    |                           |                           |                                                                                        |                         |
| A355          | A35500 to A35915 | Inner Board Monitoring Area           | The function of these words is defined by the Inner Board.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                    | Determined by Inner Board | Determined by Inner Board | ---                                                                                    | ---                     |
| A360 to A391  | A36001 to A39115 | Executed FAL Number Flags             | <p>The flag corresponding to the specified FAL number will be turned ON when FAL(006) is executed. Bits A36001 to A39115 correspond to FAL numbers 001 to 511.</p> <p>The flag will be turned OFF when the error is cleared.</p>                                                                                                                                                                                                                                                                                                                        | <p>1: That FAL was executed</p> <p>0: That FAL wasn't executed</p> | Retained                  | Cleared                   | Written when error occurs                                                              | A40215                  |

| Address |                  | Name                                                     | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Settings                                             | Status after mode change | Status at startup | Write timing                                         | Related flags, settings |
|---------|------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------------------|-------------------|------------------------------------------------------|-------------------------|
| Words   | Bits             |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      |                          |                   |                                                      |                         |
| A392    | A39204           | RS-232C Port Error Flag                                  | ON when an error has occurred at the RS-232C port. (Not valid in peripheral bus mode or NT Link mode.)                                                                                                                                                                                                                                                                                                                                                                                       | 1: Error<br>0: No error                              | Retained                 | Cleared           | Written when error occurs                            | ---                     |
|         | A39205           | RS-232C Port Send Ready Flag (No-protocol mode)          | ON when the RS-232C port is able to send data in no-protocol mode.                                                                                                                                                                                                                                                                                                                                                                                                                           | 1: Able-to-send<br>0: Unable-to-send                 | Retained                 | Cleared           | Written after transmission                           | ---                     |
|         | A39206           | RS-232C Port Reception Completed Flag (No-protocol mode) | ON when the RS-232C port has completed the reception in no-protocol mode.<br><ul style="list-style-type: none"> <li>When the number of bytes was specified: ON when the specified number of bytes is received.</li> <li>When the end code was specified: ON when the end code is received or 256 bytes are received.</li> </ul>                                                                                                                                                              | 1: Reception completed<br>0: Reception not completed | Retained                 | Cleared           | Written after reception                              | ---                     |
|         | A39207           | RS-232C Port Reception Overflow Flag (No-protocol mode)  | ON when a data overflow occurred during reception through the RS-232C port in no-protocol mode.<br><ul style="list-style-type: none"> <li>When the number of bytes was specified: ON when more data is received after the reception was completed but before RXD(235) was executed.</li> <li>When the end code was specified: ON when more data is received after the end code was received but before RXD(235) was executed. ON when 257 bytes are received before the end code.</li> </ul> | 1: Overflow<br>0: No overflow                        | Retained                 | Cleared           | ---                                                  | ---                     |
|         | A39212           | Peripheral Port Communications Error Flag                | ON when a communications error has occurred at the peripheral port. (Not valid in peripheral bus mode or NT Link mode.)                                                                                                                                                                                                                                                                                                                                                                      | 1: Error<br>0: No error                              | Retained                 | Cleared           | ---                                                  | ---                     |
| A393    | A39300 to A39307 | RS-232C Port PT Communications Flag                      | The corresponding bit will be ON when the RS-232C port is communicating with a PT in NT link mode. Bits 0 to 7 correspond to units 0 to 7.                                                                                                                                                                                                                                                                                                                                                   | 1: Communicating<br>0: Not communicating             | Retained                 | Cleared           | Written when there is a normal response to the token | ---                     |
|         | A39308 to A39315 | RS-232C Port PT Priority Registered Flags                | The corresponding bit will be ON for the PT that has priority when the RS-232C port is communicating in NT link mode. Bits 0 to 7 correspond to units 0 to 7. These flags are written when the priority registration command is received.                                                                                                                                                                                                                                                    | 1: Priority registered<br>0: Priority not registered | Retained                 | Cleared           | See <i>Function</i> column.                          | ---                     |
|         | A39300 to A39315 | RS-232C Port Reception Counter (No-protocol mode)        | Indicates (in binary) the number of bytes of data received when the RS-232C port is in no-protocol mode.                                                                                                                                                                                                                                                                                                                                                                                     |                                                      | Retained                 | Cleared           | Written when data is received                        | ---                     |

| Address |                  | Name                                                        | Function                                                                                                                                                                                                                                                                                                                                                                                                      | Settings                                                                                                                         | Status after mode change | Status at startup           | Write timing                                         | Related flags, settings |
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| Words   | Bits             |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                  |                          |                             |                                                      |                         |
| A394    | A39400 to A39407 | Peripheral Port PT Communications Flag                      | The corresponding bit will be ON when the peripheral port is communicating with a PT in NT link mode. Bits 0 to 7 correspond to units 0 to 7.                                                                                                                                                                                                                                                                 | 1: Communicating<br>0: Not communicating                                                                                         | Retained                 | Cleared                     | Written when there is a normal response to the token | ---                     |
|         | A39408 to A39415 | Peripheral Port PT Priority Registered Flags                | The corresponding bit will be ON for the PT that has priority when the peripheral port is communicating in NT link mode. Bits 0 to 7 correspond to units 0 to 7. These flags are written when the priority registration command is received.                                                                                                                                                                  | 1: Priority registered<br>0: Priority not registered                                                                             | Retained                 | Cleared                     | See <i>Function</i> column.                          | ---                     |
| A395    | A39506           | File Deleted Flags                                          | The system deleted the remainder of an EM file memory file that was being updated when a power interruption occurred.                                                                                                                                                                                                                                                                                         | 1: File deleted<br>0: No files deleted                                                                                           | Cleared                  | Cleared                     | Written when the system deletes the file.            | ---                     |
|         | A39507           |                                                             | The system deleted the remainder of a Memory Card file that was being updated when a power interruption occurred.                                                                                                                                                                                                                                                                                             | 1: File deleted<br>0: No files deleted                                                                                           | Cleared                  | Cleared                     | Written when the system deletes the file.            | ---                     |
|         | A39510           | ER/AER Flag for Background Execution (CS1-H CPU Units only) | Turns ON if an error or illegal access occurs during background execution. Turns OFF when power is turned ON or operation is started.                                                                                                                                                                                                                                                                         | 1: Error<br>0: No error<br>(Cleared when background execution is started.)                                                       | Cleared                  | Cleared                     | ---                                                  | ---                     |
|         | A39511           | Memory Corruption Detected Flag                             | ON when memory corruption is detected when the power supply is turned ON.                                                                                                                                                                                                                                                                                                                                     | 1: Memory corruption<br>0: Normal operation                                                                                      | Retained                 | See <i>Function</i> column. | Written when power is turned ON.                     | ---                     |
|         | A39512           | DIP Switch Pin 6 Status Flag                                | The status of pin 6 on the DIP switch on the front of the CPU Unit is written to this flag every cycle.                                                                                                                                                                                                                                                                                                       | 1: Pin 6 ON<br>0: Pin 6 OFF                                                                                                      | Retained                 | See <i>Function</i> column. | Written every cycle                                  | ---                     |
| A397    | ---              | Simple Backup Write Capacity (CS1-H CPU Units only)         | If a write for a simple backup operation fails, A397 will contain the Memory Card capacity that would have been required to complete the write operation. The value is in Kbytes. (This indicates that the Memory Card did not have the specified capacity when the write operation was started.)<br>A397 will be cleared to 0000 Hex when the write is completed successfully for a simple backup operation. | 0000 Hex: Write completed normally<br>0001 to FFFF Hex: Write error (value indicates required capacity from 1 to 65,535 Kbytes). | Retained                 | Retained                    | When write is executed                               | ---                     |
| A400    | All              | Error code                                                  | When a non-fatal error (user-defined FALS(006) or system error) or a fatal error (user-defined FALS(007) or system error) occurs, the 4-digit hexadecimal error code is written to this word. When two or more errors occur simultaneously, the highest error code will be recorded.<br>Refer to page 609 for details on error codes.                                                                         | Error code                                                                                                                       | Cleared                  | Cleared                     | Written when error occurs                            | ---                     |

| Address |        | Name                                            | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Settings                                            | Status after mode change | Status at startup | Write timing                             | Related flags, settings                |
|---------|--------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------|-------------------|------------------------------------------|----------------------------------------|
| Words   | Bits   |                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                     |                          |                   |                                          |                                        |
| A401    | A40106 | FALS Error Flag<br>(Fatal error)                | ON when a non-fatal error is generated by the FALS(006) instruction. The CPU Unit will continue operating and the ERR/ALM indicator will flash. The corresponding error code will be written to A400. Error codes C101 to C2FF correspond to FALS numbers 001 to 511.<br><br>This flag will be turned OFF when the FALS errors are cleared.                                                                                                                                                                                                                                           | 1: FALS(006) executed<br>0: FALS(006) not executed  | Cleared                  | Cleared           | Written when error occurs                | A400                                   |
|         | A40108 | Cycle Time Too Long Flag<br>(Fatal error)       | ON if the cycle time exceeds the maximum cycle time set in the PLC Setup (the cycle time monitoring time). The program execution cycle time is used in a Parallel Processing Mode.<br><br>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.<br><br>This flag will be turned OFF when the error is cleared.                                                                                                                                                                                                                              | 0: Cycle time under max.<br>1: Cycle time over max. | Cleared                  | Cleared           | Written when the cycle time exceeds max. | PLC Setup (Cycle time monitoring time) |
|         | A40109 | Program Error Flag<br>(Fatal error)             | ON when program contents are incorrect.<br><br>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.<br><br>The type of program error that occurred will be stored in bits 8 to 15 of A295. Refer to the description of A295 or to 2-3 <i>Checking Programs of CS/CJ Series Programmable Controllers (W394)</i> for more details on program errors.<br><br>This flag will be turned OFF when the error is cleared. | 1: Error<br>0: No error                             | Cleared                  | Cleared           | ---                                      | A294, A295, A298 and A299              |
|         | A40110 | I/O Setting Error Flag<br>(Fatal error)         | ON when an Input Unit has been installed in an Output Unit's slot or vice versa, so the Input and Output Units clash in the registered I/O table.<br><br>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.<br><br>This flag will be turned OFF when the error is cleared.                                                                                                                                                                                                                                                               | 1: Error<br>0: No error                             | Cleared                  | Cleared           | ---                                      | ---                                    |
|         | A40111 | Too Many I/O Points Flag<br>(Fatal error)       | ON when the number of I/O points being used in Basic I/O Units exceeds the maximum allowed for the PLC.<br><br>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.<br><br>This flag will be turned OFF when the error is cleared.                                                                                                                                                                                                                                                                                                         | 1: Error<br>0: No error                             | Cleared                  | Cleared           | ---                                      | A407                                   |
|         | A40112 | Inner Board Stopped Error Flag<br>(Fatal error) | ON when there is an Inner Board Error (Watchdog timer error).<br><br>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.<br><br>This flag will be turned OFF when the error is cleared, but will be turned ON again unless the cause of the error is eliminated.                                                                                                                                                                                                                                                                          | 1: Error<br>0: No error                             | Cleared                  | Cleared           | ---                                      | ---                                    |

| Address |        | Name                                                  | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Settings                                         | Status after mode change | Status at startup | Write timing | Related flags, settings  |
|---------|--------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------|-------------------|--------------|--------------------------|
| Words   | Bits   |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                          |                   |              |                          |
| A401    | A40113 | Duplication Error Flag (Fatal error)                  | <p>ON in the following cases:</p> <ul style="list-style-type: none"> <li>Two CPU Bus Units have been assigned the same unit number.</li> <li>Two Special I/O Units have been assigned the same unit number.</li> <li>Two Basic I/O Units have been allocated the same data area words.</li> </ul> <p>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.</p> <p>The duplicated unit number is indicated in A409 to A416.</p> <p>(This flag will be turned OFF when the error is cleared.)</p>                                          | 1: Duplication error<br>0: No duplication        | Cleared                  | Cleared           | ---          | A410 to A416             |
|         | A40114 | I/O Bus Error Flag (Fatal error)                      | <p>ON when an error occurs in a data transfer between the CPU Unit and a Unit mounted to a slot.</p> <p>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.</p> <p>The slot number (00 to 09) where the I/O Bus Error occurred is written to A40400 to A40407 in binary and the rack number (00 to 07) is written to A40408 to A40415 in binary</p> <p>(This flag will be turned OFF when the error is cleared.)</p>                                                                                                                   | 1: Error<br>0: No error                          | Cleared                  | Cleared           | ---          | A404                     |
|         | A40115 | Memory Error Flag (Fatal error)                       | <p>ON when an error occurred in memory or there was an error in automatic transfer from the Memory Card when the power was turned ON.</p> <p>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.</p> <p>The location where the error occurred is indicated in A40300 to A40308, and A40309 will be turned ON if there was an error during automatic transfer at start-up.</p> <p>This flag will be turned OFF when the error is cleared. (The automatic transfer at start-up error cannot be cleared without turning off the PLC.)</p> | 1: Error<br>0: No error                          | Cleared                  | Cleared           | ---          | A40300 to A40308, A40309 |
| A402    | A40202 | Special I/O Unit Setting Error Flag (Non-fatal error) | <p>ON when an installed Special I/O Unit does not match the Special I/O Unit registered in the I/O table. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.</p> <p>The unit number of the Unit where the setting error occurred is indicated in A428 to A433.</p> <p>(This flag will be turned OFF when the error is cleared.)</p>                                                                                                                                                                                           | 1: Setting error detected<br>0: No setting error | Cleared                  | Cleared           | ---          | A428 to A433             |

| Address |        | Name                                              | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Settings                                                  | Status after mode change | Status at startup | Write timing | Related flags, settings          |
|---------|--------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------|-------------------|--------------|----------------------------------|
| Words   | Bits   |                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                           |                          |                   |              |                                  |
| A402    | A40203 | CPU Bus Unit Setting Error Flag (Non-fatal error) | ON when an installed CPU Bus Unit does not match the CPU Bus Unit registered in the I/O table. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.<br>The unit number of the Unit where the setting error occurred is written to A427.<br>(This flag will be turned OFF when the error is cleared.)                                                                                                                                         | 1: Setting error detected<br>0: No setting error          | Cleared                  | Cleared           | ---          | A427                             |
|         | A40204 | Battery Error Flag (Non-fatal error)              | ON if the CPU Unit's battery is disconnected or its voltage is low and the Detect Battery Error setting has been set in the PLC Setup.<br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.<br>This flag can be used to control an external warning light or other indicator to indicate that the battery needs to be replaced.<br>(This flag will be turned OFF when the error is cleared.)                                              | 1: Error<br>0: No error                                   | Cleared                  | Cleared           | ---          | PLC Setup (Detect Battery Error) |
|         | A40205 | SYSMAC BUS Error Flag (Non-fatal error)           | ON when an error occurs in a data transfer in the SYSMAC BUS system. The number of the Master involved is indicated with bits A40500 and A40501.<br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. (This flag will be turned OFF when the error is cleared.)                                                                                                                                                                           | 1: Error<br>0: No error                                   | Cleared                  | Cleared           | ---          | A40500, A40501                   |
|         | A40206 | Special I/O Unit Error Flag (Non-fatal error)     | ON when an error occurs in a data exchange between the CPU Unit and a Special I/O Unit (including an error in the Special I/O Unit itself).<br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The Special I/O Unit where the error occurred will stop operating and the unit number of the Unit where the data exchange error occurred is indicated in A418 through A423.<br>(This flag will be turned OFF when the error is cleared.) | 1: Error in one or more Units<br>0: No errors in any Unit | Cleared                  | Cleared           | ---          | A418 to A423                     |
|         | A40207 | CPU Bus Unit Error Flag (Non-fatal error)         | ON when an error occurs in a data exchange between the CPU Unit and an CPU Bus Unit (including an error in the CPU Bus Unit itself).<br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The CPU Bus Unit where the error occurred will stop operating and the unit number of the Unit where the data exchange error occurred is indicated in A417.<br>(This flag will be turned OFF when the error is cleared.)                         | 1: Error in one or more Units<br>0: No error in any Unit  | Cleared                  | Cleared           | ---          | A417                             |

| Address |        | Name                                             | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Settings                               | Status after mode change | Status at startup | Write timing | Related flags, settings                                |
|---------|--------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------|-------------------|--------------|--------------------------------------------------------|
| Words   | Bits   |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                        |                          |                   |              |                                                        |
| A402    | A40208 | Inner Board Error Flag<br>(Non-fatal error)      | ON when an error occurs in a data exchange between the CPU Unit and the Inner Board (including an error in the Inner Board itself).<br><br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The Inner Board will stop operating and details on the error will be written to A424.<br><br>(This flag will be turned OFF when the error is cleared.)                                                                                                                                                                                                                               | 1: Error<br>0: No error                | Cleared                  | Cleared           | ---          | A424                                                   |
|         | A40209 | I/O Verification Error Flag<br>(Non-fatal error) | ON when a Basic I/O Unit registered in the I/O Table does not match the Basic I/O Unit actually installed in the PLC because a Unit was added or removed.<br><br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.<br><br>(This flag will be turned OFF when the error is cleared.)                                                                                                                                                                                                                                                                                               | 1: Mismatch<br>0: No mismatch          | Cleared                  | Cleared           | ---          | ---                                                    |
|         | A40210 | PLC Setup Error Flag<br>(Non-fatal error)        | ON when there is a setting error in the PLC Setup. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The location of the error will be written to A406.<br><br>(This flag will be turned OFF when the error is cleared.)                                                                                                                                                                                                                                                                                                                                                          | 1: Error<br>0: No error                | Cleared                  | Cleared           | ---          | A406                                                   |
|         | A40212 | Basic I/O Unit Error Flag<br>(Non-fatal error)   | ON when an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units).<br><br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The location of the error will be written to A408.<br><br>(This flag will be turned OFF when the error is cleared.)                                                                                                                                                                                                                                                                  | 1: Error<br>0: No error                | Cleared                  | Cleared           | ---          | A408                                                   |
|         | A40213 | Interrupt Task Error Flag<br>(Non-fatal error)   | ON when the Detect Interrupt Task Errors setting in the PLC Setup is set to "Detect" and an interrupt task is executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS I/O Unit.<br><br>This flag will also be turned ON if an attempt is made to refresh a Special I/O Unit's I/O from an interrupt task with IORF(097) while the Unit's I/O is being refreshed by cyclic I/O refreshing (duplicate refreshing).<br><br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.<br><br>(This flag will be turned OFF when the error is cleared.) | 1: Interrupt task error<br>0: No error | Cleared                  | Cleared           | ---          | A426, PLC Setup (Detect Interrupt Task Errors setting) |



| Address |                  | Name                                     | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Settings                                                            | Status after mode change | Status at startup | Write timing                    | Related flags, settings |
|---------|------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------|-------------------|---------------------------------|-------------------------|
| Words   | Bits             |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                     |                          |                   |                                 |                         |
| A402    | A40215           | FAL Error Flag<br>(Non-fatal error)      | <p>ON when a non-fatal error is generated by executing FAL(006). The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.</p> <p>The bit in A360 to A391 that corresponds to the FAL number specified in FALS(006) will be turned ON and the corresponding error code will be written to A400. Error codes 4101 to 42FF correspond to FAL numbers 001 to 2FF (0 to 511).</p> <p>(This flag will be turned OFF when the error is cleared.)</p>                                                            | <p>1: FALS(006) error occurred</p> <p>0: FALS(006) not executed</p> | Cleared                  | Cleared           | Written when error occurs       | A360 to A391, A400      |
| A403    | A40300 to A40308 | Memory Error Location                    | <p>When a memory error occurs, the Memory Error Flag (A40115) is turned ON and one of the following flags is turned ON to indicate the memory area where the error occurred</p> <p>A40300: User program<br/>A40304: PLC Setup<br/>A40305: Registered I/O Table<br/>A40307: Routing Table<br/>A40308: CPU Bus Unit Settings</p> <p>When a memory error occurs, the CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.</p> <p>(The corresponding flag will be turned OFF when the error is cleared.)</p> | <p>1: Error</p> <p>0: No error</p>                                  | Cleared                  | Cleared           | ---                             | A40115                  |
|         | A40309           | Memory Card Start-up Transfer Error Flag | <p>ON when automatic transfer at start-up has been selected and an error occurs during automatic transfer. An error will occur if there is a transfer error, the specified file does not exist, or the Memory Card is not installed.</p> <p>(This flag will be turned OFF when the error is cleared by turning the power off. The error cannot be cleared without turning the power off.)</p>                                                                                                                                                           | <p>1: Error</p> <p>0: No error</p>                                  | Cleared                  | Cleared           | Written when power is turned ON | ---                     |
| A404    | A40400 to A40407 | I/O Bus Error Slot Number                | <p>Contains the 8-bit binary slot number (00 to 09) where an I/O Bus Error occurred.</p> <p>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. The I/O Bus Error Flag (A40114) will be ON.</p> <p>(This flag will be turned OFF when the error is cleared.)</p>                                                                                                                                                                                                                                            | 00 to 09 Hex (slot No. 0 to 9)                                      | Cleared                  | Cleared           | ---                             | A40114                  |
|         | A40408 to A40415 | I/O Bus Error Rack Number                | <p>Contains the 8-bit binary rack number (00 to 07) where an I/O Bus Error occurred.</p> <p>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. The I/O Bus Error Flag (A40114) will be ON.</p> <p>(This flag will be turned OFF when the error is cleared.)</p>                                                                                                                                                                                                                                            | 00 to 03 Hex (Rack No. 0 to 3)                                      | Cleared                  | Cleared           | ---                             | A40114                  |

| Address |                   | Name                                                      | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Settings                                                                                                | Status after mode change | Status at startup | Write timing              | Related flags, settings  |
|---------|-------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------|-------------------|---------------------------|--------------------------|
| Words   | Bits              |                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                         |                          |                   |                           |                          |
| A405    | A40500 and A40501 | SYSMAC BUS Master Flags                                   | When a transmission error occurs in the SYSMAC BUS system, the flag for the affected Master Unit will be turned ON.<br><br>A40500: Flag for Master Unit #0<br>A40501: Flag for Master Unit #1<br>(The flag will be turned OFF when the error is cleared.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1: Error<br>0: No error                                                                                 | Cleared                  | Cleared           | ---                       | ---                      |
|         | A40515            | Peripheral Servicing Too Long Flag (CS1-H CPU Units only) | Turns ON when the peripheral servicing time in a Parallel Processing Mode exceeds 2 s. This will also cause a cycle time error and operation will stop.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1: Too long (Parallel processing cannot be used.)<br>0: Not too long (Parallel processing can be used.) | Cleared                  | Cleared           | Written when error occurs | A268                     |
| A406    | All               | PLC Setup Error Location                                  | When there is a setting error in the PLC Setup, the location of that error is written to A406 in 4-digit hexadecimal. The location is given as the address displayed on a Programming Console.<br><br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.<br>(A406 will be cleared when the cause of the error is eliminated.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0000 to 01FF hexadecimal                                                                                | Cleared                  | Cleared           | Written when error occurs | A40210                   |
| A407    | A40700 to A40712  | Too Many I/O Points, Details                              | The 6 possible causes of the Too Many I/O Points Error are listed below. The 3-digit binary value in A40713 to A40715 indicates the cause of the error (values 0 to 5 correspond to causes 1 to 6, below).<br><br>The 13-bit binary value in A40700 to A40712 indicates the details: the excessive value or the duplicated unit number.<br><br>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.<br><br>1) The number of I/O points will be written here when the total number of I/O points set in the I/O Table (excluding Slave Racks) exceed the maximum allowed for the CPU Unit.<br><br>2) The number of interrupt inputs will be written here when there are more than 32 interrupt inputs.<br><br>3) The unit number of the Slave Unit will be written here when a unit number is duplicated or the number of I/O points on a C500 Slave Unit exceeds 320.<br><br>4) The unit number of the I/O Terminal (excluding Slave Racks) will be written here when a unit number is duplicated<br><br>5) The unit number of the Master Unit will be written here when a unit number is duplicated or the unit number is outside of the allowed setting range.<br><br>6) The number of Racks will be written here when the number of Expansion I/O Racks exceeds the maximum.<br><br>(The relevant value will be written here (A40700 to A40712) when the error occurs. These bits will be cleared when the error is cleared.) | 0000 to 1FFF hexadecimal                                                                                | Cleared                  | Cleared           | Written when error occurs | A40111, A40713 to A40715 |

| Address |                  | Name                                        | Function                                                                                                                                                                                                                                                                                                                                                                                                                    | Settings                                                                                                                                                                                                                                                                                                                                                              | Status after mode change | Status at startup | Write timing              | Related flags, settings |
|---------|------------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------|---------------------------|-------------------------|
| Words   | Bits             |                                             |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                       |                          |                   |                           |                         |
| A407    | A40713 to A40715 | Too Many I/O Points, Cause                  | <p>The 3-digit binary value of these bits indicates the cause of the Too Many I/O Points Error and shows the meaning of the value written to bits A40700 to A40712.</p> <p>Values of 000 to 101 (0 to 5) correspond to causes 1 through 6 described in "Too Many I/O Points, Cause 1," above.</p> <p>(These bits will be cleared when the error is cleared.)</p>                                                            | <p>000: Too many I/O total</p> <p>001: Too many interrupt I/O</p> <p>010: Duplicate Remote I/O Slave Unit unit numbers or too many I/O on C500 Remote I/O Slave Units (more than 320)</p> <p>011: Duplicate I/O Terminal unit numbers</p> <p>100: Duplicate Remote I/O Master Unit unit numbers or undefined unit numbers (not 0 or 1)</p> <p>101: Too many Racks</p> | Cleared                  | Cleared           | Written when error occurs | ---                     |
| A408    | A40800 to A40807 | Basic I/O Unit Error, Slot Number           | <p>When an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units), A40212 will be turned ON and the slot number where the error occurred will be written here in binary.</p> <p>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.</p> <p>(These bits will be cleared when the error is cleared.)</p> | 00 to 09 hexadecimal (Slots 0 to 9)                                                                                                                                                                                                                                                                                                                                   | Cleared                  | Cleared           | ---                       | A40212                  |
| A408    | A40808 to A40815 | Basic I/O Unit Error, Rack Number           | <p>When an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units), A40212 will be turned ON and the Rack number where the error occurred will be written here in binary.</p> <p>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.</p> <p>(These bits will be cleared when the error is cleared.)</p> | 00 to 07 hexadecimal (Racks 0 to 7)                                                                                                                                                                                                                                                                                                                                   | Cleared                  | Cleared           | ---                       | A40212                  |
| A409    | A40900 to A40907 | Expansion I/O Rack Number Duplication Flags | <p>The corresponding flag will be turned ON when an Expansion I/O Rack's starting word address was set from a Programming Device and two Racks have overlapping word allocations or a Rack's starting address exceeds CIO 0901. Bits 00 to 07 correspond to Racks 0 to 7.</p> <p>(The corresponding flag will be cleared when the error is cleared.)</p>                                                                    | 1: Error<br>0: No error                                                                                                                                                                                                                                                                                                                                               | Cleared                  | Cleared           | ---                       | ---                     |
| A410    | A41000 to A41015 | CPU Bus Unit Number Duplication Flags       | <p>The Duplication Error Flag (A40113) and the corresponding flag in A410 will be turned ON when an CPU Bus Unit's unit number has been duplicated. Bits 00 to 15 correspond to unit numbers 0 to F.</p> <p>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.</p>                                                                                                             | 1: Duplication detected<br>0: No duplication                                                                                                                                                                                                                                                                                                                          | Cleared                  | Cleared           | ---                       | A40113                  |

| Address      |                  | Name                                      | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Settings                                                | Status after mode change | Status at startup | Write timing | Related flags, settings |
|--------------|------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------------|-------------------|--------------|-------------------------|
| Words        | Bits             |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                         |                          |                   |              |                         |
| A411 to A416 | A41100 to A41615 | Special I/O Unit Number Duplication Flags | <p>The Duplication Error Flag (A40113) and the corresponding flag in A411 through A416 will be turned ON when a Special I/O Unit's unit number has been duplicated.</p> <p>Bits 00 to 15 correspond to unit numbers 0 to F.</p> <p>(Bits A41100 to A41615 correspond to unit numbers 000 to 05F (0 to 95).)</p> <p>CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light.</p> <p>The corresponding bit will also be turned ON when the Special I/O Unit's words are also allocated to a Basic I/O Unit on an Expansion I/O Rack because of the Expansion I/O Rack's starting word setting.</p>                                                                              | <p>1: Duplication detected</p> <p>0: No duplication</p> | Cleared                  | Cleared           | ---          | A40113                  |
| A417         | A41700 to A41715 | CPU Bus Unit Error, Unit Number Flags     | <p>When an error occurs in a data exchange between the CPU Unit and an CPU Bus Unit, the CPU Bus Unit Error Flag (A40207) is turned ON and the bit in A417 corresponding to the unit number of the Unit where the error occurred is turned ON. Bits 00 to 15 correspond to unit numbers 0 to F.</p> <p>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.</p>                                                                                                                                                                                                                                                                                                   | <p>1: Error</p> <p>0: No error</p>                      | Cleared                  | Cleared           | ---          | A40207                  |
| A418 to A423 | A41800 to A42315 | Special I/O Unit Error, Unit Number Flags | <p>When an error occurs in a data exchange between the CPU Unit and a Special I/O Unit, the Special I/O Unit Error Flag (A40206) will be turned ON.</p> <p>Each bit corresponds to a unit number. Bit 00 in A418 to bit 15 in A423 correspond to unit numbers 0 to 95.</p> <p>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.</p> <p>(Bits A41800 to A42315 correspond to unit numbers 000 to 05F (0 to 95).)</p> <p>The unit number of the Unit where the error occurred is indicated in A417.</p> <p>If the unit number of the Unit is uncertain, none of the flags will be turned ON.</p> <p>(The flag will be turned OFF when the error is cleared.)</p> | <p>1: Error</p> <p>0: No error</p>                      | Cleared                  | Cleared           | ---          | A40206                  |
| A424         | A42400 to A42415 | Inner Board Error Information             | <p>When an error occurs in a data exchange between the CPU Unit and the Inner Board, the Inner Board Error Flag (A40208) and the appropriate bits in A424 will be turned ON.</p> <p>•The meaning of the bits in A424 depends upon the model of Inner Board that is being used. Refer to the Board's operation manual for details.</p> <p>A424 will be cleared when the error is cleared.</p>                                                                                                                                                                                                                                                                                                                         |                                                         | Cleared                  | Cleared           | ---          | ---                     |

| Address |                  | Name                                             | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Settings                                                                      | Status after mode change | Status at startup | Write timing                                         | Related flags, settings        |
|---------|------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------|-------------------|------------------------------------------------------|--------------------------------|
| Words   | Bits             |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                               |                          |                   |                                                      |                                |
| A425    | A42504 to A42506 | Slave Number of SYS-MAC BUS Error After Start-up | When there is an error in a Slave Rack, these bits contain the Slave's unit number.<br>These bits are reset when the system is restarted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0 to 4 Hex (Unit No. 0 to 4)                                                  | Cleared                  | Cleared           | Written every cycle                                  | ---                            |
|         | A42504           |                                                  | When there is an error in an Optical I/O Unit (excluding Slave Racks), the status of A42504 (ON or OFF) indicates whether the Unit is allocated high or low bytes<br>This flag is turned OFF when the system is restarted.                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1: High<br>0: Low                                                             |                          |                   |                                                      |                                |
|         | A42508 to A42515 |                                                  | When there is an error in a Slave Rack, this byte contains the 2-digit hexadecimal unit number of the Master to which the Slave is connected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | B0: Unit 0<br>B1: Unit 1                                                      | Cleared                  | Cleared           | Written every cycle                                  | ---                            |
|         |                  |                                                  | When there is an error in an Optical I/O Unit, this byte contains its 2-digit hexadecimal unit number (00 to 1F, or 0 to 31 decimal).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 00 to 1F hex (0 to 31)                                                        |                          |                   |                                                      |                                |
| A426    | A42600 to A42611 | Interrupt Task Error, Task Number                | When A40213 is ON, the content of these bits depends upon the status of A42615 (the Interrupt Task Error Cause Flag).<br>1) A42615 OFF:<br>An interrupt task was executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS Remote I/O Unit. A42600 to A42611: contain the interrupt task number.<br>2) A42615 ON:<br>An attempt was made to refresh a Special I/O Unit's I/O from an interrupt task with IORF(097) while the Unit's I/O is being refreshed by cyclic I/O refreshing (duplicate refreshing). A42600 to A42611: contain the Special I/O Unit's unit number.<br>These bits will be cleared when the error is cleared. | Task number:<br>000 to 0FF (0 to 255)<br>Unit number:<br>000 to 05F (0 to 95) | Cleared                  | Cleared           | ---                                                  | A40213<br>A42615               |
|         | A42615           | Interrupt Task Error Cause Flag                  | When A40213 (the Interrupt Task Error Flag) is ON, this flag indicates the cause of the error. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.<br>A42615 will be ON if a Special I/O Unit was refreshed from the interrupt task while it was already being refreshed.<br>A42615 will be OFF if the interrupt task was executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS Remote I/O Unit.                                                                                                                                                                           | 1: Duplicated refreshing<br>0: Interrupt task executed over 10 ms             | Cleared                  | Cleared           | ---                                                  | A40213,<br>A42600 to<br>A42611 |
| A427    | A42700 to A42715 | CPU Bus Unit Setting Error, Unit Number Flags    | When an CPU Bus Unit Setting Error occurs, A40203 and the bit in this word corresponding to the Unit's unit number are turned ON. Bits 00 to 15 correspond to unit numbers 0 to F.<br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.                                                                                                                                                                                                                                                                                                                                                                           | 1: Setting error<br>0: No setting error                                       | Cleared                  | Cleared           | Written when power is turned ON or I/O is recognized | A40203                         |

| Address      |                  | Name                                              | Function                                                                                                                                                                                                                                                                                                                                                                       | Settings                                | Status after mode change | Status at startup | Write timing                                               | Related flags, settings |
|--------------|------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------|-------------------|------------------------------------------------------------|-------------------------|
| Words        | Bits             |                                                   |                                                                                                                                                                                                                                                                                                                                                                                |                                         |                          |                   |                                                            |                         |
| A428 to A433 | A42800 to A43315 | Special I/O Unit Setting Error, Unit Number Flags | When a Special I/O Unit Setting Error occurs, A40202 and the bit in these words corresponding to the Unit's unit number are turned ON. Bits 00 to 15 correspond to unit numbers 0 to F.<br>(Bits A42800 to A43315 correspond to unit numbers 000 to 05F (0 to 95).)<br>The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. | 1: Setting error<br>0: No setting error | Cleared                  | Cleared           | Written when power is turned ON or I/O is recognized       | A40202                  |
| A440         | All              | Max. Interrupt Task Processing Time               | Contains the Maximum Interrupt Task Processing Time in units of 0.1 ms.<br>(This value is written after the interrupt task with the max. processing time is executed and cleared when PLC operation begins.)                                                                                                                                                                   | 0000 to FFFF hexadecimal                | Cleared                  | Cleared           | See Function column.                                       | ---                     |
| A441         | All              | Interrupt Task With Max. Processing Time          | Contains the task number of the interrupt task with the maximum processing time. Hexadecimal values 8000 to 80FF correspond to task numbers 00 to FF. Bit 15 is turned ON when an interrupt has occurred.<br>(This value is written after the interrupt task with the max. processing time is executed and cleared when PLC operation begins.)                                 | 8000 to 80FF hexadecimal                | Cleared                  | Cleared           | See Function column.                                       | ---                     |
| A442         | A44211 to A44212 | PLC Link Operating Level Detection Flags          | Indicate whether PLC Link Units are mounted to the PLC as follows:<br>A44211: PLC Link operating level 1<br>A44212: PLC Link operating level 0                                                                                                                                                                                                                                 | 1: Unit mounted<br>0: Unit not mounted  | Retained                 | Cleared           | Written when power is turned ON or when Unit is restarted. | CIO 247 to CIO 250      |

## Read/Write Area (Set by User)

| Addresses    |                  | Name                          | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Settings                                                                                                       | Status after mode change | Status at startup    | Write timing         | Related Flags, Settings                           |
|--------------|------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------|----------------------|----------------------|---------------------------------------------------|
| Word         | Bit              |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                |                          |                      |                      |                                                   |
| A500         | A50012           | IOM Hold Bit                  | Turn this bit ON to preserve the status of the I/O Memory when shifting from PROGRAM to RUN or MONITOR mode or vice versa. The I/O Memory includes the CIO Area, Transition Flags, Timer Flags and PVs, Index Registers, Data Registers, and the Current EM Bank Number.<br><br>(If the status of the IOM Hold Bit itself is preserved in the PLC Setup (IOM Hold Bit Status), the status of the I/O Memory Area will be retained when the PLC is turned ON or power is interrupted.)                            | 1: Retained<br>0: Not retained                                                                                 | Retained                 | See Function column. | See Function column. | PLC Setup (IOM Hold Bit Status setting)           |
|              | A50013           | Forced Status Hold Bit        | Turn this bit ON to preserve the status of bits that have been force-set or force-reset when shifting from PROGRAM to MONITOR mode or vice versa. Bits that have been force-set or force-reset will always return to their default status when shifting to RUN mode.<br><br>(If the status of the Forced Status Hold Bit itself is preserved in the PLC Setup (Forced Status Hold Bit Status), the status of force-set and force-reset bits will be retained when the PLC is turned ON or power is interrupted.) | 1: Retained<br>0: Not retained                                                                                 | Retained                 | See Function column. | See Function column. | PLC Setup (Forced Status Hold Bit Status setting) |
|              | A50014           | Error Log Reset Bit           | Turn this bit ON to reset the Error Log Pointer (A300) to 00.<br><br>The contents of the Error Log Area itself (A100 to A199) are not cleared. These words can be cleared from a Programming Device or by writing 0000 to all of the words.<br><br>(This bit is automatically reset to 0 after the Error Log Pointer is reset.)                                                                                                                                                                                  | 0→1: Clear                                                                                                     | Retained                 | Cleared              | ---                  | A100 to A199, A300                                |
|              | A50015           | Output OFF Bit                | Turn this bit ON to turn OFF all outputs from Basic I/O Units and Special I/O Units. The INH indicator on the front of the CPU Unit will light while this bit is ON.<br><br>(The status of the Output OFF Bit is retained through power interruptions.)                                                                                                                                                                                                                                                          |                                                                                                                | Retained                 | Retained             | ---                  | ---                                               |
| A501         | A50100 to A50115 | CPU Bus Unit Restart Bits     | Turn these bits ON to restart (initialize) the CPU Bus Unit with the corresponding unit number. Bits 00 to 15 correspond to unit numbers 0 to F.<br><br>When a restart bit is turned ON, the corresponding CPU Bus Unit Initializing Flag (A30200 to A30215) will be turned ON. Both the restart bit and initializing flag will be turned OFF automatically when initialization is completed.                                                                                                                    | 0 to 1: Restart<br>1 to 0: Restart completed<br><br>Turned OFF by the system when the Unit has been restarted. | Retained                 | Cleared              | ---                  | A30200 to A30215                                  |
| A502 to A507 | A50200 to A50715 | Special I/O Unit Restart Bits | Turn these bits ON to restart (initialize) the Special I/O Unit with the corresponding unit number. Bits A50200 to A50715 correspond to unit numbers 0 to 95.<br><br>When a restart bit is turned ON, the corresponding Special I/O Unit Initializing Flag (A33000 to A33515) will be turned ON. Both the restart bit and initializing flag will be turned OFF automatically when initialization is completed.                                                                                                   | 0 to 1: Restart<br>1 to 0: Restart completed<br><br>Turned OFF by the system when the Unit has been restarted. | Retained                 | Cleared              | ---                  | A33000 to A33515                                  |

| Addresses    |        | Name                                 | Function                                                                                                                                                                                                                                                                                                                                                                                                                                      | Settings                                                                   | Status after mode change | Status at startup    | Write timing                    | Related Flags, Settings |
|--------------|--------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------|----------------------|---------------------------------|-------------------------|
| Word         | Bit    |                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |                          |                      |                                 |                         |
| A508         | A50809 | Differentiate Monitor Completed Flag | ON when the differentiate monitor condition has been established during execution of differentiation monitoring.<br>(This flag will be cleared to 0 when differentiation monitoring starts.)                                                                                                                                                                                                                                                  | 1: Monitor condition established<br>0: Not yet established                 | Retained                 | Cleared              | ---                             | ---                     |
|              | A50811 | Trace Trigger Monitor Flag           | ON when a trigger condition is established by the Trace Start Bit (A50814). OFF when the next Data Trace is started by the Sampling Start bit (A50815).                                                                                                                                                                                                                                                                                       | 1: Trigger condition established<br>0: Not yet established or not tracing  | Retained                 | Cleared              | ---                             | ---                     |
|              | A50812 | Trace Completed Flag                 | ON when sampling of a region of trace memory has been completed during execution of a Trace.<br>OFF when the next time the Sampling Start Bit (A50815) is turned from OFF to ON.                                                                                                                                                                                                                                                              | 1: Trace completed<br>0: Not tracing or trace in progress                  | Retained                 | Cleared              | -----                           | ---                     |
|              | A50813 | Trace Busy Flag                      | ON when the Sampling Start Bit (A50815) is turned from OFF to ON. OFF when the trace is completed.                                                                                                                                                                                                                                                                                                                                            | 1: Trace in progress<br>0: Not tracing (not sampling)                      |                          |                      | ---                             | ---                     |
|              | A50814 | Trace Start Bit                      | Turn this bit from OFF to ON to establish the trigger condition. The offset indicated by the delay value (positive or negative) determines which data samples are valid.                                                                                                                                                                                                                                                                      | 1: Trace trigger condition established<br>0: Not established               |                          |                      | ---                             | ---                     |
|              | A50815 | Sampling Start Bit                   | When a data trace is started by turning this bit from OFF to ON from a Programming Device, the PLC will begin storing data in Trace Memory by one of the three following methods:<br>1) Data is sampled at regular intervals (10 to 2,550 ms).<br>2) Data is sampled when TRSM(045) is executed in the program.<br>3) Data is sampled at the end of every cycle.<br>The operation of A50815 can be controlled only from a Programming Device. | 0 to 1: Starts data trace (sampling)<br>Turned ON from Programming Device. |                          |                      | ---                             | ---                     |
| A509         | A50900 | SYSMAC BUS Slave Number Refresh Bit  | Turn this bit ON to refresh the error information in A425 (unit number of Slave where error occurred after startup).                                                                                                                                                                                                                                                                                                                          |                                                                            | Retained                 | Cleared              | ---                             | A425                    |
| A510 to A511 |        | Start-up Time                        | These words contain the time at which the power was turned ON. The contents are updated every time that the power is turned ON. The data is stored in BCD.<br>A51000 to A51007: Second (00 to 59)<br>A51008 to A51015: Minute (00 to 59)<br>A51100 to A51107: Hour (00 to 23)<br>A51108 to A51115: Day of month (00 to 31)                                                                                                                    | See Function column.                                                       | Retained                 | See Function column. | Written when power is turned ON | ---                     |



| Addresses    |                  | Name                                 | Function                                                                                                                                                                                                                                                                                                                                                                     | Settings                                           | Status after mode change | Status at startup | Write timing                    | Related Flags, Settings |
|--------------|------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------|-------------------|---------------------------------|-------------------------|
| Word         | Bit              |                                      |                                                                                                                                                                                                                                                                                                                                                                              |                                                    |                          |                   |                                 |                         |
| A512 to A513 |                  | Power Interruption Time              | These words contain the time at which the power was interrupted. The contents are updated every time that the power is interrupted. The data is stored in BCD.<br>A51200 to A51207: Second (00 to 59)<br>A51208 to A51215: Minute (00 to 59)<br>A51300 to A51307: Hour (00 to 23)<br>A51308 to A51315: Day of month (00 to 31)<br>(These words are not cleared at start-up.) | See Function column.                               | Retained                 | Retained          | Written at power interruption   | ---                     |
| A514         |                  | Number of Power Interruptions        | Contains the number of times that power has been interrupted since the power was first turned ON. The data is stored in binary. To reset this value, overwrite the current value with 0000.<br>(This word is not cleared at start-up, but it is cleared when the Memory Corruption Detected Flag (A39511) goes ON.)                                                          | 0000 to FFFF hexadecimal                           | Retained                 | Retained          | Written when power is turned ON | A39511                  |
| A523         |                  | Total Power ON Time                  | Contains the total time that the PLC has been on in 10-hour units. The data is stored in binary and it is updated every 10 hours. To reset this value, overwrite the current value with 0000.<br>(This word is not cleared at start-up, but it is cleared to 0000 when the Memory Corruption Detected Flag (A39511) goes ON.)                                                | 0000 to FFFF hexadecimal                           | Retained                 | Retained          | ---                             | ---                     |
| A526         | A52600           | RS-232C Port Restart Bit             | Turn this bit ON to restart the RS-232C port. (Do not use this bit when the port is operating in peripheral bus mode.)<br>This bit is turned OFF automatically when the restart processing is completed.                                                                                                                                                                     | 0 to 1: Restart                                    | Retained                 | Cleared           | ---                             | ---                     |
|              | A52601           | Peripheral Port Restart Bit          | Turn this bit ON to restart the peripheral port.<br>This bit is turned OFF automatically when the restart processing is completed.                                                                                                                                                                                                                                           | 0 to 1: Restart                                    | Retained                 | Cleared           | ---                             | ---                     |
|              | A52614           | SYSMAC BUS Master 1 Restart Bit      | Turn this bit ON to restart SYSMAC BUS Remote I/O Master Unit 1.<br>This bit is turned OFF automatically when the restart processing is completed.                                                                                                                                                                                                                           | 0 to 1: Restart                                    | Retained                 | Cleared           | ---                             | ---                     |
|              | A52615           | SYSMAC BUS Master 0 Restart Bit      | Turn this bit ON to restart SYSMAC BUS Remote I/O Master Unit 0.<br>This bit is turned OFF automatically when the restart processing is completed.                                                                                                                                                                                                                           | 0 to 1: Restart                                    | Retained                 | Cleared           | ---                             | ---                     |
| A527         | A52700 to A52707 | Online Editing Disable Bit Validator | The Online Editing Disable Bit (A52709) is valid only when this byte contains 5A.<br>To disable online editing from a Programming Device, set this byte to 5A and turn ON A52709.<br>(Online editing refers to changing or adding to the program while the PLC is operating in MONITOR mode.)                                                                                | 5A: A52709 enabled<br>Other value: A52709 disabled | Retained                 | Cleared           | ---                             | A52709                  |
|              | A52709           | Online Editing Disable Bit           | Turn this bit ON to disable online editing. The setting of this bit is valid only when A52700 to A52707 have been set to 5A.                                                                                                                                                                                                                                                 | 1: Disabled<br>0: Not disabled                     | Retained                 | Cleared           | ---                             | A52700 to A52707        |

| Addresses     |                  | Name                                                               | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Settings                                                                                                                                                           | Status after mode change | Status at startup | Write timing | Related Flags, Settings |
|---------------|------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------|--------------|-------------------------|
| Word          | Bit              |                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                    |                          |                   |              |                         |
| A528          | A52800 to A52807 | RS-232C Port Error Flags                                           | <p>These flags indicate what kind of error has occurred at the RS-232C port; they are automatically turned OFF when the RS-232C port is restarted.</p> <p>(These flags are not valid in peripheral bus mode and only bit 5 is valid in NT Link mode.)</p> <p>Bits 0 and 1: Not used.</p> <p>Bit 2: ON when there was a parity error.</p> <p>Bit 3: ON when there was a framing error.</p> <p>Bit 4: ON when there was an overrun error.</p> <p>Bit 5: ON when there was a timeout error.</p> <p>Bits 6 and 7: Not used.</p> | See Function column.                                                                                                                                               |                          |                   | ---          | ---                     |
|               | A52808 to A52815 | Peripheral Port Error Code                                         | <p>These flags indicate what kind of error has occurred at the peripheral port; they are automatically turned OFF when the peripheral port is restarted.</p> <p>Bits 8 and 9: Not used.</p> <p>Bit 10: ON when there was a parity error.</p> <p>Bit 11: ON when there was a framing error.</p> <p>Bit 12: ON when there was an overrun error.</p> <p>Bit 13: ON when there was a timeout error.</p> <p>Bits 14 and 15: Not used.</p>                                                                                        | See Function column.                                                                                                                                               | ---                      | ---               | ---          | ---                     |
| A529          | ---              | FAL/FALS Number for System Error Simulation (CS1-H CPU Units only) | <p>Set a dummy FAL/FALS number to use to simulate the system error using FAL(006) or FALS(007).</p> <p>When FAL(006) or FALS(007) is executed and the number in A529 is the same as the one specified in the operand of the instruction, the system error given in the operand of the instruction will be generated instead of a user-defined error.</p>                                                                                                                                                                    | <p>0001 to 01FF Hex: FAL/ FALS numbers 1 to 511</p> <p>0000 or 0200 to FFFF Hex: No FAL/FALS number for system error simulation. (No error will be generated.)</p> | Retained                 | Cleared           | ---          | ---                     |
| A530          | ---              | Power Interruption Disable Setting (CS1-H CPU Units only)          | Set to A5A5 Hex to disable power interrupts (except the Power OFF Interrupt task) between DI(693) and EI(694) instructions.                                                                                                                                                                                                                                                                                                                                                                                                 | <p>A5A5 Hex: Masking power interruption processing enabled</p> <p>Other: Masking power interruption processing not enabled.</p>                                    | Cleared                  | Cleared           | ---          | ---                     |
| A595 and A596 | ---              | IR00 Output for Background Execution (CS1-H CPU Units only)        | When an index register is specified as the output for an instruction processed in the background, A595 and A596 receive the output instead of IR00.                                                                                                                                                                                                                                                                                                                                                                         | 0000 0000 to FFFF FFFF Hex (A596 contains the leftmost digits.)                                                                                                    | Cleared                  | Cleared           | ---          | ---                     |
| A597          | ---              | DR00 Output for Background Execution (CS1-H CPU Units only)        | When a data register is specified as the output for an instruction processed in the background, A597 receives the output instead of DR00.                                                                                                                                                                                                                                                                                                                                                                                   | 0000 to FFFF Hex                                                                                                                                                   | Cleared                  | Cleared           | ---          | ---                     |

| Addresses    |                  | Name                                                        | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Settings                                                  | Status after mode change | Status at startup | Write timing | Related Flags, Settings |
|--------------|------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------|-------------------|--------------|-------------------------|
| Word         | Bit              |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                           |                          |                   |              |                         |
| A598         | A59800           | FPD Teaching Bit                                            | Turn this bit ON to set the monitoring time automatically with the teaching function.<br><br>While A59800 is ON, FPD(269) measures how long it takes for the diagnostic output to go ON after the execution condition goes ON. If the measured time exceeds the monitoring time, the measured time is multiplied by 1.5 and that value is stored as the new monitoring time.<br><br>(The teaching function can be used only when a word address has been specified for the monitoring time operand.) | 1: Teach monitoring time<br>0: Teaching function off      | Cleared                  | Cleared           | ---          | ---                     |
|              | A59801           | Equals Flag for Background Execution (CS1-H CPU Units only) | Turns ON if matching data is found for an SRCH(181) instruction executed in the background.                                                                                                                                                                                                                                                                                                                                                                                                          | 1: Search data found in table<br>0: Search data not found | Cleared                  | Cleared           | ---          | ---                     |
| A600 to A603 |                  | Macro Area Input Words                                      | When MCRO(099) is executed, it copies the input data from the specified source words (input parameter words) to A600 through A603 and executes the specified subroutine with that input data.                                                                                                                                                                                                                                                                                                        | Input data:<br>4 words                                    | Cleared                  | Cleared           | ---          | ---                     |
| A604 to A607 |                  | Macro Area Output Words                                     | After the subroutine specified in MCRO(099) has been executed, the results of the subroutine are transferred from A604 through A607 to the specified destination words. (output parameter words).                                                                                                                                                                                                                                                                                                    | Output data:<br>4 words                                   | Cleared                  | Cleared           | ---          | ---                     |
| A608         | A60800           | Inner Board Restart Bit                                     | Turn the corresponding bit ON to restart (initialize) Inner Board 0 or 1.<br><br>The bit is turned OFF automatically when the restart processing is completed.                                                                                                                                                                                                                                                                                                                                       | ---                                                       | Retained                 | Cleared           | ---          | ---                     |
| A609 to A613 | A60900 to A61315 | Inner Board User Interface Area                             | The data transferred from the CPU Unit to the Inner Board is defined and used at the Inner Board.<br><br>The contents of these words is retained when the power is turned ON.                                                                                                                                                                                                                                                                                                                        | ---                                                       | Retained                 | Retained          | ---          | ---                     |
| A619         | A61901           | Peripheral Port Settings Changing Flag                      | ON while the peripheral port's communications settings are being changed. This flag will be turned ON when STUP(237) is executed and it will be turned OFF after the settings have been changed.                                                                                                                                                                                                                                                                                                     | 1: Changing<br>0: Not changing                            | Retained                 | Cleared           | ---          | ---                     |
|              | A61902           | RS-232C Port Settings Changing Flag                         | ON while the RS-232C port's communications settings are being changed. This flag will be turned ON when STUP(237) is executed and it will be turned OFF after the settings have been changed.                                                                                                                                                                                                                                                                                                        | 1: Changing<br>0: Not changing                            | Retained                 | Cleared           | ---          | ---                     |

| Addresses |                  | Name                                                              | Function                                                                                                                                                                                                                                                                                                                                                                                         | Settings                       | Status after mode change | Status at startup | Write timing | Related Flags, Settings |
|-----------|------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------|-------------------|--------------|-------------------------|
| Word      | Bit              |                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                  |                                |                          |                   |              |                         |
| A620      | A62001           | Communications Unit 0, Port 1 Settings Changing Flag              | <p>The corresponding flag will be ON when the settings for that port are being changed.</p> <p>The flag will be turned ON when STUP(237) is executed and it will be turned OFF by an event issued from the Serial Communications Unit after the settings have been changed.</p> <p>It is also possible for the user to indicate a change in serial port settings by turning these flags ON.</p>  | 1: Changing<br>0: Not changing | Retained                 | Cleared           | ---          | ---                     |
|           | A62002           | Communications Unit 0, Port 2 Settings Changing Flag              |                                                                                                                                                                                                                                                                                                                                                                                                  | 1: Changing<br>0: Not changing | Retained                 | Cleared           | ---          | ---                     |
|           | A62003           | Communications Unit 0, Port 3 Settings Changing Flag              |                                                                                                                                                                                                                                                                                                                                                                                                  | 1: Changing<br>0: Not changing | Retained                 | Cleared           | ---          | ---                     |
|           | A62004           | Communications Unit 0, Port 4 Settings Changing Flag              |                                                                                                                                                                                                                                                                                                                                                                                                  | 1: Changing<br>0: Not changing | Retained                 | Cleared           | ---          | ---                     |
|           | A62100 to A63515 | Communications Units 0 to 15, Ports 1 to 4 Settings Changing Flag | Same as above.                                                                                                                                                                                                                                                                                                                                                                                   | 1: Changing<br>0: Not changing | Retained                 | Cleared           | ---          | ---                     |
| A636      | A63601           | Communications Board Port 1 Settings Changing Flag                | <p>The corresponding flag will be ON when the settings for that port are being changed.</p> <p>The flag will be turned ON when STUP(237) is executed and it will be turned OFF by an event issued from the Serial Communications Board after the settings have been changed.</p> <p>It is also possible for the user to indicate a change in serial port settings by turning these flags ON.</p> | 1: Changing<br>0: Not changing | Retained                 | Cleared           | ---          | ---                     |
|           | A63602           | Communications Board Port 2 Settings Changing Flag                |                                                                                                                                                                                                                                                                                                                                                                                                  | 1: Changing<br>0: Not changing | Retained                 | Cleared           | ---          | ---                     |
|           | A63603           | Communications Board Port 3 Settings Changing Flag                |                                                                                                                                                                                                                                                                                                                                                                                                  | 1: Changing<br>0: Not changing | Retained                 | Cleared           | ---          | ---                     |
|           | A63604           | Communications Board Port 4 Settings Changing Flag                |                                                                                                                                                                                                                                                                                                                                                                                                  | 1: Changing<br>0: Not changing | Retained                 | Cleared           | ---          | ---                     |

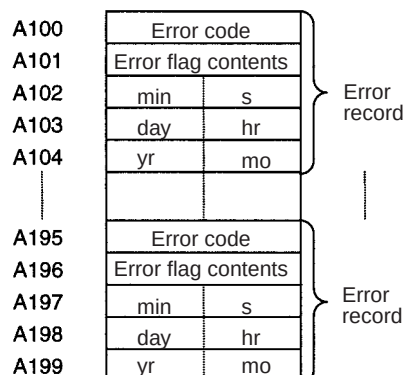
| Addresses    |        | Name                                                        | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Settings                                                                                      | Status after mode change | Status at startup | Write timing | Related Flags, Settings |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |
|--------------|--------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------|-------------------|--------------|-------------------------|----|------|----|----|------|----|----|------|----|----|-----|----------|---------|-----|-----|
| Word         | Bit    |                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                               |                          |                   |              |                         |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |
| A650         | A65014 | Replacement Error Flag (except pre-version-1 CS1 CPU Units) | ON when the Replacement Start Bit (A65015) is turned ON to replace the program, but there is an error. If the Replacement Start Bit is turned ON again, the Replacement Error Flag will be turned OFF.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1: Replacement error<br>0: No replacement error, or the Replacement Start Bit (A65015) is ON. | Retained                 | Cleared           | ---          | ---                     |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |
|              | A65015 | Replacement Start Bit (except pre-version-1 CS1 CPU Units)  | Program replacement starts when the Replacement Start Bit is turned ON if the Program Password (A651) is valid (A5A5 Hex). Do not turn OFF the Replacement Start Bit during program replacement.<br><br>When the power is turned ON or program replacement is completed, the Replacement Start Bit will be turned OFF, regardless of whether replacement was completed normally or in error.<br><br>It is possible to confirm if program replacement is being executed by reading the Replacement Start Bit using a Programming Device, PT, or host computer.                                                                                                                                                                                                                                                                        | 1: Program replaced<br>0: Replacement completed, or after power is turned ON                  | Retained                 | Cleared           | ---          | ---                     |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |
| A651         | ---    | Program Password (except pre-version-1 CS1 CPU Units)       | Type in the password to replace a program.<br><br>A5A5 Hex: Replacement Start Bit (A65015) is enabled.<br><br>Any other value: Replacement Start Bit (A65015) is disabled.<br><br>When the power is turned ON or program replacement is completed, the Replacement Start Bit will be turned OFF, regardless of whether replacement was completed normally or in error.                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ---                                                                                           | Retained                 | Cleared           | ---          | ---                     |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |
| A654 to A657 | ---    | Program File Name (except pre-version-1 CS1 CPU Units)      | When program replacement starts, the program file name will be stored in ASCII. File names can be specified up to eight characters in length excluding the extension.<br><br>File names are stored in the following order: A654 to A657 (i.e., from the lowest word to the highest), and from the highest byte to the lowest. If a file name is less than eight characters, the lowest remaining bytes and the highest remaining word will be filled with spaces (20 Hex). Null characters and space characters cannot be used within file names.<br><br>Example: File name is ABC.OBJ<br><br><table><tr><td></td><td>15</td><td>0</td></tr><tr><td>A654</td><td>41</td><td>42</td></tr><tr><td>A655</td><td>43</td><td>20</td></tr><tr><td>A656</td><td>20</td><td>20</td></tr><tr><td>A657</td><td>20</td><td>20</td></tr></table> |                                                                                               | 15                       | 0                 | A654         | 41                      | 42 | A655 | 43 | 20 | A656 | 20 | 20 | A657 | 20 | 20 | --- | Retained | Cleared | --- | --- |
|              | 15     | 0                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                               |                          |                   |              |                         |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |
| A654         | 41     | 42                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                               |                          |                   |              |                         |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |
| A655         | 43     | 20                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                               |                          |                   |              |                         |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |
| A656         | 20     | 20                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                               |                          |                   |              |                         |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |
| A657         | 20     | 20                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                               |                          |                   |              |                         |    |      |    |    |      |    |    |      |    |    |     |          |         |     |     |

**Note** In CS-series PLCs, the following flags are provided in a special read-only area and can be specified with the labels given in the table. These flags are not contained in the Auxiliary Area.

| Flag area           | Name                        | Label           | Meaning                                                                                                                                                                  |
|---------------------|-----------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Condition Code Area | Error Flag                  | <b>ER</b>       | Turns ON when an error occurs in processing an instructions, indicating an error end to the instruction.                                                                 |
|                     | Access Error Flag           | <b>AER</b>      | Turns ON when an attempt is made to access an illegal area. The status of this flag is maintain only during the current cycle and only in the task in which it occurred. |
|                     | Carry Flag                  | <b>CY</b>       | Turns ON when there is a carry or borrow in a math operation, when a bit is shifted into the Carry Flag, etc.                                                            |
|                     | Greater Than Flag           | <b>&gt;</b>     | Turns ON when the result of comparing two values is “greater than,” when a value exceeds a specified range, etc.                                                         |
|                     | Equals Flag                 | <b>=</b>        | Turns ON when the result of comparing two values is “equals,” when the result of a math operation is 0, etc.                                                             |
|                     | Less Than Flag              | <b>&lt;</b>     | Turns ON when the result of comparing two values is “less than,” when a value is below a specified range, etc.                                                           |
|                     | Negative Flag               | <b>N</b>        | Turns ON when the MSB in the result of a math operation is 1.                                                                                                            |
|                     | Overflow Flag               | <b>OF</b>       | Turns ON when the result of a math operation overflows.                                                                                                                  |
|                     | Underflow Flag              | <b>UF</b>       | Turns ON when the result of a math operation underflows.                                                                                                                 |
|                     | Greater Than or Equals Flag | <b>&gt;=</b>    | Turns ON when the result of comparing two values is “greater than or equals.”                                                                                            |
|                     | Not Equal Flag              | <b>&lt;&gt;</b> | Turns ON when the result of comparing two values is “not equal.”                                                                                                         |
|                     | Less than or Equals Flag    | <b>&lt;=</b>    | Turns ON when the result of comparing two values is “less than or equals.”                                                                                               |
|                     | Always ON Flag              | <b>A1</b>       | This flag is always ON.                                                                                                                                                  |
|                     | Always OFF Flag             | <b>A0</b>       | This flag is always OFF.                                                                                                                                                 |
| Clock Pulse Area    | 0.02-s clock pulse          | <b>0.02s</b>    | Repeatedly turns ON for 0.02 s and OFF for 0.02 s.                                                                                                                       |
|                     | 0.1-s clock pulse           | <b>0.1s</b>     | Repeatedly turns ON for 0.1 s and OFF for 0.1 s.                                                                                                                         |
|                     | 0.2-s clock pulse           | <b>0.2s</b>     | Repeatedly turns ON for 0.2 s and OFF for 0.2 s.                                                                                                                         |
|                     | 1-s clock pulse             | <b>1s</b>       | Repeatedly turns ON for 1 s and OFF for 1 s.                                                                                                                             |
|                     | 1-min clock pulse           | <b>1min</b>     | Repeatedly turns ON for 1 min and OFF for 1 min.                                                                                                                         |

## Details on Auxiliary Area Operation

### A100 to A199: Error Log Area



The following data would be generated in an error record if a memory error (error code 80F1) occurred on 1 April 1998 at 17:10:30 with the error located in the PLC Setup (04 Hex).

|    |    |
|----|----|
| 80 | F1 |
| 00 | 04 |
| 10 | 30 |
| 01 | 17 |
| 98 | 04 |

The following data would be generated in an error record if an FALS error with FALS number 001 occurred on 2 May 1997 at 8:30:15.

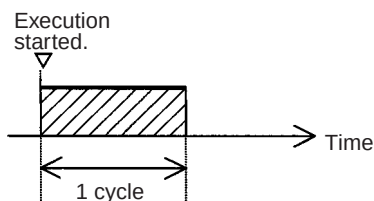
|    |    |
|----|----|
| C1 | 01 |
| 00 | 00 |
| 30 | 15 |
| 02 | 08 |
| 97 | 05 |

## Error Codes and Error Flags

| Classification                  | Error code         | Meaning                                 | Error flags                     |
|---------------------------------|--------------------|-----------------------------------------|---------------------------------|
| System-defined fatal errors     | 80F1               | Memory error                            | A403                            |
|                                 | 80C0 to 80C7, 80CF | I/O bus error                           | A404                            |
|                                 | 80E9               | Duplicate number error                  | A410, A411 to 416 (See note 3.) |
|                                 | 80E1               | Too many I/O error                      | A407                            |
|                                 | 80E0               | I/O setting error                       | ---                             |
|                                 | 80F0               | Program error                           | A295 to 299 (See note 4.)       |
|                                 | 809F               | Cycle time too long error               | ---                             |
|                                 | 80EA               | Duplicate Expansion Rack number error   | A40900 to 40907                 |
| User-defined fatal errors       | C101 to C2FF       | FALS instruction executed (See note 1.) | ---                             |
| User-defined non-fatal errors   | 4101 to 42FF       | FAL instruction executed (See note 2.)  | ---                             |
| System-defined non-fatal errors | 008B               | Interrupt task error                    | A426                            |
|                                 | 009A               | Basic I/O error                         | A408                            |
|                                 | 009B               | PLC Setup setting error                 | A406                            |
|                                 | 0200 to 020F       | CS-series CPU Bus Unit error            | A417                            |
|                                 | 0300 to 035F       | Special I/O Unit error                  | A418 to 423 (See note 5.)       |
|                                 | 00A0 to 00A1       | SYSMAC BUS error                        | A405                            |
|                                 | 0400 to 040F       | CS-series CPU Bus Unit setup error      | A427                            |
|                                 | 0500 to 055F       | Special I/O Unit setup error            | A428 to 433 (See note 5.)       |

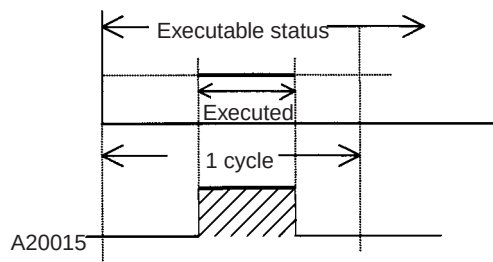
- Note**
1. C101 to C2FF will be stored for FALS numbers 001 to 511.
  2. 4101 to 42FF will be stored for FAL numbers 001 to 511.
  3. The contents of the error flags for a duplicate number error are as follows:  
 Bits 0 to 7: Unit number (binary), 00 to 5F Hex for Special I/O Units, 00 to 0F Hex for CS-series CPU Bus Units  
 Bits 8 to 14: All zeros.  
 Bit 15: Unit type, 0 for CS-series CPU Bus Units and 1 for Special I/O Units.
  4. Only the contents of A295 is stored as the error flag contents for program errors.
  5. 0000 Hex will be stored as the error flag contents.

## A20011: First Cycle Flag

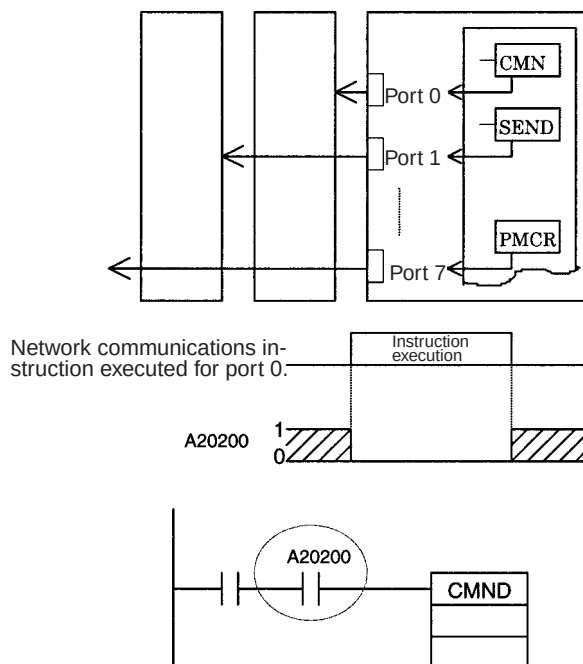


## A20015: Initial Task Flag

A20015 will turn ON during the first time a task is executed after it has reached executable status. It will be ON only while the task is being executed and will not turn ON if following cycles.



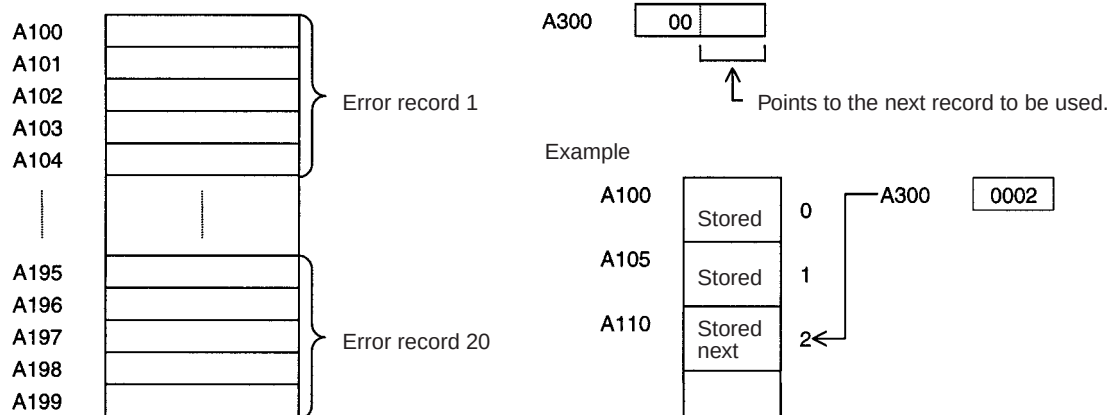
## A20200 to A20207: Communications Port Enabled Flags



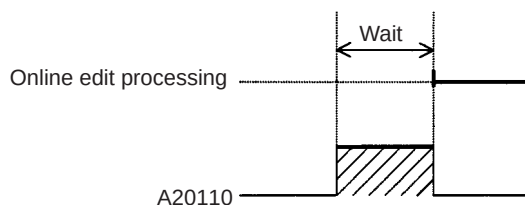
The program is designed so that CMND(490) will be executed only when A20200 is ON.



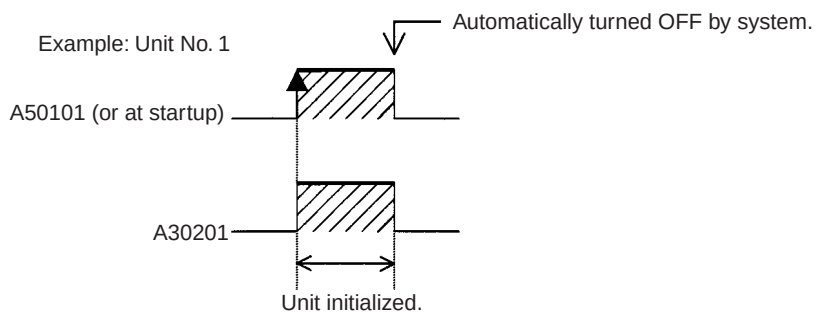
## A300: Error Record Pointer



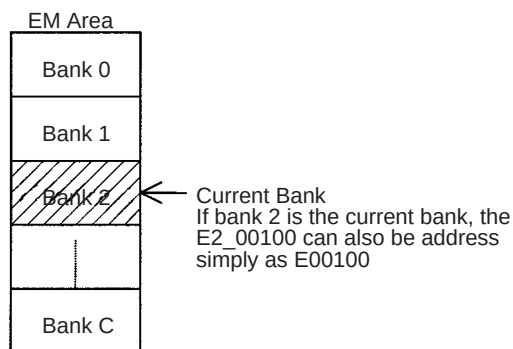
## A20110: Online Editing Wait Flag



## A50100 to A50115: CPU Bus Unit Restart Bits and A30200 to A30215: CPU Bus Unit Initialization Flags



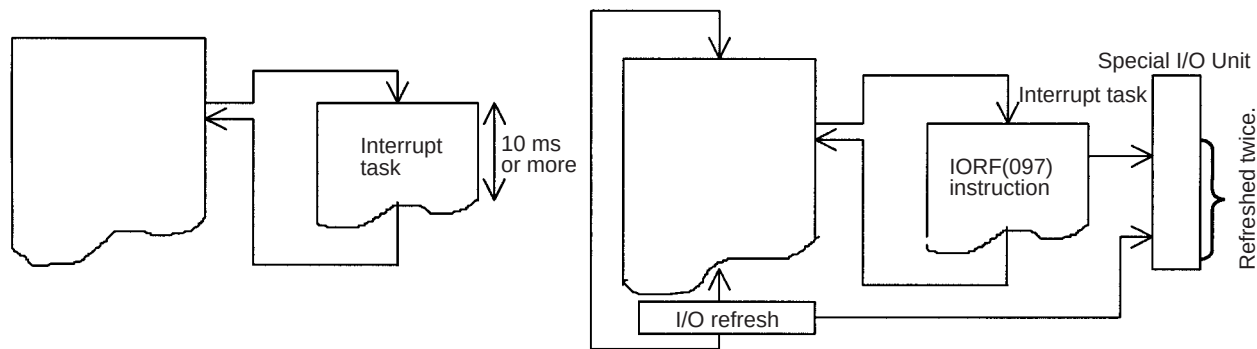
## A301: Current EM Bank



A40109: Program Error

| Error                                | Address |
|--------------------------------------|---------|
| UM Overflow Error Flag               | A29515  |
| Illegal Instruction Flag             | A29514  |
| Distribution Overflow Error Flag     | A29513  |
| Task Error Flag                      | A25912  |
| No END(001) Error Flag               | A29511  |
| Illegal Area Access Error Flag       | A29510  |
| Indirect DM/EM Addressing Error Flag | A29509  |

A42615: Interrupt Task Error Cause Flag





# Appendix C

## Memory Map of PLC Memory Addresses

### PLC Memory Addresses

PLC memory addresses are set in Index Registers (IR00 to IR15) to indirectly address I/O memory. Normally, use the MOVE TO REGISTER (MOVR(560)) and MOVE TIMER/COUNTER PV TO REGISTER (MOVW(561)) instructions to set PLC memory addresses into the Index Registers.

Some instructions, such as DATA SEARCH (SRCH(181)), FIND MAXIMUM (MAX(182)), and FIND MINIMUM (MIN(183)), output the results of processing to an Index Register to indicate an PLC memory address.

There are also instructions for which Index Registers can be directly designated to use the PLC memory addresses stored in them by other instructions. These instructions include DOUBLE MOVE (MOVL(498)), some symbol comparison instructions (=L, <>L, <L, >L, <=L, and >=L), DOUBLE COMPARE (CMPL(060)), DOUBLE DATA EXCHANGE (XCGL(562)), DOUBLE INCREMENT BINARY (++L(591)), DOUBLE DECREMENT BINARY (--L(593)), DOUBLE SIGNED BINARY ADD WITHOUT CARRY (+L(401)), DOUBLE SIGNED BINARY SUBTRACT WITHOUT CARRY (-L(411)), SET RECORD LOCATION (SETR(635)), and GET RECORD LOCATION (GETR(636)).

The PLC memory addresses all are continuous and the user must be aware of the order and boundaries of the memory areas. As reference, the PLC memory addresses are provided in a table at the end of this appendix.

**Note** Directly setting PLC memory addresses in the program should be avoided whenever possible. If PLC memory addresses are set in the program, the program will be less compatible with new CPU Unit models or CPU Units for which changes have been made to the layout of the memory.

### Memory Configuration

There are two classifications of the RAM memory (with battery backup) in a CS-series CPU Unit.

**Parameter Areas:** These areas contain CPU Unit system setting data, such as the PLC Setup, CS-series CPU Bus Unit Setups, etc. An illegal access error will occur if an attempt is made to access any of the parameter areas from an instruction in the user program.

**I/O Memory Areas:** These are the areas that can be specified as operands in the instructions in user programs.

## Memory Map

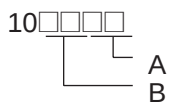
| Classification   | PLC memory addresses (Hex) | User addresses       | Area                                                                                                                                               |
|------------------|----------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameter areas  | 00000 to 0B0FF             | ---                  | PLC Setup Area<br>Registered I/O Table Area<br>Routing Table Area<br>CS-series CPU Bus Unit Setup Area<br>Real I/O Table Area<br>Unit Profile Area |
| I/O memory areas | 0B100 to 0B1FF             | ---                  | Reserved for system.                                                                                                                               |
|                  | 0B200 to 0B7FF             | ---                  | Reserved for system.                                                                                                                               |
|                  | 0B800 to 0B801             | TK00 to TK31         | Task Flag Area                                                                                                                                     |
|                  | 0B802 to 0B83F             | ---                  | Reserved for system.                                                                                                                               |
|                  | 0B840 to 0B9FF             | A000 to A447         | Read-only Auxiliary Area                                                                                                                           |
|                  | 0BA00 to 0BBFF             | A448 to A959         | Read/Write Auxiliary Area                                                                                                                          |
|                  | 0BC00 to 0BDFF             | ---                  | Reserved for system.                                                                                                                               |
|                  | 0BE00 to 0BEFF             | T0000 to T4095       | Timer Completion Flags                                                                                                                             |
|                  | 0BF00 to 0BFFF             | C0000 to C4095       | Counter Completion Flags                                                                                                                           |
|                  | 0C000 to 0D7FF             | CIO 0000 to CIO 6143 | CIO Area                                                                                                                                           |
|                  | 0D800 to 0D9FF             | H000 to H511         | Holding Area                                                                                                                                       |
|                  | 0DA00 to 0DDFF             | ---                  | Reserved for system.                                                                                                                               |
|                  | 0DE00 to 0DFFF             | W000 to W511         | Work Area                                                                                                                                          |
|                  | 0E000 to 0EFFF             | T0000 to T4095       | Timer PVs                                                                                                                                          |
|                  | 0F000 to 0FFFF             | C0000 to C4095       | Counter PVs                                                                                                                                        |
|                  | 10000 to 17FFF             | D00000 to D32767     | DM Area                                                                                                                                            |
|                  | 18000 to 1FFFF             | E0_00000 to E0_32767 | EM Area bank 0                                                                                                                                     |
|                  | 20000 to 27FFF             | E1_00000 to E1_32767 | EM Area bank 1                                                                                                                                     |
|                  | 28000 to 2FFFF             | E2_00000 to E2_32767 | EM Area bank 2                                                                                                                                     |
|                  | 30000 to 37FFF             | E3_00000 to E3_32767 | EM Area bank 3                                                                                                                                     |
|                  | 38000 to 3FFFF             | E4_00000 to E4_32767 | EM Area bank 4                                                                                                                                     |
|                  | 40000 to 47FFF             | E5_00000 to E5_32767 | EM Area bank 5                                                                                                                                     |
|                  | 48000 to 4FFFF             | E6_00000 to E6_32767 | EM Area bank 6                                                                                                                                     |
|                  | 50000 to 57FFF             | E7_00000 to E7_32767 | EM Area bank 7                                                                                                                                     |
|                  | 58000 to 5FFFF             | E8_00000 to E8_32767 | EM Area bank 8                                                                                                                                     |
|                  | 60000 to 67FFF             | E9_00000 to E9_32767 | EM Area bank 9                                                                                                                                     |
|                  | 68000 to 6FFFF             | EA_00000 to EA_32767 | EM Area bank A                                                                                                                                     |
|                  | 70000 to 77FFF             | EB_00000 to EB_32767 | EM Area bank B                                                                                                                                     |
|                  | 78000 to 7FFFF             | EC_00000 to EC_32767 | EM Area bank C                                                                                                                                     |
|                  | F8000 to FFFFF             | E0000 to E32767      | EM Area, current bank                                                                                                                              |

# Appendix D

## PLC Setup Coding Sheets for Programming Console

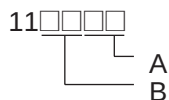
Use the following coding sheets when setting the PLC Setup from a Programming Console.

### Address



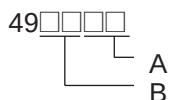
|   | Value (Hex) | Rack 0, Slot 0 I/O Response Time |
|---|-------------|----------------------------------|
| A | 00          | 8 ms                             |
|   | 10          | No filter                        |
|   | 11          | 0.5 ms                           |
|   | 12          | 1 ms                             |
|   | 13          | 2 ms                             |
|   | 14          | 4 ms                             |
|   | 15          | 8 ms                             |
|   | 16          | 16 ms                            |
|   | 17          | 32 ms                            |
| B | 00          | 8 ms                             |
|   | 10          | No filter                        |
|   | 11          | 0.5 ms                           |
|   | 12          | 1 ms                             |
|   | 13          | 2 ms                             |
|   | 14          | 4 ms                             |
|   | 15          | 8 ms                             |
|   | 16          | 16 ms                            |
|   | 17          | 32 ms                            |

Address



|   | Value (Hex) | Rack 0, Slot 2 I/O Response Time |
|---|-------------|----------------------------------|
| A | 00          | 8 ms                             |
|   | 10          | No filter                        |
|   | 11          | 0.5 ms                           |
|   | 12          | 1 ms                             |
|   | 13          | 2 ms                             |
|   | 14          | 4 ms                             |
|   | 15          | 8 ms                             |
|   | 16          | 16 ms                            |
|   | 17          | 32 ms                            |
|   |             |                                  |
|   | Value (Hex) | Rack 0, Slot 3 I/O Response Time |
| B | 00          | 8 ms                             |
|   | 10          | No filter                        |
|   | 11          | 0.5 ms                           |
|   | 12          | 1 ms                             |
|   | 13          | 2 ms                             |
|   | 14          | 4 ms                             |
|   | 15          | 8 ms                             |
|   | 16          | 16 ms                            |
|   | 17          | 32 ms                            |
|   |             |                                  |

Address



|   | Value (Hex) | Rack 7, Slot 8 I/O Response Time |
|---|-------------|----------------------------------|
| A | 00          | 8 ms                             |
|   | 10          | No filter                        |
|   | 11          | 0.5 ms                           |
|   | 12          | 1 ms                             |
|   | 13          | 2 ms                             |
|   | 14          | 4 ms                             |
|   | 15          | 8 ms                             |
|   | 16          | 16 ms                            |
|   | 17          | 32 ms                            |
|   |             |                                  |
|   | Value (Hex) | Rack 7, Slot 9 I/O Response Time |
| B | 00          | 8 ms                             |
|   | 10          | No filter                        |
|   | 11          | 0.5 ms                           |
|   | 12          | 1 ms                             |
|   | 13          | 2 ms                             |
|   | 14          | 4 ms                             |
|   | 15          | 8 ms                             |
|   | 16          | 16 ms                            |
|   | 17          | 32 ms                            |
|   |             |                                  |

## Address

80□□□□

A

|   | Value (Hex) | IOM Hold Bit Status at Startup | Forced Status Hold Bit Status at Startup |
|---|-------------|--------------------------------|------------------------------------------|
| A | C000        | Retained                       | Retained                                 |
|   | 8000        | Retained                       | Cleared                                  |
|   | 4000        | Cleared                        | Retained                                 |
|   | 0000        | Cleared                        | Cleared                                  |

## Address

81□□□□

A

|   | Value (Hex) | Startup Mode                              |
|---|-------------|-------------------------------------------|
| A | PRCN        | Mode on Programming Console's mode switch |
|   | PRG         | PROGRAM mode                              |
|   | MON         | MONITOR mode                              |
|   | RUN         | RUN mode                                  |

## Address

83□□□□

A

|   | Value (Hex) | Startup Condition (CS1-H CPU Units only) |
|---|-------------|------------------------------------------|
| A | 8000        | Don't wait.                              |
|   | 0000        | Wait for all Units and Boards.           |

## Address

84□□□□

A

|   | Value (Hex) | Inner Board Setting (CS1-H CPU Units only) |
|---|-------------|--------------------------------------------|
| A | 8000        | Don't wait.                                |
|   | 0000        | Wait for all Boards.                       |

## Address

128□□□□

A

|   | Value (Hex) | Low Battery Voltage Detection | Interrupt Task Error Detection |
|---|-------------|-------------------------------|--------------------------------|
| A | C000        | Do not detect                 | Do not detect                  |
|   | 8000        | Do not detect                 | Detect                         |
|   | 4000        | Detect                        | Do not detect                  |
|   | 0000        | Detect                        | Detect                         |



## Address

129      
 A

|   | Value (Hex) | FAL Error Log Registration (CS1-H CPU Units only) |
|---|-------------|---------------------------------------------------|
| A | 8000        | Don't store user-defined FAL error in error log.  |
|   | 0000        | Store user-defined FAL error in error log.        |

## Address

136      
 A

|   | Value (Hex) | EM File Memory Conversion          |
|---|-------------|------------------------------------|
| A | 0000        | None                               |
|   | 0080        | EM File Memory Enabled: Bank No. 0 |
|   | 0081        | EM File Memory Enabled: Bank No. 1 |
|   | to          | to                                 |
|   | 008C        | EM File Memory Enabled: Bank No. C |

## Address

144      
 A  
 B

## Peripheral Port

|   | Value (Hex) | Data bits | Stop bits | Parity |
|---|-------------|-----------|-----------|--------|
| A | 00          | 7 bits    | 2 bits    | Even   |
|   | 01          | 7 bits    | 2 bits    | Odd    |
|   | 02          | 7 bits    | 2 bits    | None   |
|   | 04          | 7 bits    | 1 bit     | Even   |
|   | 05          | 7 bits    | 1 bit     | Odd    |
|   | 06          | 7 bits    | 1 bit     | None   |
|   | 08          | 8 bits    | 2 bits    | Even   |
|   | 09          | 8 bits    | 2 bits    | Odd    |
|   | 0A          | 8 bits    | 2 bits    | None   |
|   | 0C          | 8 bits    | 1 bit     | Even   |
|   | 0D          | 8 bits    | 1 bit     | Odd    |
|   | 0E          | 8 bits    | 1 bit     | None   |

|   | Value (Hex) | Communications mode                   |
|---|-------------|---------------------------------------|
| B | 00          | Default (Rightmost 2 digits ignored.) |
|   | 80          | Host link                             |
|   | 82          | NT link                               |
|   | 84          | Peripheral bus                        |
|   | 85          | Host link                             |

Address

145      
A

## Peripheral Port

|   | Value (Hex) | Baud rate   |
|---|-------------|-------------|
| A | 0000        | 9,600 bps   |
|   | 0001        | 300 bps     |
|   | 0002        | 600 bps     |
|   | 0003        | 1,200 bps   |
|   | 0004        | 2,400 bps   |
|   | 0005        | 4,800 bps   |
|   | 0006        | 9,600 bps   |
|   | 0007        | 19,200 bps  |
|   | 0008        | 38,400 bps  |
|   | 0009        | 57,600 bps  |
|   | 000A        | 115,200 bps |

**Note** Set 0000 to 0009 Hex for standard NT Links and 000A Hex for high-speed NT Links.

Address

147      
A

## Peripheral Port

|   | Value (Hex) | Host link Unit No. |
|---|-------------|--------------------|
| A | 0000        | No. 0              |
|   | 0001        | No. 1              |
|   | 0002        | No. 2              |
|   | to          | to                 |
|   | 001F        | No. 31             |

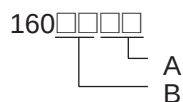
Address

150      
A

## Peripheral Port

|   | Value (Hex) | NT Link Mode Maximum Unit No. |
|---|-------------|-------------------------------|
| A | 0000        | No. 0                         |
|   | 0001        | No. 1                         |
|   | to          | to                            |
|   | 0007        | No. 7                         |

## Address

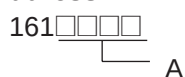


## RS-232C Port

|   | Value (Hex) | Data bits | Stop bits | Parity |
|---|-------------|-----------|-----------|--------|
| A | 00          | 7 bits    | 2 bits    | Even   |
|   | 01          | 7 bits    | 2 bits    | Odd    |
|   | 02          | 7 bits    | 2 bits    | None   |
|   | 04          | 7 bits    | 1 bit     | Even   |
|   | 05          | 7 bits    | 1 bit     | Odd    |
|   | 06          | 7 bits    | 1 bit     | None   |
|   | 08          | 8 bits    | 2 bits    | Even   |
|   | 09          | 8 bits    | 2 bits    | Odd    |
|   | 0A          | 8 bits    | 2 bits    | None   |
|   | 0C          | 8 bits    | 1 bit     | Even   |
|   | 0D          | 8 bits    | 1 bit     | Odd    |
|   | 0E          | 8 bits    | 1 bit     | None   |

|   | Value (Hex) | Communications mode                   |
|---|-------------|---------------------------------------|
| B | 00          | Default (Rightmost 2 digits ignored.) |
|   | 80          | Host link                             |
|   | 82          | NT link                               |
|   | 83          | No-protocol                           |
|   | 84          | Peripheral bus                        |
|   | 85          | Host link                             |

## Address



## RS-232C Port

|   | Value (Hex) | Baud rate   |
|---|-------------|-------------|
| A | 0000        | 9,600 bps   |
|   | 0001        | 300 bps     |
|   | 0002        | 600 bps     |
|   | 0003        | 1,200 bps   |
|   | 0004        | 2,400 bps   |
|   | 0005        | 4,800 bps   |
|   | 0006        | 9,600 bps   |
|   | 0007        | 19,200 bps  |
|   | 0008        | 38,400 bps  |
|   | 0009        | 57,600 bps  |
|   | 000A        | 115,200 bps |

**Note** Set 0000 to 0009 Hex for standard NT Links and 000A Hex for high-speed NT Links.

Address  
162□□□□  
A

RS-232C Port

|   | Value (Hex) | No-protocol mode delay |
|---|-------------|------------------------|
| A | 0000        | 0 ms                   |
|   | 0001        | 10 ms                  |
|   | to          | to                     |
|   | 270F        | 99,990 ms              |

Address  
163□□□□  
A

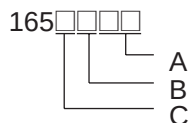
RS-232C Port

|   | Value (Hex) | Host link Unit No. |
|---|-------------|--------------------|
| A | 0000        | No. 0              |
|   | 0001        | No. 1              |
|   | 0002        | No. 2              |
|   | to          | to                 |
|   | 001F        | No. 31             |

Address  
164□□□□  
A  
B

|   | Value (Hex) | No-protocol Mode End Code   |
|---|-------------|-----------------------------|
| A | 00          | 00                          |
|   | to          | to                          |
|   | FF          | FF                          |
|   | Value (Hex) | No-protocol Mode Start Code |
| B | 00          | 00                          |
|   | to          | to                          |
|   | FF          | FF                          |

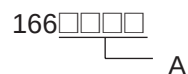
## Address



## RS-232C Port

|   | Value (Hex) | No-protocol Mode reception data volume           |
|---|-------------|--------------------------------------------------|
| A | 00          | 256                                              |
|   | 01          | 1                                                |
|   | to          | to                                               |
|   | FF          | 256                                              |
|   | Value (Hex) | No-protocol Mode end code setting                |
| B | 0           | None (Specify the amount of data being received) |
|   | 1           | Yes (Specify the end code)                       |
|   | 2           | End code is set to CF+LF                         |
|   | Value (Hex) | No-protocol Mode start code setting              |
| C | 0           | None                                             |
|   | 1           | Yes                                              |

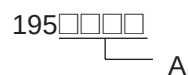
## Address



## RS-232C Port

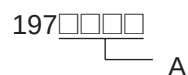
|   | Value (Hex) | Maximum Unit No. in NT Link Mode |
|---|-------------|----------------------------------|
| A | 0000        | No. 0                            |
|   | 0001        | No. 1                            |
|   | to          | to                               |
|   | 0007        | No. 7                            |

## Address



|   | Value (Hex) | Scheduled interrupt time unit |
|---|-------------|-------------------------------|
| A | 0000        | 10 ms                         |
|   | 0001        | 1.0 ms                        |

## Address



|   | Value (Hex) | Instruction Error Operation |
|---|-------------|-----------------------------|
| A | 0000        | Continue operation          |
|   | 8000        | Stop operation              |

Address

198□□□□

A

|   | Value (Hex) | Background Communications Port Number<br>(CS1-H CPU Units only) |
|---|-------------|-----------------------------------------------------------------|
| A | 0 to 7      | Communications port number 0 to 7 (logical port number)         |

|   | Value (Hex) | Background Processes (CS1-H CPU Units only)\ |                          |                            |
|---|-------------|----------------------------------------------|--------------------------|----------------------------|
|   |             | Table data instructions                      | Text string instructions | Data shifting instructions |
| B | E00         | Yes                                          | Yes                      | Yes                        |
|   | C00         | Yes                                          | Yes                      | No                         |
|   | A00         | Yes                                          | No                       | Yes                        |
|   | 800         | Yes                                          | No                       | No                         |
|   | 600         | No                                           | Yes                      | Yes                        |
|   | 400         | No                                           | Yes                      | No                         |
|   | 100         | No                                           | No                       | Yes                        |
|   | 000         | No                                           | No                       | No                         |

Address

208□□□□

A

|   | Value (Hex) | Minimum Cycle Time          |
|---|-------------|-----------------------------|
| A | 0000        | Cycle time not fixed        |
|   | 0001        | Cycle time fixed: 1 ms      |
|   | to          | to                          |
|   | 7D00        | Cycle time fixed: 32,000 ms |

Address

209□□□□

A

|   | Value (Hex) | Watch Cycle Time        |
|---|-------------|-------------------------|
| A | 0000        | Default: 1,000 ms (1 s) |
|   | 8001        | 10 ms                   |
|   | to          | to                      |
|   | 8FA0        | 40,000 ms               |

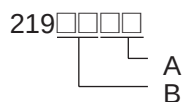
Address

218□□□□

A

|   | Value (Hex) | Fixed Peripheral Servicing Time |
|---|-------------|---------------------------------|
| A | 0000        | Default (4% of the cycle time)  |
|   | 8000        | 00 ms                           |
|   | 8001        | 0.1 ms                          |
|   | to          | to                              |
|   | 80FF        | 25.5 ms                         |

## Address

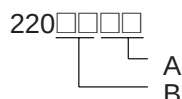


|   | Value (Hex) | Slice Time for Peripheral Servicing in Peripheral Servicing Priority Mode |
|---|-------------|---------------------------------------------------------------------------|
| A | 00          | Disable Peripheral Servicing Priority Mode.                               |
|   | 01 to FF    | 0.1 to 25.5 ms (in 0.1-ms increments)                                     |

|   | Value (Hex) | Slice Time for Program Execution in Peripheral Servicing Priority Mode |
|---|-------------|------------------------------------------------------------------------|
| B | 00          | Disable Peripheral Servicing Priority Mode.                            |
|   | 05 to FF    | 5 to 255 (in 1-ms increments)                                          |

|   | Value (Hex) | Slice Time for Program Execution in Parallel Processing Mode (CS1-H CPU Units only) |
|---|-------------|-------------------------------------------------------------------------------------|
| B | 00          | Don't use Parallel Processing Mode                                                  |
|   | 01          | Parallel Processing with Synchronous Memory Access                                  |
|   | 02          | Parallel Processing with Asynchronous Memory Access                                 |

## Address



|   | Value (Hex) | Unit/Port for Priority Servicing                    |
|---|-------------|-----------------------------------------------------|
| A | 00          | Disable Peripheral Servicing Priority Mode.         |
|   | 10 to 1F    | CPU Bus Unit unit number (0 to 15) + 10 Hex         |
|   | 20 to 7F    | CPU Special I/O Unit unit number (0 to 96) + 20 Hex |
|   | FC          | RS-232C port                                        |
|   | FD          | Peripheral port                                     |
|   | Value (Hex) | Unit/Port for Priority Servicing                    |
| B | 00          | Disable Peripheral Servicing Priority Mode.         |
|   | 10 to 1F    | CPU Bus Unit unit number (0 to 15) + 10 Hex         |
|   | 20 to 7F    | CPU Special I/O Unit unit number (0 to 96) + 20 Hex |
|   | FC          | RS-232C port                                        |
|   | FD          | Peripheral port                                     |

## Address

221      
 A  
 B

|   | Value (Hex) | Unit/Port for Priority Servicing                    |
|---|-------------|-----------------------------------------------------|
| A | 00          | Disable Peripheral Servicing Priority Mode.         |
|   | 10 to 1F    | CPU Bus Unit unit number (0 to 15) + 10 Hex         |
|   | 20 to 7F    | CPU Special I/O Unit unit number (0 to 96) + 20 Hex |
|   | FC          | RS-232C port                                        |
|   | FD          | Peripheral port                                     |
|   | Value (Hex) | Unit/Port for Priority Servicing                    |
| B | 00          | Disable Peripheral Servicing Priority Mode.         |
|   | 10 to 1F    | CPU Bus Unit unit number (0 to 15) + 10 Hex         |
|   | 20 to 7F    | CPU Special I/O Unit unit number (0 to 96) + 20 Hex |
|   | FC          | RS-232C port                                        |
|   | FD          | Peripheral port                                     |

## Address

222      
 Not used.  
 A

|   | Value (Hex) | Unit/Port for Priority Servicing                    |
|---|-------------|-----------------------------------------------------|
| A | 00          | Disable Peripheral Servicing Priority Mode.         |
|   | 10 to 1F    | CPU Bus Unit unit number (0 to 15) + 10 Hex         |
|   | 20 to 7F    | CPU Special I/O Unit unit number (0 to 96) + 20 Hex |
|   | FC          | RS-232C port                                        |
|   | FD          | Peripheral port                                     |

## Address

225      
 A

|   | Value (Hex) | Power OFF Interrupt Task | Power OFF Detection Delay Time |
|---|-------------|--------------------------|--------------------------------|
| A | 0000        | Disabled                 | 0 ms                           |
|   | 0001        |                          | 1 ms                           |
|   | to          |                          | to                             |
|   | 000A        |                          | 10 ms                          |
|   | 8000        | Enabled                  | 0 ms                           |
|   | 8001        |                          | 1 ms                           |
|   | to          |                          | to                             |
|   | 800A        |                          | 10 ms                          |



Address

226□□□□

A

|   | Value<br>(Hex) | Special I/O Unit Cyclic Refreshing 0: Yes 1: No |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |
|---|----------------|-------------------------------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
|   |                | Unit number                                     |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |
|   |                | 15                                              | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| A | 0000           | 0                                               | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|   | 0001           | 0                                               | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
|   | 0002           | 0                                               | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
|   | 0003           | 0                                               | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
|   | 0004           | 0                                               | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
|   | 0005           | 0                                               | 0  | 0  | 0  | 0  | 0  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
|   | to             |                                                 |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |
|   | FFFF           | 1                                               | 1  | 1  | 1  | 1  | 1  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Addresses 227 through 231 are the same as 226.

# Appendix E

## Connecting to the RS-232C Port on the CPU Unit

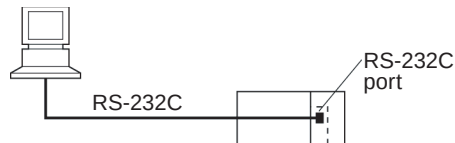
### Connection Examples

The wiring diagrams for connecting to the RS-232C port are provided in this appendix. In actual wiring, we recommend the use of shielded twisted-pair cables and other methods to improve noise resistance. Refer to *Recommended Wiring Methods* later in this appendix for recommended wiring methods.

### Connections to Host Computers

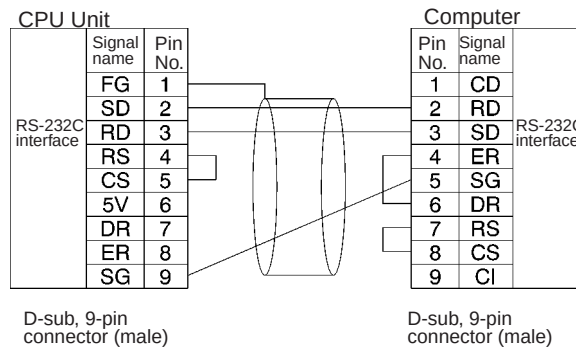
**Note** Connections to a computer running the CX-Programmer are the same as those shown here.

#### 1:1 Connections via RS-232C Port



**Note** The maximum cable length for an RS-232C connection is 15 m. RS-232C communications specifications, however, do not cover transmissions at 19.2 Kbps. Refer to documentation of the device being connected when using this baud rate.

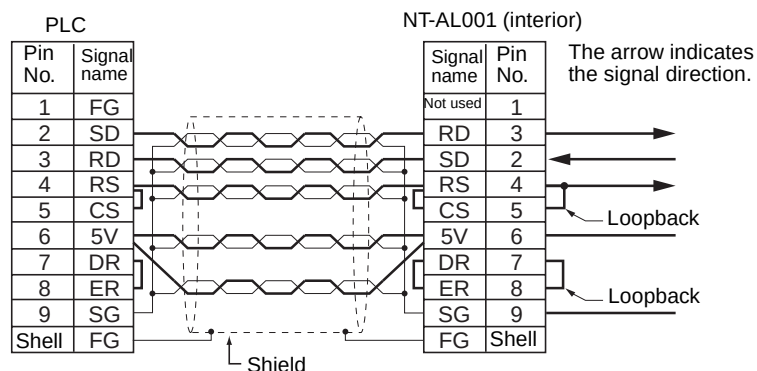
#### IBM PC/AT or Compatible Computer





Although this wiring is different from that shown in the example above, it can be used to increase noise immunity if required.

Wiring with XW2Z-□□0T-1 (10 Conductors)



- When the NT-AL001-E Link Adapter is connected to the RS-232C port on the CPU Unit, 5 V is supplied from pin 6, eliminating the need for a 5-V power supply.
- Do not use the 5-V power from pin 6 of the RS-232C port for anything but the NT-AL001-E Link Adapter. Using this power supply for any other external device may damage the CPU Unit or the external device.
- The XW1Z-□□0T-1 Cable is designed to connect the NT-AL001-E and contains special wiring for the CS and RS signals. Do not use this cable for any other application. Connecting this cable to other devices can damage them.

### DIP Switch Settings on the NT-AL001-E Link Adapter

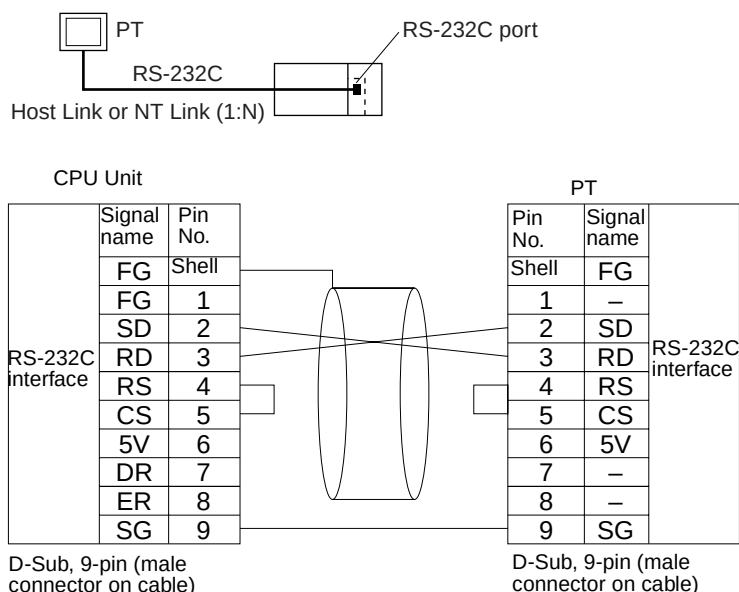
There is a DIP switch on the NT-AL001-E Link Adapter that is used to set RS-422A/485 communications parameters. Set the DIP switch as required for the serial communications mode according to the following table.

| Pin | Function                                                                                                                        | Default setting |
|-----|---------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 1   | Not used. (Leave set to ON.)                                                                                                    | ON              |
| 2   | Internal terminating resistance setting.<br>ON: Terminating resistance connected.<br>OFF: Terminating resistance not connected. | ON              |
| 3   | 2-wire/4-wire setting                                                                                                           | OFF             |
| 4   | Both pins ON: 2-wire communications<br>Both pins OFF: 4-wire communications                                                     | OFF             |
| 5   | Communications mode (See note.)                                                                                                 | ON              |
| 6   | Both pins OFF: Always send.<br>5 OFF/6 ON: Send when RS-232C's CS is high.<br>5 ON/6 OFF: Send when RS-232C's CS is low.        | OFF             |

**Note** Turn OFF pin 5 and turn ON pin 6 when connected to a CS-series CPU Unit.

## Connection Example to Programmable Terminal (PT)

### Direct Connection from RS-232C to RS-232C



- Communications Mode: Host Link (unit number 0 only for Host Link)  
NT Link (1:N, N = 1 Unit only)
- OMRON Cables with Connectors:  
XW2Z-200T-1: 2 m  
XW2Z-500T-1: 5 m

## Recommended Wiring Methods

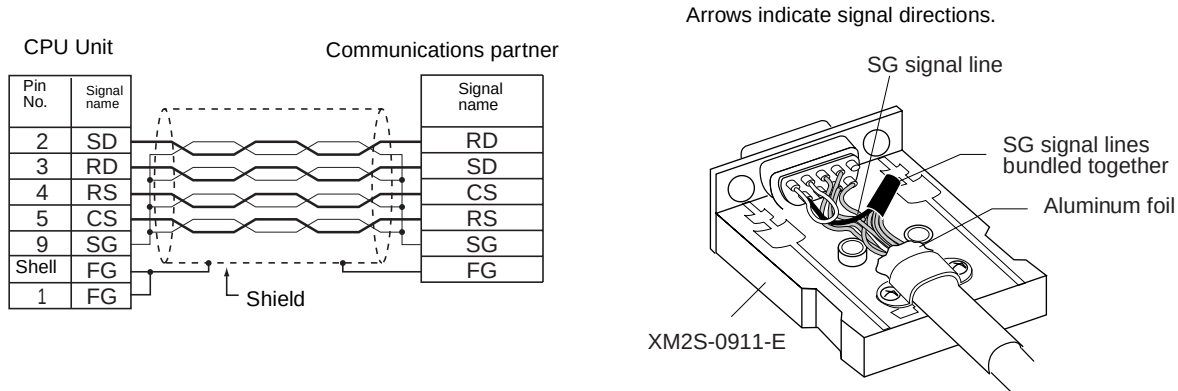
We recommend the following wiring methods for RS-232C, especially in environment prone to noise.

1. Use shielded twisted-pair cable for communications cables. The following RS-232C cables are recommended.

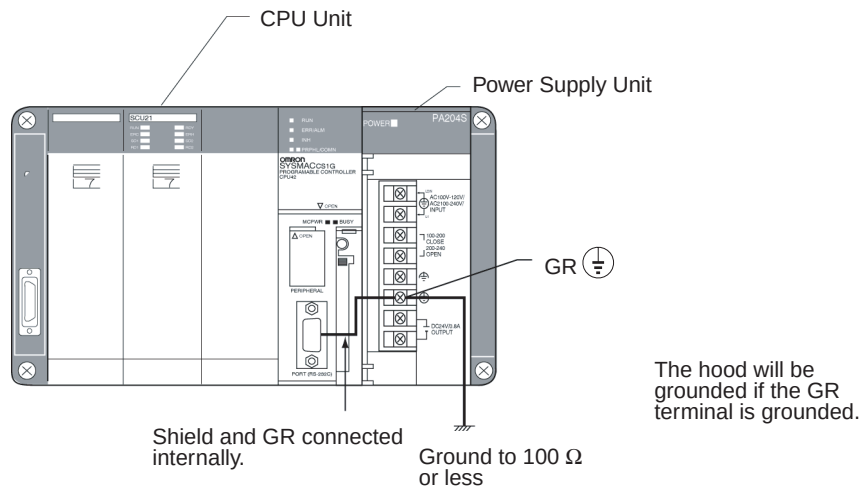
| Model                                                                                               | Manufacturer        |
|-----------------------------------------------------------------------------------------------------|---------------------|
| UL2464 AWG28×5P IFS-RVV-SB (UL approved)<br>AWG28×5P IFVV-SB (not UL approved)                      | Fujikura Ltd.       |
| UL2464-SB (MA) 5P×28AWG (7/0.127) (UL approved)<br>CO-MA-VV-SB 5P×28AWG (7/0.127) (not UL approved) | Hitachi Cable, Ltd. |

2. Use a twisted-pair cable for each signal line and SG (signal ground) to connect the CPU Unit to a communications partner. Also, bundle all the SG lines at the Board/Unit and at the other device and connect them together.
3. Connect the shield line of the communications cable to the hood (FG) of the RS-232C connector at the Board/Unit. Also, ground the protective earth (GR) terminal of the Power Supply Units on the CPU Rack and the CS-series Expansion Racks to a resistance of 100  $\Omega$  or less. The following example shows

connecting SD-SG, RD-SG, RS-SG, and CS-SG for Serial Communications Mode using a twisted-pair cable using the peripheral bus.



**Note** The hood (FG) is internally connected to the protective earth (GR) terminal on the Power Supply Unit through the CPU Rack or CS-series Expansion Rack. FG can thus be connected by connecting the protective earth (GR) terminal on the Power Supply Unit. The hood (FG) is also electrically connected to pin 1 (FG), but the connection resistance between the shield and the FG is smaller for the hood. To reduce contact resistance between the hood (FG) and the FG, connect the shield both to the hood (FG) and to pin 1 (FG).



## Wiring Connectors

Use the following procedures to wire connectors.

### 1. Preparing the Cable

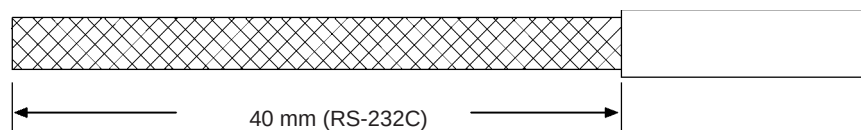
Lengths for steps in the procedure are provided in the diagrams.

#### Connecting the Shield Line to the Hood (FG)

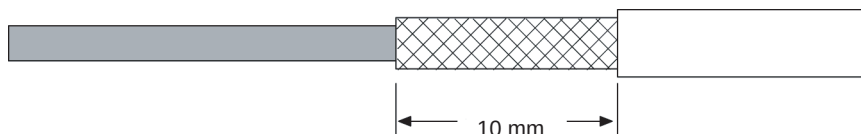
1. Cut the cable to the required length, leaving leeway for wiring and laying the cables.



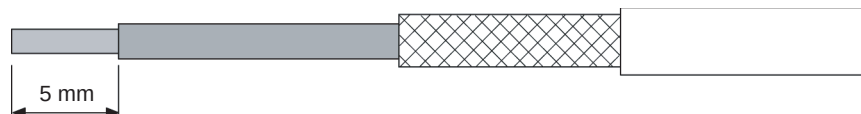
2. Use a razor blade to cut away the sheath, being careful not to damage the braiding.



3. Use scissors to cut away all but 10 mm of the exposed braiding.



4. Use wire strippers to remove the insulation from the end of each wire.



5. Fold the braiding back over the end of the sheath.



6. Wrap aluminum foil tape over the top of the braiding for one and a half turns.

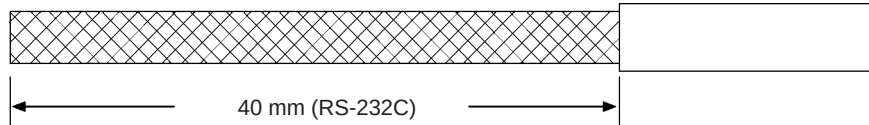


**Not Connecting the Shield to the Hood (FG)**

1. Cut the cable to the required length, leaving leeway for wiring and laying the cables.



2. Use a razor blade to cut away the sheath, being careful not to damage the braiding.



3. Use scissors to cut away the exposed braiding.



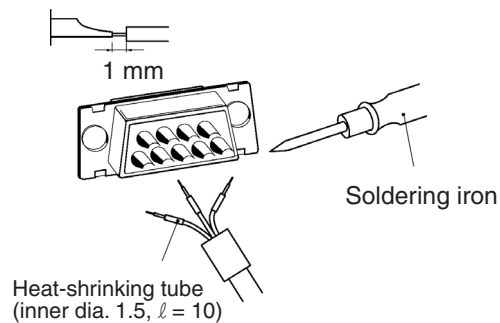
4. Use wire strippers to remove the insulation from the end of each wire.



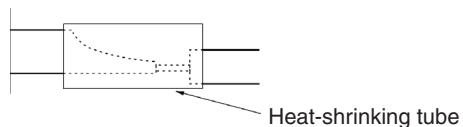
5. Wrap electrician's tape over the top and end of the the cut sheath.

**2. Soldering**

1. Place heat-shrinking tubes over all wires.
2. Pre-solder all wires and connector terminals.
3. Solder the wires.



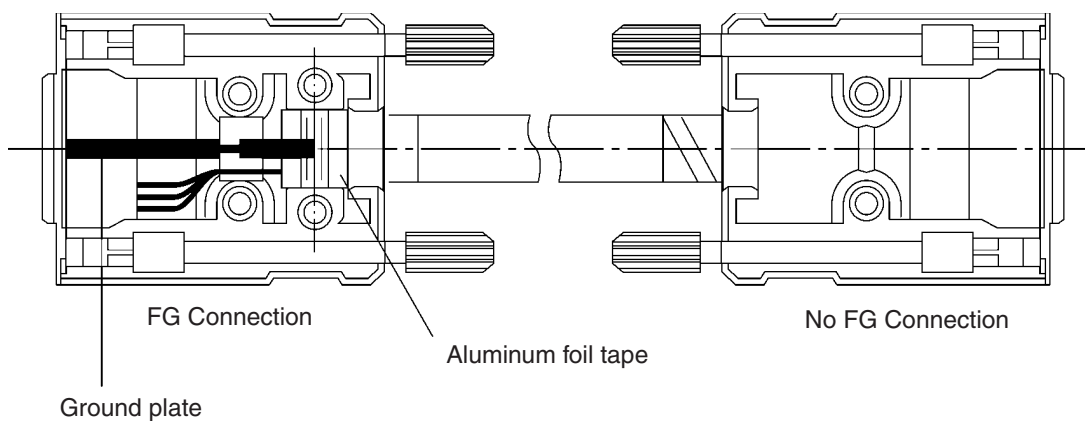
4. Move the heat-shrinking tubes onto the soldered area and shrink them into place.



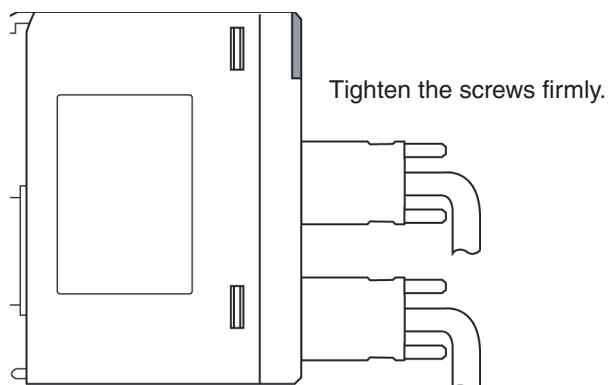


### 3. Assembling the Hood

Assemble the connector hood as shown.



### 4. Connection to the CPU Unit



- Always turn OFF the power supply to the PLC before connecting or disconnecting communications cables.
- Tighten the communications connector attachment screws to 0.4 N•m.

# Appendix F

## Restrictions in Using C200H Special I/O Units

### Restrictions in Areas and Addresses

There are restrictions in transferring I/O memory data between C200H Special I/O Units and the CPU Unit. The restrictions on the Unit depend on the group in which the Unit belongs. The five groups are shown in the following tables.

#### Units that Transfer data for Programming Inside the Unit Itself

| Group    | Models                        |
|----------|-------------------------------|
| Group I  | C200H-ASC02 ASCII Unit        |
| Group II | C200H-ASC11/21/31 ASCII Units |

#### Units that Transfer data for Allocated Words

| Group     | Models                                                                                                                                                             |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group III | C200H-CT001-V1/CT002 High-speed Counter Units, C200H-IDS01-V1/ IDS21 ID Sensor Units, C200H-NC111/NC112/NC211 Position Control Units, C200H-FZ001 Fuzzy Logic Unit |
| Group IV  | C200H-CT021 High-speed Counter Unit, C200H-MC221 Motion Control Unit, C200H-DRT21 C200H I/O Link Unit, C200HW-NC113/NC213/ NC413 Position Control Units            |

#### Units that Do Not Transfer data for Programming or Allocated Words

| Group   | Models                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group V | C200H-TS001/TS002/TS101/TS102 Temperature Sensor Units, C200H-TC001/TC002/TC003/TC101/TC102/TC103 Temperature Controller Units, C200H-PID01/PID02/PID03 PID Control Units, C200H-TV001/TV002/TV003/TV101/TV102/TV103 Heating/Cooling Units, C200H-OV001 Voice Unit, C200H-ID501/ID215 High-density Input Units, C200H-OD501/OD215 High-density Output Units, C200H-MD501/MD215/MD115 High-density I/O Units, C200HW-SRM21 CompoBus/S Master Unit, C200H-AD001/AD002/AD003 Analog Input Units, C200H-DA001/DA002/DA003/DA004 Analog Output Units, C200H-MAD01 Analog I/O Unit, C200HW-DRM21-V1 DeviceNet Master Unit, C200H-CP114 Cam Positioner Unit, T200H-MIF01 M-Net Interface Unit |

If any of the above Units in groups I to IV are used in combination with the following functionality, the restrictions described in the rest of this section apply for area and address specifications.

- Data transfers with the CPU Unit from instructions (PLC READ, PLC WRITE, etc.) in the program executed by the C200H Special I/O Unit. This applies to the ASCII Units only.
- Data transfers with the CPU Unit for allocated words or DM area specifications (i.e., source/destination areas and addresses).

**Note** There are no restriction in using the IORD(222) and IOWR(223) instruction in the CPU Unit to transfer data. These instruction can thus be used in the CPU Unit to transfer data for Units that support data transfer for IORD(222) and IOWR(223), i.e., C200H-CT021, C200H-MC221, and C200H-ASC11/ASC21/ASC31.

**Restrictions in Using Existing ASCII Unit Programs**

The following replacements in areas and addresses will be made if existing ASCII Unit programs are used.

For most addresses, a zero (0) will simply be added as the most significant digit. The following three exceptions exist.

- 1,2,3...**
1. AR 00, AR02 to AR 27 (C200H AR Area words) will specify H100, H102 to H127 in the CS-series CPU Unit.
  2. TIM 000 to TIM 511 and CNT 000 to CNT 511 (C200H Timer/Counter Area words) will specify T0000 to T0511 in the CS-series CPU Unit.
  3. LR 00 to LR 63 (C200H LR Area words) will specify CIO 1000 to CIO 1063 in the CS-series CPU Unit.
  4. AR 01 and CIO 281 cannot be specified. Use other addresses.

**Corresponding Addresses for C200H-ASC02 (Group I)**

| Area/Address specifications in a C200H CPU Unit |               |                            | Areas/Addresses in a CS-series CPU Unit  |                  |
|-------------------------------------------------|---------------|----------------------------|------------------------------------------|------------------|
| Code                                            | Area          | Addresses                  | Area                                     | Address          |
| @R                                              | IR            | 000 to 255                 | CIO                                      | 000 to 0255      |
| @L                                              | LR            | LR 00 to LR 63             | CIO                                      | 1000 to 1063     |
| @H                                              | HR            | HR 00 to HR 99             | Holding                                  | H000 to H099     |
| @A                                              | AR            | AR 00                      | Holding                                  | H100             |
|                                                 |               | AR01                       | Cannot be accessed. Use another address. |                  |
|                                                 |               | AR02 to AR27               | Holding                                  | H102 to H127     |
| @G                                              | Timer/Counter | TIM/CNT 000 to TIM/CNT 511 | Timer/Counter                            | T0000 to T0511   |
| @D                                              | DM            | DM 0000 to DM 0999         | DM                                       | D00000 to D00999 |
|                                                 |               | DM 0000 to DM 1999         |                                          | D20000 to D20999 |

**Corresponding Addresses for C200H-ASC11/ASC21/ASC31 (Group II)**

| Area/Address specifications in a C200H CPU Unit |               |                            | Areas/Addresses in a CS-series CPU Unit  |                      |
|-------------------------------------------------|---------------|----------------------------|------------------------------------------|----------------------|
| Code                                            | Area          | Addresses                  | Area                                     | Address              |
| @R                                              | IR            | 000 to 280                 | CIO                                      | 0000 to 0280         |
|                                                 |               | 281                        | Cannot be accessed. Use another address. |                      |
|                                                 |               | 282 to 511                 | CIO                                      | 0282 to 0511         |
| @L                                              | LR            | LR 00 to LR 63             | CIO                                      | 1000 to 1063         |
| @H                                              | HR            | HR 00 to HR 99             | Holding                                  | H000 to H099         |
| @A                                              | AR            | AR 00                      | Holding                                  | H100                 |
|                                                 |               | AR 01                      | Cannot be accessed. Use another address. |                      |
|                                                 |               | AR 02 to AR 27             | Holding                                  | H102 to H127         |
| @G                                              | Timer/Counter | TIM/CNT 000 to TIM/CNT 511 | Timer                                    | T0000 to T0511       |
| @D                                              | DM            | DM 0000 to DM 6655         | DM                                       | D00000 to D6655      |
| @E                                              | EM            | EM 0000 to EM 6143         | EM                                       | E0_00000 to E0_06143 |

**Restrictions in Programming C200H Special I/O Units for the CS Series (Groups I to IV)**

There following restrictions in area and address specifications exist in programming inside C200H Special I/O Units (i.e., ASCII Unit) or in specifying C200H Special I/O Unit allocations for the CS-series CPU Unit.

- 1,2,3...**
1. CIO 0256 to CIO 0999 cannot be specified for Units in Group I or III, CIO 0281, 0512 to CIO 0999 cannot be specified for Units in Group II or IV, and CIO 1064 to CIO 6143 cannot be specified.
  2. Addresses in the Work Area (W000 to W511) cannot be specified.
  3. H101 and H128 to H511 cannot be specified, and H100, H102 to H127 must be specified using AR 00, AR02 to AR 27.
  4. Timers T0512 to T4095 cannot be specified.
  5. Counters (C0000 to C4095) cannot be specified.
  6. D01000 to D19999 and D21000 to D32767 in Group I or III D06656 to D32767 in Group II or IV cannot be specified.

Note If D1000 to D1999 are specified in a C200H Special I/O Unit for data transfer, the CS Series will interpret them as D20000 to D20999. Do not use D1000 to D1999.

7. E0\_06144 to E0\_32767 (bank 0) and E□\_00000 to E□\_32767 in all banks except bank 0 cannot be specified.

**Special I/O Units in Groups I and III**

| Area/Address specifications in CS-series CPU Unit |                      | Areas/Addresses to use in C200H Special I/O Unit |                            |
|---------------------------------------------------|----------------------|--------------------------------------------------|----------------------------|
| Area                                              | Addresses            | Area                                             | Address                    |
| CIO                                               | 0000 to 0255         | IR                                               | 000 to 255                 |
|                                                   | 0256 to 0999         |                                                  | Not addressable.           |
| CIO                                               | 1000 to 1063         | LR                                               | LR 00 to LR 63             |
| CIO                                               | 1064 to 6143         | IR                                               | Not addressable.           |
| Work                                              | W000 to W511         | None                                             | ---                        |
| Auxiliary                                         | A000 to A959         | None                                             | ---                        |
| Holding                                           | H000 to H099         | HR                                               | HR 00 to HR 99             |
|                                                   | H100                 | AR                                               | AR 00                      |
|                                                   | H101                 | AR                                               | Not addressable.           |
|                                                   | H102 to H127         | AR                                               | AR 02 to AR 27             |
|                                                   | H128 to H511         | None                                             | ---                        |
| Timer                                             | T0000 to T0511       | Timer/Counter                                    | TIM/CNT 000 to TIM/CNT 511 |
|                                                   | T0512 to Y4095       |                                                  | Not addressable.           |
| Counter                                           | C0000 to C4095       |                                                  | Not addressable.           |
| DM                                                | D00000 to D00999     | DM                                               | DM0000 to DM 0999          |
|                                                   | D06656 to D19999     |                                                  | Not addressable.           |
|                                                   | D20000 to D20999     |                                                  | DM1000 to DM1999           |
|                                                   | D21000 to D32767     |                                                  | Not addressable.           |
| EM                                                | E0_00000 to E0_32767 | None                                             | ---                        |
|                                                   | E1_00000 to EC_32767 |                                                  | ---                        |

## Special I/O Units in Groups II and IV

| Area/Address specifications in CS-series CPU Unit |                      | Areas/Addresses to use in C200H Special I/O Unit |                            |
|---------------------------------------------------|----------------------|--------------------------------------------------|----------------------------|
| Area                                              | Addresses            | Area                                             | Address                    |
| CIO                                               | 0000 to 0280         | IR                                               | 000 to 280                 |
|                                                   | 0281                 |                                                  | Not addressable.           |
|                                                   | 0282 to 0511         |                                                  | 282 to 511                 |
|                                                   | 0512 to 0999         |                                                  | Not addressable.           |
| CIO                                               | 1000 to 1063         | LR                                               | LR 00 to LR 63             |
| CIO                                               | 1064 to 6143         | IR                                               | Not addressable.           |
| Work                                              | W000 to W511         | None                                             | ---                        |
| Auxiliary                                         | A000 to A959         | None                                             | ---                        |
| Holding                                           | H000 to H099         | HR                                               | HR 00 to HR 99             |
|                                                   | H100                 | AR                                               | AR 00                      |
|                                                   | H101                 |                                                  | Not addressable.           |
|                                                   | H102 to H127         |                                                  | AR 02 to AR 27             |
|                                                   | H128 to H511         | None                                             | ---                        |
| Timer                                             | T0000 to Y0511       | Timer/Counter                                    | TIM/CNT 000 to TIM/CNT 511 |
|                                                   | T0512 to Y4095       |                                                  | Not addressable.           |
| Counter                                           | C0000 to C4095       |                                                  | Not addressable.           |
| DM                                                | D00000 to D06655     | DM                                               | DM0000 to DM 6655          |
|                                                   | D06656 to D32767     |                                                  | Not addressable.           |
| EM                                                | E0_00000 to E0_06143 | EM                                               | EM0000 to EM6143           |
|                                                   | E0_06144 to E0_32767 |                                                  | Not addressable.           |
|                                                   | E1_00000 to EC_32767 |                                                  | Not addressable.           |

## Functions with Addressing Restrictions

Restrictions apply to the following functions.

### ASCII Units

| Group | Unit        | Model                       | Function with restricted addressing                                                           | Alternative                                                                                                       |
|-------|-------------|-----------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| I     | ASCII Units | C200H-ASC02                 | Areas and addresses in read/write operands for PLC READ, PLC WRITE, PLC READ@ and PLC WRITE@. | Write to available addresses and then transfer to the desired locations. (See the note following the next table.) |
| II    |             | C200H-ASC11/<br>ASC21/ASC31 | Areas and addresses in read/write operands for PLC READ, PLC WRITE, PLC READ@, PLC WRITE@     | Use IORD(222) and IOWR(223) (#00□□).                                                                              |

## Other C200H Special I/O Units

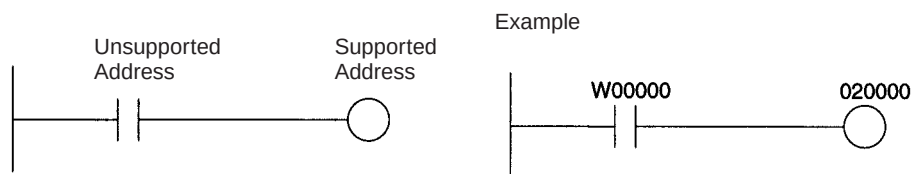
| Group | Unit                     | Model                       | Function with restricted addressing                                                                                                                                                                                                                                            | Alternative                                                                          |
|-------|--------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| III   | High-speed Counter Units | C200H-CT001-V1/<br>CT002    | Setting the source areas and addresses in allocated words n+2 and n+3 for transferring words m to m+99 (high-speed counter system data).                                                                                                                                       | Write to available addresses and then transfer to the desired locations. (See Note.) |
|       | ID Sensor Units          | C200H-IDS01-V1/<br>IDS21    | Setting the source areas and addresses in allocated word n+2 for command data.<br><br>Setting the destination areas and addresses in allocated word n+3 for storing data read from Data Carriers.                                                                              |                                                                                      |
|       | Position Control Units   | C200H-NC111/<br>NC112/NC211 | Setting the source areas and addresses in allocated word n+4 for position data and speeds.                                                                                                                                                                                     |                                                                                      |
|       | Fuzzy Logic Unit         | C200H-FZ001                 | Setting the source areas and addresses in allocated word n+1 for fuzzy input write data to be transferred to the Fuzzy Logic Unit.<br><br>Setting the destination areas and addresses in allocated word n+3 for fuzzy logic results data to be read from the Fuzzy Logic Unit. |                                                                                      |
| IV    | High-speed Counter Unit  | C200H-CT021                 | Setting the source areas and addresses in allocated word m+4 for upper/lower limits, present values, and other data to be transferred to the High-speed Counter Unit.                                                                                                          | Use IORD(222) and IOWR(223).                                                         |
|       | Motion Control Unit      | C200H-MC221                 | Setting the source/destination areas and addresses for expansion information.                                                                                                                                                                                                  |                                                                                      |
|       | C200H I/O Link Unit      | C200HW-DRT21                | Setting the areas and addresses in allocated words n+1 to n+4 in the CPU Unit for automatic transfer of I/O memory of the CPU Unit to which the C200H I/O Link Unit is mounted to the DeviceNet Master Unit.                                                                   | Write to available addresses and then transfer to the desired locations. (See Note.) |

**Note** Examples of the alternative method are shown below.

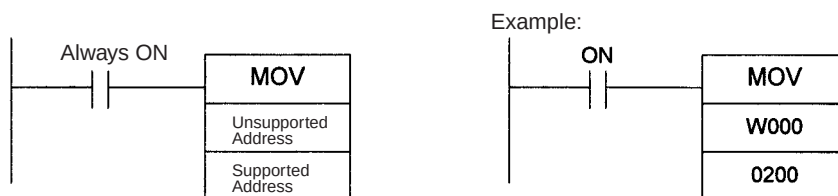
#### Reading CPU Unit Data from a Special I/O Unit

Write the data from the unsupported address to a supported address and then read the data from the supported address to the Special I/O Unit.

##### • Bit Data



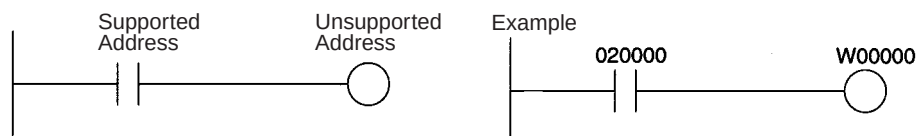
##### • Word Data



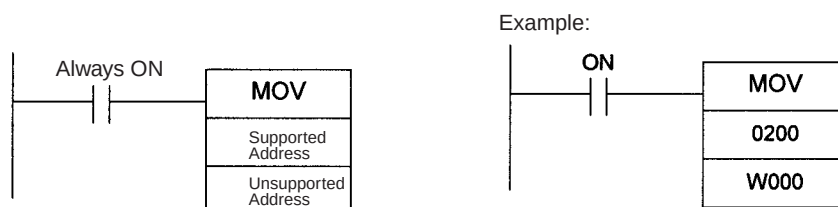
# Reading Special I/O Unit Data from the CPU Unit

Read the data from the Special I/O Unit and then write the data from the supported address to an unsupported address.

## • Bit Data



## • Word Data



# Precautions When Using C200HW-DRM21-V1 DeviceNet Master Unit

When using a DeviceNet Master Unit, limitations apply when using the following functions (except for data transfer).

## Allocation Limitations

Only the following areas can be allocated when allocating remote I/O using a Configurator.

| Area | Allocation words             |
|------|------------------------------|
| CIO  | 0000 to 0235<br>0300 to 0511 |
| HR   | H000 to H099                 |
| LR   | 1000 to 1063                 |
| DM   | D00000 to D05999             |

- Note**
- When creating master parameters using a configurator, set the PLC model to C200HX/HG/HE(-Z) (except for the C200HE-CPU11).
  - When reading master parameters from a master using a configurator, set the PLC model to the C200HX-CPU85.

## Limitations when using DM as the Status Area

When using the DeviceNet Master Unit, the following words will be allocated in addition to the DM Area words allocated to the Unit as a Special I/O Unit.

Master Status Area: D06032 + (2 x unit number)

Communications cycle time present value: D06033 + (2 x unit number)

Do not use these words for other applications, because data is updated when the DeviceNet Master Unit is being used.

# Index

## Numerics

24-V DC output power, 230

26-V power supply, 109

## A

Access Error Flag, 364

addresses

memory map, 615

allocations

*See also* I/O allocations

Always OFF Flag, 364

Always ON Flag, 364

Analog Timer Units, 188

dimensions, 191

specifications, 80, 190

applications

precautions, xviii

arc killers, 513

Auxiliary Area, 333, 581

read/write section, 602–609

read-only section, 581–601

## B

B7A Link Terminals, 179

background execution

special flags, 349

background execution settings, 258

Backplane Insulation Plates, 216

Backplanes, 144

Basic I/O Units, 56

available models, 153

basic I/O errors, 444

components, 155

dimensions, 157

error information, 341

fuse status flags, 334, 581

I/O allocations, 284

I/O response time, 271, 334, 399, 583

mounting, 216

specifications, 74, 474

wiring, 234

battery

Battery Set, 62

compartment, 36, 122

error, 446

error flag, 345, 594

installation, 36

low battery error detection, 257, 274

replacement, 460, 463

service life, 460

Battery Error Flag, 594

battery-free operation, 14

block programs

instruction execution times, 426

BUSY indicator, 53

## C

C200H Expansion I/O Backplanes, 68

C200H High-density I/O Units, 171

C200H Special I/O Units

restrictions on data transfers, 637

C200H-PRO27-E Programming Console, 134

C200HX/HG/HE PLCs

comparison, 29

cables, 62–65, 67–69, 71, 220, 240

connections, 223

*See also* I/O Connecting Cables

Carry Flag, 364

CIO Area, 305

description, 313

circuit configurations

*See also* specifications

CJ Series

definition, xi

clearing memory, 38, 198

clock

clock data, 345, 589

setting the clock, 39

clock instructions

execution times, 424

clock pulses

flags, 366

communications, 25

baud rate, 266

Communications Port Enabled Flags, 611

data, 56

distances, 98

errors, 446

flags, 347

instruction execution times, 423

network instruction execution times, 423

networks, 95

overview, 98

protocol support, 87

serial communications, 5

specifications, 98

system expansion, 86

Communications Port Enabled Flags, 611

comparison instructions

execution times, 409

compatibility with previous PLCs, 14

CompoBus/S, 97

components

Analog Timer Unit, 189

Basic I/O Units, 155

C200H Expansion I/O Backplanes, 148



- C200H High-density Units, 171
- CPU Backplane, 145
- CPU Unit, 52, 117
- CS-series Expansion Backplane, 147
- Group-2 High-density I/O Units, 169
- Power Supply Units, 141
- Condition Flags, 363
  - saving and loading status, 365
- connectors, 237
  - connector pin arrangement, 138
  - RS-232C connectors, 634
- contact protection circuit, 513
- control panels
  - installation, 212
- Controller Link, 96
- conversion instructions
  - execution times, 415
- cooling
  - fan, 210
- Counter Area, 351
- counters
  - execution times, 406
- CPU Backplanes, 144
  - dimensions, 146
- CPU Bus Unit Area
  - capacity, 110
- CPU Bus Units, 56
  - data exchange, 299
  - error information, 343
  - errors, 445
  - I/O allocations, 293, 325, 354
  - Initialization Flags, 334, 587
  - memory area, 325
  - mounting, 216
  - refreshing, 12, 299
  - related flags/bits, 612
  - Restart Bits, 334, 602
  - setting area capacity, 110
  - settings, 368
  - setup errors, 446
  - specifications, 85
- CPU Racks
  - description, 60
  - maximum current consumption, 99
  - troubleshooting, 453
- CPU Unit, 116
  - capabilities, 55
  - components, 52, 117
  - connections, 57
  - CPU errors, 437
  - dimensions, 124
  - DIP switch, 53, 119, 250
  - indicators, 53
  - initialization, 377
  - operation, 373
  - RS-232C port connections, 629
- CPU Units
  - comparison, 15
  - models, 116
- CQM1-PRO01-E Programming Console, 133
- crimp terminals, 231–232
- CS Series
  - definition, xi
- CS1 CPU Units, 42, 116
- CS1-H CPU Unit
  - features, 11
- CS1-H CPU Units, 42, 116
  - functions, 27
  - new instructions, 13
- CS-series Basic I/O Units
  - wiring, 236
- CS-series CPU Bus Unit Area, 325
- CS-series CPU Bus Units
  - See also* CPU Bus Units
- CS-series Expansion Backplanes
  - See also* Expansion Backplanes
- CS-series High-density I/O Units, 166
- current consumption, 99
  - tables, 102
- CX-Programmer, 135, 200
  - peripheral servicing, 375
- cycle time
  - computing, 385–403
  - effects of online editing, 399
  - errors, 443
  - example calculations, 398
  - flags, 335
  - maximum cycle time, 335, 584
  - present cycle time, 335, 584
  - setting, 260, 277
- Cycle Time Too Long Flag, 345, 592

## D

- data areas
  - forcing bit status, 311
  - overview, 305
  - status after fatal errors, 311
  - status after mode changes, 312
  - status after power interruptions, 312
- data control instructions
  - execution times, 420
- Data Link Area, 324
- data links, 324
- data movement instructions
  - execution times, 410
- Data Registers, 361
- data registers
  - sharing, 13, 310, 335, 362

- data shift instructions
  - execution times, 410
- data tracing
  - related flags/bits, 336
- date
  - setting the clock, 39
- debugging, 205
  - flags, 336
- debugging instructions
  - execution times, 424
- decrement instructions
  - execution times, 411
- DeviceNet, 96
  - See also* DeviceNet
- DeviceNet (CompoBus/D) Area, 319–320
- dimensions, 187
  - Analog Timer Unit, 191
  - Backplane Insulation Plates, 216
  - Backplanes, 146
  - Basic I/O Units, 157
  - C200H Expansion I/O Backplanes, 149
  - C200H High-density I/O Units, 176
  - CPU Racks, 51
  - CPU Unit, 124
  - CS-series High-density I/O Units, 168
  - Group-2 High-density I/O Units, 170
  - installation, 215
  - Memory Cards, 129
  - Power Supply Units, 143
- DIN track
  - mounting, 218
- DIP switch, 119, 250
- display instructions
  - execution times, 424
- DM Area, 352
  - changing settings, 202
  - settings, 195
- DR00 Output for Background Execution, 349
- ducts
  - wiring, 213
- Dynamic Input Mode, 174
- Dynamic Output Mode, 173

## **E**

- EC Directives, xxiii
- electrical noise, 247
- EM Area, 354
  - current EM bank, 612
- EM bank
  - current EM bank, 612
- EM file memory, 124, 355
  - initializing, 126
  - PC Setup settings, 258, 274
  - starting bank, 588

- emergency stop circuit, 208
- environmental conditions
  - checking, 451
- Equals Flag, 364
- Equals Flag for Background Execution, 349
- ER/AER Flag for Background Execution, 349
- error codes, 591, 610
- Error Flag, 364
- error log, 432, 609–610
- Error Log Area, 339, 432, 582, 609–610
- error messages, 437
- errors
  - basic I/O errors, 349
  - communications error flags, 347
  - CPU Bus Units, 343
  - CPU Rack, 453
  - CPU standby errors, 438
  - error codes, 591, 610
  - error log, 10, 339, 432, 609
  - error messages, 437
    - Programming Consoles, 436
  - Expansion I/O Rack, 453
  - FAL/FALS flags, 340
  - fatal errors, 438
  - flags, 364
  - flash memory, 340
  - Inner Boards, 349
  - Input Units, 454
  - memory error flags, 340
  - non-fatal, 444
  - Output Units, 455
  - PC Setup errors, 349
  - peripheral service time too long, 345
  - programming error flags, 349
  - settings, 257
  - Special I/O Units, 349
  - status after fatal errors, 311
  - SYSMAC Bus, 344
  - troubleshooting, 431, 433–451
  - user-programmed errors, 432
- Ethernet, 96
- execution settings, 256
- execution times, 403–429
- Expansion Backplanes, 68, 147
- Expansion I/O Backplanes, 68, 148
- Expansion I/O Racks
  - troubleshooting, 453
- Expansion Racks
  - description, 64
  - maximum current consumption, 99
  - maximum number allowed, 67
- external interrupts
  - response time, 403

## F

- fail-safe circuits, 208
- failure diagnosis instructions
  - execution times, 424
- FAL Error Flag, 340
- FAL error storage setting, 257
- FAL errors, 444
  - flag, 596
- FAL/FALS Number for System Error Simulation, 340
- FALS Error Flag, 340
- FALS errors, 443
  - flag, 592
- fatal errors, 438
- fatal operating errors, 438
- features, 3
  - overview, 2
- file management
  - overview, 8
- file memory, 124
  - converting EM Area to file memory, 355
  - file names, 125
  - initializing, 126
  - instruction execution times, 423
  - related flags/bits, 336
- file memory instructions
  - execution times, 423
- file names, 125
- FINS commands, 92–93, 298, 300
- FINS messages, 93
- First Cycle Flag, 335, 383, 582, 611
- first Rack word
  - Programming Console display, 290
- flags
  - table, 581
- flash memory, 120
  - data dates, 346
- Flash Memory Error, 340
- floating-point math instructions
  - execution times, 416
- flowchart
  - environmental conditions check, 451
  - error processing flowchart, 435
  - I/O check, 452
  - overall CPU operation, 373
  - PLC cycle, 385
  - power supply check, 447
- Forced Status Hold Bit, 334, 602
- functionality, 20
- fuses
  - fuse status flags, 334, 581
  - replacing, 466

## G

- general specifications, 50
- Greater Than Flag, 364
- Greater Than or Equals Flag, 364
- grounding, 233
- Group-2 High-density I/O Units, 169
  - components, 169
  - dimensions, 170
  - wiring, 236

## H

- hardware
  - specifications, 50
- High-density I/O Units
  - dimensions, 168, 176
  - limitations, 570, 579
  - See also* C200H High-density I/O Units
  - See also* CS-series High-density I/O Units
  - specifications, 498–511, 561–569
- high-speed inputs, 175
- Holding Area, 332
- Host Link System, 88, 91

## I

- I/O
  - checking, 452
- I/O allocations, 281
  - reserving words, 291
- I/O Area, 313
  - initializing, 313
- I/O Bus error, 439
- I/O Connecting Cables, 220
- I/O Control Units, 149
- I/O Interface Units, 149
- I/O interrupts
  - response time, 402
  - setting, 162
- I/O memory, 120, 302
  - addresses, 615
  - areas, 616
  - effects of operating mode changes, 380
  - structure, 303
- I/O refreshing, 375
- I/O response time, 399–401
  - Basic I/O Units, 334
  - calculating, 399
- I/O table
  - errors, 445
  - registering, 194, 199, 295
- I/O Table Setting error, 441
- I/O Table Verification error, 445
- I/O tables

- error information, 296
- I/O Terminal Area, 330
- I/O Unit Cover, 236
- immediate refreshing
  - input bits and words, 314
  - output bits and words, 317
- increment instructions
  - execution times, 411
- index registers, 9, 356
  - sharing, 13, 310, 335, 361
- indicators, 53, 117
  - CPU Unit, 53, 117
  - error indications, 433
- indirect addressing
  - DM Area, 353
  - EM Area, 355
  - index registers, 356
- inductive load surge suppressor, 247
- Initial Task Execution Flag, 335
- Initial Task Flag, 611
- Initial Task Startup Flag, 582
- initialization
  - CPU Bus Units, 587
  - CPU Unit, 377
  - file memory, 126
  - I/O Area, 313
- Inner Board Area, 326
- Inner Board setting, 256
- Inner Boards
  - error information, 344
  - fatal Inner Board error, 440
  - installing, 123, 226
  - monitoring, 589
  - non-fatal Inner Board error, 445
  - related flags/bits, 335
  - words allocated to Inner Boards, 326, 354
- input bits, 314
- input devices
  - wiring, 243
- input instructions
  - execution times, 404
- Input Units
  - specifications, 74
  - troubleshooting, 454
- inputs
  - high-speed, 175
- inspection
  - procedures, 458–469
- installation, 194, 196, 207
  - control panels, 212
  - DIN track, 218
  - environment, 210
    - ambient conditions, 210
    - cooling, 210
  - fail-safe circuits, 208
  - initial setup, 36
  - Inner Boards, 226
  - mounting height, 214
  - mounting Units, 216
  - package contents, 35
  - precautions, xviii, 210
- instruction execution times, 403–429
- instructions
  - DI(693), 383
  - EI(694), 383
  - execution times, 403
  - failure diagnosis, 10
  - index registers, 9
  - loops, 9
  - ranges, 9
  - records and tables, 9
  - stacks, 9
  - steps per instruction, 403
  - table data processing instructions, 418
  - text strings, 9
- interrupt control instructions
  - execution times, 421
- Interrupt Input Units, 159
  - response time, 402
  - specifications, 485–497
- Interrupt Task error, 444
- Interrupt Task Error Cause Flag, 613
- interrupt tasks
  - error flag, 613
  - error information, 341
  - errors, 444
- interrupts, 159
  - Power OFF Interrupt Task, 260, 279
  - response time, 402–403
  - See also* I/O interrupts
  - See also* scheduled interrupts
- IOM Hold Bit, 334, 602
- IORF(097) refreshing
  - input bits and words, 315
  - output bits and words, 318
- IR/DR Operation between Tasks, 335
- IR00 Output for Background Execution, 349

## **J-L**

- leakage current
  - output, 246
- Less Than Flag, 364
- Less Than or Equals Flag, 364
- Link Adapters
  - current consumption, 109
- Link Area, 324
- Local Network Table, 368
- logic instructions

execution times, 415  
loops  
instructions, 9

## M

maintenance  
procedures, 460  
Master Units  
*See also* Remote I/O Master Units  
MCPWR indicator, 53  
memory  
capacities, 55  
clearing, 38, 194, 198  
memory areas, 44  
memory block map, 120  
memory map, 616  
*See also* data areas  
memory areas, 301  
*See also* memory  
Memory Cards, 53–54, 61, 124  
dimensions, 129  
indicators, 53  
initializing, 126  
installing, 129  
installing in a personal computer, 131  
overview, 8  
removing, 130  
memory error, 439  
Memory Error Flag, 340, 593  
momentary power interruption, 381  
MONITOR mode, 378  
monitoring, 205  
remote monitoring, 7  
mounting  
DIN track, 218–219  
DIN Track Mounting Bracket, 218

## N

Negative Flag, 364  
network instructions  
execution times, 423  
networks, 95  
Controller Link, 96  
DeviceNet (CompoBus/D), 96  
Ethernet, 96  
multilevel networks, 6  
overview, 98  
related flags/bits, 347  
new instructions, 13  
noise  
reducing electrical noise, 247  
non-fatal operating errors, 444  
Not Equal Flag, 364

NT Links, 89  
maximum unit number, 264

## O

online editing  
effect on cycle time, 399  
Online Editing Flags, 582  
Online Editing Wait Flag, 612  
related flags/bits, 336  
operating environment  
precautions, xviii  
operating modes  
description, 378  
effects of mode changes on counters, 352  
effects of mode changes on data areas, 312  
effects of mode changes on timers, 351  
operations allowed in each mode, 378  
operation  
checking, 197  
checking operation, 194  
CPU Unit, 373  
preparations, 194  
testing, 195, 203  
trial operation, 204  
output bits, 316  
output instructions  
execution times, 405  
Output OFF Bit, 336, 602  
Output Units  
replacing fuses, 466  
replacing relays, 468  
specifications, 76  
troubleshooting, 455  
Overflow Flag, 364

## P

parallel processing, 12  
parallel processing modes, 270, 374  
Parameter Area, 302, 366, 616  
Parameter Date, 346  
parts  
replacing parts, 460  
PC Setup, 11, 194, 367  
changing settings, 201  
coding sheets, 617  
error information, 340  
errors, 445  
overview, 254  
performance, 3  
peripheral devices  
*See also* Programming Devices  
peripheral port  
communications error, 446

- connecting a personal computer, 64
  - related flags/bits, 348, 591
  - removing cover, 122
  - settings, 250, 266, 275
  - specifications, 138
  - peripheral servicing, 375
    - priority servicing, 584, 626–627
    - setting, 270, 278
  - Peripheral Servicing Cycle Time, 335
  - Peripheral Servicing Priority Mode, 3, 584, 626–627
  - Peripheral Servicing Too Long Flag, 345
  - personal computer
    - connecting, 64
    - installing a Memory Card, 131
  - PLC Link
    - flags, 323
    - Operating Level Flags, 344, 601
  - PLC Link Area, 322
  - PLCs
    - cooling, 210
  - power consumption, 99
  - Power Holding Time, 382
  - power interruptions
    - CPU operation for power interruptions, 381–385
    - disabling, 334, 383
    - effects on data areas, 312
    - information, 346, 604
    - momentary interruptions, 381
    - Power OFF Detection Delay Time, 260, 279
    - power OFF interrupt task, 260, 279
  - power interrupts
    - holding time, 382
  - power OFF detection delay, 382
  - Power OFF Detection Time, 382
  - power OFF interrupts
    - response time, 403
  - power OFF processing, 381–382
  - power supply
    - 24 V, 230
    - checking, 447
    - CPU processing for power interruptions, 381
    - specifications, 50
  - Power Supply Units, 141
    - dimensions, 143
    - emergency stop, 208
    - grounding, 233
    - wiring AC Units, 228
    - wiring DC Units, 232
  - precautions, xv
    - applications, xviii
    - data transfers for C200H Special I/O Units, 637
    - general, xvi
    - handling precautions, 459
    - interlock circuits, 209
    - operating environment, xviii
    - output surge current, 246
    - output wiring, 246
    - periodic inspections, 458
    - safety, xvi
      - safety circuits, 208
  - printing, 206
  - Program Error Flag, 592
  - program errors, 442, 613
  - PROGRAM mode, 378
  - Programmable Terminals
    - RS-232C connection example, 632
  - programming, 195, 202
    - capacity, 55
    - converting programs, 428
    - error flag, 592
    - errors, 442
    - examples, 536
    - instruction execution times, 403
    - program capacity, 55
    - program error information, 339
    - program errors, 613
    - remote programming, 7
    - saving the program, 206
    - See also* tasks
    - symbols, 4
    - transferring the program, 195, 203
  - Programming Consoles, 62, 133
    - connecting, 62
    - error messages, 436
    - PC Setup coding sheets, 617
    - peripheral servicing, 375
    - See also* Programming Devices
  - Programming Devices, 131
    - connecting, 62
    - connections, 22
    - peripheral servicing, 375
    - Windows, 11
  - protocol macros, 5, 90
    - system configuration, 90
- ## R
- range instructions, 9
  - record-table instructions, 9
  - refreshing
    - I/O refreshing, 314, 316, 375
    - immediate refreshing, 314, 317
    - IORF(097), 315, 318
  - Registered I/O Table, 367
  - Relay Network Table, 368
  - Relay Output Units
    - specifications, 76, 472
  - relays
    - Output Unit

- replacement, 468
- remote I/O communications
  - CompoBus/S, 97
  - SYSMAC BUS Slave Racks, 71
- Remote I/O Master Units
  - SYSMAC BUS, 71
- Remote I/O System, 71
- replacement parts, 466, 468
- reserving I/O words, 291
- response time
  - settings, 261
- Restart Bits
  - CPU Bus Units, 334
  - Inner Board, 335
  - M-Net Interface, 308
  - peripheral port, 348
  - RS-232C port, 348
  - Special I/O Units, 334
  - SYSMAC BUS, 347
- Routing Tables, 367
- RS-232C port
  - communications error, 446
  - connecting a personal computer, 64
  - connection examples, 629–632
  - pin arrangement, 138
  - recommended wiring methods, 632
  - related flags/bits, 348, 590
  - settings, 250, 262, 275
  - specifications, 138
- RUN mode, 378
- RUN output, 231
  - specifications, 50

## **S**

- safety circuits, 208
- safety precautions, xvi
- scheduled interrupts
  - response time, 402
  - setting, 162
  - time units, 276
- self-maintaining bits, 332
- sequence control instructions
  - execution times, 406
- serial communications
  - communications information, 348
  - protocols, 87
  - See also* communications
  - system configuration, 86
- serial communications instructions
  - execution times, 423
- setup
  - initial setup, 194
  - preparations for operation, 194
  - See also* installation

- short-circuit protection, 246, 535–536, 541–542
- simulating system errors, 340
- Slave Racks
  - I/O allocations to SYSMAC BUS Slave Racks, 294, 329
  - I/O response time, 400
  - maximum current consumption, 100
  - SYSMAC BUS, 72
- Special I/O Unit Area, 327
- Special I/O Units, 56
  - data exchange, 296
  - disabling cyclic refreshing, 280
  - error information, 349
  - errors, 445
  - I/O allocations, 292
  - Initialization Flags, 334, 587
  - mounting, 216
  - Restart Bits, 334, 602
  - restrictions on C200H Units, 637
  - setup errors, 446
  - specifications, 80, 561
  - words allocated to Special I/O Units, 327, 353
- special math instructions
  - execution times, 416
- specifications, 41–42
  - Analog Timer Unit, 190
  - Analog Timer Units, 80
  - Basic I/O Units, 474–497
  - C200H High-density I/O Units, 80, 561–569
  - C200H Special I/O Units, 81
  - C200H-IA121, 475
  - C200H-IA122, 476
  - C200H-IA122V, 476
  - C200H-IA221, 477
  - C200H-IA222, 479
  - C200H-IA222V, 479
  - C200H-ID211, 482, 492
  - C200H-ID212, 482
  - C200H-ID215, 562
  - C200H-ID216, 489
  - C200H-ID217, 495, 498, 533, 548, 552, 557, 560
  - C200H-ID218, 490
  - C200H-ID219, 496
  - C200H-ID501, 561
  - C200H-IM211, 480
  - C200H-IM212, 481
  - C200H-MD115 (dynamic), 575
  - C200H-MD115 (static), 573
  - C200H-MD215 (dynamic), 578
  - C200H-MD215 (static), 576
  - C200H-MD501 (dynamic), 572
  - C200H-MD501 (static), 570
  - C200H-OA221, 515–516
  - C200H-OA222V, 518
  - C200H-OA223, 517
  - C200H-OA224, 519
  - C200H-OC221, 507

- C200H-OC222, 508
  - C200H-OC222V, 509
  - C200H-OC223, 503
  - C200H-OC224, 505
  - C200H-OC224V, 506
  - C200H-OC225, 510
  - C200H-OC226, 511
  - C200H-OD211, 523
  - C200H-OD212, 524
  - C200H-OD213, 521
  - C200H-OD214, 534
  - C200H-OD215 (dynamic), 568
  - C200H-OD215 (static), 567
  - C200H-OD217, 538
  - C200H-OD218, 527
  - C200H-OD219, 530
  - C200H-OD21A, 542
  - C200H-OD21B, 545
  - C200H-OD411, 522
  - C200H-OD501 (dynamic), 566
  - C200H-OD501 (static), 564
  - C200HS-INT01, 485
  - communications, 98
  - CPU Units, 42
  - CS-series CPU Bus Units, 85
  - CS-series High-density I/O Units, 498
  - CS-series Special I/O Units, 84
  - functions, 47
  - general, 50
  - Input Units, 74
  - Output Units, 77
  - peripheral port, 138
  - RS-232C port, 138
  - Special I/O Units, 80
  - stack instructions, 9
    - execution times, 419
  - stack processing
    - execution times, 419
  - Standard I/O Units
    - specifications, 474–497
  - standby errors, 438
  - standby operating errors, 438
  - Startup Condition, 438
  - startup condition, 256
  - startup mode
    - setting, 256, 273
  - Step Flag, 582
  - step instructions
    - execution times, 422
  - subroutine instructions
    - execution times, 421
  - subroutines
    - execution times, 421
  - Support Software
    - See also* personal computer
  - switch settings, 196
    - Analog Timer Unit, 189
    - Basic I/O Units, 155
    - C200H Expansion I/O Backplanes, 148
    - C200H Group-2 High-density Units, 169
    - C200H High-density I/O Units, 171
    - C200H High-density Units, 171
    - CPU Backplane, 145
    - CPU Unit, 119
    - CS-series Expansion Backplanes, 147
    - peripheral port, 138
    - Power Supply Units, 141
    - RS-232C port, 141
    - See also* DIP switch
  - symbol math instructions
    - execution times, 412
  - SYSMAC BUS
    - communications information, 347
    - error information, 344
    - errors, 445
    - I/O allocations to other Slaves, 330
    - I/O allocations to Slave Racks, 294, 329
    - I/O response time, 400
  - SYSMAC BUS Area, 329
  - SYSMAC BUS Slave Racks
    - description, 71
    - I/O allocations, 294
    - maximum current consumption, 100
  - system configuration, 41
    - basic, 57
    - Host Link, 88
    - NT Link, 89
    - serial communications, 86
    - SYSMAC BUS remote I/O, 71
- ## T
- task control instructions
    - execution times, 428
  - Task Error Flag, 586
  - Task Flags, 362
  - Task Started Flag, 335
  - tasks
    - description, 4
    - instruction execution times, 428
    - related flags/bits, 335
    - See also* interrupt tasks
    - Task Flags, 362
  - terminal blocks, 235
    - Basic I/O Units, 155
  - terminal connections
    - See also* specifications
  - Terminators, 149
  - text strings
    - instruction execution times, 428



- instructions, 9
- time
  - setting the clock, 39
- Timer Area, 350
- timers
  - execution times, 406
- Too Many I/O Points error, 441
- TR Area, 349
- tracing
  - data tracing, 10
  - See also* data tracing
- Triac Output Units
  - specifications, 76, 472
- troubleshooting, 431
  - overview, 10

## U

- Underflow Flag, 364
- Units
  - available models, 153
  - classifications, 56
  - limitations, 72
  - lists, 61
- user program
  - automatically transferring, 250
  - disabling, 250
- User Program Date, 346

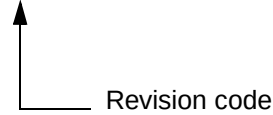
## V–W

- voltage
  - setting, 229
- wiring, 194, 196, 207, 228
  - AC Input Units, 244
  - Basic I/O Units, 234
  - DC Input Units, 243
  - I/O devices, 243
  - I/O Units with Connectors, 236
  - installing wiring ducts, 213
  - power supply, 228
  - precautions, 210
    - interlock circuits, 209
    - output surge current, 246
  - procedure, 237
  - recommended RS-232C wiring methods, 632
  - wire size, 237
- Work Area, 331
- work bits, 331
- work words, 331

# Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

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The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

| Revision code | Date          | Revised content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| 01            | February 1999 | Original production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 02            | October 1999  | Revisions and additions for version-1 CPU Units. See page 118 of the <i>CS-series Programming Manual</i> for a list.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 03            | May 2000      | <p>Revisions and additions as follows:</p> <p><b>All:</b> "CS1 High-density I/O Unit" changed to "CS1 Basic I/O Units with connectors."</p> <p><b>Page xi:</b> Information on CX-Programmer and CX-Server manuals added.</p> <p><b>Page 38:</b> Noise immunity specification changed.</p> <p><b>Pages 54 to 57, 84, 85, 120, and 542:</b> Tables reworked and expanded.</p> <p><b>Page 63:</b> Note added on Voice Unit.</p> <p><b>Page 67:</b> Note added.</p> <p><b>Page 87:</b> Voice Unit added to top table. Model numbers added to bottom table.</p> <p><b>Pages 122, 124, 181, and 493:</b> CS1 Unit information added.</p> <p><b>Pages 124 and 125:</b> Interrupt Input Unit section reworked and section added on High-speed Input Unit.</p> <p><b>Page 127:</b> Subsection moved to end of section.</p> <p><b>Pages 132:</b> Section reworked and moved before previous section.</p> <p><b>Page 134:</b> Section reworked and renamed.</p> <p><b>Page 144:</b> Two sections added.</p> <p><b>Page 180:</b> Information added for 20-terminal Units</p> <p><b>Pages 182 and 183:</b> Section headings changed and information added.</p> <p><b>Page 186 to 188:</b> Models added to diagrams and diagrams added.</p> <p><b>Pages 188:</b> Last line of page changed.</p> <p><b>Page 191:</b> Information on residual voltages added.</p> <p><b>Page 192:</b> Information on sensor surge current and fuse capacity added.</p> <p><b>Page 217:</b> Information for task flags changed.</p> <p><b>Page 224:</b> Information on DM area allocations for DeviceNet added.</p> <p><b>Page 225:</b> Note added.</p> <p><b>Pages 292 and 293:</b> "Host link mode" removed from default settings.</p> <p><b>Page 459:</b> Less than sign changed to equals sign.</p> <p><b>Page 470:</b> Reference to other manual added.</p> <p><b>Page 493:</b> Information added.</p> <p><b>Page 545:</b> Section starting at bottom of page redone.</p> <p><b>Page 548:</b> Information added to I/O interrupt task description.</p> <p><b>Page 549:</b> Information added.</p> <p><b>Page 551 to 574:</b> "Top: Min. Bottom: Max." removed from table column heading.</p> <p><b>Pages 550 to 554:</b> Small table added on differentiation; ! execution times added.</p> <p><b>Page 583:</b> Fatal Inner Board error description rewritten.</p> <p><b>Page 588 and 589:</b> Part of <i>Cause</i> removed from non-fatal Inner Board error and low battery error.</p> <p><b>Page 609:</b> Tables added.</p> <p><b>Page 611 to end of appendix:</b> CS1 Units added.</p> <p><b>Page 620, 621, and 622:</b> OC222N, OC226N, and OC224N added.</p> <p><b>Page 627 to 630:</b> Circuit configuration diagrams corrected.</p> <p><b>Page 630, 651, 658, and 659:</b> Note added.</p> <p><b>Pages 648, 651, 654 to 657, 671, 673, 680, and 682:</b> Diagrams revised.</p> <p><b>Page 649:</b> Note changed.</p> <p><b>Page 659:</b> Last two sentences removed.</p> <p><b>Page 754:</b> Information added to notes.</p> <p><b>Page 762:</b> Information added to restrictions at bottom of page.</p> |

## Revision History

| Revision code | Date         | Revised content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 04            | August 2000  | <p>Revisions and additions to add CS1 Long-distance Expansion Racks and Peripheral Servicing Mode. Specific changes are as follows:</p> <p><b>Page xvii:</b> "Power Supply Unit" added to mounting/dismounting warning.</p> <p><b>Pages 4,16, 41, 48 to 51, 84, 118 to 121, 187 to 190, 292, and 613:</b> Changes and additions for CS1 Long-distance Expansion Racks.</p> <p><b>Pages 4, 16, 307, 313, 322, 539, 729, and 792:</b> Changes and additions for Peripheral Servicing Priority Mode.</p> <p><b>Pages 45, 46, 106, and 108:</b> Programming Console model added.</p> <p><b>Page 51:</b> CS1W-INT01 added (two locations).</p> <p><b>Page 52:</b> Headings corrected in middle of page.</p> <p><b>Page 89:</b> Section added on CPU Unit Setting Area capacity.</p> <p><b>Page 100:</b> "Etc." replaced with "SYSMAC LINK link tables and Controller Link link tables."</p> <p><b>Pages 118 to 121:</b> Weights added.</p> <p><b>Pages 147 to 151:</b> Information on I/O number switch removed/replaced (not used for CS1).</p> <p><b>Section 7:</b> "CompoBus/D" changed to "DeviceNet" (with references left to CompoBus/D).</p> <p><b>Page 234:</b> Status area added to top graphic.</p> <p><b>Page 243:</b> Information added to note.</p> <p><b>Page 323:</b> Information added to top graphic.</p> <p><b>Page 532:</b> Table added to bottom of page.</p> <p><b>Pages 560, 562, and 563:</b> Note added after table.</p> |
| 05            | January 2001 | <p>New products added and other changes made as follows:</p> <p><b>Pages 59, 62, 89, 90, 94, 129, 130, 133, 135, 574, 645, 646, 648, 650, 672, 680, 682, and 686:</b> Information added on new products.</p> <p><b>Page 325:</b> Paragraph below diagram changed.</p> <p><b>Page 631:</b> Remedy added for "Input irregularly turns ON/OFF."</p> <p><b>Pages 631 and 632:</b> Replacing Unit added for 4 remedies.</p> <p><b>Page 635:</b> First row for "User-serviceable parts" changed.</p> <p><b>Page 642:</b> Model added to note following table.</p> <p><b>Page 648:</b> Precautions added before <i>Basic I/O Units</i>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## Revision History

| Revision code | Date           | Revised content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 06            | October 2001   | New products added to the manual, including the new High-speed CPU Units (CS1-H CPU Units). (Extensive changes too numerous to list.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 07            | September 2002 | <p>"PC" was changed to "PLC" throughout the manual. "CS1" was changed to "CS Series" where appropriate (i.e., when not referring directly to a CPU Unit). In addition, the following changes were made:</p> <p><b>Page v:</b> Change made to information on OMRON product references.</p> <p><b>Page xi:</b> Model numbers changed or added in several places.</p> <p><b>Page xv:</b> Precautionary information added.</p> <p><b>Page 2:</b> Minor change made to callouts.</p> <p><b>Page 5:</b> Line added before graphic.</p> <p><b>Page 6:</b> "CompoBus/D" added in one place.</p> <p><b>Page 12:</b> Wording changed in second heading.</p> <p><b>Pages 14, 17, 348, 349, 350, 402, 422:</b> Information related to new timer/counter instructions added.</p> <p><b>Pages 57, 62, 64, 65, 66, 69, 72, 74, 75, 76, 77, 132:</b> Notes added.</p> <p><b>Pages 57, 129, 184:</b> New section headings added.</p> <p><b>Page 60:</b> 32 corrected to 64 in two places.</p> <p><b>Page 61:</b> Information on new CPU Backplanes added.</p> <p><b>Page 64:</b> Information added to middle section.</p> <p><b>Pages 67, 69, 76, 102, 143, 145, 163, 211, 262, 391, 469, 573:</b> Information added to tables.</p> <p><b>Page 132:</b> Minor changes made to information in table.</p> <p><b>Pages 141, 144:</b> Tables added.</p> <p><b>Page 143:</b> Numerical corrections made in two places.</p> <p><b>Page 150, 162, 163, 166, 168:</b> Page references removed.</p> <p><b>Pages 198, 200, 201:</b> Information reordered.</p> <p><b>Page 233, 558, 626, 627, 628:</b> Minor changes made to headings.</p> <p><b>Page 256:</b> Third table removed.</p> <p><b>Pages 270, 277:</b> Changes made to graphic callouts.</p> <p><b>Pages 280, 281:</b> Callout moved.</p> <p><b>Page 300:</b> Second graphic replaced.</p> <p><b>Pages 356, 360:</b> Changes made to explanation of I/O Hold Bit operation.</p> <p><b>Page 377:</b> 25 changed to 15 in bottom graphic.</p> <p><b>Page 378:</b> Minor change in wording.</p> <p><b>Page 386:</b> Information added before bottom table.</p> <p><b>Page 387:</b> Information added before second table.</p> <p><b>Page 393:</b> Numerical changes made in two places in table.</p> <p><b>Page 395:</b> First note removed.</p> <p><b>Pages 400 to 425:</b> Zeroes added before instruction codes where appropriate (i.e., to make them three digits long.)</p> <p><b>Page 406:</b> Numerical corrections made in six places.</p> <p><b>Page 454:</b> Minor change made to wording of text before table.</p> <p><b>Page 457:</b> Changes made to bottom table in several places.</p> <p><b>Page 459:</b> Last heading removed.</p> <p><b>Appendix A:</b> Minor changes made to graphics and notation used for input voltage, maximum switching capacity, and external power supply throughout the Appendix.</p> <p><b>Page 553:</b> Information on TTL I/O Unit added.</p> <p><b>Page 589:</b> Change made to setting range for A406.</p> <p><b>Page 623:</b> Graphic replaced.</p> |

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### *Revision History*

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OPERATION MANUAL

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