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V700-series
Electromagnetic Inductive RFID System

OPERATION MANUAL

OMRON

V700-series Electromagnetic Inductive RFID System

Operation Manual

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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 “PC” means Programmable Controller and is not used as an abbreviation for anything else.

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.

TABLE OF CONTENTS

TABLE OF CONTENTS

About this Manual:

This manual describes the installation and operation of the V700-series Electromagnetic Inductive RFID System and includes the sections described below.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate the V700-series Electromagnetic Inductive RFID System.

Section 1 provides the characteristics and system configuration of the V700 System as well as an outline of its operation.

Section 2 provides the specifications and performance characteristics of each component of the V700 System.

Section 3 provides the modes and functions in detail.

Section 4 provides installation information for the V700 System.

Section 5 provides the communications functions and provides details on communications-related data and commands.

Section 6 provides the installation and use of the Programming Console in relation to the V700 System.

Section 7 provides information on trial operation, errors and remedies, and maintenance and trouble-shooting.

Section 8 provides information on the V700 communications characteristics including communications ranges and communications times.

Section 9 provides reference data relating to V700 communications, ID Tags, Antennas, and proximity sensors.

The ***Appendices*** provide an ASCII code table, a list of standard models, and information on enclosure ratings.

⚠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 V700-series Electromagnetic Inductive RFID System and related devices.

The information contained in this section is important for the safe and reliable application of the V700-series Electromagnetic Inductive RFID System. You must read this section and understand the information contained before attempting to set up or operate a V700-series Electromagnetic Inductive RFID System.

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 installing and operating the V700-series Electromagnetic Inductive RFID System. Be sure to read this manual before attempting to use the System and keep this manual close at hand for reference during operation.

⚠ WARNING It is extremely important that a V700-series Electromagnetic Inductive RFID System 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 the System to the above-mentioned applications.

3 Safety Precautions

⚠ WARNING Always connect to a class-3 ground (to 100 Ω or less) when installing the System. Not connecting to a class-3 ground 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 take any unit apart or touch the inside while the power is being supplied. Doing so may result in electric shock.

4 Application Precautions

⚠ Caution Be sure to observe the following precautions to ensure safety in installing or operating the System.

- Do not use the System in an environment subject to flammable, explosive, or corrosive gases.
- Do not attempt to take any Units apart, to repair any Units, or to modify any Units in any way.

- Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals.
- Use crimp terminals of specified size for wiring.
- Be sure that the items with locking devices are properly locked into place before using the System.
- Be sure that the DC Power Supply Unit exclusively designed for the V700 Series is used and is not connected to any other device.
- Be sure that the power supply voltage is within the rated range of 24 VDC+10% and –15%.
- Do not remove the ferrite cores attached to the V700-H01 and V700-H02.
- Install the ferrite core supplied with the V700-CD1D-V3 or V700-CD2D-V3 according to the specified instructions.
- Be sure to observe all warnings, cautions, and safety precautions specified in the manual.

5 Correct Use

⚠ Caution Do not install the V700-H01, V700-H02, V700-CD1D-V3, or V700-CD2D-V3 in the following locations:

- Locations subject to direct sunlight.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to shock or vibration.

⚠ Caution Be sure to observe the following wiring precautions:

- Do not wire the lines of the RFID System alongside high-tension or power lines.
- Check the polarity of each terminal and make sure not to make mistakes in polarity.

⚠ Caution Be sure to observe the following precaution when cleaning the V700-H01, V700-H02, V700-CD1D-V3, or V700-CD2D-V3:

- Organic solvents may damage the paint coating on the casing or resin part of the product. Do not use paint thinner or any other organic solvent to clean the product.

6 Applicable Standards

The V700-series Electromagnetic Inductive RFID System conforms to the following standards:

- EC Directives EN50081-2
- EC Directives EN50082

7 EN/IEC Standards

- In connection with EC unification, eighteen European countries will integrate their conventional safety standards into EN standards. When the EN standards come into effect, they will apply as the unified European standards in place of the conventional safety standards.
- EN standards are based on IEC standards. Therefore, machines that are exported to Europe from Asia or North America must satisfy EN standards. Otherwise, the machines must satisfy IEC standards if the machines do not fall under EN standards.

- The CE marking is provided by EC Directives. A product bearing a CE marking meets the safety standards specified by all relevant EC Directives. If the product is a machine, it must satisfy the EC Machinery Directive, Low-voltage Directive (LVD), and EMC requirements of the EC Directives. The product must satisfy the EMC and LVD requirements of the EC Directives, if the product is a home electronics appliance or office machine. Machines bearing CE markings can be freely exported to European countries. In other words, a CE marking is the passport for export to Europe.
- EC Directives are provided for the purpose of European unification. Approximately 300 EC Directives have been passed. EC Directives for machines are called Machine Directives. According to the Machine Directives (EC Directive Document number 89/392/EEC), machines exported to Europe on and after January 1, 1995 must bear CE markings.
- EMC standards are for electro-magnetic compatibility. A machine must satisfy the EMC requirements of EC directives by taking countermeasures against EMI (electro-magnetic interference) and EMC (electro-magnetic susceptibility).

Electromagnetic Inductive RFID System

The V700-series Electromagnetic Inductive RFID System as a combined system of Controller(s), ID Tag(s), and Antenna(s) satisfies EC Directive requirements. The following is a list of applicable V700-series products and corresponding standards.

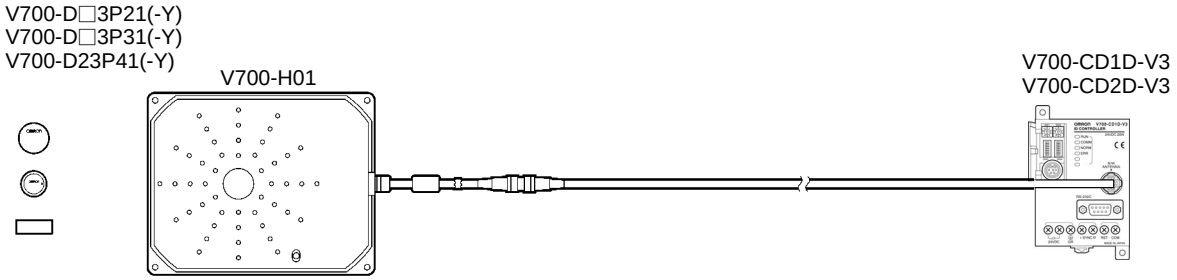
Models	EMC Directives	Remarks
Controllers: V700-CD1D-V3 and V700-CD2D-V3 Antenna: V700-H01 Tags: V700-D□3P21(-Y), V700-D□3P31(-Y), and V700-D23P41(-Y)	EMI Standard: EN50081-2 EMS Standard: EN50082-2	Attach a ferrite core (TDK ZCAT2032-0930) each to the DC power supply line and FG line of the Controller. The Antenna Cable is attached with a ferrite core (TDK ZCAT2035-0930A-BK). Do not remove the ferrite core.

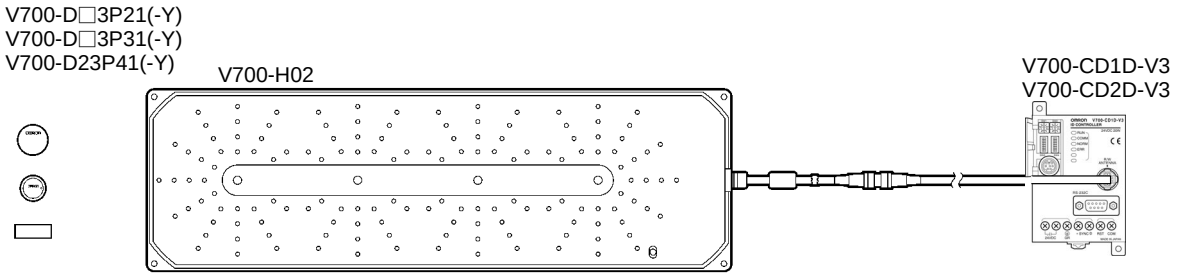
SECTION 1
Characteristics and System Configuration

This section provides the characteristics and system configuration of the V700 System as well as an outline of its operation.

1-1 Characteristics

The V700-series Electromagnetic Inductive RFID System is ideal for the construction of highly functional, long-distance wireless ID systems for material control and logistics.





V700-CD1D-V3 and V700-CD2D-V3 (RFID) Controllers

The V700-CD1D-V3 and V700-CD2D-V3 can connect to a personal computer or Programmable Controller (PC) to control an RFID System. The V700-CD1D-V3 has an RS-232C interface and the V700-CD2D-V3 has an RS-485 interface.

V700-H01 and V700-H02 (RFID) R/W Antennas

The V700-H01 is a standard antenna that is 250 by 200 mm in size, ideal for long-distance communications, and ensuring a minimum communications distance of 250 mm. The V700-H02 is a wide-field antenna that is 650 by 200 mm in size. Compared with the V700-H01, the V700-H02 provides rough positioning and better communications with ID Tags moving at high-speed.

Wide Variety of ID Tags

There are 6 ID Tag models available: the V700-D□3P21, V700-D□3P21-Y, V700-D□3P31, V700-D□3P31-Y, V700-D□3P41, and V700-D□3P41-Y. The versions without the "-Y" suffix are standard versions with all functions except the high-speed access function. The versions with the "-Y" suffix are equipped with the high-speed access function.

V700-D□3P21 and V700-D□3P21-Y

The V700-D□3P21(-Y) Data Carriers are thin (1.2 mm thick and 23 mm in diameter), making them ideal for applications such as installation in equipment.

V700-D□3P31 and V700-D□3P31-Y

The V700-D□3P31(-Y) Data Carriers are thicker (2.8 mm thick and 20 mm in diameter), but can withstand harsh conditions. They are resistant to water and chemicals and can hold data for 200 hours at 180°C.

V700-D□3P41 and V700-D□3P41-Y

The V700-D□3P31(-Y) Data Carriers are long and thin (25 mm long and 3.9 mm in diameter), so they can be installed easily in a hole drilled in equipment. They can retain data between –40°C and 110°C and have very good water resistance.

Highly Functional RFID System

The RFID System operates in either multiple, simultaneous access mode or FIFO (first-in, first-out) read/write mode. In multiple, simultaneous access mode, if there is more than one ID Tag in the communications area, the RFID System reads and writes data from and to the all ID Tags at one time. In FIFO read/write mode, the RD-ID System reads and writes data to one ID Tag after another as they come into the communications area.

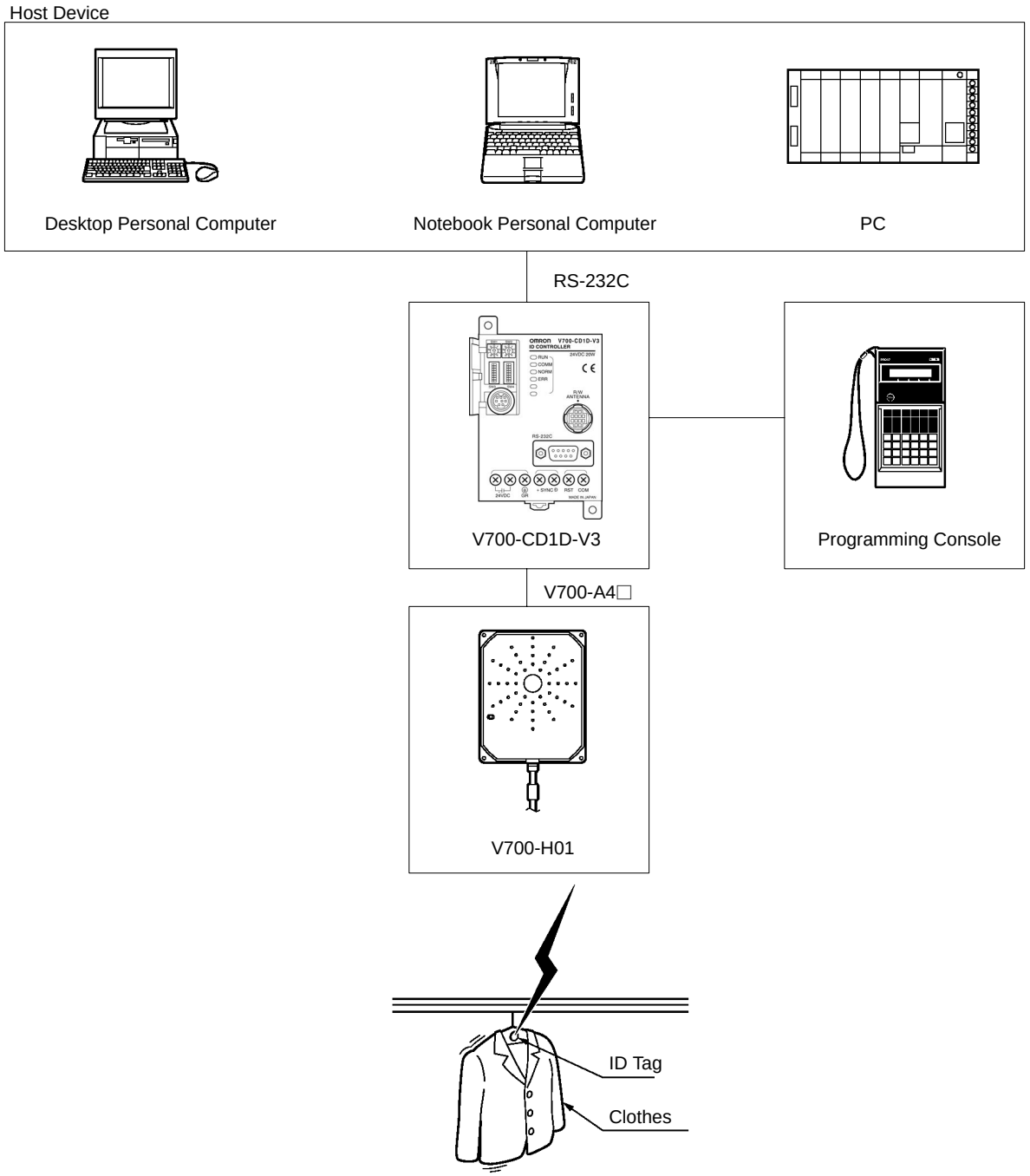
Ease of Use

The C200H-PRO27-E Programming Console (sold separately) can be connected to the RFID System over the V700-P10 Programming Console Conversion Cable (sold separately). With the Programming Console, the communications condition of the System can be monitored on-line. Furthermore, the error log of the System and the ambient noise measurement in the communications area can be read with ease. All these functions make it possible to start up the System quickly and improve the efficiency of on-site maintenance work on the System.

1-2 System Configuration

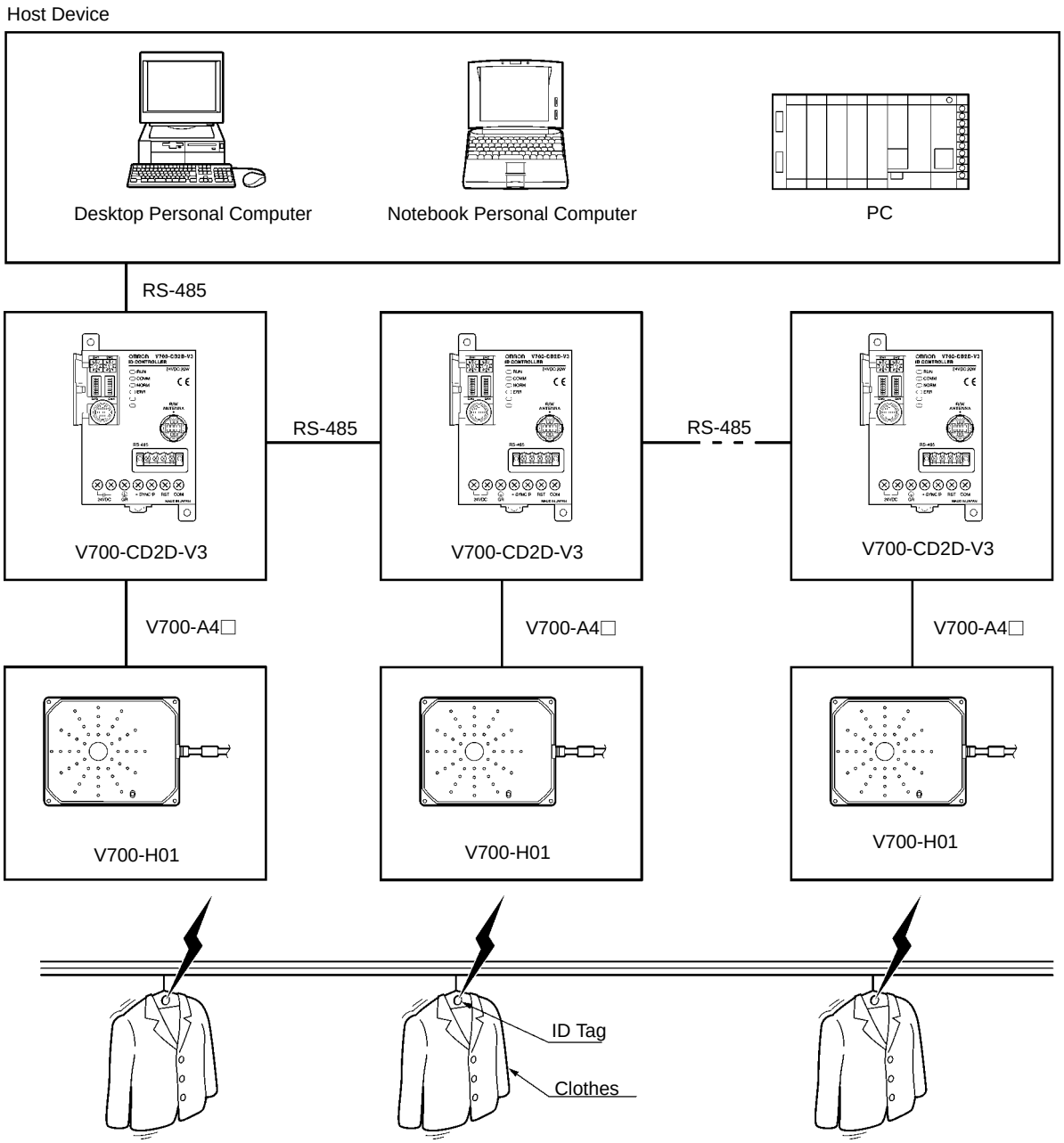
1-2-1 Example V700-CD1D-V3 System Configuration

The V700-CD1D-V3 has a built-in RS-232C serial interface that is used for communications with a personal computer or PC. The V700-CD1D-V3 controls communications with the ID Tags based on the commands sent from the host.



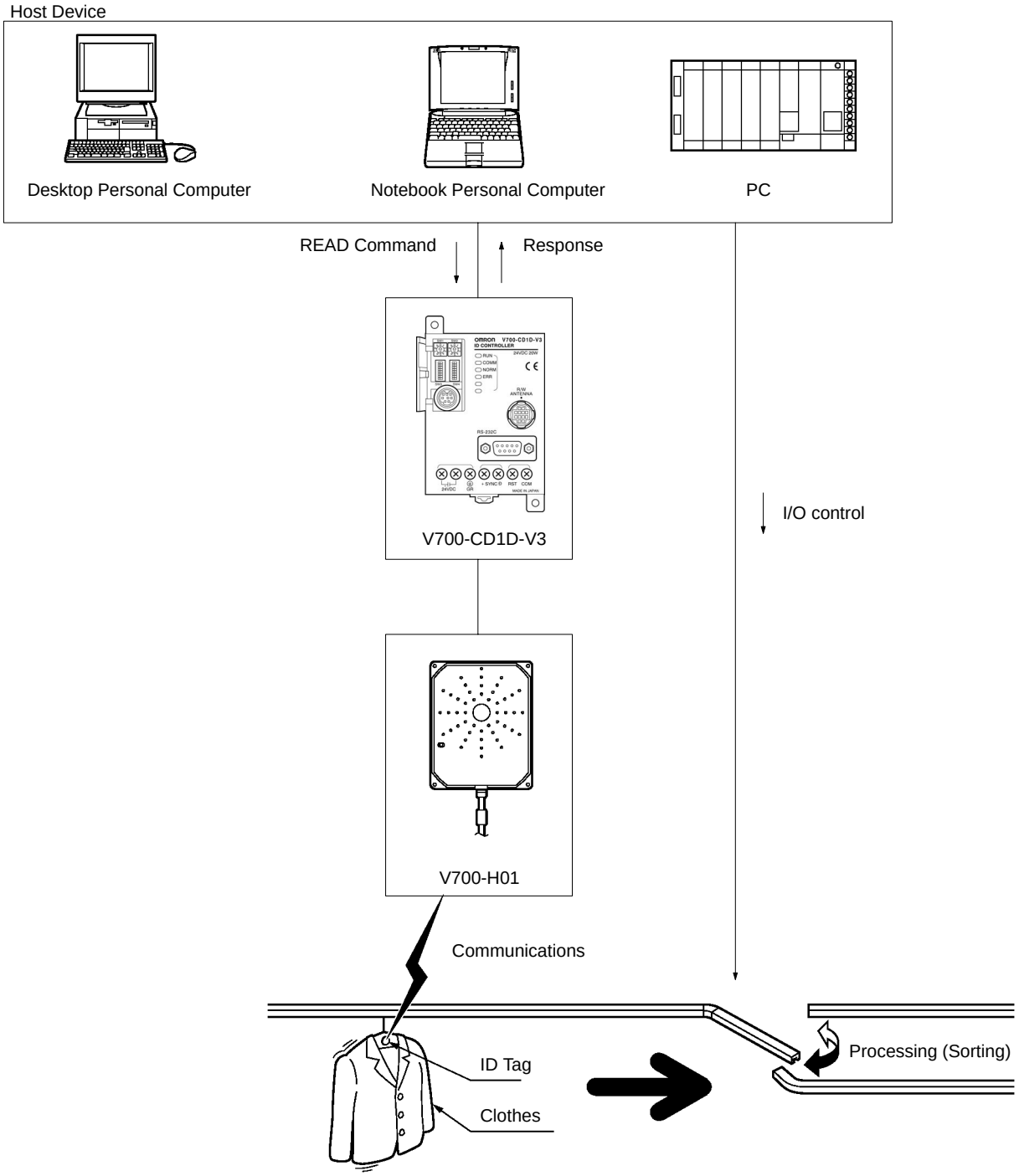
1-2-2 Example V700-CD2D-V3 System Configuration

The V700-CD1D-V3 Controllers are equipped with an RS-485 interface, allowing a single personal computer or PC to be connected to as many as 31 Controllers. The RS-485 method also allows for longer connections because the total RS-485 cable length can be up to 300 m.



1-3 Outline of Operation

The following provides the outline of the operation of the RFID System using an example that sorts items of clothing each attached with an ID Tag.



1, 2, 3...

1. When the host sends the command to the Controller, the Antenna stands by for the arrival of the ID Tag.
2. When the ID Tag arrives in the communications area, the Controller receives data in the memory area of an ID Tag specified by the READ command and sends the data as a response to the host.
3. The host sorts the clothes on the basis of the data.

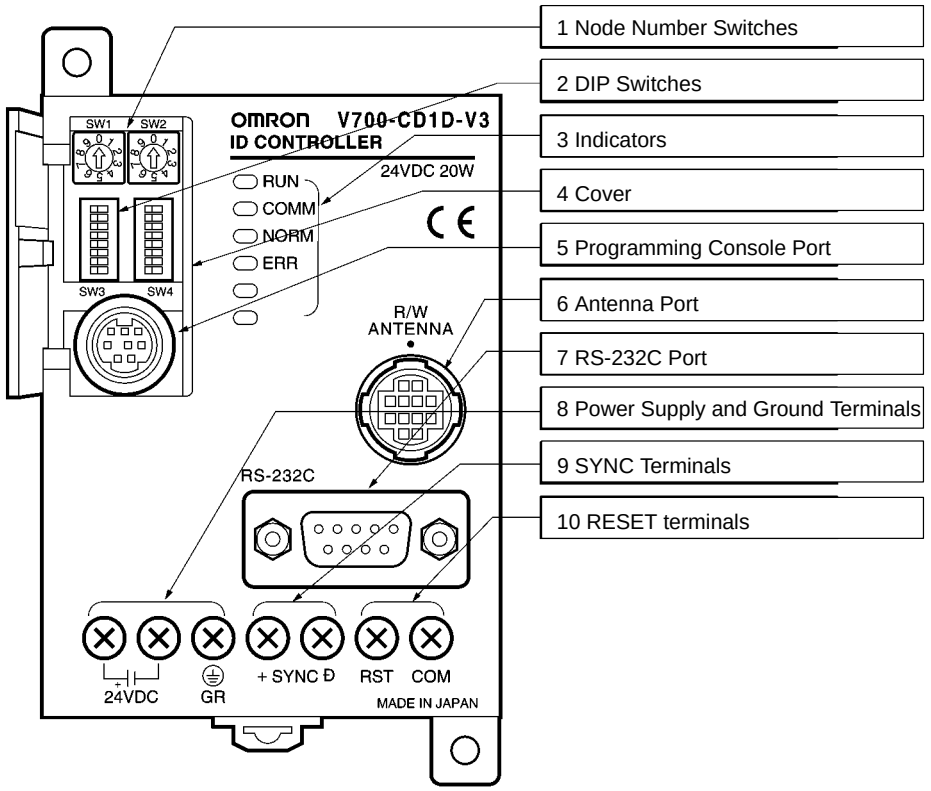
SECTION 2
Specifications and Performance

This section provides the specifications and performance characteristics of each component of the V700 System.

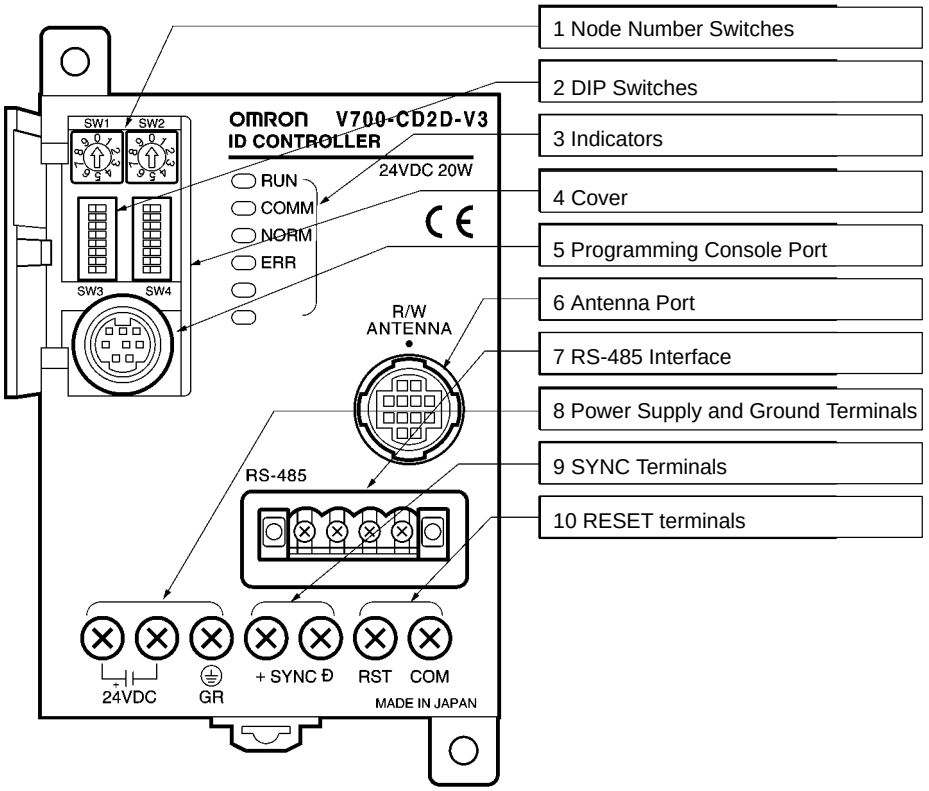
2-1 Controller

2-1-1 Nomenclature

V700-CD1D-V3



V700-CD2D-V3



Refer to all sections following this section for the functions of the Controller in detail. Refer to *Section 4 Setting, Mounting and Connection Methods* for the settings and connections of the Controller.

No.	Name		Function	Description
1	Node number switch		Used for node number settings	The node number is used to identify each Controller when a single host computer is connected to a maximum of 32 Controllers.
2	DIP switch		Used for mode settings	Various settings are possible (e.g., communications synchronization, energy-saving, communications distance, termination resistance, baud rate, data length, parity, stop bit length, communications mode, and time-out settings).
3	Indicator		The following indicators are available.	
	RUN	Green	RUN indicator	Turns ON when the Controller is in normal operation.
	COMM	Green	Communications indicator	Turns ON when the Controller is in communications with the ID Tag.
	NORM	Green	Normal indicator	Turns ON and OFF once when the communications finish with no error.
	ERR	Red	Error indicator	Turned ON and OFF once if a communications error results. Turned ON if a system error results.
4	Cover		Protection of SW1 through SW4 and the Programming Console port	Open the cover only when necessary.
5	Programming Console port		Connecting to the Programming Console	OMRON's C200H-PRO27-E Programming Console (sold separately) can be connected through the V700-P10 Programming Console Conversion Cable (sold separately). The V700-P10 is provided with a dedicated key sheet used for the operation of the Programming Console.
6	Antenna Port		Connecting to the Antenna	A single Antenna can be connected through the V700-A4□ Antenna Cable (sold separately). The following Antennas are available. • V700-H01 (standard antenna, 250 x 200 mm in size) • V700-H02 (wide-field antenna, 650 x 200 mm in size)
7	RS-232C port (V700-CD1D-V3)		Connecting to host device	A personal computer or PC can be connected through the RS-232C port.
	RS-485 interface (V700-CD2D-V3)		Connecting to host device	A personal computer or PC can be connected through the RS-485 interface.
8	Power supply terminals		Connecting to power supply	
	24 VDC+		Connecting to power supply	Connect +24 VDC.
	24 VDC–			Connect 0 V.
	GR		Connecting to ground	Ground this terminal at a resistance of less than 100 Ω.
9	SYNC terminals		Used for synchronization	
	SYNC+		Connecting to synchronous signal	These terminals are used together for synchronizing more than one Controller in order to reduce the distance of mutual interference of each corresponding Antenna.
	SYNC–			
10	RESET terminals		Connecting to RESET signal	
	RST		RESET signal	These terminals are used together in order to use external RESET input.
	COM		COMMON signal	

2-1-2 Specifications

General Specifications

Item	Specification
Supply voltage	24 VDC $^{+10\%}/_{-15\%}$
Power consumption	20 W max. at 100 V
Insulation resistance	20 MΩ min. (by 100 VDC Megger) between the following components: 1) Ground and both power supply terminals 2) Both power supply terminals and both I/O terminals 3) Both power supply terminals and casing 4) Both I/O terminals and ground 5) Both I/O terminals and casing 6) Ground terminal and casing.
Dielectric strength	Leakage current 10 mA max. when 500 VAC (50/60 Hz) was applied for 1 minute to the 6 component combinations listed above.
Vibration resistance	Destruction: 10 to 150 Hz, 0.3-mm double amplitude at 20 m/s^2 in X, Y, and Z directions four times each for 8 minutes
Shock resistance	Destruction: 200 m/s^2 in ±X. ±Y. and ±Z directions 3 times each (18 times total)
Ambient operating temperature	–10°C to 55°C (with no icing)
Ambient operating humidity	35% to 85% (with no condensation)
Ambient storage temperature	–25°C to 65°C (with no icing)
Ambient storage humidity	35% to 95% (with no condensation)
Construction	Panel-mounting
Ground	Ground at a resistance of less than 100 Ω. If the Controller is not grounded, communications with ID Tags can be affected easily by surrounding noise.
Weight	Approx. 290 g

Performance Specifications

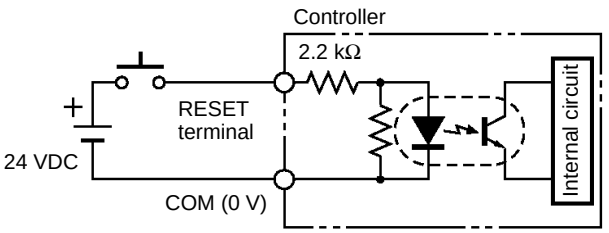
Item	Specification
Radio communications functions	1) Single, FIFO Read/Write, or multiple mode access function 2) Write protect function 3) Memory check function 4) Mutual interference prevention function
Maintenance functions	Noise environment measurement function and error logging function
Self-diagnostic functions	CPU, host communications, Controller communications, and synchronous communications errors are checked.

I/O Specifications

External RESET Input

Input voltage	24 VDC $^{+10\%}/_{-15\%}$ (including ripples)
Input impedance	2.2 kΩ
Input current	10 mA TYP (24 VDC)
ON voltage	19 V min.
OFF voltage	5 V max.
Input response time	70 ms max.

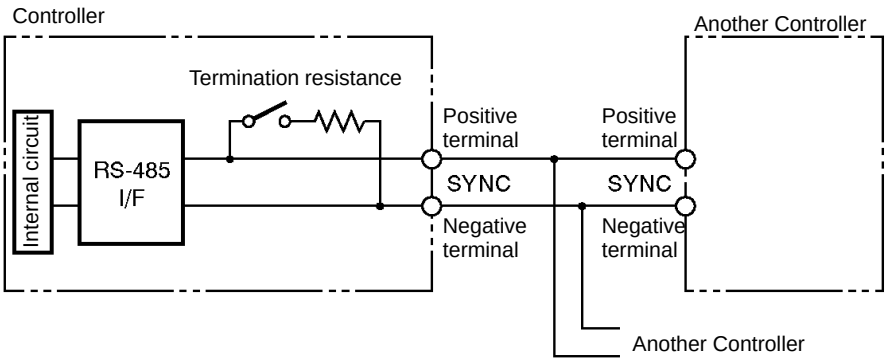
Circuit Configuration



SYNC

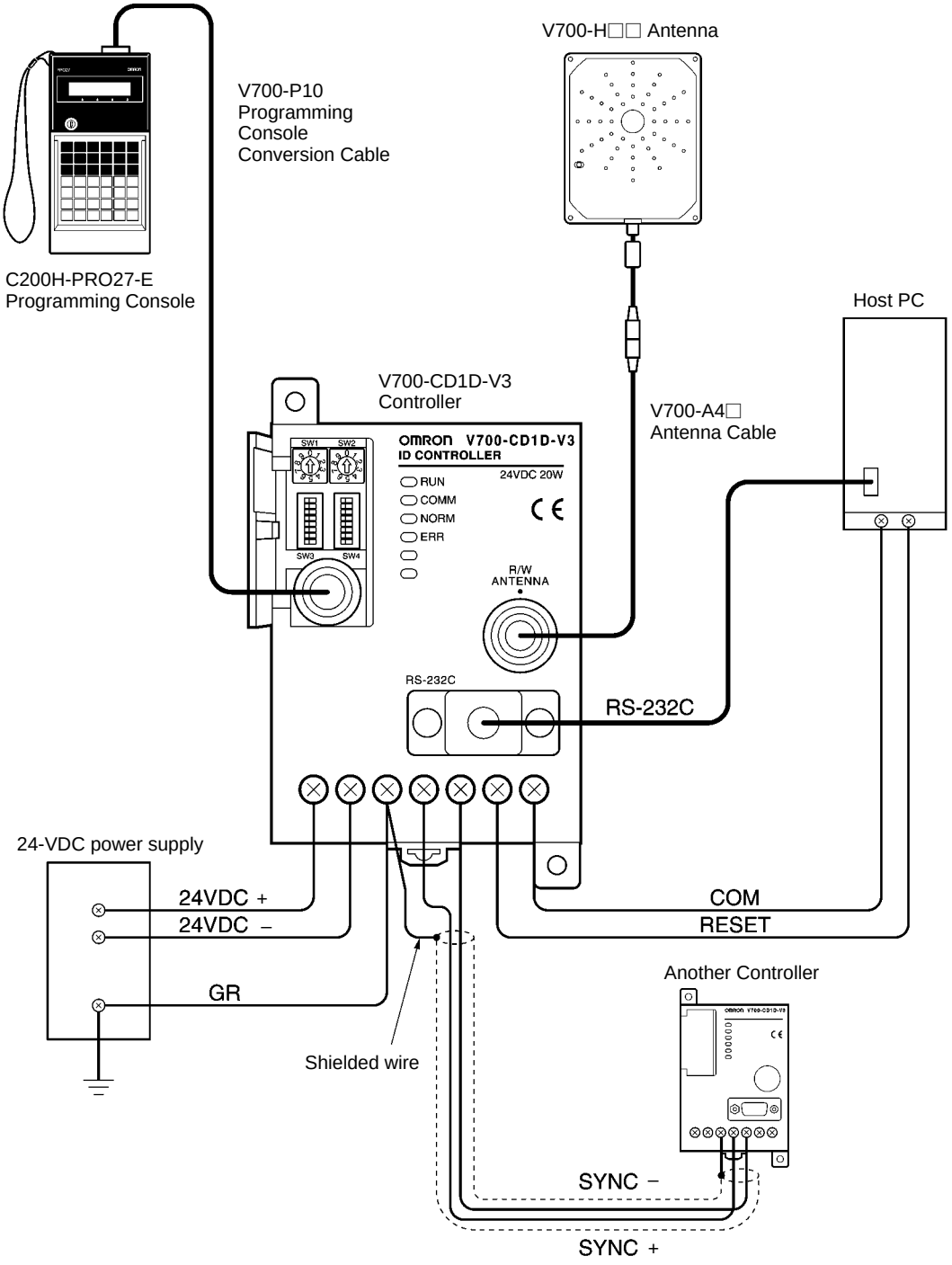
I/O interface	Conforms to RS-485

Circuit Configuration

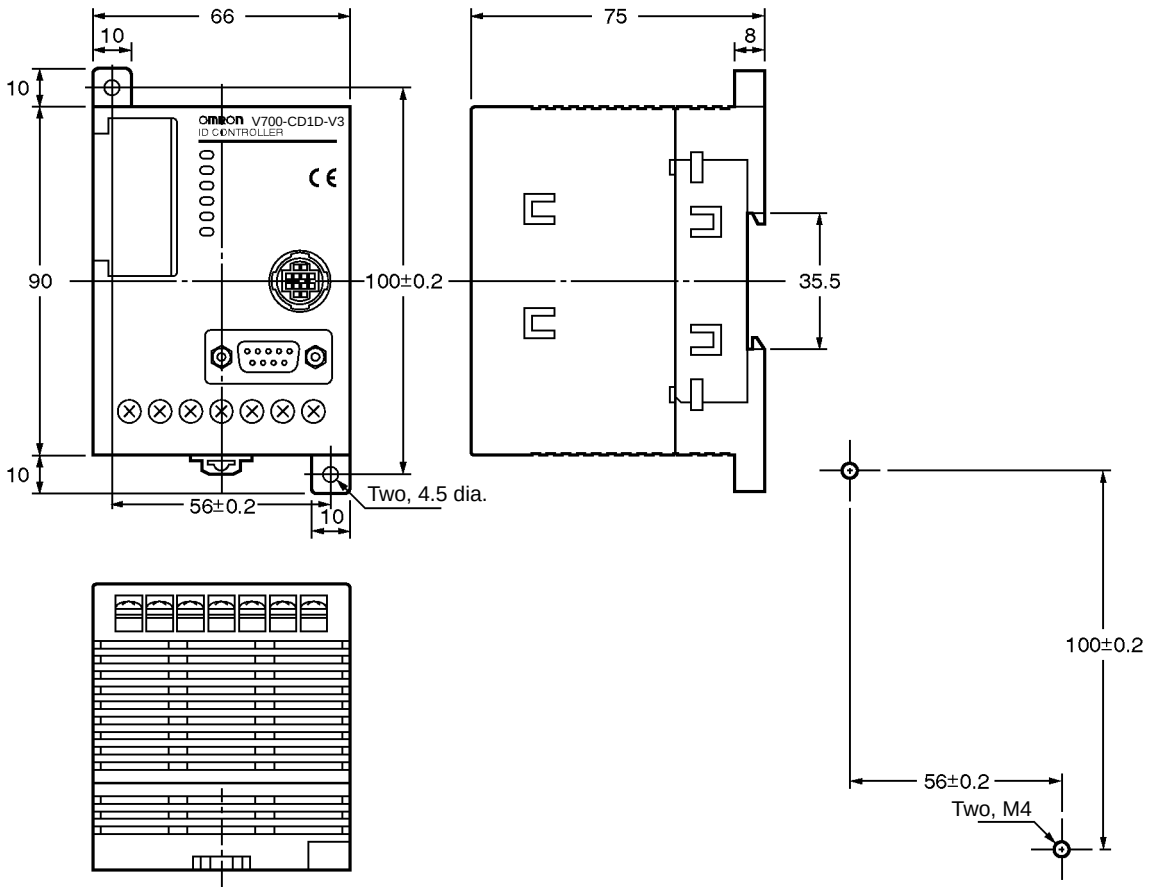


⚠ Caution The positive SYNC or negative SYNC terminal is not an RS-485 terminal. Do not connect anything other than coaxial cables to these terminals.

Wiring Example



2-1-3 Dimensions



Casing material: PC/ASA resin

2-2 Antenna

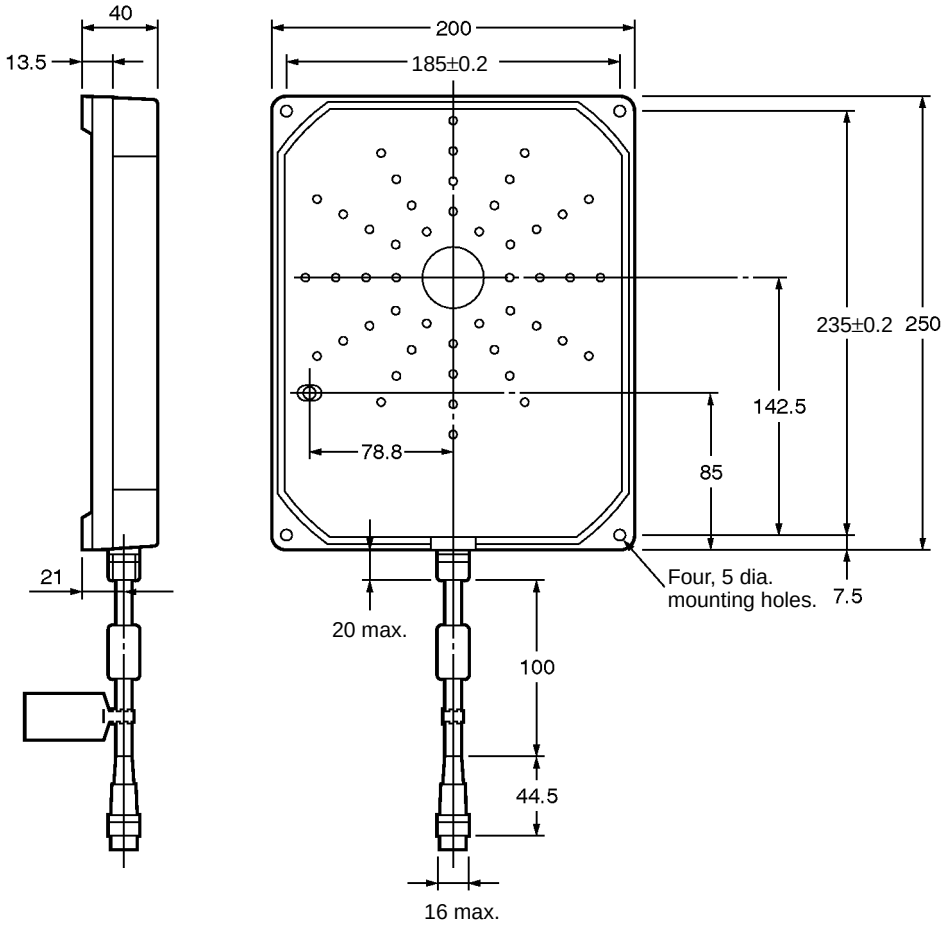
2-2-1 Specifications

Item	Model	
	V700-H01	V700-H02
Oscillation frequency	125 kHz	
Insulation resistance	20 MΩ min. (500 VDC) between the cable terminals and casing.	
Dielectric strength	Leakage current of 1 mA max. when 1,000 VAC (50/60 Hz) was applied between the cable terminal and casing for 1 minute	
Vibration resistance	Destruction: 10 to 150 Hz, 1.5 mm double amplitude at 100 m/s^2 in X, Y, and Z directions twice each for 8 minutes	
Shock resistance	No errors after 300 m/s^2 shock three times each in ±X, ±Y, and ±Z directions (18 times total)	
Ambient operating temperature	–20°C to 55°C (with no icing)	
Ambient storage temperature	–35°C to 65°C (with no icing)	
Ambient operating humidity	35% to 95% (with no condensation)	
Ambient storage humidity	35% to 85% (with no condensation)	
Degree of protection	IP40 (except connector) meets IEC60529 standard	
Material	The case is PC/ASA resin, the rear panel is phenol resin, and the cable is PVC cable (not water-resistant or oil-resistant at the connector).	
Cable length	The cable may be extended to a total length of 50.1 m max.	
LED indication	Power supply: Green Communications: Orange	
Weight	Approx. 800 g	Approx. 1,760 g

Caution The Antenna is not water-resistant. Do not allow the Antenna to become wet.

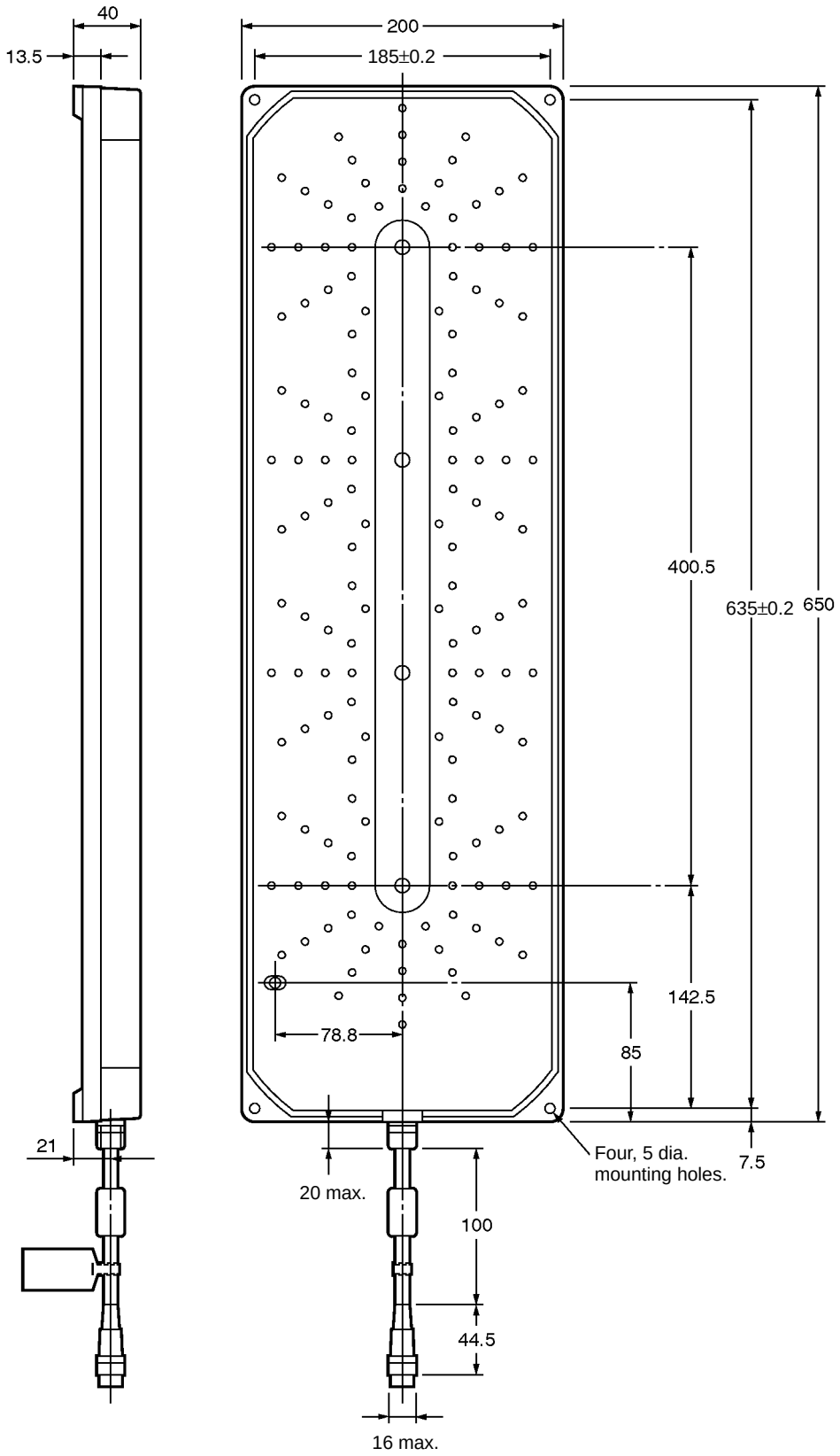
2-2-2 Dimensions

V700-H01



Casing material	PC/ASA resin
Rear panel material	Phenol resin
Cable	PVC

V700-H02



Casing material	PC/ASA resin
Rear panel material	Phenol resin
Cable	PVC

2-3 ID Tags

2-3-1 Specifications

Item	Model		
	V700-D□3P21(-Y)	**V700-D□3P31(-Y)**	**V700-D23P41(-Y)**
Type of memory	EEPROM		
Data retention time	10 years after data is written		
Data writing limit	100,000 times per address		
Ambient operating temperature (when communicating)	–10°C to 50°C (with no icing)	–20°C to 70°C (with no icing)	–25°C to 70°C (with no icing)
Ambient operating temperature (when not communicating)	–10°C to 50°C (with no icing)	–40°C to 110°C (with no icing)	–40°C to 110°C (with no icing)
Ambient storage temperature	–10°C to 50°C (with no icing)	–40°C to 110°C (with no icing)	–40°C to 110°C (with no icing)
Ambient operating humidity	35% to 85% (with no condensation)	No limits	35% to 85% (with no condensation)
Heat resistance tests	---	Constant high temperature: 180°C for 200 hours Thermal cycling: 200 cycles of 30 minutes each, cycling between room temperature and 180°C	---
Degree of protection	IP30 (IEC60529 standards)	IP68 (IEC60529 standards)	IP67 (IEC60529 standards)
Vibration resistance	Destruction: 10 to 500 Hz, 2.0-mm double amplitude at 150 m/s^2 in X, Y, and Z directions three times each for 11 minutes	Destruction: 10 to 2,000 Hz, 0.75-mm single amplitude No error when vibrated at 150 m/s^2 in X, Y, and Z directions ten times each for 15 minutes	
Shock resistance	Destruction: 500 m/s^2 in ±X, ±Y, and ±Z directions three times each	No error: 500 m/s^2 in ±X, ±Y, and ±Z directions three times each (18 times total)	
Material	PBT resin with PET resin coating	PPS resin	Case: PBT resin Filler: Epoxy resin
Weight	Approx. 1.5 g	Approx. 2 g	Approx. 1 g

ID Tag Memory Capacity

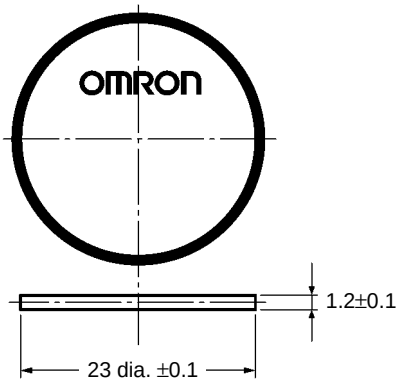
Model	Memory capacity	Remarks
V700-D13P21	128 bytes (user area is 112 bytes)	Only 3 models are equipped with the high-speed access function: V700-D13P21-Y, V700-D13P31-Y, V700-D23P41-Y
V700-D13P21-Y (special order item)		
V700-D13P31		
V700-D13P31-Y (special order item)		
V700-D23P21 (special order item)	256 bytes (user area is 240 bytes)	
V700-D23P31 (special order item)		
V700-D23P41		
V700-D23P41-Y (special order item)		

Note The V700-D□3P31(-Y) can be stored at a temperature of 180°C for 200 hours. The V700-D□3P31(-Y) can be, however, in normal operation (i.e., the V700-D□3P31(-Y) located in the communications area) at a maximum of 70°C. This means the temperature of the ID Tag itself in operation must not exceed 70°C. Before using the ID Tag, conduct some tests and check that the temperature of the ID Tag itself in operation is 70°C maximum. If the temperature of the ID Tag is 180°C, it normally takes a period of one minute for the temperature to drop

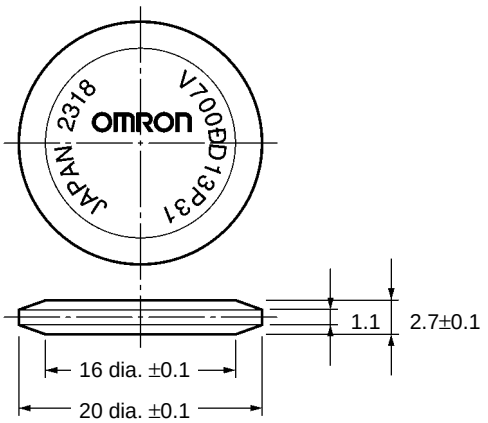
to 70°C at an ambient temperature of 25°C. Take this into consideration when cooling down the ID Tag.

2-3-2 Dimensions

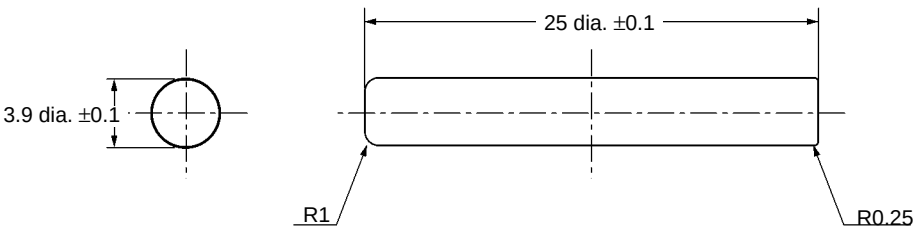
V700-D□3P21(-Y)



V700-D□3P31(-Y)



V700-D23P41(-Y)



2-3-3 Memory Map

The ID Tags are available with two sizes of memory capacity: 128 bytes (user area = 112 bytes) and 256 bytes (user area = 240 bytes). The memory is configured in one-byte units and specified by addresses 00h to 6Fh (112-byte ID Tags) or 00h to EFh (240-byte ID Tags). Each eight-byte block of memory, such as 00h to 07h and 08h to 0Fh, is treated as one page.

Page	8 bytes/page							
1	00h	01h	02h	03h	04h	54h	06h	07h
2	08h	09h	0Ah	08h	0Ch	0Dh	0Eh	0Fh
3	10h	11h	12h		…	…		17h
4	18h	19h	1Ah		…	…		1Fh
5	20h							27h
6	28h							2Fh
7	30h							37h
8								
9								
10	:							:
11	:							:
12								
13								
14	68h				…	…		6Fh
15	70h				…	…		77h
16	78h				…	…		7Fh
:	:							:
:	:							:
29	E0h	E1h			…	…		E7h
30	E8h	E9h			…	…		EFh

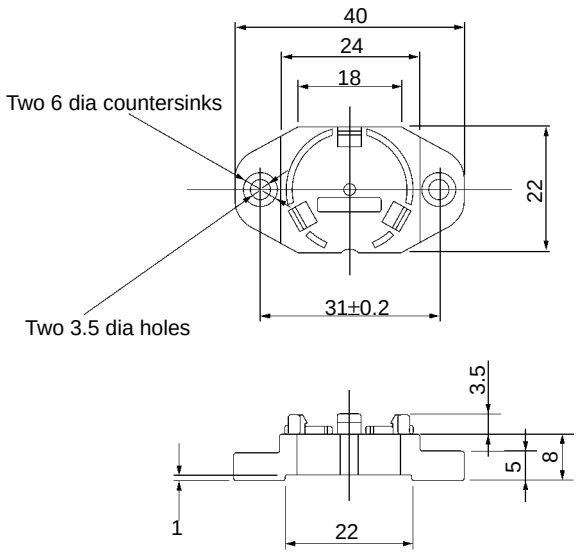
112 bytes

240 bytes

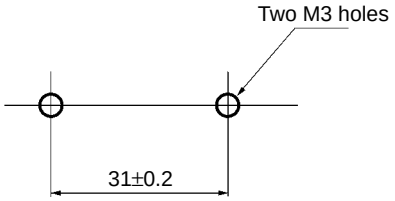
2-3-4 V700-A80 Attachment for the V700-D□3P31(-Y) ID Tags

The V700-A80 Attachment is a special attachment bracket that can be used to attach a coin-shaped ID Tag to a workpiece. It is compatible with the V700-D□3P31(-Y) coin-shaped ID Tags.

V700-A80 Dimensions



Mounting Hole Dimensions



Installation Procedure

1, 2, 3...

1. Set the coin-shaped ID Tag into the V700-A80 Attachment. The coin-shaped ID Tags are not directional, so the ID Tag can be installed with either side up.
2. Screw the Attachment to the workpiece with M3 screws. Tighten the screws to a proper torque (0.3 to 0.5 N·m).

General Specifications

The Attachment's specifications meet or exceed the ID Tag's specifications.

Mounting on Metal

When the ID Tag is mounted in a V700-A80 Attachment, there is an 8-mm gap between the ID Tag and the mounting surface. If the workpiece is metal, refer to *9-5 Influence of a Metal Surface behind the ID Tag* for details on the effects of the metal surface on communications.

Precautions

Do not install and remove the ID Tag repeatedly. Doing so will weaken the holding power of the Attachment and there is a risk of breaking the Attachment's holding clips.

If the ID Tag must be removed from the Attachment, it can be removed by inserting a flat-blade screwdriver in the gap between the Tag and Attachment (on the bottom of the Attachment) and gently prying out the Tag. Do not attempt to remove the Tag with your bare fingers; you may cut yourself.

2-4 Cable

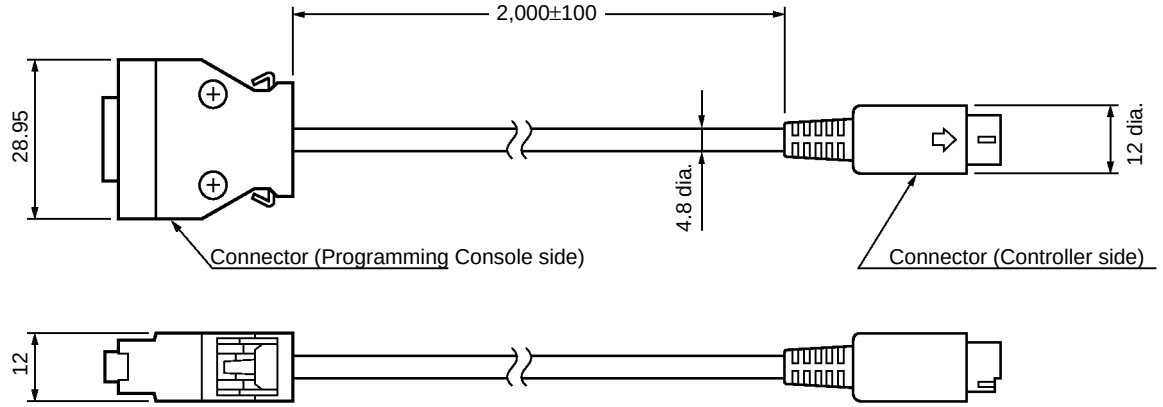
2-4-1 Specifications

Item	Model	
	V700-P10	**V700-A4□**
Number of conductors	8	10
Insulation resistance	50 MΩ min. (at 250 VDC) between conductor and shield	5 MΩ min. (at 500 VDC) between conductor and shield
Dielectric strength	250 VAC 1 min.	500 VAC 1 min.
Maximum operating temperature	70°C	80°C
Remarks	Connectors are not water resistant.	Connectors are not water resistant.

2-4-2 Dimensions

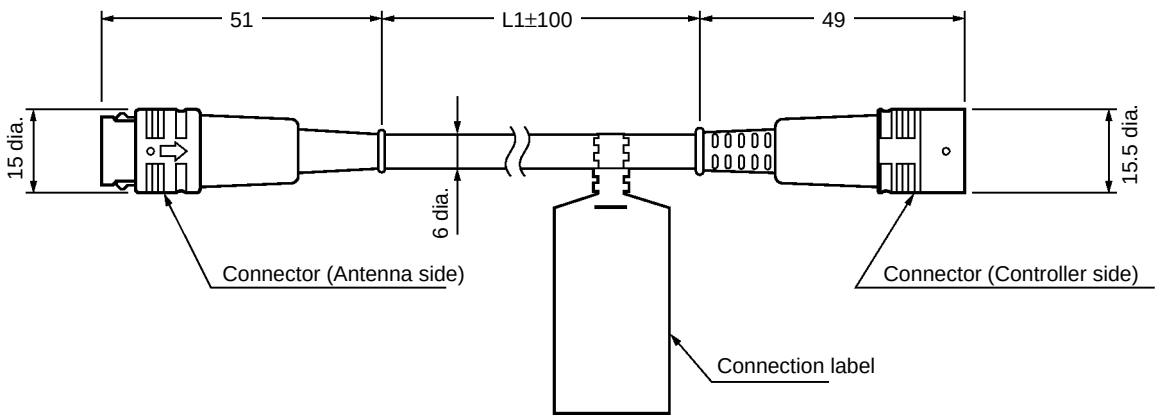
V700-P10

Model	V700-P10
Length	Approx. 2 m
Weight	Approx. 110 g



V700-A4□

Item	Model					
	V700-A40	**V700-A41**	**V700-A42**	**V700-A43**	**V700-A44**	**V700-A45**
Length	Approx. 2 m	Approx. 3 m	Approx. 5 m	Approx. 10 m	Approx. 20 m	Approx. 30 m
Weight	Approx. 150 g	Approx. 220 g	Approx. 360 g	Approx. 700 g	Approx. 1,350 g	Approx. 2,000 g
L1	2,000	3,000	5,000	10,000	20,000	30,000



2-5 External Communications Specifications

Item	Specification
Communications method	Electromagnetic induction (with no battery)
Modulation method	ASK mode
Transmission frequency	125 kHz
Reception frequency	125 kHz
Radiated electric field strength	15 μV/m max. at a distance of λ/12π from the antenna
Communications error detection	16-bit CRC (Cyclic Redundancy Check) is used to check communications in both directions between the antenna and ID Tag.

2-6 V700 Communications Specifications

V700-CD1D-V3 The Controller can be connected to a personal computer or PC with a standard RS-232C interface.

Item	Specifications
Conforming standards	RS-232C
Communications method	EIA/TIA-232-E
Baud rate (See note.)	4,800 bps, 9,600 bps, 19,200 bps, 38,400 bps Be sure to set the baud rate to 9,600 bps or higher when commands are used in repeat mode. Otherwise, all moving ID Tags may not be processed. Refer to *Section 5 Communications Functions* for the commands used in repeat mode.
Sync (See note.)	Start-stop synchronization with 1 stop bit or 2 stop bits
Transmission code (See note.)	ASCII7 or JIS8
Max. number of Controllers	32
Error control (See note.)	Vertical parity (even, odd, or none), Horizontal parity as BCC (BCC can be disabled.)
Cable length	15 m max.
Suitable connector	D-sub 9-pin male connector OMRON XM2A-0901 Plug and XM2S-0911 Hood provided with the Controller
Recommended cable	Hitachi Cable CO-MA-VV-SB 5PX28AWG

Note These communications settings are set on the Controller's DIP switches. Refer to *Section 4 Setting, Mounting, and Connection Methods* for details.

V700-CD2D-V3 The Controller can be connected to a personal computer or PC with a standard RS-485 interface.

Item	Specifications
Conforming standards	RS-485
Communications method	EIA RS-485 standard, 1:N two-wire two-way duplex communications
Baud rate (See note 1.)	4,800 bps, 9,600 bps, 19,200 bps, 38,400 bps Be sure to set the baud rate to 9,600 bps or higher when commands are used in repeat mode. Otherwise, all moving ID Tags may not be processed. Refer to *Section 5 Communications Functions* for the commands used in repeat mode.
Sync (See note 1.)	Start-stop synchronization with 1 stop bit or 2 stop bits
Transmission code (See note 1.)	ASCII7 or JIS8
Max. number of Controllers	31
Error control (See note 1.)	Vertical parity (even, odd, or none) Horizontal parity as BCC (BCC can be disabled.)
Cable length	300 m max.
Suitable connector	One Nihon Weidmuller BLZ4CD2D set is provided with the Controller.
Recommended cable	Tachii Electric Wire MVVS4CX0.5Sq (See note 2.)

Note 1. These communications settings are set on the Controller's DIP switches. Refer to *Section 4 Setting, Mounting, and Connection Methods* for details.

2. When the recommended cable is not available, use an equivalent shielded cable with 20 AWG twisted-pair wire.

SECTION 3
Functions

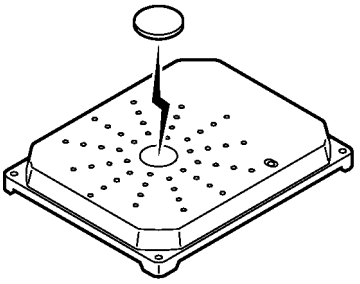
This section provides the modes and functions in detail.

3-1 Single, FIFO Read/Write, and Multiple Access Functions

Three communication modes are available depending on the number or state of Tags in the communication area. Commands can be used for selecting one of them.

Single Mode

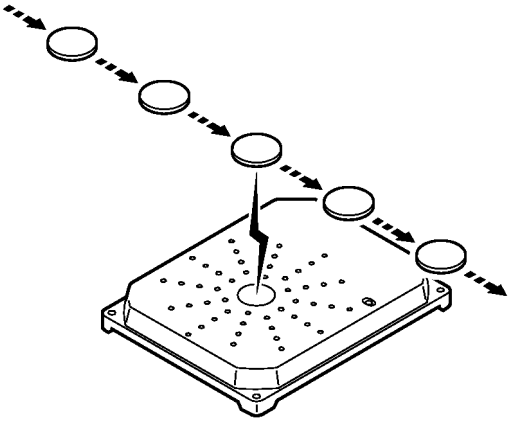
In this mode, the Controller communicates with just one ID Tag in the communication area. Set up the system so that only one ID Tag can be in the communications area at a time. A communications error will occur if there are two or more ID Tags in the Antenna's communication area.



FIFO Read/Write Mode

In the FIFO (first-in, first-out) read/write mode, the RFID System reads and writes data to and from each ID Tag coming into the communications area one after another. Since every ID Tag finished with communications is set to access prohibit, communications will be performed only with the next ID Tag that arrives in the Antenna's communication area.

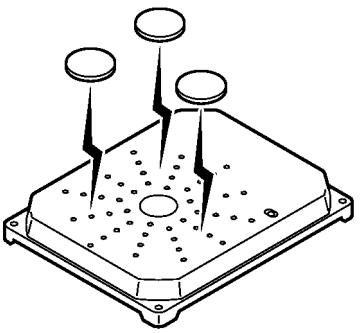
When a Tag moves out of the Antenna's communications area, it's "access prohibit" status is released and it can communicate again.



Multiple, Simultaneous Access Mode

In this mode, communications with all ID Tags in the communications area can be made on receipt of the command.

If the selective access function is being used, it is possible to communicate with a particular Tag out of the multiple Tags in the Antenna's communications area.



Note In FIFO read/write mode, make sure that multiple ID Tags do not arrive in the communications area together, otherwise a communications error will result and further communications will not be possible until there is only a single ID Tag in the communications area.

3-2 Serial Number Read Function

This function reads the ID Tag's serial number. The ID Tag's serial number cannot be overwritten.

Using the Function

1, 2, 3...

1. When the READ command's first read address and no. of read bytes parameters are set to "✳✳✳✳", the ID Tag's 4-byte serial number will be read and returned in the response.
2. The data type parameter must be set to HEX. A command error will occur if the data type is set to ASCII.
3. The communications time required for this command is the same as the time required for standard 1-page read operation.

Serial Number Source

The serial number is written to the ID Tag's system area at the factory.

3-3 High-speed Access Function (ID Tags with -Y Suffix Only)

ID Tags with the "-Y" suffix are equipped with a high-speed access function that reads and writes data at high speed. The high-speed access function can be used with the READ command and WRITE command only, command connections cannot be used.

Up to 1 page of data can be read or written to addresses between 00 and 6F Hex. The communications method must be set to Quick Trigger (QT), Quick Auto (QA), or Quick Repeat (QR). These communications methods have been added specifically for the high-speed access function.

Applicable ID Tags (V700-D□3P□1-Y)

The high-speed access function can be used with the V700-D□3P□1-Y ID Tags, but the multiple and selective access functions cannot be used.

Communications Times for Reference

The following tables compare the communications times required when reading or writing 8 bytes of data using the high-speed access function and regular access function.

Not Synchronous (Reference Values)

Operation	High-speed access	Regular access
Read	66.7 ms	107.4 ms
Write	115.6 ms	166.3 ms

RO Synchronous (Reference Values)

Operation	High-speed access	Regular access
Read	103.4 ms	154.1 ms

RW Synchronous (Reference Values)

Operation	High-speed access	Regular access
Read	115.6 ms	172.4 ms
Write	168.4 ms	225.2 ms

3-4 Lock Function

The lock function can be used to prevent the data in pages 1 to 6 from being overwritten. Pages are locked independently and a page cannot be released once it has been locked.

If the LOCK command is executed with the lock bits all set to 0, the command will read the lock information that has been set for the ID Tag. A command code has been added for the lock function.

Lock Information

The following table shows the configuration of the byte containing the lock information. Bits 2 through 7 are the lock bits for pages 1 through 6. Bits 0 and 1 are always 0.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Page 6	Page 5	Page 4	Page 3	Page 2	Page 1	Set to 0.	Set to 0.

Precaution

Once a page has been locked, it cannot be released.

3-5 Write Protect Function

The write protect function can be used to write-protect individual pages and prevent the accidental loss of fixed information such as a pallet number or product information.

The write-protect information can be set in the tag to write-protected individual pages independently, so any region or combination of pages can be protected. A protection error will occur if the WRITE command is executed on a write-protected page.

There is one write-protect bit is assigned to each page, for a total of 30 bits. Set the corresponding bit to 1 to write-protect a particular page. Set the corresponding bit to 0 to clear the write-protection on a particular page. The following diagram shows the configuration of the protection information (4 bytes or 32 bits) used in the WRITE PROTECT command. Refer to *5-6-11 WRITE PROTECT (WP)* for more details.

Protection information																							
b7	b6		b1	b0	b7	b6		b1	b0	b7	b6		b1	b0	b7	b6		b3	b2	b1	b0
Page 30	Page 29		Page 24	Page 23	Page 22	Page 21		Page 16	Page 15	Page 14	Page 13		Page 8	Page 7	Page 6	Page 5		Page 2	Page 1	Always 0	Always 0

3-6 Memory Check Function

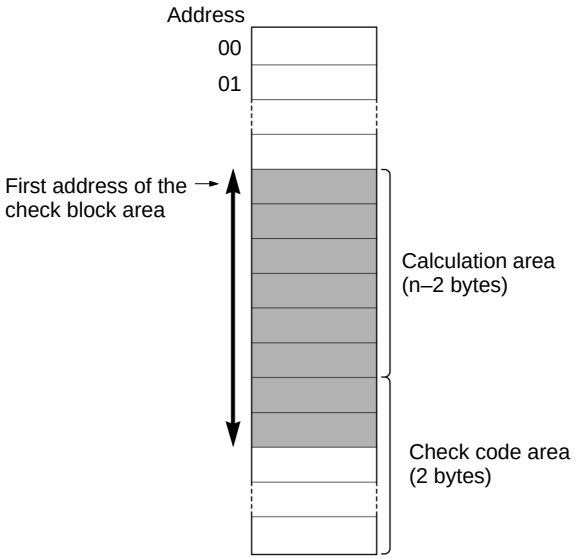
A check code is attached to data in the tag to indicate when an error has occurred in the data due to an EEPROM overwrite or unknown cause. The formula used to calculate the CRC code is: $X^{16} + X^{12} + X^5 + 1$. Refer to *5-6-8 MEMORY CHECK (MC)* and *5-6-9 MEMORY CALCULATE (MK)* for more details.

Configuration of the Check Block Area

The memory check is performed using the MEMORY CALCULATE command (MK) that writes the check code and the MEMORY CHECK command (MC) that verifies the check code.

The check block is specified by the first address and the number of bytes (n) indicated in the command. The first part of the check block (n–2 bytes) is the calcula-

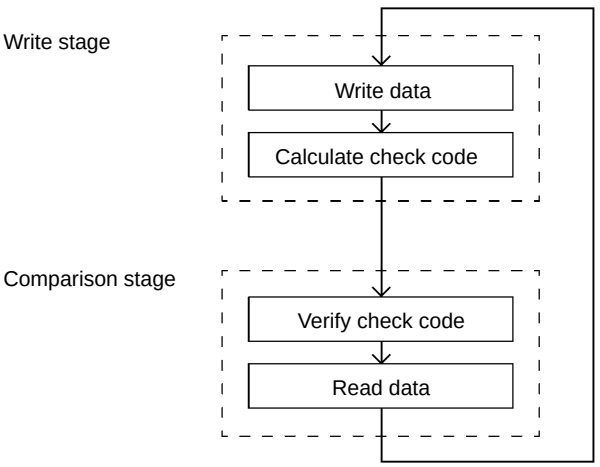
tion area. The second part of the check block (2 bytes) is the check code area that contains the check code.



When a command is sent to write the check code, the CRC code of the data in the calculation area is calculated and written in the check code area (last two bytes). When a command is sent to verify the check code, the CRC code of the data in the calculation area is calculated and compared with the data in the check code area. If they match, response code 75 is returned to indicate normal data transmission; if they do not match, response code 75 is returned to warn that a data error occurred.

Using the Memory Check Function

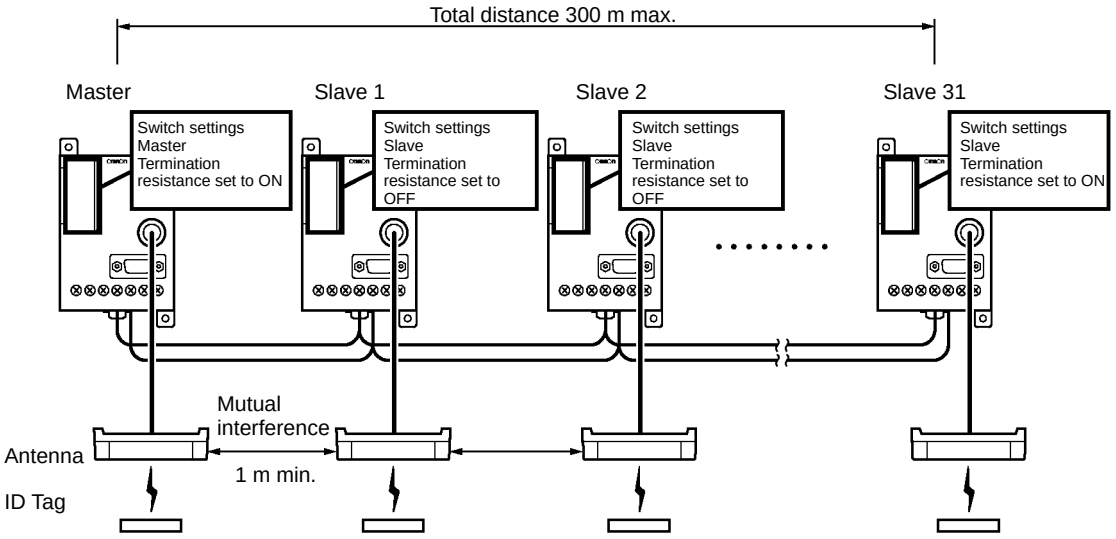
After writing the desired data, execute the MEMORY CALCULATE command (MK) that calculates the check code and writes it to the check code area. Before reading the data, execute the MEMORY CHECK command (MC) that calculates the check code and compares it to the code in the check code area. The memory check will show if the ID Tag's internal data was corrupted.



3-7 Mutual Interference Prevention Function

If two or more Antennas are used close to one another, they will not operate properly due to mutual interference. It is possible to reduce the mutual interference between the Antennas and use them closer together if the Controllers are connected together with SYNC cables. Refer to *9-3 Mutual Interference between Antennas* for more details.

The mutual interference distance between Antennas can be reduced by connecting the Controllers' SYNC terminals together to synchronize operation as shown in the following diagram. One of the Controllers connected in series is set as the Master and the others are set as Slaves. Be sure to enable the terminators of the Controllers at the ends of the line and disable the terminators of other Controllers. A maximum of 32 Controllers (the Master and up to 31 Slaves) can be connected within a total cable distance of 300 m maximum. The Master/Slave settings can be made using the Controller's DIP switch or a command sent from the host device.



There are two types of synchronous operation: R/W (read/write) synchronous and RO (read-only) synchronous functions. With R/W synchronization, all commands can be used. With RO synchronization, the commands that write data to the ID Tags (WT, AD, SB, PW, MK, and WP) cannot be used. The advantage of RO synchronization is that it requires a shorter communications time than the R/W synchronization. Refer to *8-3 Communications Time* for details.

Item	Synchronous function		
	RW	RO	No synchronous function
Synchronous cable	To be connected		Not required
Mutual interference distance between Antennas	Short		Long
WRITE command	Possible to use	Not possible to use	Possible to use
Communications time	Long	Slightly long	Short

Note

1. Be sure to enable the SYNC termination resistance only on the two Controllers at each end of the SYNC cable and disable the SYNC termination resistance on all of the other Controllers. The RFID System's operation will be unstable if the terminators are not set correctly.
2. Set the same synchronization setting (RW, RO, or no synchronization) on all of the Controllers that are connected together with the SYNC cable. If the

settings are not the same, the Slave Controllers will not be able to synchronize properly and their ERR indicators will go ON. Set the Master/Slave settings from the host device before beginning communications with the ID Tags.

3-8 Energy-saving Mode

The RFID System can be set to energy-saving mode.

If it is possible to send commands only during communications, the Antenna power can be shut down to reduce the total power consumption of the RFID System. In energy-saving mode, the power consumption of the RFID System is approximately 30% of that in normal operation. Set energy-saving mode with the Controller's DIP switch.

If the Controller is set to energy-saving mode, the Antenna will have output only at the time of communications. This mode is available while a communications command is issued to select the single trigger, single auto, or multi-trigger option.

Item	Mode	
	Normal mode	Energy-saving mode
Power consumption	High	Low
Antenna output during communications	ON	
Antenna output during standby periods	ON	OFF
Command group A	Available	
Command group B	Available	Not available
Command group C	Not available	Available
Other commands	Available	

Note

1. **Command Group A**
   Single trigger, single auto, and multi-trigger
   Command Group B
   Single repeat, FIFO trigger, FIFO auto, FIFO repeat, and multi-repeat
   Command Group C
   Selective access
2. Do not set the Controller to energy-saving mode if the single repeat, FIFO trigger, FIFO auto, FIFO repeat, or multi-repeat option is selected, otherwise a command error will result.

3-9 Communications Distance Setting

The RFID System allows a selection of either long-distance mode (automatic selection of amplification factor) or stable-communications mode (no change in amplification factor). The communications distance setting is made on the Controller's DIP switch.

Long-distance Mode

In order to perform long-distance communications, the RFID System automatically selects the amplification factor when the Antenna receives signals from the ID Tag. If the ID Tag is far, the amplification factor increases automatically in order to receive the weak signal of the ID Tag.

Stable Communications Mode

If there is excessive noise (particularly, air-conditioner noise), the automatic selection of the amplification factor should be suppressed. If this automatic selection is suppressed, the RFID System cannot communicate with far ID Tags but the RFID can perform stable communications even under an environment where noise is prevalent.

Comparing the Modes

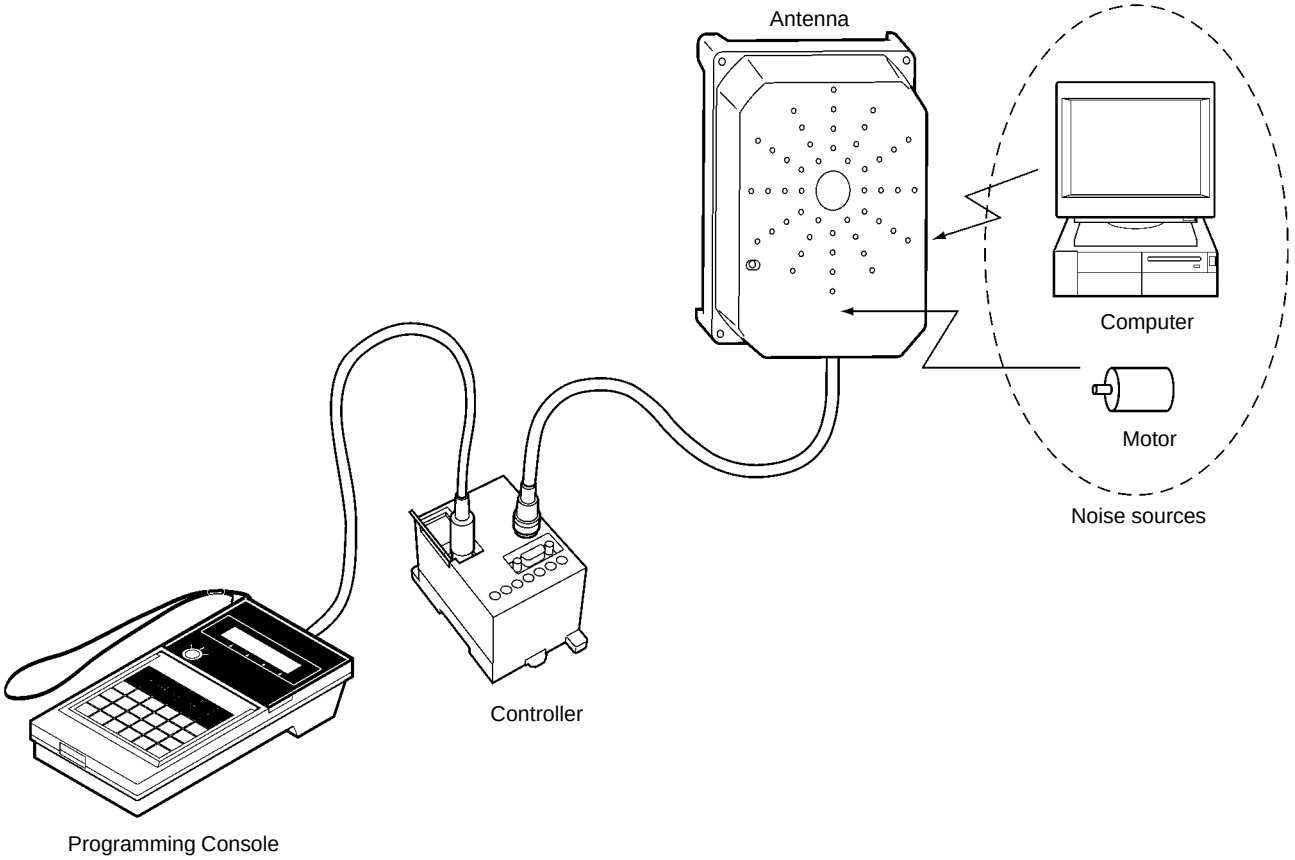
Item	Mode	
	Long-distance mode	**Stable communications mode**
Antenna's signal reception amplification factor	Automatic selection	Always low
Communications distance	Long distance	Short compared to long-distance mode
Environmental noise interference	Affected easily	Not affected easily

Note Environmental noise can be easily checked with the Programming Console. Refer to *3-10 Noise Environment Measurement Function*. If the noise environment measurement function is executed after the Controller is in long-distance mode, the existing value must not exceed 30. Otherwise, it is recommended that the Controller be used in stable communications mode.

3-10 Environmental Noise Measurement Function

A Programming Console can be used to check for noise in the environment where the Antenna is installed.

Use this function to arrange the best location and best direction of the Antenna or to determine whether to set the Controller to long-distance mode or stable communications mode. It is recommended that this function be used to check the noise environment before installing the RFID System.



To use this function, connect the C200H-PRO27-E Programming Console (sold separately) through the V700-P10 Programming Console Conversion Cable (sold separately) to the Controller. Refer to *6-6-8 Noise Environment Check* for details.

3-11 Error Logging Function

The error log data of the RFID System can be read on-line through the Programming Console.

Two types of error log data can be read, which makes it possible to analyze system errors.

1. Latest Error Log

The Controller keeps a record of errors resulted in RUN mode after the Controller is turned ON. The Programming Console can read information on these errors, thus making it possible to find causes of errors. The Controller keeps a record of a maximum of 30 errors. New errors replace the existing record in chronological order beginning with the oldest error record. The records will be completely lost when the Controller is turned OFF or reset or when it receives a RESET command.

2. Statistic Error Log

The Controller keeps a count of the number of times that each type of error (error code) has occurred. The Controller also calculates MCBF (mean cycle between failures) simultaneously. The Controller keeps all these data items until the user turns OFF or resets the Controller.

The following formula is used to calculate the MCBF:

$$\text{MCBF} = \frac{\text{Total number of host commands}}{\text{Total number of errors that occurred}}$$

To use this function, connect the C200H-PRO27-E Programming Console (sold separately) to the Controller through the V700-P10 Programming Console Conversion Cable (sold separately). Refer to *6-6-9 Latest Error Data* and *6-6-10 Statistic Error Data* for details.

Note The record of all errors will be lost when the Controller is turned OFF or reset or when it receives a RESET command. Do not turn OFF or reset the Controller in order to keep the records.

SECTION 4
Setting, Mounting, and Connection Methods

This section provides installation information for the V700 System.

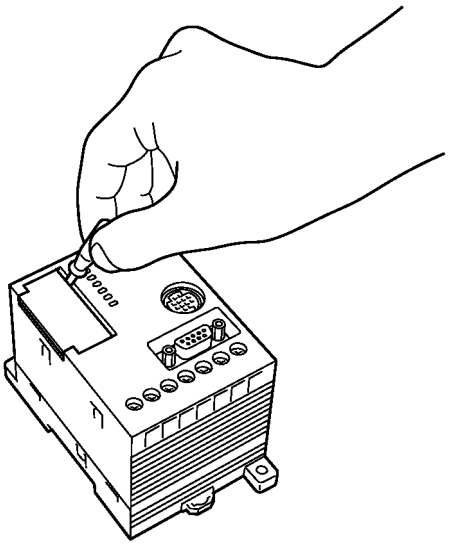
4-1 Controller

4-1-1 Switch Settings

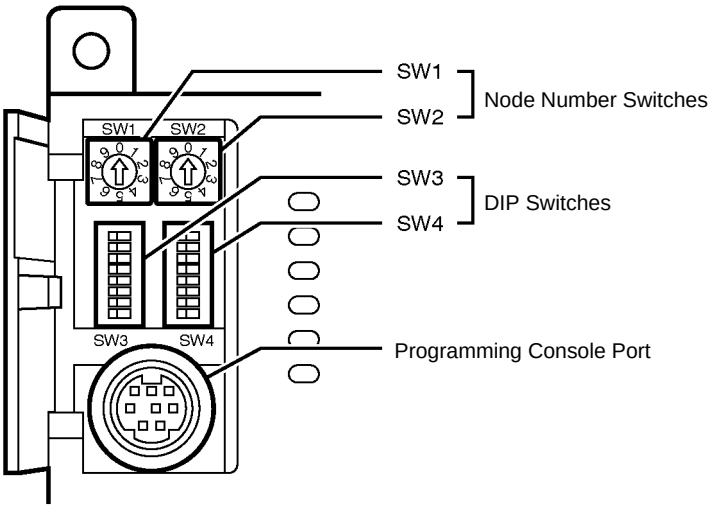
Open the cover of the Controller to make switch settings.

Opening the Cover

A screwdriver is provided with the Controller. Open the cover by inserting the screwdriver into the groove on the left side of the cover.



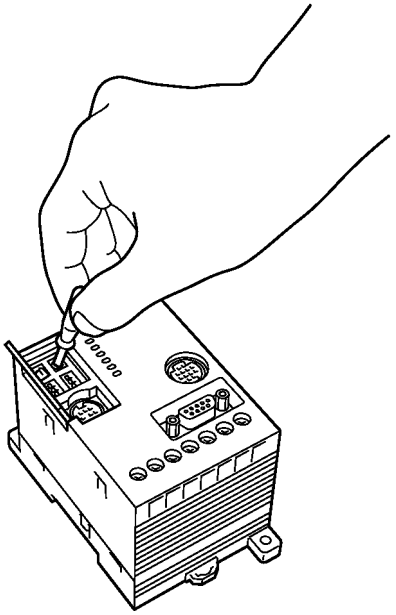
Under the cover, there are two node number switches (SW1 and SW2), two DIP switches (SW3 and SW4), and a port to connect the Programming Console.



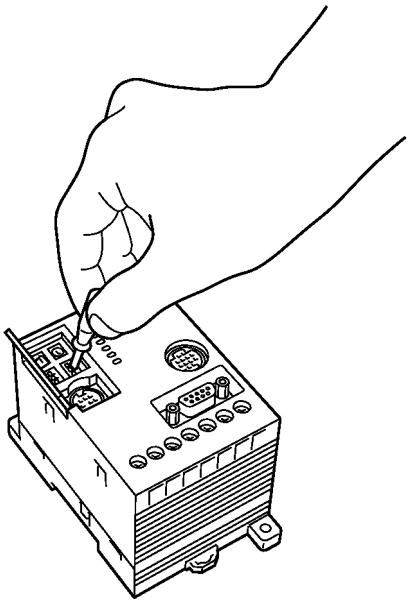
Settings

Use the provided screwdriver to make switch settings as shown below.

Node Number Settings

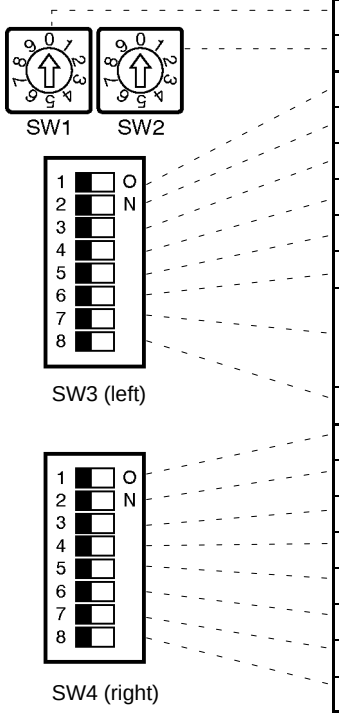


DIP Switch Settings



Default Set Values

The following table shows default set values.



Switch	Name		Default setting	Meaning
SW1	Node number (10's digit)		0	Node number 00
SW2	Node number (1's digit)		0	
SW3-1	Communications format setting		OFF	BCC mode
SW3-2	Communications sync setting		OFF	No sync
SW3-3			OFF	
SW3-4			OFF	
SW3-5	Low power consumption setting		OFF	Normal mode
SW3-6	Communications distance setting		OFF	Long-distance mode
SW3-7	V700-CD1D-V3	Not used	OFF	Not used
	V700-CD2D-V3	RS-485 termination resistance setting	OFF	Not terminated
SW3-8	Termination resistance setting		OFF	Not terminated
SW4-1	Baud rate setting		OFF	9,600 bps
SW4-2			OFF	
SW4-3	Data length setting		OFF	7 (ASCII7)
SW4-4	Parity bit setting		OFF	Even
SW4-5			OFF	
SW4-6	Stop bit length setting		OFF	2
SW4-7	Communications mode setting		OFF	No ACK/NACK control
SW4-8	Time-out setting		OFF	See note. (500 ms)

Note The pin 8 setting of SW4 will be meaningless if pin 7 is set to OFF.

Node Number Settings

Node Number

If more than one Controller is connected to a single host through Link Adapters, each Controller needs an ID number so that the host can discriminate each of them. Such an ID number is called node number. Each Controller must have a unique node number.

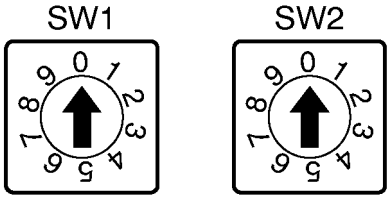
Each command or response of the Controller includes the node number of the Controller. Communications will not be possible if the node number is wrong. The node number must be correctly set regardless of whether the host is connected to a single or multiple Controllers.

The node number is set with the two rotary switches. As shown below, SW1 on the left is for 10's digit and SW2 on the right is for 1's digit, which can set numbers within a range between 00 and 31.

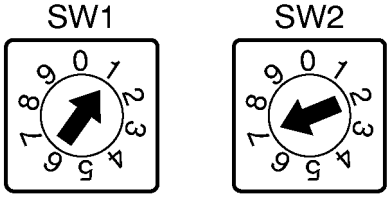
SW1	SW2	Node number
10's digit	1's digit	
0	0	0
0	1	1
0	2	2
0	3	3
0	4	4
0	5	5
0	6	6
0	7	7
0	8	8
0	9	9
1	0	10
1	1	11
:	:	:
2	9	29
3	0	30
3	1	31
3	2	Prohibited setting
:	:	:
9	9	Prohibited setting

Note

1. Do not set the node number between 32 and 99.
2. The node number switches are factory-set to 00. The following diagram shows example settings of 0 and 17.



Node No. 0



Node No. 17

DIP Switch Settings

SW3

Pin 1: Communications Format Setting

Sets whether BCC format is used in communications with the host.

Pin 1	Description
ON	BCC is not used.
OFF	BCC is used.

Pins 2, 3, and 4: Communications Sync Setting

If two or more Antennas are used closely together, the Controllers must operate in synchronous operation in order to prevent mutual interference. Therefore, communications sync settings are required in each Controller. Refer to *3-7 Mutual Interference Preventive Function (Synchronous Function)* for details.

Pin 2	Pin 3	Pin 4	Description
ON	ON	ON	Slave RO
		OFF	Slave RW
	OFF	ON	Master RO
		OFF	Master RW
OFF	ON	ON	Set from host device
		OFF	Not used (Do not set the pins to this setting.)
	OFF	ON	Not used (Do not set the pins to this setting.)
		OFF	No sync

Note

1. Make sure to set only one of the Controllers as the Master and the other Controllers as Slaves in synchronous operation, otherwise the RFID System will not operate.
2. Make sure that all Controllers in synchronous operation are the same in mode (i.e., RW sync, RO sync, or no sync), otherwise the Controllers will be affected and will not communicate properly.

Pin 5: Low Power Consumption Setting

In case commands can be issued at the time of communications only, the Antenna power can be shut down to reduce the total power consumption of the RFID System. In energy-saving mode, the power consumption of the RFID System is approximately 30% of that in normal operation.

If the Controller is set to energy-saving mode, the Antenna will have output only at the time of communications. This mode is available after the communications command is issued to select the single trigger, single auto, or multi-trigger option.

Pin 5	Description
ON	Energy-saving
OFF	Normal mode

Note Do not set the Controller to energy-saving mode if the single repeat, FIFO trigger, FIFO auto, FIFO repeat, or multi-repeat option is selected, otherwise a command error will result.

Pin 6: Communications Distance

In order to perform long-distance communications, the RFID System automatically selects the amplification factor when the Antenna receives signals from the ID Tag.

It may, however, be better not to select the automatic amplification factor if multiple commands are used or if there is excessive noise. If this automatic selection is suppressed, the RFID System cannot communicate with far ID Tags but the RFID can perform stable communications.

The RFID System allows a selection of either the long-distance mode (automatic selection of amplification factor) or stable-communications mode (no change in amplification factor).

Pin 6	Description
ON	Stable communications mode
OFF	Long-distance mode

Note Environmental noise can be easily checked with the Programming Console by executing the NOISE CHECK command when the Controller is in long-distance mode. Then if the value of noise reads more than 30, it is recommended that the Controller be used in stable communications mode.

Pin 7 (V700-CD1D-V3): Not Used

This pin is not used in the V700-CD1D-V3. Leave pin 7 set to OFF.

Pin 7 (V700-CD2D-V3): RS-485 Termination Resistance

When two or more Controllers are connected to a host device, just the 2 devices at the ends of the communication cable (Controller or host) must be terminated to ensure stable operation. Turn ON pin 7 to enable the Controller's terminator if it is at one end of the cable.

Pin 7	Description
ON	RS-485 termination resistance enabled
OFF	RS-485 termination resistance disabled

Note Be sure to enable the termination resistance of the devices at each end of the RS-485 communications cable. The devices in between must not be terminated. Operation will be unstable if the system is not terminated correctly.

Pin 8: Termination Resistance

If two or more Controllers with Antennas are located closely together, the Controllers must be in synchronous operation in order to prevent Antenna mutual interference. In that case, the Controllers must be connected to one another in series through a synchronous cable and the termination resistance of the Controller at each end must be set to ON for stable communications.

Use this pin to set the termination resistance to ON or OFF.

Pin 8	Description
ON	Termination resistance is ON.
OFF	Termination resistance is OFF.

Note

1. Be sure to set only the termination resistance of the Controller at each end to ON and that of any other Controller to OFF, otherwise the Controllers will not be in stable operations.
2. Always set pin 1 SW3 to OFF, otherwise the Controller may not operate properly.

SW4

Pins 1 and 2: Baud Rate Setting

Pin 1	Pin 2	Description
ON	ON	38,400 bps
	OFF	19,200 bps
OFF	ON	4,800 bps
	OFF	9,600 bps

Pin 3: Data Length Setting

Pin 3	Description
ON	8 bits (JIS 8 bits)
OFF	7 bits (ASCII 7 bits)

Pins 4 and 5: Parity Bit Setting

Pin 4	Pin 5	Description
ON	ON	No parity
	OFF	
OFF	ON	Odd parity
	OFF	Even parity

Pin 6: Stop Bit Length Setting

Pin 6	Description
ON	1 bit
OFF	2 bits

Pin 7: Communications Mode Setting

This setting determines whether or not ACK/NACK control is performed between the host and controller.

Pin 7	Description
ON	ACK/NACK control
OFF	No ACK/NACK control

Pin 8: Time-out Setting

This setting determines the time-out period of ACK/NACK control.

This setting is effective only when pin 7 is set to ON (ACK/NACK control ON). If pin 7 is OFF, the setting on pin 8 is irrelevant and it can be either OFF or ON.

Pin 8	Description
ON	5 s
OFF	500 ms

4-1-2 Installation Environment

The V700-CD1D-V3 and V700-CD2D-V3 Controllers are highly reliable control devices capable of withstanding tough environments. In order to ensure the full, reliable performance of the RFID system, however, observe the following.

Installation

Do not install the Controller under the following conditions.

- The ambient temperature is not within a range between –10°C and 55°C or there are radical temperature changes resulting in condensation.
- The humidity is not within a range between 35% and 85%.
- There is corrosive gas, flammable gas, dust, salt, or metal powder.
- The Controller is affected by direct vibration or shock.
- The Controller is exposed to direct sunlight.
- Water, oil, or chemical is sprayed onto the Controller.

Enclosed-mounting Position

The Controller can be used at an ambient temperature range between –10°C and 55°C.

- Make sure that the Controller is provided with sufficient ventilation space.
- Do not install the Controller close to heaters, transformers, or resistors that radiate excessive heat.
- If the ambient temperature exceeds 55°C, be sure to install a forced-ventilation fan or cooler to keep the temperature below 55°C.
- If power lines or high-tension lines with large currents are located close to the Controller, be sure to test the Controller carefully and make sure that wires connected to the Controller are not affected by the noise of power lines or high-tension lines.

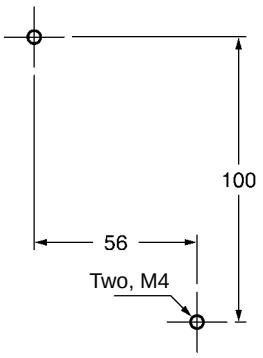
Note Be sure to abide by the above before installing the Controller and carefully test the Controller.

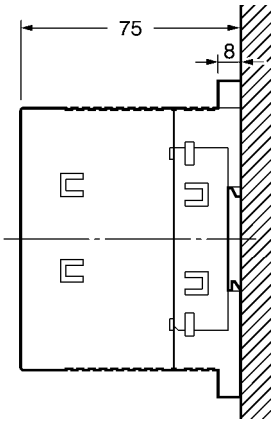
4-1-3 Mounting

The Controller can be mounted to DIN tracks or enclosed-mounted to panels with screws.

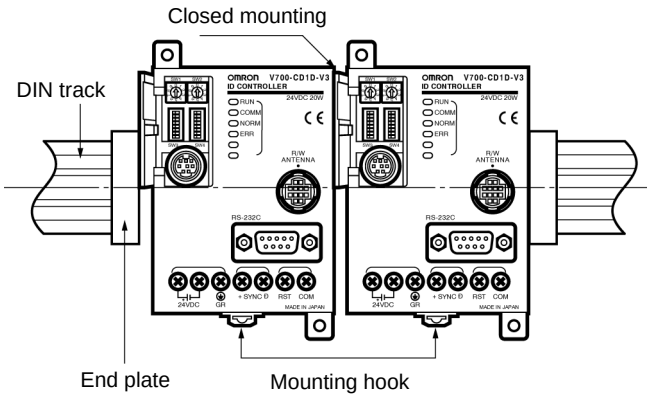
Enclosed Mounting

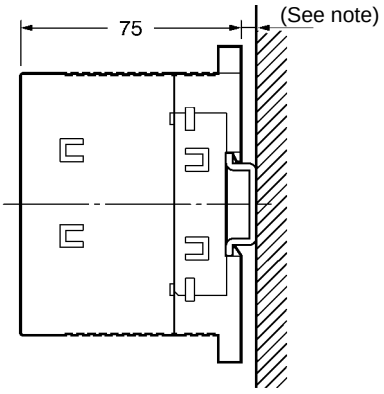
Be sure to secure the Controller with M4 screws together with spring washers and flat washers. Do not apply a threadlock adhesive to the screws to secure the screws, because the adhesive may damage the Controller case material.



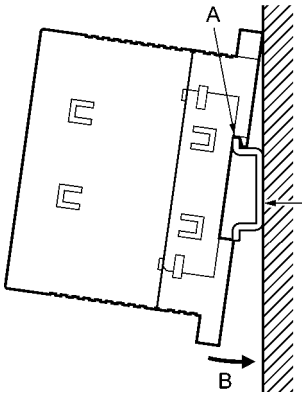


DIN Track Mounting





Note Take the height of the DIN track into consideration at the time of mounting.



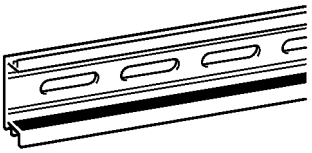
DIN track (1 m long)
OMRON PFP-100N2 is recommended.

Height: 80 mm max.

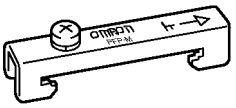
(1) Hook the Controller to part A. Then press the Controller in direction B to mount the Controller.

(2) Pull the mounting hook downwards. Then lift the Controller upwards to disconnect the Controller.

PFP-100N2 DIN Track



PFP-M End Plate

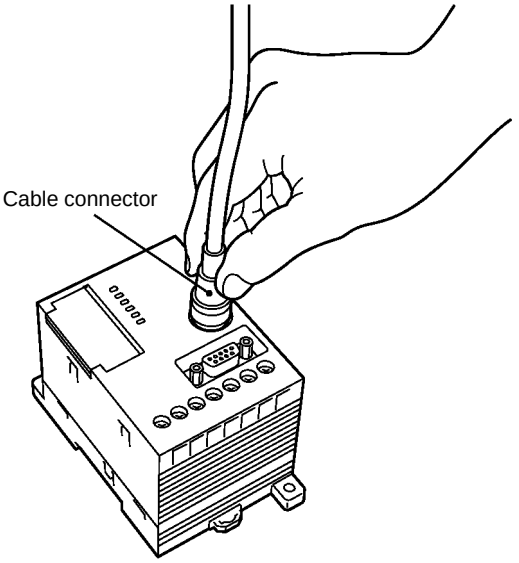


4-1-4 Connection and Disconnection of Antenna Connector

A single antenna can be connected to the Controller through the V700-A4□ Antenna Cable (sold separately), the standard length of which is 30 m maximum. Two Antenna Cables can be connected up to a total length of 50 m. The Antenna is provided with a 0.1-m-long cable. Therefore the length between the Antenna and Controller is 50.1 m in this case.

Connection of Antenna Connector

Connection

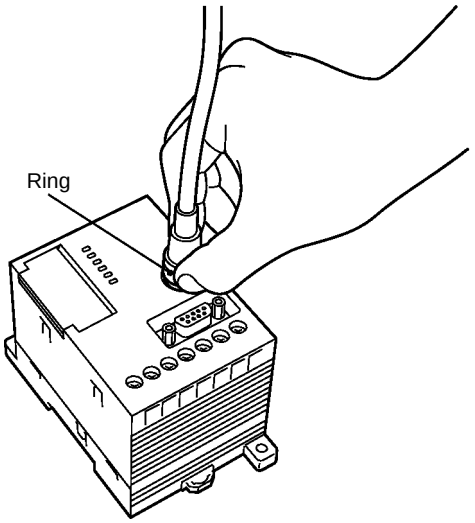


1, 2, 3...

1. Hold and insert the connector into the port so that the point marked in black on the panel of the Controller coincides with the point marked in white on the connector.
2. Press the connector straight until the connector is locked.

Note Do not hold and press the ring of the connector, otherwise the connector is not locked. Be sure to hold the connector.

Disconnection



Hold and pull the ring straight upwards.

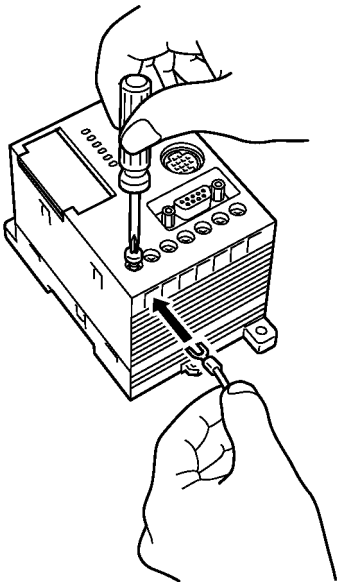
Note Do not hold and pull the connector, otherwise the connector cannot be removed. Be sure to hold the ring.

⚠ **Caution** Do not pull the cable, otherwise the cable may break or be damaged.

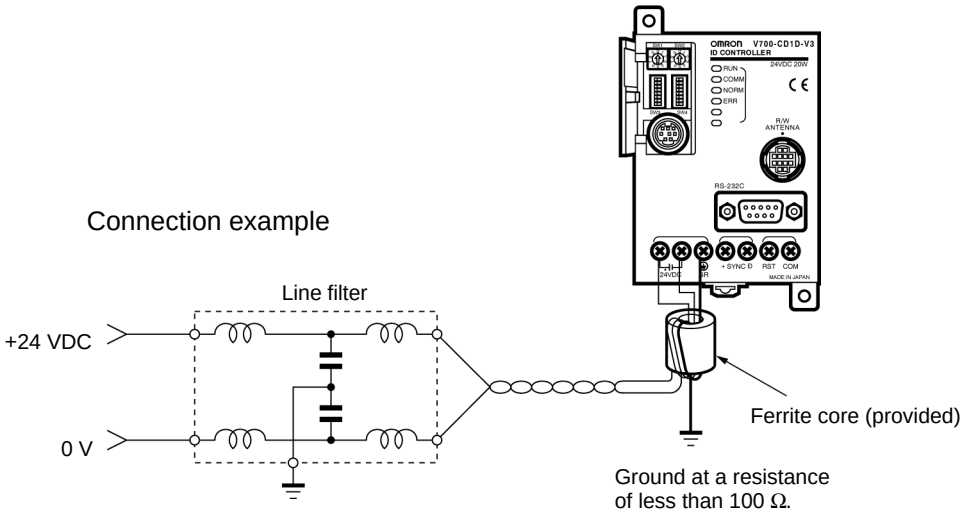
Note Do not connect or disconnect the connector while the Controller is turned ON, otherwise the Controller may malfunction. Do not use more than two cables (up to 50 m total) to connect the Controller to the attached cable of the Antenna.

4-1-5 Wiring

Wire the Controller as shown below.



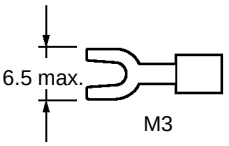
Power Supply and Ground Wires



The power supply and ground terminals use M3 set screws. The following type of solderless terminals can be connected to these terminals. Tighten each screw to a torque of approximately 6 kgf·cm.

Examples of Suitable Solderless Terminals

Manufacturer	Model	Suitable wire	Shape
J.S.T. Mfg Co., Ltd.	1.25-N3A	AWG24 to AWG16	Fork-shaped
J.S.T. Mfg Co., Ltd.	1.25-Y3A		



The Controller can internally withstand the noise on the power line. By providing power to the Controller through the noise filter, the noise between the Controller and ground can be greatly reduced.

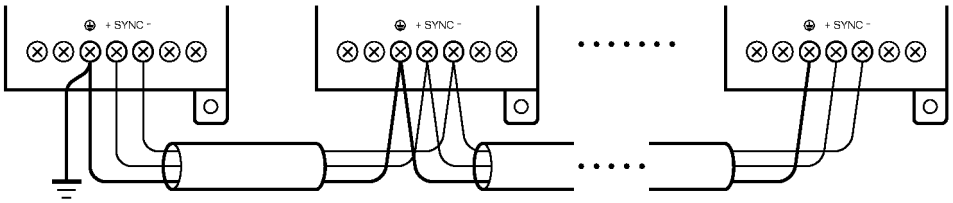
Recommended Compact DC Power Supply (OMRON)

Model	Output	Input voltage
S82K-03024	24 VDC 1.3 A	100/200 VAC
S82J-0224	24 VDC 1.1 A	100 VAC

The maximum power consumption of the Controller is 20 W (i.e., 0.8 A at 24 VDC). An inrush current, however, will flow when the Controller is turned ON. Take this into consideration when preparing the power supply. A power supply with an output of 1.1 A min. at 24 VDC is recommended.

Note

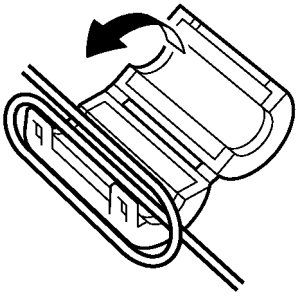
1. If the Antenna and power supply are too close, some noise generated from the power supply may interfere the communications of the Antenna. Make sure that there is a distance of 1 m or more between the Antenna and power supply.
2. If the Controller and Antenna are too close, the Controller may interfere with the communications between the Antenna and ID Tag. Make sure that there is a distance of 80 cm or more between the Controller and Antenna.
3. Provide 24 VDC to the Controller. The permissible variation of the power supply is between 20.4 and 26.4 VDC (i.e., 24 VDC $^{-15\%}/_{+10\%}$). Make sure that the supply voltage is within this range.
4. The maximum power consumption of the Controller is 20 W. An inrush current of approximately 30 A at 24 VDC, however, flows when the Controller is turned ON. Take this into consideration when preparing the power supply.
5. Provide a power wire with a thickness of at least AWG18 in order to prevent the dropping of voltage. It is recommended that twisted-pair wire be used for the power line.
6. Ground the Controller at a resistance of less than 100 Ω to protect the Controller from noise interference. The thickness of the ground wire must be at least AWG18. If two or more Controllers are connected to one another in synchronous operation, be sure to ground the Controller located at either end of the system at a resistance of less than 100 Ω and connect the ground terminals of other Controllers with the shielded wire of the synchronous cable. If the Controller is not ground properly, it may not operate.



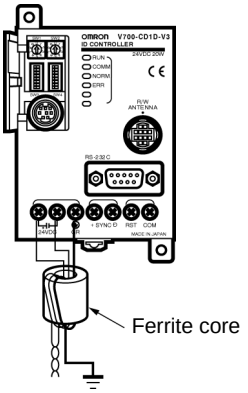
- Use the provided ferrite core for the suppression of noise generation as shown below.

1, 2, 3...

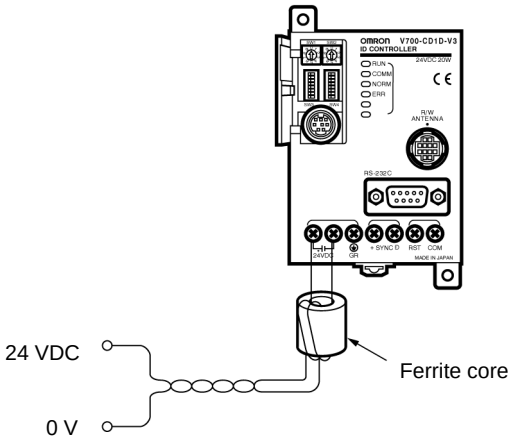
1. Wire the power supply and ground wires.
2. Wind the power supply and ground wires together around the ferrite core once so that the ferrite core will not move as shown below. The ferrite core must be located within 10 cm of the Controller.



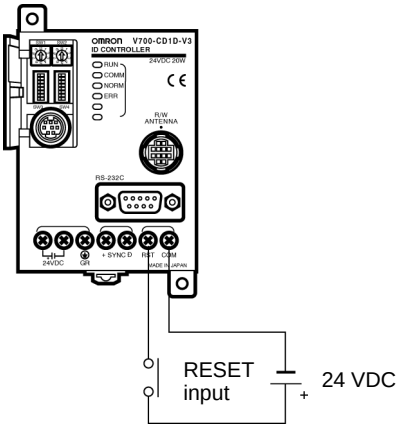
3. Close and press the ferrite core until the ferrite core clicks so that the ferrite core will be locked.



4. If the synchronous cable is used, wind only the power supply wires around the ferrite core as shown below.

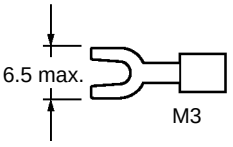


Wiring RESET Signal



I/O Solderless Terminal

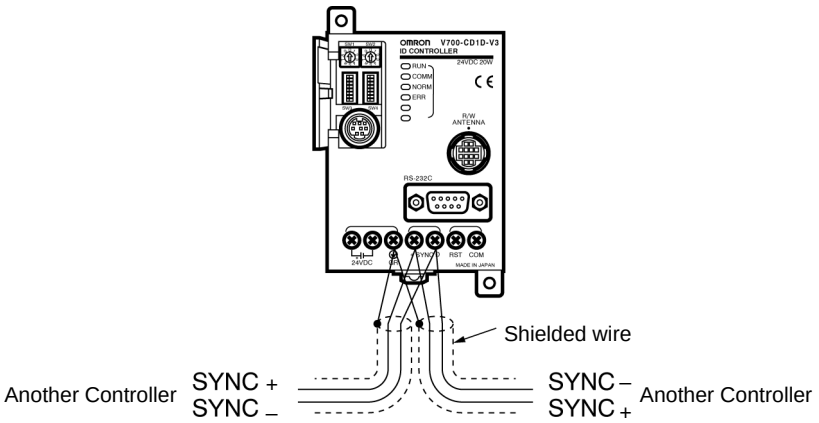
The I/O terminals use M3 set screws. The following type of solderless terminal can be connected to these terminals



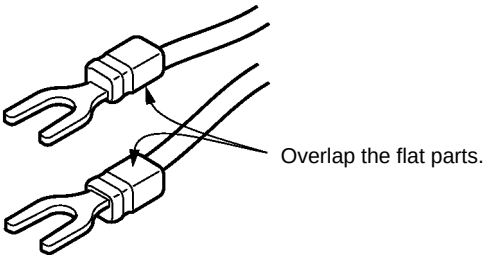
Tighten each screw to a torque of approximately 0.6 N·m.

Note
1. Make sure that the input voltage does not exceed a maximum permissible input voltage of 26.4 V, otherwise the Controller may malfunction.
2. Separate power lines and high-tension lines from the input line in order to protect the input line from noise interference.

Wiring SYNC Signal



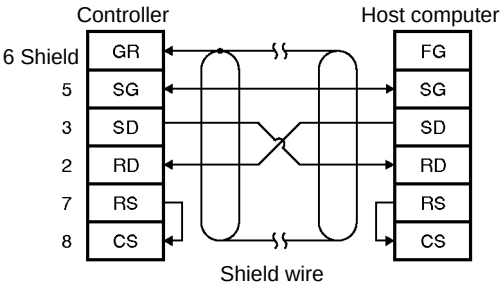
- Connect the SYNC signals of other Controllers operating in synchronization.
- If more than three Controllers operate in synchronization, two solderless terminals must be connected to a single terminal. In that case, insert the solderless terminals by overlapping the flat parts of the solderless terminals as shown below. Then secure the solderless terminals with the screw.



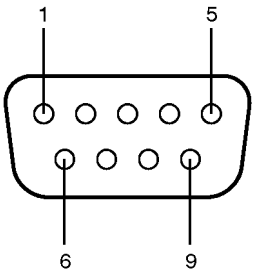
Note The SYNC+ and SYNC– lines each can have a total length of 300 m for the whole system.

4-1-6 Connection of the RS-232C Interface (V700-CD1D-V3 Only)

Signal name	Symbol	Signal direction		Pin number
		Input	Output	
Maintenance ground	GR	---	---	6 Shield
Signal ground or common retrace line	SG	---	---	5
Send data	SD	---	OK	3
Receive data	RD	OK	---	2
Request send	RS	---	OK	7
Clear to send	CS	OK	---	8



Connector Pin Arrangement
when Viewed from the Controller



The diagram on the left-hand side indicates that the shield wire is grounded on the Controller side.

Note 1. Ground the shield wire on either the Controller side or the host computer side. (In the example above, the shield wire is grounded at the Controller.)

2. Internally short-circuit pins 7 (RS) and 8 (CS).

Connection to Host through IBM PC/AT or Compatible Computer, 9-pin Port

Connector Pin Arrangement
when Viewed from the Controller

Controller		Connecting device	IBM PC/AT or compatible	
9-pin male		Cables with connectors	9-pin female	
6 Shield	GR		FG	
5	SG		SG	5
3	SD		SD	3
2	RD		RD	2
7	RS		RS	7
8	CS		CS	8

Shielded wire

Connecting to OMRON C200H PC

Connector Pin Arrangement
when Viewed from the Controller

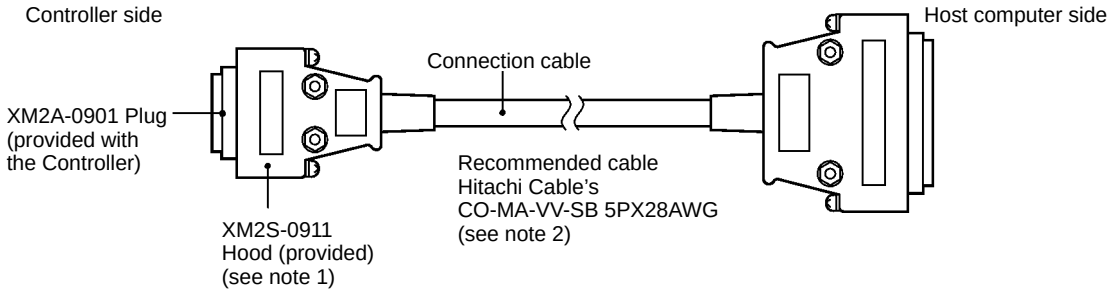
Controller		Connecting device	C200H-ASC02	
9-pin male		Cables with connectors	9-pin male	
6 Shield	GR		FG	1
5	SG		SG	9
3	SD		SD	2
2	RD		RD	3
7	RS		RS	4
8	CS		CS	5

Shielded wire

Assembly and Connection of Communications Connector

An OMRON communications connector conforming to EMI standards is provided with the Controller. Use this communications connector or an equivalent one.

Prepare a connection cable and a connector for the host computer. Refer to *Appendix B Ordering Information* for details.

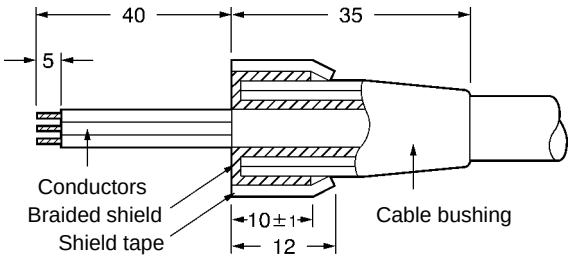


Note 1. A connector conforming to EMI standards is provided with the Controller.

2. Use the above cable or an equivalent one with an external diameter of 7 mm.

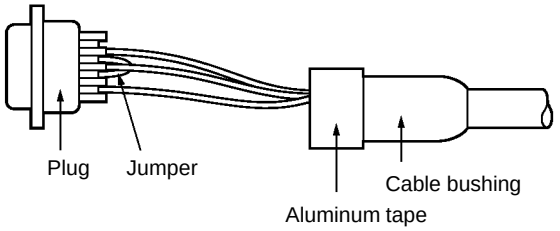
Assembly of Connector

1, 2, 3... 1. Process the end of the cable as shown below.



- Insert the cable into the cable bushing.
- Untangle the braided shield for approximately 10 mm and fold it back on the cable bushing.
- Apply shield tape to the untangled braided shield.

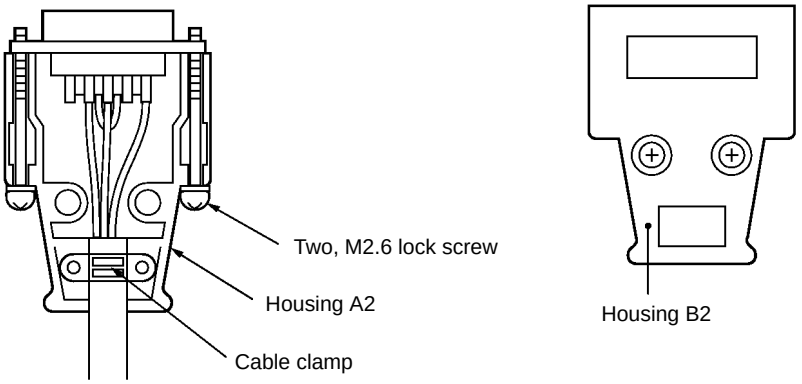
2. Solder the conductors to the plug pins.



Pin number	Symbol	Name
6 Shield	GR	Ground
5	SG	Signal ground
3	SD	Send data
2	RD	Receive data
7 (see note)	RS	Request send
8 (see note)	CS	Clear to send

Note Short-circuit pins 7 (RS) and 8 (CS) with a jumper.

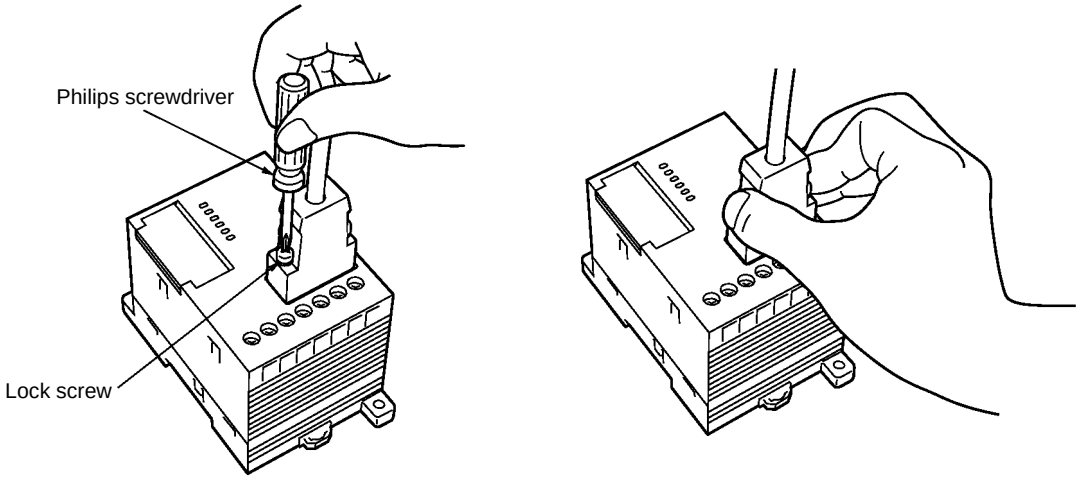
3. Attach housing A2 of the Hood to the Plug and secure the aluminum-taped portion with the cable clamp and two screws.



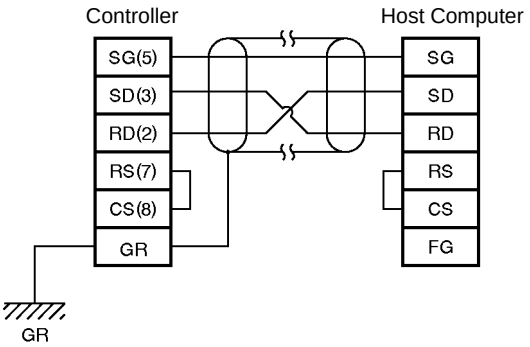
4. Put on housing B2 to complete the connector assembly.

Connection and Disconnection of Connector

- When connecting the connector, be sure to hold the connector by hand and insert the connector. Then secure the connector with two lock screws.
- When disconnecting the connector, completely loosen the two lock screws. Then hold the protruding part of the connector hood by hand and pull the connector straight out. If the connector is difficult to disconnect, hold the Controller by hand while pulling out the connector.



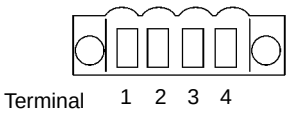
Note Example of Grounding from Controller



- The shielded wire must be grounded either from the Controller or the host computer for the prevention of system malfunctions. The above is an example of grounding from the Controller.
- Short-circuit the RS and CS pin in the connector.

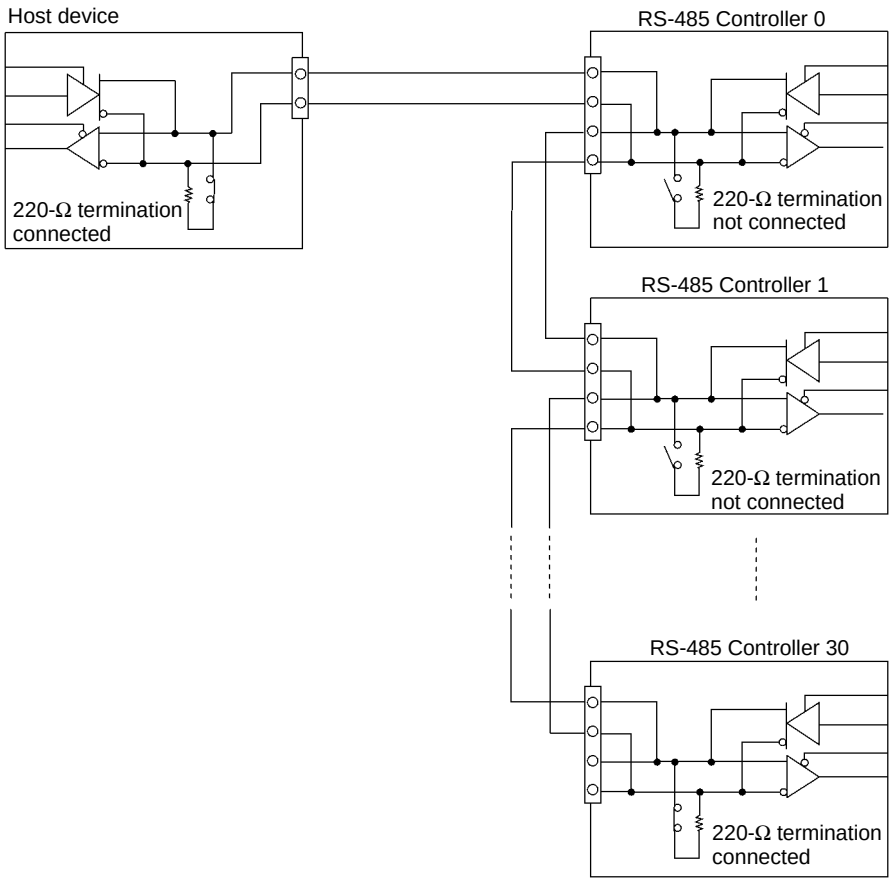
4-1-7 Connection of the RS-485 Interface (V700-CD2D-V3 Only)

The following diagram shows the configuration of the RS-485 interface. Terminal 1 is connected to terminal 3 within the RS-485 controller and terminal 2 is connected to terminal 4.



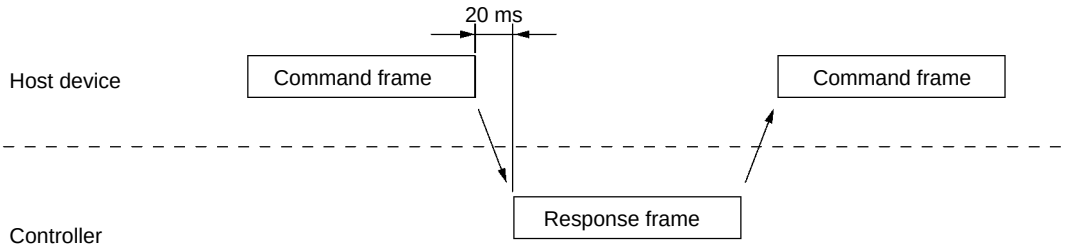
Terminal	1	2	3	4
Polarity	+	–	+	–

1:N RS-485 Connections The following diagram shows the basic connections in a 1:N system.



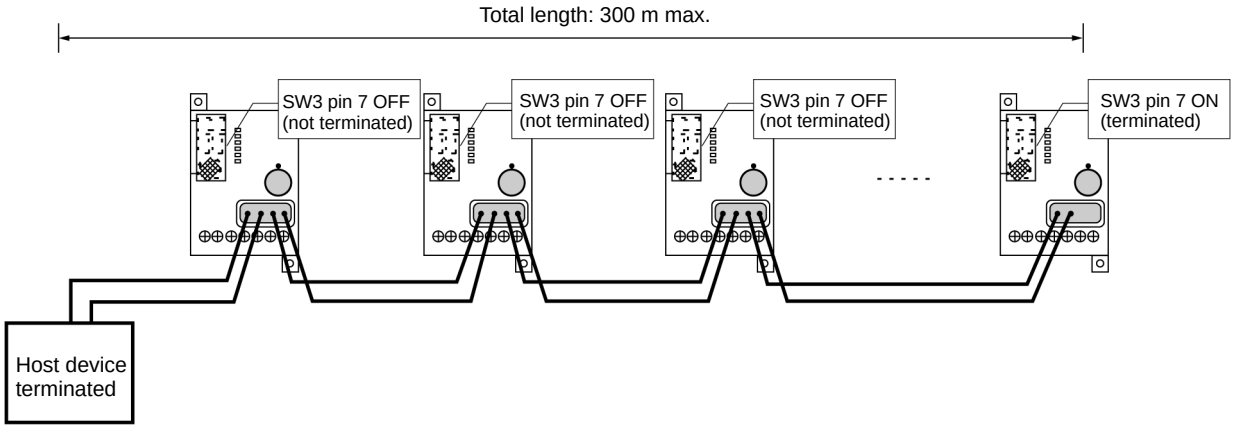
Set up the host device's processing to confirm that a response has been received from the Controller before sending the next command.

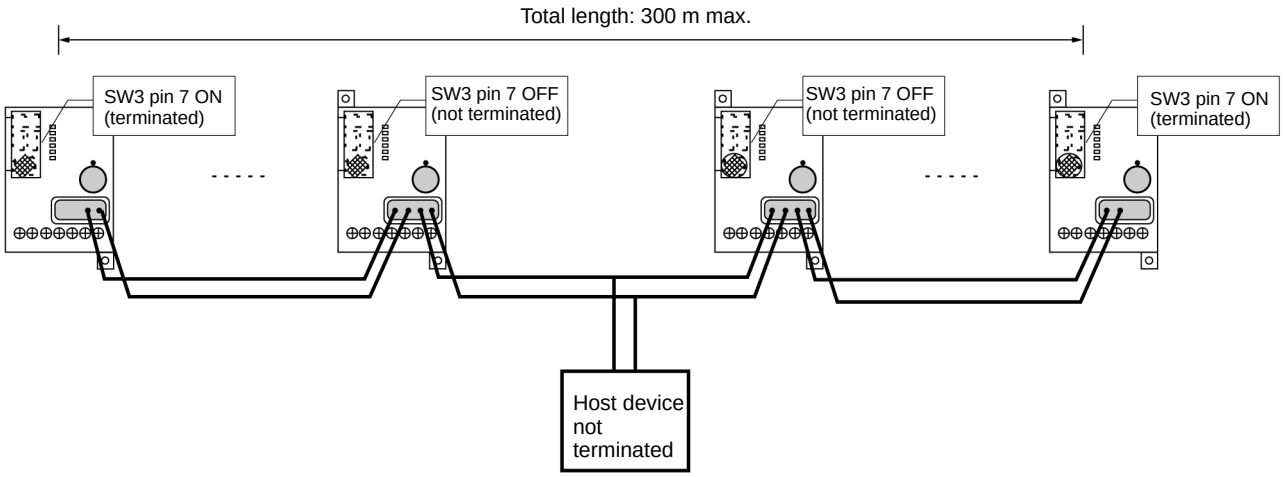
When an RS-232C/RS-485 Adapter is being used at the host device, send the command only when transmission is allowed. Furthermore, switch the host device to allow reception within 20 ms after the command is sent. The host may not be able to communicate with the Controller if the host is not able to receive within 20 ms.



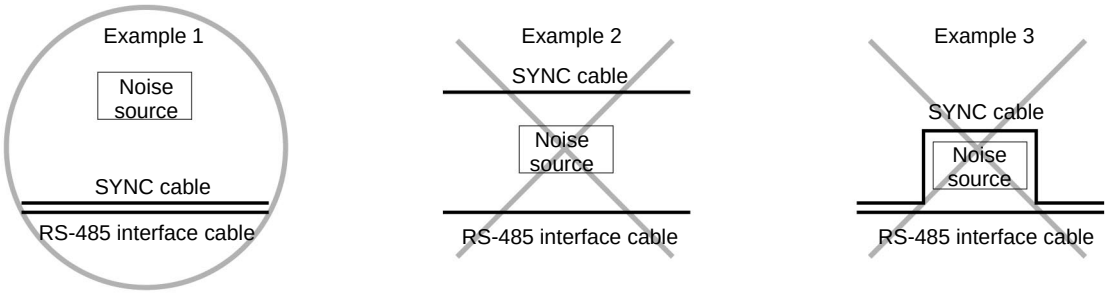
Wiring Examples

When using the mutual interference prevention function, use a 4-conductor shielded cable. Use two of the wires as the SYNC lines and the other two wires as the RS-485 interface lines. Connect the shield wire to the ground terminal.





If you do not use the recommended cable, wire the SYNC cable parallel with the RS-485 interface cable. To avoid noise problems, do not wire the cables separately as shown in examples 2 and 3 below. (Typical noise sources are other electronic devices, power lines, and AC adapters.)

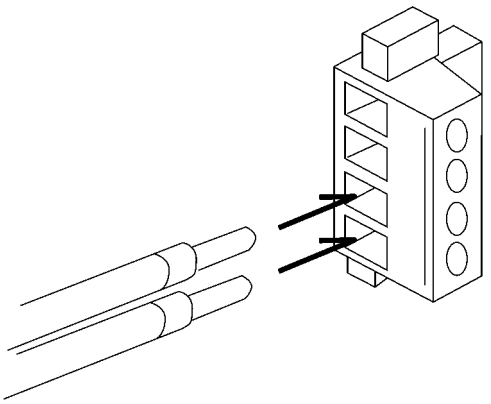


Preparing and Installing Connectors

Use the following procedure to prepare and connect the communications connectors.

1, 2, 3...

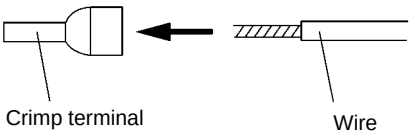
1. Attach crimp terminals to the stripped ends of the communications wires. Check the alignment of the connector and insert the wires into the correct holes in the connector.



- Recommended Cable: MVVS 4CX0.5Sq

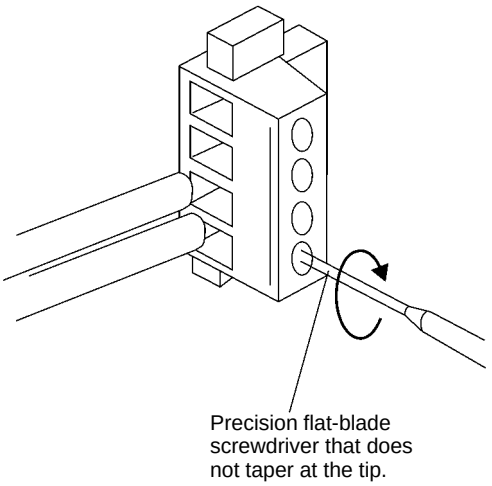
  Use two of the cable's wires as the RS-485 interface lines and the other two wires as the SYNC lines. Connect the shield wire to the ground terminal. See *Wiring SYNC Signals* on page 48 for details.

- Recommended Terminals: Nihon Weidmuller H-sleeve Series

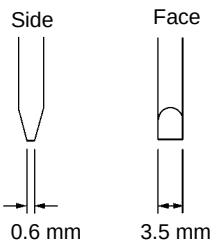


  Insert the wire into the pin terminal and crimp it. Nihon Weidmuller sells the PZ-series Crimping Tool for crimping these terminals.

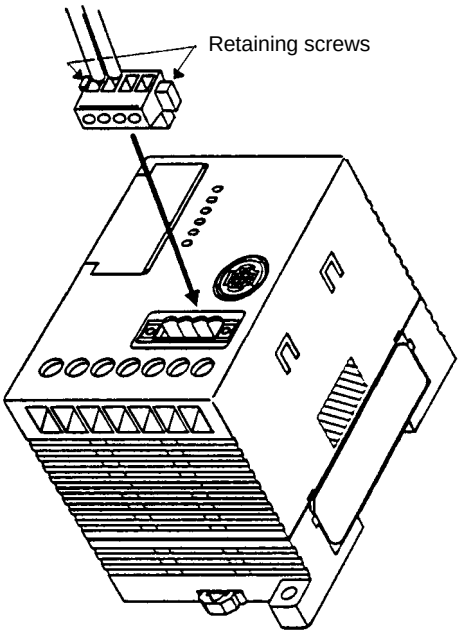
2. Tighten the connector's set screws to secure each of the wires in the connector. A regular screwdriver that tapers at the end may not fit into the screw hole, so use a screwdriver with a tip and shaft that are the same width. Tighten the screws to a proper torque (about 0.5 N·m).



OMRON sells the following screwdriver that is ideal for this application.



3. Install the connector in the Controller. Align the cable's connector with the Controller's connector and insert the cable's connector fully into the Controller. Tighten the retaining screws to a proper torque (about 0.3 N·m).



4. To remove the connector, completely loosen the two retaining screws and pull the connector straight out of the Controller. If the connector is difficult to remove, push against the Controller while pulling out the connector.

Note Do not connect wires in the connector while it is installed in the Controller.

4-2 Installation of Antenna

4-2-1 Installation Environment

Installation Location

Do not install the Antenna in the following locations.

- The ambient temperature is not within a range between –20°C and 55°C or locations with radical temperature changes resulting in condensation.
- The humidity is not within a range between 35% and 80%.
- There is corrosive gas, flammable gas, dust, salt, or metal powder.
- The Antenna will be subjected to direct vibration or shock.
- Water, oil, or chemical will be sprayed onto the Antenna.

Countermeasures Against Noise

The communications range of the Antenna drops due to ambient noise. Refer to *9-1 Communications Distance Characteristics vs. Ambient Noise* for details.

The following provides information on countermeasures against ambient noise.

Power Lines and High-tension Lines

Do not wire the Antenna cable along with high-tension lines or power lines. Keep the Antenna cable as far away as possible from them.

Inverters, Motors, and Other Driving Mechanisms

Be sure to ground the frames of driving mechanisms and keep them as far away as possible from the Antenna.

Displays of Personal Computers and Programmable Terminals

Keep the displays of personal computers and Programmable Terminals as far away as possible from the Antenna.

Switching Power Supplies

Be sure to ground switching power supplies and keep them as far away as possible from the Antenna.

If the Antenna is still influenced by noise in spite of the above countermeasures taken, the communications range must be reduced.

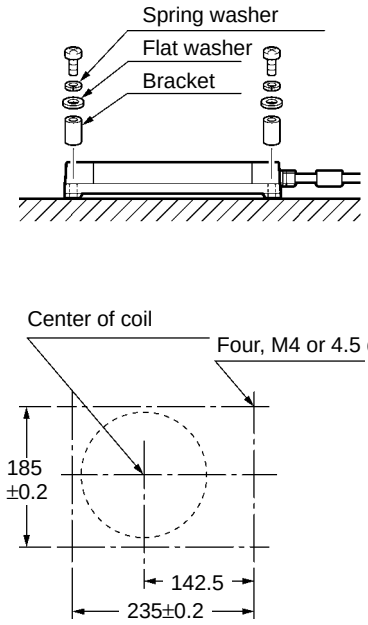
The Controller in stable communications mode rather than long-distance mode withstands more ambient noise although the communications range decreases.

Note Keep the above in mind before installing the Antenna. Before the Antenna is put in actual use, be sure to conduct enough tests of the Antenna.

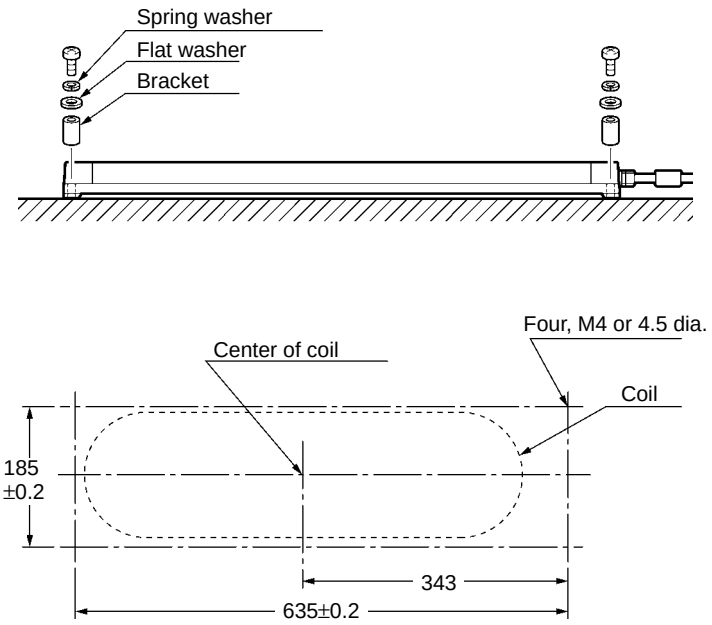
4-2-2 Mounting the Antenna

Be sure to attach the provided bracket to the Antenna and mount the Antenna with four, M4 screws with spring washers and flat washers as shown below.

V700-H01



V700-H02



4-3 ID Tag

4-3-1 Installation Environment

Do not install ID Tags in the following locations.

- Locations with corrosive gas, flammable gas, dust, or metal powder
- Within an electronic oven

4-3-2 Mounting Method

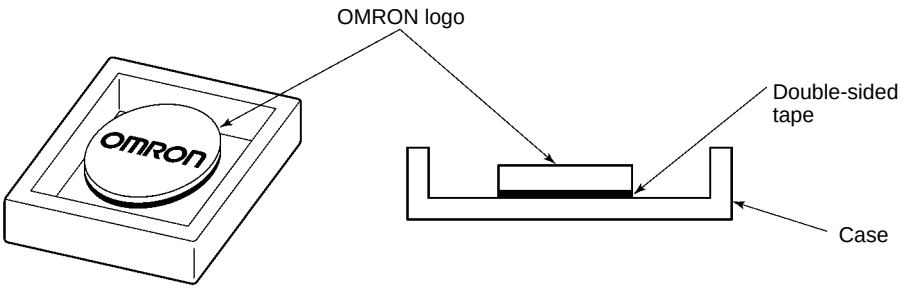
Observe the following guidelines when mounting ID Tags.

- Do not machine, cut, or open holes in the ID Tag.
- Do not impose excessive force on the ID Tag,
- Do not mount the ID Tag on or nearby metal objects.

V700-D□3P21(-Y) ID Tag Orientation

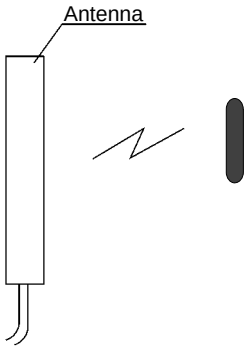
We assume that the V700-D□3P21(-Y) ID Tags will be mounted in a case.

If the case will be subjected to strong vibration or shock, we recommend attaching the ID Tag to the case with double-sided tape. Attach the side of the ID Tag without the OMRON logo (the black side) with the tape.



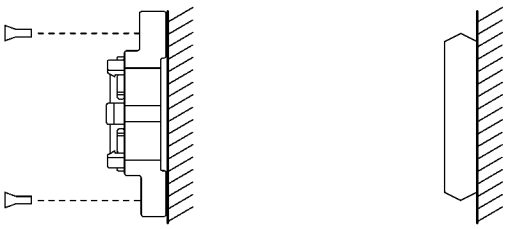
V700-D□3P31(-Y) ID Tag Orientation

Mount the V700-D□3P31(-Y) ID Tags so that they will be parallel to the antenna. The ID Tag's characteristics are the same whether the front or the back of the ID Tag is facing the antenna.



Mounting Example (Attaching the ID Tag with Adhesive)

We recommend mounting the ID Tag with adhesive or with screws using the V700-A80 Attachment. See *2-3-4 V700-A80 Attachment for the V700-D□3P31(-Y) ID Tags* for details.



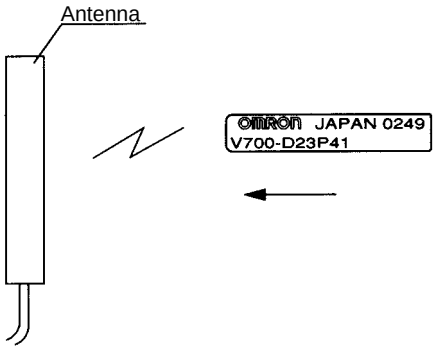
Recommended Adhesive

We recommend an epoxy adhesive when mounting the ID Tag to a resin or plastic surface. Verify that the epoxy's approved temperature range exceeds the maximum ambient temperatures where the ID Tag will be mounted.

Note Epoxy adhesive may not provide enough holding strength when the ID Tag is being mounted to polyethylene, polypropylene, Teflon compounds, or silicone compounds. Contact the adhesive maker for details on compatible surfaces.

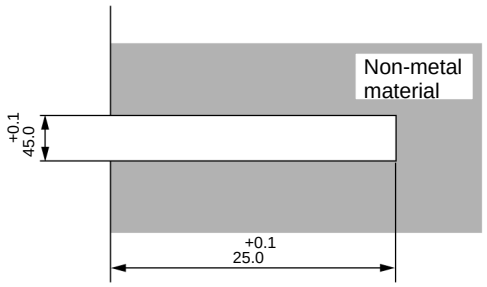
V700-D□3P41(-Y)

Mount the V700-D□3P41(-Y) ID Tags as shown in the following diagram to ensure the maximum communications distance. The communications distance will drop about 10 mm if the Tag is installed backwards.



Mounting Example (Attaching the ID Tag with Adhesive)

Refer to the following diagram for mounting-hole dimensions. There is a danger of damaging the ID Tag by pressing it into place, so we recommend mounting the ID Tag with adhesive.



Note The ID Tag's diameter is only 4 mm, but drill a hole about 4.5-mm in diameter to allow the adhesive to flow around the Tag and fill the gap between the Tag and the hole walls.

Recommended Adhesive

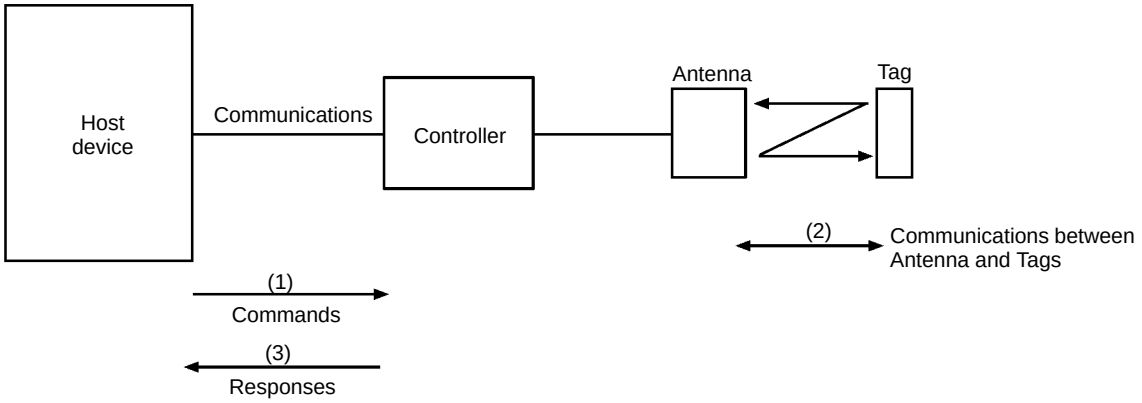
We recommend an epoxy adhesive when mounting the ID Tag to a resin or plastic surface. Verify that the epoxy's approved temperature range exceeds the maximum ambient temperatures where the ID Tag will be mounted.

Note Epoxy adhesive may not provide enough holding strength when the ID Tag is being mounted to polyethylene, polypropylene, Teflon compounds, or silicone compounds. Contact the adhesive maker for details on compatible surfaces.

SECTION 5
Controlling Operation from the Host Device

This section provides the communications functions and provides details on communications-related data and commands.

5-1 Controller Operating States



The Controller can be in two operating states, ready (ready to receive a command) or processing (processing a command).

Ready to Receive Command

In this state, the Controller has no command in process and the Controller is ready to receive any command other than a subcommand. When a command is received, the Controller starts processing the command.

Processing Command

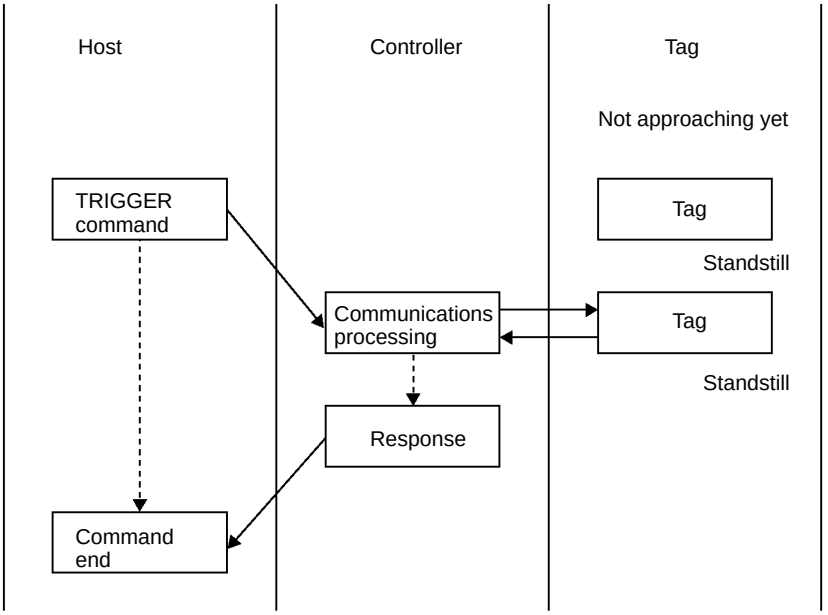
After a command is received by the Controller, the Controller ignores the next command until the Controller processes the command and returns a response. The Controller, however, accepts the STOP or RESET command anytime.

5-2 Communications Sequences

The sequence of operations, such as the exchange of data and response timing, depends upon the instructions requested in the command. Operation also depends upon the status of the Tag within range of the Antenna and the status of the connection with the host.

5-2-1 Single Trigger Mode

In single trigger mode, the Controller communicates with the ID Tag that is within range when the command is received, so it is necessary to check that there is an ID Tag within communications range before sending the command. If the ID Tag is not within communications range, an error response is returned.



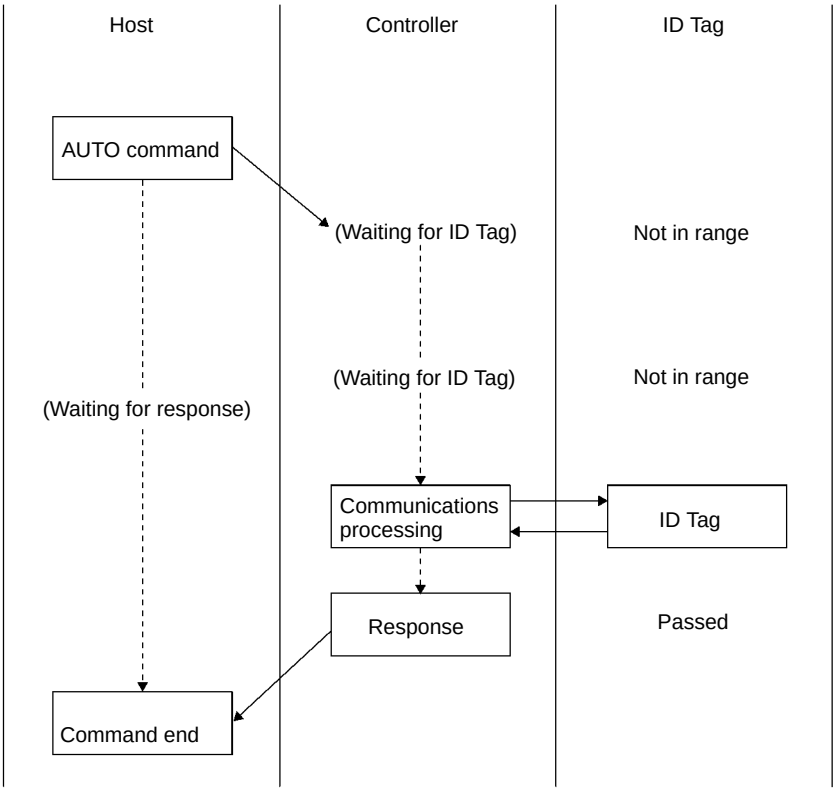
1, 2, 3...

1. The host must send the command after checking that the ID Tag is within communications range.
2. The Controller communicates with the ID Tag for data processing according to the command.
3. After the data is processed, the Controller returns a response indicating that the Controller is finished with data processing. The host receives the response and waits for the next ID Tag to approach.

Note When operating the system in single trigger mode, send the command when an ID Tag is within the communications range.

5-2-2 Single Automatic Mode

In automatic mode, the Controller waits for the ID Tag to reach the antenna's communications range and then communicates with the Tag.



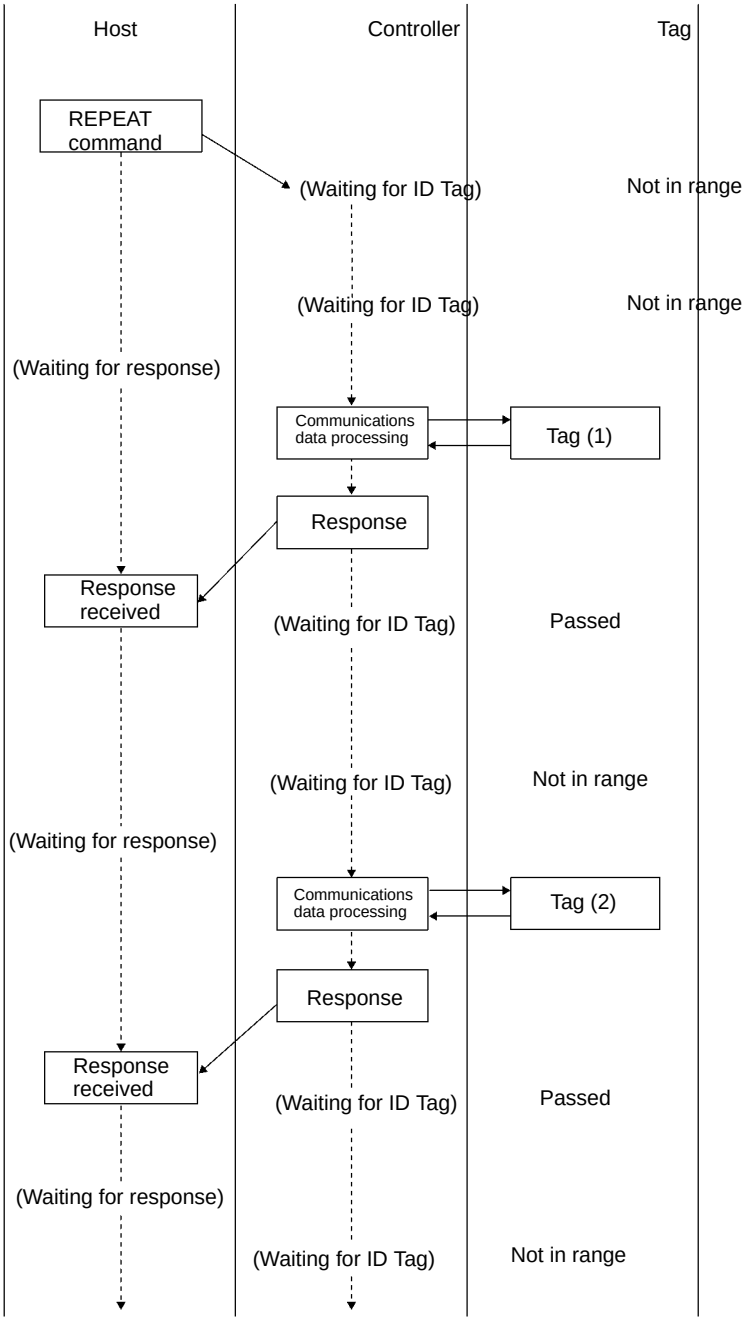
1, 2, 3...

1. The host sends the AUTO command.
2. The Controller does not return a response while the ID Tag is approaching. During this time the communications path between the host and Controller is kept busy.
3. When the ID Tag passes in front of the Antenna, the Controller processes the communications data exchanged with the ID Tag according to the command.
4. After the data is processed, the Controller returns a response to the host indicating that the Controller is finished with data processing.

Note In single automatic mode, the Controller will wait for the ID Tag to come into range. This wait status can be interrupted by sending the STOP command (ST).

5-2-3 Single Repeat, FIFO Repeat, and Multi-repeat Modes

In these repeat modes, when the Controller receives a command from the host, the Controller waits for the arrival of an ID Tag. Each time that an ID Tag passes within communications range, the Controller communicates with the ID Tag and returns a response to the host. As long as the Controller is in one of these repeat modes, it will be in the “command processing” state and cannot receive commands other than the STOP or RESET commands. The Controller must be switched to the “ready” state by sending the STOP or RESET command in order to accept other commands.



1, 2, 3...

1. The host sends the REPEAT command.
2. The Controller does not return a response until the ID Tag is in range.
3. When the ID Tag passes through the communications area of the Antenna, the Controller communicates with ID Tag according to the command.

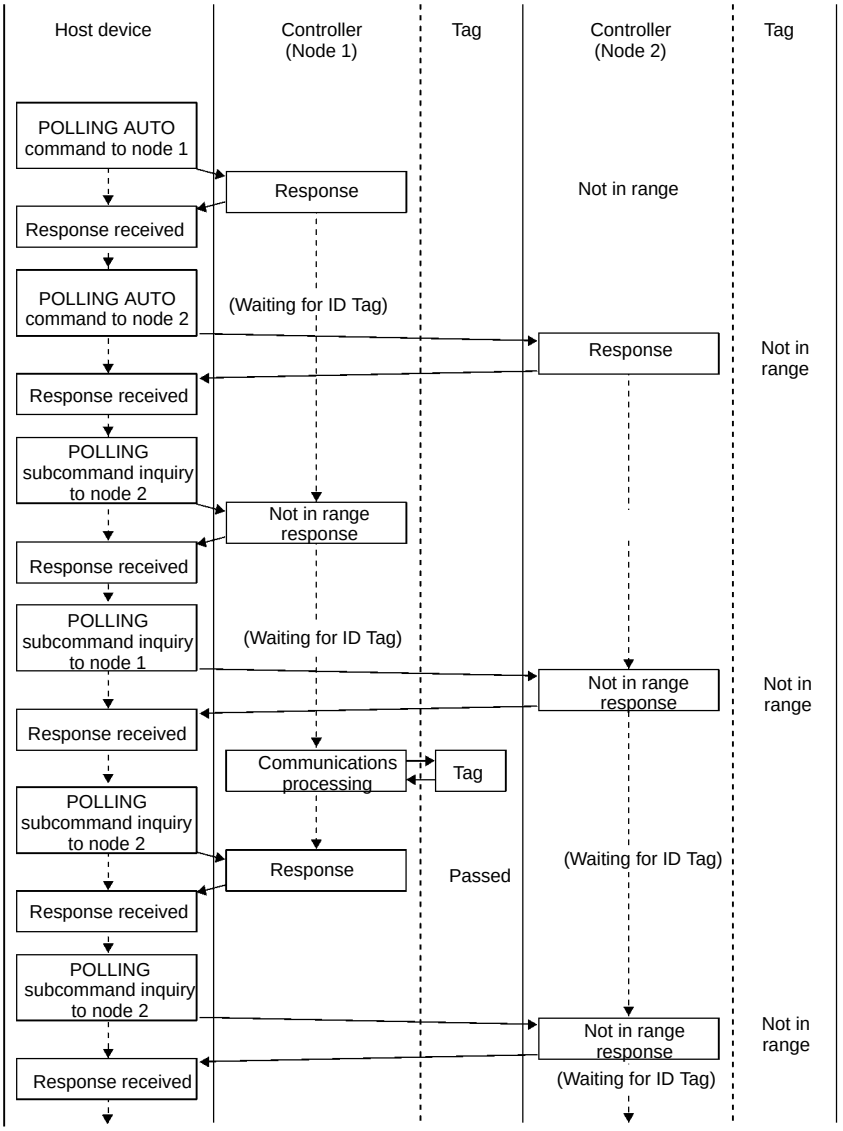
4. After the data is processed, the Controller returns a response to the host indicating that the Controller is finished with data processing. Then the Controller awaits the next ID Tag.
5. When the next ID Tag passes through the communications area of the Antenna, the Controller communicates with the ID Tag.
6. After the data is processed, the Controller returns a response to the host indicating that the Controller is finished with data processing.

Note Use the STOP command (ST) to interrupt the Controller's "repeat" status. The Controller will enter the "ready to receive command" status.

5-2-4 Polling Auto Mode

If a normal AUTO command is sent to one of the Controllers while a single host is controlling more than one Controller, the communications path between the host and the Controller receiving the AUTO command will be kept busy and the host will not be able to control any other Controller. However, if the POLLING AUTO command is sent instead, the Controller will return a response at the request of the host. In this way, the communications path to the host will not be kept busy. Therefore, the host can send a command to another Controller. While the POLLING AUTO command is executed, no command other than the POLLING subcommand or RESET command can be executed.

In the following example, the POLLING AUTO command is executed to two Controllers.



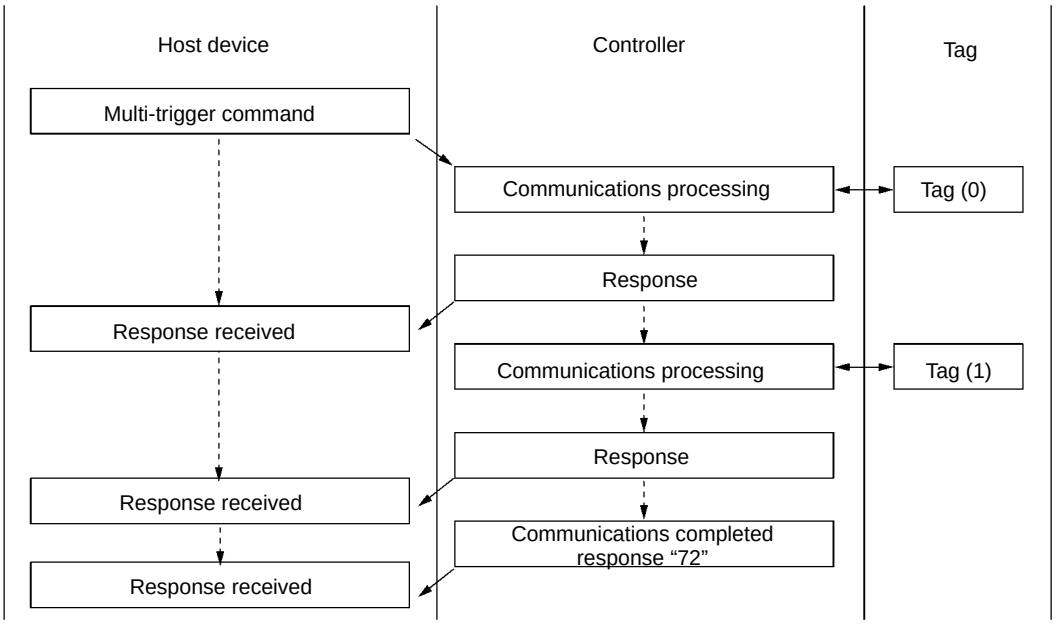
1, 2, 3...

1. The host sends the POLLING AUTO command to node 1.
2. After the command is received, the Controller returns a response to the host indicating the acceptance of the command.
3. The host sends the POLLING AUTO command to node 2.
4. After the command is received, the Controller returns a response to the host indicating the acceptance of the command.
5. The host can use subcommands to check the process of command execution or cancel the execution of the POLLING AUTO processing. If the ID Tag has not arrived yet, a response indicating the status is sent in reply to an inquiring subcommand.
6. When the ID Tag passes through the communications area of node 1's Antenna, communication is established.
7. If a subcommand is sent for confirmation to the Controller that has finished processing communications with the ID Tag, the Controller will return a response of a process result.

5-2-5 Multi-trigger and Multi-repeat Modes

In these modes, the Controller communicates with all of the ID Tags within the communication area.

Multi-trigger Mode
In multi-trigger mode, the Controller communicates with all of the ID Tags that are in range when the command is received. When the Controller completes processing, it returns a response indicating that communications have been completed.



Multi-repeat Mode
In multi-repeat mode, the Controller will wait for ID Tags to come into range after the command is received. The Controller will continue to communicate with all ID Tags that come into range. Execute the STOP command to stop the multi-repeat processing.

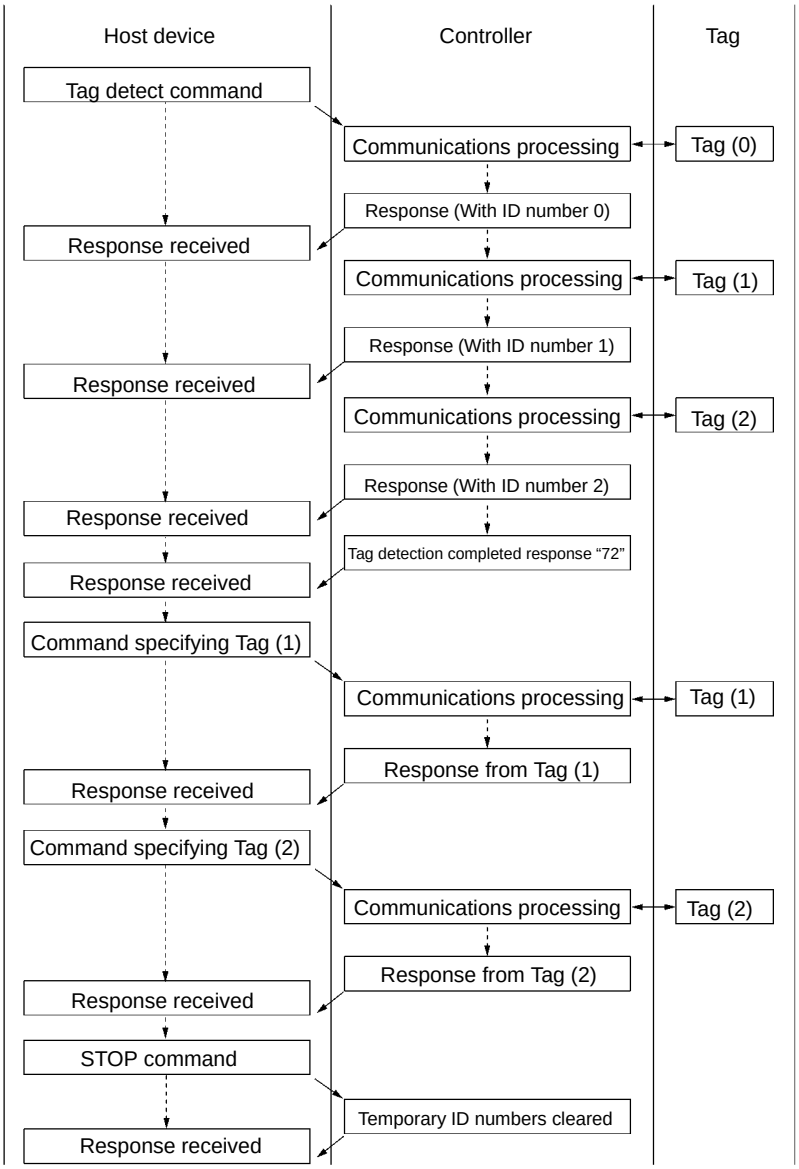
Note Do not set the Controller to Energy-saving mode when using the multi-repeat function.

5-2-6 Selective Access Mode

The Controller will communicate with a particular ID Tag out of the multiple ID Tags in range of the Antenna. Two commands are needed to use the selective access function. Use the Tag detect command to allocate temporary ID numbers to the ID Tags in the communication area and use the Tag specify command to communicate with a particular ID Tag based on the temporary ID number that was assigned to it.

Note The Controller must be set to Energy-saving mode when using the selective access function.

Overview of the Selective Access Function



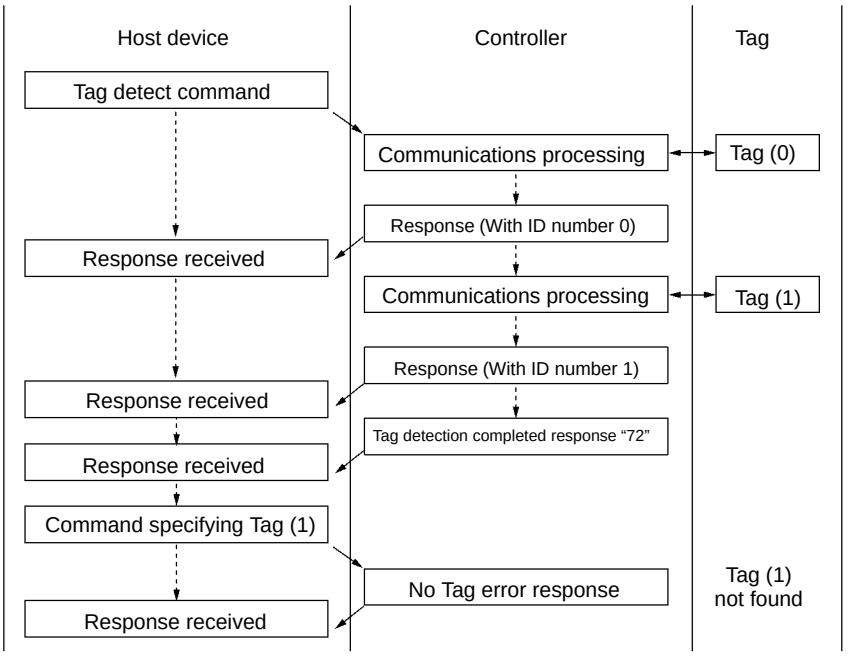
1, 2, 3... 1. The host sends the Tag detect command to the Controller.

2. The Controller communicates with the ID Tags that are in the Antenna's communication area, records up to 16 temporary ID numbers (0 to F) internally, and attaches the corresponding ID numbers with each response to the host device. When the Controller has completed communications with all of the ID Tags in the communications area, it returns a response indicating that Tag detection has been completed.
3. Send a Tag specify command to the Controller with the ID number of the ID Tag with which you want to communicate.
4. The Controller executes the Tag specify command on the specified ID Tag.
5. When all of the required processing has been completed, send a STOP command from the host device to the Controller. When the Controller receives the STOP command, it erases the previously stored ID numbers. (The stored ID numbers will not be erased until the STOP command is executed.)

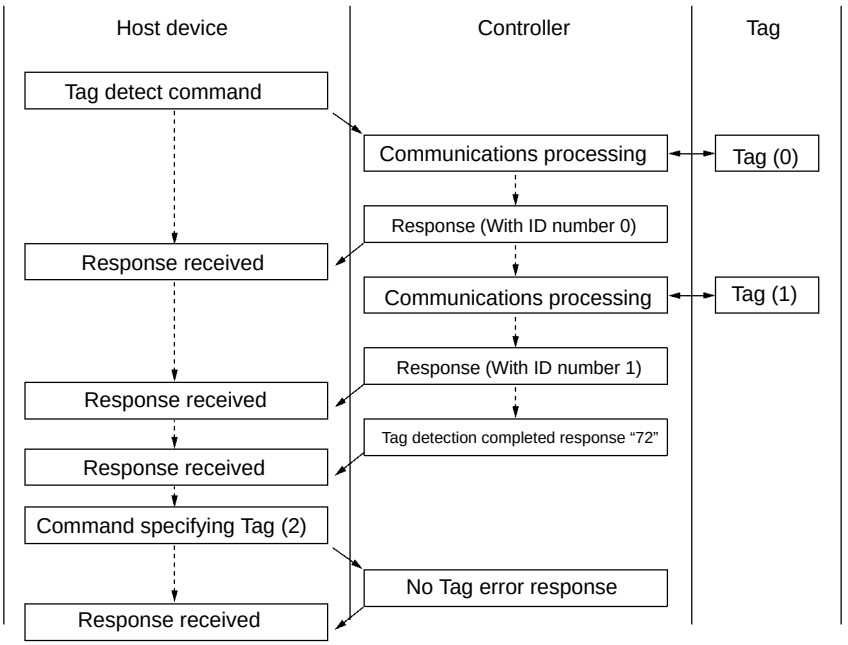
Precautions when using the Selective Access Function

1, 2, 3...

1. When using the selective access function, the Controller must be set to Energy-saving mode by turning on pin 5 of DIP switch 3 (SW3-5) on the Controller. A command error will occur if the selective access function is used while the Controller is in regular emission mode.
2. If the Tag specify command is executed but the ID Tag with the specified ID number isn't within the communication area, the Controller will return a "No Tag" error to the host device.



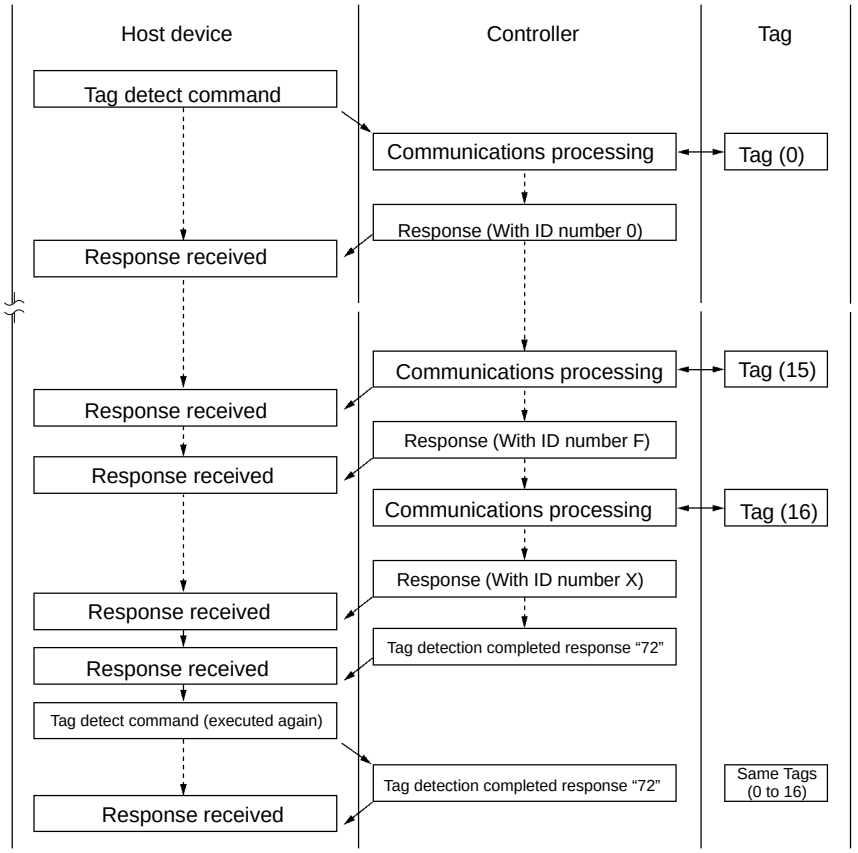
3. If the Tag specify command is executed with a temporary ID number that wasn't recorded in the Controller, the Controller will return a "No Tag" error to the host device.



4. If there are 17 or more ID Tags within the communication area when the Tag detect command is executed, the Controller will record temporary ID num-

bers for the first 16 ID Tags but will not record ID numbers for the remaining ID Tags. The Controller will return responses for all of the ID Tags and will attach "X" as the ID number for the 17th and higher Tags. (A command error will occur if the Tag specify command is executed with "X" as the ID number.)

5. Once the ID numbers are recorded in the Controller, they are not erased until the STOP command is executed. Only the two selective access commands and the RESET command (XZ) can be received until the STOP command is executed. If the Tag detect command is executed again and no new ID Tags have arrived in the communication area, the Controller will return just the Tag detection completed response.
6. If new ID Tags have arrived in the communication area since the Tag detect command was last executed and the Tag detect command is executed again, the Controller will communicate only with the newly arrived Tags and record their new ID numbers internally. (If 16 ID numbers have already been recorded, the Controller will return ID number "X" as described above in step 4.)

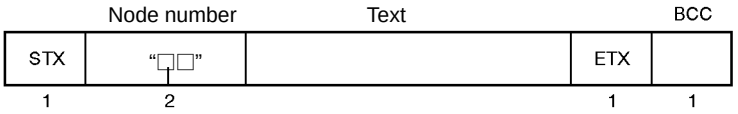


Note The Controller must be set to Energy-saving mode when using the selective access function.

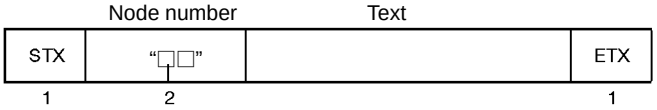
5-3 Command and Response Frame Structure

Commands and responses exchanged between the host and Controllers are in the following frame structure. A DIP Switch setting (pin SW3–1) can be used to enable or disable attachment of the BCC byte.

BCC Enabled Format (Pin SW3–1 OFF)



BCC Disabled Format (Pin SW3–1 ON)

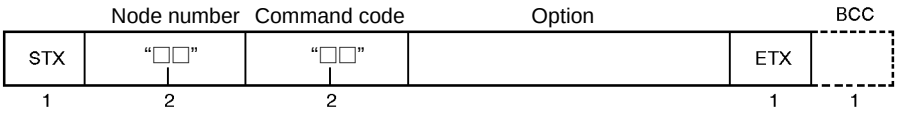


Name	Description
STX	This code indicates the beginning of a communications frame. This code is 02h in ASCII.
Node number	This indicates the node number of the Controller that can be set within a range between 00 and 31 (decimal) on the rotary switches of the of the Controller. If a node number is identically set to one that is set by using the node number setting switch on the Controller, a response will be returned with the same node number.
ETX	This code specifies the end of the command/response. This code is 03h in ASCII.
BCC	This stands for block check character. The results of horizontal parity calculation from just after STX through ETX is displayed with a single character. Refer to *NO TAG Data Code Designation* for BCC calculation.

Command

The text of a command consists of a command code and an option that specifies a variety of data items.

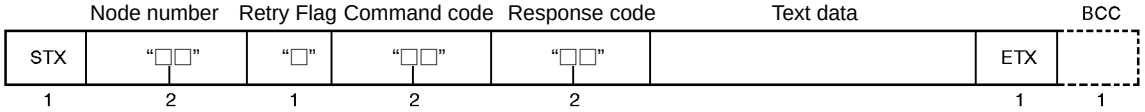
After receiving STX, the Controller receives data up to ETX. Then the Controller will execute the command if the node number in the command is correct. If STX is received again after the first STX is received and before receiving ETX, the first STX will be ignored.



Name	Description
Command code	The command code indicates the command that the Controller executes. Refer to *5-3-1 Command List* for all command codes available.
Option	Used to designate specified optional settings or to designate read data or write data. For details, refer to the format of each command.

Response

The text of a response consists of a Retry Flag, command code, response code, and text data.



Name	Description
Retry Flag	The Retry Flag is set to 0 if ACK OR NACK control is not used. The Retry Flag is set to 1 and the previous response is returned if no ACK is received within a specified time in ACK/NACK control.
Command code	The executed command code is sent.
Response code	A response code is attached to the result of command execution and sent to the host. Refer to *5-12 List of Response Codes*.
Text data	Some commands enable the Controller to send data. Refer to the frame structure of each command for details.

5-3-1 Command List

Commands can be classified into five types.

1, 2, 3... 1. Communications Commands

The communications command is used for communications with ID Tags.

2. Communications Subcommands

The subcommand is used for the inquiry of the results or cancellation of execution when the POLLING AUTO command is used.

3. Controller Control Commands

The Controller control command is used for interrupting communications with ID Tags or resetting the Controller.

4. Host Commands

The host command is used for communications tests of the host and Controllers.

5. Host Subcommands

The host subcommand is used for ACK/NACK control.

Command type	Command code	Command name	Function
Communications command	RD	READ	Reads memory data from a Tag.
	WT	WRITE	Write data to the memory of a Tag.
	AD	ADD	Adds the specified data to memory data in hexadecimal and writes the results to the memory of a Tag.
	SB	SUBTRACT	Subtracts the specified data from the memory data in hexadecimal and writes the results to the memory of a Tag.
	PR	POLLING AUTO	Performs a single autoread using polling.
	PW	POLLING AUTOWRITE	Performs a single autowrite using polling.
	MC	MEMORY CHECK	Compares check codes in Tag memory.
	MK	MEMORY CALCULATE	Calculates check codes in Tag memory.
	WP	WRITE PROTECT	Sets and releases write protection for each page.
	LK	LOCK	Sets locks on pages of Tag memory
Communications subcommand	PC	POLLING CHECK	Checks polling operation with the Controller.
	PE	POLLING END	Ends polling.
Controller control command	ST	STOP	Ends communications with the ID Tag.
	XZ	RESET	Resets the Controller after receiving the command.
	MS	SWITCH SYNC	Switches the Controller's synchronization setting.
Host command	TS	TEST	Sends the received data to the host.
Host subcommand	AK	ACK	Sends this command to the Controller if a proper response for ACK/NACK control is possible.
	NK	NACK	Sends this command to the Controller if proper response for ACK/NACK control is impossible.

5-3-2 List of Options

The following nine options can be specified in commands. There are four commands (READ, WRITE, ADD, and SUBTRACT) that can use all of the options.

Symbol	Name	Description
ST	Single Trigger	Communicates with the one ID Tag in the Antenna's communications area.
SA	Single Auto	Waits for an ID Tag to approach and communicates with that one ID Tag in the Antenna's communications area.
SR	Single Repeat	Waits for an ID Tag to approach and communicates with that one ID Tag in the Antenna's communications area. The Controller waits and communicates with other Tags as they reach the Antenna's communications area.
FT	FIFO Trigger	Communicates with ID Tags one at a time as they enter the Antenna's communications area.
FA	FIFO Auto	Waits for an ID Tag to approach and communicates with the ID Tags one at a time as they enter the Antenna's communications area.
FR	FIFO Repeat	Waits for an ID Tag to approach and communicates with the ID Tags one at a time as they enter the Antenna's communications area. The Controller waits and communicates with other Tags as they reach the Antenna's communications area.
ME	Multi-trigger	Communicates with all the Tags within the communications area of the Antenna. Sends a "communications completed" response after communicating with all of the ID Tags.
MR	Multi-repeat	Communicates with all the Tags within the communications area of the Antenna. Communicates with new ID Tags as they enter the Antenna's communications area.
L□ (□: ∗ or 0 to F)	Selective Access	Communicates with a particular ID Tag out of the multiple ID Tags within the communications area of the Antenna.
QT (See note 1.)	Quick Trigger	Communicates at high-speed with the one ID Tag in the Antenna's communications area.
QA (See note 1.)	Quick Auto	Waits for an ID Tag to approach and communicates at high-speed with that one ID Tag in the Antenna's communications area.
QR (See note 1.)	Quick Repeat	Waits for an ID Tag to approach and communicates at high-speed with that one ID Tag in the Antenna's communications area. The Controller waits and communicates at high-speed with other Tags as they reach the Antenna's communications area.

Note 1. The QT, QA, and QR commands can be used with the V700-D□3P□1-Y ID Tags only.

2. Do not set the Controller to energy-saving mode if the single repeat, FIFO trigger, FIFO auto, FIFO repeat, or multi-repeat options are used, otherwise a command error will result. The Controller must be set to energy-saving mode when using the selective access function.

5-3-3 Data Code Designation

Specify in the command whether read or write data is handled as ASCII text data or handled as hexadecimal numeric data.

ASCII Code Designation Data of one character uses a single byte (or a single address) in ASCII or JIS8 in the memory of the ID Tag.

Example of ASCII Code Designation

If “OMRON” is written to the five bytes beginning with address 10h in the memory, the addresses will be occupied with the following data.

ID Tag memory

Address			
10h	4	F	“O”
11h	4	D	“M”
12h	5	2	“R”
13h	4	F	“O”
14h	4	E	“N”

HEX Code Designation

Two characters of data are treated as two-digit hexadecimal data, so only two-digit hexadecimal values 00 through FF can be accepted. The two hexadecimal characters occupy one byte of ID Tag memory.

Example of HEX Code Designation

If “1234” is written to the two bytes beginning with address 20h, the addresses will be occupied with the following data.

ID Tag memory

Address		
20h	1	2
21h	3	4

5-3-4 Designating the First Address and Number of Bytes

The following table provides information on commands that designates the first address and number of bytes along with the designation range of the first address and bytes. A command error will result if a value not within the range is specified.

Command code	Designation range of first address	Designation range of bytes	
READ	00h to EFh	ASCII code	01h to F0h
		HEX code	01h to 80h
WRITE	00h to EFh	ASCII code	01h to F0h
		HEX code	01h to 80h
ADD	00h to EFh	01h to 08h	
SUBTRACT	00h to EFh	01h to 08h	
POLLING AUTO	00h to EFh	ASCII code	01h to F0h
		HEX code	01h to 80h
POLLING AUTOWRITE	00h to EFh	ASCII code	01h to F0h
		HEX code	01h to 80h
MEMORY CHECK	□0h to □5h or □8h to □Dh, provided that □ is between 0 and E.	01h to F0h	
MEMORY CALCULATE	□0h to □5h or □8h to □Dh, provided that □ is between 0 and E.	01h to F0h	

Note Addresses and bytes can be specified within the above ranges. If a range exceeding the memory capacity of the ID Tag is designated, an address error or

command error will result. Be sure to check the memory capacity of the ID Tag before use.

5-3-5 Example of BCC Calculation

BCC is the result of the horizontal parity calculation of the data right after STX up to ETX inclusive. BCC conforms to JIS5001 standards.

	Node number		Command code				Text					BCC
STX	0	0	R	D	S	T	A	0	0	1	0	ETX	63

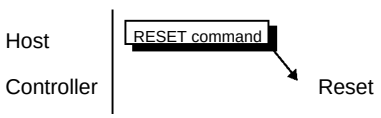
Command data		ASCII code data	
0	0011		0000
		EOR	
0	0011		0000
		EOR	
R	0101		0010
		EOR	
D	0100		0100
		EOR	
S	0101		0011
		EOR	
T	0101		0100
		EOR	
A	0100		0001
		EOR	
1	0011		0001
		EOR	
0	0011		0000
		EOR	
0	0011		0000
		EOR	
1	0011		0001
		EOR	
0	0011		0000
		EOR	
ETX	0000		0011
Calculation result	0110		0011

5-4 Explanation of Commands and Responses

The transmission of a command from the host to the Controller or the transmission of a response from the Controller to the host varies with the type of command and the difference in communications designation.

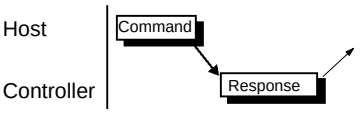
No Response

When the Controller receives the RESET command, the Controller is reset without returning a response and waits for the next command.



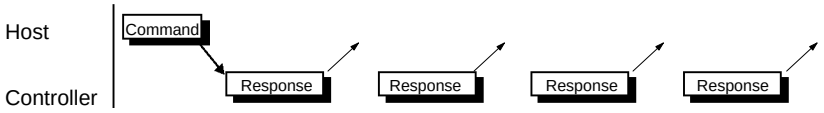
One to One

If the single trigger, single auto, FIFO trigger, or FIFO auto option is specified for communications with the ID Tag or a command not for communications with the ID Tag is specified, a single response will be returned for a single command.



Multiple Responses

If the single repeat, FIFO repeat, multiple trigger, or multiple repeat option is specified for communications with the ID Tag, multiple responses will be returned for a single command.



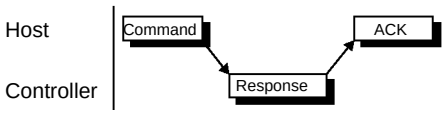
5-5 ACK/NACK Control

When ACK/NACK control is being used and the host was not able to receive a response normally, it is possible to receive a response even if communications with the Tag are not executed again. ACK/NACK control verifies that the host received the response normally, so response data communications can be performed reliably.

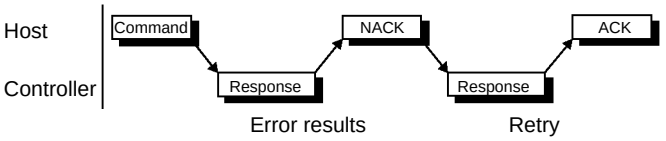
Use of ACK/NACK Control

The Controller returns a response for a command sent from the host and the host sends ACK when the response to the command is received. Then the Controller determines that the host has received the response normally and waits for the next command. If the Controller does not receive ACK within a preset time-out period or the Controller receives NACK, the Retry Flag is set and the response is returned to the Controller again. This is repeated at least nine times.

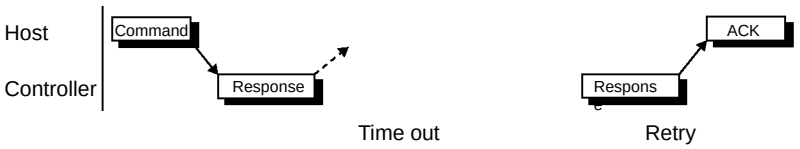
The host receives a response normally and sends ACK.



The host sends NACK because a response is not received normally.



The host does not send ACK/NACK within a preset time-out period.

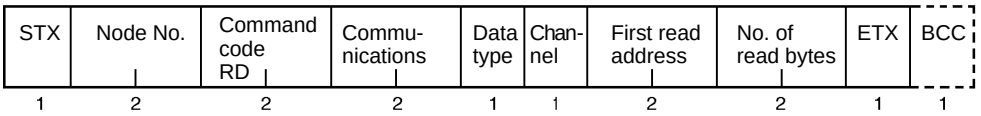


5-6 Communications Commands

5-6-1 READ: RD

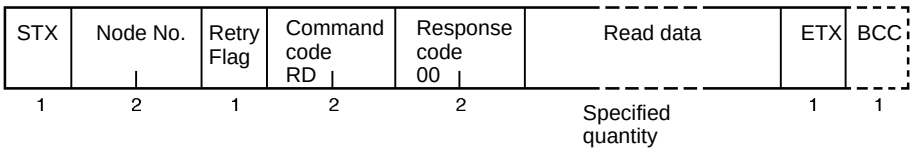
Reads data from a Tag.

Command Frame Structure

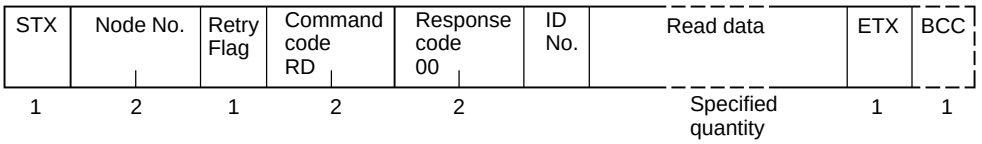


Communications	Specify the communications method with the Tag. ST: Single trigger SA: Single auto SR: Single repeat FT: FIFO trigger FA: FIFO auto FR: FIFO repeat ME: Multi-trigger MR: Multi-repeat L□: Selective access (□ = ∗ for Tag detect, ID number 0 to F for Tag specify.) QT: Quick Trigger QA: Quick Auto QA: Quick Repeat
Data type	Specify whether the data read from the Tag is ASCII or Hex. A: ASCII code H: HEX code
Channel	Always 1.
First read address	Specify in Hex the first address from which data is to be read from the Tag. Setting range: 00h to EFh
No. of read bytes	Specify in Hex the number of bytes to be read from the Tag. Setting range: 01h to F0h (reading ASCII data) 01h to 80h (reading Hex data)

Response Frame Structure



Response Frame Structure for Selective Access Function (Excluding Detection Completed Response)



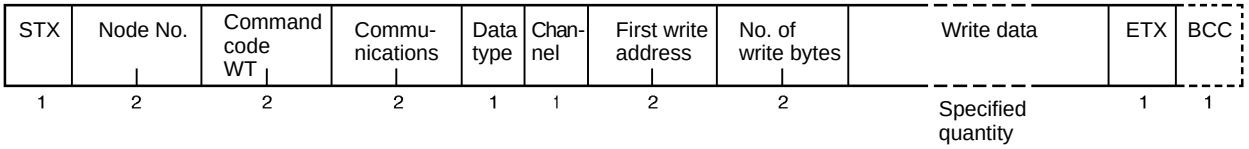
Response code	00: Normal end Refer to *5-12 List of Response Codes* for other response codes.
ID No.	This is the temporary ID number assigned to the Tag by the Controller for the selective access function. Normally the ID No. is between 0 and F, but the Controller will return ID number "X" for the 17th and later Tags if the max. number of Tags (16) was exceeded.
Read data	Data read from the ID Tag, which consists of the following characters. ASCII code: Number of bytes to be read HEX code: Number of bytes to be read x 2

Note Make sure that the specified data is within the memory capacity of the ID Tag.

5-6-2 WRITE: WT

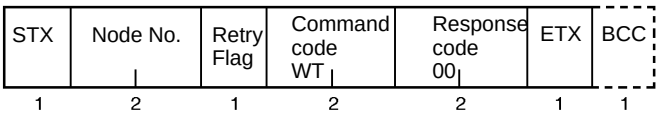
Writes data to a Tag.

Command Frame Structure

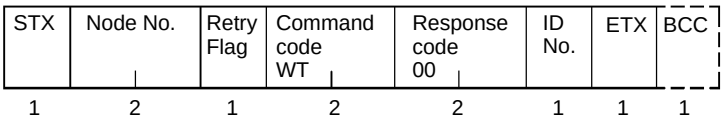


Communications	Specify the communications method with the Tag. ST: Single trigger SA: Single auto SR: Single repeat FT: FIFO trigger FA: FIFO auto FR: FIFO repeat ME: Multi-trigger MR: Multi-repeat L□: Selective access (□ = ∗ for Tag detect, ID number 0 to F for Tag specify.) QT: Quick Trigger QA: Quick Auto QA: Quick Repeat
Data type	Specify whether the data written to the Tag is ASCII or Hex. A: ASCII code H: HEX code
Channel	Always 1.
First write address	Specify in Hex the first address to which data is to be written to the Tag. Setting range: 00h to EFh
No. of write bytes	Specify in Hex the number of bytes to be written to the Tag. Setting range: 01h to F0h (writing ASCII data) 01h to 80h (writing Hex data)
Write data	Data written to the ID Tag, which consists of the following characters. ASCII code: Number of bytes to be written HEX code: Number of bytes to be written x 2

Response Frame Structure



Response Frame Structure for Selective Access Function (Excluding Detection Completed Response)



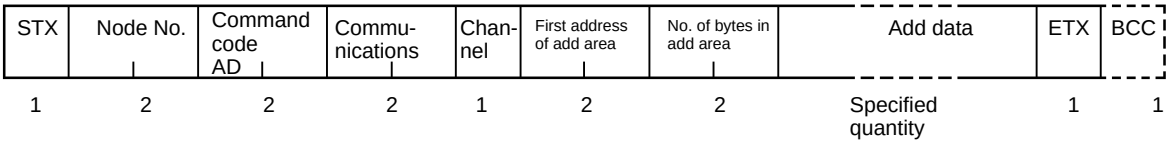
Response code	00: Normal end Refer to *5-12 List of Response Codes* for other response codes.
ID No.	This is the temporary ID number assigned to the Tag by the Controller for the selective access function. Normally the ID No. is between 0 and F, but the Controller will return ID number "X" for the 17th and later Tags if the max. number of Tags (16) was exceeded.

Note Make sure that the specified data is within the memory capacity of the ID Tag.

5-6-3 ADD: AD

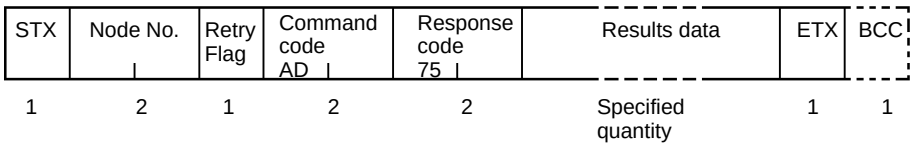
The data in the memory of the ID Tag is treated as hexadecimal data, to which AD data is added.

Command Frame Structure

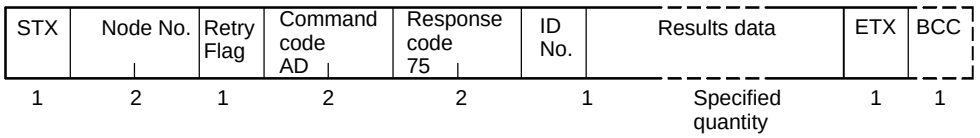


Communications	Specify the communications method with the Tag. ST: Single trigger FR: FIFO repeat SA: Single auto ME: Multi-trigger SR: Single repeat MR: Multi-repeat FT: FIFO trigger L□: Selective access FA: FIFO auto (□ = ∗ for Tag detect, ID number 0 to F for Tag specify.)
Channel	Always 1.
First address of add area	The first address of data to be added in hexadecimal. Setting range: 00h to EFh
No. of bytes in add area	The number of data bytes to be added in hexadecimal. Setting range: 01h to 08h
Add data	Data to be added to the ID Tag. The number of AD data characters is twice as large as the number of AD area bytes.

Response Frame Structure



Response Frame Structure for Selective Access Function (Excluding Detection Completed Response)



Response code	75: Normal response with no overflow. 76: Normal response with overflow. Refer to *5-12 List of Response Codes* for other response codes.
ID No.	This is the temporary ID number assigned to the Tag by the Controller for the selective access function. Normally the ID No. is between 0 and F, but the Controller will return ID number "X" for the 17th and later Tags if the max. number of Tags (16) was exceeded.
Results data	The result of the addition of data is sent. If overflow results, the previous data is sent.

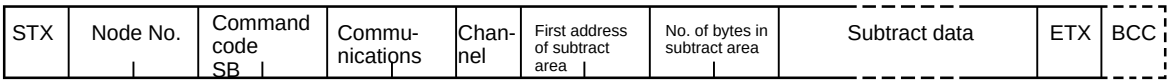
Note 1. Make sure that the AD area is within a single page, otherwise a command error will result.

2. Make sure that the specified data is within the memory capacity of the ID Tag.

5-6-4 SUBTRACT: SB

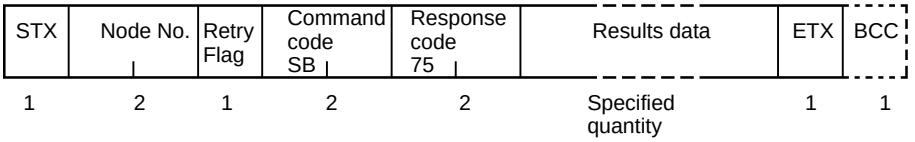
The data in the memory of the ID Tag is treated as hexadecimal data, to which SB data is subtracted.

Command Frame Structure

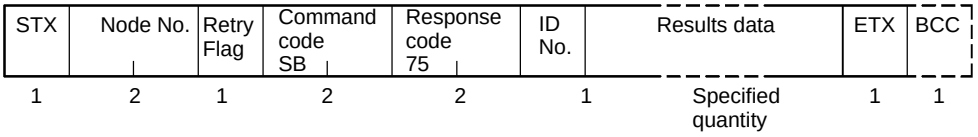


Communications	Specify the communications method with the Tag. ST: Single trigger FR: FIFO repeat SA: Single auto ME: Multi-trigger SR: Single repeat MR: Multi-repeat FT: FIFO trigger L□: Selective access FA: FIFO auto (□ = ∗ for Tag detect, ID number 0 to F for Tag specify.)
Channel	Always 1.
First address of subtract area	The first address of data to be subtracted in hexadecimal. Setting range: 00h to EFh
No. of bytes in subtract area	The number of data bytes to be subtracted in hexadecimal. Setting range: 01h to 08h
Subtract data	Data to be added to the ID Tag. The number of SB data characters is twice as large as the number of SB area bytes.

Response Frame Structure



Response Frame Structure for Selective Access Function (Excluding Detection Completed Response)



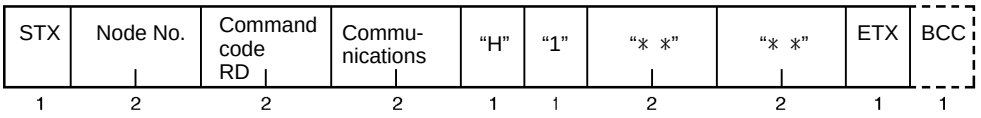
Response code	75: Normal response with a result not below 0. 76: Normal response with a result below 0. Refer to *5-12 List of Response Codes* for other response codes.
ID No.	This is the temporary ID number assigned to the Tag by the Controller for the selective access function. Normally the ID No. is between 0 and F, but the Controller will return ID number "X" for the 17th and later Tags if the max. number of Tags (16) was exceeded.
Results data	The result of the subtraction of data is sent. If the result is below 0, the previous data is sent.

Note
1. Make sure that the SB area is within a single page, otherwise a command error will result.
2. Make sure that the specified data is within the memory capacity of the ID Tag.

5-6-5 SERIAL NUMBER READ: RD

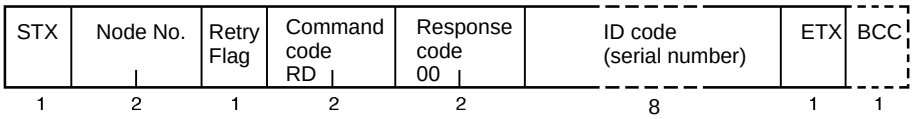
Reads the serial number written to the ID Tag in the factory.

Command Frame Structure

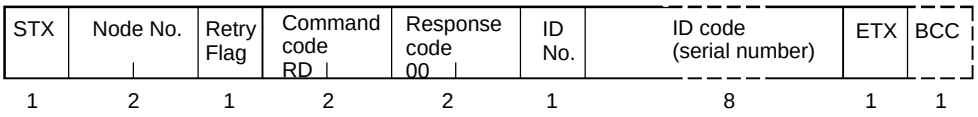


Communications	Specify the communications method with the Tag. ST: Single trigger SA: Single auto SR: Single repeat FT: FIFO trigger FA: FIFO auto FR: FIFO repeat ME: Multi-trigger MR: Multi-repeat L□: Selective access (□ = ∗ for Tag detect, ID number 0 to F for Tag specify.) QT: Quick Trigger QA: Quick Auto QA: Quick Repeat

Response Frame Structure



Response Frame Structure for Selective Access Function (Excluding Detection Completed Response)

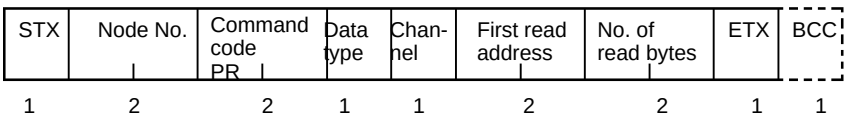


Note
1. The Tag's serial number cannot be overwritten.
2. The data type must be set to hexadecimal (H). A command error will occur if ASCII data is specified.

5-6-6 POLLING AUTOREAD: PR

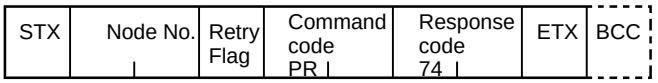
When the host sends POLLING AUTOREAD command to the Controller, the Controller immediately returns a response to the host indicating the acceptance of the command. Then the Controller waits for the approaching ID Tag and reads the data of the ID Tag when the ID Tag is in the communications area of the Antenna. When the Tag is in the communications area, the host can use a POLLING subcommand to check the results of the processing of the command.

Command Frame Structure



Data type	Specify whether the data read from the Tag is ASCII or Hex. A: ASCII code H: HEX code
Channel	Always 1.
First read address	Specify in Hex the first address of the data to be read from the Tag. Setting range: 00h to EFh
No. of read bytes	Specify in Hex the number of bytes of data to be read from the Tag. Setting range: 01h to F0h (reading ASCII data) 01h to 80h (reading Hex data)

Response Frame Structure



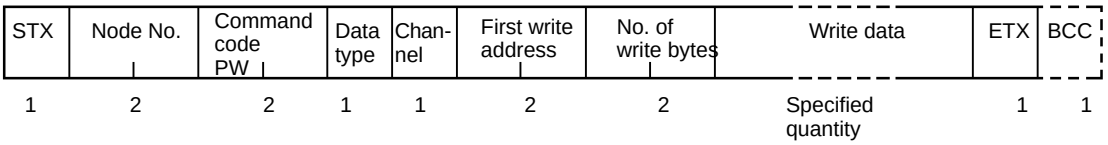
Response code	74: Command received. Refer to *5-12 List of Response Codes* for other response codes.

Note Make sure that the specified data is within the memory capacity of the ID Tag.

5-6-7 POLLING AUTOWRITE: PW

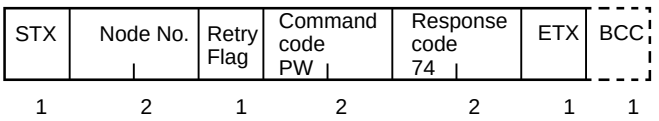
When the host sends POLLING AUTOWRITE command to the Controller, the Controller immediately returns a response to the host indicating the acceptance of the command. Then the Controller waits for the approaching ID Tag and writes data to the ID Tag. When the Tag is in the communications area, the host can use a POLLING subcommand to check the results of the processing of the command.

Command Frame Structure



Data type	Specify whether the data written to the Tag is ASCII or Hex. A: ASCII code H: HEX code
Channel	Always 1.
First write address	Specify in Hex the first address to which data is to be written to the Tag. Setting range: 00h to EFh
No. of write bytes	Specify in Hex the number of bytes to be written to the Tag. Setting range: 01h to F0h (writing ASCII) 01h to 80h (writing Hex)
Write data	Data written to the ID Tag, which consists of the following characters. ASCII code: Number of bytes to be written HEX code: Number of bytes to be written x 2

Response Frame Structure



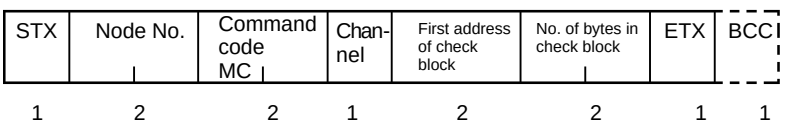
Response code	74: Command received. Refer to *5-12 List of Response Codes* for other response codes.

Note Make sure that the specified data is within the memory capacity of the ID Tag.

5-6-8 MEMORY CHECK: MC

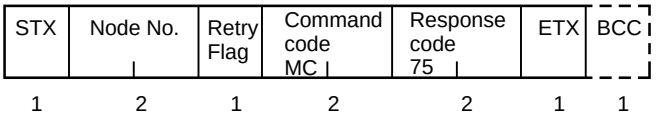
This command uses the generating polynomial $X^{16} + X^{12} + X^5 + 1$ to calculate the check block designated by the user and to compare the results with the check code attached to the check block.

Command Frame Structure



Channel	Always 1.
First address of check block	Specify in Hex the first address of the check block. Setting range: □0h to □5h or □8h to □Dh, provided that □ is between 0 and E.
No. of bytes in check block	Specify in Hex the number of bytes in the check block. Setting range: 03h to F0h

Response Frame Structure



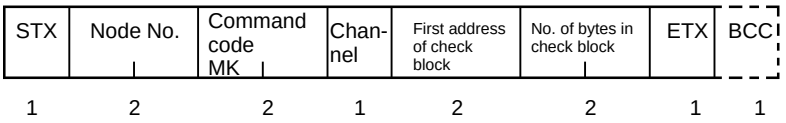
Response code	75: The comparison results are correct. 76: The comparison results are not correct. Refer to *5-12 List of Response Codes* for other response codes.

Note Make sure that the specified data is within the memory capacity of the ID Tag.

5-6-9 MEMORY CALCULATE: MK

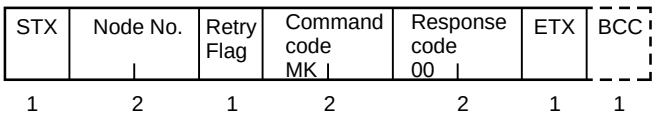
This command uses the generating polynomial $X^{16} + X^{12} + X^5 + 1$ to calculate the check block designated by the user and to write the check code to the last three bytes of the check block.

Command Frame Structure



Channel	Always 1.
First address of check block	Specify in Hex the first address of the check block. Setting range: □0h to □5h or □8h to □Dh, provided that □ is between 0 and E.
No. of bytes in check block	Specify in Hex the number of bytes in the check block. Setting range: 03h to F0h

Response Frame Structure



Response code	00: Normal end Refer to *5-12 List of Response Codes* for other response codes.

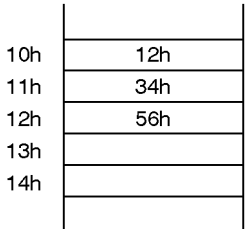
Note
1. Do not specify both “set” and “clear” for the same page. When both “set” and “clear” are specified for the same page, the “set” will be executed.
2. Do not set “1” for “Fixed to 0.” Setting “1” will result in a command error.
3. Make sure that the specified data is within the memory capacity of the ID Tag.

Memory Check Function Example

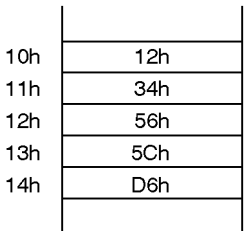
In the following example, the data in addresses 10h to 12h is checked.

1, 2, 3...

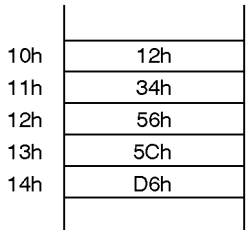
1. In this example, the following data already exists in the memory of the ID Tag.



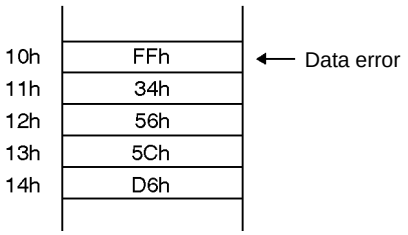
2. Execute MK11005 (the MEMORY CALCULATE command). The CRC code 5CD6 calculated from the data 123456 is written to addresses 13h and 14h.



3. Execute MC11005 (the MEMORY CHECK command). The normal response MC75 will be returned if the data coincides.



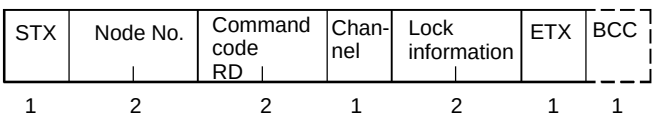
4. If the data does not coincide, MC76 (a data error warning) will be returned.



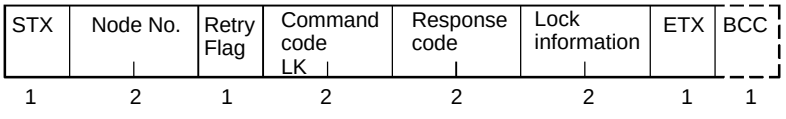
5-6-10 LOCK: LK

Locks access to pages 1 to 6 individually. The data in locked pages cannot be overwritten.

Command Frame Structure



Response Frame Structure



Channel	Always 1.
Lock information	Set the corresponding bits in the following diagram to 1 to lock the corresponding pages. If all of the bits in the lock information byte are set to 0, the LOCK command will read the lock information that has been set for the ID Tag.

Lock Information

The following table shows the configuration of the “lock information” that contains the lock bits for pages 1 through 6. Bits 2 through 7 are the lock bits for pages 1 through 6. Bits 0 and 1 are always 0.

Consider the 8 bits of lock information as binary data and convert that binary data to two hexadecimal digits when setting or reading the lock information.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Page 6	Page 5	Page 4	Page 3	Page 2	Page 1	Always 0.	Always 0.

Precautions

Once a page has been locked, it cannot be released.

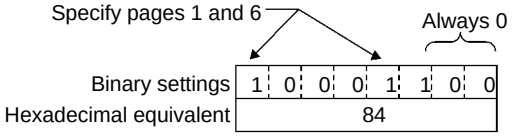
Do not set “1” for a bit listed as “Always 0.” A command error will occur if one of these bits is set to 1.

Example 1: Setting Locks

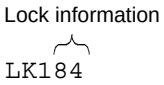
This example shows the command and response formats when locking pages 1 and 6 in an ID Tag that already has page 2 locked.

1, 2, 3...

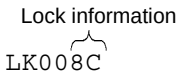
1. The following diagram shows the lock information settings that lock pages 1 and 6.

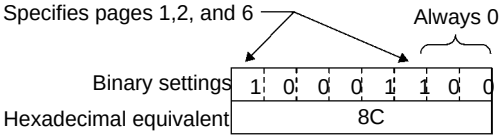


2. The required lock information setting is 84, so the following command will be sent from the host device. (This is the main part of the command and does not include the STX, ETX, BCC, and node number.)



3. Pages 1, 2, and 6 are locked in this example, so the following response is returned. (This is the main part of the response and does not include the STX, ETX, BCC, node number, or retry flag.)



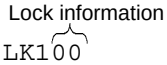


Example 2: Checking Lock Settings

The current lock settings can be checked by executing the LOCK command with the lock information set to all zeroes.

1, 2, 3...

1. The following diagram shows the command format when just checking the lock settings. (This is the main part of the command and does not include the STX, ETX, BCC, and node number.)



2. Pages 1, 2, and 6 are locked in this example, so the following response is returned. (This is the main part of the response and does not include the STX, ETX, BCC, node number, or retry flag.)

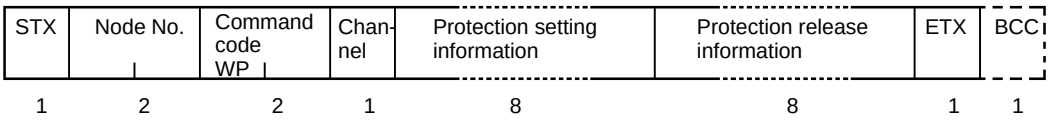
Lock information

LK008C

5-6-11 WRITE PROTECT: WP

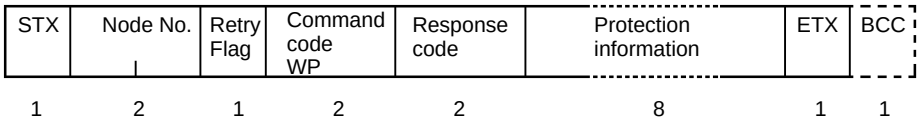
Sets and releases write protection by page.

Command Frame Structure



Channel	Always 1.
Protection setting information	Set the corresponding bits in the following diagram to 1 to write-protect pages.
Protection release information	Set the corresponding bits in the following diagram to 1 to release write protection of pages.

Response Frame Structure



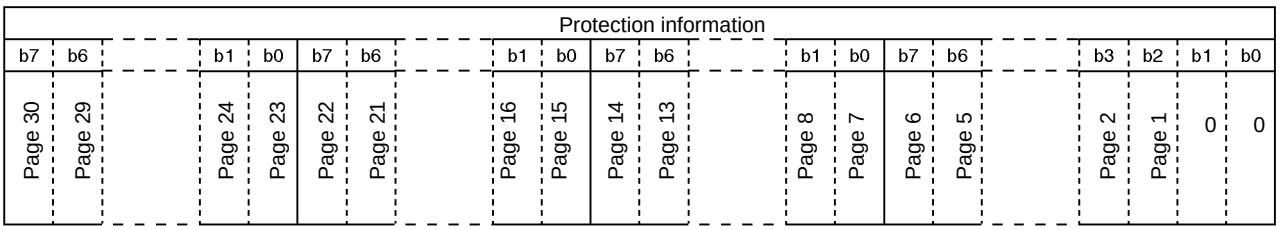
Protection information	Write-protect data set in the ID Tag is returned.

Protect Data

The protect data item on each page is expressed by single-bit data. Protect data items are arranged in decreasing numerical order beginning with those on page 30. There are protect data items on two zero-fixed pages after the protect data item on page 1.

Three 32-bit data items are considered to be binary data, the hexadecimal conversion of which is used as protect data.

The V700-D13P□□, however, uses the data items on page 1 through 14 only. The data on any other page can be set or released, which has, however, nothing to do with the operation of the V70-D13P□□.



Note

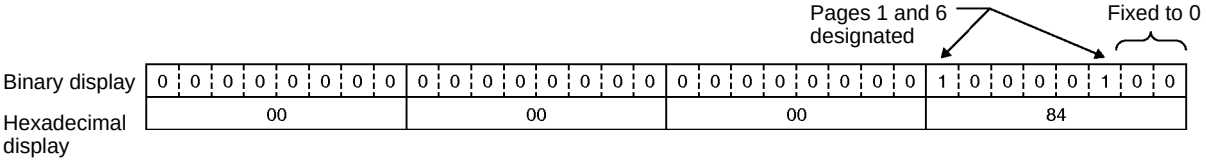
1. Do not set the write protection and the release of write protection together on the same page. If write protection and the release of write protection are set on the same page, only the write protection setting will be enabled.
2. Do not set 1 in either of the zero-fixed pages, otherwise an error will result.

Example of Write Protection Setting and Releasing

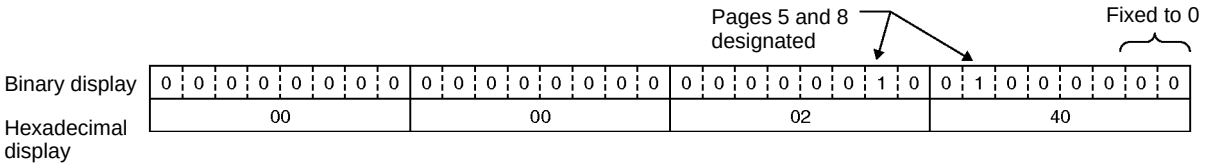
The following is an example of command execution and responses for setting write protection on pages 1 and 6 and releasing write protection on pages 5 and

8 of the ID Tag, provided that pages 2, 5, 8, and 13 the ID Tag are set to write protection.

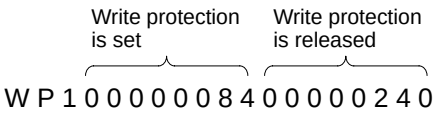
1, 2, 3... 1. The following setting is required to set the write protection on pages 1 and 6.



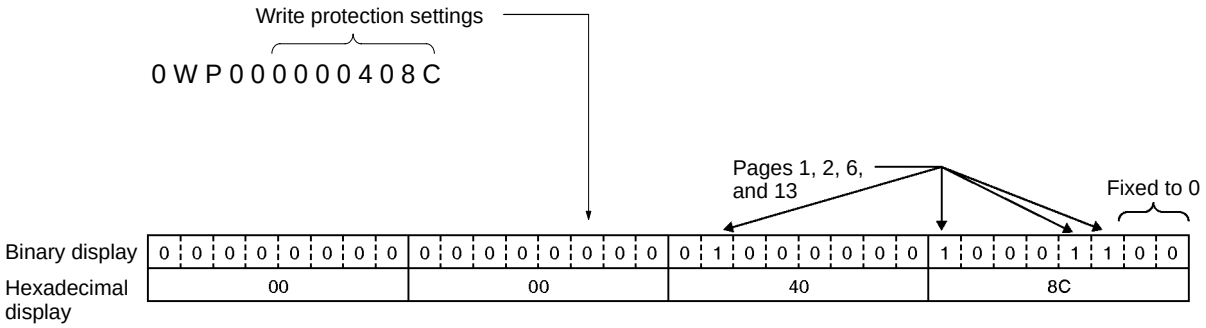
2. The following setting is required to release the write protection on pages 16 and 21.



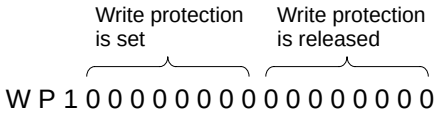
3. The following diagram shows the command (text portion shown) sent from the host.



4. Pages 1, 2, 6, and 13 are write-protected. Therefore, the following response (text portion shown) is returned.



If it is necessary to check the write protect data only, send the following command (text portion shown) without designating the data on setting or releasing write protection.

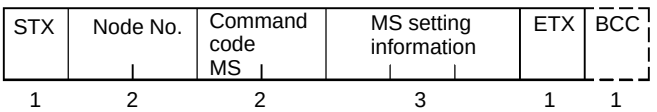


5-6-12 MASTER/SLAVE SWITCH: MS

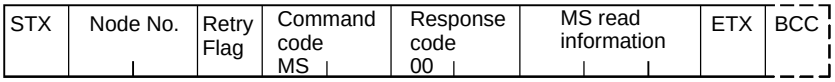
The Controller's DIP switch can be set so that the sync setting is made from the host (SW3–2 OFF, SW3–3 ON, and SW3–4 ON). When DIP switch SW3 is set this way, the MASTER/SLAVE SWITCH command can be used to switch the Controller's communications sync setting.

See *Communications Sync Setting* on page 39 for details on setting SW3.

Command Frame Structure



Response Frame Structure



MS setting information	MRW: Sets Controller as a Read/Write Master. MRO: Sets Controller as a Read-only Master. SRW: Sets Controller as a Read/Write Slave. SRO: Sets Controller as a Read-only Slave. ∗∗∗: Just reads the current controller sync setting.
MS read information	MRW: Controller is set as a Read/Write Master. MRO: Controller is set as a Read-only Master. SRW: Controller is set as a Read/Write Slave. SRO: Controller is set as a Read-only Slave. ∗∗∗: Controller sync setting has not been made yet.

Precautions

To use the MASTER/SLAVE SWITCH command, the Controller's DIP switch must be set so that the sync setting is made from the host (SW3–2 OFF, SW3–3 ON, and SW3–4 ON).

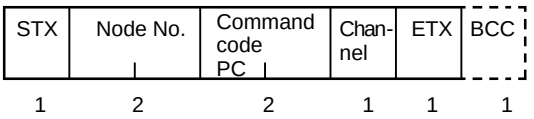
If SW3 is set so that the sync setting is made from the host, always set the Controller's sync setting from the host before beginning communications with the Tags.

5-7 Communications Subcommands

5-7-1 POLLING CHECK: PC

This subcommand is used after sending the POLLING AUTO command to check the results of the execution of the POLLING command.

Command Frame Structure

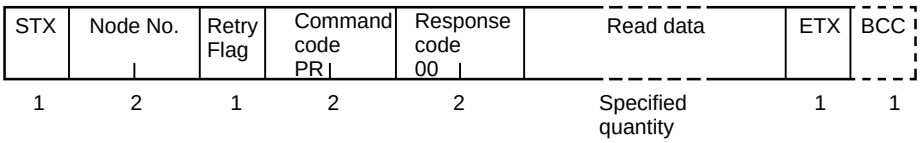


Channel	Always 1.

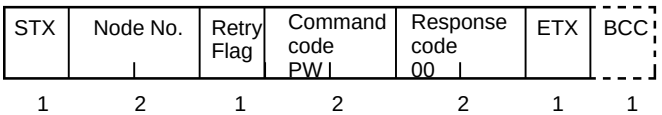
Response Frame Structure

The following frame structures are used for the response when the POLLING AUTO command is executed after the completion of communications with ID Tag and before the completion of communications with the ID Tag.

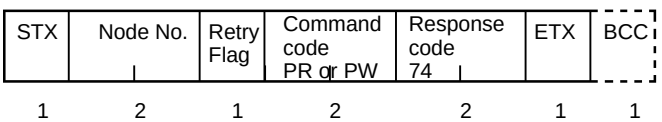
1, 2, 3... 1. POLLING AUTO



2. POLLING AUTOWRITE



3. Before Completion of Communications with ID Tag

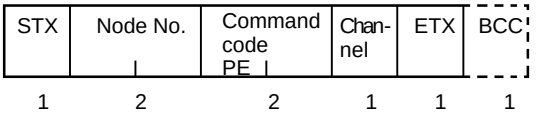


Response code	00: Normal end 74: Before completion of communications with ID Tag Refer to *5-12 List of Response Codes* for other response codes.
Read data	Data read from the ID Tag, which consists of the following characters. ASCII code: Number of bytes to be read HEX code: Number of bytes to be read x 2

5-7-2 POLLING END: PE

This subcommand is used after sending the POLLING AUTO command to cancel the execution of the POLLING AUTO command.

Command Frame Structure

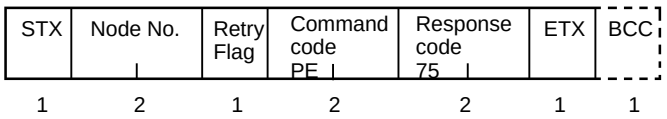


Channel	Always 1.

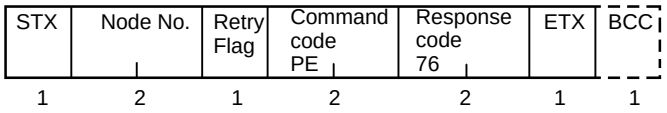
Response Frame Structure

The following frame structures are used for the response after completing communications with the ID Tag and before completing communications with the ID Tag.

1, 2, 3... 1. Before Completion of Communications with Tag



2. After Completion of Communications with Tag



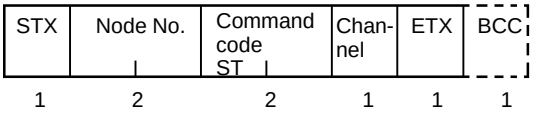
Response code	75: Before completion of communications with ID Tag 76: After completion of communications with ID Tag Refer to *5-12 List of Response Codes* for other response codes.

5-8 Control Commands

5-8-1 STOP: ST

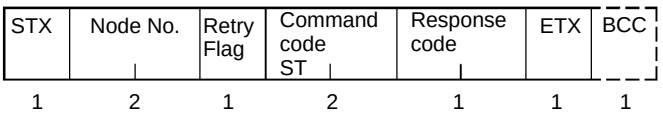
This command causes the Controller in automatic mode or repeat mode to cancel the processing of communications when this command is received by the Controller. The Controller then waits for the next command.

Command Frame Structure



Channel	Always 1.

Response Frame Structure

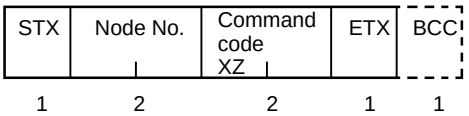


Response code	00: Normal end Refer to *5-12 List of Response Codes* for other response codes.

5-8-2 RESET: XZ

This command resets the Controller in operation. There is no response returned for this command. The Controller then waits for the next command.

Command Frame Structure



Precautions

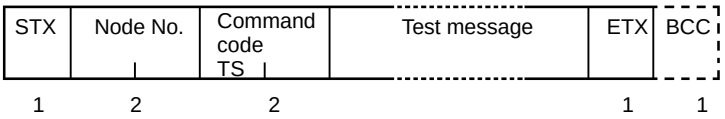
After the Controller is reset, it only takes slightly more than 20 ms for the Controller to be ready to receive the next command. After resetting the Controller, wait for approximately 100 ms to issue the next command.

5-9 Host Command

5-9-1 TEST: TS

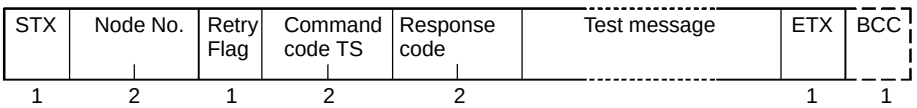
This command returns test messages sent from the host without changing anything. The test command is used for communications tests between the host and Controller.

Command Frame Structure



Test message	The number of characters within a range between 0 and 256 can be used.

Response Frame Structure



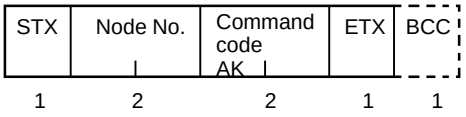
Response code	00: Normal end Refer to *5-12 List of Response Codes* for other response codes.
Test message	Returns the test message sent with the command.

5-10 Host Subcommands

5-10-1 ACK: AK

The host sends ACK to the Controller when a response from the Controller is normally received by the host. There is no response for ACK/NACK control. A command error will result if the Controller receives this command while the Controller is not awaiting ACK/NACK command.

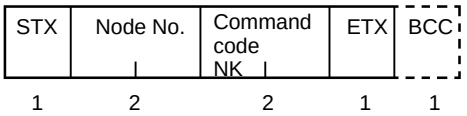
Command Frame Structure



5-10-2 NACK: NK

The host sends NACK to the Controller when a response from the Controller is not normally received by the host. When the Controller receives NACK, it will return the previous response again. The Controller will try to return it nine times. A command error will result if the Controller receives this command while the Controller is not awaiting ACK/NACK command.

Command Frame Structure

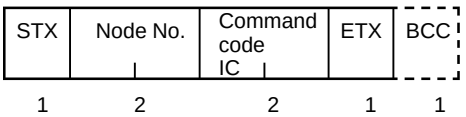


5-11 Other Commands

5-11-1 Undefined Command Response

If the Controller receives an undefined command, the Controller will return a response for the undefined command to the host.

Response Frame Structure



5-12 Response Codes

The response codes are described in the following table.

Type	Response code	Name	Meaning
Normal end	00	Normal end	No error occurred and the command ended normally.
	72	Multi-trigger end	Communications were completed with multi-trigger mode specified.
		Selective Tag detection end	Communications were completed with selective access “Tag detect” communications specified. (Tag detection completed.)
	74	Polling command received	A polling command has been received normally.
	75	Polling process canceled	The polling process was canceled before the completion of communications with the ID Tag.
		Data normal	MEMORY CHECK command (MC): The calculated check code matched the value in the check code area. ADD (AD) command: Command ended normally without an overflow in the result SUBTRACT (SB) command: Command ended normally with a result that was not less than 0.
	76	Polling process canceled	The polling process was canceled after the start of communications with the ID Tag.
		Data error	MEMORY CHECK command (MC): The calculated check code did not match the value in the check code area. ADD (AD) command: Command ended normally with an overflow in the result. SUBTRACT (SB) command: Command ended normally with a result that was less than 0.
Host communications error	10	Parity error	A parity error occurred for one of the characters in the command.
	11	Framing error	A framing error occurred for one of the characters in the command.
	12	Overrun error	An overrun error occurred for one of the characters in the command.
	13	BCC error	A received command had an incorrect BCC.
	14	Command error	The command frame structure normally received is incorrect.
	18	Frame length error	ETX was not received in 288 characters or less after STX was received.
Communications error	70	Communications error	An error occurred during communications with a Tag and communications were not completed normally.
	71	Verification error	A write process error occurred during a write.
	72	No Tag error	There was no Tag in front of the Antenna when the command was executed.
	7A	Address error	The address specification is not correct.
	7B	Not write area error	The Tag is in a read-only area.
	7C	No Antenna connected error	No Antenna is connected.
	7D	Protection error	An attempt was made to write to a write-protected area.
	7E	ID system error 1	The Tag could not process the command in its current status.
	7F	ID system error 2	The Tag does not support the command.
System error	9A	Sync error	The multiple Controllers used were not synchronized for mutual interference prevention at the time of acceptance of the command.

Precautions

If a communications error (70) or verifications error (71) occurred during a write command, it is possible that some or all of the addresses specified in the command do not contain the expected data. The data outside of the range of addresses specified in the command will not be affected.

The Controller's ERR indicator (red) will also light when the multi-trigger end response or selective Tag detection end response is sent.

5-13 Connecting Commands

The connecting command function (+) can be used to send a pair of commands to an ID Tag in one command transmission from the host.

Available Commands

The V700-CD□D-V3 supports the following 4 kinds of command combinations for use in a wide variety of applications. The following lists show which command pairings are allowed. Do not make any combinations that are not shown below.

In the following combinations, a "read command" is RD or PR; A "write command" is WT or PW. The term "ADD/SUBTRACT" means either the ADD command or SUBTRACT command.

1, 2, 3...

1. One-time Processing of Read, Write, ADD, and SUBTRACT Commands

   The following command combinations can be used to process a pair of commands (read, write, ADD, or SUBTRACT) at the same time.

   Allowed Combinations:
   Read command + Read command, Write command + Write command, Read command + Write command, Write command + Read command, ADD/SUBTRACT + ADD/SUBTRACT, Read command + ADD/SUBTRACT, Write command + ADD/SUBTRACT, ADD/SUBTRACT + Read command, ADD/SUBTRACT + Write command

   The processing regions used by the two commands must not overlap.

2. Executing WRITE PROTECT with a Write or ADD/SUBTRACT Command

   The following command combinations can be used to process a write command, ADD, or SUBTRACT at the same time as WRITE PROTECT.

   Allowed Combinations:
   Write command + WRITE PROTECT, ADD/SUBTRACT + WRITE PROTECT

3. Executing MEMORY CALCULATE with a Write or ADD/SUBTRACT Command

   The following command combinations can be used to process a write command, ADD, or SUBTRACT at the same time as MEMORY CALCULATE.

   Allowed Combinations:
   Write command + MEMORY CALCULATE, ADD/SUBTRACT + MEMORY CALCULATE

   The addresses being overwritten by a write command cannot overlap the addresses being overwritten by MEMORY CALCULATE.

4. Executing a Read Command and a MEMORY CHECK on the Data that was Read

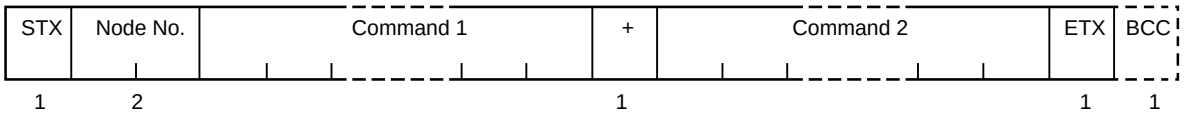
   The following command combinations can be used to process a read command and MEMORY CHECK at the same time.

   Allowed Combinations:
   Read command + MEMORY CHECK

Command and Response Frame Structure

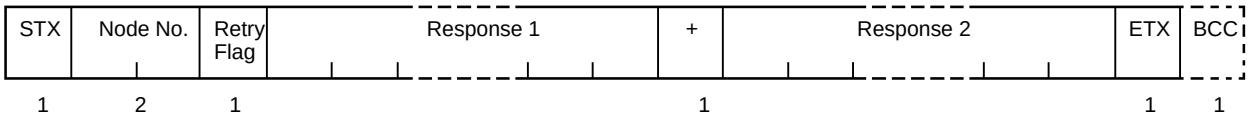
The following frame structure is used when commands are connected with "+." The STX node number, BCC, and ETX are required only once each.

Command Frame Structure

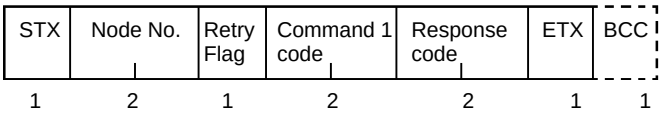


Response Frame Structure

1, 2, 3... 1. Normal End



2. Error Resulted
The command code of command 1 and the response code are sent.



Communications Specifications

When commands are connected, the communications option specified with command 1 takes precedence. The POLLING AUTOREAD and POLLING AUTOWRITE commands use the single auto option. The MEMORY CHECK, MEMORY CALCULATE, and WRITE PROTECT commands use the single trigger option.

First Address and Number of Processed Bytes

The memory area of the ID Tag specified by command 1 and that specified by command 2 for data processing must not overlap except for the following cases.

- Connection of the MEMORY CHECK command to a READ (RD or PR) command.
- Connection of MK command to WT, AD, or SB command when the addresses written by MK do not overlap the addresses written by the other command.

POLLING Process

In case command 1 is POLLING AUTOREAD or POLLING AUTOWRITE command is specified in command 1, the Controller will perform polling processing.

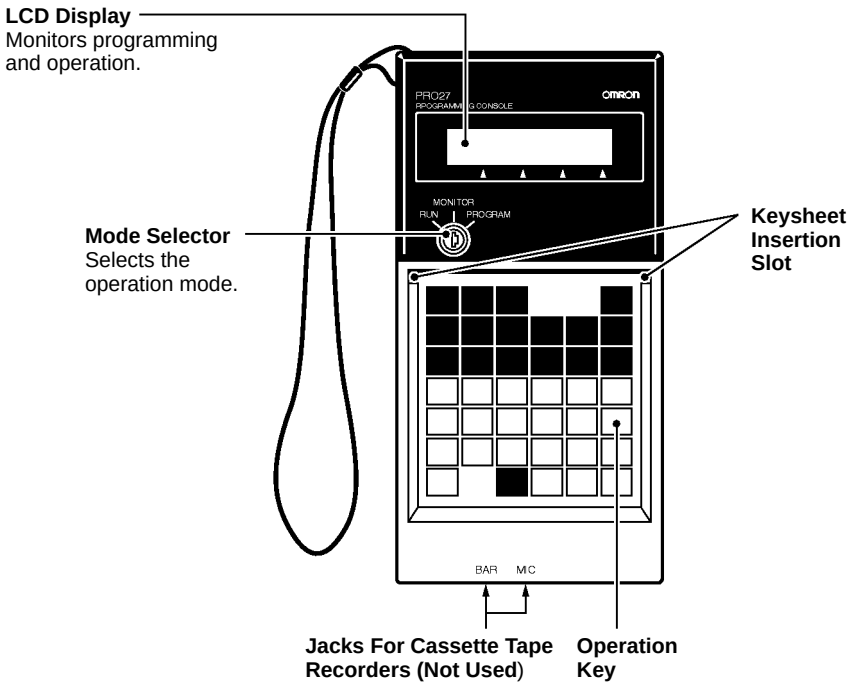
SECTION 6
Programming Console

This section provides the installation and use of the Programming Console in relation to the V700 System.

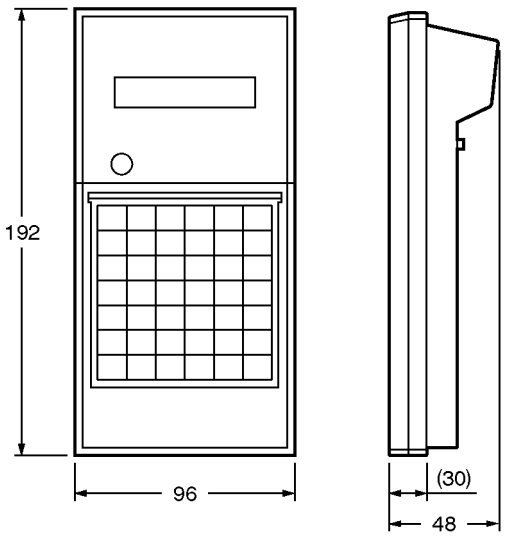
6-1 Introduction

OMRON's C200H-PRO27-E Programming Console connects to a V700-CD1D-V3 or V700-CD2D-V3 Controller through the V700-P10 Programming Console Conversion Cable, thus making it possible to test the communications between the Controller and ID Tags when starting up the system. Furthermore, the Programming Console makes it possible to check the ambient noise of a location where the Antenna is located, the read and write data of ID Tags, and the settings and error logs in the Controller. The C200H-PRO27-E Programming Console and V700-P10 Programming Console Conversion Cable are sold separately.

6-2 Nomenclature



6-3 Programming Console Dimensions

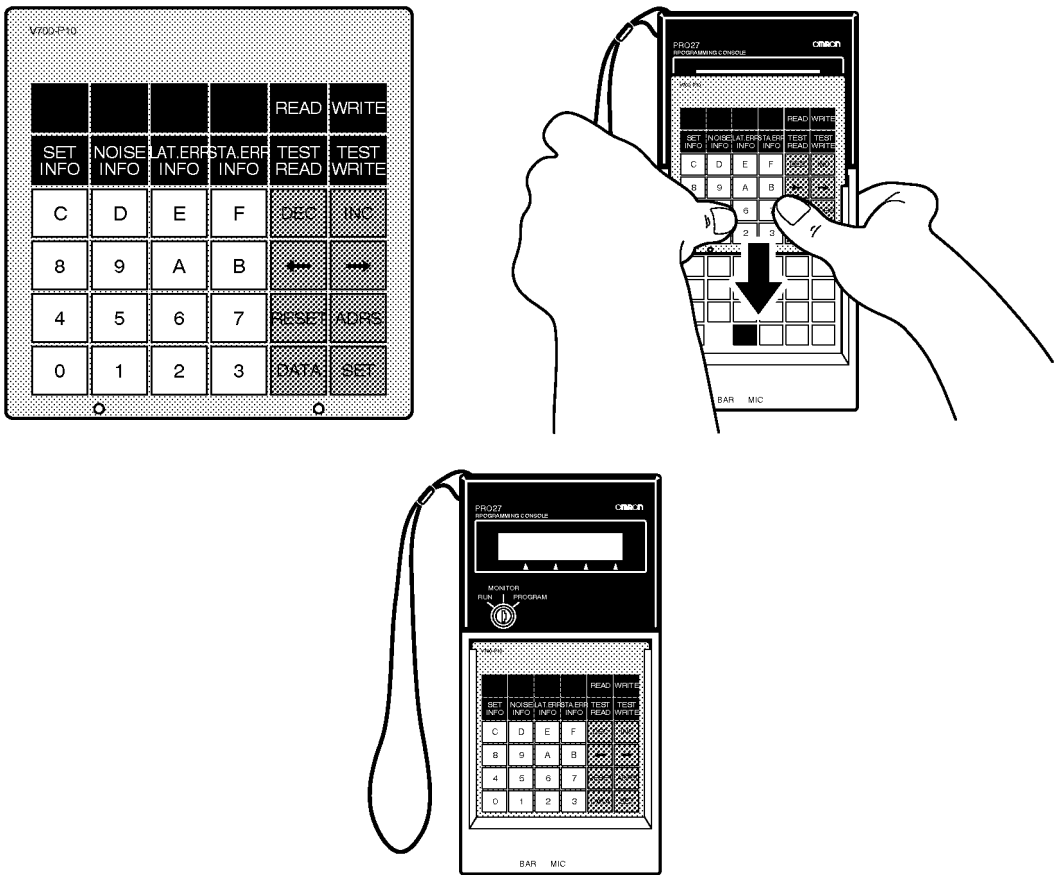


6-4 Connecting the Programming Console

The Programming Console can be connected to the Controller through the V700-P10 Programming Console Conversion Cable (sold separately). The V700-P10 is provided with a keysheet.

6-4-1 Insertion of Keysheet

As shown in the following illustration, insert the provided keysheet into the insertion slot. Then slide the keysheet downwards by pressing the keysheet with both thumbs. Continue sliding the keysheet until the small holes on the lower part of the keysheet are hidden by the bottom part of the slot of the Programming Console.



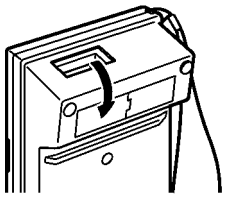
Note Be sure to insert the keysheet correctly, otherwise the keys of the Programming Console may not be pressed properly.

6-4-2 Programming Console Connection Cable

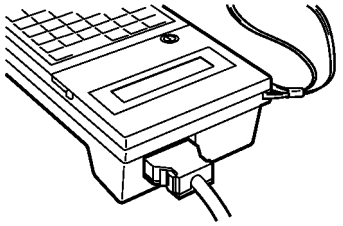
A square connector and a round connector are attached to the V700-P10 Programming Console Conversion Cable. The square connector connects to the Programming Console and the round connector connects to the Controller.

The connector can be connected or disconnected to or from the Programming Console regardless of whether power is being supplied to the Programming Console.

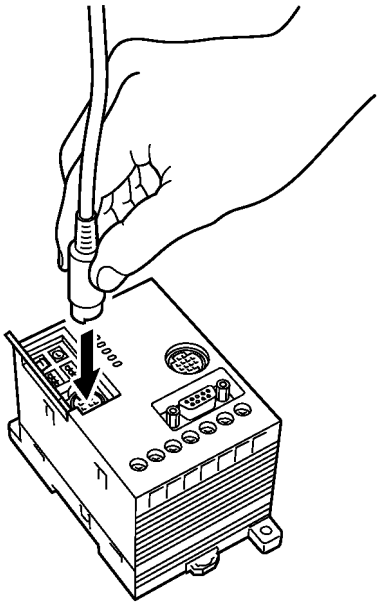
1, 2, 3... 1. Remove the rear-upper cover or rear connector cover of the Programming Console. Be careful not to misplace the removed cover.



2. Connect the square connector to the Programming Console. Press in the square connector securely until the lock lever clicks.



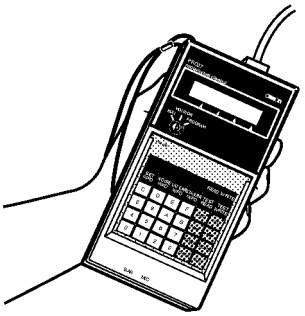
3. Open the front cover of the Controller.
4. There is an arrow mark on the round connector. Make sure that the arrow mark is faced upwards when connecting the round connector to the Programming Console port on the Controller. Press the round connector securely. This connector has no lock mechanism.



⚠ **Caution** Do not touch the wires connected to the Controller when connecting or disconnecting the connector while the Programming Console is ON, otherwise an electric shock may be received.

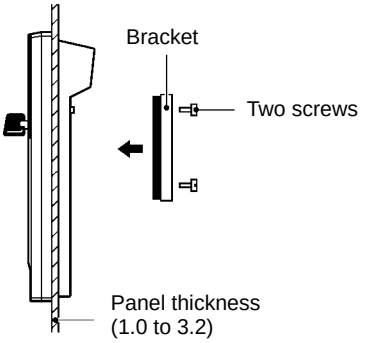
6-5 Operation

Hand-held Operation



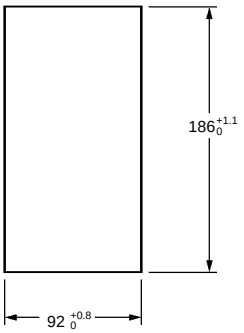
Panel Mounting

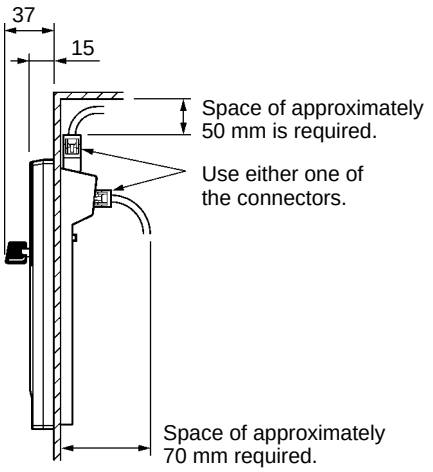
Use the C200H-ATT01 (sold separately) for the panel mounting of the Programming Console.



Mounting Dimensions

The following standard mounting dimensions conform to DIN43700.

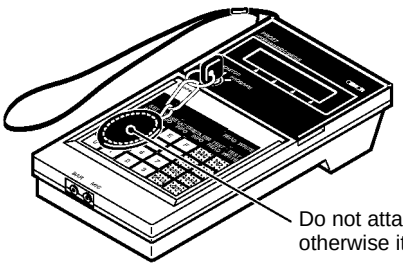




Consider the space required for the cable when mounting the Programming Console to the panel.

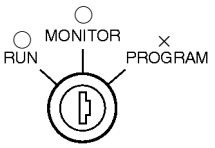
In the case of enclosed mounting, make sure that the ambient temperature is within a range between 0°C and 45°C.

Note 1. Do not attach a key ring to the mode selection key, otherwise it will be difficult to press the keys of the Programming Console.



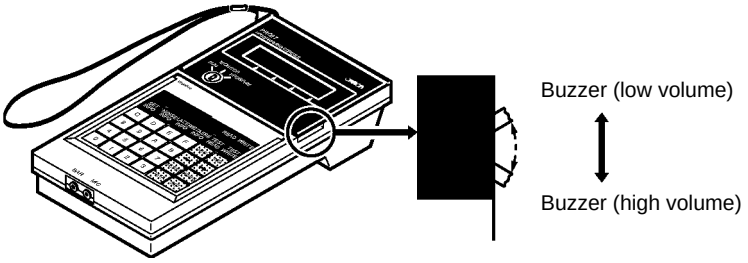
Do not attach a key ring to the mode selection key, otherwise it will be difficult to press the keys.

2. The mode selection key can be pulled out in the RUN or MONITOR position but not in the PROGRAM position.



○: Key can be pulled out.
×: Key cannot be pulled out.

3. The V700-series Controller does not operate in PROGRAM mode. Do not set the key to PROGRAM.
4. The volume of the buzzer at the time of key input can be lowered by adjusting the lever on the side of the Programming Console upwards.

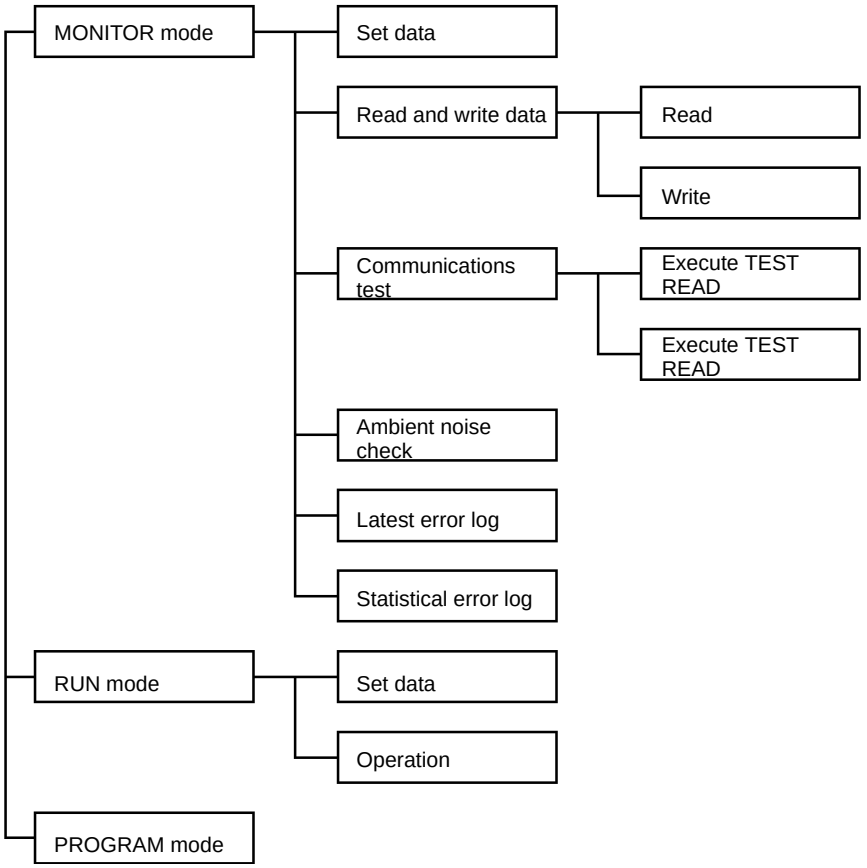


5. When disconnecting the cable from the Programming Console, press the lever on each side of the connector and pull out the connector.

6-6 Functions

The Programming Console connects to a V700-CD1D-V3 or V700-CD2D-V3 Controller, thus making it possible to test the communications between the Controller and ID Tags when starting up the system. Furthermore, the Programming Console makes it possible to check the ambient noise of the Antenna location, the read and write data of ID Tags, and the settings and error logs in the Controller.

6-6-1 Functions of the Programming Console



MONITOR Mode

- Set Data Display
  Displays data that is set with the DIP switch of the Controller.
- Read and Write Data
  Reads and writes data from and to ID Tags at a standstill in the communications area of the Antenna.
- Communications Test
  Tests communications with ID Tags moving in the communications area.
- Ambient Noise Check
  Checks the ambient noise of the Antenna location. The present, average, minimum, and maximum values of noise are displayed along with the elapsed time.
- Latest Error Log
  Displays up to 30 errors in descending order starting from the most recent one.
- Statistical Error Log
  Classifies all errors recorded after the Controller starts operating according to the response code and displays the number of each type of errors.

RUN Mode

- Set Data Display
  Displays data that is set with the DIP switch of the Controller.
- Operation Monitor
  Displays the commands and responses the Controller receives in real time.

PROGRAM Mode

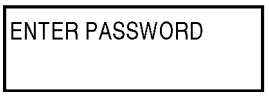
The V700-CD1D Controller does not operate in PROGRAM mode.

6-6-2 Operation Procedure

Password Input Display

The following display will appear when the Programming Console is connected. Press the RESET Key and then SET Key. Then the default state of the operation mode is displayed.

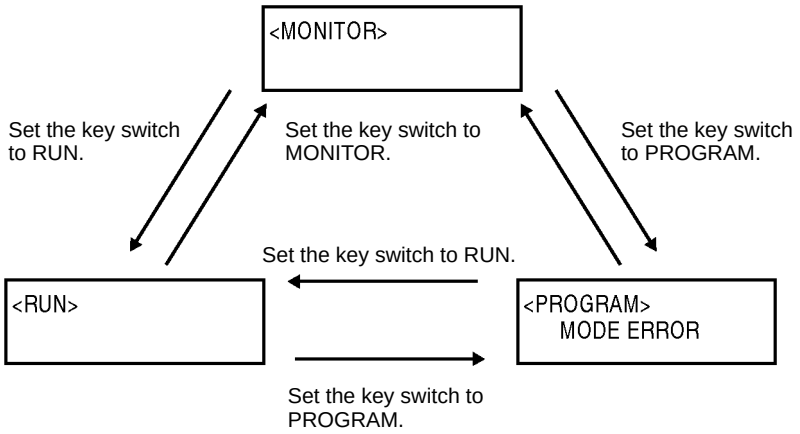
If the password is entered while the Controller is in MONITOR mode, the Controller in operation will be interrupted. In this case the Controller will wait for the next input in MONITOR mode.



Operation Mode Change

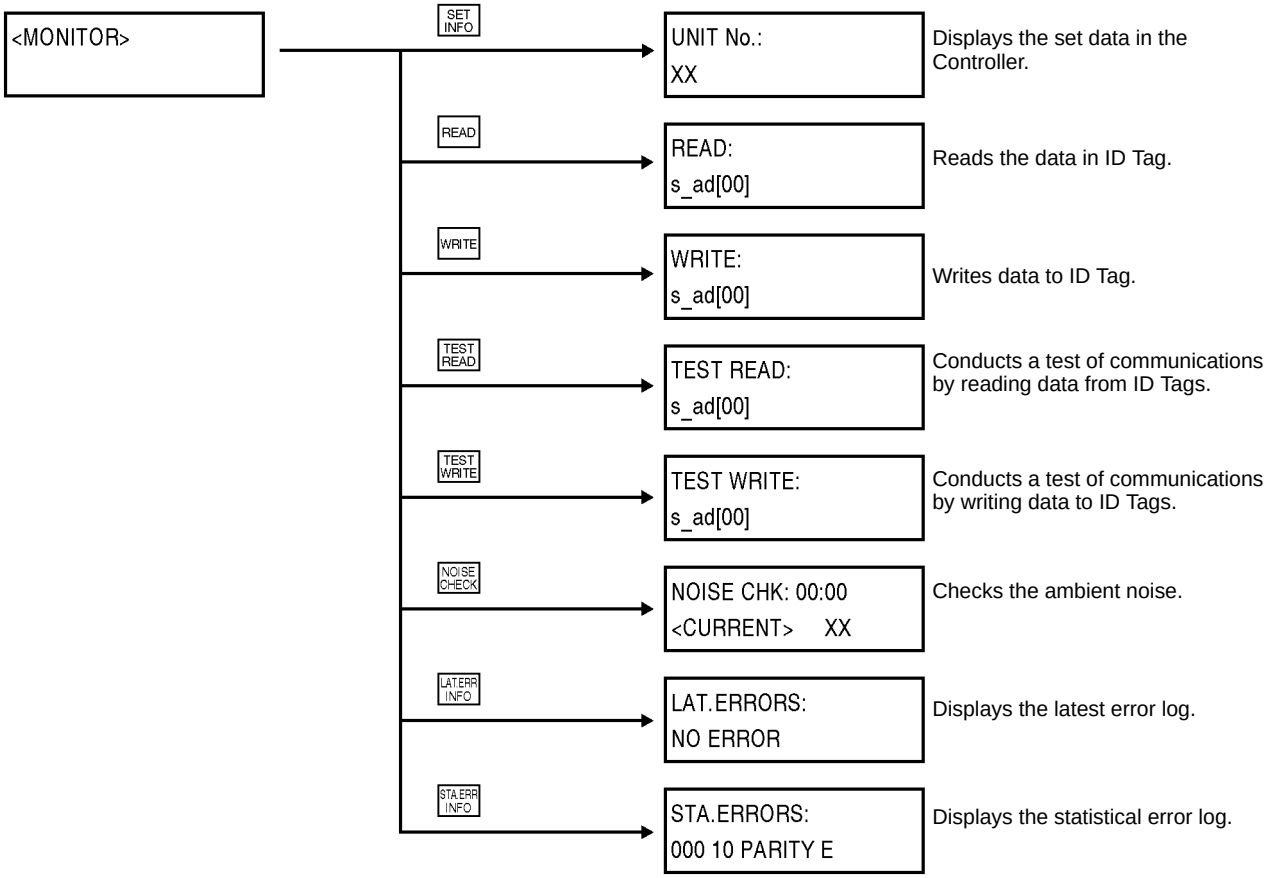
By changing the key switch setting of the Programming Console, the operating mode of the Controller will change.

- MONITOR Mode
  In MONITOR mode, communications with ID Tags are possible through the Programming Console. No command control through the host is possible.
- RUN Mode
  In RUN mode, the Programming Console can display the set data in the Controller and the operating condition of the Controller. No other functions are, however, available.
- PROGRAM Mode
  The V700-CD1D Controller does not operate in PROGRAM mode.



Key Input in Default Display of MONITOR Mode

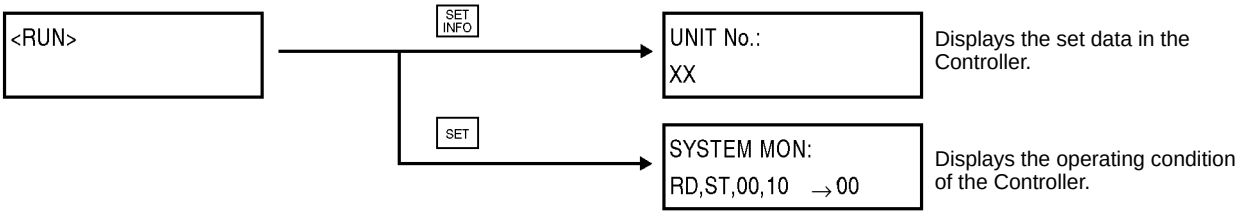
The default display in MONITOR mode appears by setting the key switch to MONITOR. The READ, WRITE, TEST READ, TEST WRITE, NOISE CHECK, LAT.ERR INFO, STA. ERR INFO, and SET INFO Keys will be available. No other keys will be available.



Note If the Controller must be kept in operation, do not input the password with the key switch set to MONITOR.

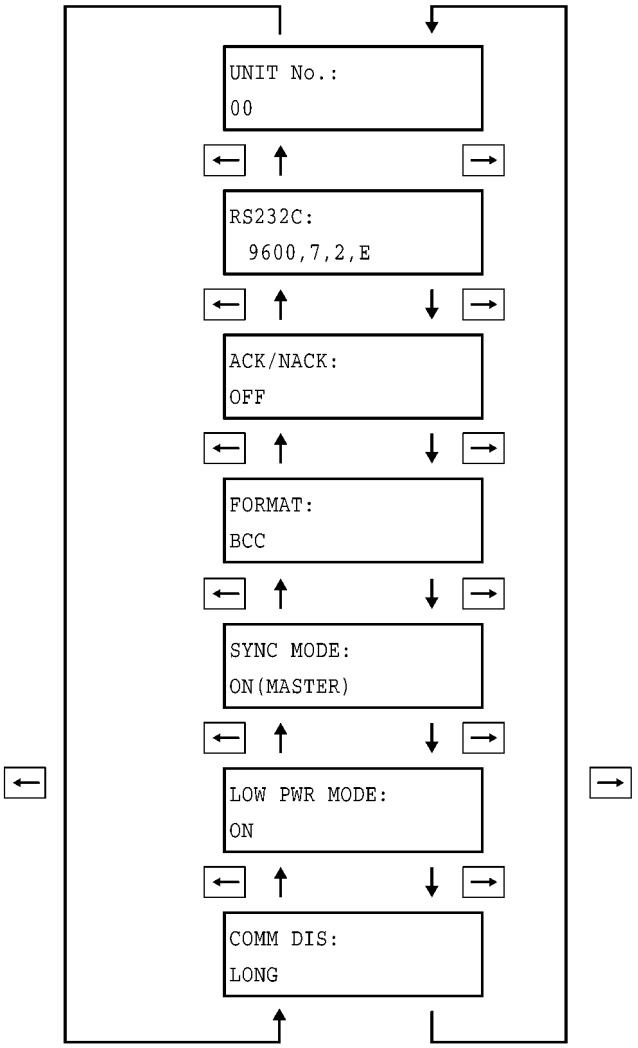
Key Input in Default Display of RUN Mode

The default display in RUN mode appears by setting the key switch to RUN. The SET INFO and SET Keys will be available. No other keys will be available.



6-6-3 Set Data Display

Data that is set with the DIP switch of the Controller is displayed item by item.



The following data items are displayed for the above.

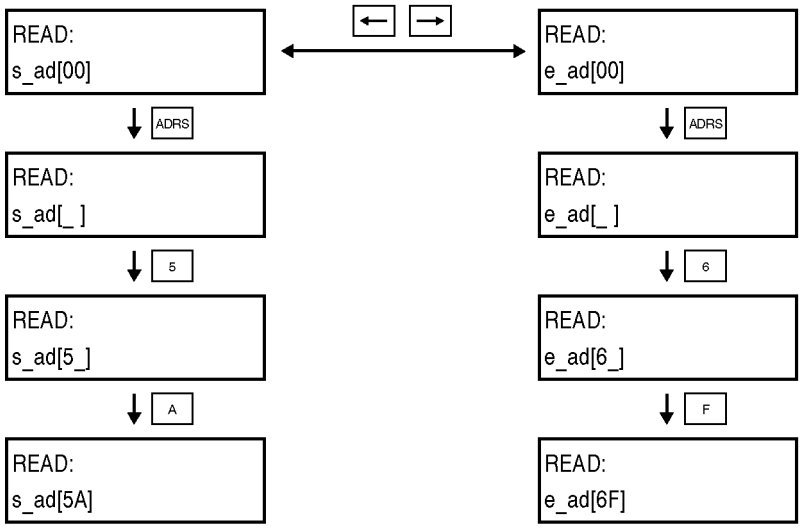
Item		Display
Node number		00 to 31
Communications format		BCC or NO BCC format
RS-232C or RS-485 settings	Baud rate	4800, 9600, 19200, 38400
	Data length	7, 8
	Stop bits	1, 2
	Parity	Even (E), odd (O), or none (N)
ACK/NACK control		OFF, ON.5s, ON.500 ms
Synchronous setting (See page 39 for details.)	Set by DIP switch	OFF, ON (Master), ON (Master RO), ON (Slave), or ON (Slave RO)
	Set from host	Undefined (UNDEF), (Master), (Master RO), (Slave), or (Slave RO)
Energy-saving setting		ON, OFF
Communications distance setting		Long (LONG) or short (SHORT) distance

6-6-4 Address Setting

Set the start address and end address to determine the area where data is to be read, written, or tests conducted.

Read Data

In the following example, the start address is set to 5Ah and the end address is set to 6Fh.



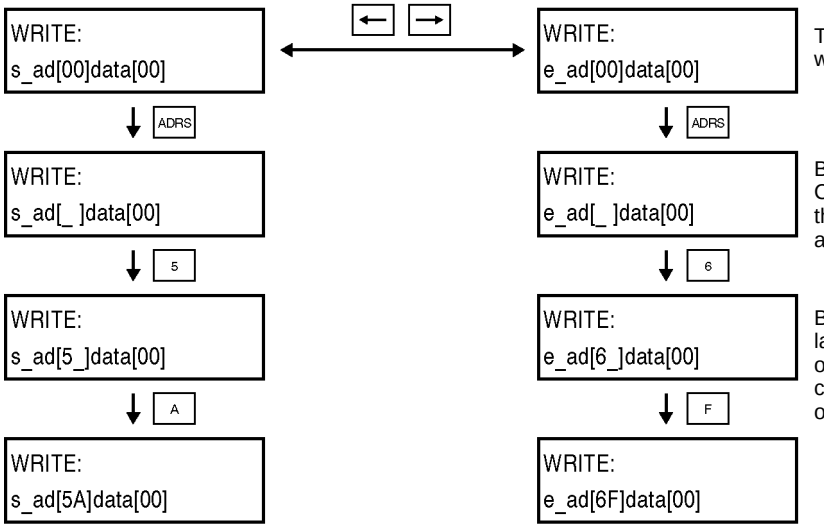
The start address and end address are selected with the Left and Right Keys.

By pressing the ADRS Key, the Programming Console is ready to accept address input. The 0 through 9 and the A through F Keys are available.

Be sure to set the end address to the same or a larger value than the value of the start address, otherwise an address error will result when communications start. An address error will also occur if an address exceeding F0h is set.

Write Data

In the following example, the start address is set to 5Ah and the end address is set to 6Fh.



The start address and end address are selected with the Left and Right Keys.

By pressing the ADRS Key, the Programming Console is ready to accept address input. The 0 through 9 and the A through F Keys are available.

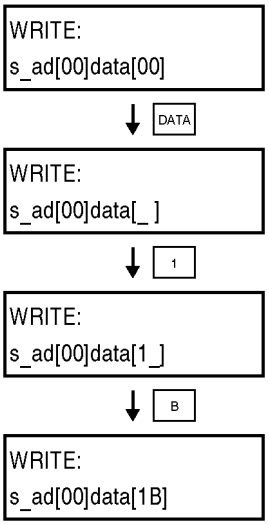
Be sure to set the end address to the same or a larger value than the value of the start address, otherwise an address error will result when communications start. An address error will also occur if an address exceeding F0h is set.

Note

1. Be sure to set the end address to the same value or larger value than that of the start address.
2. Make sure that the specified data is within the memory capacity of the ID Tag.

6-6-5 Data Setting

Set the write data in two digits within a range between 00 and FF in hexadecimal. In the following example, the data is set to 1B.

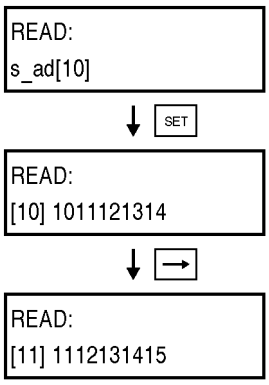


By pressing the DATA Key, the Programming Console is ready to accept address input. The 0 through 9 and the A through F Keys are available.

6-6-6 Write and Read Data

Read

The data of the desired address of the ID Tag is read and displayed.



Set the start address to 10h and the end address to 1Fh.

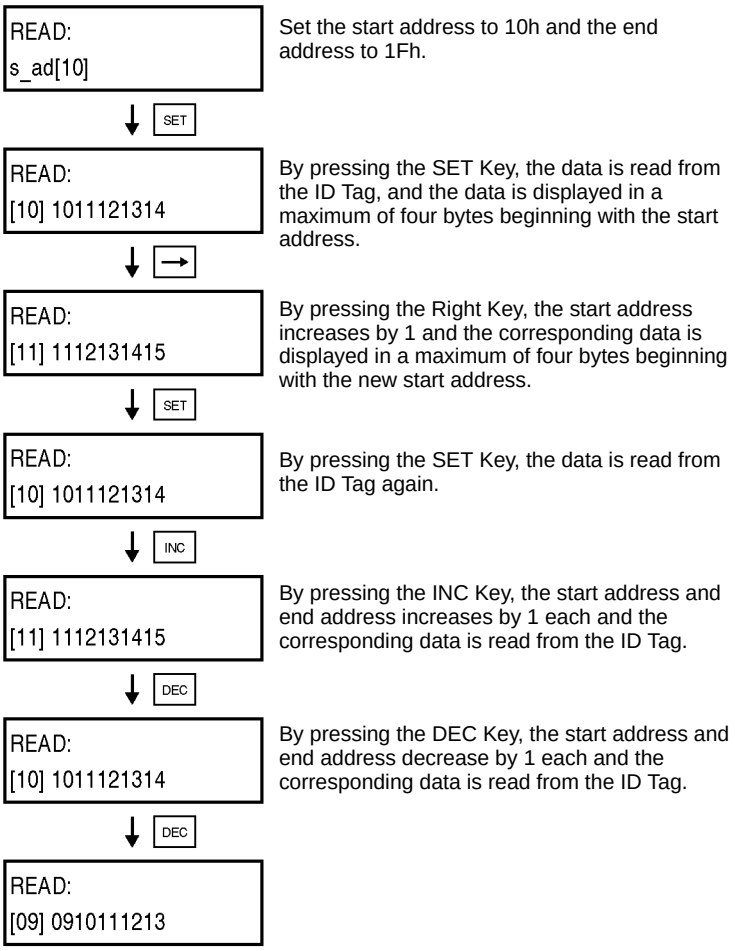
By pressing the SET Key, the data is read from the ID Tag, and the data is displayed in a maximum of four bytes beginning with the start address.

By pressing the Right Key, the start address increases by 1 and the corresponding data is displayed in a maximum of four bytes beginning with the new start address.

Note Make sure that the specified data is within the memory capacity of the ID Tag.

Read Retry

After the data is read from the ID Tag, by pressing the SET Key again, the data between the present start address and end address is read gain. By pressing the INC or DEC Key, the start address and end address increase or decrease by 1 each and the corresponding data is read.



Set the start address to 10h and the end address to 1Fh.

By pressing the SET Key, the data is read from the ID Tag, and the data is displayed in a maximum of four bytes beginning with the start address.

By pressing the Right Key, the start address increases by 1 and the corresponding data is displayed in a maximum of four bytes beginning with the new start address.

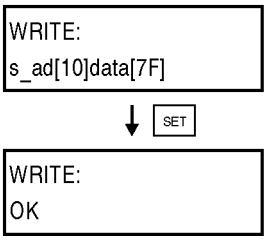
By pressing the SET Key, the data is read from the ID Tag again.

By pressing the INC Key, the start address and end address increases by 1 each and the corresponding data is read from the ID Tag.

By pressing the DEC Key, the start address and end address decrease by 1 each and the corresponding data is read from the ID Tag.

Write

Data is written to the desired address of the ID Tag. The same data is written to all the addresses in the designated area.

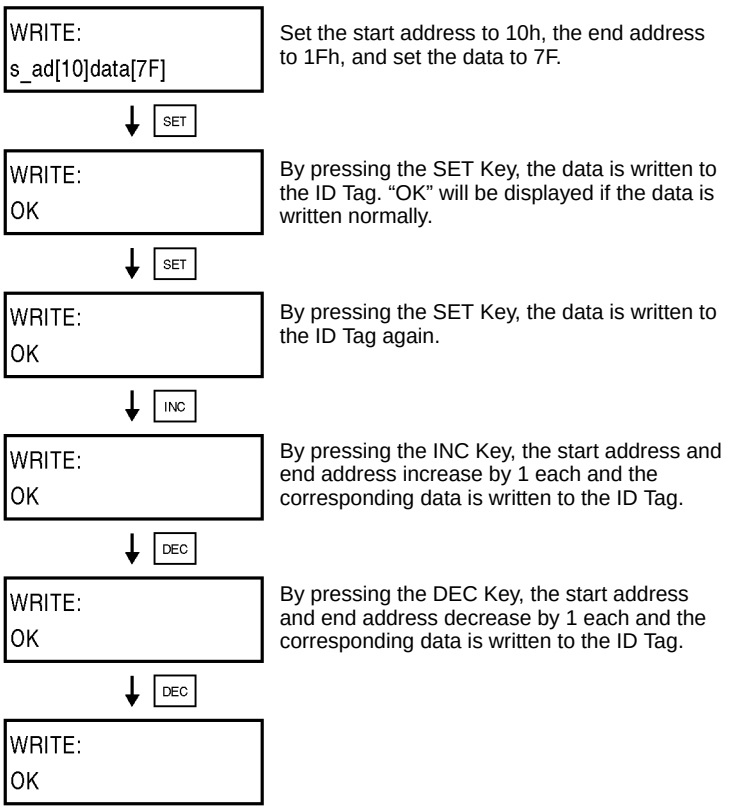


Set the start address to 10h, the end address to 1Fh, and set the data to 7F.

By pressing the SET Key, the data is written to the ID Tag. “OK” will be displayed if the data is written normally.

Write Retry

After the data is written to the ID Tag, by pressing the SET Key again, the data between the present start address and end address is written to the ID Tag again. By pressing the INC or DEC Key, the start address and end address increase or decrease by 1 each and the corresponding data is written.



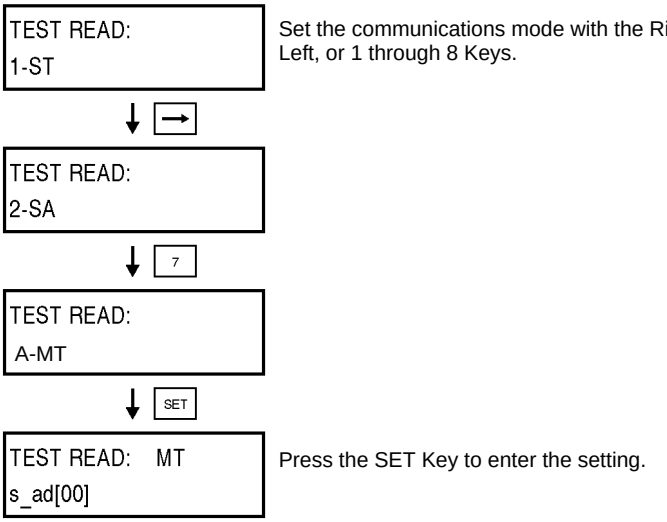
Note Make sure that the specified data is within the memory capacity of the ID Tag.

6-6-7 Test

If the testing of communications between the Antenna and ID Tag is required, use the test function so that the location of the Antenna and ID Tag and the relative speed of the ID Tag can be checked.

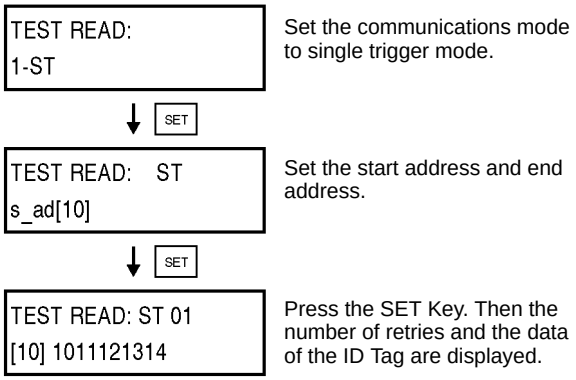
Communications Mode Setting

Before executing the TEST READ or TEST WRITE command, set the communications mode.

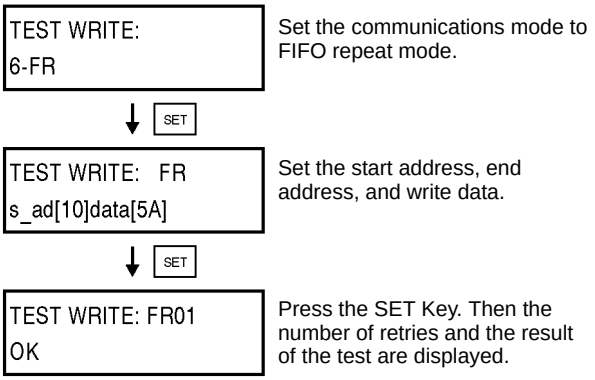


Note Settings 7–QT, 8–QA, and 9–QR are not supported by this system. (They are used for high-speed access tags.) Also, the setting A–MT represents the multi-trigger mode (ME).

Test Read

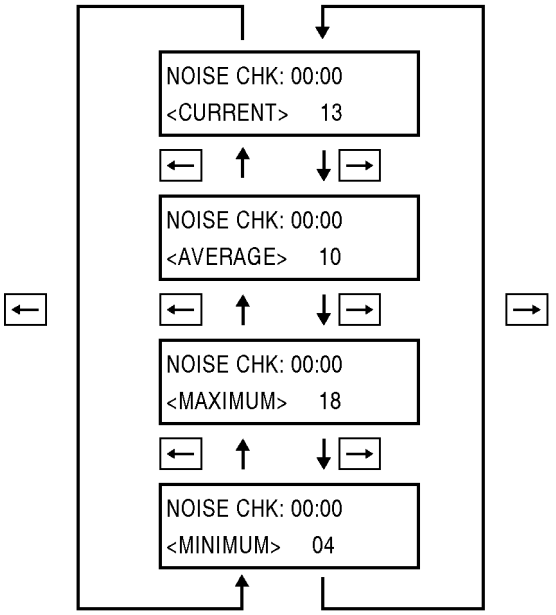


Test Write



6-6-8 Environmental Noise Check

Before the system is in full operation, the installation conditions of the Antenna and ID Tag can be set by checking the ambient noise at the Antenna location.



Displays the present noise level.

Displays the average value of noise recorded after the start of the measurement.

Displays the maximum value of noise recorded after the start of the measurement.

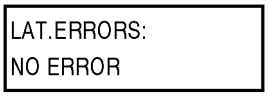
Displays the minimum value of noise recorded after the start of the measurement.

6-6-9 Reading Latest Error Log

After the Controller is turned ON, the Controller will keep a record of up to 30 errors in RUN mode if such errors result. If another error results, the Controller will keep it on record by deleting the oldest one from the record, thus always keeping the latest 30 errors.

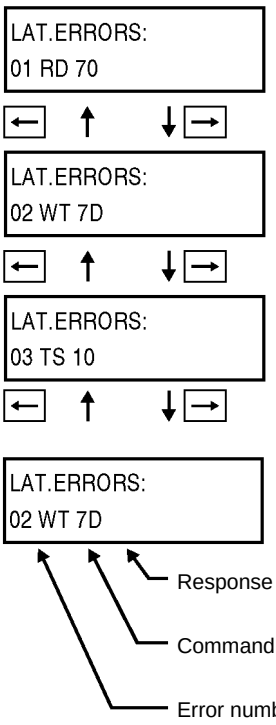
The whole record is deleted by turning OFF the Controller or resetting the Controller with RESET input.

No Error Resulting



The message “NO ERROR” will appear if there is no error.

Errors Recorded



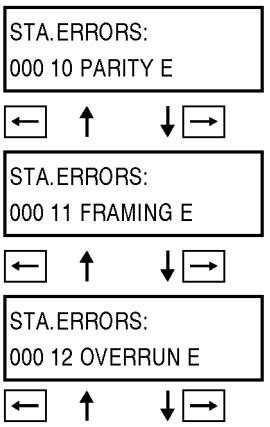
If there are errors, the errors will be read in sequence from the latest one. The error log is displayed in chronological order by pressing the Left or Right Key.

This shows the latest error log items indicating the error number, command code, and response code. For the meaning of the response code, refer to *5-12 List of Response Codes*.

Note If the error log must be kept, do not turn OFF or reset the Controller.

6-6-10 Statistical Error Log

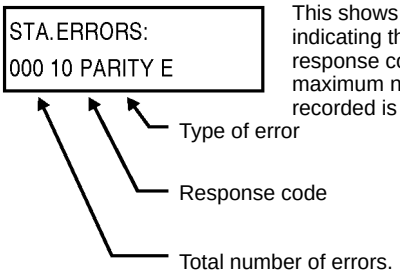
The Controller counts the number of times that each kind of error (error code) has occurred. The Controller also calculates the MCBF (mean cycle between failures) at the same time. All these data items are kept on record. The whole record is deleted by turning OFF the Controller or resetting the Controller with RESET input.



Errors are read in sequence according to the response code beginning with the ones with the smallest response code number. The error log can be scrolled by pressing the Right of Left Key.

After all error data items are displayed, the MCBF data is displayed by pressing the Right Key.

$$\text{MCBF} = \frac{\text{Total number of host commands}}{\text{Total number of errors that occurred}}$$



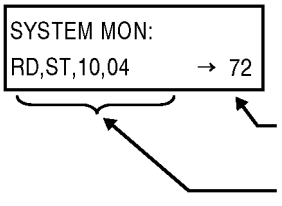
This shows the statistical error log items indicating the number of errors recorded, their response codes, and the types of errors. The maximum number of errors that can be recorded is 999.

Error code	Name	Display
10	Parity error	PARITY E
11	Framing error	FRAMING E
12	Overrun error	OVERRUN E
13	BCC error	BCC E
14	Command error	FORMAT E
18	Frame length error	FRAME E
70	Communications error	COM.DC E
71	Verification error	VERIFY E
72	No Tag error	NO DC E
7A	Address error	ADRS E
7B	Not write area error	WT AREA E
7C	No Antenna connected error	ANT E
7D	Protection error	PROTECT E
7E	ID system error 1	ID SYS1 E
7F	ID system error 2	ID SYS2 E
9A	Sync error	SYNC E

Note If you want to retain the statistical error information, do not turn OFF or reset the Controller.

6-6-11 RUN Monitor

The command received by the Controller and the results of the execution of the command can be monitored in RUN mode.



Displays the received command and the response code. The command's data is displayed in the following order: command code, communications designation, start address, and number of bytes executed.

Response code

Command received

SECTION 7
Startup and Full Operation

This section provides information on trial operation, errors and remedies, and maintenance and troubleshooting.

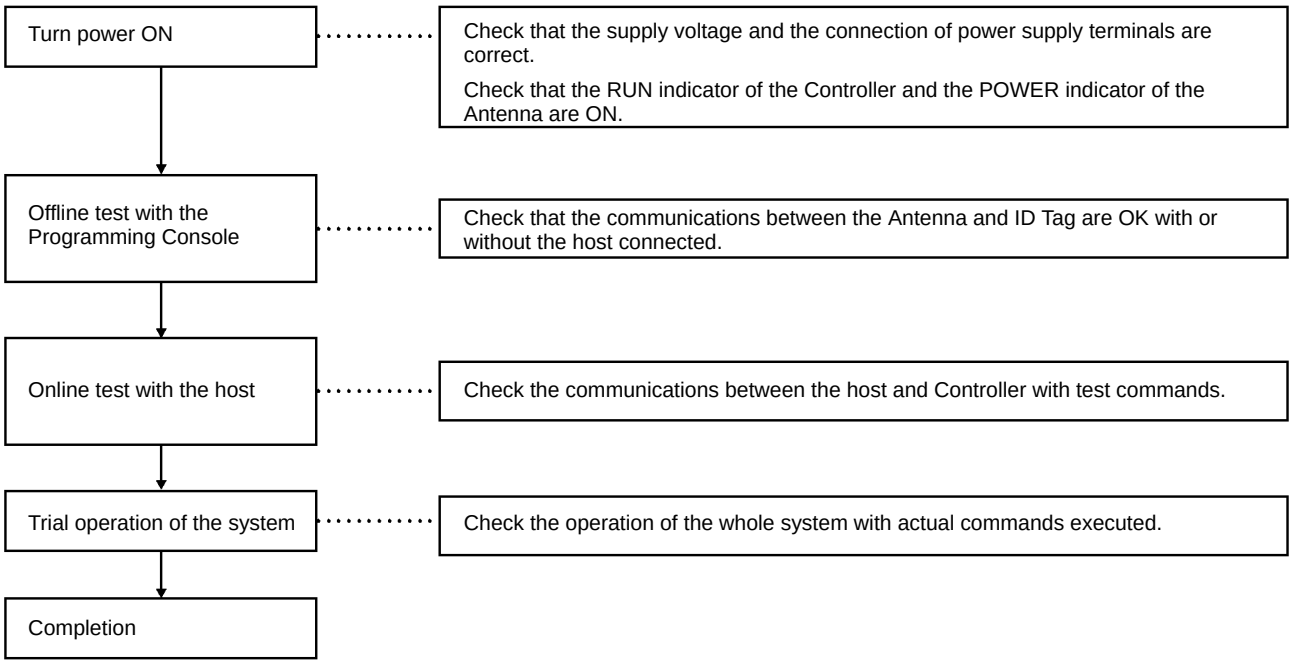
7-1 Trial Operation

Check Items

Check the following on the RD-ID System before the trial operation of the whole system.

Items	Detail	Page
Power supply and I/O lines	• Are the power supply and I/O lines properly wired? • Are all the terminal screws tightened securely?	45
DIP switch settings	• Is the node number set correctly? • Are the communications specifications set correctly? • Is the communications distance mode set correctly? • Is the energy-saving mode set correctly?	38 to 41
Antenna	Is the Antenna connected properly?	43
Host connection	Is the RS-232C or RS-485 connector connected properly?	49
Location of Antenna and ID Tag	Are the Antenna and ID Tag located properly?	Section 9

Procedure for Trial Operation



Offline Test with Programming Console

By using the Programming Console, the communications between the Antenna and ID Tag can be tested without the host connected. This test allows checking of the mounting position of the Antenna and the movement speed of the ID Tag before the trial operation of the whole system. Refer to *Section 6 Programming Console* for details.

Communications Test with Host

By using test commands, the communications between the Controller and host can be tested. This test allows the checking of the cable connection and the processing operation of communications before the trial operation of the whole system.

- Prepare a simple communications program on the host and transmit test commands.
- If the communications line is normal, the Controller returns the data received.

7-2 Self-diagnostic Function

The Controller has a self-diagnostic function to check a variety of items in order to reduce the downtime of the system that may result due to operational failures. If an error results, the details of the error may be read through the Programming Console.

Details of Errors

Errors detected by the Controller can be classified into “fatal errors” and “nonfatal errors.”

Fatal Errors

If the hardware of the Controller fails, the operation of the CPU will be interrupted and the ERROR indicator will turn ON.

Nonfatal Errors

If there is a communications error between the Controller and host or the Antenna and ID Tag, the ERROR indicator will turn ON. The Controller will keep a record of up to 30 errors in RUN mode if such errors result. If another error should result, the Controller will keep it on record by deleting the oldest one from the record, thus always keeping the most recent 30 errors. The Programming Console makes it possible to read the details of these errors and the number of times that each type of error has occurred. A synchronization error will occur and the ERR indicator will light if a Slave is using the mutual interference prevention function but its synchronization signal is not correct.

Error type	Item	Indicator			
		RUN	COMM	NORM	ERR
Normal operation	Awaiting command	ON	OFF	OFF	OFF
	Communicating with ID Tag	ON	ON	OFF	OFF
	Normal completion of communications with ID Tag	ON	OFF	ON	OFF
Fatal error	CPU error	OFF	OFF	OFF	ON
Nonfatal error	Communications error between Antenna and ID Tag	ON	OFF	OFF	ON
	Communications error between Controller and host	ON	OFF	OFF	ON (See note.)
	System error	ON	OFF	OFF	ON (See note.)
	Synchronization error (Slave)	ON	OFF	OFF	ON

Note The ERR indicator will light once when the error occurs.

7-3 Errors and Troubleshooting

The 7 main causes for operating problems in the V700 System are listed below:

- Noise interference . . . . . Take steps to reduce noise.
- Fault in an external device
- Fault in the Controller
- Fault in the Antenna
- Fault in the Cable
- Fault in the ID Tag
- Other problem

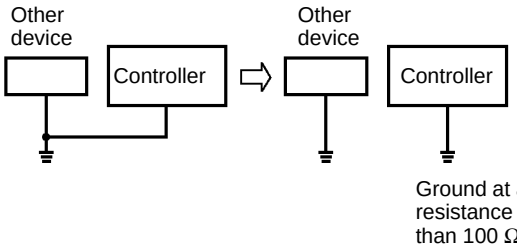
. . . . . Repair required.

7-3-1 Noise Interference

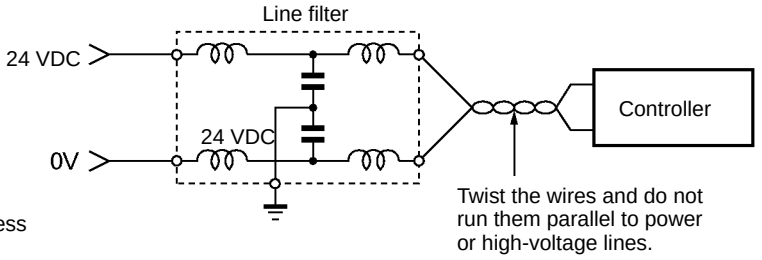
If the system is malfunctioning because of noise, refer to the following table to help identify the source and take the necessary steps to correct the problem.

Source	Likely cause	Remedy
Noise is generated when power is turned ON to a device. Sources may include high-capacity motors, transformers, and capacitors.	Momentary voltage drop in the power supply caused by inrush current to high-capacity loads.	• Increase the capacity of the power supply and/or power supply cables.
	Common mode noise caused by momentary voltage drop.	• Supply power through a 1:1 ungrounded insulating transformer. • Do not share a ground with high-capacity loads. Ground the V700 System independently to 100 Ω or less.
Noise is generated at irregular intervals.	Noise superimposed on power lines.	• Supply power through a 1:1 ungrounded insulating transformer or noise filter. • Do not share a ground with high-capacity loads. Ground the V700 System independently to 100 Ω or less.
	Ambient noise radiated in room.	• If the system is operating without synchronization between Antennas and there are Antennas less than 20 m apart, use synchronization to eliminate interference.
		If a noise source such as one of the following is in the vicinity, separate it from the Antenna by at least 1 m. (See note 2.) • Computer, AC adapter for a computer, switching power supply, Programmable Terminal, Proximity Switch

Improve Grounding



Reduce Noise on Power Line



Note
1. The environmental noise measurement function can be used to check for the presence of ambient noise.
2. The recommended separation of 1 m between the Antenna and radiating noise sources is an approximate value. Use the environmental noise measurement function to check whether a greater separation is required for the actual noise source.

7-3-2 Error Lists

The details of the following errors are recorded in the Controller. The error codes and error messages can be read through the Programming Console.

Communications Error between Controller and Host

Response code	Name	Likely cause
10	Parity error	• There is a mistake in the settings for communications between the host and Controller (baud rate or communications format). • There is a problem with the RS-232C or RS-485 wiring. (Check termination and ambient noise.)
11	Framing error	
12	Overrun error	
13	BCC error	• There is a problem with the BCC calculation method. • There is a problem with the RS-232C or RS-485 wiring. (Check termination and ambient noise.)
14	Format error	• The command frame was incorrect. (Illegal character, incorrect location of STX/ETX, etc.)
18	Frame length error	• The command could not be sent. (The conditions required for execution of the command were not met.)

Communications Error between Controller and ID Tag

Response code	Name	Meaning
70	Communications error	• The distance between the Antenna and ID Tag is incorrect or the ID Tag's speed is incorrect. • The FG or power supply wiring is incorrect (ambient noise). • There is too much noise around the Antenna. (Ground or shield the noisy device or change the Antenna location.)
71	Verification error	The ID Tag has reached its life expectancy (100,000 write operations).
72	No Tag error	The distance between the Antenna and ID Tag is incorrect.
7A	Address error	• The command's address and number of bytes settings are incorrect. • The specified address range exceeds the memory area of the ID Tag.
7B	Not write area error	The distance between the Antenna and ID Tag was incorrect when the write command was executed.
7C	No Antenna connected error	No Antenna is connected or the Antenna is connected incorrectly.
7D	Protection error	• An attempt was made to write to a write-protected page. • The command's address and number of bytes settings are incorrect.
7E	ID system error 1	• The environmental conditions are not within the Tag's specifications. (ID Tag damaged.) • The ID Tag being used does not support the operation.
7F	ID system error 2	

7-4 Maintenance and Inspection

The V700 Series must be inspected on a daily or regular basis so that the functions of the V700 Series can be used in good condition.

The V700 Series consists of semiconductors that last almost indefinitely. The following malfunctions may, however, result due to the operating environment and conditions.

1, 2, 3...

1. Element deterioration due to overvoltage or overcurrent.
2. Element deterioration due to continuous stress caused by high ambient temperature.
3. Connector contact faults or insulation deterioration due to humidity and dust.
4. Connector contact faults or element corrosion due to corrosive gas.

Inspection Items

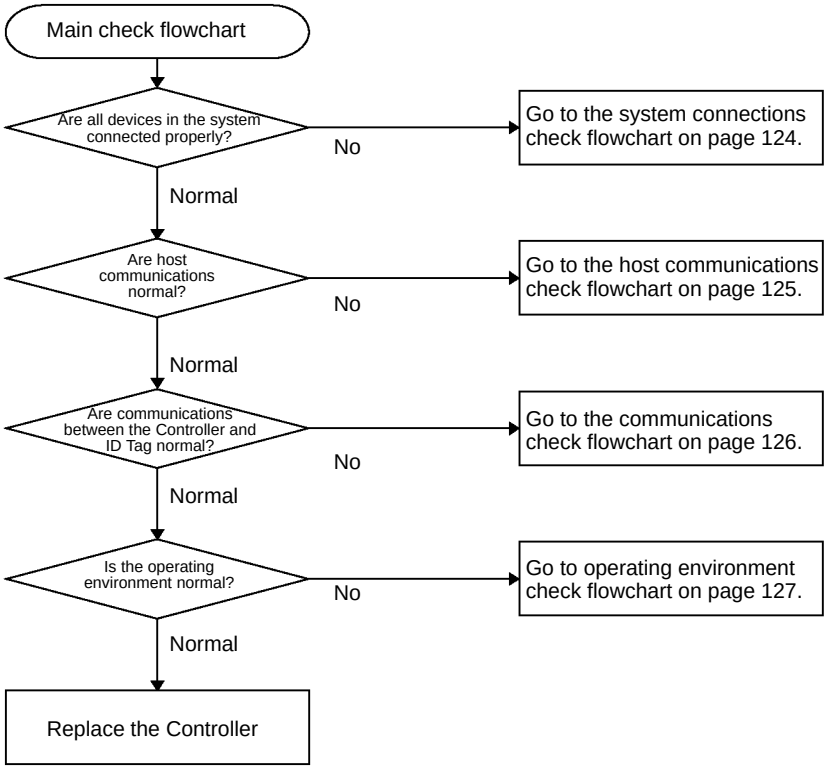
Item	Detail	Criteria	Remarks
Supply voltage fluctuation	Check that the supply voltage fluctuation at the power supply terminal block is within the permissible range.	Supply voltage rating	Multimeter
	Check that there is no frequent instantaneous power failures or radical voltage drops.	Within permissible voltage fluctuation range	Power supply analyzer
Environment (1) Ambient temperature (2) Ambient humidity (3) Vibration and shock (4) Dust (5) Corrosive gas	(1) and (2) Check that the ambient temperature and humidity are within the specified ranges. (3) Check that no vibration or shock is transmitted from any machines. (4) Check that the system is free of dust accumulation. (5) Check that no metal part of the system is discolored or corroded.	(1), (2) and (3) The ambient temperature, humidity, vibration, and shock must be within the specified ranges. (4) The system must be free of dust accumulation. (5) The environment must be free of corrosive gas.	Maximum and minimum thermometer Hygrometer
Panel condition (1) Ventilation (2) Packing for any enclosed construction	(1) Check that the system is ventilated properly with natural ventilation, forced ventilation, or cooling air. (2) Check that the packing is properly attached with no damage.	(1) The interior temperature must be within a range between –10°C and 55°C with proper ventilation. (2) The packing has no damage.	---
I/O power supply (1) Voltage fluctuation (2) Ripple	Check on the I/O terminal block that the voltage fluctuation and ripple are within the permissible ranges.	The voltage fluctuation and ripple must be within the permissible ranges.	Multimeter Oscilloscope
Mounting condition	Check that each device is securely mounted.	There must be no loose screws.	---
	Check that each connector is securely connected.	Each connector is locked or securely tightened with screws	---
	Check that no screw of the terminal block is loosened.	There must be no loose screws.	---
	Check that no wire is broken or nearly broken.	There must be no wire that is broken or nearly broken.	---
	Check that the distance between the ID Tag and Antenna is within the specified range.	The distance between the ID Tag and Antenna must be within the specified range.	---
	Check that the GR terminal is grounded to a resistance of 100 Ω or less.	The ground must be within specifications.	---
Error logging	Check the details of error logs.	---	---

7-5 Troubleshooting

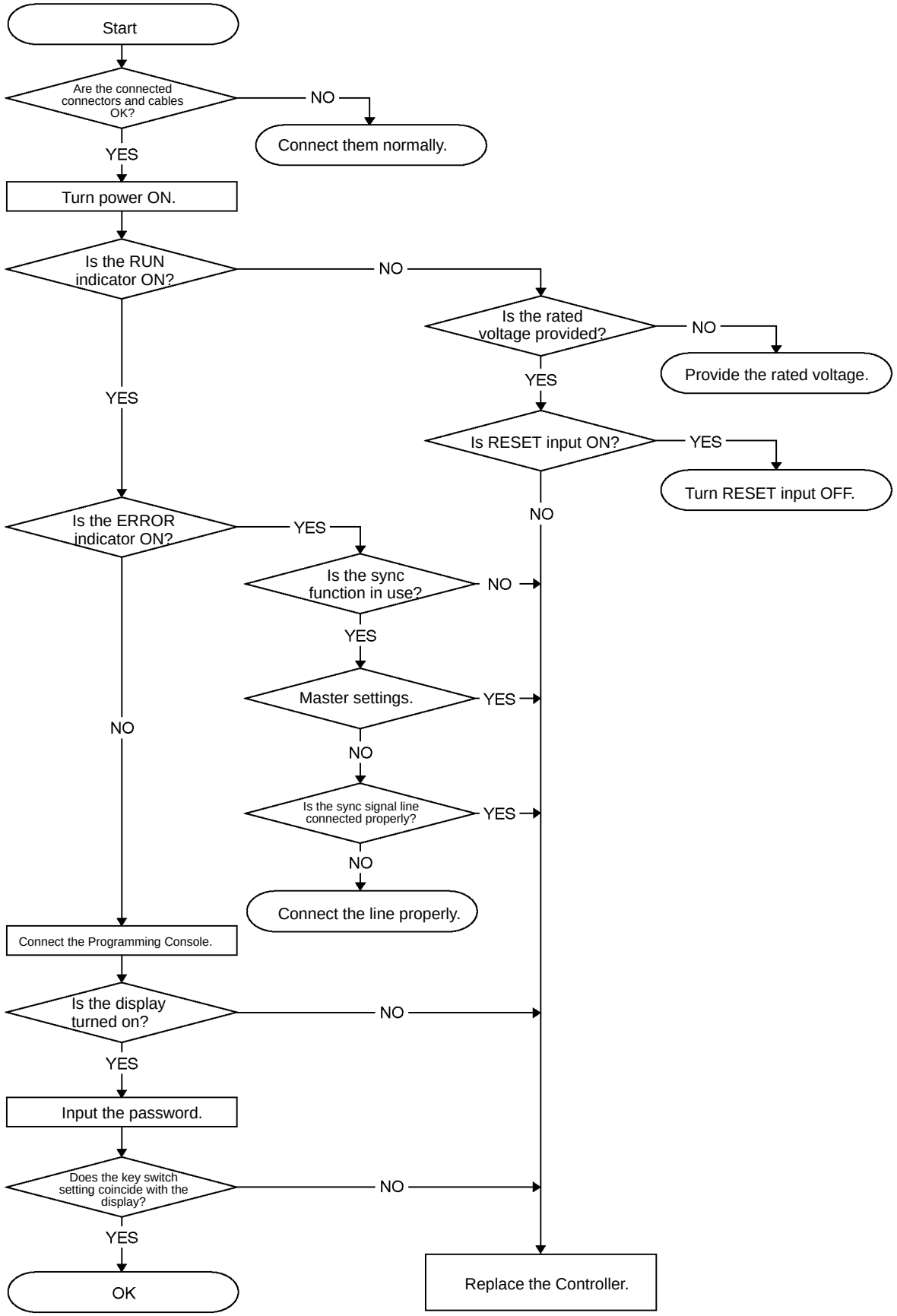
If an error results, fully check the whole situation, determine the relationship between the system and any other device, and refer to the following flowcharts for troubleshooting.

Main Check Flowchart

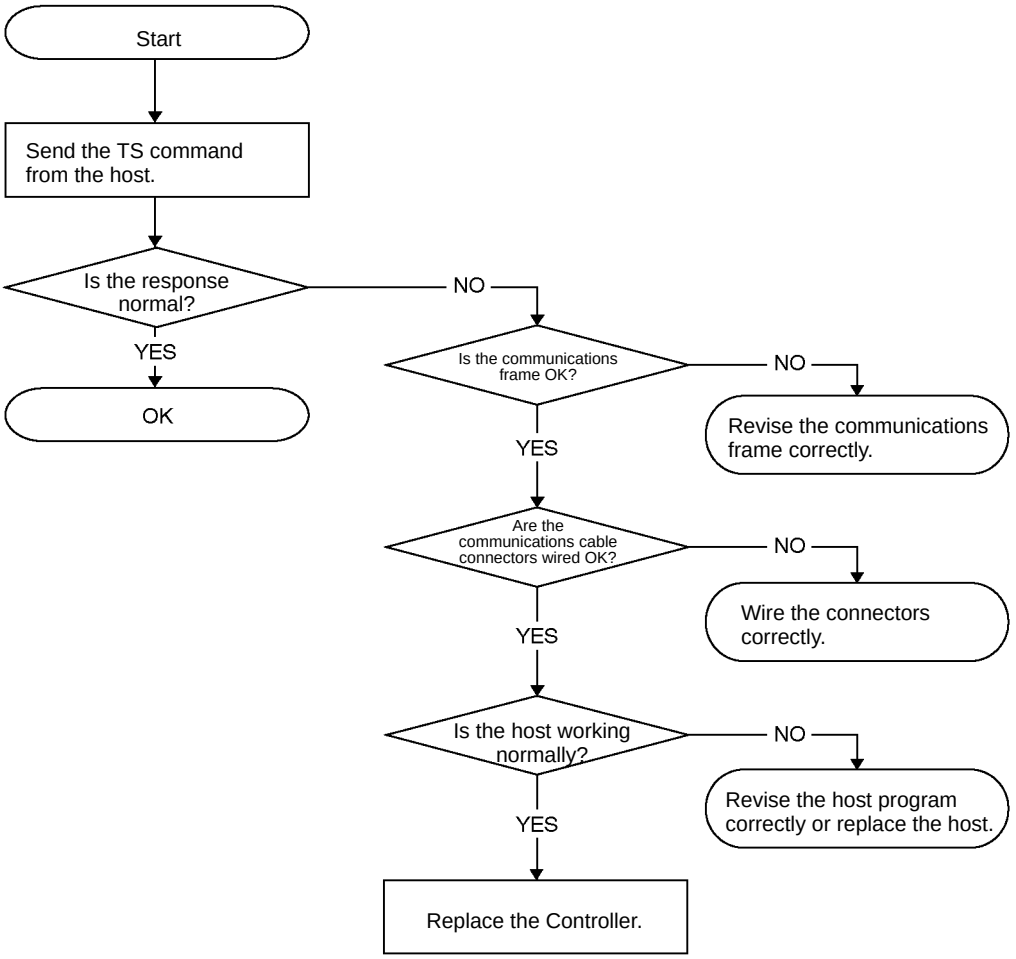
Use the following main check flowchart to determine the cause of the error.



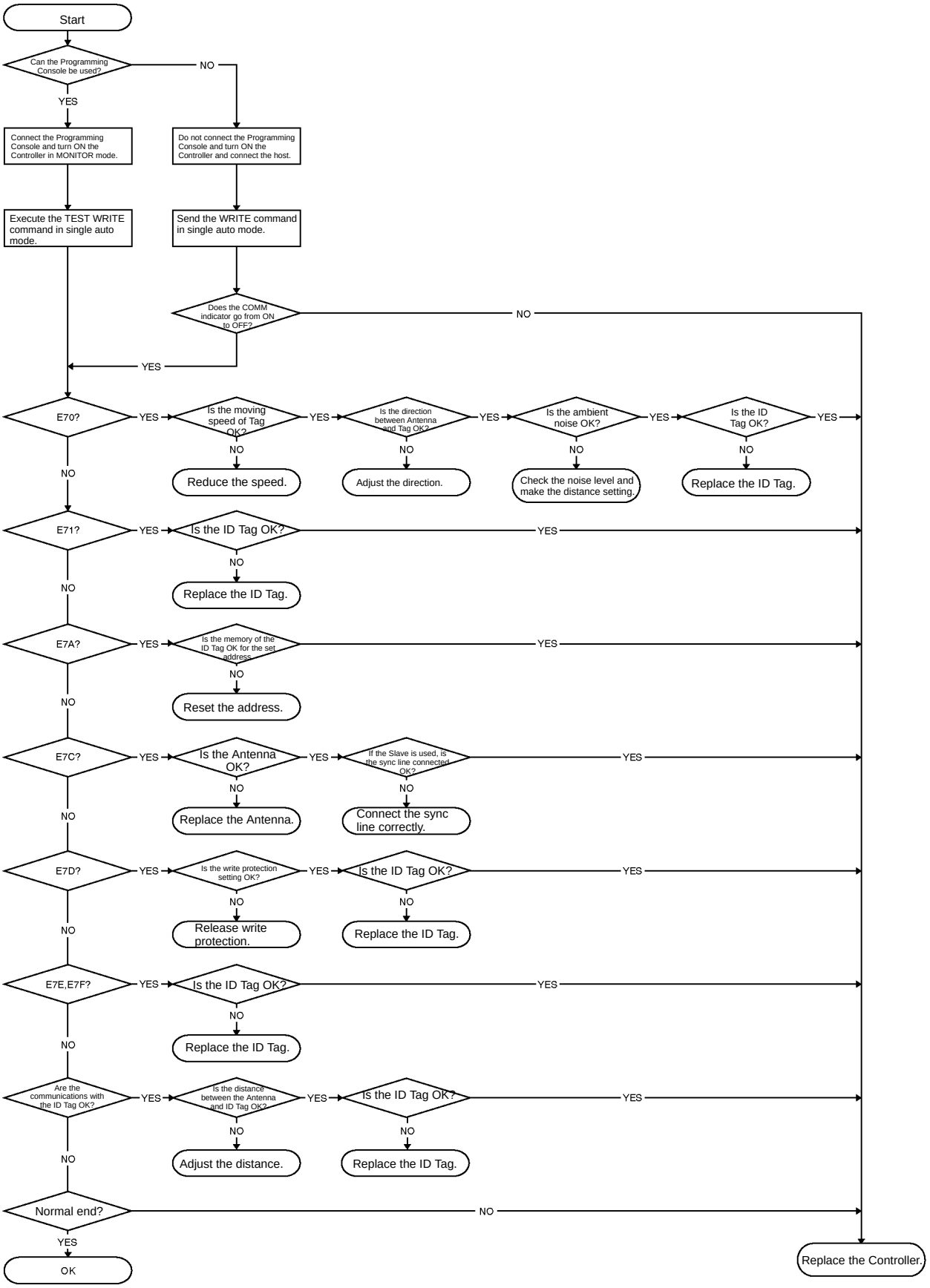
System Connections Check Flowchart



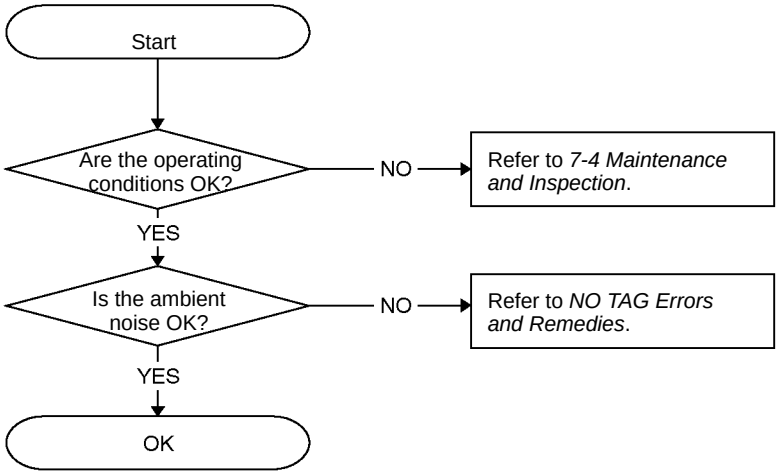
Host Communications Check Flowchart



Communications Check Flowchart



Operating Environment Check Flowchart



SECTION 8
Communications Characteristics (Reference)

This section provides V700 communications characteristics such as communications ranges and communications times.

8-1 Maximum Communications Distance

The maximum communications distance varies with the installation and environmental conditions. Be sure to check the required conditions carefully.

Maximum Communications Distance in Long-distance Mode

ID Tag			Antenna	
			V700-H01	V700-H02
V700-D□3P21(-Y) or V700-D□3P31(-Y)	Max. communications distance		250 mm (typ)	280 mm (typ)
	Recommended set distance	Tag not moving	0 to 200 mm	0 to 200 mm
		Tag moving	100 to 200 mm	100 to 200 mm
V700-D23P41(-Y)	Max. communications distance		220 mm (typ)	240 mm (typ)
	Recommended set distance	Tag not moving	0 to 200 mm	0 to 200 mm
		Tag moving	45 to 200 mm	45 to 200 mm

Maximum Communications Distance in Stable Communications Mode

ID Tag			Antenna	
			V700-H01	V700-H02
V700-D□3P21(-Y) or V700-D□3P31(-Y)	Max. communications distance		200 mm (typ)	250 mm (typ)
	Recommended set distance	Tag not moving	0 to 160 mm	0 to 160 mm
		Tag moving	80 to 160 mm	80 to 160 mm
V700-D23P41(-Y)	Max. communications distance		180 mm (typ)	180 mm (typ)
	Recommended set distance	Tag not moving	0 to 150 mm	0 to 150 mm
		Tag moving	45 to 150 mm	45 to 150 mm

8-2 Communications Areas (Reference)

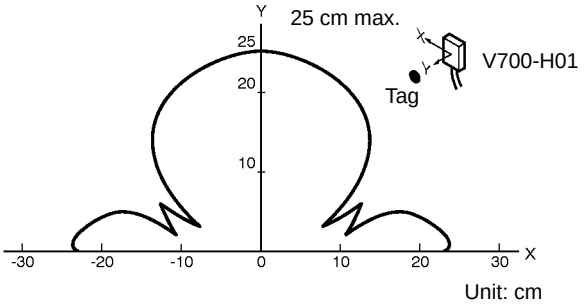
The following diagrams show the communications areas of the V700-H01 and V700-H02 Antennas. The actual communications areas will vary depending on the installation and grounding conditions.

8-2-1 Communications Areas in Long-distance Mode

Communications with a V700-D□3P21(-Y) or V700-D□3P31(-Y) ID Tag

V700-H01 Antenna

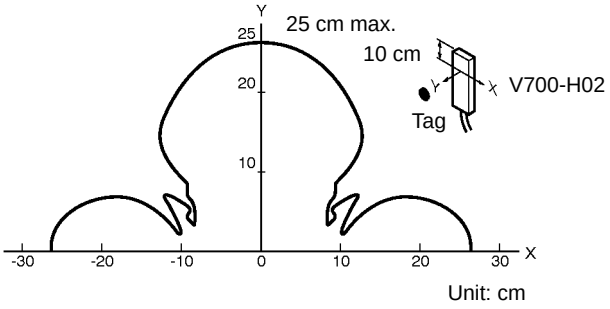
The following diagram shows the communications area perpendicular to the V700-H01's surface, centered at the center of the Antenna.



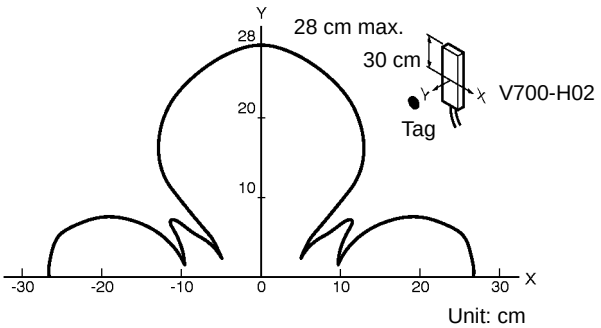
Unit: cm

V700-H02 Antenna

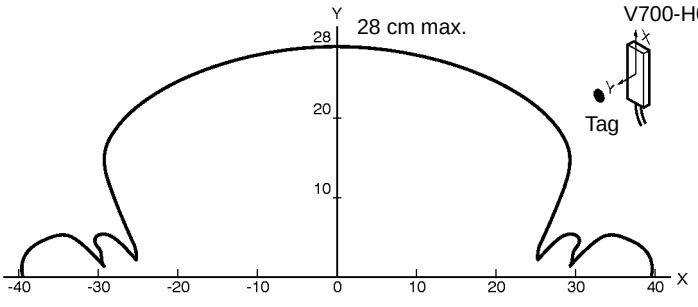
The following diagrams show the communications areas perpendicular to the V700-H02's surface. Two diagrams are provided for the narrow dimension of the Antenna: the measurement at the center and at 20 mm from the center.



Unit: cm



Unit: cm

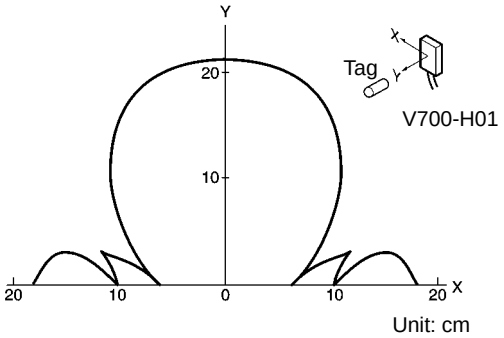


Unit: cm

Communications with a V700-D23P41(-Y) ID Tag

V700-H01 Antenna

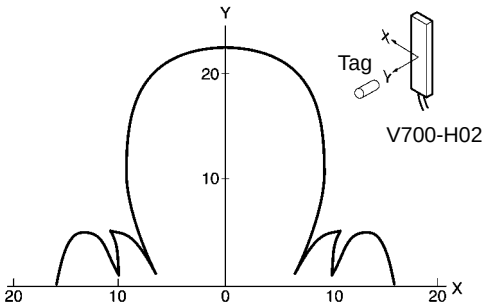
The following diagram shows the communications area perpendicular to the V700-H01 Antenna's surface, centered at the center of the Antenna.



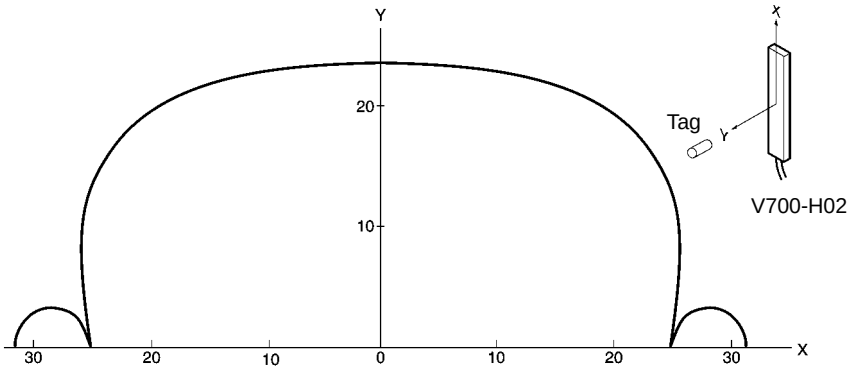
Unit: cm

V700-H02 Antenna

The following diagrams show the communications areas of the V700-H02, both centered at the center of the Antenna.



Unit: cm

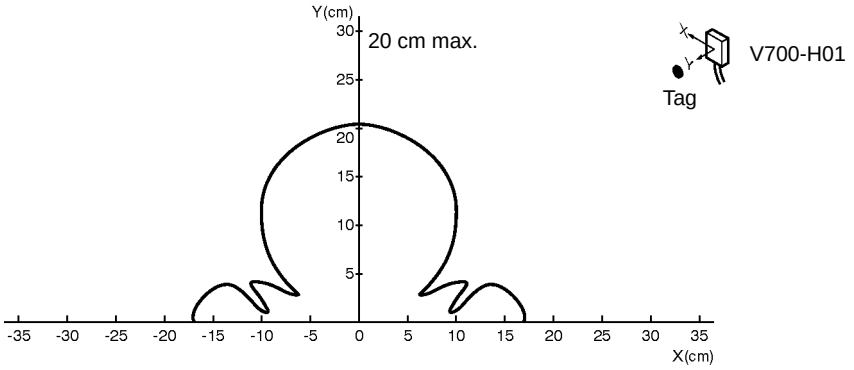


8-2-2 Communications Areas in Stable Communications Mode

Communications with a V700-D□3P21(-Y) or V700-D□3P31(-Y) ID Tag

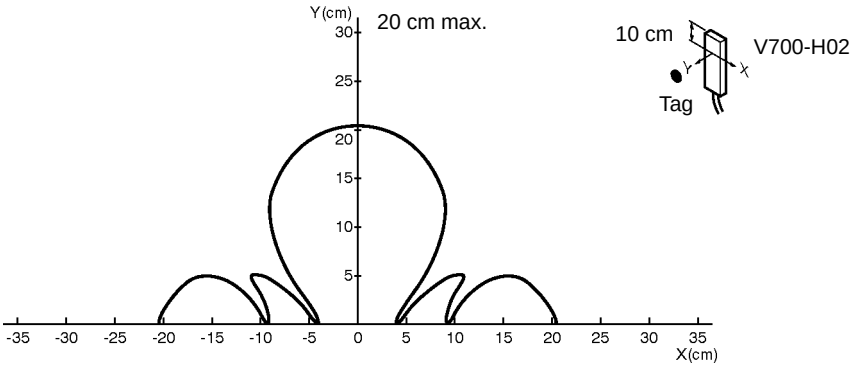
V700-H01 Antenna

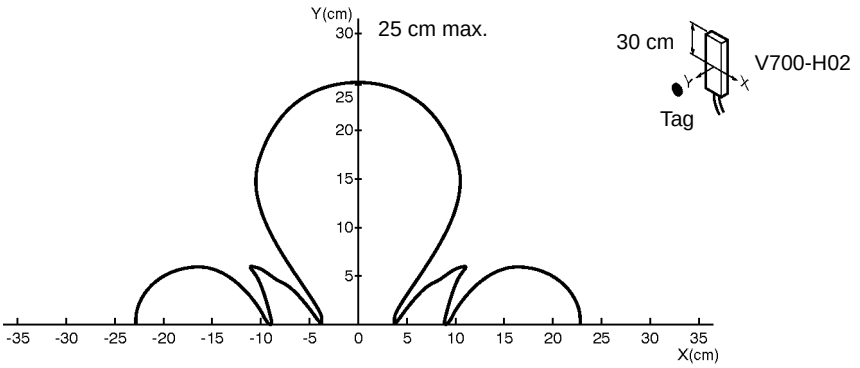
The following diagram shows the communications area perpendicular to the V700-H01's surface, centered at the center of the Antenna.

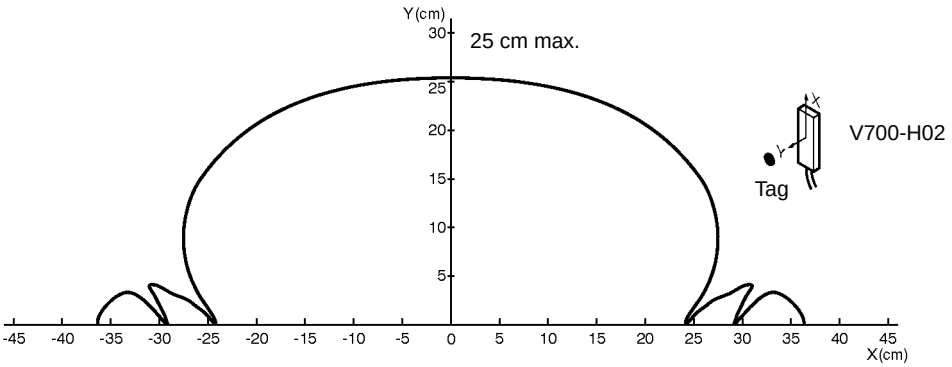


V700-H02 Antenna

The following diagrams show the communications areas perpendicular to the V700-H02's surface. Two diagrams are provided for the narrow dimension of the Antenna: the measurement at the center and at 20 mm from the center.



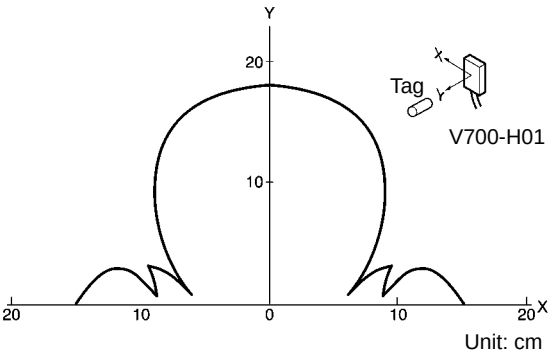




Communications with a V700-D23P41(-Y) ID Tag

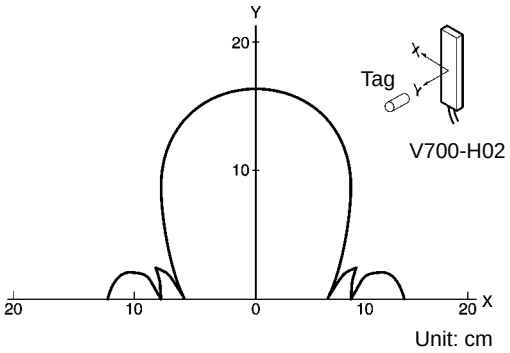
V700-H01 Antenna

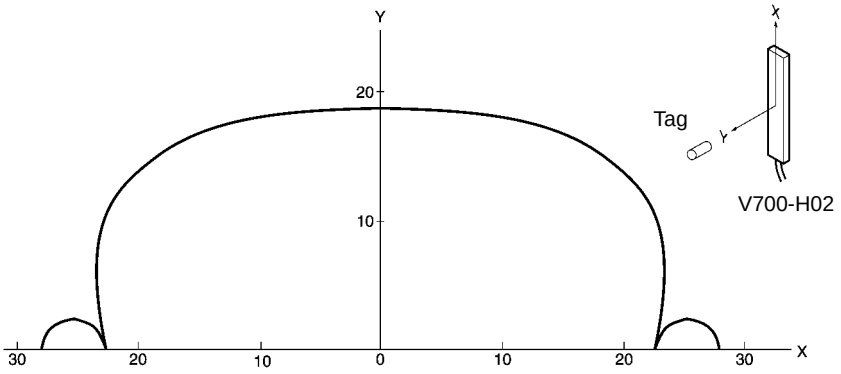
The following diagram shows the communications area perpendicular to the V700-H01 Antenna's surface, centered at the center of the Antenna.



V700-H02 Antenna

The following diagrams show the communications areas of the V700-H02, both centered at the center of the Antenna.





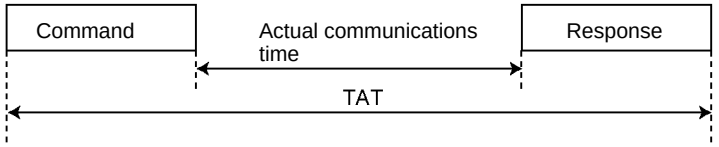
8-3 Communications Time (Reference)

The V700-series Controller reads or writes eight-byte data per page from or to addresses X0h through X7h or X8h through XFh. In order to minimize the communications time, therefore, specify the address and the number of bytes so as to minimize the number of pages.

- The following chart specifies the TAT (turn-around time) and actual communications time.
- The actual communications time varies with the sync setting of the Controller.
- The actual communications time in the following charts is the time required for communications between the Antenna and ID Tag, not including communica-

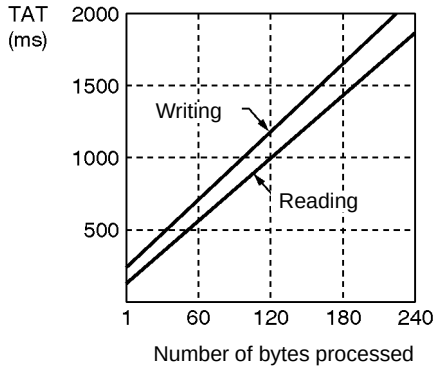
tions with the host. Use this for calculating the speed of the ID Tag for the execution of auto commands.

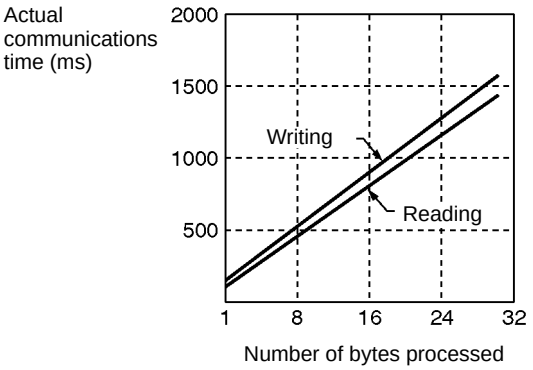
Example



Note If auto commands are being used, the communications time will vary slightly depending on when the ID Tag reaches the Antenna's communication area. When calculating the proper ID Tag speed, add one page to the actual number of pages being processed (e.g., use 2 pages if only 1 page is being processed) and calculate the speed from this number of pages and the width of the communication area.

No Sync (Reference Values)



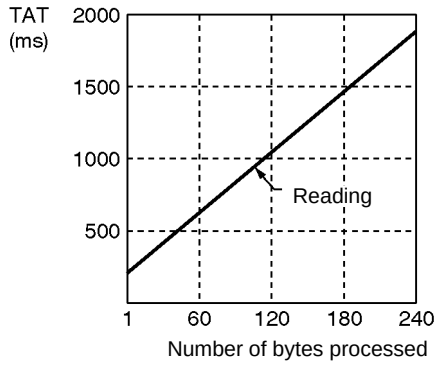


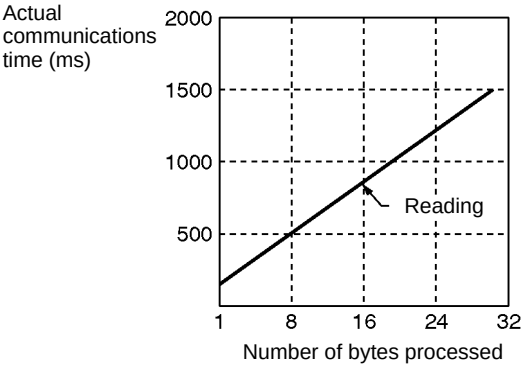
Calculation Formula

Operation	Actual communications time (msec)
Reading	T = 46.7N + 60.7
Writing	T = 52.8N + 113.5

Note N: Number of pages processed

Read-only Sync (Reference Values)



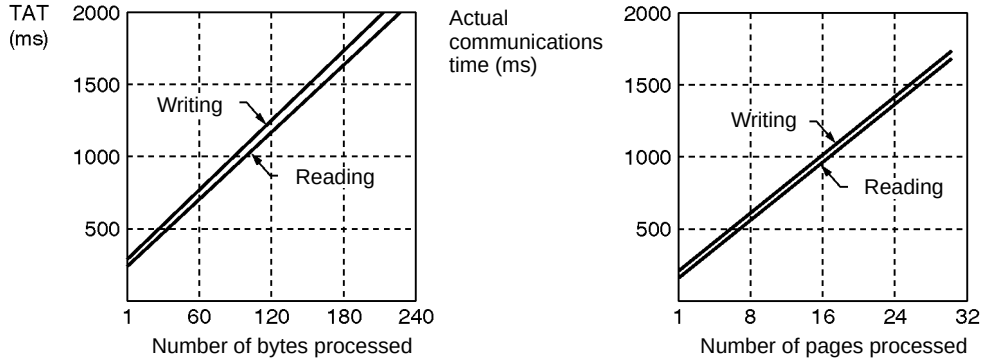


Calculation Formula

Operation	Actual communications time (msec)
Reading	T = 46.7N +107.4

Note N: Number of pages processed

Read/Write Sync (Reference Values)



Calculation Formula

Operation	Actual communications time (msec)
Read	T = 52.8N + 119.6
Write	T = 52.8N + 172.4

Note N: Number of pages processed

Actual Communications Time in Multiple, Simultaneous Access Mode

The actual communications time between the Controller and ID Tag with multiple, simultaneous access mode varies with the operating conditions, such as the number of ID Tags in the communications area and the ID code combination of each ID Tag as well as the number of bytes to be processed.

The following table lists average values of communications time as reference values on condition that the ID codes are used at random.

Number of ID Tags	8 bytes to be read (ms)	8 bytes to be written (ms)
5	579	873
10	1,191	1,547
15	1,857	2,275
20	2,523	3,002
30	3,853	4,455
50	6,344	7,192

Note

1. The provided TAT data is an example in which the V700-CD1D-V3 Controller is used under the following conditions for host communications:
   The data is continuously sent with no space between characters, a baud rate of 9,600 bps, and a data length of 7 bits with 2 stop bits and even parity.
2. The number of bytes in TAT data is the number of code-specified bytes in ASCII.

SECTION 9
Reference Data

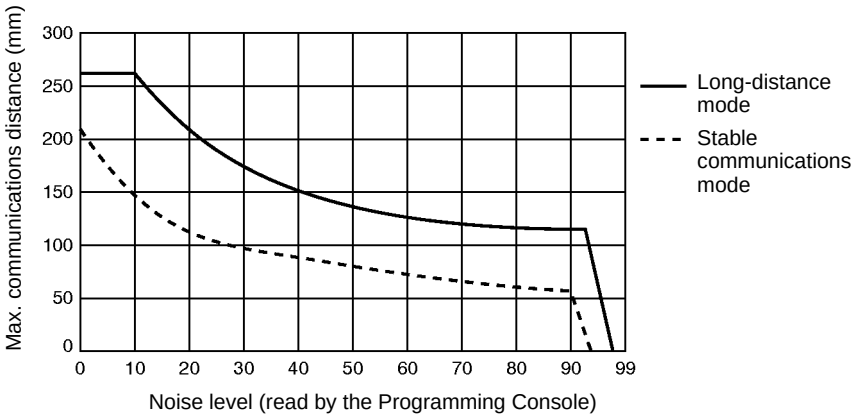
This section provides reference data relating to V700 communications, ID Tags, Antennas, and proximity sensors.

9-1 Effects of Noise on Communications Distance

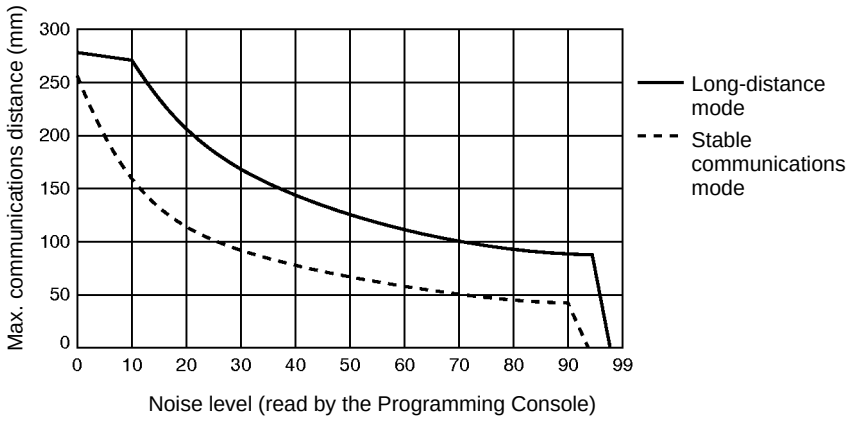
The communications distance characteristics may deteriorate due to the ambient noise at the Antenna location. Before installing the Antenna, use the environmental noise measurement function to measure the noise level in the installation environment, and determine the communications distance by referring to the following charts.

Communications with a V700-D□3P21(-Y) or V700-D□3P31(-Y) ID Tag

V700-H01 Antenna

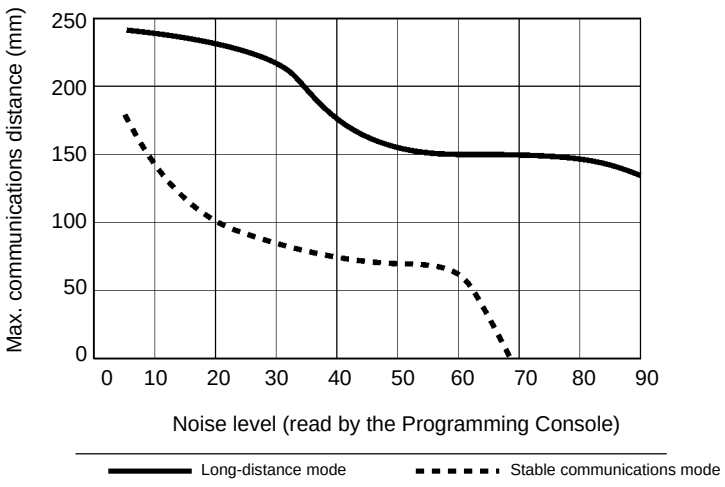


V700-H02 Antenna

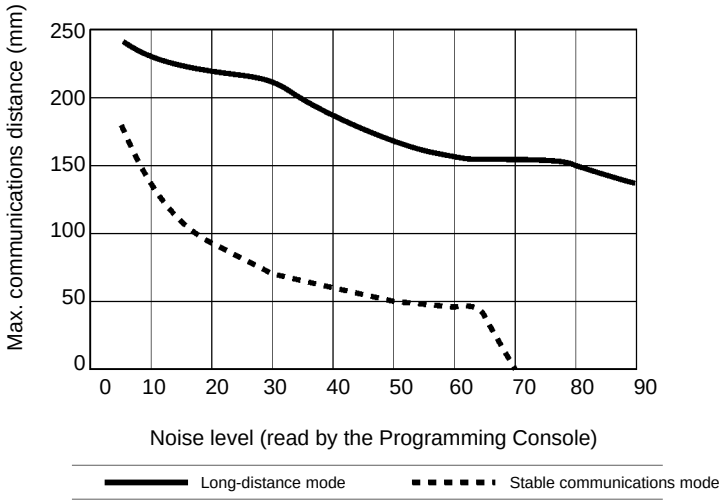


Communications with a V700-D23P41(-Y) ID Tag

V700-H01 Antenna



V700-H02 Antenna



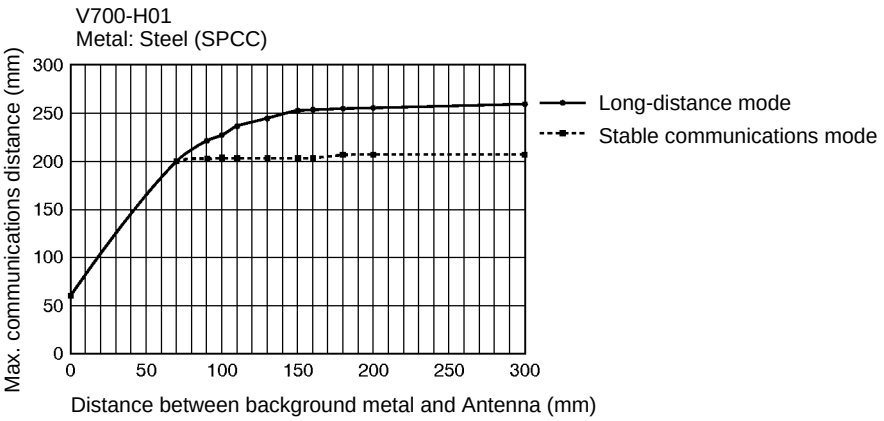
9-2 Influence of a Metal Surface behind the Antenna

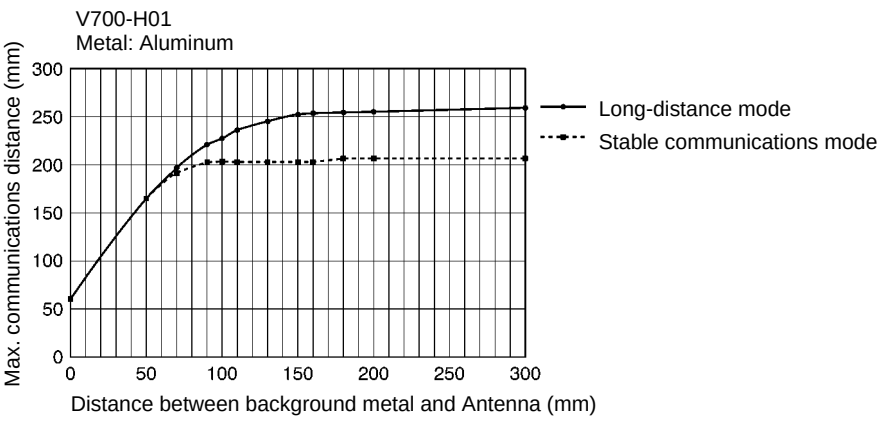
The Antenna is influenced by background metal.

The communications area of the Antenna will be reduced if there is metal (the same size as the Antenna) behind the Antenna. The reduction of the communications area depends upon the distance between the Antenna and metal surface, as shown in the following diagrams.

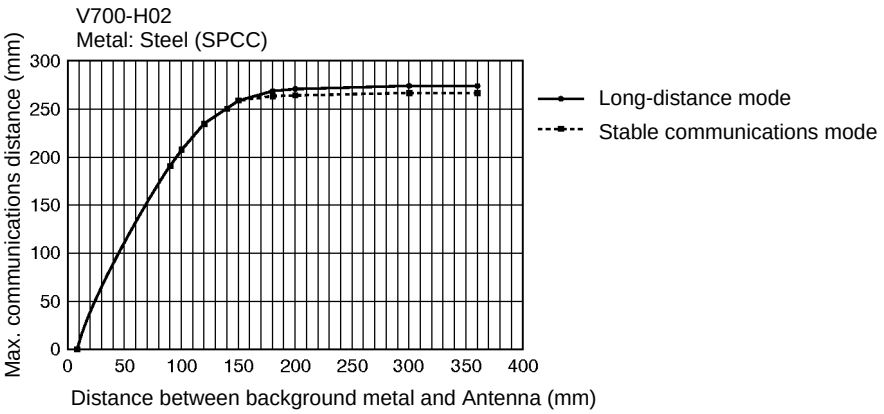
Communications with a V700-D□3P21(-Y) or V700-D□3P31(-Y) ID Tag

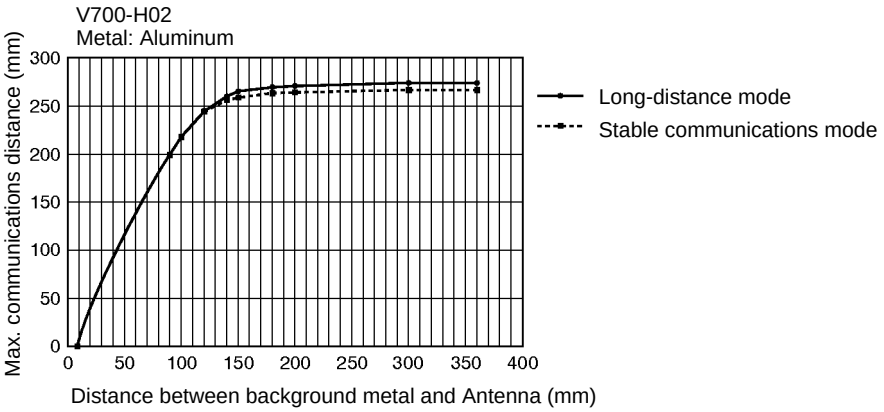
V700-H01 Antenna

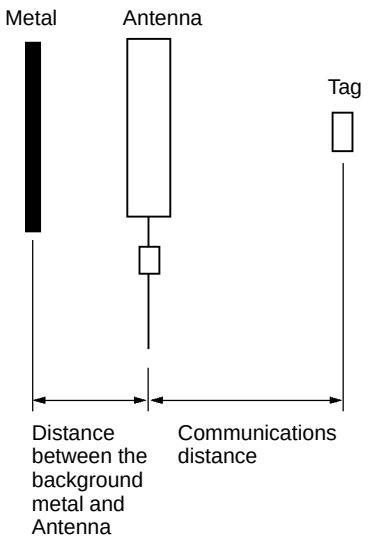




V700-H02 Antenna

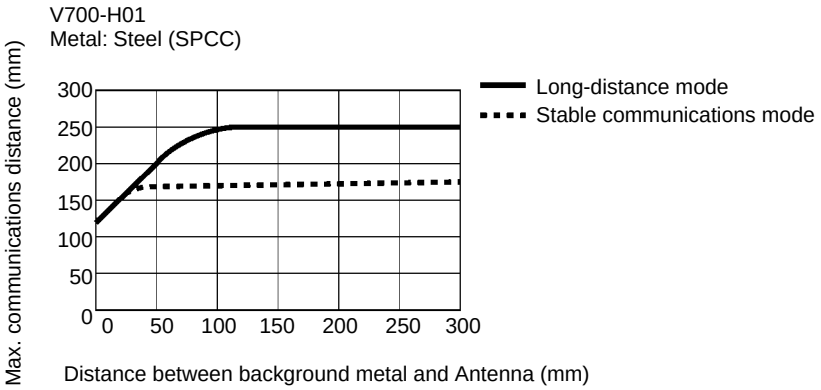


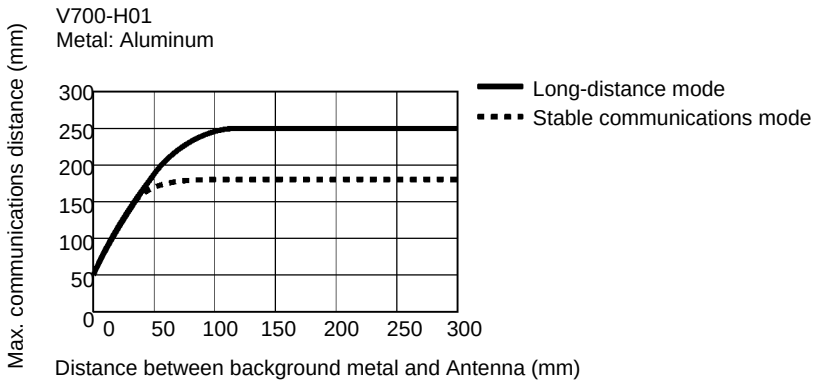




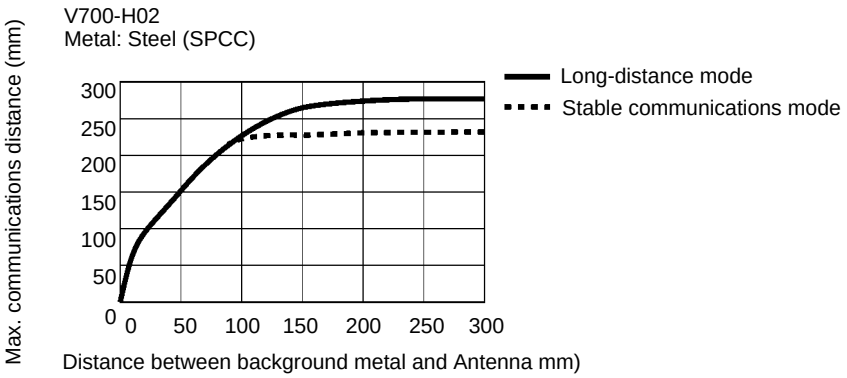
Communications with a V700-D23P41(-Y) ID Tag

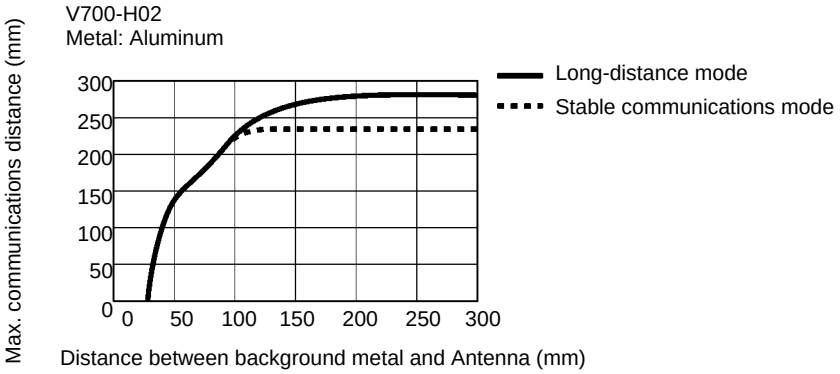
V700-H01 Antenna

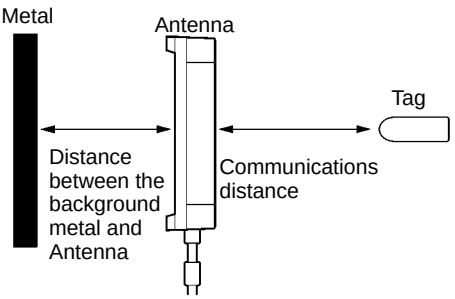




V700-H02 Antenna







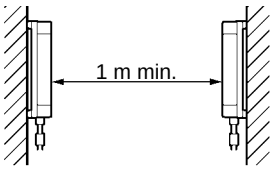
9-3 Mutual Interference between Antennas

If more than one Antenna is used, be sure to keep the Antennas away from each other as shown below.

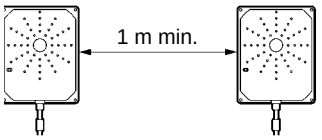
Synchronous Operation

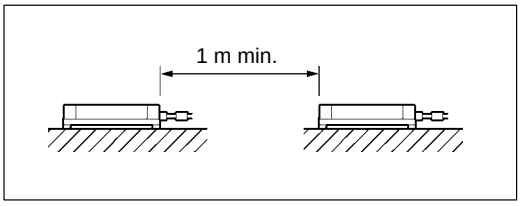
V700-H01

Located Face-to-face



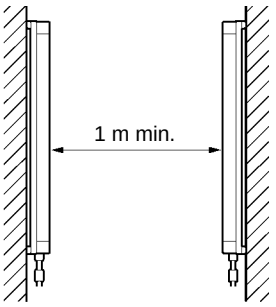
Located in Parallel



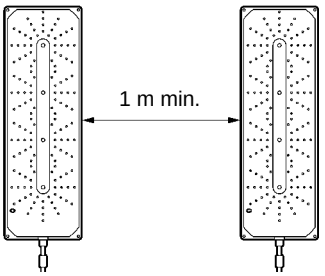


V700-H02

Located Face-to-face



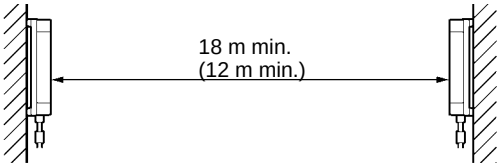
Located in Parallel



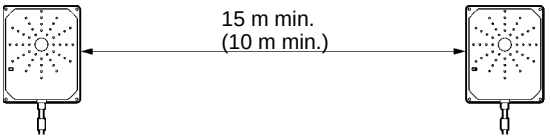
Asynchronous Operation

V700-H01 Antenna

Located Face-to-face

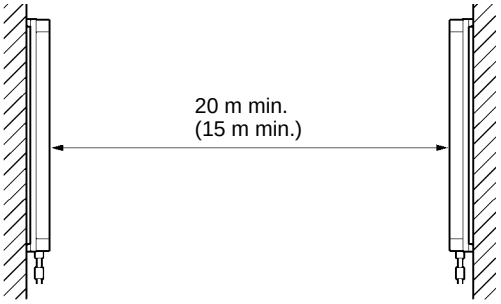


Located in Parallel

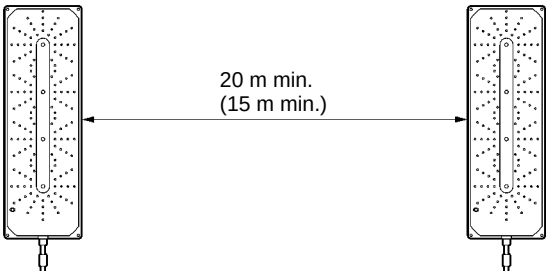


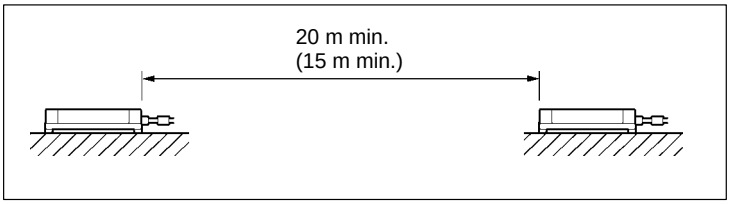
V700-H02 Antenna

Located Face-to-face



Located in Parallel





Values in parentheses are applicable in stable communications mode.

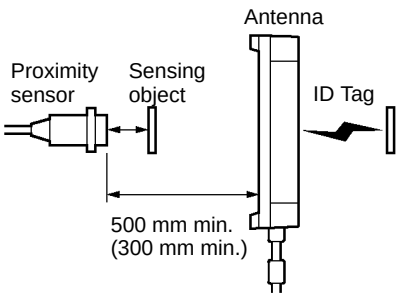
9-4 Interference between Proximity Sensor and Antenna

The V700 Series employs electromagnetic induction at a frequency of 125 kHz. Therefore, if the Antenna and proximity sensor are installed close to each other, the Antenna and proximity sensor may malfunction due to mutual interference. The Antenna and proximity sensor will most probably operate without malfunctioning if they are kept away from each other as shown below. However, be sure to conduct a test to make sure that they operate normally, before they are put in actual operation.

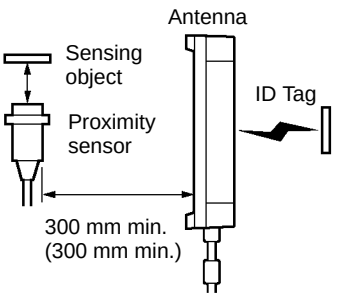
V700-H01 Antenna

Keep them away from each other as shown below.

Located Face-to-face

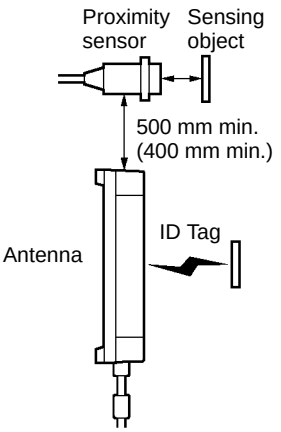


Located Vertically to Each Other

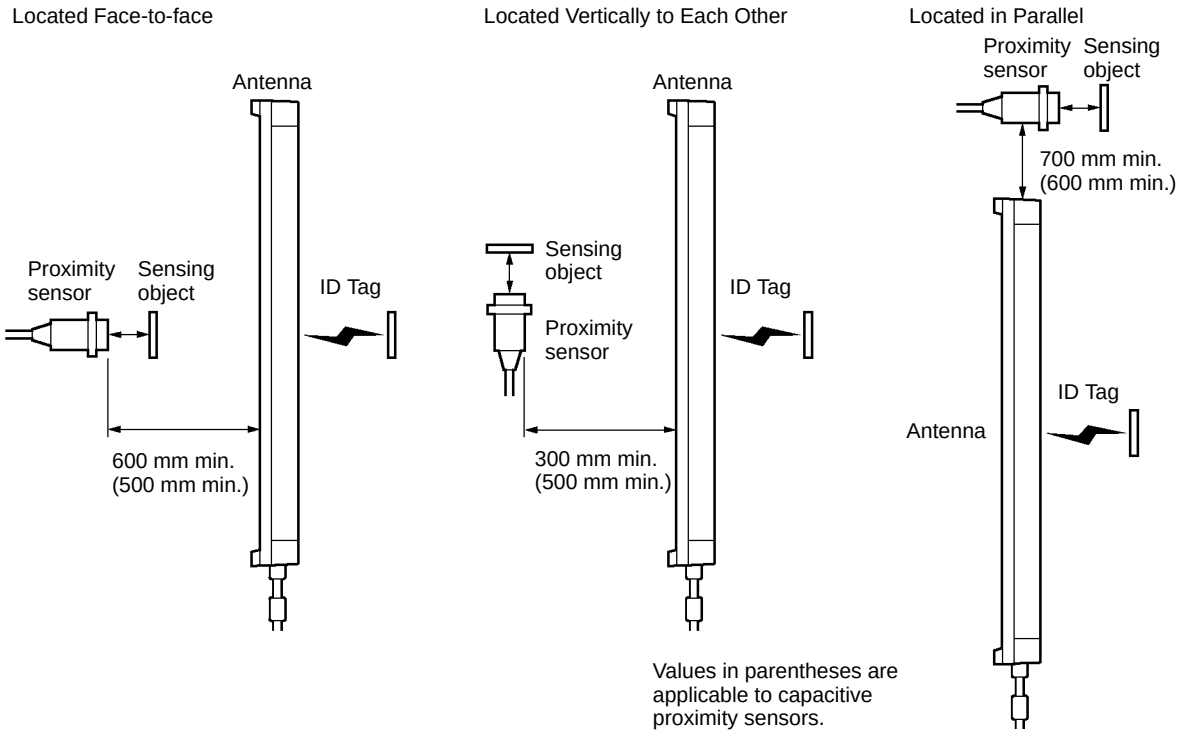


Values in parentheses are applicable to capacitive proximity sensors.

Located in Parallel



V700-H02 Antenna Keep them away from each other as shown below.



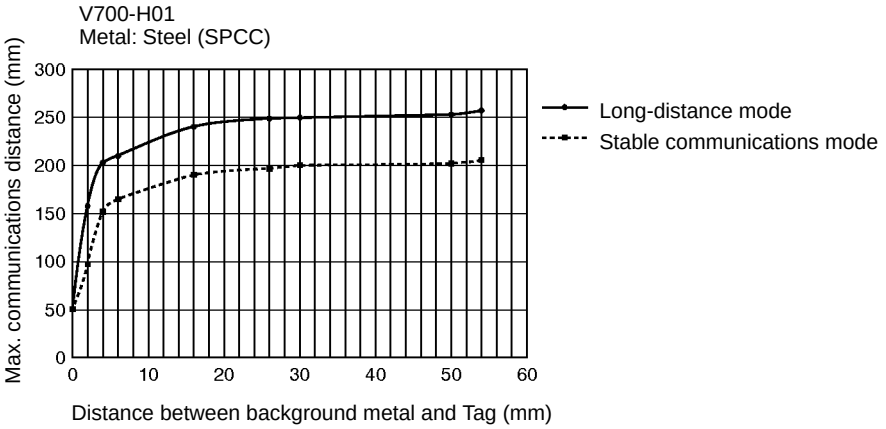
9-5 Influence of a Metal Surface behind the ID Tag

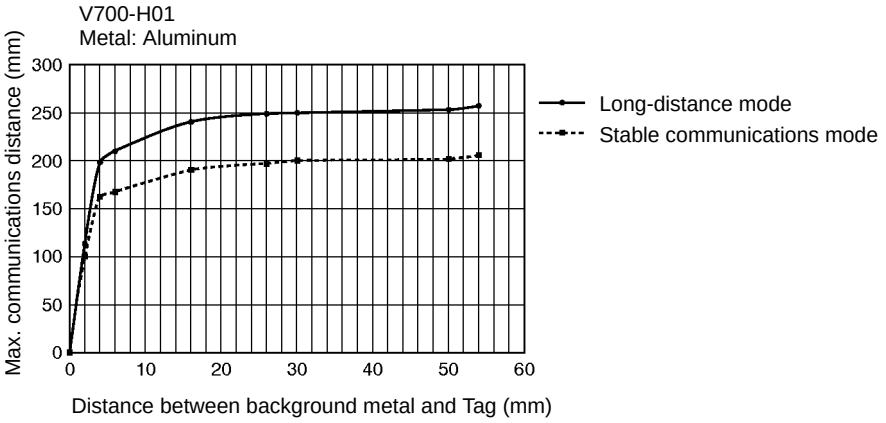
The ID Tag is influenced by background metal.

The communications distance of the ID Tag will decrease if there is metal behind the ID Tag as shown below.

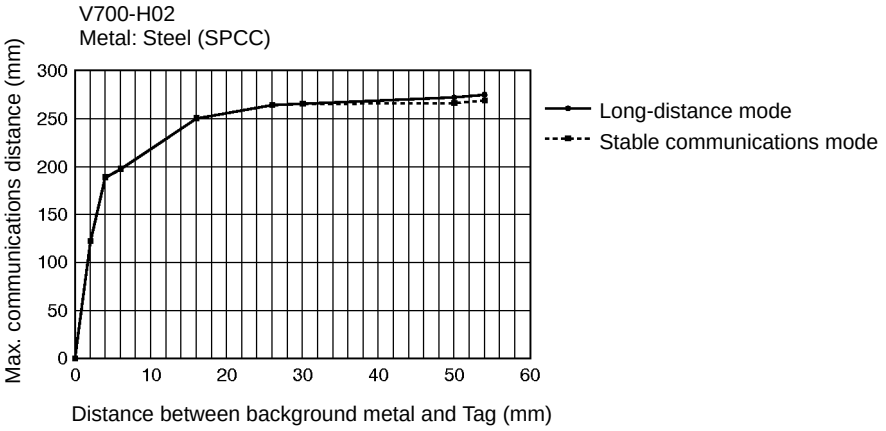
V700-D□3P21(-Y) and V700-D□3P31(-Y) ID Tags

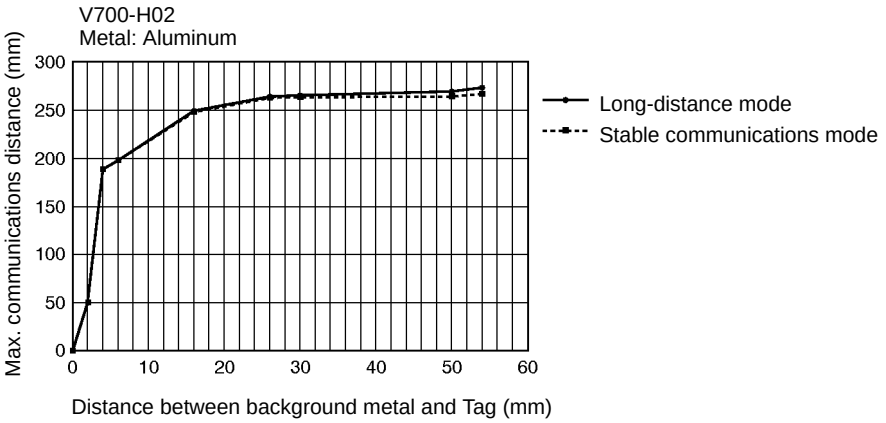
V700-H01 Antenna

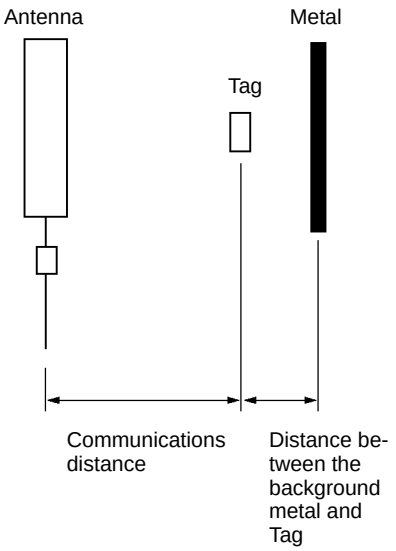




V700-H02 Antenna

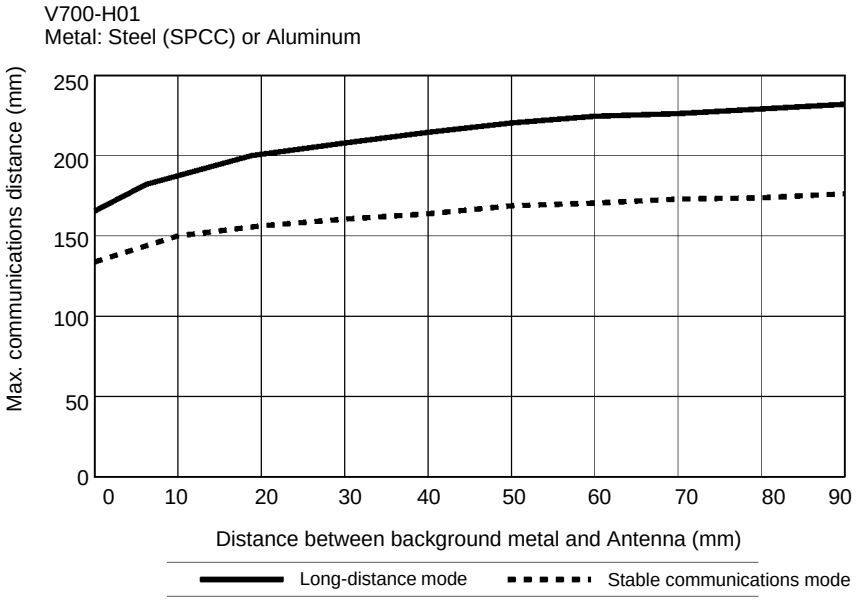




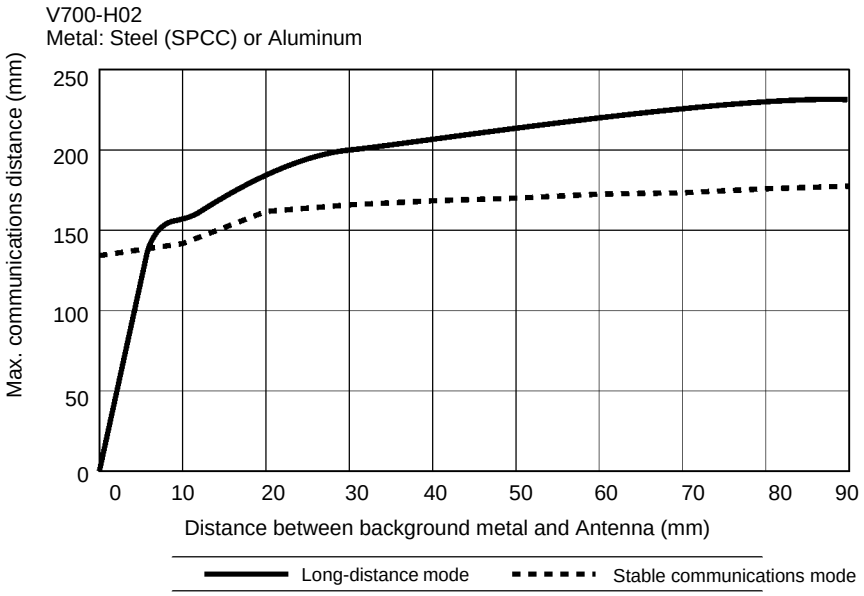


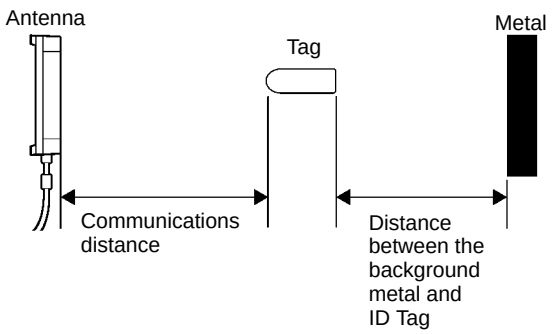
V700-D23P41(-Y) ID Tag

V700-H01 Antenna



V700-H02 Antenna

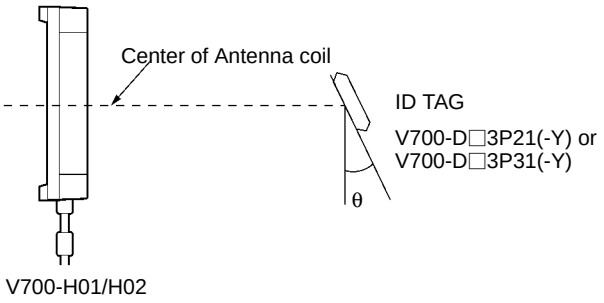




9-6 Influence of ID Tag Angle

The maximum communications distance between the Antenna and ID Tag will be available if the Antenna and ID Tag are located in parallel to each other. Take the angle of the ID Tag into consideration when mounting the ID Tag. The communications distance will be reduced if the ID Tag is not located in parallel to the Antenna as shown below.

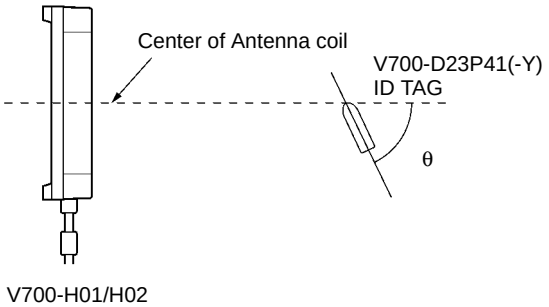
V700-D□3P21(-Y) and V700-D□3P31(-Y) ID Tags



Reduction of Communications Distance

θ°	H01	H02
0	0%	0%
10	1%	1%
20	4%	4%
30	9%	12%
40	18%	21%
60	39%	39%

V700-D23P41(-Y) ID Tag



Reduction of Communications Distance

θ°	H01	H02
0	0%	0%
10	1.5%	1.6%
20	2.5%	3.5%
30	6.5%	10%
40	13%	18%
60	29%	31%

9-7 Chemical Resistance of ID Tag

V700-D13P31

The V700-D13P31 ID Tag uses PPS resin. Refer to the following and be sure not to use any chemical that has a bad influence on PPS resin.

Chemical		Room temperature	90°C	Chemical		Room temperature	90°C
Hydrochloric acid	37%	A	A	Sodium dichromate solution		A	A
	10%	A	A	Phenol solution	5%	A	A
Sulfuric acid	98%	A	B	Glacial acetic acid		A	A
	50%	A	A	Acetic acid		A	A
	30%	A	A	Oleate		A	A
	3%	A	A	Methanol (Methyl alcohol)	95%	A	A
Nitric acid	60%	B	C	Methanol (Methyl alcohol)	95%	A	A
	40%	A	B	Acetic ether		A	A
	10%	A	A	Diethyl hexyl sebacate		A	A
Hydrogen fluoride aqueous solution	40%	A	A	Acetone		A	A
Chromic acid	40%	A	A	Diethyl ether		A	A
Hydrogen peroxide aqueous solution	28%	A	B	n-heptane		A	A
	3%	A	A	2, 2, 4 trimethyl penthane		A	A
NaOH aqueous solution	60%	A	A	Benzene		A	A
	10%	A	A	Toluene		A	A
	1%	A	A	Aniline		A	A
Aqueous ammonia	28%	A	B	Mineral oil		A	A
	10%	A	B	Gasoline		A	A
Sodium chloride	10%	A	A	Insulation oil		A	A
Sodium carbonate	20%	A	A	Dichloroehylene		A	A
	2%	A	A	Carbon tetrachloride		A	A

Note

1. A: No influence
   B: May discolor or melt PPS resin
   C: Deform or cracks PPS resin
2. The table provides information on changes in PPS resin that are kept in the chemical at room temperature and 90°C. If the actual operating conditions of the system is different from the table data in temperature, chemical type, or chemical viscosity, conduct a test under the actual conditions before the system goes into actual operation.

V700-D23P41

The V700-D13P31 ID Tag is made with PBT resin (polybutylene terephthalate resin) and epoxy resin is used for the filler resin. Refer to the following tables and be sure not to use any chemical that affects the ID Tag's materials.

Chemicals that Deform or Crack PBT or Epoxy Resins

PBT	Epoxy resin
Acetone, ethylene dichloride, alkali such as sodium hydroxide	Aqua regia, chromic acid, sulfuric acid (90% RT), nitric acid (60% RT), ammonia solution, acetone, methylene chloride, phenol

Chemicals that may Discolor or Melt PBT or Epoxy Resins

PBT	Epoxy resin
Hydrochloric acid (10%), acetic acid (5%), benzene	Sulfuric acid (10% RT), nitric acid (10% RT), concentrated hydrochloric acid, acetic acid (50% RT), nitric acid, calcium hydroxide, benzene, creosol, alcohol, toluene, xylene, grease

Chemicals that have Little Effect on PBT or Epoxy Resins

PBT	Epoxy resin
Sulfuric acid (30% RT), concentrated hydrochloric acid, acetic acid, ethyl acetate (100%), potassium permanganate (5%), ethyl acetate, carbon tetrachloride, methanol, ethanol, gasoline	Ammonia, potassium hydroxide, petroleum, YUSHIROKEN S50, CHEMICOOL Z, Velocity No. 3, YUSHIROKEN EE-30Y, methyl ethyl ketone, sodium hydroxide (10% RT)

Note The results listed in the table above are from tests performed at room temperature. Chemicals that have little effect at room temperature may have an effect at high or low temperatures, so test under actual conditions before operating the system.

Appendix A
ASCII Table

Rightmost 4 bits / Leftmost 4 bits: b8 to b5	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
b4 to b1 / Row / Line	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0000	0	NUL	TC7(DLE)	(SP)	0	@	P	`	p			Unde-fined	ー	タ	ミ		
0001	1	TC1(SOH)	DC1	!	1	A	Q	a	q			。	ア	チ	ム		
0010	2	TC2(STX)	DC2	"	2	B	R	b	r			「	イ	ツ	メ		
0011	3	TC3(ETX)	DC3	#	3	C	S	c	s			」	ウ	テ	モ		
0100	4	TC4(EOT)	DC4	$	4	D	T	d	t			、	エ	ト	ヤ		
0101	5	TC5(ENQ)	TC8(NAK)	%	5	E	U	e	u			・	オ	ナ	ユ		
0110	6	TC6(ACK)	TC9(SYN)	&	6	F	V	f	v			ヲ	カ	ニ	ヨ		
0111	7	BEL	TC10(ETB)	'	7	G	W	g	w			ァ	キ	ヌ	ラ		
1000	8	FE0(BS)	CAN	(	8	H	X	h	x			ィ	ク	ネ	リ		
1001	9	FE1(HT)	EM	)	9	I	Y	i	y			ゥ	ケ	ノ	ル		
1010	10	FE2(LF)	SUB	*	:	J	Z	j	z			ェ	コ	ハ	レ		
1011	11	FE3(VT)	ESC	+	;	K	[	k	{			ォ	サ	ヒ	ロ		
1100	12	FE4(FF)	IS4(FS)	,	<	L	¥	l	|			ャ	シ	フ	ワ		
1101	13	FE5(CR)	IS3(GS)	-	=	M	]	m	}			ュ	ス	ヘ	ン		
1110	14	S0	IS2(RS)	.	>	N	^	n	¯			ョ	セ	ホ	゛		
1111	15	S1	IS1(US)	/	?	O	_	o	DEL			ッ	ソ	マ	゜		Unde-fined

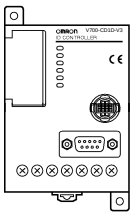
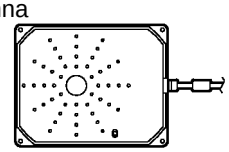
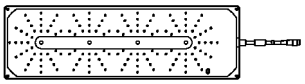
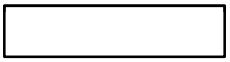
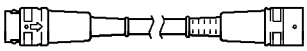
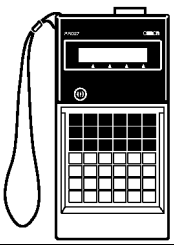
Undefined (columns 8 and 9)

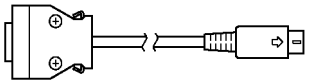
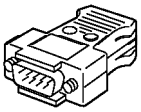
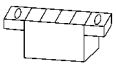
Undefined (columns 14 and 15)

Note The character in row 5, line 12 is "\" in ASCII.

Appendix B
Standard Models

Controller and System Components

Name	Specification	Model	Remarks
Controller 	RS-232C interface Supply voltage: 24 VDC	V700-CD1D-V3	---
	RS-485 interface Supply voltage: 24 VDC	V700-CD2D-V3	
Antenna 	External dimensions: 250 x 200	V700-H01	Standard antenna
Antenna 	External dimensions: 650 x 200	V700-H02	Wide-field antenna
ID Tag 	128-byte memory	V700-D13P31	Coin-shaped, environment-resistant
	256-byte memory	V700-D23P31 (Special order)	
	128-byte memory	V700-D13P31-Y (Special order)	Coin-shaped, environment-resistant, high-speed access function
ID Tag 	128-byte memory	V700-D13P21	Thin model, for incorporation
	256-byte memory	V700-D23P21 (Special order)	
	128-byte memory	V700-D13P21-Y (Special order)	Thin model, for incorporation, high-speed access function
ID Tag 	256-byte memory	V700-D23P41	Cylindrical for drilled hole
		V700-D23P41-Y (Special order)	Cylindrical for drilled hole, high-speed access function
Connection Cable 	2 m	V700-A40	Used for connecting the Controller and Antenna.
	3 m	V700-A41	
	5 m	V700-A42	
	10 m	V700-A43	
	20 m	V700-A44	
	30 m	V700-A45	
Programming Console 	---	C200H-PRO27-E	---

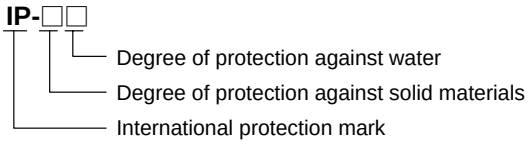
Name	Specification	Model	Remarks
Programming Console Conversion Cable 	2 m	V700-P10	A dedicated keysheet is provided.
Communications Connector 	Connector Plug	XM2A-0901	One set is provided with the V700-CD1D-V2.
	Connector Hood	XM2S-0911	
Communications Connector 	Connector Plug	BLZ4CD2D	One set is provided with the V700-CD2D-V2D.

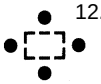
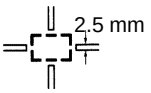
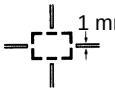
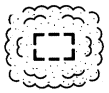
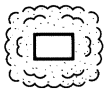
Appendix C
Enclosure Ratings

Protection Ratings

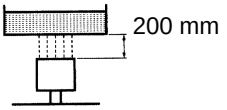
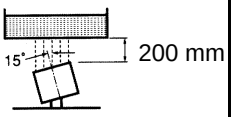
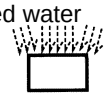
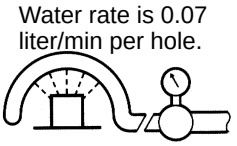
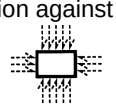
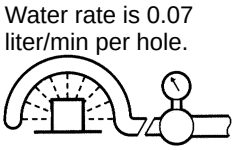
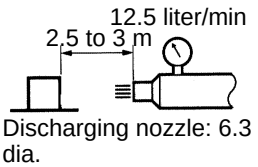
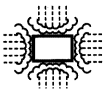
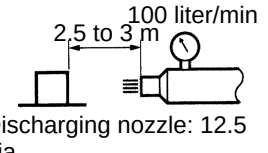
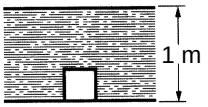
Note International protection degrees are determined by the following tests. Be sure to check the sealing capability under the actual operating environment and conditions before actual use.

IEC (International Electrotechnical Commission) Standards (IEC 60529 January 1997)



Degree	Protection	
0		No protection
1		Protects against penetration of any solid object, such as a hand, that is 50 mm or more in diameter.
2		Protects against penetration of any solid object, such as a finger, that is 12.5 mm or more in diameter.
3		Protects against penetration of any solid object, such as a wire, that is 2.5 mm or more is diameter.
4		Protects against penetration of any solid object, such as a wire, that is 1 mm or more in diameter.
5		Protects against penetration of dust of a quantity that may cause malfunction or obstruct the safe operation of the product.
6		Protects against penetration of all dust.

Degree of Protection Against Water

Degree	Protection		Test method (with fresh water)
0	No protection	Not protected against water.	No test
1	Protection against water drops 	Protects against vertical drops of water towards the product.	Water is dropped vertically towards the product from the test machine for 10 min. 
2	Protection against water drops 	Protects against drops of water approaching at a maximum angle of 15° to the left, right, back, and front of vertical towards the product.	Water is dropped for 2.5 min each (i.e., 10 min in total) towards the product inclined 15° to the left, right, back, and front from the test machine. 
3	Protection against sprinkled water 	Protects against sprinkled water approaching at a maximum angle of 60° from vertical towards the product.	Water is sprinkled at a maximum angle of 60° to the left and right from vertical for 10 min from the test machine 
4	Protection against water spray 	Protects against water spray approaching at any angle towards the product.	Water is sprayed at any angle towards the product for 10 min from the test machine. 
5	Protection against water jet spray 	Protects against water jet spray approaching at any angle towards the product.	Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine. 
6	Protection against high-pressure water jet spray 	Protects against high-pressure water jet spray approaching at any angle towards the product.	Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine. 
7	Protection underwater 	Resists the penetration of water when the product is placed underwater at specified pressure for a specified time.	The product is placed 1 m deep in water (if the product is 850 mm max. in height) for 30 min. 
8	Protection underwater 	Can be used continuously underwater.	The test method is determined by the manufacturer and user.

OMRON Testing Methods

Note 1. In additions to the following test for IP67 for Proximity Sensors, the detection distance and insulation resistance performance were confirmed after 5 cycles of heat shock testing consisting of immersion in 0°C water for 1 hour and 70°C water for 1 hour.

2. Application conditions for the E2F Proximity Sensor: Natural conditions at 10 m or less under water as follows: 1) No water immersion after 1 hour in water at 2 atmospheres and 2) the detection distance and insulation resistance performance must be maintained after 20 repetitions of the above heat shock cycle.

NEMA (National Electrical Manufacturers Association)

The following table from NEMA enclosure shows conversions to IEC60529. This table cannot be used in reverse.

NEMA250	IEC60529	NEMA250	IEC60529
1	IP10	4, 4X	IP56
2	IP11	5	IP52
3	IP54	6, 6P	IP67
3R	IP14	12, 12K	IP52
3S	IP54	13	IP54

Note From attachment A to NEMA standard 250. There are differences between the NEMA enclosure ratings and IEC60529, including those in resistance to corrosion, resistance to rust, wettability, etc.

Index

A–B

C–D

E–F

G–I

L–N

O–P

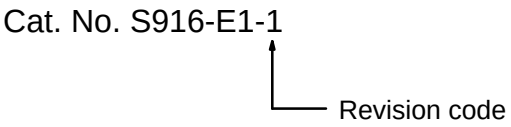
R

S

T–W

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

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http://www.omron.com/card/rfid/

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