Cat. No. Z140-E1-2

V530-R150E–2, V530-R150EP-2

2-Dimensional Code Reader (Fixed Type)

OPERATION MANUAL

OMRON

V530-R150E-2, V530-R150EP-2 2-Dimensional Code Reader (Fixed Type)

Operation Manual

Produced November 2000

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.

Visual Aids

The following headings will help you locate different types of information.

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

→ Indicates pages where additional information can be found.

1 Indicates a procedure. The step numbers in the procedure correspond to the numbers in any related illustrations.

Notation

Model Name

This product comes in two different models: V530-R150E-2 (input/output type: NPN) and V530-R150EP-2 (input/output type: PNP). In this manual, both models are referred to under the model number “V530-R150.”

Screen Messages

In this manual, screen messages are given in bold/italic.
E.g.: ***Register***

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No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

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About this Manual:

This manual describes the features, specifications and operation of the V530-R150 2-Dimensional Code Reader and includes the following sections.

Section 1 gives an overview of the features, applications and basic configurations for the V530-R150 2-Dimensional Code Reader.

Section 2 describes the different parts of the V530-R150 2-Dimensional Code Reader, and details the connections and other procedures necessary for installation.

Section 3 describes the specifications, procedures,inputs and outputs used when operating the V530-R150 2-Dimensional Code Reader via terminal blocks.

Section 4 describes the specifications, procedures, inputs and outputs used when operating the V530-R150 2-Dimensional Code Reader via RS-232C.

Section 5 gives an overview of menu operations for the V530-R150 2-Dimensional Code Reader and explains the procedures required to perform basic operations.

Section 6 gives details of the functions and operations possible with the V530-R150 2-Dimensional Code Reader, including the procedures necessary for communications with external devices.

Section 7 gives basic maintenance procedures and inspection items for the V530-R150 2-Dimensional Code Reader.

Section 8 gives specifications and dimensions for the component parts of the V530-R150 2-Dimensional Code Reader.

Section 9 details errors that may occur with the V530-R150 2-Dimensional Code Reader and gives procedures for dealing with those errors.

The ***Appendices*** provide ASCII codes, examples of FCS check programs, and data capacity tables.

⚠ 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 V530-R150 2-Dimensional Code Reader.

The information contained in this section is important for the safe and reliable application of the V530-R150 2-Dimensional Code Reader. You must read this section and understand the information contained before attempting to set up or operate a V530-R150 2-Dimensional Code Reader.

1 Safety Precautions . . . . . .
2 General Precautions . . . . . .
3 Installation Precautions . . . . . .
4 Package Contents . . . . . .

1 Safety Precautions

Caution Do not touch fluorescent or halogen light while the power in ON or immediately after the power is turned OFF. These lights generate heat and can cause burns.

The following must be followed to ensure the safety.

Caution Do not use the V530-R150 in environments with flammable or explosive gases.

Caution Install the V530-R150 away from high-voltage equipment or motors to ensure safety during operation and maintenance.

Caution Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals.

Caution Cover the terminal blocks with the Terminal Block Protection covers.

Caution Use DC power supplies with safe extra low-voltage circuits for the main V530-R150 power supply and terminal block power supplies in order to prevent an occurrence of high voltages.

Caution Use the power supply cables and crimp terminals of specified sizes.

Caution Use at the power supply voltages specified in this manual.

Caution Double-check all wiring and switch settings before turning ON the power supply.

Caution Be sure to securely tighten the screws when mounting V530-R150 components.

Caution Do not dismantle, repair or modify any V530-R150 components.

Caution Dispose of V530-R150 components as industrial waste.

Caution To prevent damage from static electricity, use a wrist strap or another device for preventing electrostatic charges when touching terminals or signal line.

Caution Do not turn OFF the power while a message is being displayed indicating that processing is being performed. Data in memory will be destroyed, and the V530-R150 may not operate correctly the next time it is started. Please note that the V530-R150 can not restart if the power is turned OFF while the start up message is on a screen.

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 unclear 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 properly 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.

3 Installation Precautions

The V530-R150 is highly reliable and resistant to most environmental factors. The following guidelines, however, must be followed to ensure reliability and optimum use of the V530-R150.

Components

Be sure to use the Camera, Camera Cable, and Console designed for the V530-R150.

- Camera (F150-S1A)
- Camera Cable (F150-VS)
- Console (F150-KP)

Installation Site

Do not install the V530-R150 in locations subject to the following conditions.

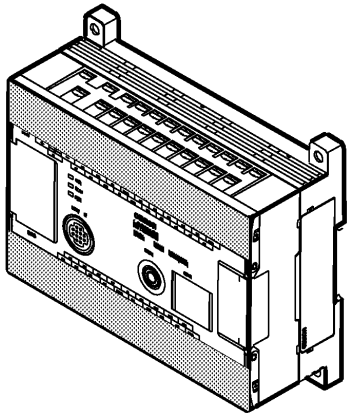
- Ambient temperatures outside of 0 to +40°C for the F300-M09 Video Monitor (recommended monitor) or outside of +50°C for all other V530-R150 components.
- Condensation due to rapid temperature fluctuations
- Relative humidities outside 35 to 85%
- Corrosive or flammable gases
- Dust, salt, or iron particles
- Direct vibration or shock
- Direct sunlight
- Water, oil, or chemical fumes or spray

Installation

Orientation of Controller

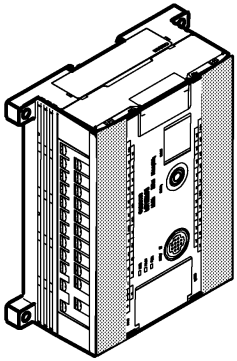
To improve heat dissipation, install the controller in the following orientation only:

CORRECT

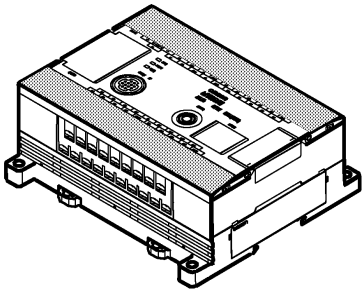


Do not install the controller in the orientations shown in the following diagram.

INCORRECT

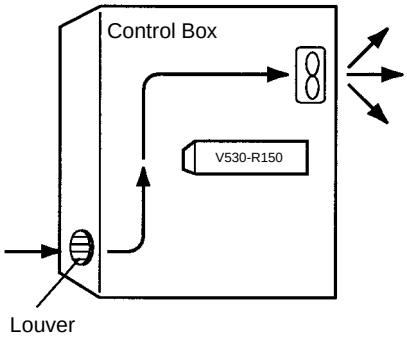


INCORRECT



Ambient Temperature

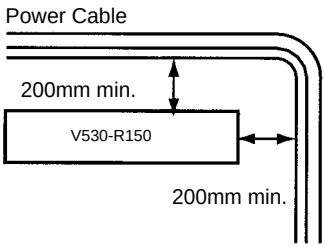
- Maintain a minimum clearance of 50mm above and below V530-R150 components to improve air circulation.
- Do not install V530-R150 components immediately above strong heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not let the ambient operating temperature exceed 50°C.
- Provide a forced-air fan or air conditioning if the ambient temperature might exceed 50°C.



Noise Resistance

Use the following measures to help increase noise resistance.

- Do not install V530-R150 components in a cabinet containing high-voltage equipment.
- Do not install V530-R150 components within 200 mm of power cables.



Cables

Always turn OFF the power before connecting or disconnecting cables.

Cameras

The camera's case is connected to the 0V line in the internal circuits.
Heed the following precautions to prevent noise interference.

- Do not ground the camera.
- Do not remove the base attached to the camera.
- Do not remove the core attached to the F150-VS camera cable.

Video Monitor

(When using the recommended F300-M09)

Heed the following precautions to prevent noise interference if the video monitor case is metallic, because it is connected to the 0V line in the internal circuits.

- Do not ground the video monitor.
- Do not ground the metallic part of the connector.
- Secure the video monitor with plastic screws if it is being mounted to a metallic surface.

2-Dimensional Code

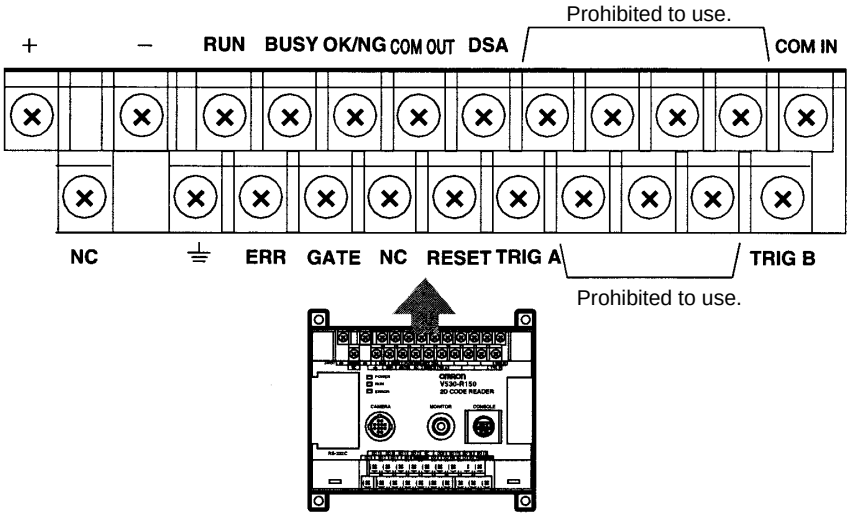
- The blank margin (quiet zone) is necessary around 2-dimensional codes. 4 cells are required for QR Code and Data Matrix.
- Adjust the only one reading code to be within the field of vision. Reading can not be performed correctly if more than one code are on a screen.
- Adjust the field of vision of a camera for the 2-dimensional code to be at least 5 pixels per cell.

RESET Terminal

Do not use RESET input immediately after power is turned ON. When using RESET input to synchronize execution timing, wait at least 1 s after turning ON the V530-R150 power supply before turning ON the RESET terminal.

Terminals

Do not connect anything to the terminals with no names.



4 Package Contents

Confirming Package Contents

Check the contents of the package as soon as you receive the V530-R150.

Contact the nearest OMRON representative if any of the following items are missing.

- V530-R150 2-Dimensional Code Reader Controller
- Operation Manual (this manual)

SECTION 1
Features

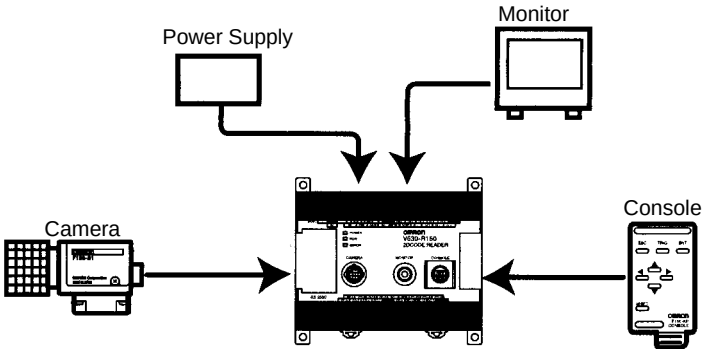
This section gives an overview of the features, applications and basic configurations for the V530-R150 2-Dimensional Code Reader.

1-1 Overview of V530-R150 Application . . . . . .
1-2 Functions . . . . . .
1-3 Trigger Inputs and Outputs . . . . . .

1-1 Overview of V530-R150 Application

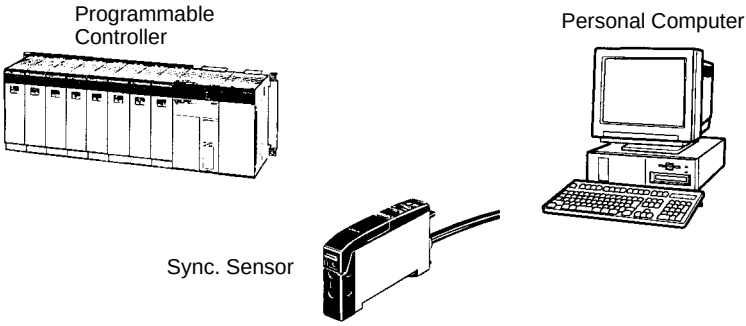
The following illustrations show configurations and typical applications for the V530-R150.

Unit Connections and Wiring



Refer to *Section 2 Installation* for detailed descriptions.

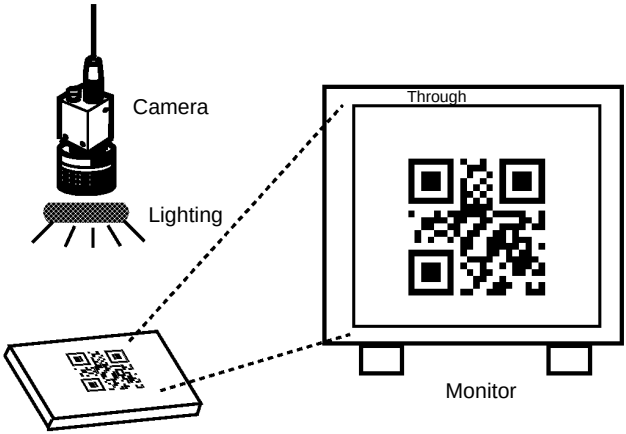
Connections for Peripheral Devices



Refer to *Section 3 Terminal Blocks* and *Section 4 RS-232C* for detailed descriptions.

Displaying Images

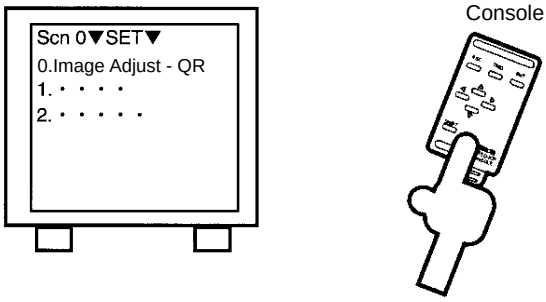
Switch to through image and adjust the focus, camera setting distance, and lighting.



Refer to *2-4 Camera, 2-5 CCTV Lens*, and *2-6 Lighting* for detailed descriptions.

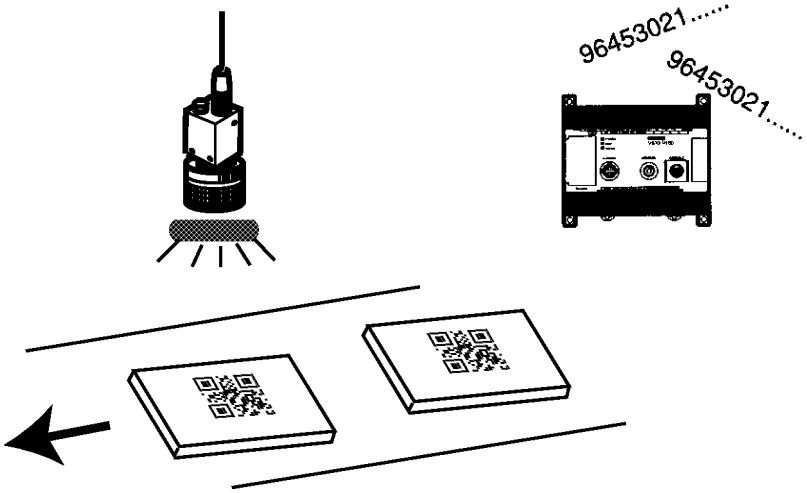
Setting Reading Conditions

Operate the Console while checking menus on the monitor.



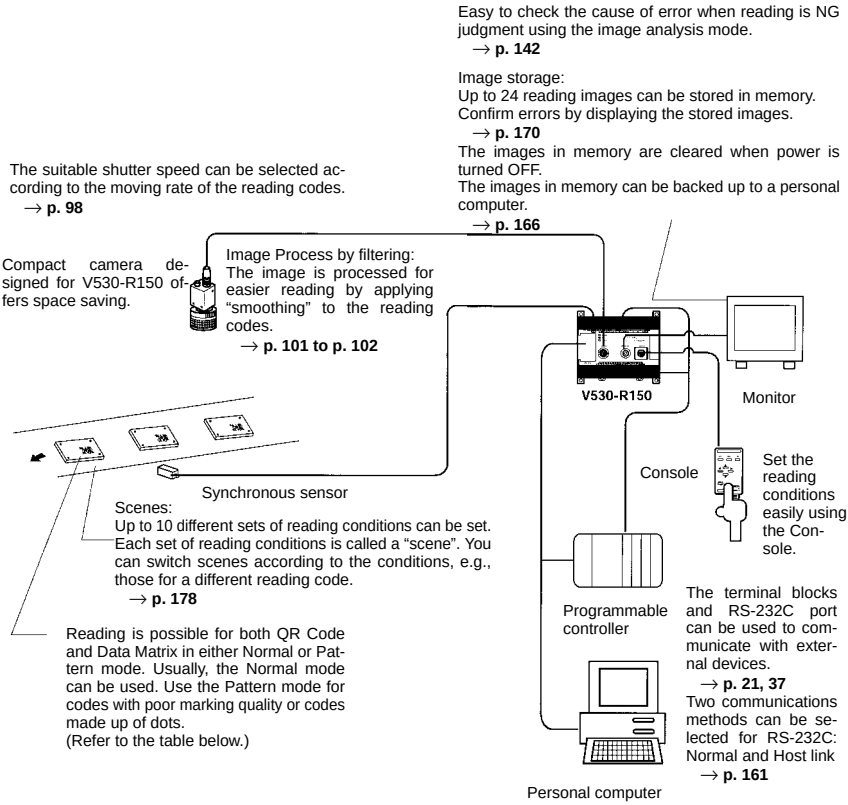
Refer to *Section 5 Operations* and *Section 6 Functions and Operations* for detailed descriptions.

Performing Reading



Refer to *6-2 MON (Monitor) Mode* and 6-3 *RUN Mode* for detailed descriptions.

1-2 Functions



Specifications

Reading code	QR Code (model 1, 2)	Data Matrix (ECC200)
Matrix size	21 x 21 cell to 41 x 41 cell (Version 1 to 6)	10 x 10 cell to 26 x 26 cell (8 x 32 cell: Pattern only)
Readable direction	360 degrees (All directions)	
Resolution	Varies according to magnification and features of the lens to be used. (See note.)	
Reading region		
Reading depth		

Note Adjust the field of vision to be at least five pixels per cell. Pixel number is measured by ***SET/Image Analysis/Measure Length***.
→ **p. 149**

1-3 Trigger Inputs and Outputs

Trigger Inputs

- Trigger inputs from terminal blocks: → **p. 25**
  Enter input signals to perform one shot reading, continuous reading and level trigger.
- Trigger inputs from RS-232C: → **p. 46, 52**
  Enter input signals to perform one shot reading and continuous reading.
  Select normal or host link as communications method.
- Trigger inputs from Console:
  Press the TRIG Key to perform one reading.

Reading Judgment Outputs

- To terminal blocks: → **p. 25**
  Judgment is output to the OK/NG terminal.
  Judgment is output to terminals DO0 to DO3 by using the coincidence judgment function.
- To RS-232C → **p. 46, 52**
  Reading judgment and data are output.
  Select normal or host link as communications method.

SECTION 2
Installation

This section describes the different parts of the V530-R150 2-Dimensional Code Reader, and details the connections and other procedures necessary for installation.

2-1 Component Names and Functions . . . . . .
2-2 Connections . . . . . .
2-3 Power Supply and Ground . . . . . .
2-3-1 Crimp Terminals and Cables . . . . . .
2-3-2 Protective Conductor (Earth) Wiring . . . . . .
2-3-3 Wiring the Power Supply . . . . . .
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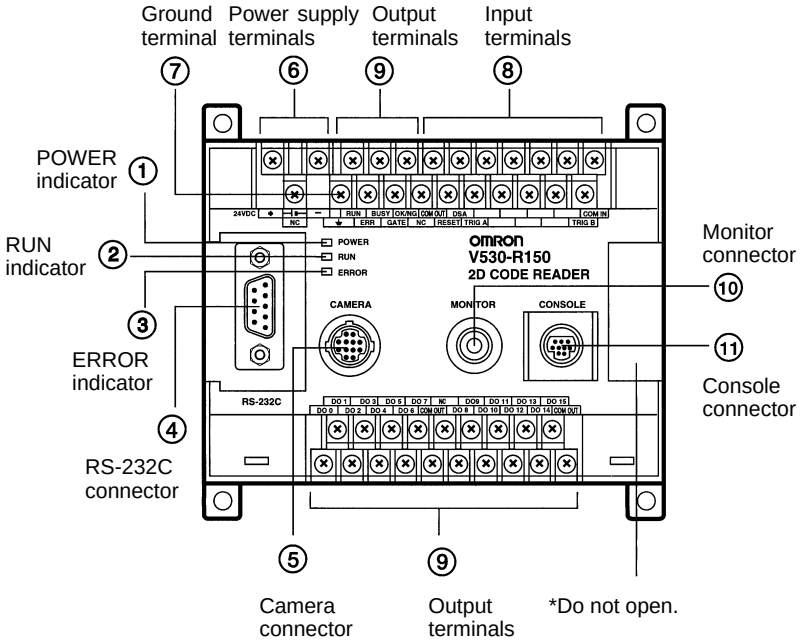
2-5 CCTV Lens . . . . . .
2-6 Lighting . . . . . .
2-7 Mounting the Controller . . . . . .
2-7-1 Mounting to DIN Track . . . . . .
2-7-2 Mounting on a Flat Surface . . . . . .

2-1 Component Names and Functions

The following diagram shows the terminals, connectors, and indicators on the V530-R150 2-Dimensional Code Reader.



① Lit while power is ON.

② Lit in RUN mode.

③ Lit when an error occurs.

④ Connects the V530-R150 to a computer, Programmable Controller, or other external device.

⑤ Connects to the Camera.

⑥ Wired to the power supply.

⑦ Wired to a ground.

⑧ Wired to external devices, such as synchronous sensors or inputs from a Programmable Controller.

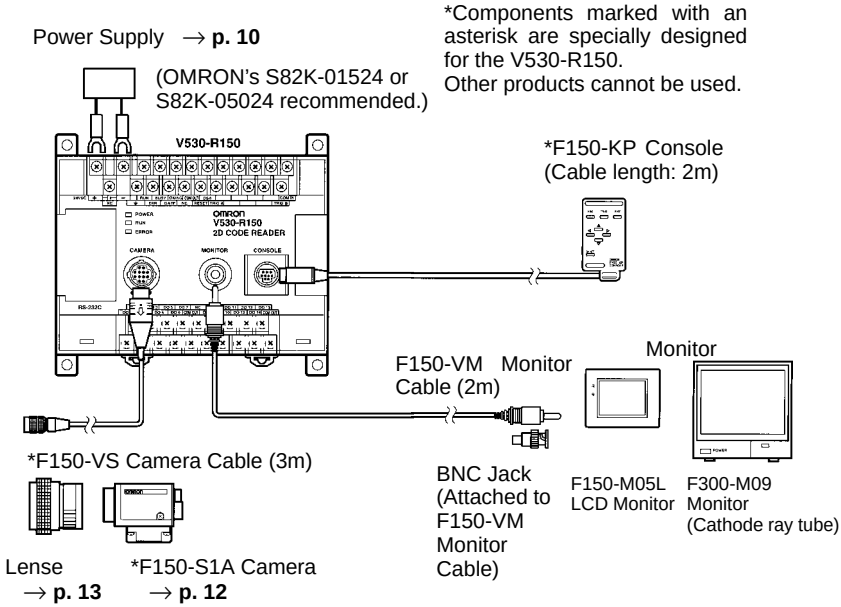
⑨ Wired to external devices, outputs to a Programmable Controller.

⑩ Connects to the monitor.

⑪ Connects to the Console.

2-2 Connections

Connect the basic component as shown in the following diagram. Details are provided later in this section.



Note Turn OFF the power to the Controller before connecting or disconnecting cables. Connecting or disconnecting cables with power turned ON can damage peripheral devices.

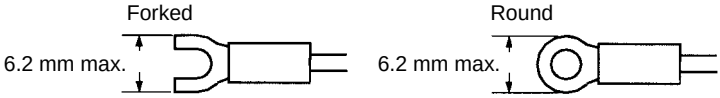
2-3 Power Supply and Ground

Wire the power supply and the ground to the top terminal block, and tighten the screws to a torque of between 0.5 and 0.6 N•m. After wiring, check to make sure that the wiring is correct.

⚠ **Caution** Cover the terminal blocks with the Terminal Block Protection Covers. Uncovered terminal blocks can result in electric shock.

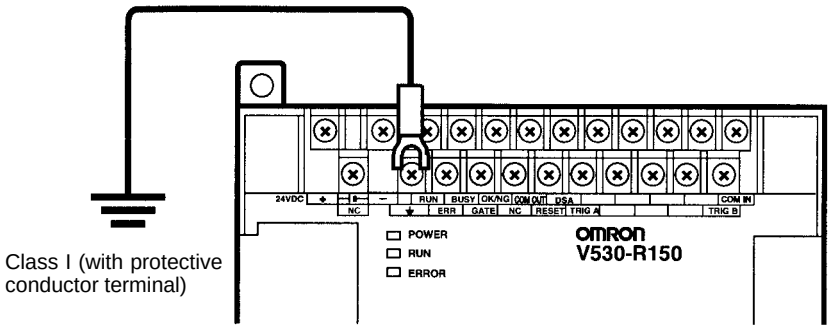
2-3-1 Crimp Terminals and Cables

The terminal block uses M3 terminal screws. Use appropriate crimp terminals for M3 screws, as shown below.



Applicable wire size: Insulated wire, 1.31 to 1.65 mm^2 (AWG16 to AWG15)

2-3-2 Protective Conductor (Earth) Wiring



Class I (with protective conductor terminal)

Note

1. Use an appropriate ground. An insufficient ground can affect V530-R150 operation or result in damage to V530-R150 components.
2. To avoid damage to the equipment, do not share the protective conductor wiring with any other devices nor wire the protective conductor terminal to the girder. Be sure to wire the protective conductor of the equipment independently.
3. Keep the ground line as short as possible.

2-3-3 Wiring the Power Supply

⚠ Caution Use a DC power supply with safe extra low-voltage circuits on the secondary side. Excessively high voltages can result in electric shock.

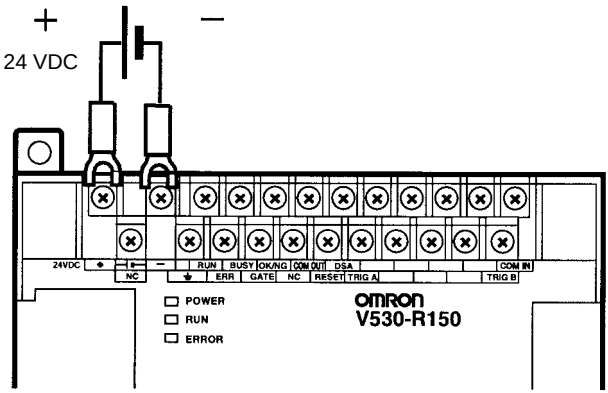
Power supply

Use a power supply with the following specifications. We recommend using OMRON's S82K-01524 Power Supply.

Output current	0.6 A min.
Power supply voltage	24 VDC+10%, –15%

Use a power supply with the following specifications when connecting the V530-R150 and F150-M05L LCD Monitor to one power supply. We recommend using OMRON's S82K-05024 Power Supply.

Output current	1.6 A min.
Power supply voltage	24 VDC+10%, –15%



Note

1. Wire the Power Supply Unit independently of other devices. In particular, keep the power supply wired separately from inductive loads.
2. Keep the power supply cable as short as possible.
3. If UL recognition is required, use a UL class II power supply.

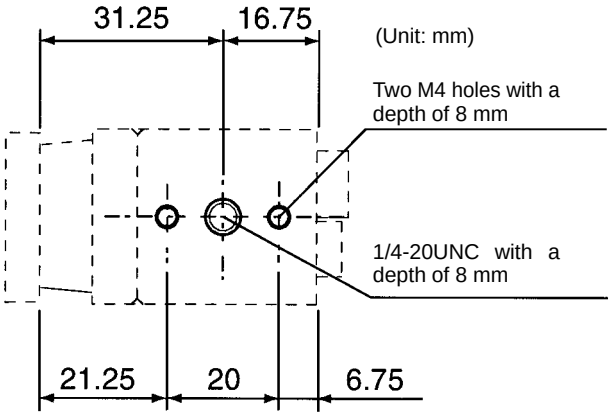
2-4 Camera

The camera is designed for the V530-R150.

Mounting the Camera

The specified camera distance is only an approximation. Mount the Camera so that it can be adjusted within a range containing the specified distance from the reading object.

- Camera

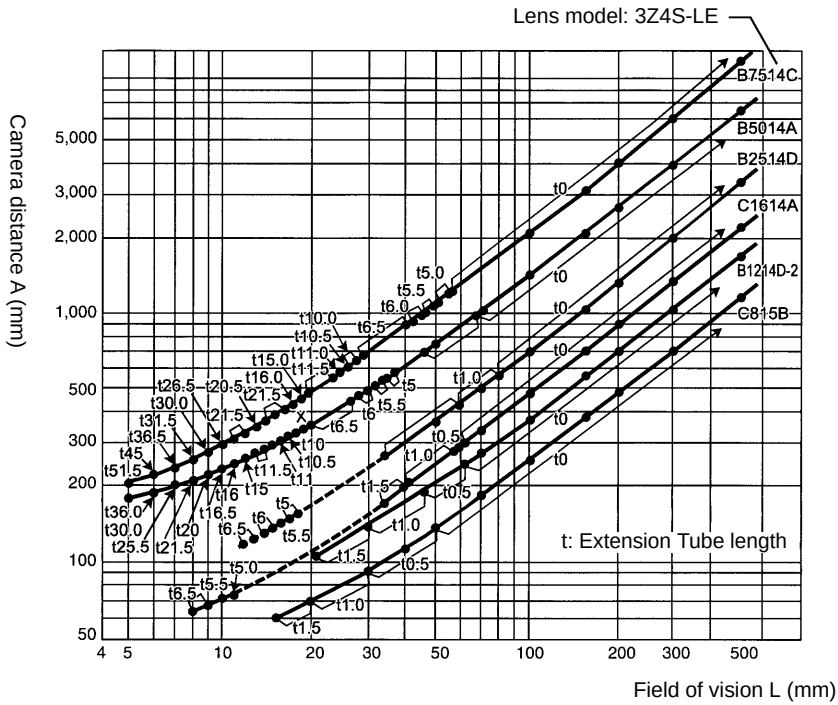


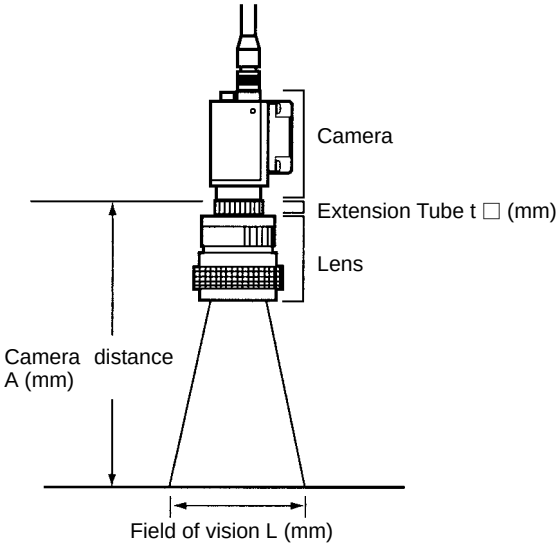
2-5 CCTV Lens

When using a F150-S1A Camera, refer to the following graph to select the appropriate Lens end Extension Tube. The lens required will differ depending on the size of the reading object and the distance from the Camera. Adjust the field of vision of the Camera so that a 2-dimensional code is at least 5 pixels per cell.

Optical Chart

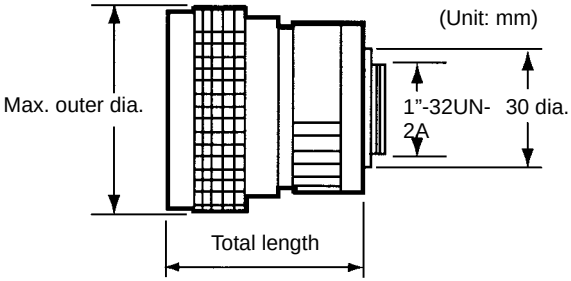
The X axis of the graph shows field of vision L (mm), and the Y axis shows the camera distance A (mm). The curves on the graph indicate different lenses, and the "t" values indicates the lengths of the Extension Tubes. The values in the following chart are approximations, and the Camera must be adjusted after it is mounted.





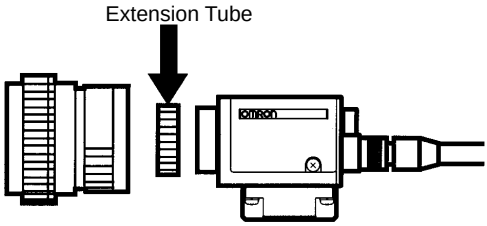
Lens

	Focal length	Brightness	Max. outer diameter	Total length	Filter size
3Z4S-LE C418DX	4.8 mm	F1.8	40.5 mm dia.	35.5 mm	---
3Z4S-LE B618CX-2	6.5 mm	F1.8	48 mm dia.	42 mm	
3Z4S-LE C815B	8.5 mm	F1.5	42 mm dia.	40 mm	M40.5 × P0.5
3Z4S-LE B1214D-2	12.5 mm	F1.4	42 mm dia.	50 mm	
3Z4S-LE C1614A	16.0 mm	F1.4	30 mm dia.	33 mm	M27 × P0.5
3Z4S-LE B2514D	25.0 mm	F1.4	30 mm dia.	37.3 mm	
3Z4S-LE B5014A	50.0 mm	F1.4	48 mm dia.	48 mm	M46 × P0.75
3Z4S-LE B7514C	75.0 mm	F1.4	62 mm dia.	79 mm	M58 × P0.75

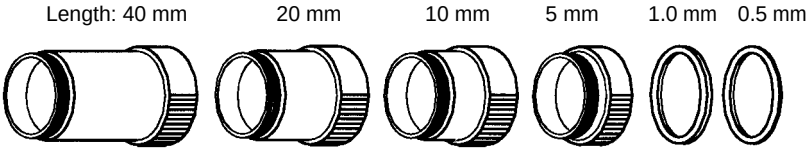


Extension Tubes

One or more Extension Tubes are inserted between the lens and the Camera to focus the Camera image. Use a combination of one or more of the six sizes of tube to achieve the required length.



Model	Max. outer diameter	Length
3Z4S-LE EX-C6	31 mm dia.	Set of 6 tubes 0.5 mm, 1 mm, 5 mm, 10 mm, 20 mm, and 40 mm



Note

1. Do not use the 0.5-mm and 1.0-mm Extension Tubes attached to each other. Since these Extension Tubes are placed over the threaded section of the Lens or other Extension Tubes the connection may loosen when more than one 0.5-mm or 1.0-mm Extension Tube are used together.
2. Reinforcement may be required for a combination of Extension Tubes exceeding 30 mm if the Camera is subject to vibration.

2-6 Lighting

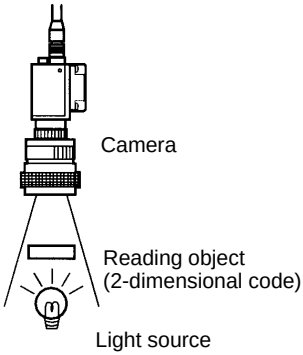
A stable image must be obtained to ensure accurate inspection. Use appropriate lighting for the application and the reading object.

Lighting Methods

Back Lighting

A stable, high-contrast image can be obtained using back lighting.

Applications: Transparent objects such as LCD glass

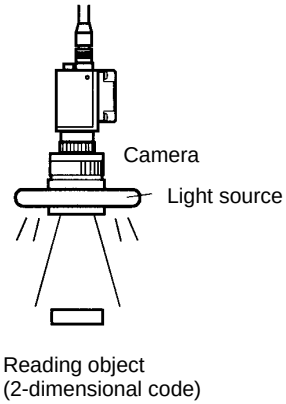


Reflected Lighting

Ring Lights

Light is shone uniformly on the reading object. The difference in reflection factors of the background and the marking enable stable detection.

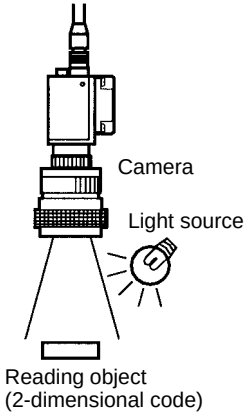
Applications: Paper labels and corrugated cardboard



Oblique Lighting

Detection is made by distinguishing regular and diffuse reflected light.

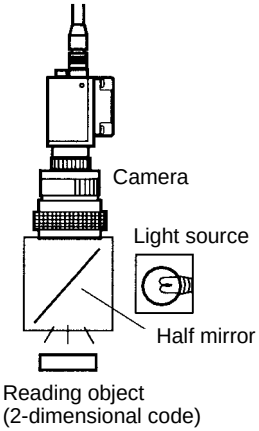
Applications: PCBs and electronic parts



Coaxial Lighting

A stable image with few shadows can be obtained of a reading object with an uneven surface by detecting only regular reflected light.

Applications: Mirror-like objects such as wafers

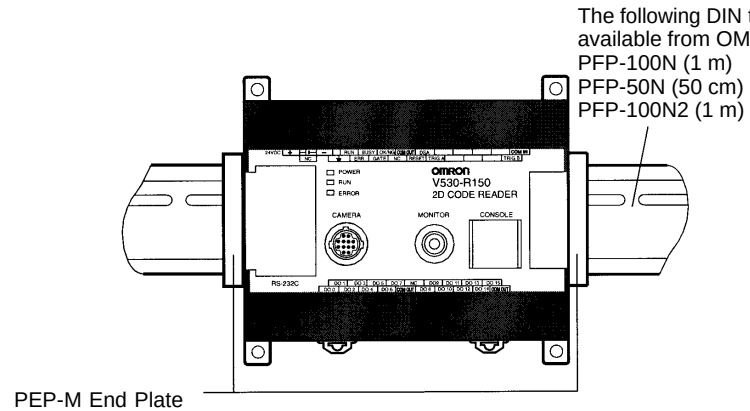


2-7 Mounting the Controller

The V530-R150 2-Dimensional Code Reader can be mounted to DIN Track or a flat surface.

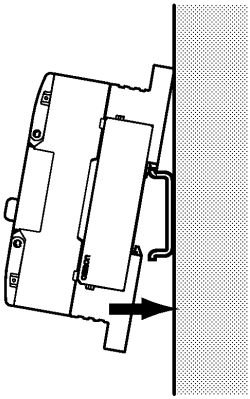
2-7-1 Mounting to DIN Track

The 2-Dimensional Code Reader can be easily mounted to or removed from 35-mm DIN Track.



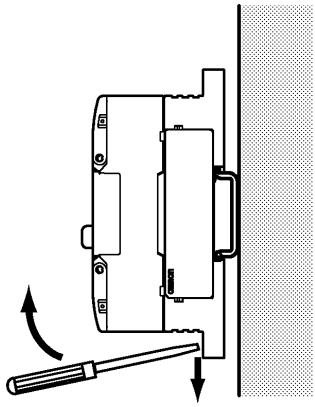
Mounting the Controller

Hook the Controller into the DIN Track as shown in the diagram and then press in at the bottom until the Controller locks into place.

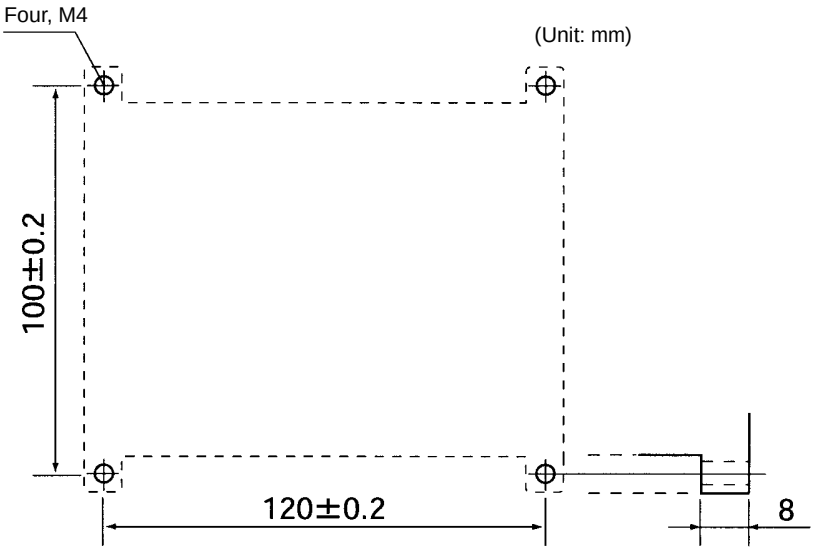


Removing the Controller

Use a screwdriver to pull the hook down and then pull out the Controller from the bottom.



2-7-2 Mounting on a Flat Surface



SECTION 3
Terminal Blocks

This section describes the specifications, procedures,inputs and outputs used when operating the V530-R150 2-Dimensional Code Reader via terminal blocks.

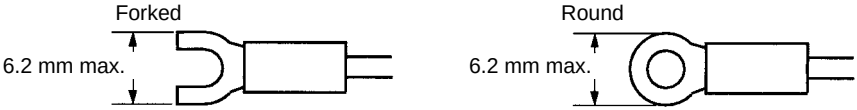
3-1 Specifications . . . . . .
3-1-1 Crimp Terminals and Cables . . . . . .
3-1-2 Specifications . . . . . .
3-1-3 Terminals . . . . . .
3-2 Trigger Input and Output Format . . . . . .
3-2-1 Trigger Input . . . . . .
3-2-2 Output Format . . . . . .
3-3 Timing Chart . . . . . .
3-3-1 One Shot Mode . . . . . .
3-3-2 Continuous Mode . . . . . .
3-3-3 Reading Level Trigger (when trigger mode is “Level Trigger”) . . . . . .
3-4 System Examination . . . . . .

3-1 Specifications

3-1-1 Crimp Terminals and Cables

The terminal block uses M3 terminal screws. Use appropriate crimp terminals for M3 screws, as shown below. Tighten the screws to a torque of between 0.5 and 0.6 N•m. After wiring, check to make sure that the wiring is correct.

⚠ Caution Cover the terminal blocks with the Terminal Block Protection Covers. Uncovered terminal blocks can result in electric shock.

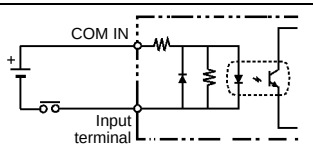
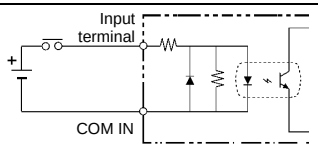


Applicable wire size: Insulated wire, 1.31 to 1.65 mm^2 (AWG16 to AWG15)

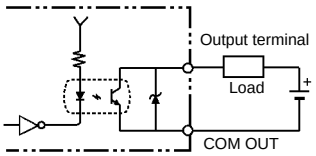
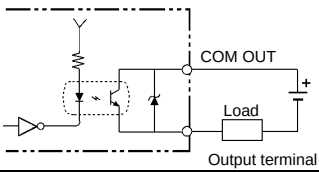
3-1-2 Specifications

⚠ Caution Use a DC power supply with safe extra low-voltage circuits on the secondary side. Excessively high voltage can result in electric shock.

Input Specifications

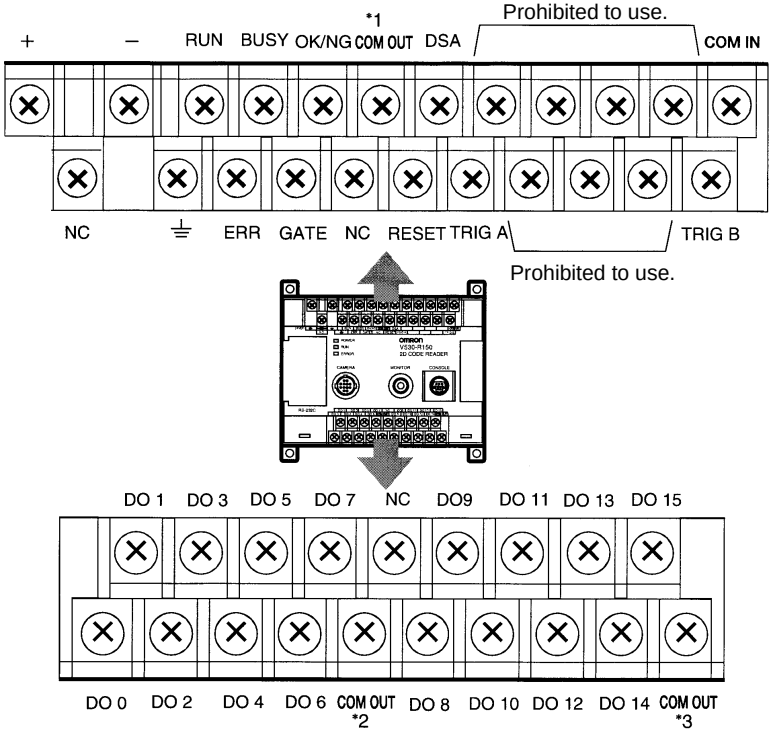
Item	V530-R150E-2 (NPN model)	V530-R150EP-2 (PNP model)
Input voltage	12 to 24 VDC ±10%	
ON current	3 to 15 mA	
ON voltage	8.8 V max.	
OFF current	0.1 mA max.	
OFF voltage	4.5 V min.	
ON delay	RESET input: 10 ms max. Others: 0.5 ms max.	
OFF delay	RESET input: 15 ms max. Others: 0.7 ms max.	
Internal circuits		

Output Specifications

Item	V530-R150E-2 (NPN model)	V530-R150EP-2 (PNP model)
Output voltage	12 to 24 VDC ±10%	
Load current	45 mA max.	
ON residual voltage	2 V max.	
OFF leakage current	0.1 mA max.	
Internal circuits		

Note If UL recognition is required, use a UL class II power supply.

3-1-3 Terminals



There are 3 kinds of COM OUT (*1 to *3) for each output terminal. Connect with reference to the following table.

A

Top		Bottom	
+	Power supply	NC	Not connected
–		⏚	Appropriate ground
RUN	Control output	ERR	Error output
BUSY		GATE	Control output
OK/NG	Judgment output	NC	Not connected
COM OUT (*1)	For RUN, ERR, BUSY, GATE, and OK/NG	RESET	Restart
DSA	Prohibited to use	TRIG A	Trigger input (One shot mode)
COM IN		TRIG B	Trigger input (Continuous or Level Trigger mode)

B

Top		Bottom	
DO 1	Coincidence output	DO 0	Coincidence output
DO 3		DO 2	
DO 5	Prohibited to use	DO 4	Prohibited to use
DO 7		DO 6	
NC	Not connected	COM OUT (*2)	For DO 0 to DO7
DO 9	Prohibited to use	DO 8	Prohibited to use
DO 11		DO 10	
DO 13		DO 12	
DO 15		DO 14	
		COM OUT (*3)	For DO 8 to DO15

Note

1. Do not reverse the connections of the signal terminals and COM terminals.
2. Do not use RESET input immediately after power is turned ON.
   When using RESET input to synchronize execution timing, wait at least 1 s after turning ON the V530-R150 power supply before turning ON the RESET terminal.

3-2 Trigger Input and Output Format

3-2-1 Trigger Input

Reading is performed by inputting a signal to the TRIG A or B terminals when in MON (monitor) or RUN mode.

TRIG A Terminal (One shot mode)

One reading is performed on the rising edge (OFF to ON) of TRIG A signal.

Correct Reading: Reading ends, then reading judgment is output.
Incorrect Reading: Reading continues to be performed for the number of retries specified in the setting conditions.

How to set the number of retries. → **p. 107, 115, 122, 133**

As the TRIG A signal is synchronous with the shutter input of the Camera, an accurate image of the moving object can be obtained.

TRIG B Terminal (Continuous mode / Level trigger mode)

Changed by setting of communications specifications.
→ **p. 164**

Trigger Mode	Detail
Continuous mode (Default setting)	Performs continuous reading while the TRIG B terminal is ON. In this mode, the reading accuracy and number of retry settings are disabled for the TRIG B input.
Level trigger mode	Repeats reading while the TRIG B terminal is ON until reading judgement is OK (readable).

3-2-2 Output Format

Signals are output in RUN mode but not in MON (monitor) mode.

OK/NG Terminal

Output OK/NG judgment.

Judgment	Detail
OK	OK when 2-dimensional codes are read successfully. The reading data will be output to RS-232C.
NG	NG when 2-dimensional codes are not read successfully. The error code will be output to RS-232C. NG when coincidence judgment is set to ON and the reading data is not coincident with the registered data 0 to 3. The reading data will be output to RS-232C.

OK: ON or NG: ON (i.e.: whether output turns ON for an OK judgment or an NG judgment) can be selected in the communications

specifications settings.
The default setting is NG: ON. → **p. 164**

DO0 to DO3 Terminals

While the coincidence judgment function is ON, the signals are as follows:

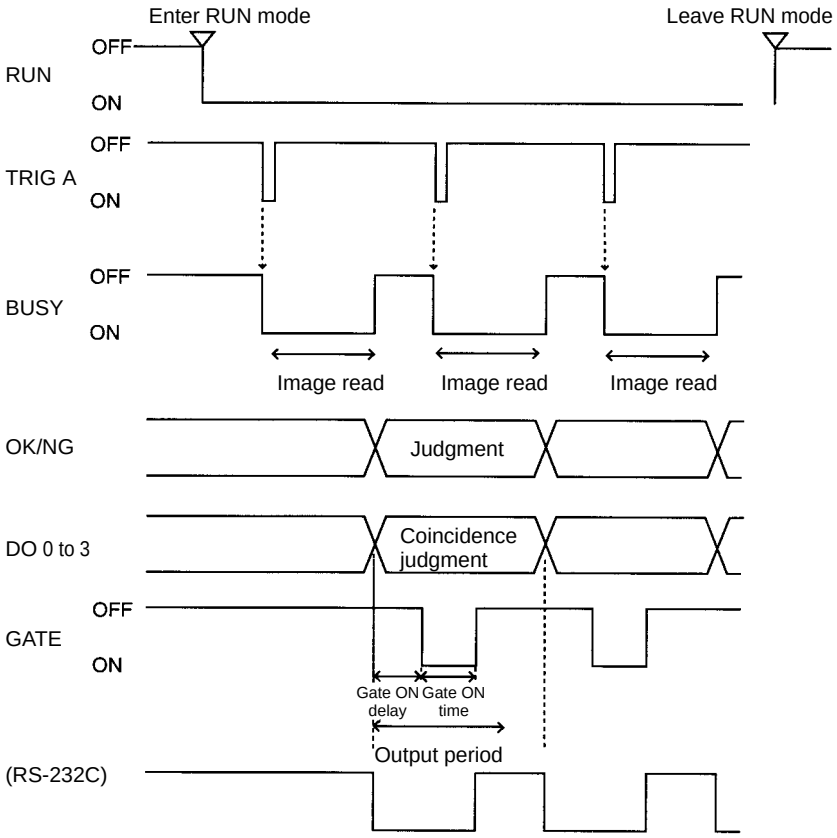
How to set coincidence judgment function → **p. 139**

Coincident with registered data 0: DO0 terminal turns ON.
Coincident with registered data 1: DO1 terminal turns ON.
Coincident with registered data 2: DO2 terminal turns ON.
Coincident with registered data 3: DO3 terminal turns ON.

Note The initial status of the output terminals is OFF. The terminals, however, may turn ON for approximately 0.5 s when the power is turned ON. Be sure to allow for this when connecting to an external device.

3-3 Timing Chart

3-3-1 One Shot Mode



Note The output time to RS-232C changes depending on the data volume or baud rate.

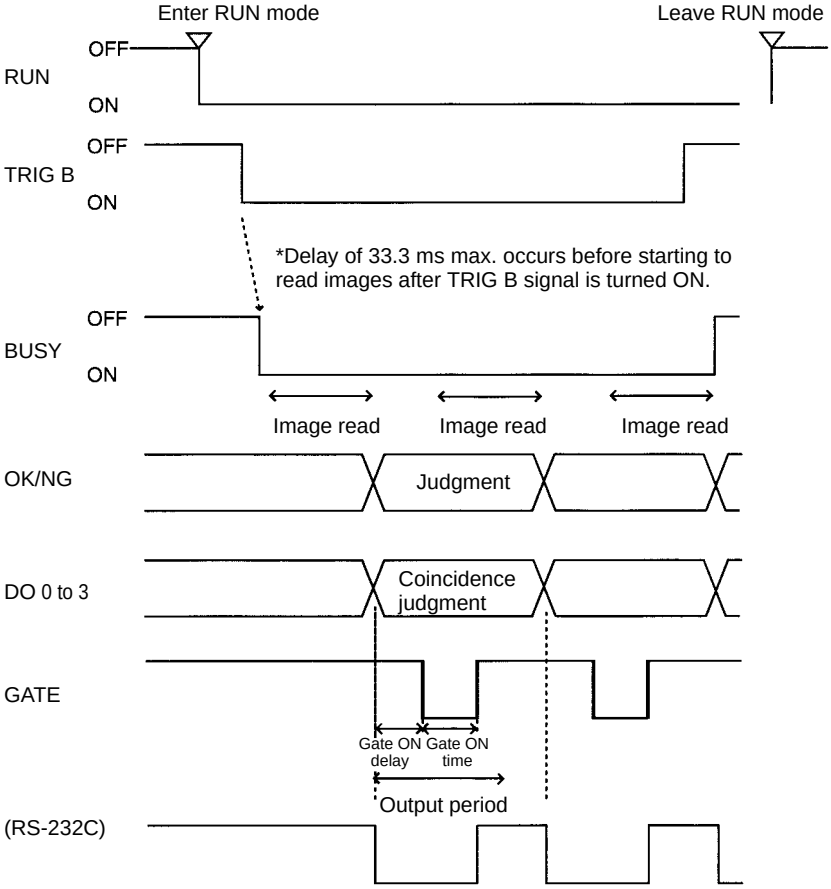
Output Terminals

Terminal	Function
RUN	Turns ON during RUN mode.
BUSY	Shows that the V530-R150 is reading an image, changing settings, etc. Do not input the next command while the BUSY signal is ON. Otherwise, commands may not be properly executed.
OK/NG	Outputs the judgment under the set reading conditions. (Can be set to turn ON for either OK or NG judgment.)
GATE	Used to control the timing with which the reading judgment is read at the external device. The duration for which the GATE terminal is turned ON can be set as required for the external device to correctly read the reading judgment. Make the output cycle shorter than the duration of the reading (TRIG A input). If the cycle is longer, the output timing falls behind as readings are repeated. Gate ON delay, Gate ON time and Output period are set under the set communications conditions. → **p. 164**

Input Terminals

Terminal	Function
TRIG A	Inputs a reading trigger from a photoelectric sensor or other external device. One reading is taken on the rising edge of the TRIG A signal. Turn ON for at least 0.5ms. The duration of TRIG A signal input depends on reading time. While reading is being performed, BUSY terminal turns ON and does not accept input signals. Refer to *3-4 System Examination* for the standard reading time.

3-3-2 Continuous Mode



Note The output time to RS-232C changes according to the data volume and baud rate.

Output Terminals

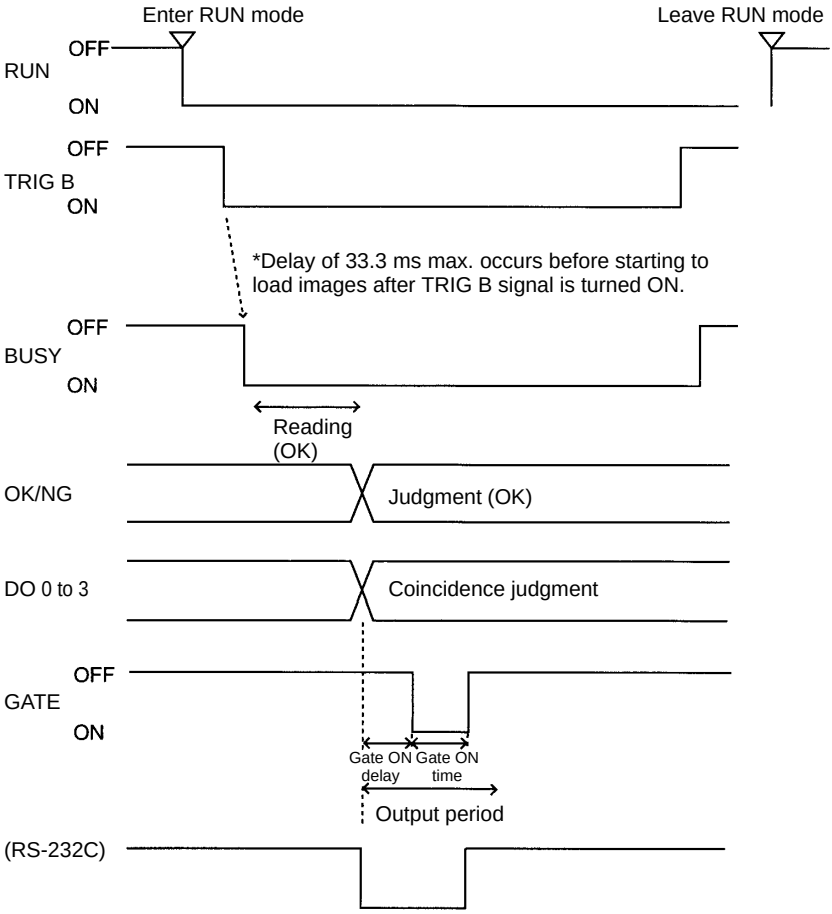
Terminal	Function
RUN	Turns ON during RUN mode.
BUSY	Shows that the V530-R150 is reading an image, changing settings, etc. Do not input the next command while the BUSY signal is ON. Otherwise, commands may not be properly executed.
OK/NG	Outputs the judgment under the set reading conditions. (Can be set to turn ON for either OK or NG judgment.)
GATE	Used to control the timing with which the reading judgment is read at the external device. The duration for which the GATE terminal is turned ON can be set as required for the external device to correctly read the reading judgment. Make the output cycle shorter than the duration of the reading. If the cycle is longer, the output timing falls behind as readings are repeated. Gate ON delay, Gate ON time and Output period are set under the set communications conditions. → **p. 164**

Input Terminals

Terminal	Function
TRIG B	Continuous reading is performed when TRIG B signal is turned ON.

3-3-3 Reading Level Trigger (when trigger mode is "Level Trigger")

OK judgment (Readable)



Note The output time to RS-232C changes according to the data volume and baud rate.

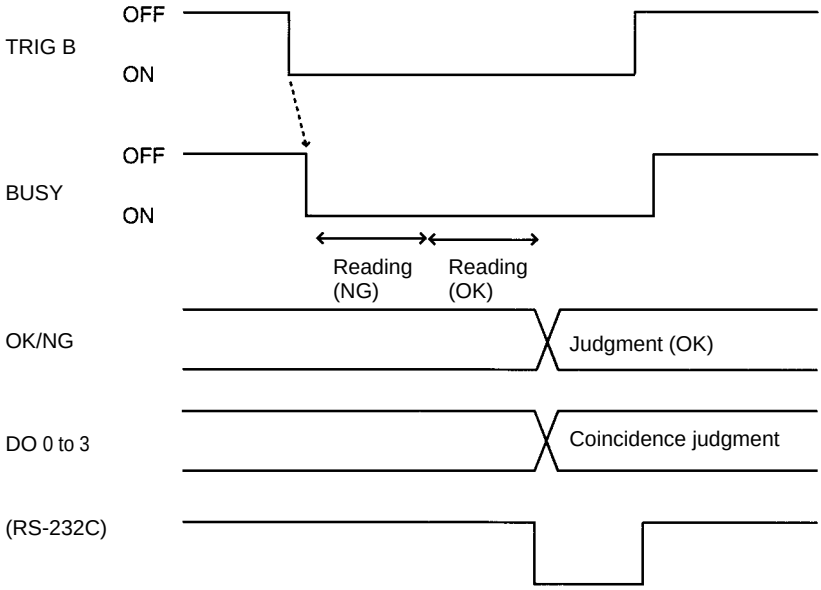
Output Terminals

The same as continuous mode.

Input Terminals

Terminal	Function
TRIG B	Continuous reading is performed while TRIG B signal is turned ON until OK (readable) reading judgment is output.

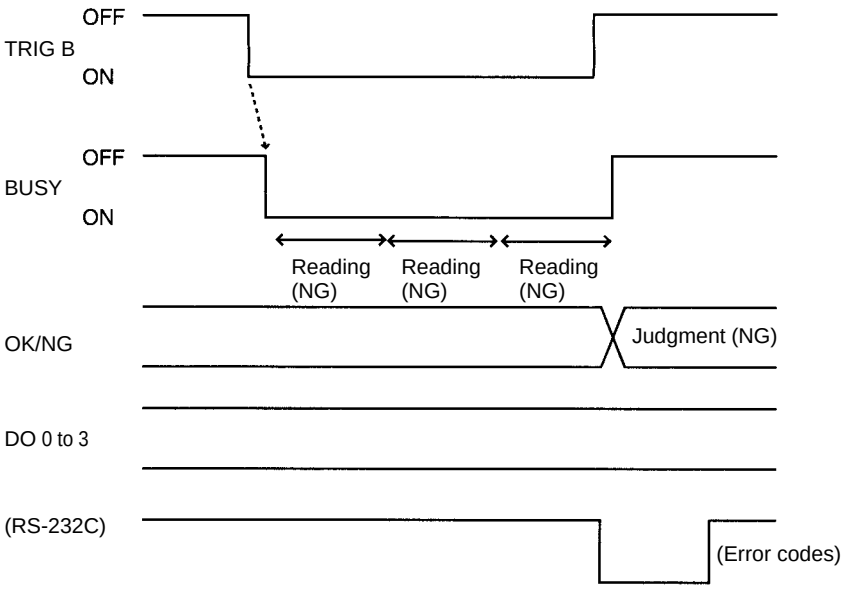
OK judgment obtained after repeated reading:



Note The output time to RS-232C will vary according to the data volume and baud rate.

NG judgment after repeated reading:

NG is output when TRIG B is turned OFF.



Note The output time to RS-232C will vary according to the data volume and baud rate.

3-4 System Examination

Processing Time Calculation

Processing time (reading time) is calculated as follows:

Processing time = Shutter time of camera + Delay of loading image (see note) + Loading image time (33.3 ms fixed)

+ Decode time + Display time

Note A delay will occur before starting to load monitor images if through images are displayed. A delay may also occur depending on the trigger input method.

Reading Moving Objects

Please note the following to prevent delay when loading images.

- Use the TRIG A signal for timing input.
  As the TRIG A signal is synchronous with the shutter input of the Camera, an accurate image of the moving object can be obtained.
- Set the image to be displayed on the monitor to “Freeze”.
  When through images are displayed, a delay of 33.3 ms max. occurs before loading images after the TRIG A signal input.

Line Speed

If the object moves while the image is being loaded after the shutter is released, the image will be blurred. Set the line speed according to the shutter speed (using V530-R150 menu), the cell size of objects, and the field of vision of the Camera.

Tact Time

A certain interval is necessary between reading objects during which the next trigger signal is not input. This interval (time) is called “Tact Time”.

(e.g.) Processing time for reading: 500 ms; Line speed: 30 m/min

$$\frac{30}{60} \times 0.5 = 0.25$$

The distance moved in 500 ms is 0.25 m. Therefore, an interval allowing 0.25 m min. of movement is necessary.

Number of Retries

If reading is NG, reading continues to be performed for the number of retries specified by the setting conditions. When reading moving objects, reading may continue after the object has left the field of vision. Set the number of retries so that reading is performed while the object is still within the field of vision, or set to 0.

Continuous Reading

Regardless of the displayed image (through/freeze), a 33.3 ms max. delay occurs before loading the image after the TRIG B signal is input.

Standard Processing Time (values for OMRON's standard codes)

QR Code (Normal Mode)

Matrix size	Processing time
21 X 21 (Version 1)	160 ms
29 X 29 (Version 3)	200 ms
41 X 41 (Version 6)	260 ms

Data Matrix (Normal Mode)

Matrix size	Processing time
10 X 10	180 ms
14 X 14	190 ms
26 X 26	250 ms

Note The data here are standard values. When installing, calculate the processing time according to the actual specifications and confirm the value in the actual operating environment. The processing time is displayed in the upper-right corner of the screen when reading is performed in MON (monitor) or RUN mode.

SECTION 4
RS-232C

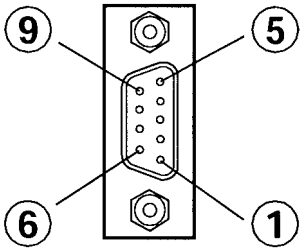
This section describes the specifications, procedures, inputs and outputs used when operating the V530-R150 2-Dimensional Code Reader via RS-232C.

4-1 Specifications . . . . . .
4-1-1 Connector . . . . . .
4-1-2 Wiring . . . . . .
4-1-3 Connection . . . . . .
4-2 Communication Settings . . . . . .
4-2-1 Normal Communications Mode . . . . . .
4-2-2 Host Link . . . . . .
4-3 Trigger Inputs and Output Format . . . . . .
4-3-1 Normal . . . . . .
4-3-2 Communications Mode: Host Link . . . . . .
4-4 FCS Calculation . . . . . .
4-5 Connection Examples . . . . . .
4-5-1 Connection Examples for Programmable Controller (Normal) . . . . . .
4-5-2 Connection Examples for Programmable Controller (Host Link) . . . . . .
4-5-3 Connection Examples for Personal Computers (Normal) . . . . . .
4-5-4 Connection Examples for Multidrop (Normal) . . . . . .

4-1 Specifications

4-1-1 Connector

The V530-R150 uses 9-pin D-SUB female connectors. The pin numbers and names are shown below.



Recommended OMRON Connector

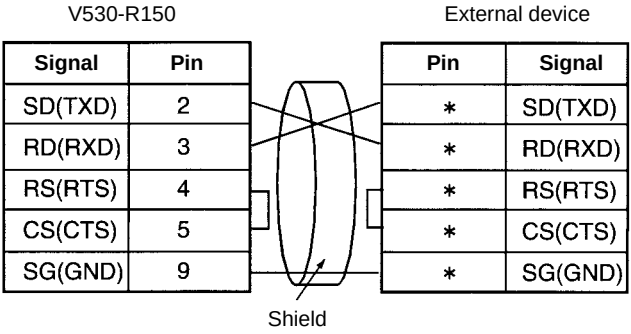
Model	Model No.
Plug	XM2A-0901
Hood	XM2S-0911

Pin	Signal	Name
1	FG (GND)	Frame ground
2	SD (TXD)	Send Data
3	RD (RXD)	Receive Data
4	RS (RTS)	Request to Send
5	CS (CTS)	Clear to Send
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	SG (GND)	Signal ground

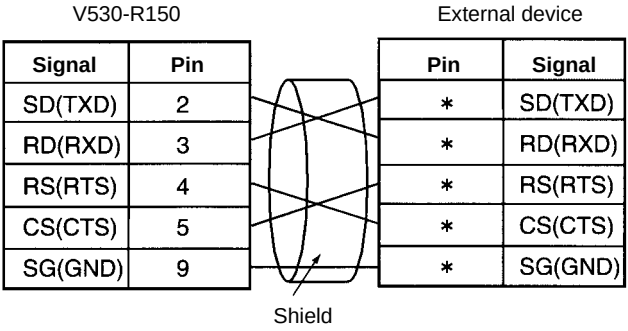
4-1-2 Wiring

Only use a shielded RS-232C cable.

Standard Connections



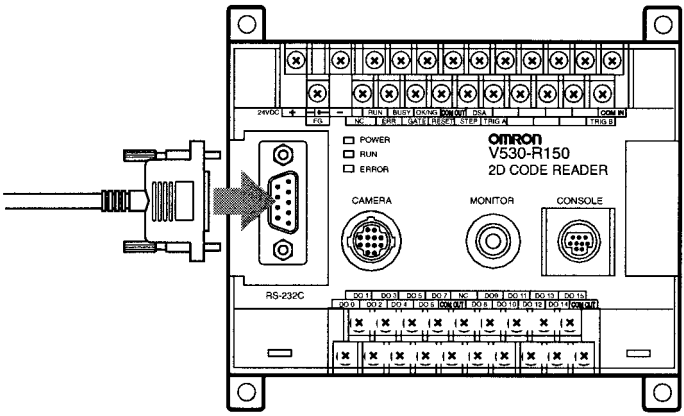
Connections for RS/CS Control



Note Pin numbers will depend on the external device being connected.
Refer to the manual for the external device.

4-1-3 Connection

Align the connector with the socket and press the connector straight into place. Tighten the two screws on the edges of the connector.



Note

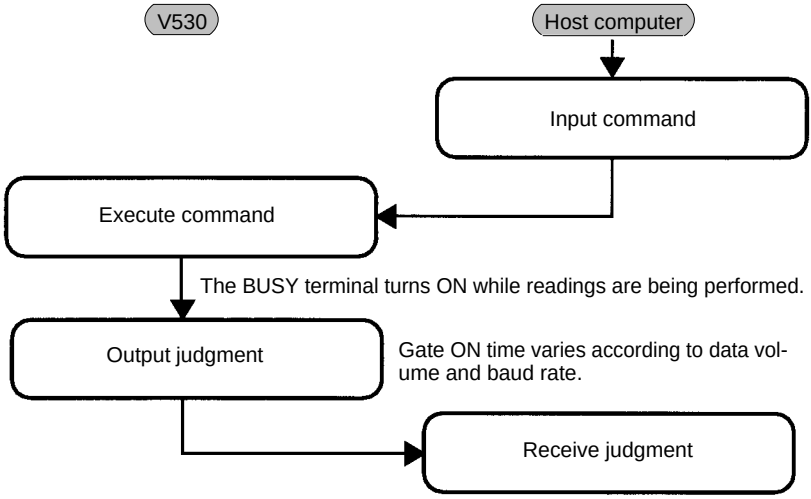
1. Always turn OFF the power supply before connecting or disconnecting cables. Peripheral devices can be damaged if connected or disconnected with the power supply turned ON.
2. Always tighten the connector screws.

4-2 Communication Settings

4-2-1 Normal Communications Mode

If the Normal communications mode is selected, data can be output in normal format to an external device via the RS-232C port.
Communications method setting menu → **p. 161, 162**

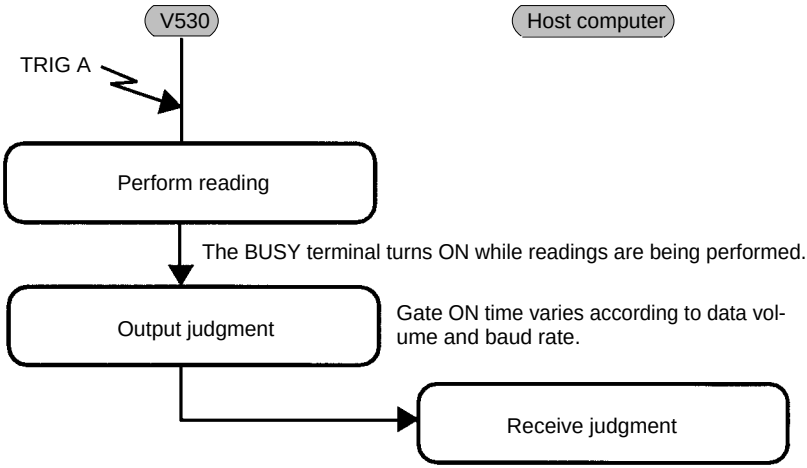
I/O via the RS-232C Port



A timeout error occurs if there is no response from the host computer within the set time when RS/CS or Xon/off is selected for flow control. An ERR (error) message appears on the screen, and the error terminal turns ON.

Program example → **p. 64**

TRIG A Signal as Reading Trigger



A timeout error occurs if there is no response from the host computer within the set time when RS/CS or Xon/off is selected for flow control. An error message appears on the screen, and the ERR (error) terminal turns ON.

Program example → **p. 59**

4-2-2 Host Link

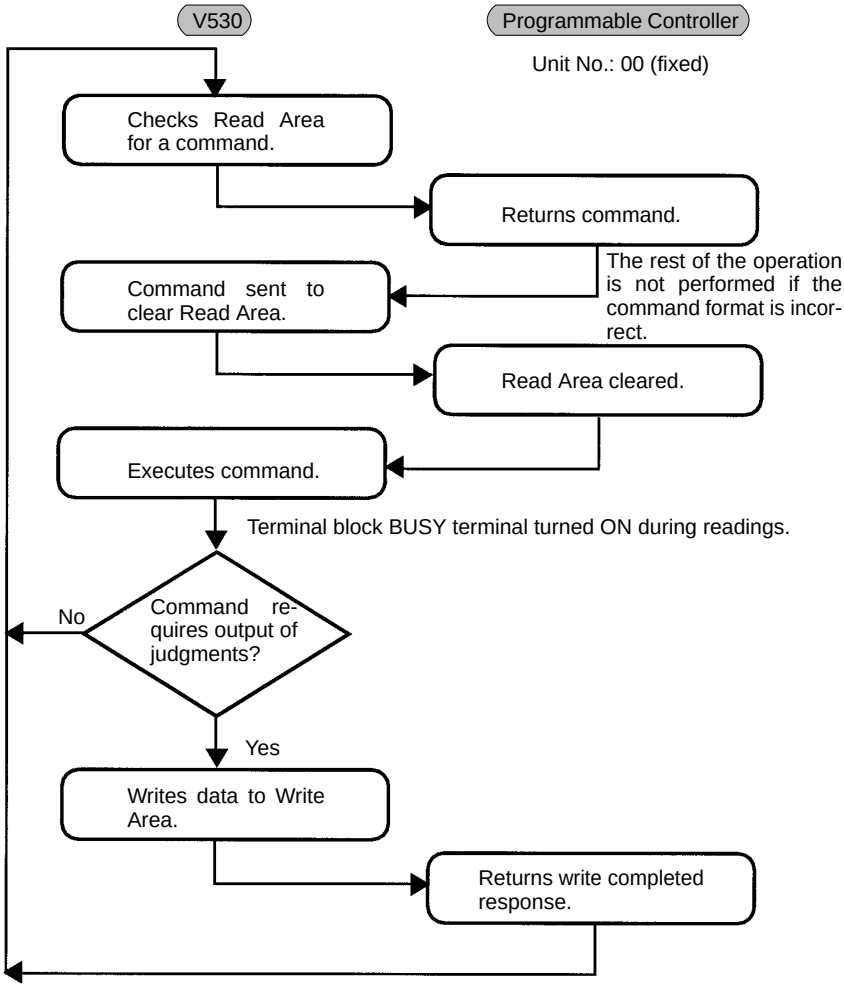
Select Host Link for the communications mode to communicate in Host Link format with a Programmable Controller or other host device via the RS-232C port.

Communications method setting menu → **p. 161, 163**

I/O via the RS-232C Port

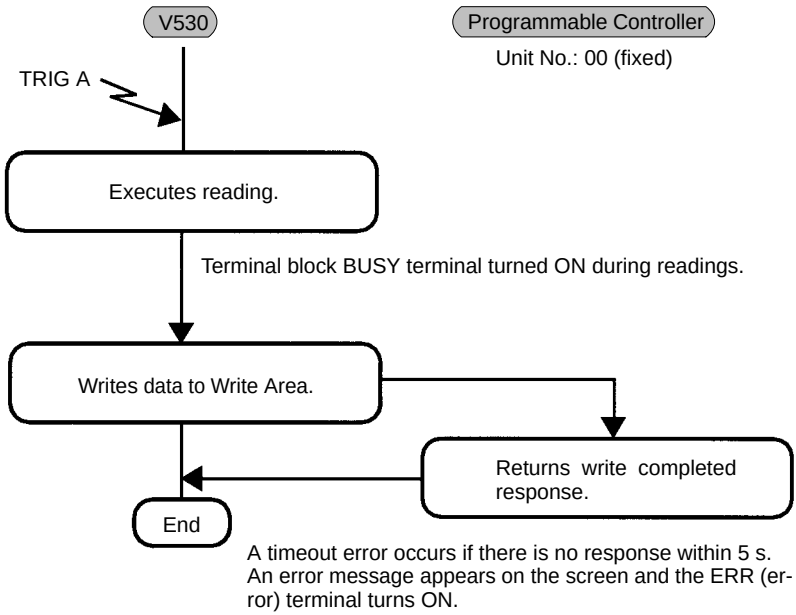
Commands for the V530-R150 are written to the Read Area in the Programmable Controller.

The V530-R150 automatically reads these commands, executes them, and writes any judgments to the Write Area.



TRIG A Signal as Reading Trigger

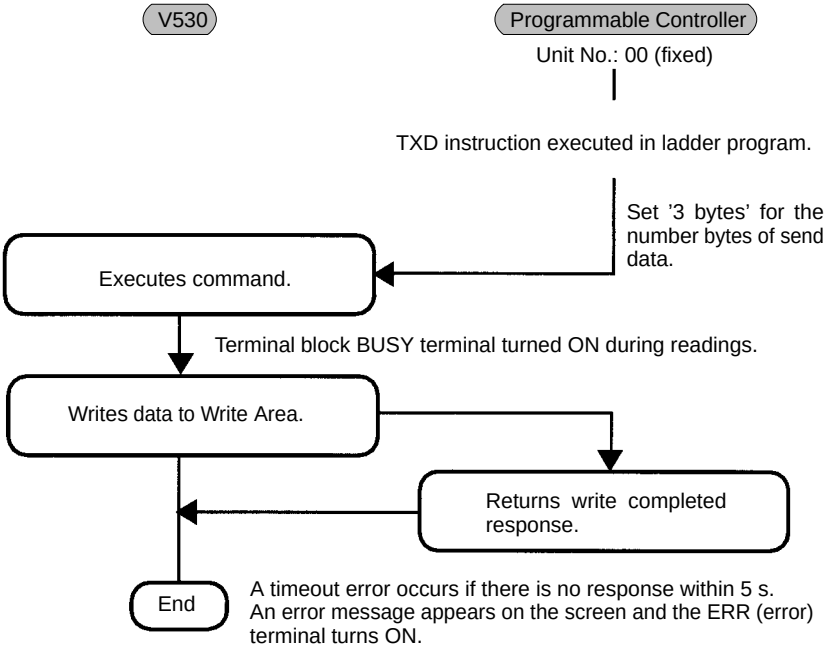
Set the Read Area to “None.”



A timeout error occurs if there is no response within 5 s. An error message appears on the screen and the ERR (error) terminal turns ON.

Using TXD Instructions

Commands are sent from the Programmable Controller to the V530-R150 using TXD instructions in the Programmable Controller's ladder program instead of the Read Area. If TXD instructions are to be used to send commands, set the Read Area to "None."



Program example → **p. 62**

4-3 Trigger Inputs and Output Format

4-3-1 Normal

Command

Connection	Function	Command
1:1	One shot reading	@GL
	Start continuous reading	@GC
	Stop continuous reading	@SC
	Request to resend reading data	@RS
	Read the scene number currently displayed	@SN
	Switch the scene	@SN_Scene No.
1:N (Multidrop)	One shot reading	@GL_unit No.
	Polling	@RD_Unit No.
	Read the scene number currently displayed	@MS_Unit No.
	Switch the scene	@MS_Unit No. Scene No.

Note "_" in the above commands means space.

Error Code

The following error codes are output according to the cause of error when the reading is NG. (FP = Finder Pattern; TP = Timing Pattern.)
Refer to *9-2 Error Codes and Countermeasures* for details.

QR Code (Normal Mode or Pattern Mode)

Error Code	Description
E000	No FP
E001	Missing 2 FPs
E002	Missing 1 FP
E003	3 FPs in wrong position
E004	More than 3 FPs
E010	Decode error
E011	
E012	
E013	
E020	
E030	Pattern search NG

Data Matrix

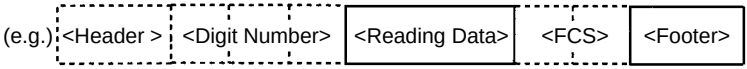
- Normal Mode or Pattern Mode

Error Code	Description
E100	No candidate for FP
E110	No FP
E111	Error 1 FP
E112	FP in wrong position
E120	Decode error
E121	
E122	
E123	
E150	

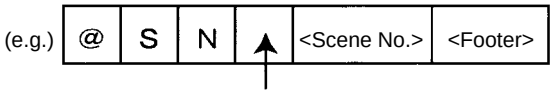
- Pattern Mode

Error Code	Description
E160	No TP
E161	More than 1 TP
E170	No FP
E171	More than 1 FP
E172	FP in wrong position
E180	Decode error
E181	
E182	

- The items in dotted boxes can be selected to be added or not in the communication setting menu. → **p. 161**



- Insert one space in the blank box.



One Shot Reading (@GL) 1:1 Connection

Reading ends and the judgments are output when the reading is correctly performed. When the reading is not correctly performed reading continues to be performed for the number of retries specified in the setting conditions.

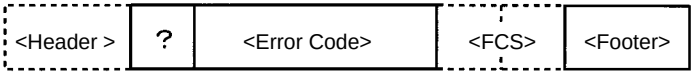
Send

Receive

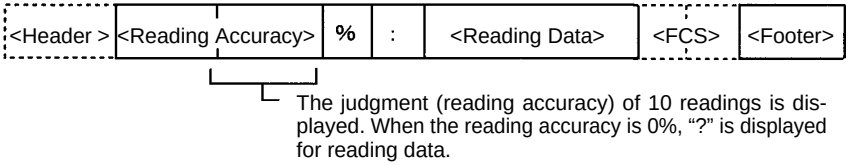
Correct reading:

Incorrect reading:

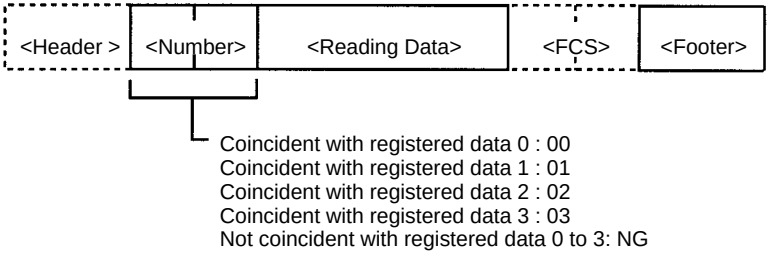
Reading continues to be performed for the number of retries specified in the setting conditions. An error code is output when an error occurs.



When Reading Accuracy is ON:



When Coincidence Judgment is ON:

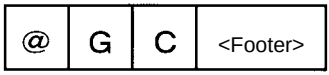


Continuous Reading (@GC, @SC) 1:1 Connection

Performs continuous reading until the stop command (@SC) is sent.

Send

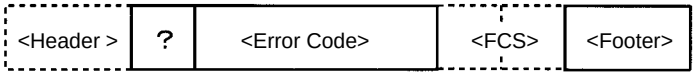
Starts reading.



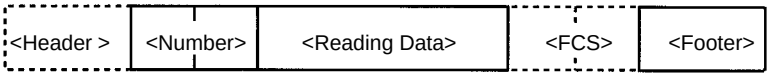
Receive

Correct reading:

Incorrect reading:



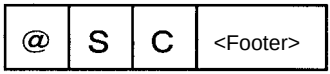
When Coincidence Judgment is ON:



Coincident with registered data 0 : 00
Coincident with registered data 1 : 01
Coincident with registered data 2 : 02
Coincident with registered data 3 : 03
Not coincident with registered data 0 to 3: NG

Send

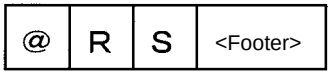
Stops continuous reading.



Request to Resend Scene Data (@RS) 1:1 Connection

Resends the last reading data.
If the command is input while reading is performed, the data will be resent after the reading is completed.

Send



Receive

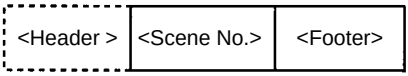
Last reading data

Read the Scene Number Currently Displayed (@SN) 1:1 Connection

The displayed scene number (0 to 9) is output.

Send

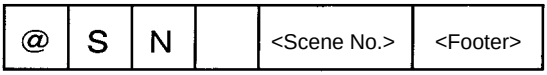
Receive



Switch the Scene (@SN Scene No.) 1:1 Connection

Switches the scene number to be displayed.

Send

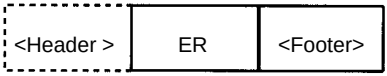


Specify 0 to 9 for the scene no.

Receive

Correctly switched:

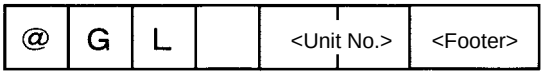
Incorrectly switched:



One Shot Reading (@GL Unit No., @RD Unit No.) 1:N Connection

Reading ends if the reading is performed correctly. If the reading is not performed correctly, reading continues to be performed for the number of retries specified in the setting conditions. Reading data is not output until polling commands are given.

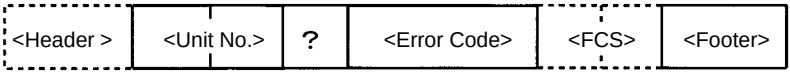
Send



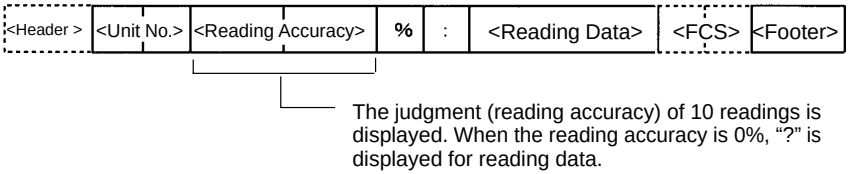
Receive

Correct reading:

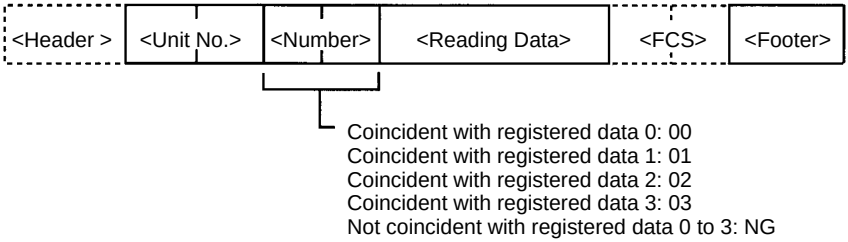
Incorrect reading:



When Reading Accuracy is ON:

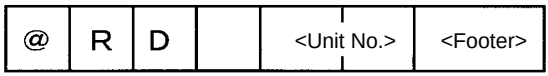


When coincidence judgment is ON:



Send

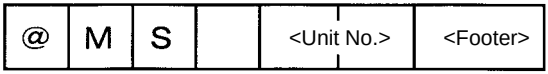
Polling



Read the Scene Number Currently Displayed (@MS Unit No.) 1:N Connection

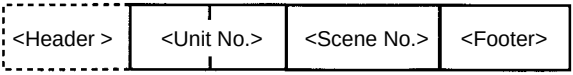
The displayed scene number (0 to 9) is output.

Send



Receive

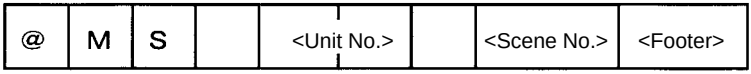
Data is output from the V530-R150 without polling commands.



Switch the Scene (@MS Unit No. Scene No.) 1:N Connection

Switches the scene number to be displayed.

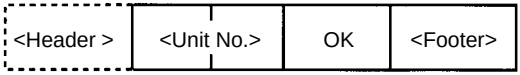
Send



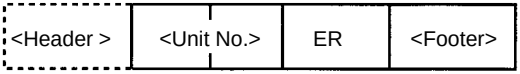
Receive

Data is output from the V530-R150 without polling commands.

Correctly switched:



Incorrectly switched:



4-3-2 Communications Mode: Host Link

Command Table

Command Code	Function
10	One shot reading
11	Start continuous reading
12	Stop continuous reading
20	Switch to a specified scene number
21	Increase the displayed scene number by one
22	Decrease the current scene number by one
23	Read the scene number currently displayed

Error Code Table

Following error codes are output according to the cause of errors when NG reading judgment is output. (FP = Finder Pattern; TP = Timing Pattern.)
Refer to *9-2 Error Codes and Countermeasures* for details.

QR Code (Normal Mode or Pattern Mode)

Error Code	Description
E000	No FP
E001	Missing 2 FPs
E002	Missing 1 FP
E003	3 FPs in wrong position
E004	More than 3 FPs
E010	Decode error
E011	
E012	
E013	
E020	
E030	Pattern search NG

Data Matrix

- Normal Mode or Pattern Mode

Error Code	Description
E100	No candidate for FP
E110	No FP
E111	Error 1 FP
E112	FP in wrong position
E120	Decode error
E121	
E122	
E123	
E150	

- Pattern Mode

Error Code	Description
E160	No TP
E161	More than 1 TP
E170	No FP
E171	More than 1 FP
E172	FP in wrong position
E180	Decode error
E181	
E182	

One Shot Reading (10) 1:1 Connection

Reading ends and the judgments are output when the reading is correctly performed. When the reading is not correctly performed, reading continues to be performed for the number of retries specified in the setting conditions. The reading judgments are output to a write word.

Read

Begin read word	Bit				Setting
	15 to 12	11 to 8	7 to 4	3 to 0	
+0	0 0 0 0	0 0 0 0	0 0 0 1	0 0 0 0	Command code

Continuous Reading (11, 12) 1:1 Connection

Starts continuous reading

Continuous reading is performed.
The reading judgment is output to a write word.

Read

Begin read word	Bit				Setting
	15 to 12	11 to 8	7 to 4	3 to 0	
+0	0 0 0 0	0 0 0 0	0 0 0 1	0 0 0 1	Command code

Stops continuous reading.

Read

Begin read word	Bit				Setting
	15 to 12	11 to 8	7 to 4	3 to 0	
+0	0 0 0 0	0 0 0 0	0 0 0 1	0 0 1 0	Command code

Reading Judgment

Write

Begin write word	Bit			
	15 to 12	11 to 8	7 to 4	3 to 0
+0	Write flag	0 0 0 0	0 0 0 0	0 0 0 0
+1	Reading data 1st byte		Reading data 2nd byte	
+2	Reading data 3rd byte		Reading data 4th byte	
to	to		to	
+27	Reading data 53th byte		Reading data 54th byte	
+28	Reading data 55th byte		Reading data 56th byte	

- Reading data is stored with ASCII codes.
- Write flag switches between [0 0 0 0] ←→ [1 1 1 1] each time data is output. Monitor the flag to see whether reading judgment has been written.
- The data capacity (max.) of codes is as follows.
  Letters and numbers: 56 letters
  The reading data after 56th letter are ignored.
- When reading is NG, error codes are output to word +1.
- When the byte of reading data is an odd number, a space (ASCII code 20) is inserted in 0 to 7th byte.

Switch the Scene (20) 1:1 Connection

Specify the scene number to be switched.

Read

Begin read word	Bit				Setting
	15 to 12	11 to 8	7 to 4	3 to 0	
+0	0 0 0 0	0 0 0 0	0 0 1 0	0 0 0 0	Command code
+1	– – – –	– – – –	– – – –	Scene No.	Scene number (0 to 9)

Either 0 or 1 can be set for "–."

Switch the Scene Number +1 (21) 1:1 Connection

Increases the scene number by one.
When the current scene number is 9, the scene number will switch to 0.

Read

Begin read word	Bit				Setting
	15 to 12	11 to 8	7 to 4	3 to 0	
+0	0 0 0 0	0 0 0 0	0 0 1 0	0 0 0 1	Command code

Switch the Scene Number –1 (22) 1:1 Connection

Decreases the scene number by one.
When the current scene number is 0, the scene number will switch to 9.

Read

Begin read word	Bit				Setting
	15 to 12	11 to 8	7 to 4	3 to 0	
+0	0 0 0 0	0 0 0 0	0 0 1 0	0 0 1 0	Command code

Read the Scene Number Currently Displayed (23) 1:1 Connection

Read

Begin read word	Bit				Setting
	15 to 12	11 to 8	7 to 4	3 to 0	
+0	0 0 0 0	0 0 0 0	0 0 1 0	0 0 1 1	Command code

Write

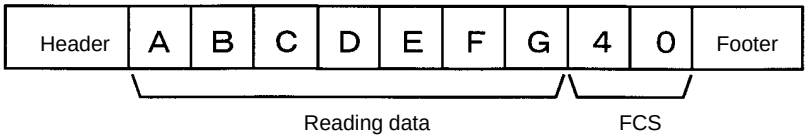
Begin write word	Bit				Setting
	15 to 12	11 to 8	7 to 4	3 to 0	
+0	Write flag	0 0 0 0	0 0 0 0	0 0 0 0	Write flag
+1	0 0 0 0	0 0 0 0	0 0 0 0	Scene No.	Scene number (0 to 9)

Write flag switches between [0 0 0 0] ←→ [1 1 1 1] each time data is output. Monitor the flag to confirm whether reading judgment has been written.

4-4 FCS Calculation

FCS (Frame Check Sequence) can be attached to output data to improve communications. (For normal communications only). FCS is the result of taking the XOR for each byte between header and footer (8 bits) and converting to 2-character ASCII codes. Each time data is received, the host link calculates the FCS and checks it against the FCS attached to sending data so that sending data can be checked for errors. Refer to *Appendix B FCS Check Program Examples (BASIC).* → **p. 212**

(e.g.) Reading data:ABCDEFG
The sending data is as shown below.



Calculation

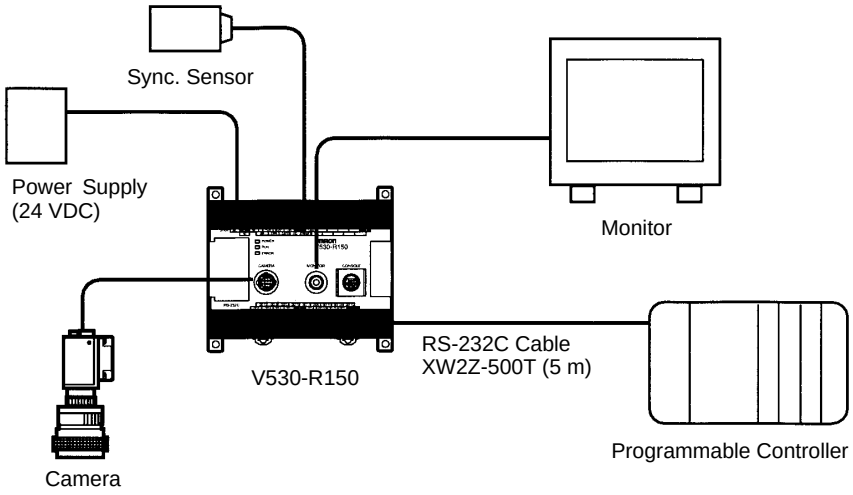
	ASCII code		
A	41	0100	0001
		XOR	
B	42	0100	0010
		XOR	
C	43	0100	0011
		XOR	
D	44	0100	0100
		XOR	
E	45	0100	0101
		XOR	
F	46	0100	0110
		XOR	
G	47	0100	0111
Result		0100	0000
		↓	↓
		4	0

Converted into hexadecimal and used as ASCII codes.

4-5 Connection Examples

4-5-1 Connection Examples for Programmable Controller (Normal)

System Configuration



Power Supply Unit: CQM1-PA**
CPU Unit: CQMI-CPU***

Cable Wiring

V530-R150

Signal	Pin No.
SD(TXD)	2
RD(RXD)	3
RS(RTS)	4
CS(CTS)	5
SG(GND)	9

Programmable Controller

Pin No.	Signal
2	SD(TXD)
3	RD(RXD)
4	RS(RTS)
5	CS(CTS)
9	SG(GND)

Shield

Communication Settings

- V530-R150 → **p. 161**

Item	Setting
Baud rate	19200 bps
Data length	8 bit
Parity bits	EVEN
Stop bits	2 bit
Header	None
Footer	CR
Mode	Normal

- Programmable Controller:
  Turn OFF the DIP switch of CQM1.
  Set DM6645 to [1001], DM6646 to [0904], DM6648 to [1000] and DM6649 to [0D00].
  Match communication settings with the V530-R150. Refer to the operation manual for CQM1 for the ways to change the setting.

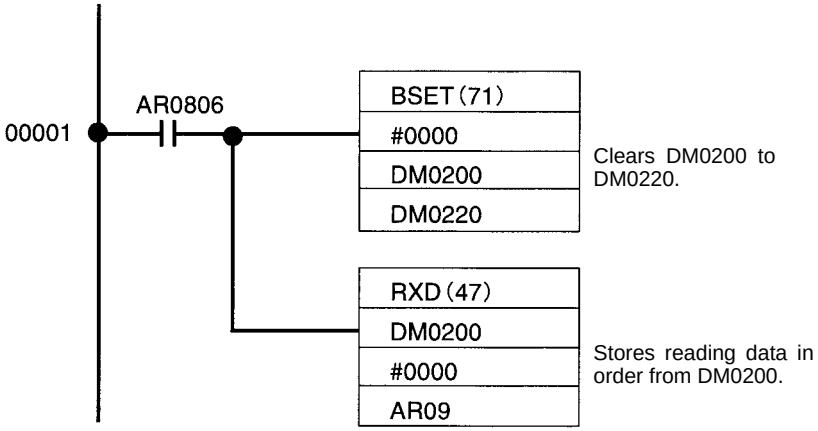
Program Examples

This is an example of a program in which a Programmable Controller (CQM1) receives the data which is read at a V530-R150.

1 Set the reading conditions of the V530-R150 and set the reading mode to RUN mode.

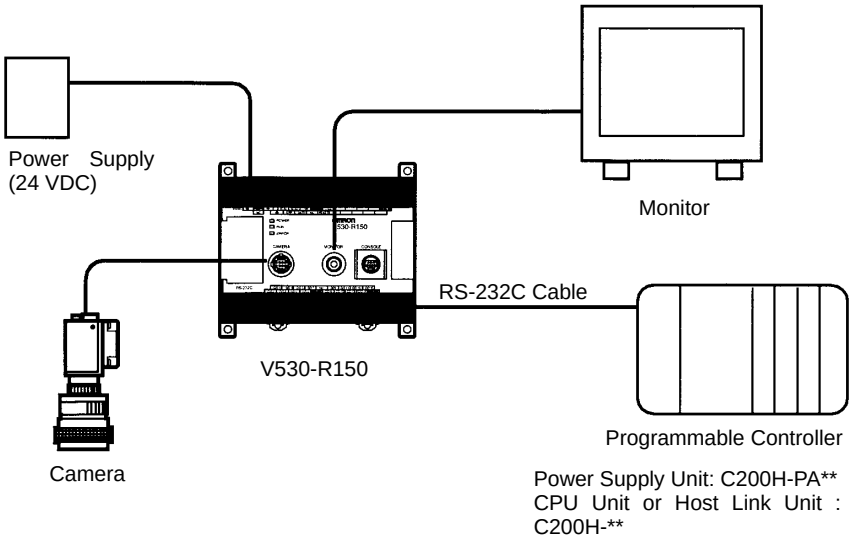
2 The synchronous sensor or trigger input of the console sends the reading trigger to the V530-R150.
→ The V530-R150 reads the code and outputs data.

3 The data received from the CQM1 is saved in order from the highest digit in DM0200 from the first bit.

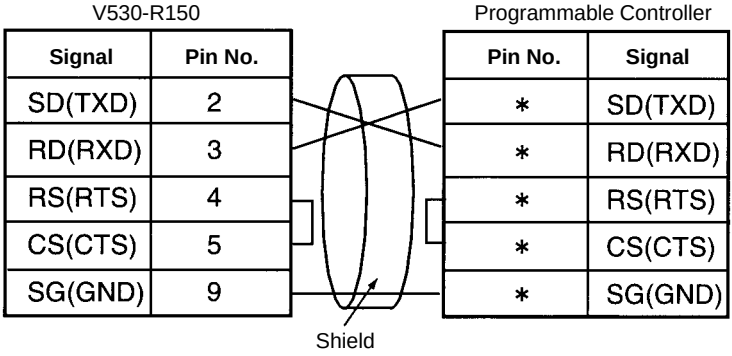


4-5-2 Connection Examples for Programmable Controller (Host Link)

System Configuration



Cable Wiring



(*) Pin numbers will depend on the CPU unit or Host Link Unit being connected. Refer to the manual for the Programmable Controller being connected.

Communication Settings

- V530-R150 → **p. 161, 163**

Item		Setting
Communication setting	Baud rate	The same settings as those of the Programmable Controller.
	Data length	
	Parity bits	
	Stop bits	
	Mode	Host link
Host Link setting	Read area	None
	Begin read word	---
	Write area	DM
	Begin write word	0110

- Programmable Controller

Item	Setting
Communications mode	SYSWAY (Host Link)
1 : 1 / 1: N	1 : N
Unit No.	00
Baud rate	Match the settings with a V530-R150
Data length	
Parity bits	
Stop bits	

Set DM0100 to [0010] in advance.

Program Examples

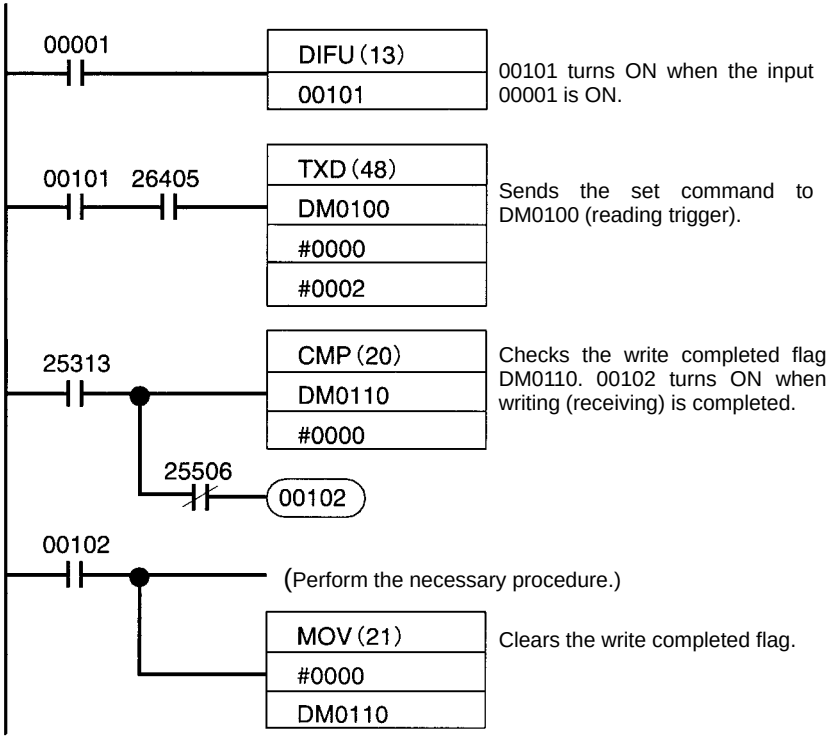
A command (reading trigger) is sent to the V530-R150 and the data received at the V530-R150 is written to the specified words of the Programmable Controller.

1 Set the reading conditions of the V530-R150 and set the reading mode to RUN mode.

2 Set the reading start command [0010] to DM0100.

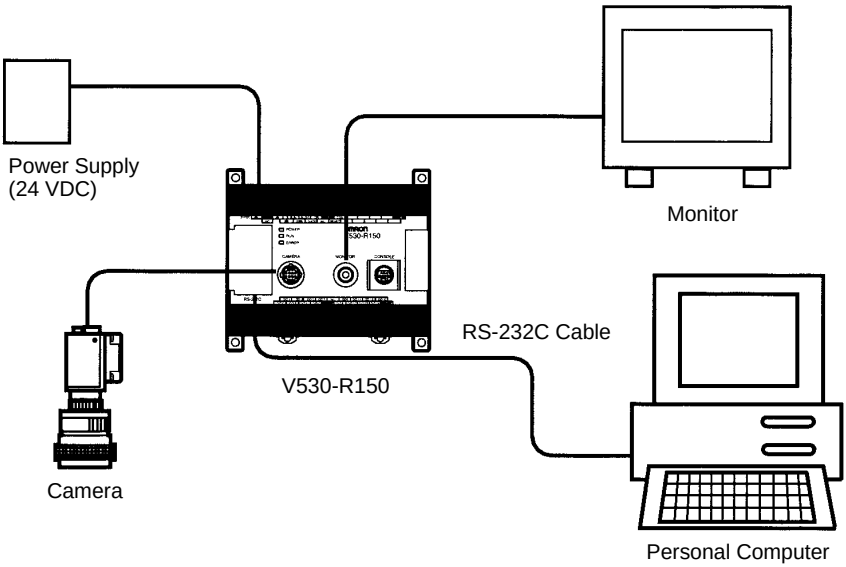
3 The Programmable Controller sends the reading start command.
→ The V530-R150 reads codes and writes to DM0111.

4 The Programmable Controller checks if the data has been written by checking the writing flag [DM0110].

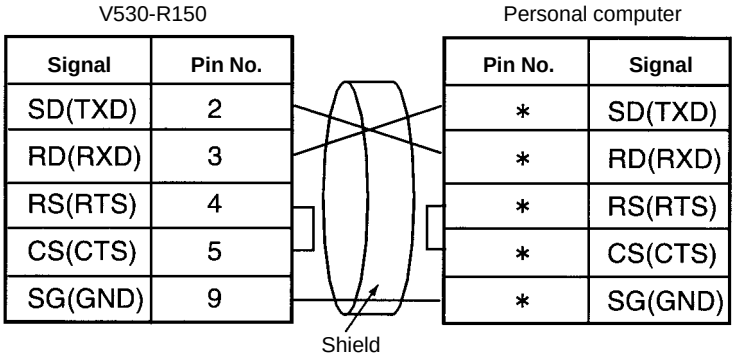


4-5-3 Connection Examples for Personal Computers (Normal)

System Configuration



Cable Wiring



V530-R150

Signal	Pin No.
SD(TXD)	2
RD(RXD)	3
RS(RTS)	4
CS(CTS)	5
SG(GND)	9

Personal computer

Pin No.	Signal
*	SD(TXD)
*	RD(RXD)
*	RS(RTS)
*	CS(CTS)
*	SG(GND)

Shield

(*) Pin numbers will depend on the type of personal computer connected. Refer to the manual of the personal computer.

Communication Settings

Match the communication settings (baud rate, data length, parity bits, and stop bits) of the personal computer and V530-R150. Set the communications mode of the V530-R150 to ***Normal***.

→ **p. 161, 162**

Program Example

```
100 CLOSE #1
110 OPEN ”COM:E73NN” AS #1 (OPEN communications port)
120 PRINT #1,”@GL”+CHR(&H0D) (Send single reading command)
130 INPUT #1,RESDATA$ (Load data; footer code:CR)
140 PRINT ”READ DATA=”;RESDATA$ (Display reading data)
150 GOTO 120 (Repeat)
160 END
```

4-5-4 Connection Examples for Multidrop (Normal)

Details on the procedure for connecting an RS-232C/RS-422(485) converter and performing communications with several V530-R150s from one host (computer or Programmable Controller) are given here.

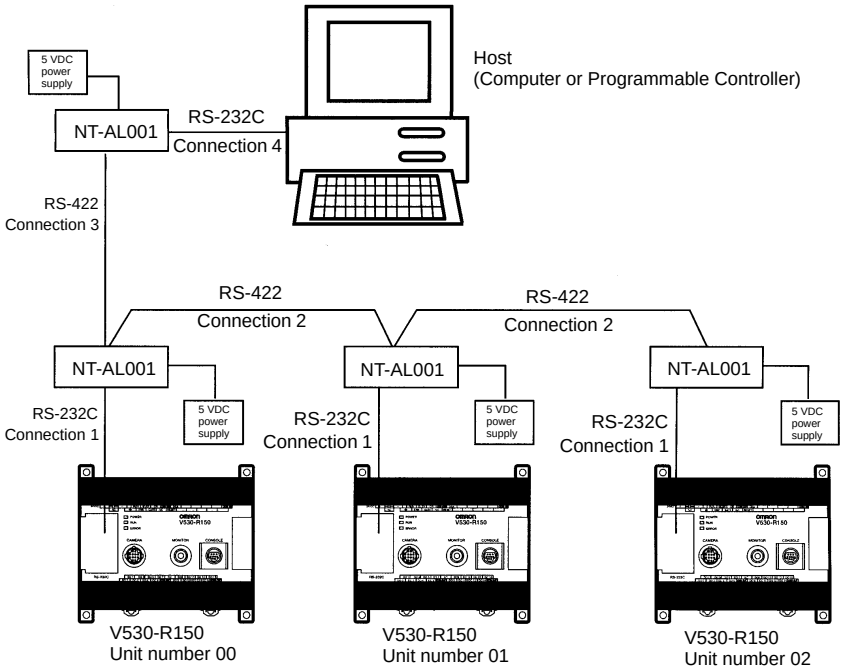
Unit numbers 00 to 31 can be set for the V530-R150. All communications data between the host includes unit numbers, and commands will be ignored by V530-R150s whose unit numbers differ from those contained in the command data. Communications data formats for multidrop are the same as for other communications except for the inclusion of the unit number.

Reading data is read with the sending of a polling (read) command from the host side. Even if the data is read correctly, it is not output until polling commands are given.

System Configuration

The number of RS-232C/RS-422(485) converters/adapters required will be one more than the number of V530-R150s in the system. An example of a configuration using OMRON’s

NT-AL001 Adapter is given below. Descriptions of connections 1 to 4 are given after the diagram.



NT-AL001 RS-232C/RS-422 Adapter Settings

The DIP switch settings for the that is connected to the host are different from the settings for the other NT-AL001s. Both settings are given in the following table.

NT-AL001	Setting
NT-AL001 connected to the host	Pin 1: ON (always ON)
	Pin 2: ON (terminating resistance)
Other NT-AL001s (connected to the V530-R150s)	Pin 1: ON (always ON)
	Pin 6: ON (RS control)

Cable Wiring

Connection 1

The wiring required between V530-R150s and NT-AL001s is shown below.

V530-R150

Signal	Pin No.
SD (TXD)	2
RD (RXD)	3
RS (RTS)	4
CS (CTS)	5
SG (GND)	9

NT-AL001

Pin No.	Signal	Meaning
2	SD (TXD)	Send data
3	RD (RXD)	Receive data
4	RS (RTS)	Request to send
5	CS (CTS)	Clear to send
6	+5 V	Power supply (+5 V)
9	SG (GND)	Signal ground

Connection 2

The wiring required between NT-AL001s is shown below.

NT-AL001

Signal	Pin No.
SG (GND)	2
SDB	3
SDA	4
RDB	5
RDA	6

NT-AL001

Pin No.	Signal
2	SG (GND)
3	SDB
4	SDA
5	RDB
6	RDA

Connection 3

The wiring required between the NT-AL001 on the host side and the NT-AL001 on the V530-R150 side is shown below.

NT-AL001 on host side

Signal	Pin No.
SG (GND)	2
SDB	3
SDA	4
RDB	5
RDA	6

NT-AL001 on V530-R150 side

Pin No.	Signal
2	SG (GND)
3	SDB
4	SDA
5	RDB
6	RDA

Connection 4

The wiring required between the host and the NT-AL001 is shown below.

Host

Signal	Pin No.
SD (TXD)	⁎
RD (RXD)	⁎
RS (RTS)	⁎
CS (CTS)	⁎
SG (GND)	⁎

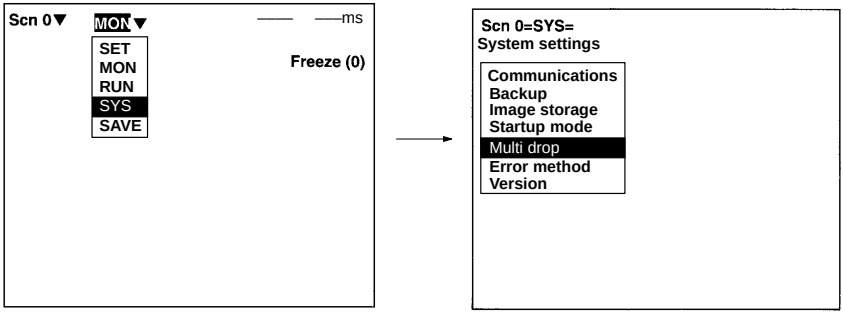
5 V power supply

NT-AL001

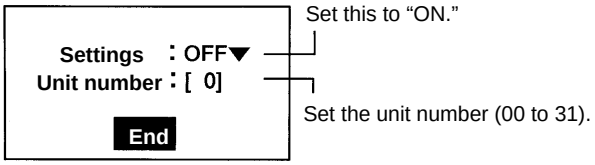
Pin No.	Signal	Meaning
2	SD (TXD)	Send data
3	RD (RXD)	Receive data
4	RS (RTS)	Request to send
5	CS (CTS)	Clear to send
6	+5 V	Power supply (+5 V)
9	SG (GND)	Signal ground

V530-R150 Settings

1 Go into system mode and select ***multi drop***.



2 The following screen will be displayed. Set each of the displayed items.

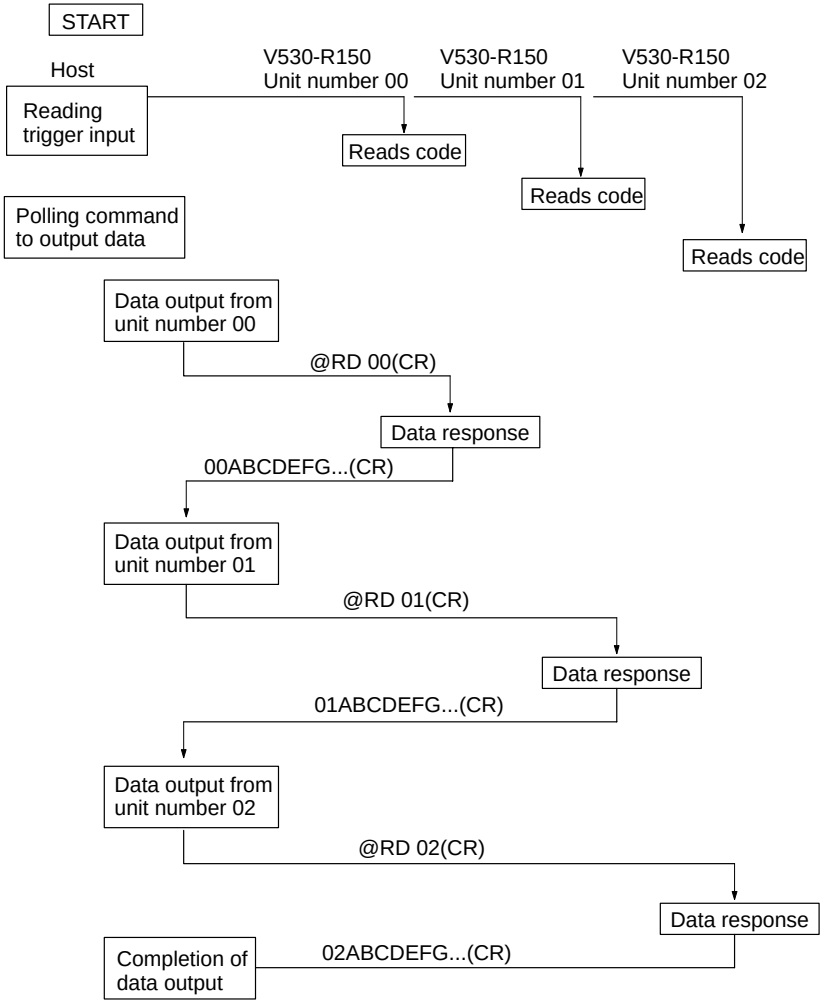


3 Select ***End***.

Process Flow

- Set the unit numbers for each of the V530-R150s. (In this example, the unit numbers are set to 00, 01, and 02.)
- After the V530-R150 reads a code, it holds the data without outputting it. Polling commands are sent out in order from the host and the data is downloaded.

Note If a reading trigger is turned ON before the data is downloaded, the V530-R150 will operate as shown below and the previous reading data will be overwritten.



SECTION 5
Operations

This section gives an overview of menu operations for the V530-R150 2-Dimensional Code Reader and explains the procedures required to perform basic operations.

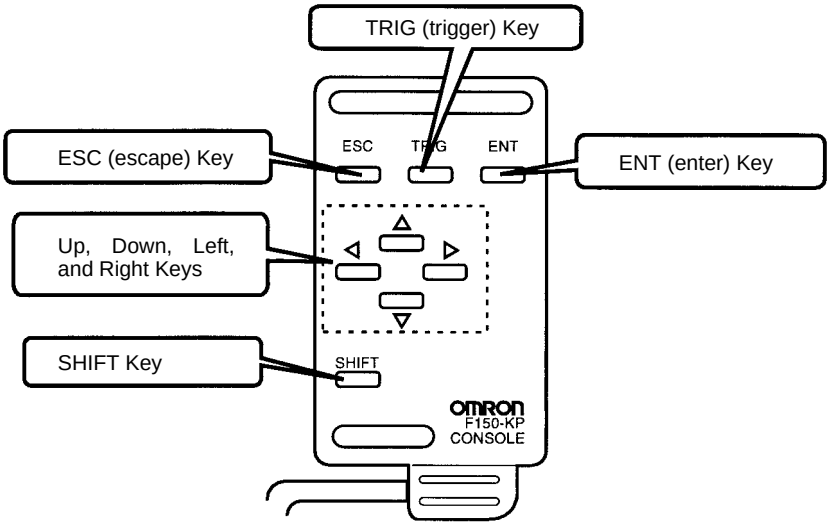
For more details of operations on the V530-R150, refer to *Section 6 Functions and Operations*.

5-1 Menu Operations . . . . . .
5-2 STEP 1 Starting . . . . . .
5-3 STEP 2 Setting Reading Conditions . . . . . .
5-4 STEP 3 Checking Reading . . . . . .
5-5 STEP 4 Starting Code Reading . . . . . .
5-6 STEP 5 Quitting . . . . . .

5-1 Menu Operations

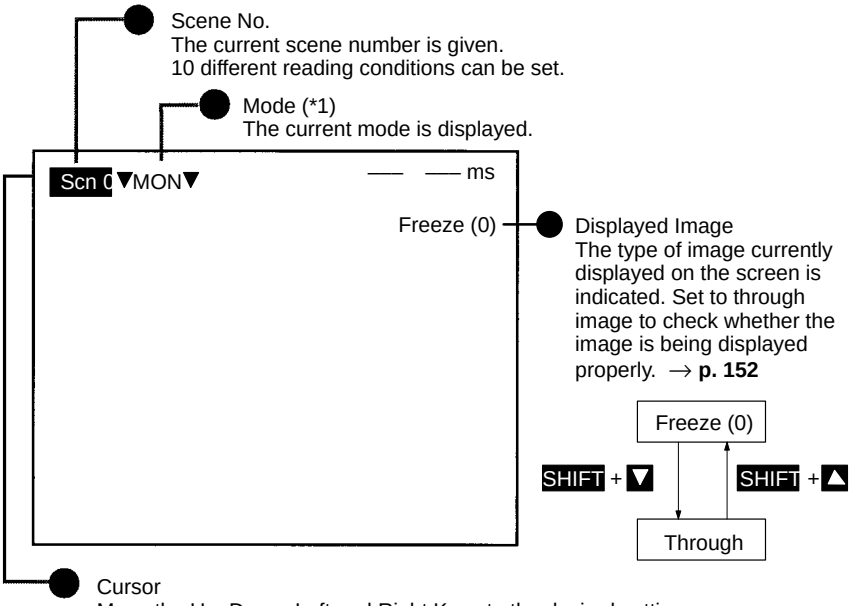
Console

The Console is used to perform menu operations. Be sure to familiarize yourself with Console operations before actually using the menus.



Key	Function
ESC	Interrupts processing and returns to the previous menu display.
TRIG	Starts code reading (One push → One reading)
ENT	Executes a function or sets a value.
/	Used to move the cursor up and down to select items. Also used to set values. The Up Key increases a value by 1 and the Down Key decreases a value by 1. Continue pressing the Up or Down Key to quickly increase or decrease a value.
□/	Used to move the cursor left or right to select items.
SHIFT	Must be pressed in combination with another key to have any affect. Specific functions are assigned to Shift + another key for specific screens.

Screen Displays



Mode (*1)

Mode	Description
SET (Set)	Used to set reading conditions.
MON (Monitor)	Used to confirm the reading can be properly performed under the set conditions. Judgments are displayed on the monitor and are not output to external devices.
RUN (Run)	Used to read codes. The judgment is output to external devices or RS-232C via the terminal blocks.
SYS (System)	Used to set system conditions such as communications specifications.
SAVE (Save)	Used to save setting data to flash memory. Be sure to save and turn OFF power to the V530-R150 after changing the settings.

5-2 STEP 1 Starting

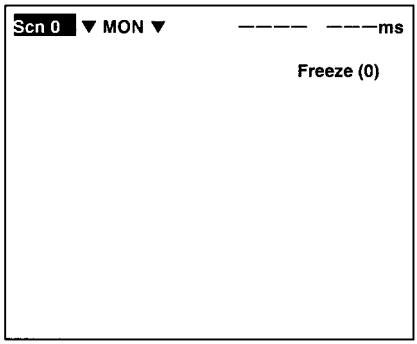
Procedure

1 Be sure that the basic V530-R150 components have been connected correctly. → **p. 9**

2 Turn ON the power supply on the monitor.

3 Turn ON the power supply on the V530-R150.

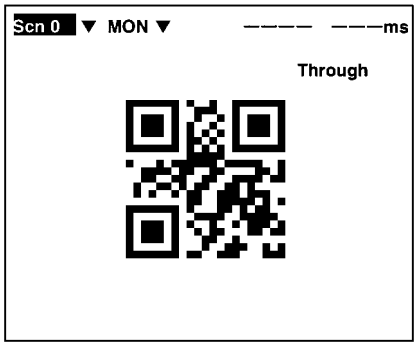
A startup message appears followed by a processing message. After a short pause, the initial screen appears. The following screen appears the first time power is turned ON.



Note Never input the reset signal or turn OFF the power when startup messages are displayed. Data may be lost, and the V530-R150 may not operate properly the next time it is started.

4 Be sure that the 2-dimensional code is correctly displayed within the field of vision on the monitor.

The through image is displayed by pressing the SHIFT + Down Keys. If not displayed correctly, adjust the focus, camera setting distance and lighting. → **p. 13, 16**



Startup Mode

Use the startup mode in order to make daily operation more efficient. → **p. 172**

5-3 STEP 2 Setting Reading Conditions

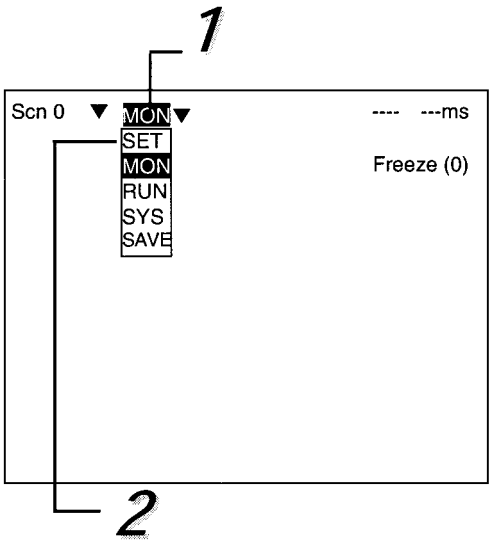
The default setting is for MON (monitor) mode to be displayed when the power is first turned ON. Before setting the reading conditions it is necessary to switch to SET mode.

Note This section only describes the necessary functions for basic operations. Other functions are described in *Section 6 Functions and Operations*.

Procedure

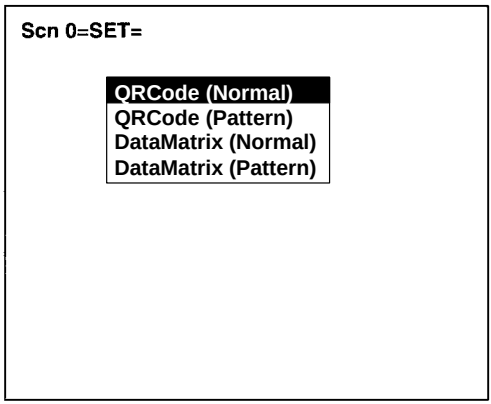
1 Move the cursor to ***MON*** (monitor) using the Right Key and press the ENT Key.

The mode selections are displayed.



2 Move to ***SET*** using the Up Key and press the ENT Key.

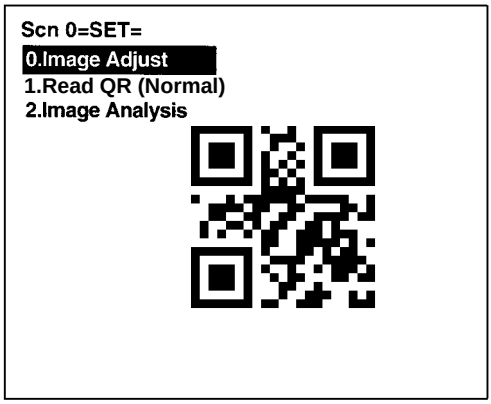
The following screen is displayed. The screen is in SET mode.



QR Code Reading

Select the required shutter speed and symbol color. The other reading conditions can be set using the teaching function. Using the teaching function, a reading is performed on the reading object and, based on this, parameters are set automatically.

3 Select ***QRCode (Normal)***.
The following screen will be displayed.

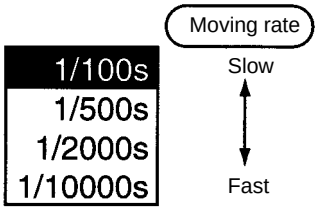


4 Select ***0.Image Adjust***.

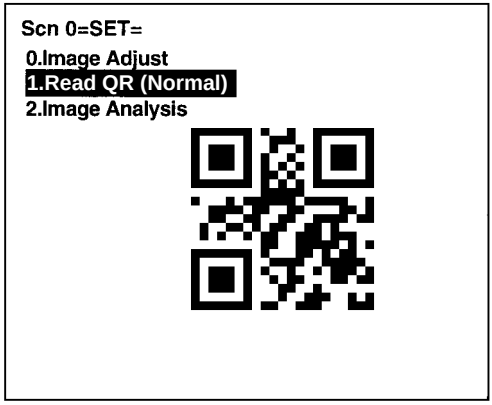
5 Select ***Shutter Speed***.

6 Select the shutter speed according to the movement of the reading object.

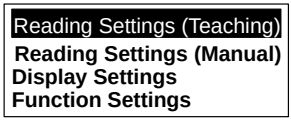
Press the ENT Key to set the shutter speed. The display will return to the window shown in step 5.
Press the ESC Key once to go back to the window shown in step 3.



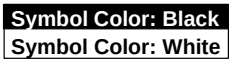
7 Select ***Read QR (Normal)***.



8 Select ***Reading Settings (Teaching)***.

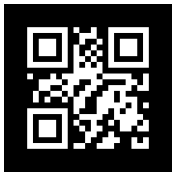


9 Select the symbol color using the Up/Down Keys.
Press the ENT Key to validate the setting and go back to the window shown in step 8.



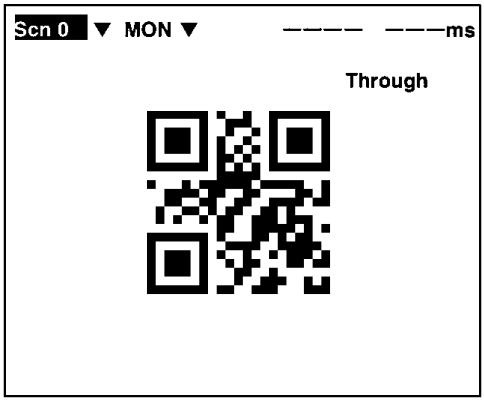
Black: Black symbol printed on white base.

White: White symbol printed on black base.



10 Press the ESC Key once to go back to the window shown in step 3.

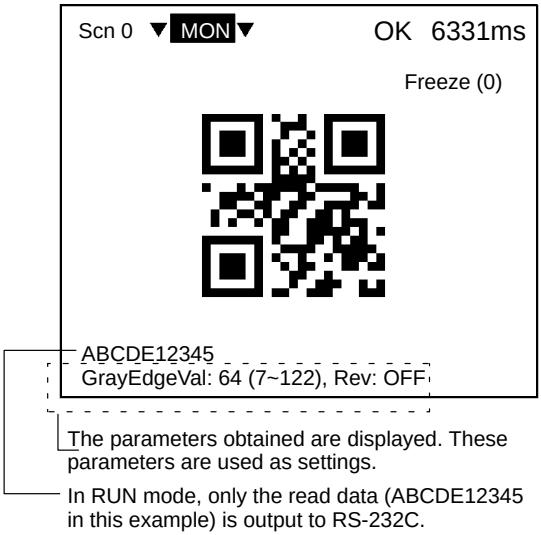
11 Press the ESC Key once more to return to MON (monitor) mode.



12 Press the TRIG Key on the Console to perform one reading.

Parameters are set based on the data obtained with this reading. If reading is performed successfully, the teaching function will automatically turn OFF. To repeat this operation, go back to SET mode and repeat the procedure from step 7.

These parameters can be displayed and changed if necessary from ***Reading Settings (Manual)***. → **p. 107**



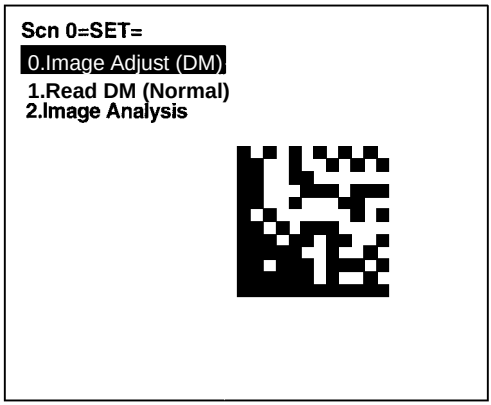
If reading is not performed correctly, the teaching function will stay ON. To turn the teaching function OFF, select ***Reading Settings (Manual)*** from the screen shown in step 8, and press the ENT Key. The teaching function will be turned OFF by entering the ***Reading Settings (Manual)*** window.

13 This completes the settings.

Data Matrix Reading

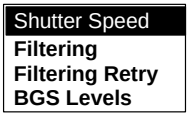
Select the required shutter speed and matrix size. The other reading conditions can be set using the teaching function. Using the teaching function, a reading is performed on the reading object and, based on this, parameters are set automatically.

3 Select ***DataMatrix (Normal)***. The following screen will be displayed.



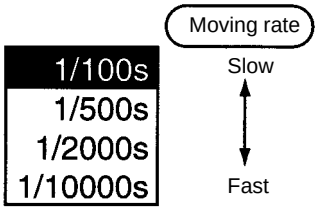
4 Select ***0. Image Adjust (DM)***.

5 Select ***Shutter Speed***.

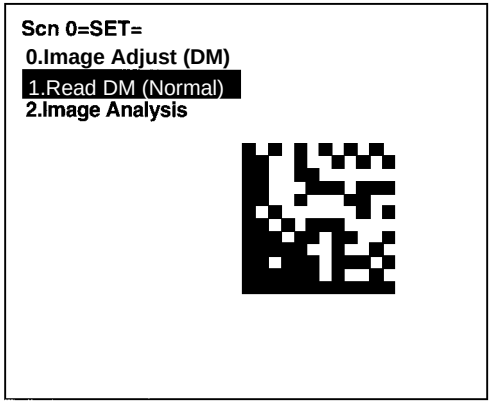


6 Select the shutter speed according to the movement of the reading object.

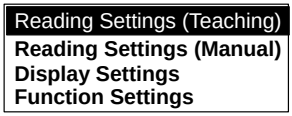
Press the ENT Key to set the shutter speed. The display will return to the window shown in step 5.
Press the ESC Key once to go back to the window shown in step 3.



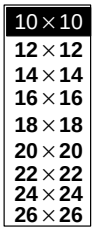
7 Select ***1. Read DM (Normal)***.



8 Select ***Reading Settings (Teaching)***.

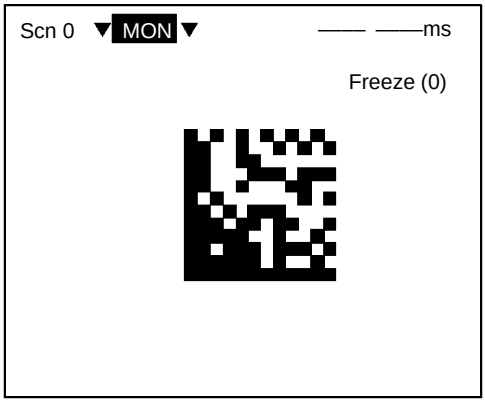


9 Select the matrix size for the code using the Up/Down Keys. Press the ENT Key to validate the setting and go back to the window shown in step 8.



10 Press the ESC Key once to go back to the window shown in step 3.

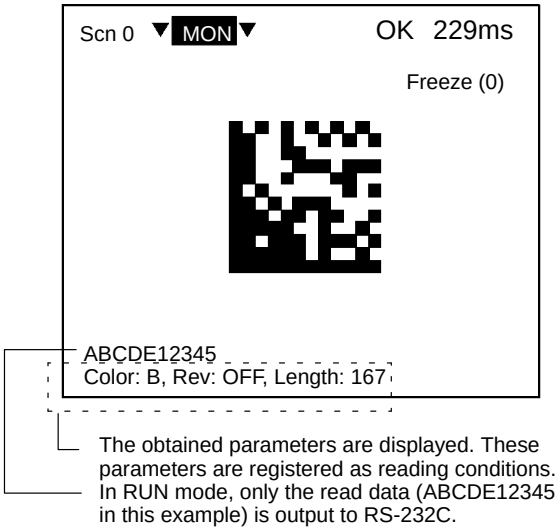
11 Press the ESC Key once more to return to MON (monitor) mode.



12 Press the TRIG Key on the Console to perform one reading.

Parameters are set based on the data obtained with this reading. If reading is performed successfully, the teaching function will automatically turn OFF. To repeat this operation, go back to SET mode and repeat the procedure from step 7.

The parameters can be displayed and changed if necessary from ***Reading Settings (Manual)***. → **p.122**



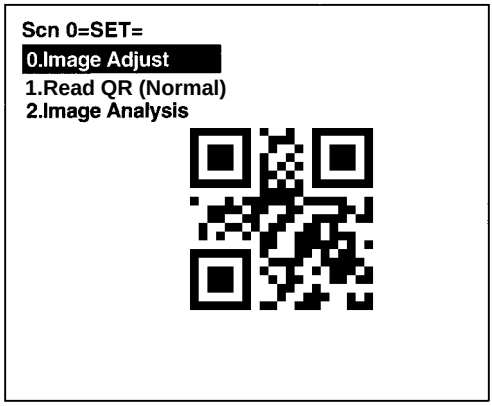
13 This completes the settings.

5-4 STEP 3 Checking Reading

Confirm whether reading is performed correctly under the setting conditions. The reading is performed in MON (monitor) mode. Reading judgment is not output to terminal blocks or RS-232C but displayed on the monitor.

Procedure

1 Press the ESC Key from the basic screen of SET mode to enter MON (monitor) mode.



2 Press the TRIG Key on the Console.

One reading is performed. A trigger can be input via terminal blocks or RS-232C. Reading judgement is not output to the terminal blocks or RS-232C but displayed on the monitor.

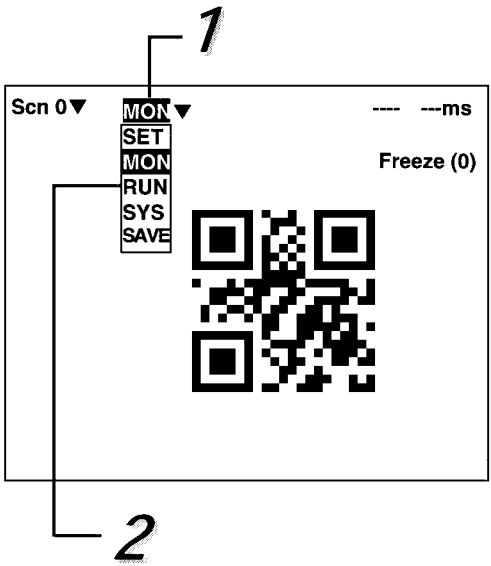
Note For details of countermeasures when reading is not performed correctly... → **p. 196**

5-5 STEP 4 Starting Code Reading

Enter RUN mode to perform readings. The reading judgment is output to external devices through terminal blocks or RS-232C.

Procedure

1 Move the cursor to ***MON*** (monitor) and press the ENT Key.
The mode selections are displayed.



2 Select ***RUN***.

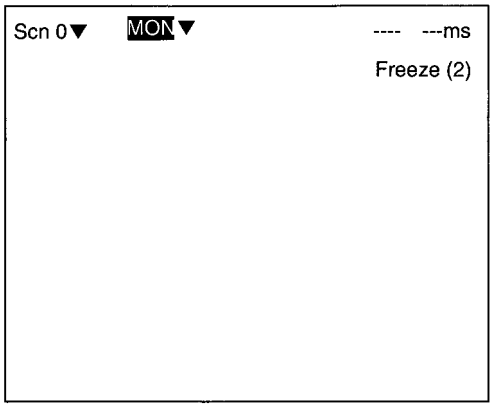
3 Input reading trigger.
Reading is performed.

5-6 STEP 5 Quitting

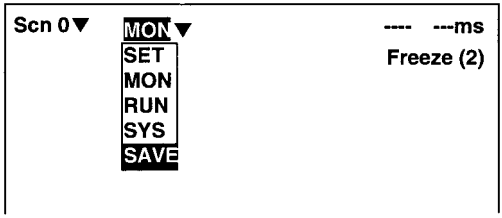
Note Be sure to save the revised setting data to flash memory before turning OFF.
As the V530-R150 loads data from flash memory at startup, any new data be will lost if it is not saved to flash memory. Also, images in RAM are cleared when power is turned OFF. It is recommended that images are backed up on a computer as they can not be saved to flash memory. → **p. 166**

Procedure

1 Basic screen is displayed.



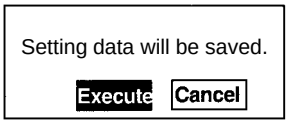
2 Select ***MON*** (monitor) and press the ENT Key.



3 Select ***SAVE***.

4 Select ***Execute*** after the confirmation message is displayed.

When saving has been completed, the screen from step 1 will be returned.



Note Never input the reset signal or turn OFF the power when processing messages are displayed. Data may be lost, and the V530-R150 may not operate properly the next time it is started.

5 Turn OFF the power for the V530-R150.

SECTION 6
Functions and Operations

This section gives details of the functions and operations possible with the V530-R150 2-Dimensional Code Reader, including the procedures necessary for communications with external devices.

6-1 SET (Setting) Mode . . . . . .
- 6-1-1 Menu Registration . . . . . .
- 6-1-2 Menu Tree . . . . . .
- 6-1-3 Image Adjust . . . . . .
- 6-1-4 Read QR (Normal) . . . . . .
- 6-1-5 Read QR (Pattern) . . . . . .
- 6-1-6 Read DM (Normal) . . . . . .
- 6-1-7 Read DM (Pattern) . . . . . .
- 6-1-8 Display Settings . . . . . .
- 6-1-9 Function Settings . . . . . .
- 6-1-10 Image Analysis . . . . . .

6-2 MON (Monitor) Mode . . . . . .

6-3 RUN Mode . . . . . .

6-4 System . . . . . .
- 6-4-1 Communications Method . . . . . .
- 6-4-2 Backup . . . . . .
- 6-4-3 Image Storage . . . . . .
- 6-4-4 Startup Mode . . . . . .
- 6-4-5 Multi Drop . . . . . .
- 6-4-6 Error Method . . . . . .
- 6-4-7 Version . . . . . .

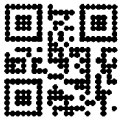
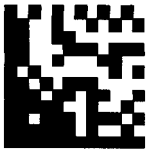
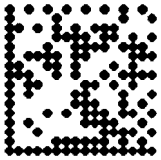
6-5 Scenes . . . . . .

6-6 Saving to Flash Memory . . . . . .

6-1 SET (Setting) Mode

6-1-1 Menu Registration

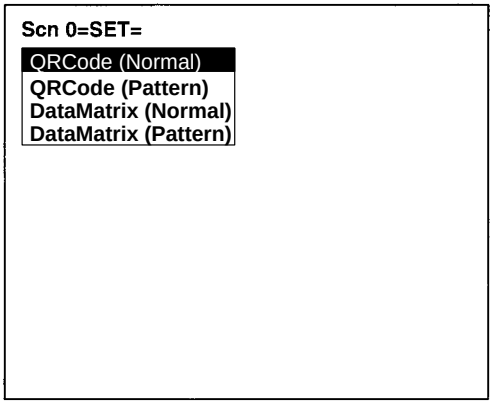
The V530-R150 has the four reading modes shown below. Chose the mode that is appropriate for the type of code and the conditions in which it is to be read.

Menu	Contents
QR Code (Normal)	This mode can normally be used for QR Code reading.
QR Code (Pattern)	Try this mode when reading codes of poor marking quality or codes made up of dots, or any other codes for which stable reading is not possible. Images of finder patterns (the symbols in 3 of the corners) are registered, and the position of codes is determined by searching for these images.  **Note** This mode has an orientation tolerance of ±10°. Reading is not possible for orientations greater than this.
Data Matrix (Normal)	This mode can normally be used for Data Matrix reading. 
Data Matrix (Pattern)	Try using this mode when reading codes of poor marking quality or codes made up of dots, or in any other situation where stable reading is not possible. An image of the finder pattern (the L-shape described by 3 of the corners) is registered, and the position of codes is determined by searching for this image.  **Note 1:** This menu has an orientation tolerance of ±10°. Reading is not possible for orientations greater than this. **Note 2:** There is only one orientation of L-shape for which a finder pattern image can be obtained. **Note 3:** Adjust the field of vision of the Camera so there are at least 10 pixels per cell and there is a margin of at least 2 pixels around the code.

Procedure

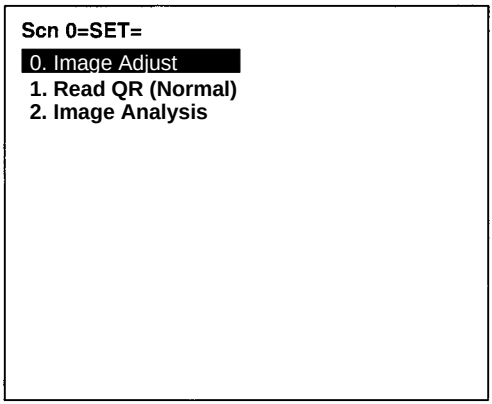
1 Enter the ***SET*** mode.

The following items will be displayed.



2 Select the required item using the Up/Down Keys and press the ENT Key.

Example: If ***QRCode (Normal)*** is selected, the following screen will be displayed.

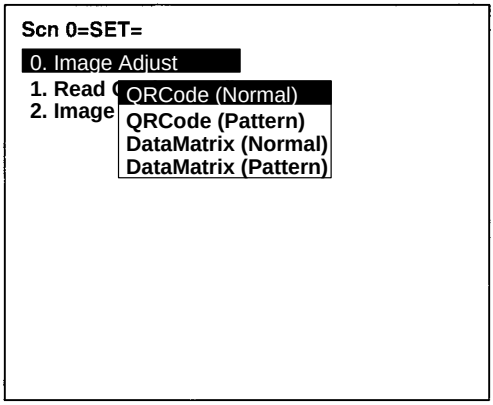


Changing Modes

Procedure

1 Press the SHIFT and ESC Keys together.

The modes will be displayed.

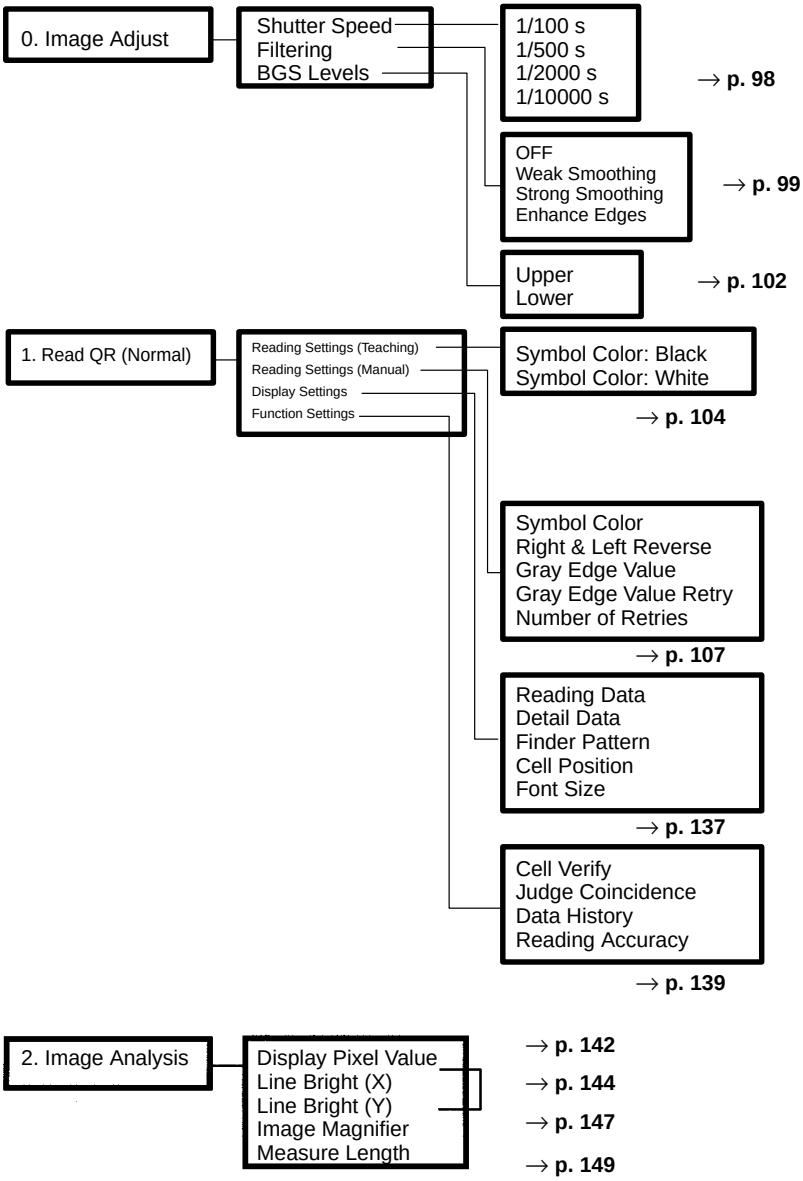


2 Select the required item using the Up/Down Keys and press the ENT Key.

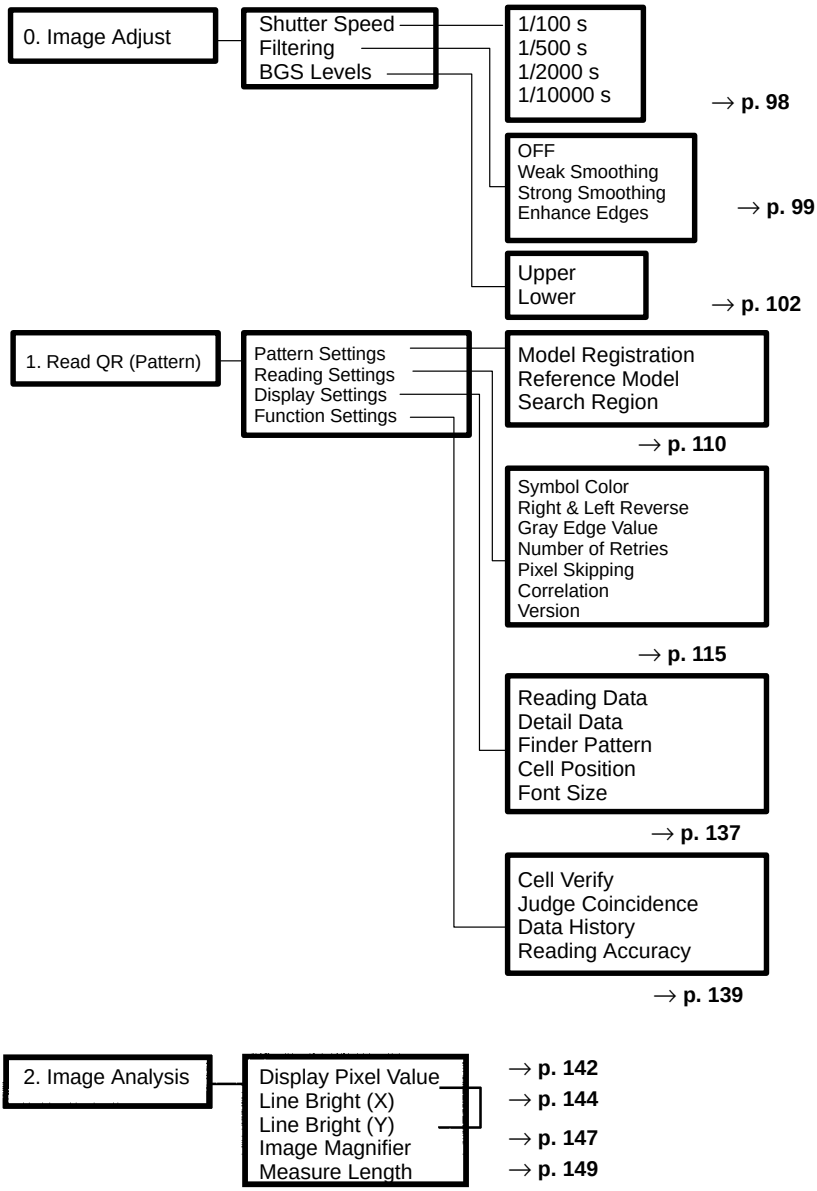
6-1-2 Menu Tree

Explanations that apply to more than one mode are covered together. For explanations of the various operations, refer to the pages given in the following menu tree.

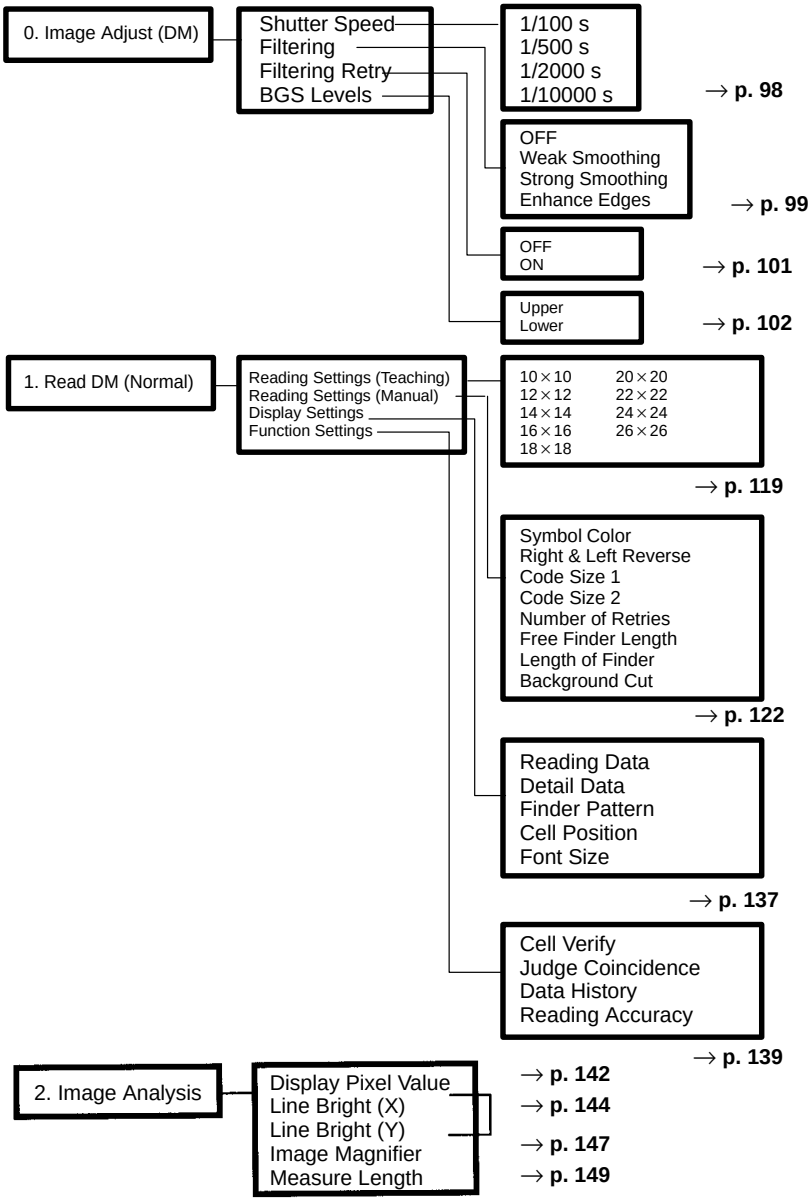
For QR Code Reading in Normal Mode



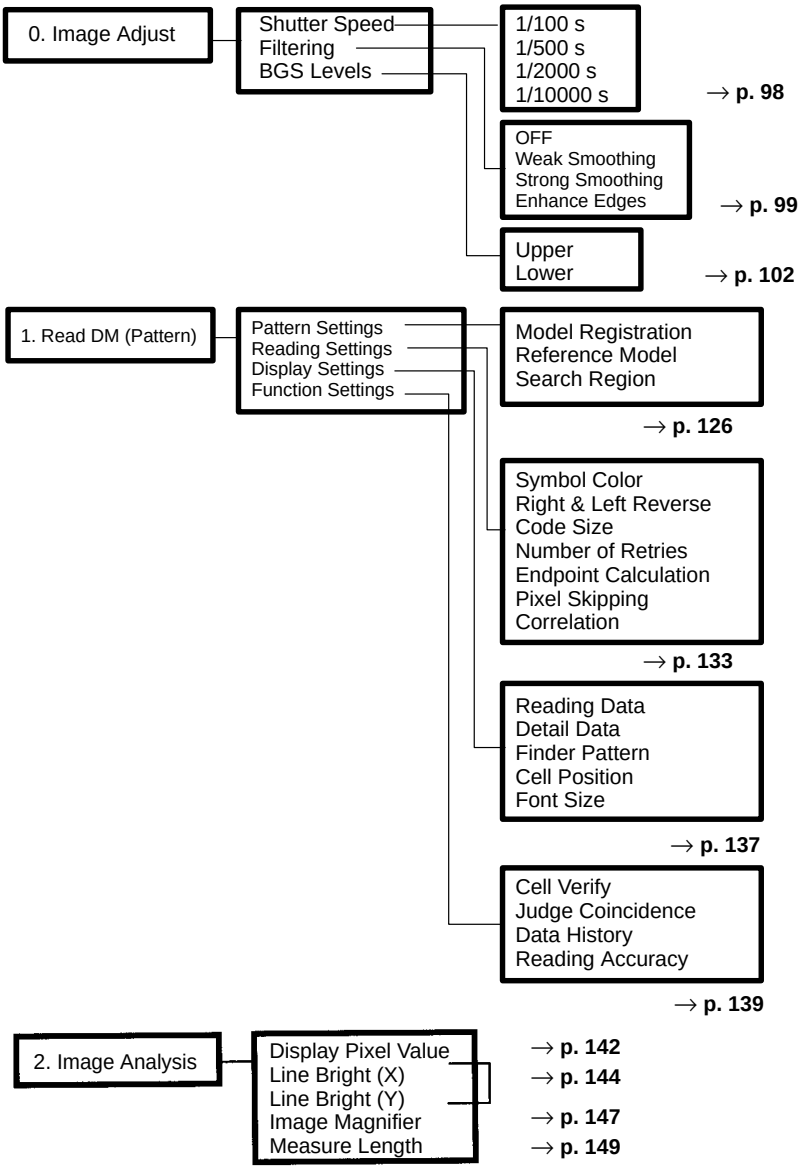
For QR Code Reading in Pattern Mode



For Data Matrix Code Reading in Normal Mode



For Data Matrix Code Reading in Pattern Mode



6-1-3 Image Adjust

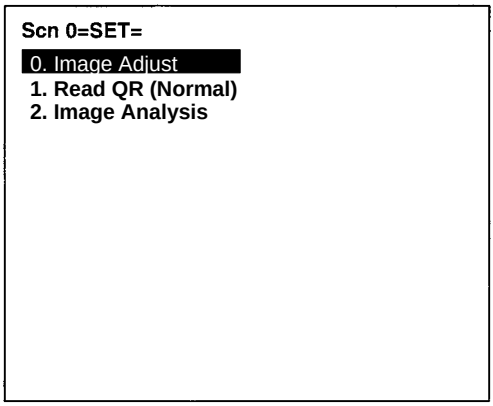
0. Image Adjust — **Shutter Speed**

0. Image Adjust (DM) — **Shutter Speed**

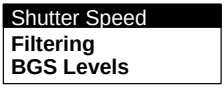
The suitable shutter speed can be selected according to the moving rate of the reading codes.

Procedure

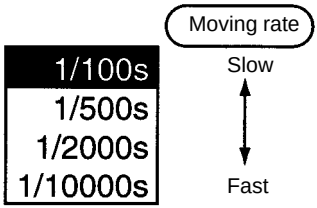
1 Select ***0. Image Adjust***.



2 Select ***Shutter Speed***.



3 Select an appropriate speed whilst viewing the image.
Press the ENT Key to validate the setting.



0. Image Adjust — **Filtering**

0. Image Adjust (DM) — **Filtering**

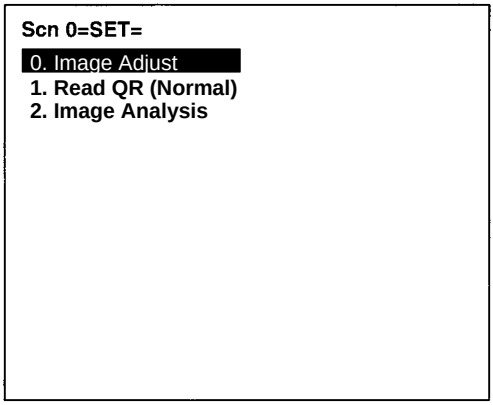
Select the way the image taken by the Camera is to be processed before it is displayed.

Filtering selection	Function
OFF	No filtering is performed.
Smoothing	The effects of noise are suppressed to produce a smooth image. The strength of the smoothing can be selected (strong or weak).
Enhance Edges	Borders between light and dark areas are enhanced.

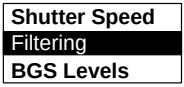
Note It is recommended that ***Weak Smoothing*** is selected as the filtering method. When reading Data Matrix codes in Normal mode, turn ON the ***Filtering Retry*** setting to read codes made up of dots more effectively.

Procedure

1 Select ***0. Image Adjust***.



2 Select ***Filtering***.



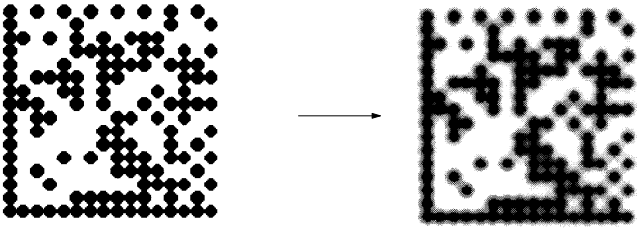
3 Select an appropriate filtering method whilst viewing the image.

Press the ENT Key to validate the setting.

0. Image Adjust (DM) — **Filtering Retry**

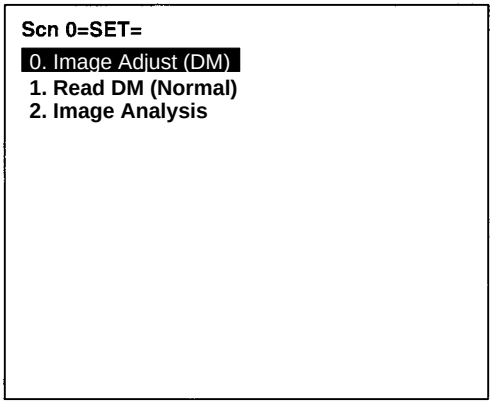
If this setting is turned ON, the filtering method set will be performed twice. The time required for filtering will increase by approximately 33 ms, but when reading codes made up of dots, reading can be performed with greater stability by performing smoothing twice.

Example: Image obtained when smoothing is performed twice.

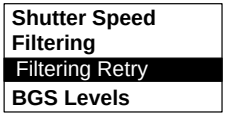


Procedure

1 Select ***0. Image Adjust (DM)***.



2 Select ***Filtering Retry***.



3 Select either ***OFF*** or ***ON***, and press the ENT Key to validate the setting.

OFF
ON

0. Image Adjust — **BGS Levels**

0. Image Adjust (DM) — **BGS Levels**

Use this setting to set lower and upper limits of the density for images that are read. Densities lower than the set lower limit will be converted to 0 (i.e., areas with that density will not be read) and densities higher than the set upper limit will be converted to 255, and intermediate densities will be graded between 0 and 255. In other words, only the areas with densities between the set lower and upper limits will be read.

Lower limit: 150 Upper limit: 255

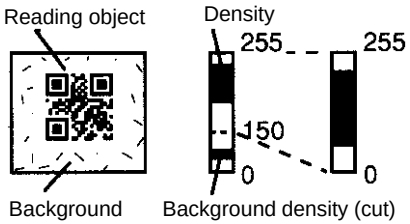
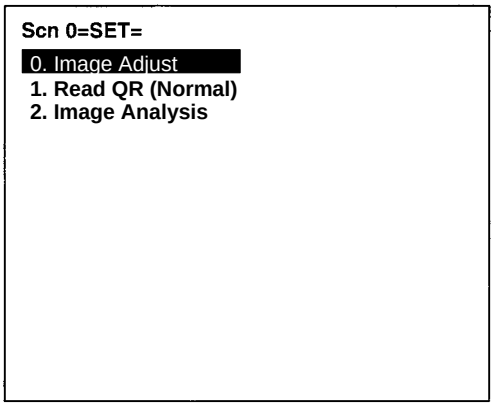


Image areas with densities of 149 or lower will not be read and the density will be changed to 0.

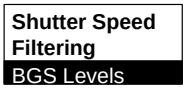
Only image areas with densities between 150 and 255 will be read. The whole image is graded from 0 to 255.

Procedure

1 Select ***0. Image Adjust***.

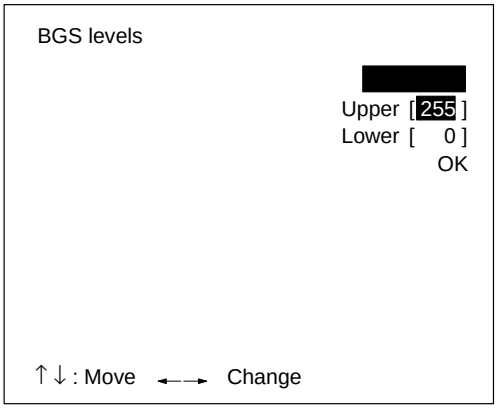


2 Select ***BGS Levels***.



3 Change the upper and lower limits as required.

Press the Right Key to increase values by 1. Press the Left Key to decrease values by 1. Press the SHIFT Key together with Right/Left Key to increase/decrease values by 10.



4 Select ***OK*** to validate the settings.

6-1-4 Read QR (Normal)

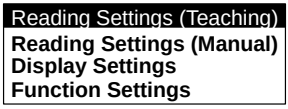
1. Read QR (Normal) — **Reading Settings (Teaching)**

Using the teaching function, a reading image is obtained, measurement is performed on this image, and based on the results of this measurement, parameters for reading conditions (Right & Left Reverse, Gray Edge Value) are automatically determined. The results of the settings made using the teaching function can be viewed in ***Reading Settings (Manual)***.

Teaching Procedure

1 Select ***Read QR (Normal)***.

2 Select ***Reading Settings (Teaching)***.



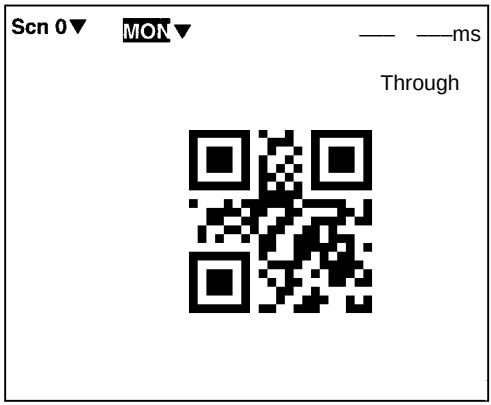
3 Select the required symbol color.

Use the Up/Down Keys to select the required setting, and validate this setting by pressing the ENT Key. The display will return to the window shown in step 2.

Black	Black symbol printed on white base.	
White	White symbol printed on black base.	

4 Press the ESC Key to return to the window shown in step 1.

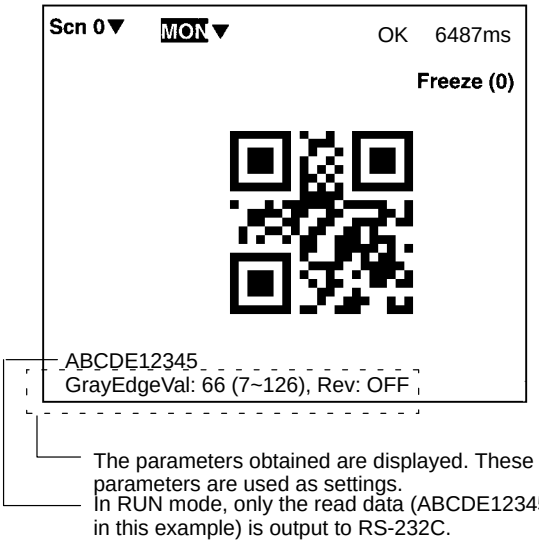
5 Press the ESC Key once more to return to MON (monitor) mode.



6 Press the TRIG Key on the Console to perform one reading.

Parameters will be registered based on the results of the first reading. If the reading is performed correctly, the teaching function will automatically turn OFF. To redo the settings, go to SET mode and repeat the procedure from step 1.

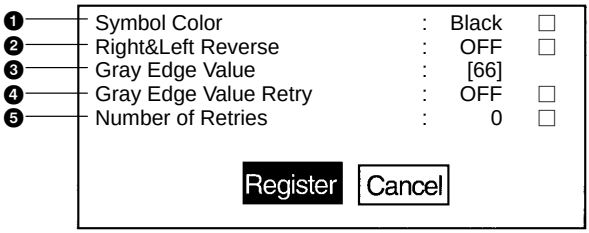
It is possible to view and, if necessary, change the parameter setting in ***Reading Settings (Manual)***.
→ **p.107**



If reading is not performed correctly, the teaching function will stay ON. To turn the teaching function OFF, select ***Reading Settings (Manual)*** from the screen shown in step 2, and press the ENT Key. The teaching function will be turned OFF by entering the ***Reading Settings (Manual)*** window.

1. Read QR (Normal) — **Reading Settings (Manual)**

The reading conditions can be set manually. If parameters have been set using the teaching function, those parameters can be viewed or changed, if necessary, from this menu.



Note Items 2 and 3 above can be set using the teaching function.

1 Select the color of symbol.

Black (Default setting)	Black symbol printed on white base.	
White	White symbol printed on black base.	

2 Select whether Right & Left Reverse of QR Codes is necessary.

ON	For reading an image after reflection, or through the back of a transparent material, such as glass.
OFF (Default setting)	For normal reading (from the front of the object)

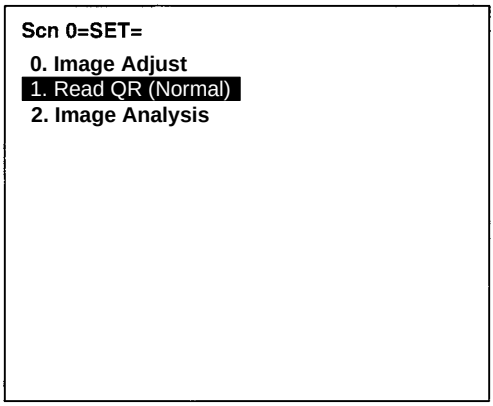
3 Select the gray edge value (i.e., the ratio of black and white) used to detect finder patterns. (Setting range: 1 to 127; default setting: 32.)
If the ratio of the intensity of black and white is large, set to a large value, and if the ratio of the intensity of black and white is small, set it to a small value.
This setting can be made using the teaching function (which automatically measures the optimum value), so whenever resetting the reading conditions, always use this function first. → **p.104**

4 Select whether Gray Edge Value Retry is necessary. If it is turned ON, and reading is not correctly performed, then the reading will be attempted again with a higher or lower gray edge value. (Default setting: OFF)

5 Select the number of times reading is repeated in the event of incorrect reading. A fresh image will be obtained and reading performed for the number of times specified. (Setting range: 0 to 9; default setting: 0.)

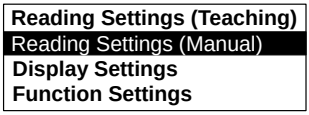
Normal Procedure

1 Select ***Read QR (Normal)***.

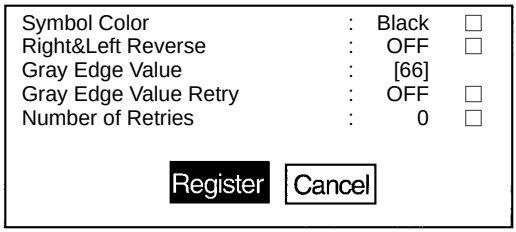


2 Select ***Reading Settings (Manual)***.

The parameters will be displayed.



3 Edit the parameters as required.



4 Select ***Register***.

<Observe the following points for QR Code reading in Normal mode>

1 Set the filtering method to weak smoothing.

2 If there is enough time available, turn ON the Gray Edge Value Retry function, and set the number of retries to a value between 1 and 9.

3 Adjust the field of vision for the Camera so that there are at least 5 pixels per cell.

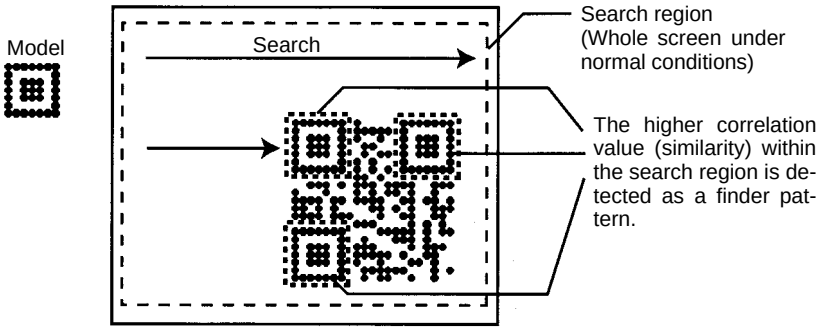
4 Ensure that there is a quiet zone (blank margin) of at least 4 cells around the code.

6-1-5 Read QR (Pattern)

1. Read QR (Pattern) — **Pattern Settings**

The method of registering model images of finder patterns, and using these models to find finder patterns from input images is called “pattern search.” Because image patterns are used, code positions can still be found with greater accuracy than with Normal mode, even if the printing quality is poor.

Note There is an orientation tolerance of ±10° with this method. Models cannot be detected for orientations greater than this.

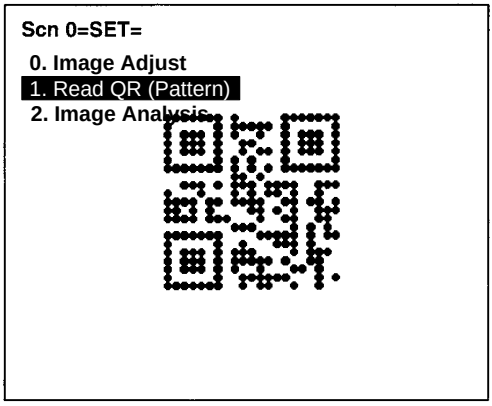


Model Registration

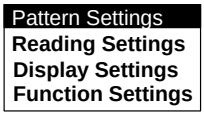
Use the following procedure to register models of finder patterns.

Procedure

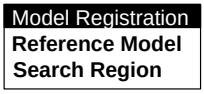
1 Select ***Read QR (Pattern)***.



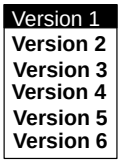
2 Select ***Pattern Settings***.



3 Select ***Model Registration***.

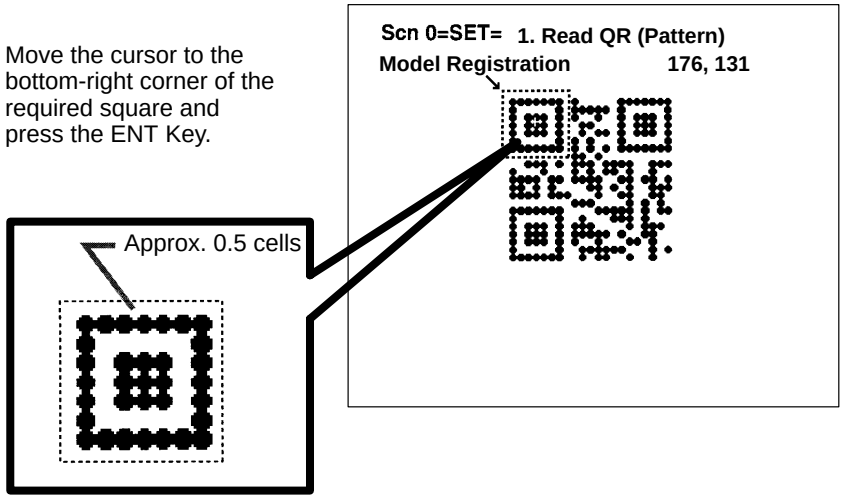


4 Select the QR Code version.



5 Draw a square over the region to be registered as a model.

Move the cursor to the top-left corner of the required square and press the ENT Key.



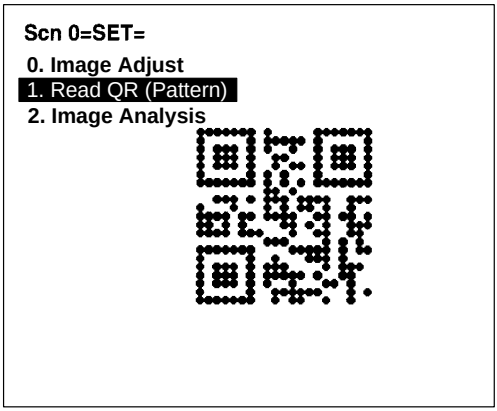
Note Register a find pattern with a margin of approx. 0.5 cells.

Reference Model

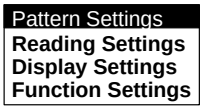
It is possible to view the model image (without the surrounding code) by displaying it on the monitor screen. After registering a model, be sure to use this function to check that the finder patterns for the model have been registered.

Procedure

1 Select ***Read QR (Pattern)***.

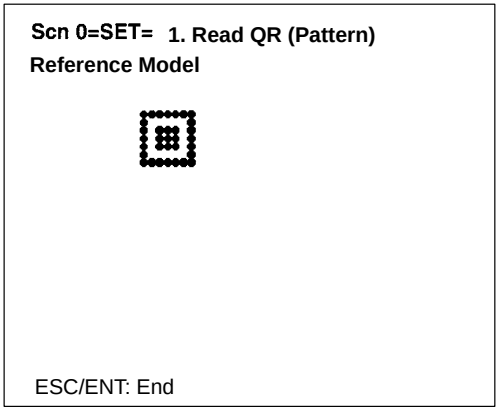


2 Select ***Pattern Settings***.



3 Select ***Reference Model***.

The model image will be displayed.



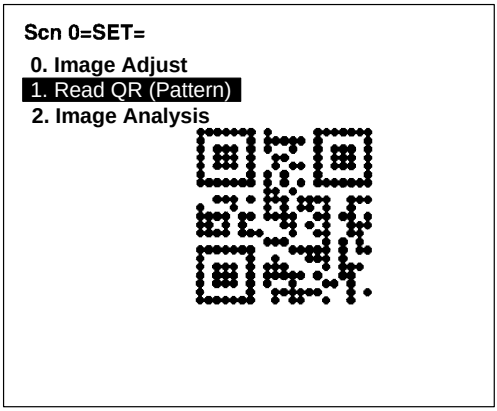
4 Press the ENT or ESC Key to leave this screen.

Search Region

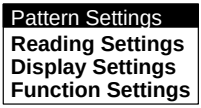
Specify the range over which to search for the model.

Procedure

1 Select ***Read QR (Pattern)***.

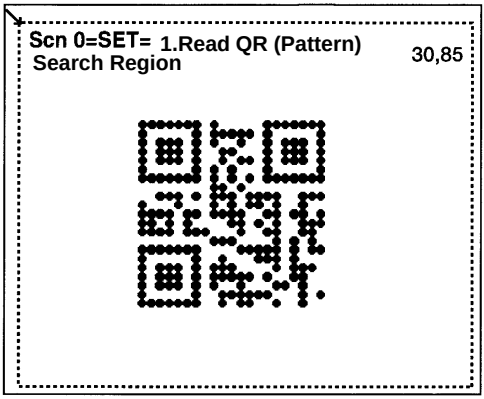


2 Select ***Pattern Settings***.



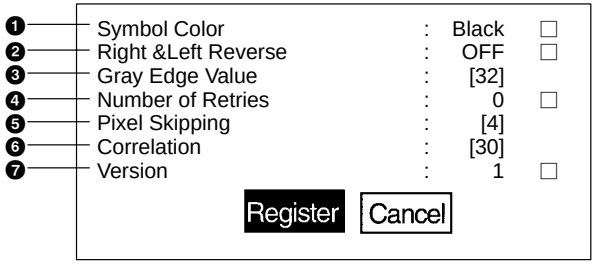
3 Select ***Search Region***.

4 Draw a square over the region to be searched. Under normal conditions, draw the whole screen.



1. Read QR (Pattern) — Reading Settings

Set the reading conditions and the conditions for searching for a model for QR Code reading.



1 Select the color of symbol.

Black (Default setting)	Black symbol printed on white base.	
White	White symbol printed on black base.	

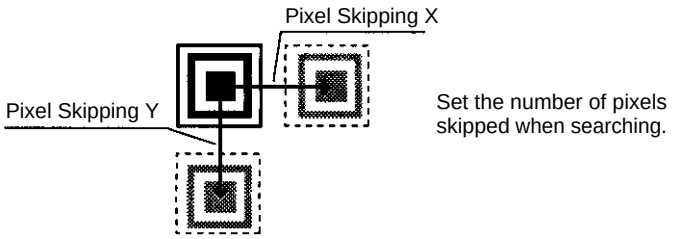
2 Select whether Right & Left Reverse of QR Codes is necessary.

ON	For reading an image after reflection, or through the back of a transparent material, such as glass.
OFF (Default setting)	For normal reading (from the front of the object)

3 Select the gray edge value (i.e., the ratio of black and white). (Setting range: 1 to 127; default setting: 32.) If the ratio of the intensity of black and white is large, set to a large value, and if the ratio of the intensity of black and white is small, set it to a small value.

4 Select the number of times reading is repeated in the event of incorrect reading. A fresh image will be obtained and reading performed for the number of times specified. (Setting range: 0 to 9 times; default setting: 0.)

5 Change the pixel skipping parameters used to search for a model. (Setting range: 1 to 20; default setting: 4.)
The processing time can be reduced if the pixel skipping parameters are set to larger values. However, depending on the image, the search may not be performed since the accuracy is reduced. After changing the setting, perform a search to confirm whether the search can be performed correctly.



6 Set the correlation threshold value for detecting finder patterns.
Correlation values higher than the threshold are detected. (Setting range: 1 to 100; default setting: 30.)

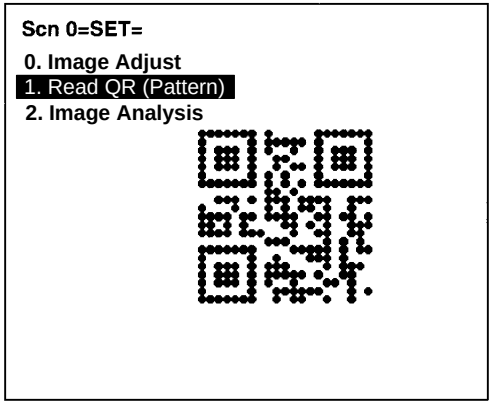
7 Set the version information for the QR Code to be read. (1 to 6) The version specified when the model was registered will be displayed. (Default setting: Version 1)

Note If the wrong version information is set, the reading can not be performed correctly.

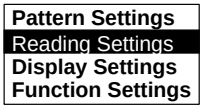
If ***Display Settings/Finder Pattern*** is set to ON, whether finder patterns can be detected or not can be confirmed on the screen. If detection is not possible, decrease the correlation threshold value and the pixel skipping parameter and check the model image. If, on the other hand, too many places are detected, increase the correlation value and pixel skipping parameter.

Procedure

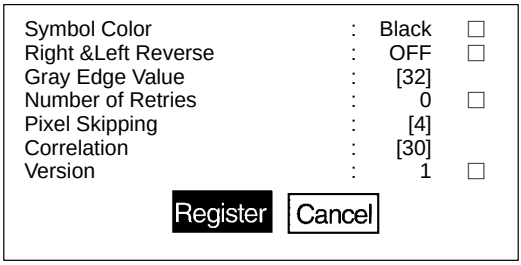
1 Select ***Read QR (Pattern)***.



2 Select ***Reading Settings***.



3 Set the items as required.



4 Select ***Register*** to validate the settings and leave this window.

<Observe the following points for QR Code reading in Pattern mode)>

1 Set the filtering method to weak or strong smoothing. (This also applies to model registration.)

2 If there is enough time available, set the number of retries to a value between 1 and 9.

3 Adjust the field of vision for the Camera so that there are at least 5 pixels per cell.

4 Ensure that there is a quiet zone (blank margin) of at least one cell around the codes.

5 If finder patterns cannot be detected, try the following countermeasures:

a) Check the model. (Confirm that finder patters have been registered.)

b) Decrease the correlation value.

c) Decrease the pixel skipping parameter.

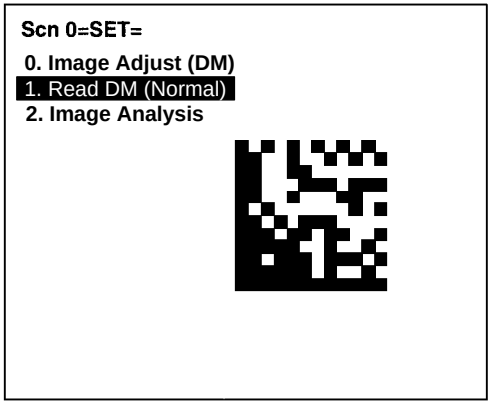
6-1-6 Read DM (Normal)

1. Read DM (Normal) — **Reading Settings (Teaching)**

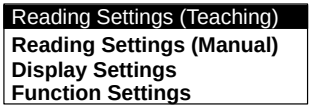
Using the teaching function, a reading image is obtained, measurement is performed on this image, and based on the results of this measurement, parameters for reading conditions (symbol color, Right & Left Reverse, Length of Finder) are automatically determined. The results of the settings made using the teaching function can be viewed in ***Reading Settings (Manual)***.

Teaching Procedure

1 Select ***Read DM (Normal)***.



2 Select ***Reading Settings (Teaching)***.



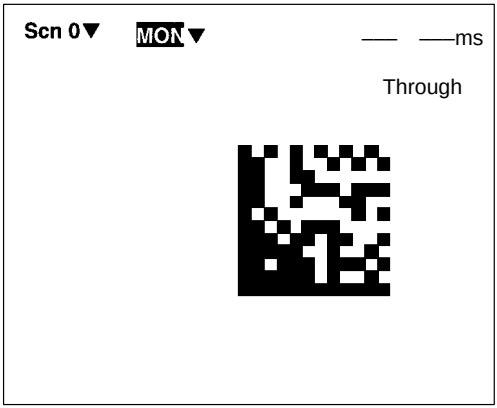
3 Select the code size.

Use the Up/Down Keys to select the required setting, and validate this setting by pressing the ENT Key. The display will return to the window shown in step 2.

10×10
12×12
14×14
16×16
18×18
20×20
22×22
24×24
26×26

4 Press the ESC Key once to return to window shown in step 1.

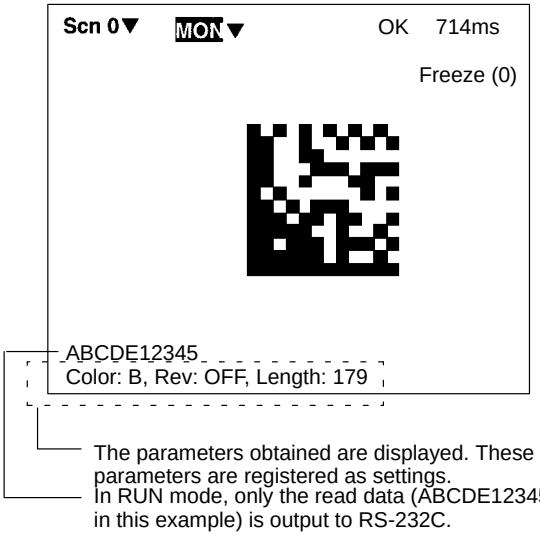
5 Press the ESC Key once more to go into MON (monitor) mode.



6 Press the TRIG Key on the Console to perform one reading.

Parameters will be set based on the results of this reading. If the reading is performed correctly, the teaching function will automatically turn OFF. To redo the settings, go to SET mode and repeat the procedure from step 1.

It is possible to view and, if necessary, change the parameter setting in ***Reading Settings (Manual)***. → **p.122**



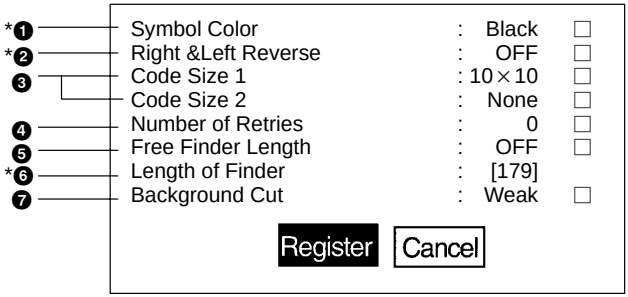
If reading is not performed correctly, the teaching function will stay ON. To turn the teaching function OFF, select ***Reading Settings (Manual)*** from the screen shown in step 2, and press the ENT Key. The teaching function will be turned OFF by entering the ***Reading Settings (Manual)*** window.

Note If the teaching operation is not successful, measure the length of finder pattern using ***Image Analysis/Measure Length*** and set this value for length of the finder pattern in ***Reading Settings (Manual)***, and then repeat the teaching operation.

1. Read DM (Normal) — **Reading Settings (Manual)**

Set the various reading condition parameters. This menu can also be used to view or change parameters set using the teaching function.

Note "Length of Finder" is the length of the finder patterns for the code expressed in pixel units. The V530-R150 detects finder patterns that correspond to this length and performs readings. "Free Finder Length" is a function that is used when there are several different sizes of reading codes, with large differences in the length of the finder. If this function is turned ON, any finder patterns at least as long as the value set as the "Length of Finder" will be detected and reading performed.



*: Indicates items set automatically using the teaching function.

1 Select the color of symbol.

Black (Default setting)	Black symbol printed on white base.
White	White symbol printed on black base.
Auto	Automatically determines the appropriate symbol color. Use this setting when reading codes that include both symbol colors. If, however, the symbol color is known to be one or the other (i.e., either black or white), set to black or white to reduce the required processing time.

2 Select whether Right & Left Reverse of Data Matrix is necessary.

ON	Necessary For reading an image after reflection, or through the back of a transparent material, such as glass.
OFF (Default setting)	For normal reading (from the front of the object)
Auto	Automatically determines whether Right & Left Reverse is required. Use this setting when reading codes that include both types. If, however, the necessity of Right & Left Reverse is known one way or the other, set to ON or OFF to reduce the required processing time.

3 Select the code size. It is possible to set up to two (1 or 2) code sizes. If the reading codes are all the same size, set this size as code size 1, and set code size 2 to "None." (10×10 to 26×26; Default setting: Code size 1 = 10×10, code size 2 = None.)

4 Select the number of retries to be made if the reading is NG. (0 to 9; Default setting: 0.)

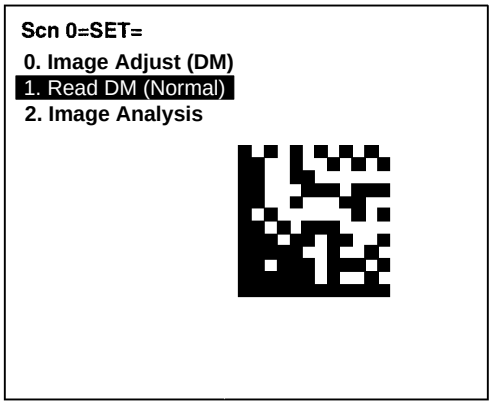
5 Use Free Finder Length when there are several different sizes of reading codes, with large differences in the length of the finder patterns. If this function is turned ON, any finder patterns at least as long as the value set for the length of the finder pattern (6) will be detected and reading performed. If the code size (and consequently the length of the finder pattern) is fixed, set to OFF.
(Default setting: OFF.)

6 Input the length of the finder pattern (L-shape) in pixel units. (50 to 480; Default setting: 150)
This setting can be made automatically using the teaching function, so whenever resetting the reading conditions, always use the teaching function first. → **p.122**
When Free Finder Length (5) is set to ON, set the minimum length of the reading codes as the value of the length of the finder pattern.

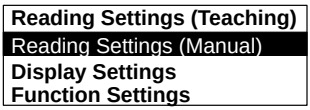
7 Select the background cut level required when searching for finder patterns (L-shapes). when reading for white symbol printed on black base, such as with direct marking, it is recommended that this level is set to middle or strong. (Weak/Middle/Strong; Default setting: Weak.)

Normal Procedure

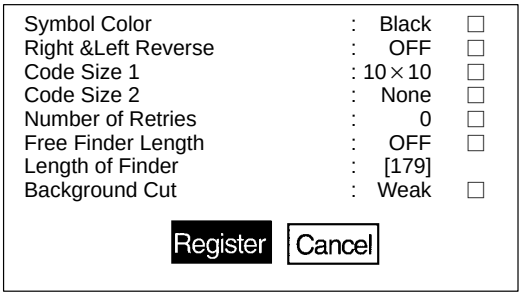
1 Select ***Read DM (Normal)***.



2 Select ***Reading Settings (Manual)***.



3 Set the items as required.



4 Select ***Register*** to validate the settings and leave this window.

<Observe the following points for Data Matrix reading in Normal mode>

1 Set the filtering method to weak or strong smoothing.

2 Turn ON the filtering retry function if necessary.

3 If the code is white symbol printed on black base, set the background cut level to middle or strong.

4 If there is enough time available, set the number of retries to a value between 1 and 9.

5 Adjust the filed of vision for the Camera so that there are at least 5 pixels per cell.

6 Ensure that there is a quiet zone (blank margin) of at least 4 cells around the codes.

7 If correct reading is not possible, try the following countermeasures:

a) Set the filtering method to strong or smoothing.

b) Change the field of vision.

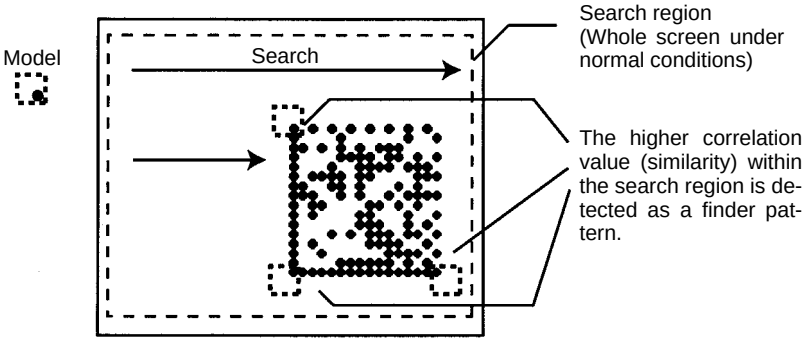
c) Use the Data Matrix (Pattern) menus.

6-1-7 Read DM (Pattern)

1. Read DM (Pattern) — **Pattern Settings**

The method of registering model images of finder patterns, and using these models to find finder patterns from input images is called “pattern search.” Because image patterns are used, code positions can still be found with greater accuracy than with Normal mode, even if the printing quality is poor.

Note There is an orientation tolerance of ±10° with this method. Models cannot be detected for orientations greater than this.



Note When using this menu, set the field of vision to satisfy the following conditions.

- There are more than 10 pixels per cell.
- There is a margin of at least 2 cells around the code.

The orientation of the (L-shape) finder pattern is restricted to the following:

No other orientation is possible and so ensure that code images are obtained in the correct orientation.

Example: OK

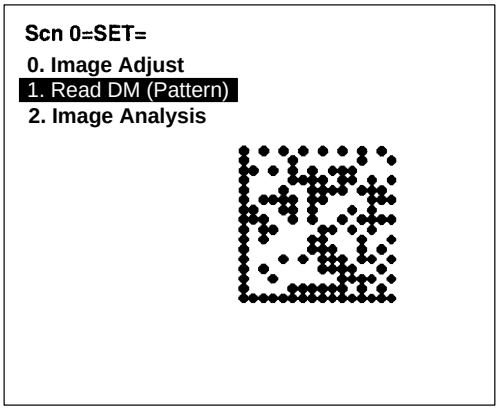
NG

Model Registration

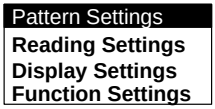
Use the following procedure to register models of finder patterns.

Procedure

1 Select ***Read DM (Pattern)***.

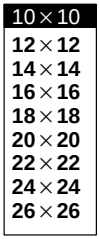


2 Select ***Pattern Settings***.



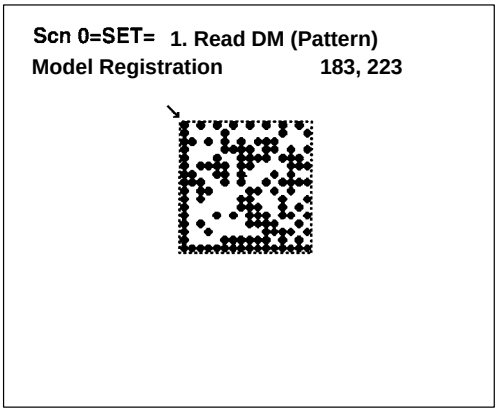
3 Select ***Model Registration***.

4 Select the code size.



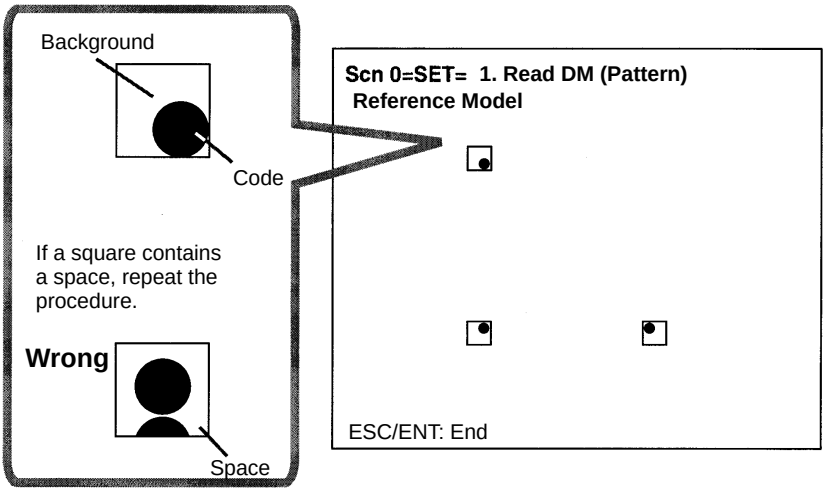
5 Draw a square that fits onto the code without leaving any gaps.

Specify the top-left and bottom-right corners of the square. Use the Up/Down/Right/Left Keys to move the cursor to the required positions and press the ENT Key.



6 Check the position of the square, and press the ENT or ESC key to validate the setting and leave this screen.

Note Go to ***Reference Model***, and check that models, including background, are registered in 3 places.

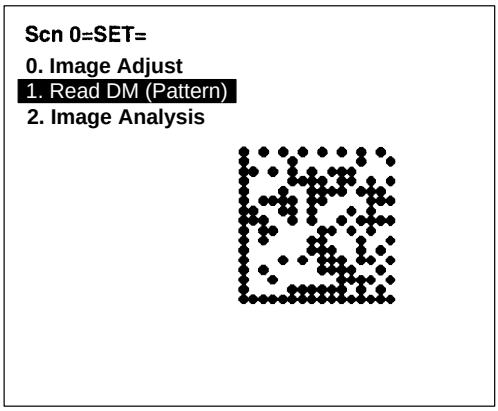


Reference Model

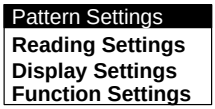
It is possible to view the model image (without the surrounding code) by displaying it on the monitor screen. After registering a model, be sure to use this function to check that all 3 places of the model including background, have been registered correctly.

Procedure

1 Select ***Read DM (Pattern)***.

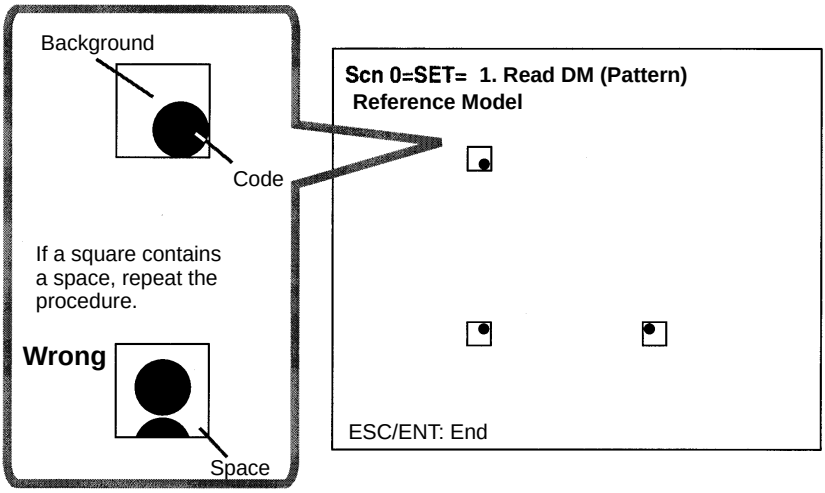


2 Select ***Pattern Settings***.



3 Select ***Reference Model***. The model image will be displayed.

Model Registration
Reference Model
Search Region



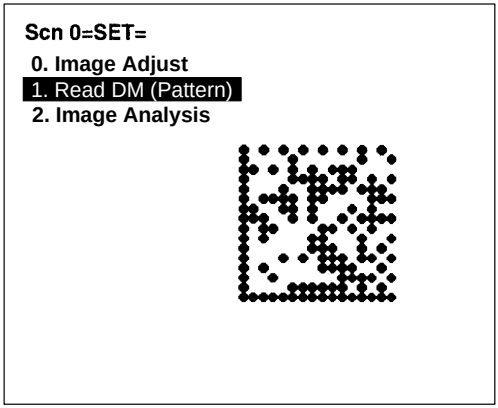
4 Press the ENT or ESC Key to leave this screen.

Search Region

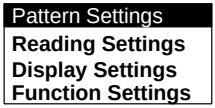
Specify the range over which to search for the model.

Procedure

1 Select ***Read DM (Pattern)***.

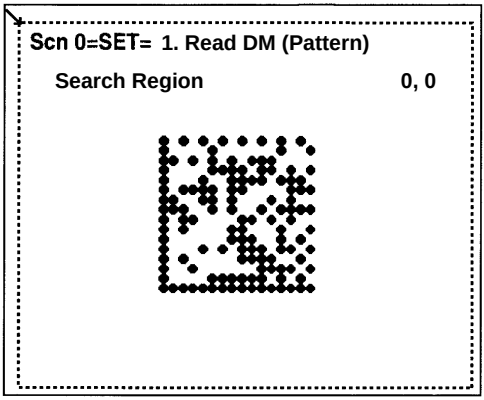


2 Select ***Pattern Settings***.



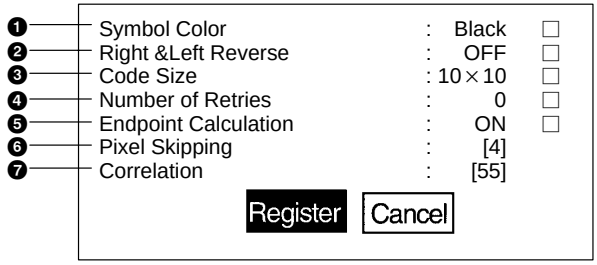
3 Select ***Search Region***.

4 Draw a square over the region to be searched. Under normal conditions, draw the whole screen.



1. Read DM (Pattern) — **Reading Settings**

Set the reading conditions and the conditions for searching for a model when reading Data Matrix codes.



1 Select the color of symbol.

Black (Default setting)	Black symbol printed on white base.
White	White symbol printed on black base.

2 Select whether Right & Left Reverse of Data Matrix codes is necessary.

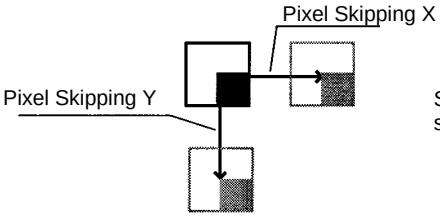
ON	For reading an image after reflection, or through the back of a transparent material, such as glass.
OFF (Default setting)	For normal reading (from the front of the object)

3 Select the code size.
(10 × 10 to 26 × 26, 8 × 32; Default setting: 10 × 10)

4 Select the number of retries to be made if the reading is NG. A fresh image will be obtained and reading performed for the number of times specified.
(0 to 9; Default setting: 0.)

5 If Endpoint Calculation is set to ON, in cases where only two endpoints of the finder pattern can be found, an estimate will be made for the third point and reading will be performed.
(Default setting: ON.)

6 Change the pixel skipping parameters used to search for a model. (1 to 20)
The processing time can be reduced if the pixel skipping parameters are set to larger values. However, depending on the image, the search may not be performed since the accuracy is reduced. After changing the setting, perform a search to confirm whether the search can be performed correctly.

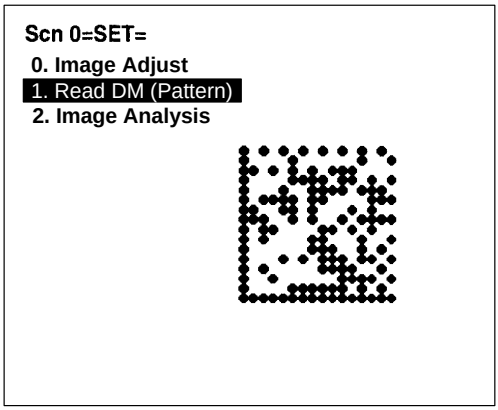


7 Set the correlation threshold value for detecting finder patterns.
Correlation values higher than the threshold are detected. (1 to 100; Default setting: 55.)

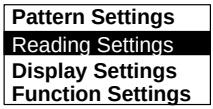
Note If ***Display Settings/Finder Pattern*** is set to ON, whether finder patterns can be detected or not can be confirmed on the screen. If detection is not possible, decrease the correlation threshold value and the pixel sipping parameter and check the model image.
If, on the other hand, too many places are detected, increase the correlation value and pixel skipping parameter.

Procedure

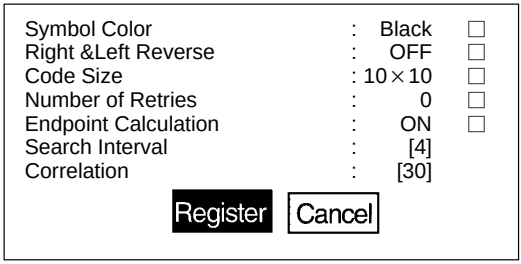
1 Select ***DM (Pattern)***.



2 Select ***Reading Settings***.



3 Set the items as required.



4 Select ***Register*** to validate the settings and leave this window.

<Observe the following points for Data Matrix reading in Pattern mode>

1 Set the filtering method to weak or strong smoothing.

2 If there is enough time available, set the number of retries to a value between 1 and 9.

3 Adjust the field of vision for the Camera so that there are at least 10 pixels per cell.

4 Ensure that there is a quiet zone (blank margin) of at least 2 cells around the codes.

5 If finder patterns cannot be detected, try the following countermeasures:

a) Check the model. (Confirm that finder patters have been registered.)

b) Decrease the correlation value.

c) Decrease the pixel skipping parameter.

6-1-8 Display Settings

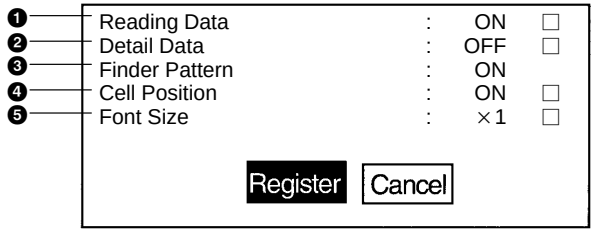
1. Read QR (Normal) — **Display Settings**

1. Read DM (Normal) — **Display Settings**

1. Read QR (Pattern) — **Display Settings**

1. Read DM (Pattern) — **Display Settings**

Set the contents displayed in MON (monitor) mode and RUN mode. The processing time will increase in proportion to the number of display items selected.



1 Select whether or not to display reading data on the screen. (The default setting is ON.)

2 Select whether or not to display detailed data on the screen. (The default setting is OFF.)
If turned ON, information such as detailed information about codes and pixels per cell, etc. is displayed.

3 Select whether or not to display finder pattern positions on the screen. (The default setting is ON.)

4 Select whether or not to display cell recognition positions on the screen. (The default setting is ON.)

Note When ***Function Settings/Cell Verify*** is set to ON, this function is invalid.

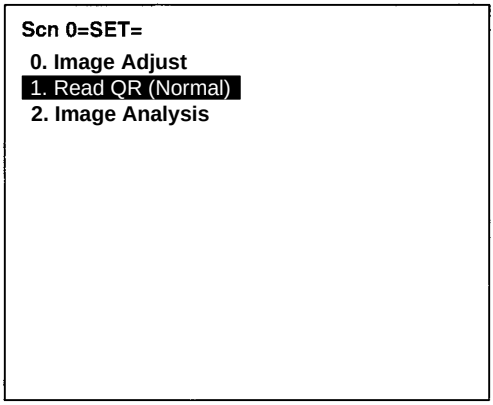
5 Select the font size of reading data to be displayed on the screen. (x1/x4; Default setting is x1.)
When the displayed data exceeds the number of letters given below, the font size is automatically set to x1.

- 64 or more letters
  (x4 when reading accuracy or data history function is ON.)

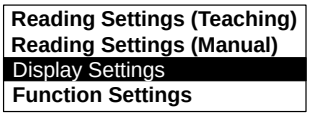
Data other than reading data (detailed data etc.) is displayed with x1 font size regardless of this setting.

Procedure

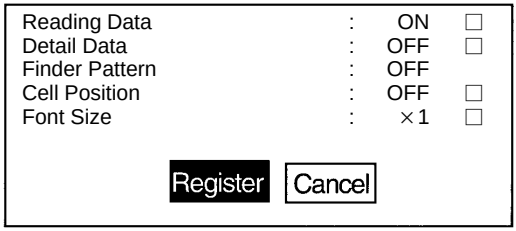
1 Select ***Read*****.



2 Select ***Display Settings***.



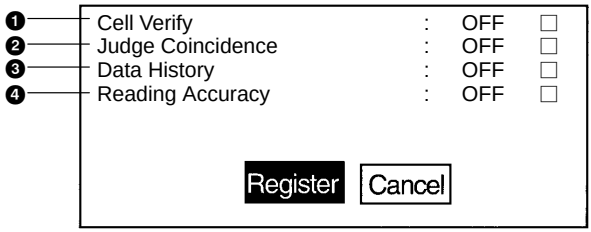
3 Set the items as required.



4 Select ***Register*** to validate the settings and leave this window.

6-1-9 Function Settings

There are functions that can be used to increase the reliability of reading. There are some restrictions as to what functions can be used together, so use the function that is more important.



Note Cell Verify can be used together with Judge Coincidence, Data History, Reading Accuracy and Judge Gray Value, but no other combination can be used together.

1 Cell Verify is a function that performs verification judgment by registering black and white information of cells as standard data.
When reading the same code continuously, surface defects can be checked for.
Set to ***Register*** to register black and white recognition of each cell and then set to ***ON***.

Register: Black and white recognition of each cell being read in the next trigger is registered as standard.

Verify: Every time reading is performed, the registered cell recognition is verified. If not verified, the section will be displayed on the screen.

OFF: No judgment is performed. (Default setting)

Note When this function is used, the setting of ***Display Settings/Cell Position*** is invalid.

2 Judge Coincidence is a function that performs coincidence judgment of reading data.
Up to 4 standard data can be registered.
Select ***Data*** (0 to 3) to register the standard data and then set to ***ON***.

Data 0 to 3:	The data read in the next trigger is registered as the number of standard data.
Verify:	Every time reading is performed, the registered standard data and reading data are verified. The judgment result is output to terminal blocks (DO0 to 3) and RS-232C (Normal).
OFF:	No judgement is performed. (Default setting)
Clr Data:	All registered data is cleared.

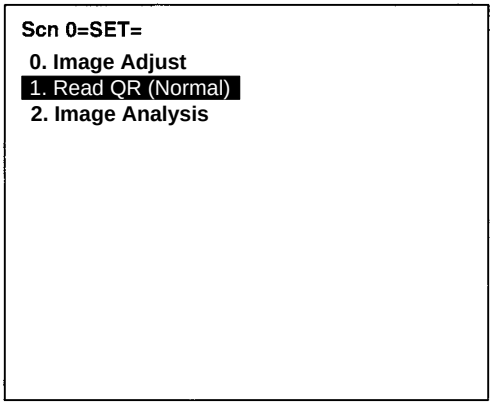
3 When Data History is turned ON, the following four items are counted and displayed on the screen.
The counted values are maintained even when the power is turned OFF if the data is saved to flash memory.
To reset the Data History, set to ***OFF*** and select ***Register***.
(The default setting is OFF.)

- Number of readings
- Number of OK readings
- Reading accuracy
  (Number of OK readings ÷ Number of readings × 100)
- Error codes

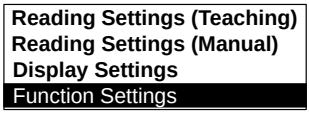
4 When Reading Accuracy is turned ON, one trigger performs ten readings.
The reading accuracy and the data from the 10th reading are displayed on a screen and output to RS-232C (Normal).
(The default setting is OFF.)

Procedure

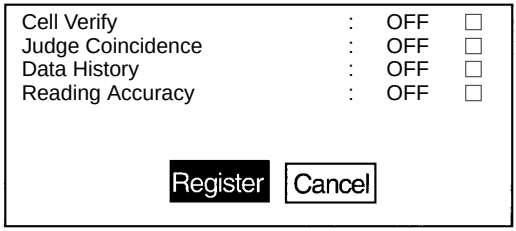
1 Select ***Read*****.



2 Select ***Function Settings***.



3 Set the items as required.

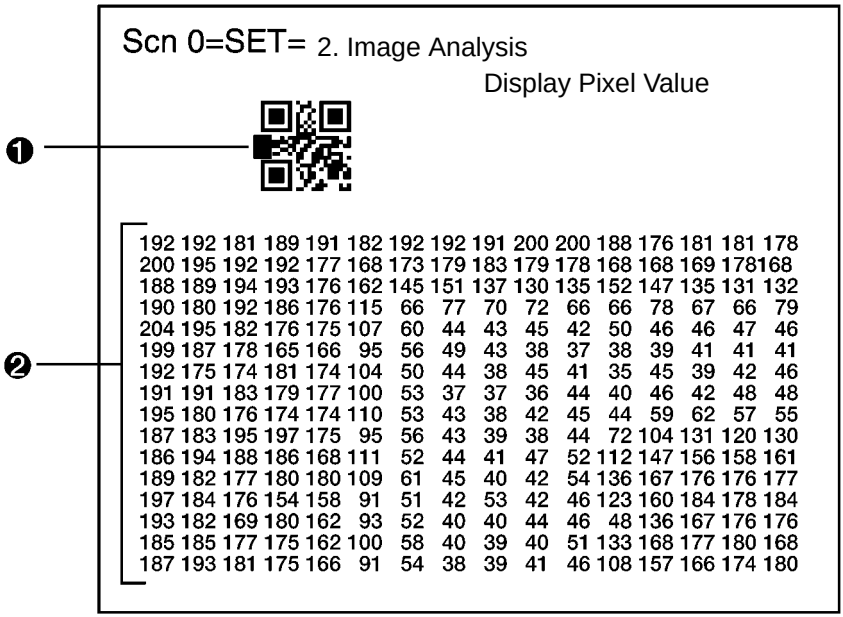


4 Select ***Register*** to validate the settings and leave this window.

6-1-10 Image Analysis

2. Image Analysis — **Display Pixel Value**

Displays the density information in the range 0 to 255 for a specific area.



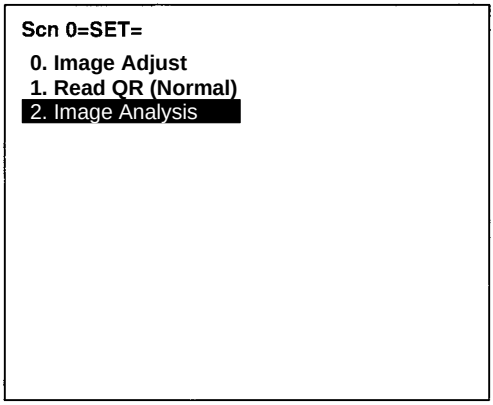
1 Specified area is 16 x 16 pixels.
Use Up/Down/Left/Right Keys to move to the position for which density information is required.
Press the SHIFT Key at the same time to move faster.

2 The density information for the specified area is displayed.

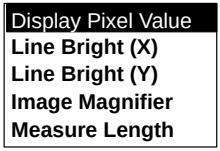
Note Analysis is not possible for through images.

Procedure

1 Select ***2.Image Analysis***.



2 Select ***Display Pixel Value***.



3 Move to the required area by using the Up/Down/Left/Right Keys.

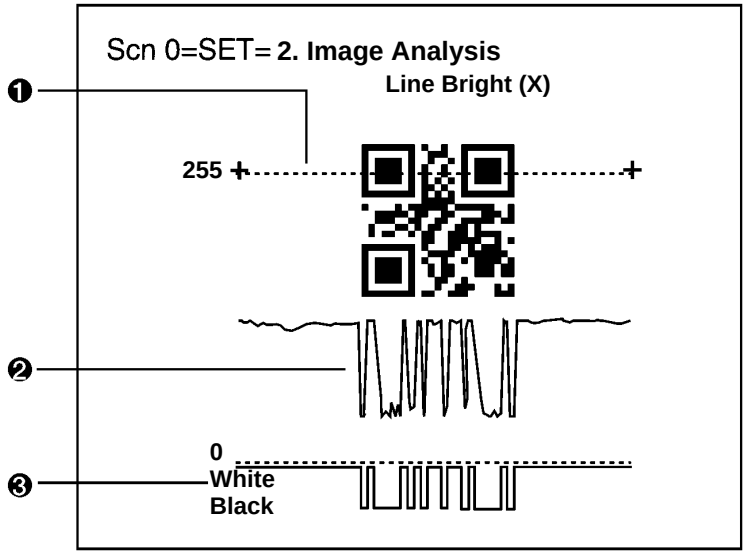
The density information will be displayed.
Press the SHIFT Key at the same time to move faster.

4 Press the ESC Key to leave this screen.

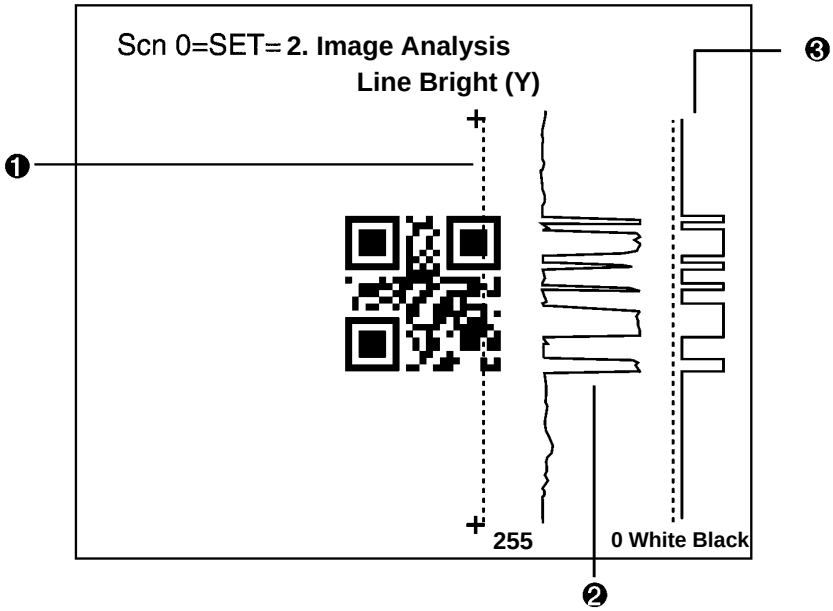
2. Image Analysis — **Line Bright**

A graph showing the density distribution for a desired horizontal or vertical line can be displayed.

- Line Bright X (fixed Y coordinate)



- Line Bright Y (fixed X coordinate)



1 Specify the beginning and end point of the line for which density distribution is to be displayed.

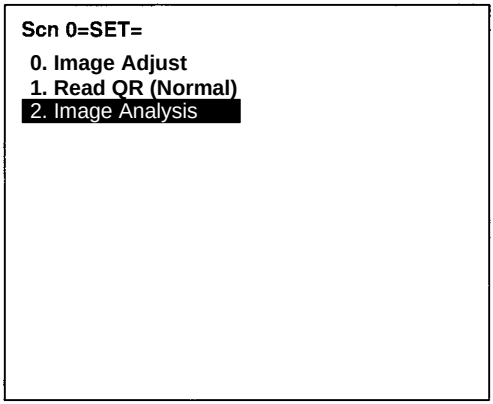
2 The density distribution is displayed.

3 The ratio of black and white with respect to the gray edge value is displayed.

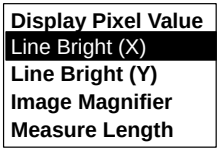
Note Analysis is not possible for through images.

Procedure

1 Select ***2. Image Analysis***.

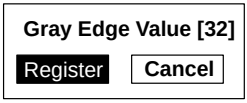


2 Select either ***Line Bright X*** or ***Line Bright Y*** as required.



3 Select the gray edge level for black and white judgment. (1 to 127)

Press the ENT Key to change the cursor to fill one digit or character. Use the Left/Right Keys to change line and use the Up/Down Keys to change the gray edge level.



4 Select ***Register***. The Line Bright screen will be displayed.

5 Move the cross cursor with the Up/Down/Left/Right Keys and press the ENT Key when the cursor is at the beginning point of the required line. Press the SHIFT Key together with the above keys to move the cursor faster.

6 Select the end point of the line.

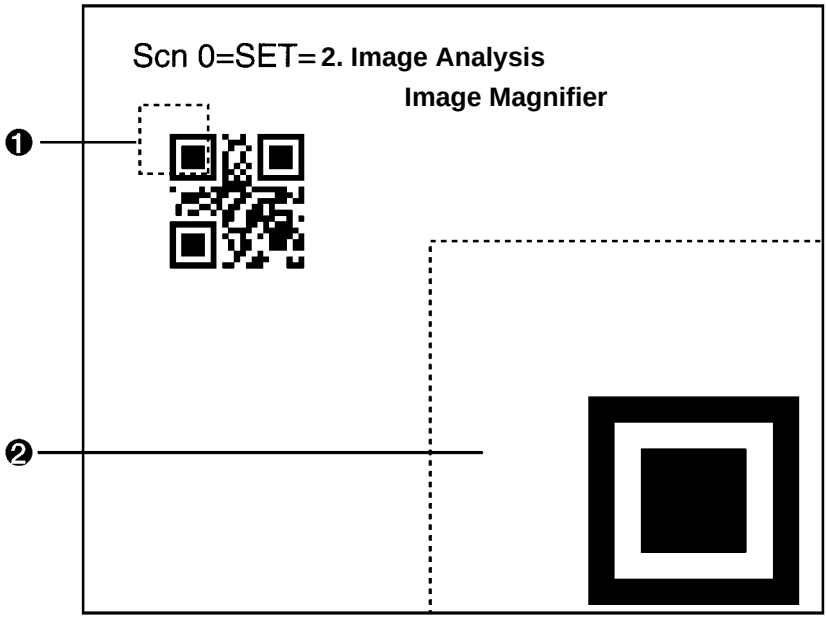
Use the Left/Right Keys (Line Bright (X)) or the Up/Down Keys (Line Bright (Y)) to move the cross cursor to the end point of the required line and press the ENT Key.

7 To change line, repeat steps 5 and 6 as required.

8 Press the ESC Key to leave this screen.

2. Image Adjust — **Image Magnifier**

Magnifies the image in a specified area.



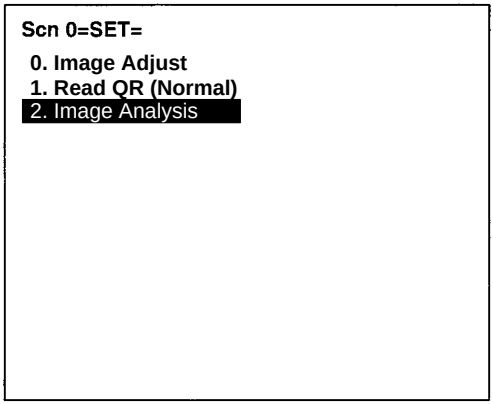
1 The specified area is 32 x 32 pixels (fixed).
Use the Up/Down/Left/Right Keys to move to the position to be magnified.
Press the SHIFT Key at the same time to move faster.

2 The image in the specified area is magnified.

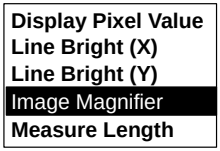
Note Analysis is not possible for through images.

Procedure

1 Select ***2.Image Analysis***.



2 Select ***Image Magnifier***.



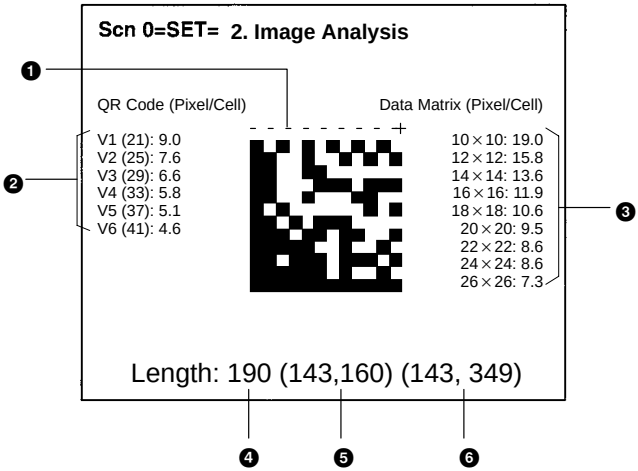
3 Move to the specified area using Up/Down/Left/Right Keys.
Press the SHIFT Key at the same time to move faster.

4 Press the ENT Key.
A magnified image is displayed within a dotted frame.

5 Press the ESC Key to leave this screen.

2. Image Analysis — **Measure Length**

Measures the size of cells in pixels.
For stable reading, adjust the field of vision to be at least five pixels per cell.



1 Specify the beginning and end point of the line to be measured.

2 The number of pixels per cell is displayed for QR Codes.

3 The number of pixels per cell is displayed for Data Matrix codes. In the above example, the number of pixels per cell for a 12 × 12 Data Matrix code is 15.8.

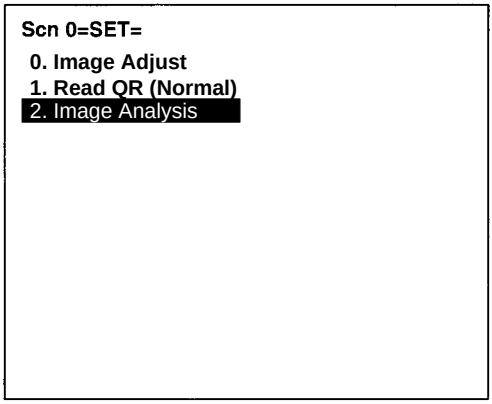
4 The length of the dotted line in pixels is displayed.

5 The coordinates of the beginning point are displayed.

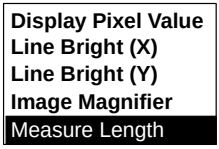
6 The coordinates of the end point are displayed.

Procedure

1 Select ***2.Image Analysis***.



2 Select ***Measure Length***.



3 Move the cross cursor to the beginning point using Up/Down/Left/Right Keys and press the ENT Key.

Press the SHIFT Key at the same time to move faster.

4 Specify the end point in the same way.

The length of the straight line is measured.

5 Press the ESC Key to leave this screen.

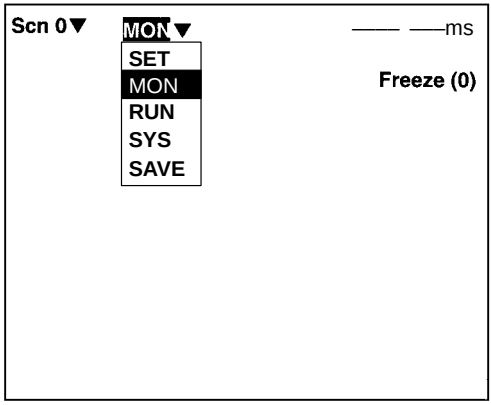
6-2 MON (Monitor) Mode

Confirms whether the reading can be correctly performed with the set conditions.
The reading judgment and data are not output to the terminal blocks or RS-232C but displayed on a monitor.

Procedure

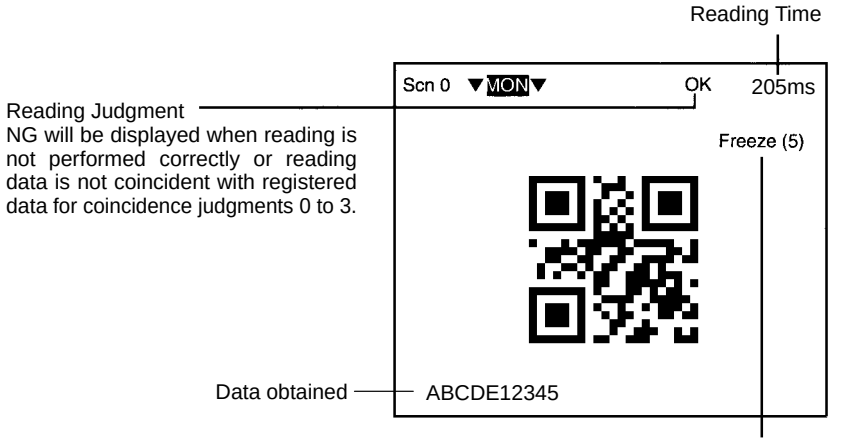
1 Enter MON (Monitor) mode.

MON (monitor) mode is automatically moved to by leaving SET mode using the ESC Key.

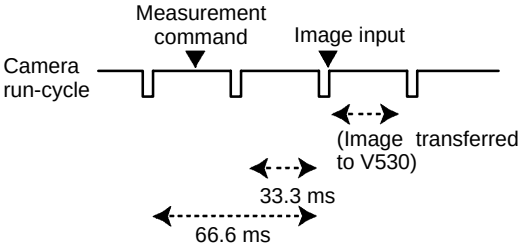


2 Input reading trigger.

- Console
  One reading is performed when the TRIG Key is pressed once.
- Terminal Block → **p. 25**
- RS-232C → **p. 46, 52**



Types of Displayed Image

Freeze ( )	A still image immediately after measurement. The memory number (0 to 23) under which the image is stored is displayed in . When reading moving objects, display freeze images.
Through	A live image from the Camera. When reading is performed on through images, a delay of 33.3 to 66.6 ms max. (depending on timing of command inputs) will occur before starting to load images. 
Memory	A reading image stored in the past. The reading images which are coincident with image storage conditions are stored in memory 0 to 23. How to set storage conditions of images. → **p. 170**
Image 0	An image after filtering according to the settings in ***SET/Image Adjust***. Reading is performed on the image after filtering.
Image 1	An edge detection image for Data Matrix processing. (For a scene in which conditions are set for QR Codes, this will be same as the Image 0.)

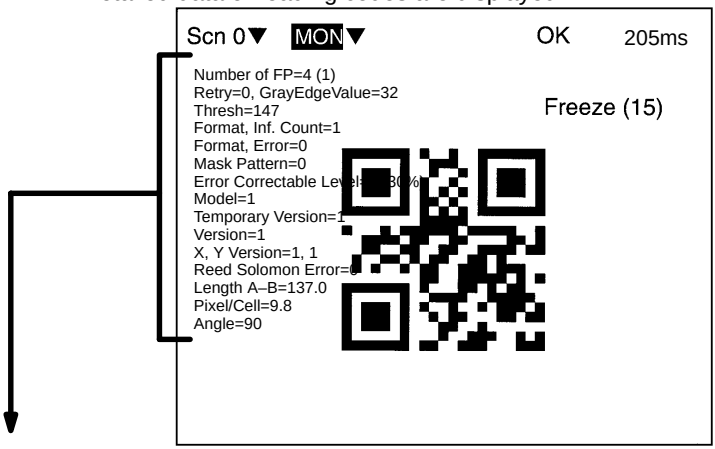
When *Reading Data* is ON:

OK: Reading data are displayed.
NG: Error codes are displayed.

(e.g.) Reading OK

When *Detail Data* is ON:

Detailed data of reading codes are displayed.



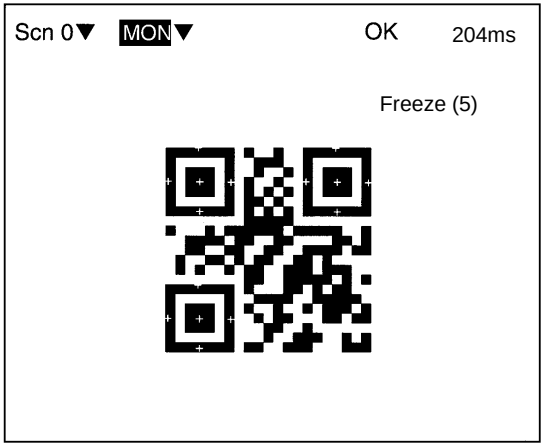
QR Code (Normal or Pattern Mode)

Number of FP	Number of finder patterns detected
Retry; Gray Edge Value (Normal)	Setting conditions
Retry; Correlation (Pattern)	
Thresh	Threshold value for black and white discrimination
Format Inf. Count	Information, such as the version of the model read from the code and the error correction level.
Format Error	
Mask Pattern	
Error Correctable Level	
Model	
Temporary Version	
Version	
X, Y Version	
Reed Solomon Error	
Length A-B	Length between finder patterns (pixel units)
Pixel/Cell	Number of pixels per cell
Angle	Code Angle

Data Matrix in Normal Mode		**Data Matrix in Pattern Mode**	
Set	Setting conditions	Set	Setting conditions
Supplementary data	Information such as the number of finder patterns found and their locations	A: B: C:	Number of finder patterns detected and their correlation values
Judge Value		OK Correlation	
Number of Line		Number of Finder	
Number of Finder		Angle of Finder	Code Angle
( ) ( ) ( )		Thresh Value	Threshold value for black and white discrimination
Angle of Finder	Code Angle	Length of Finder	Length of the finder pattern (pixel units)
Thresh Value	Threshold value for black and white discrimination	Pixel/Cell	Number of pixels per cell
Gray Edge Value	Gray edge value for searching for timing patterns		
Length of Finder	Length of the finder pattern (pixel units)	OK1: Timing	Information about endoint estimation
Pixel/Cell	Number of pixels per cell	Endpoint Calculation	

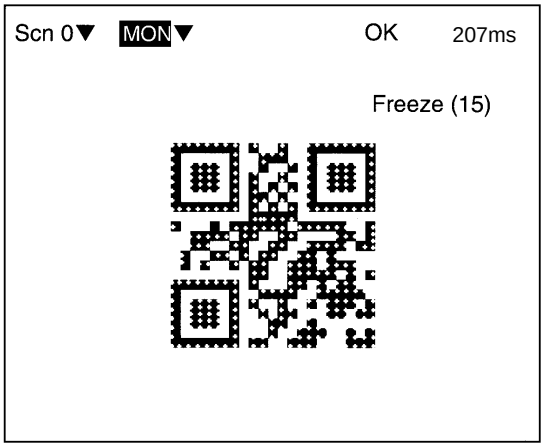
When *Finder Pattern* is ON:

A cross cursor will appear at the position recognized as a finder pattern.



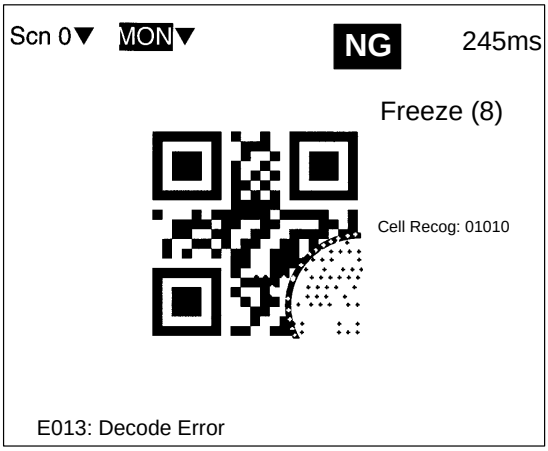
When *Cell Position* is ON:

A cross cursor will appear at the position recognized as a cell. However, when ***Read QRCode/Function Settings/Cell Verify*** is Verify, the cell recognition position is not displayed.



When *Cell Verify* is Verify:

A cross cursor will appear at the position not identified when verified with standard data. Even when ***Display Settings/Cell Position*** is ON, the result of cell recognition verification is displayed.



When *Judge Coincidence* is ON:

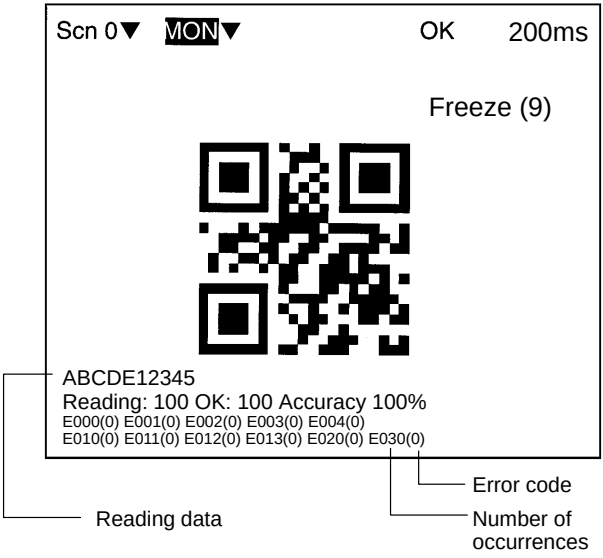
Performs coincidence judgment and the result is displayed. Turn OFF Data History and Reading Accuracy functions since they cannot be used together with Judge Coincidence.

Example: OK reading matching Register 1 data

Even if the reading is OK, if there is no match with data 0 to 3, “NG,” followed by the read data will be displayed.

When *Data History* is ON:

The number of readings and the number of OK readings recorded since this setting was turned ON, and error count results are displayed. To reset Data History, set to ***OFF*** and select ***Register***. Turn OFF Judge Coincidence and Reading Accuracy functions since they cannot be used together with Data History.

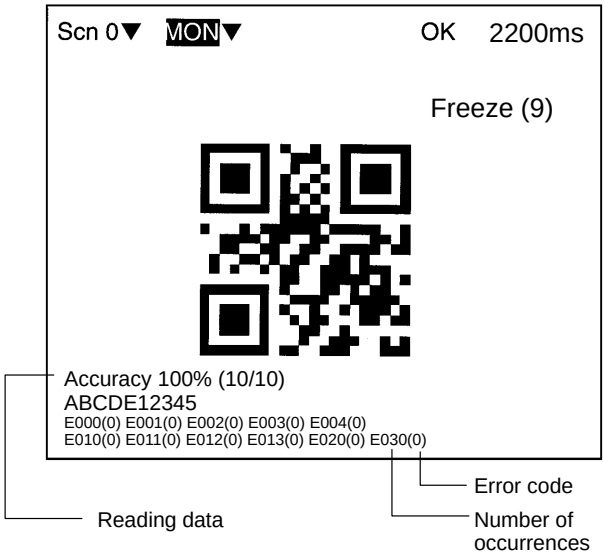


When *Reading Accuracy* is ON:

Ten readings are performed with one trigger and the result is displayed.

The reading accuracy cannot be counted for the continuous reading commands.

Turn OFF the Judge Coincidence and Data History, functions as they cannot be used together with the Reading Accuracy function.

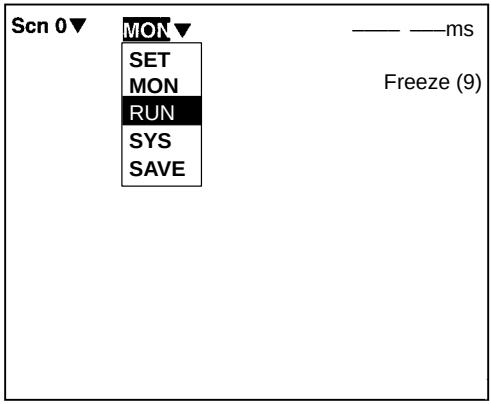


6-3 RUN Mode

Reading is performed under the setting conditions for the scene displayed.
Reading judgement and data are output to external devices. For details regarding the display items, refer to *6-2 MON (Monitor) Mode*. → **p. 151**

Procedure

1 Select RUN Mode.



2 Input reading trigger.

Commands

- Console
  One reading is performed by pressing the TRIG Key once.
- Terminal Block → **p. 25**
- RS-232C → **p. 46, 52**

Output Format

- Terminal Block → **p. 25**
- RS-232C → **p. 46, 52**

6-4 System

6-4-1 Communications Method

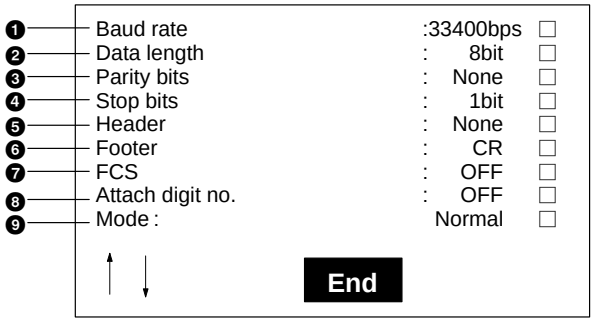
SYS — Communications

Sets communications methods when communicating to external devices via terminal blocks or RS-232C.

- When communicating in normal format via RS-232C:
  Set the communications method for ***RS-232C*** and ***Normal***.
- When communicating with host link via RS-232C:
  Set the communication method for ***RS-232C*** and ***Host link***.
- When inputting trigger or outputting reading results (OK/NG) to the OK/NG terminals on terminal blocks:
  Set the communications method for ***Terminal block***.

RS-232C

SYS — Communications
RS-232C



1 Select 2400, 4800, 9600, 19200, or 38400 (bps). (Default setting: 38400)

2 Select 7 or 8 (bits). (Default setting: 8)

3 Select None, Odd, or Even. (Default setting: None)

4 Select 1 or 2 (bits). (Default setting:1)

5 Select None, STX, or ESC. (Default setting: None)

6 Select CR, LF, or CR+LF. (Default setting: CR)

7 Select OFF or ON. (Default setting: OFF)

8 Select OFF or ON. (Default setting: OFF)
The number of digits are shown in bytes. A letter or a number is 1 digit.

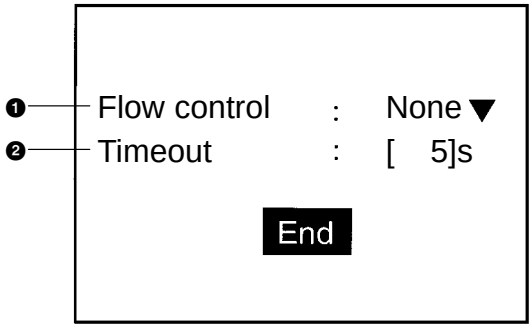
9 Select Normal or Host link (Default setting: Normal)

Normal

If ***Normal*** is selected for the communications mode, it is possible to communicate with host devices such as personal computers with normal format via RS-232C.

MON (Monitor) Mode
Receives command inputs, but the reading results are not output.

RUN Mode
Possible to input commands and output the reading results.



1 None: No flow control. (Default setting)

RS/CS: The hardware performs flow control. Use a cable that connects the RS and CS signals of the V530-R150 and external device. Data is transferred when the CS signal from the external device is ON.

Xon/off: The software performs flow control. Data is transferred according to the Xon/off codes from the external device.

Multi Drop: Select when using with multi drop. Turns on RS signals when data are transmitted.

Note When multi drop is selected, ***SYS/Multi drop*** is automatically set to ON.

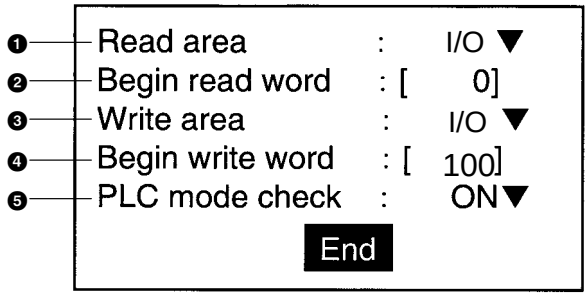
2 Set the number of seconds (1 to 120 s) before a timeout error occurs. (Default setting: 5 s)

Host Link

When ***Host link*** is selected for the communications mode, it is possible to communicate with host devices such as Programmable Controller with host link format via RS-232C.

MON (Monitor) Mode
Receives command inputs, but the reading results are not output.

RUN Mode
Possible to input commands and output the reading results.



1 Set the area from which the V530-R150 reads commands. Select I/O, HR (holding relay), LR (link relay), DM (data memory), or None. If no read area is set, commands will not be automatically read from the Programmable Controller by executing the TXD instruction in the ladder program. (The default setting is I/O.)

2 Set the first word to read in area specified above (0 to 9995). (Default setting: 0)

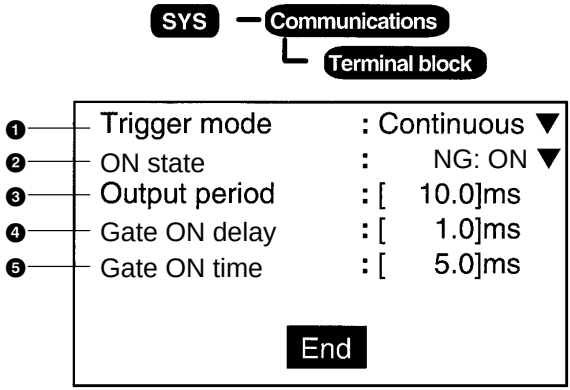
3 Set the write area where the V530-R150 writes the result. Select I/O, HR (holding relay), LR (link relay), DM (data memory), or None (No writing). (The default setting is I/O.)

4 Set the first word to write in the area specified (0 to 9996). (Default setting: 100)

5 ON: Checks the mode of the Programmable Controller in MON (monitor) and RUN modes. Reading starts with MON (monitor) mode. Error messages are displayed.
(Default setting)

OFF: Sends the command to switch mode to the Programmable Controller in MON (monitor) and RUN modes and switch the mode to MON (monitor) mode forcibly.

Terminal Block



1 Select a trigger mode for TRIG B.

Continuous (Default)	Performs continuous reading while the TRIG B terminal is turned ON. In this mode, the settings for reading accuracy and the number of retries are invalid with TRIG B input.
Level trig (trigger)	Repeats reading until an OK (readable) reading judgment is output while the TRIG B terminal is ON. In the case of an NG (not readable) reading, the NG signal is output when the TRIG B is turned OFF.

2 Select whether the OK/NG terminal is turned ON for an OK reading or an NG reading. (The default is ON for NG.)

3 Set the output period for reading judgment. Set a value between 2.0 and 10000.0 ms that is greater than the rising time + output time, and less than the reading interval. If the cycle is longer than the reading interval, the output timing will fall behind as the readings are repeated.
(The default setting is 10.0 ms.)

4 Set the time from when the result is output to the terminal block to when the GATE signal is turned ON. This time is

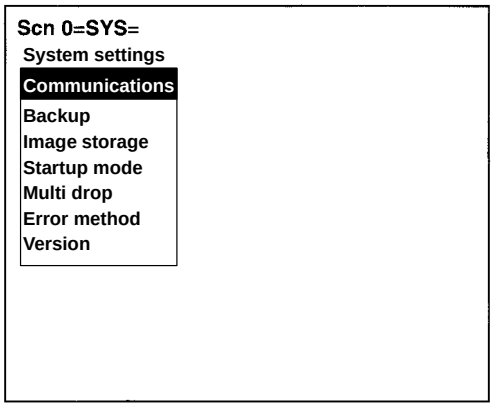
used to wait until the data output becomes stable. Set a time between 1.0 and 1000.0 ms that is longer than the delay time for the external device.
(The default setting is 1.0 ms.)

5 Set the time during which the GATE signal is ON. Set a value between 1.0 and 1000.0 ms so that the external device can read the reading judgment. (The default setting is 5.0 ms.)

Operational Procedures for RS-232C, Normal, Host Link and Terminal Block

Procedure

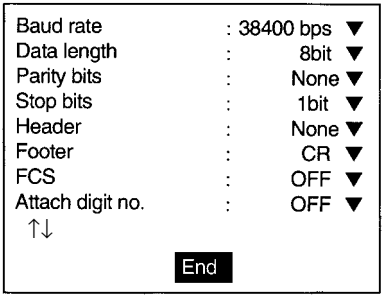
1 Select ***Communications***.



2 Select ***RS-232C***, ***Normal***, ***Host link***, or ***Terminal block***.

3 Set each item.

(e.g.) RS-232C

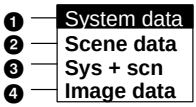


4 Select ***End*** before leaving this screen.

6-4-2 Backup

SYS — Backup

The following four setting data can be backed up to personal computers. This is a useful function for setting other devices with the same data. Backing up the setting data is recommended as a precaution against loss due to data damage or device malfunctions.



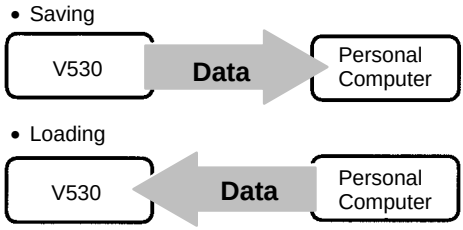
1 Back up the setting items of ***Communications***, ***Image Storage***, ***Startup mode***, ***Multi drop***, and ***Error method*** under ***System Settings*** to a personal computer.

2 Back up the items set in SET mode for each scene to a personal computer.

3 Back up system data and scene data 0 to 9 to a personal computer.

4 Back up memory images to personal computers with BMP format (*.BMP).The images can be displayed on most per-

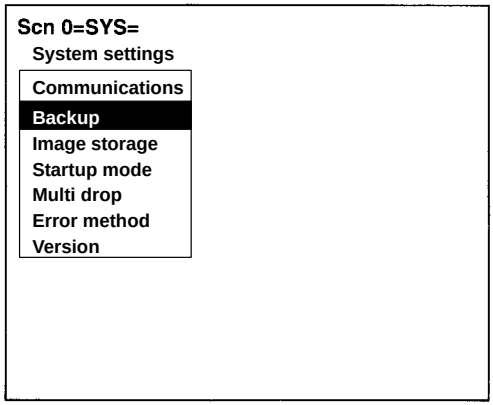
sonal computers as BMP is a common image format for Windows.



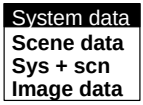
Note Never input the reset signal or turn OFF the power while saving or loading. Data may be lost, and the V530-R150 may not operate properly the next time it is started.

Procedure

1 Select ***Backup***.



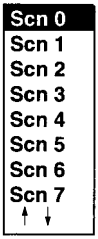
2 Select the data to be loaded or saved.



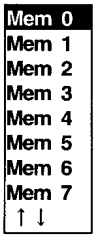
3 Select ***Load*** or ***Save***.

4 Select the number for scene data and image data.

- Scene No. (0 to 9)

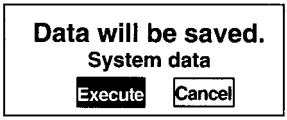


- Image Data (Memory 0 to 23, Image 0 to 1)



5 Select ***Execute*** when the confirmation message is displayed.

(e.g.) When saving system data:



Operation Examples for Personal Computers

This section describes data transfer using the Hyper Terminal provided on Windows95/98 and Windows NT4.0 computers. In this example, a RS-232C cable is connected to the COM1 port of the computer. Alter the example to suit your communications software or COM port number.
Data transfer is performed with XMODEM (-CRC or -SUM) protocol method.

Note Never input the reset signal or turn OFF the power when processing messages for saving or loading operations are displayed. Data may be lost, and the V530-R150 may not operate properly the next time it is started.

Saving Data to a Personal Computer (V530-R150 → Personal Computer)

Procedure

1 Connect the COM1 port on the computer and the V530-R150 using an RS-232 cable.

2 Make the V530-R150 communication settings.

The default communication settings are as shown in the following table. These settings can be normally used.

Item	Setting
Baud rate	38400 (bps)
Data length	8 (bit)
Parity bits	None
Stop bits	1 (bit)
Footer	CR

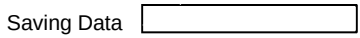
3 Start the Hyper Terminal program on the computer and make the following communication settings.

The same communication settings must be used on both the V530-R150 and the modem on the computer.

Item	Setting
Baud rate (B)	38400 (bps)
Data length (D)	8 (bit)
Parity bits	None
Stop bits	1 (bit)
Flow control	None (XMODEM protocol is used.)

4 Save data from the V530-R150.

The data transfer screen will be displayed.



5 Select ***Transfer/Receive File*** from the Hyper Terminal menu.

- Specify where the file is to be saved.
- Set the protocol to ***Xmodem***.

6 Select ***Receive*** and input the file name.

The data will be transferred from the V530-R150 to the computer.
The V530-R150 generates a timeout error if no response is received from the external device within 30 seconds. An error message will be displayed, and the error terminal will turn ON.

Loading Data From the Computer (V530-R150 ← Personal Computer)

Procedure

1 Follow steps 1 to 3 in the above procedure to connect the V530-R150 and the computer.

2 Select ***Transfer/Send File*** from the Hyper Terminal menu.

- Select the file to be loaded.
- Set the protocol to ***Xmodem***.

3 Select ***Send***.

The data transfer screen will be displayed.

4 Load data with V530-R150.

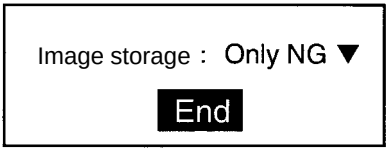
Data will be transferred from the computer to the V530-R150.
The V530-R150 generates a timeout error if no response is received from the external device within 30 seconds. An error message will be displayed, and the error terminal will turn ON.

6-4-3 Image Storage

SYS — Image storage

Selects whether to store the reading image or not. A maximum of 24 images can be stored.

Note The stored images are cleared when the power is turned OFF. Back up to a personal computer to keep the image data. → **p. 166**

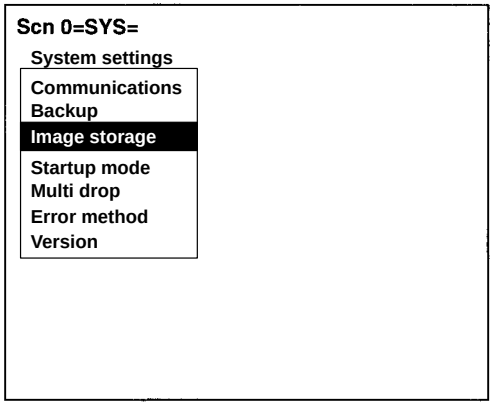


1 Select the conditions to store reading images.

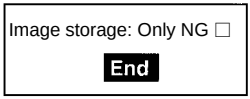
None	No images are stored.
Only NG (Default setting)	Only NG (unreadable) images are stored.
All	All images are stored regardless of readable or unreadable.

Procedure

1 Select ***Image Storage***.



2 Select the conditions.

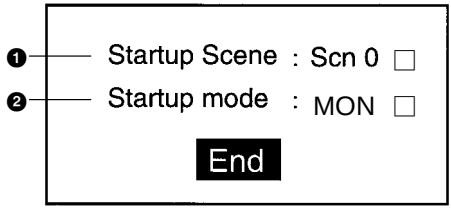


3 Select ***End*** before leaving this screen.

6-4-4 Startup Mode

SYS — Startup mode

Sets the scene number and mode to be displayed when the power is turned ON.
If the V530-R150 is set to start in RUN mode for the scene where the desired reading conditions are registered, reading can be started by simply turning the power ON.

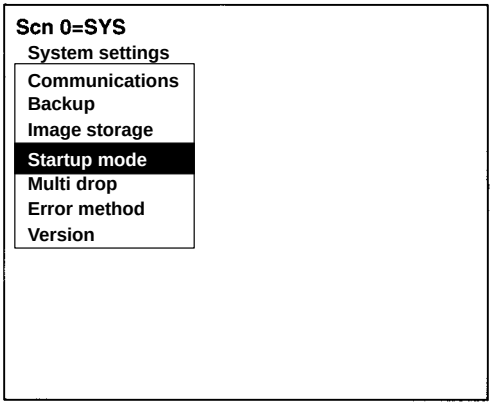


1 Select the startup scene number. (0 to 9; Default setting: 0)

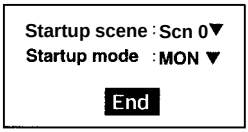
2 Select the startup mode. (SET, MON, or RUN; Default setting: MON)

Procedure

1 Select ***Startup mode***.



2 Select the startup scene number and startup mode.

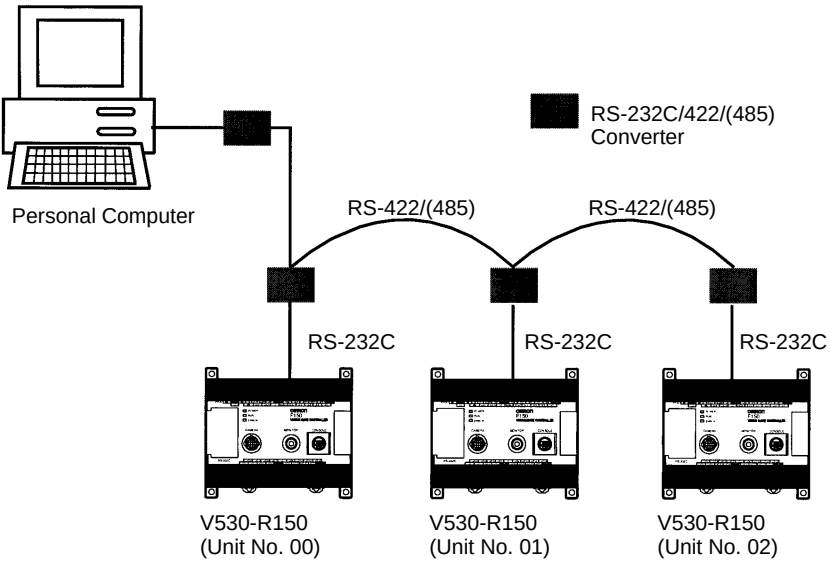


3 Select ***End*** before leaving this screen.

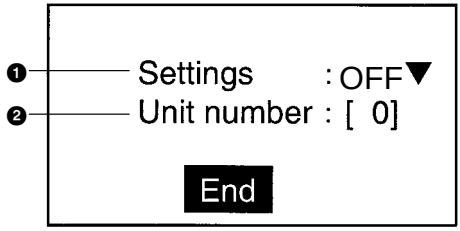
6-4-5 Multi Drop

SYS — Multi drop

One host (personal computer or Programmable Controller) can communicate with more than one V530-R150 by connecting the RS-232C/RS-422/(485) converter.
The unit number is attached to the prefix of all communication data so, set a different unit number for each V530-R150.
The multi drop function is used only when the communications method is normal.



Note Refer to the manual of the converter for the number of V530-R150 that can be connected.
The number is different depending on the converter.



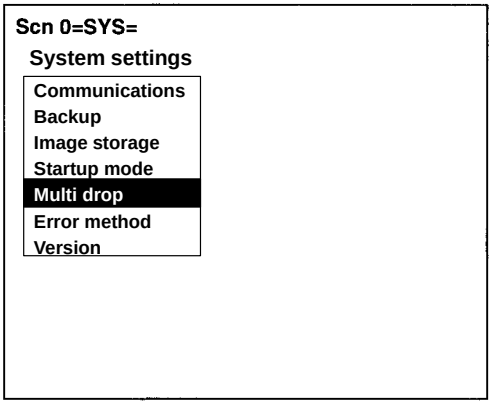
1 Select if connecting multi drop.
If ON is selected, the reading result is not output to RS-232C even when reading is performed.
When the host sends polling commands, the result will be output.
(The default setting is OFF.)

Note When this function is turned ON, the flow control in ***SYS/Communications/Normal*** is automatically set to ***Multi drop***.

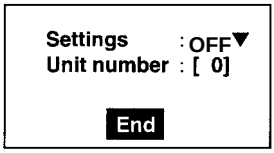
2 Set the Unit No. (0 to 31)

Procedure

1 Select ***Multi drop***.



2 Set each item.

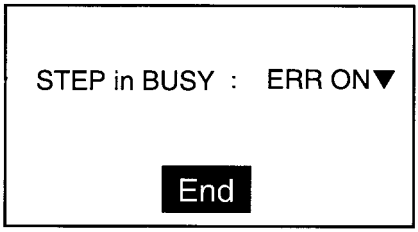


3 Select ***End*** before leaving this screen.

6-4-6 Error Method

SYS — Error method

A V530-R150 does not perform reading while the BUSY terminal is ON even when TRIG A is input. Set whether or not to turn ON the ERR terminal if a trigger signal is sent while the BUSY terminal is ON to inform the external device that the trigger has not been accepted.

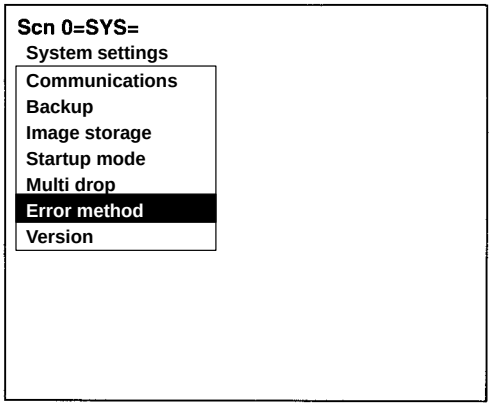


1 ERR ON (Default setting)
Reading is not performed while the BUSY terminal is ON regardless of TRIG A input.
When TRIG A is input with the correct timing, the ERR terminal turns OFF.

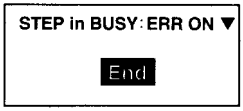
OFF
ERR terminal does not turn ON when TRIG A is input while BUSY terminal is ON. Reading is not performed.

Procedure

1 Select ***Error method***.



2 Select the error system.

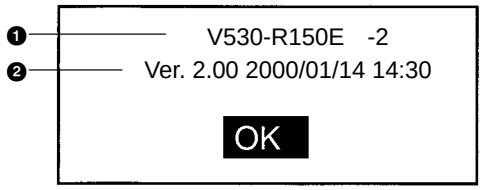


3 Select ***End*** before leaving this screen.

6-4-7 Version

SYS — Version

The model of the controller and the version of the software can be displayed.



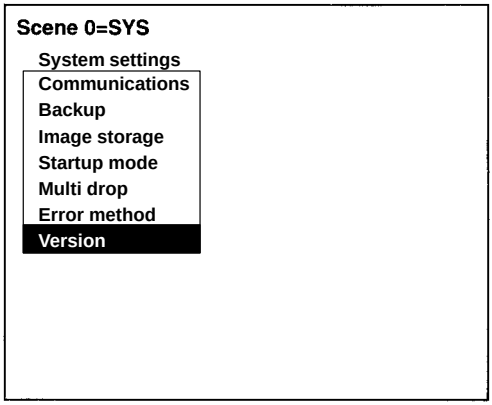
1 The model is displayed.

2 The version and production date of the software are displayed.

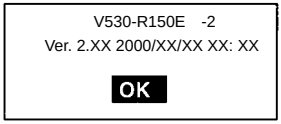
Procedure

1 Select ***Version***.

The version information is displayed.



2 Select ***OK*** before leaving this screen.

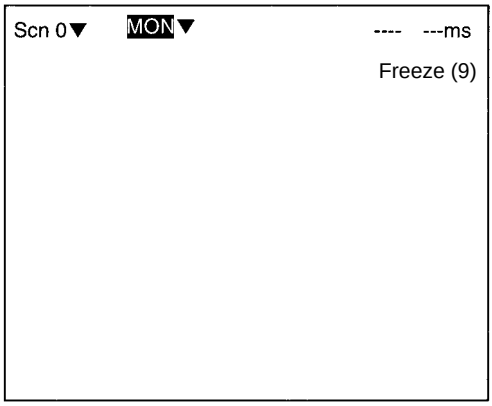


6-5 Scenes

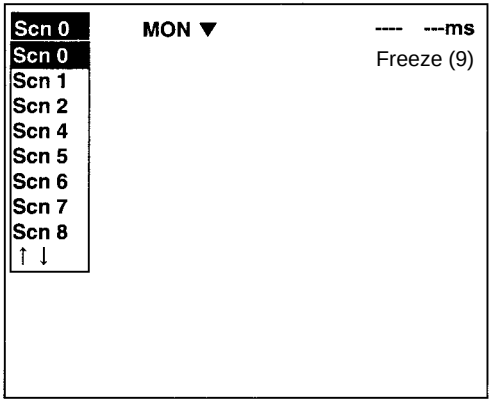
The V530-R150 has 10 scenes.
Set different reading conditions for each scene.

Procedure

1 Display the basic screen.



2 Move the cursor to ***Scn 0*** and press the ENT Key.



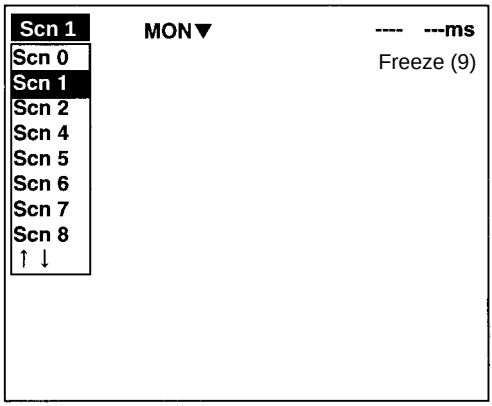
3 Move the cursor to ***Scn 1*** and press the ENT Key.

Scene 1 appears.
The mode is maintained after changing the scene.
(In this case, MON (monitor) mode.)

Copying Scene Data

Procedure

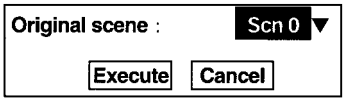
1 Move the cursor to the desired scene number and press the SHIFT+ ESC Keys.



2 Select ***Copy***.

3 Set the original scene number.

Move the cursor to "Scn □" and press the ENT Key. A list of choices will be displayed. Move to the desired scene number using the Up/Down Keys and press the ENT Key.

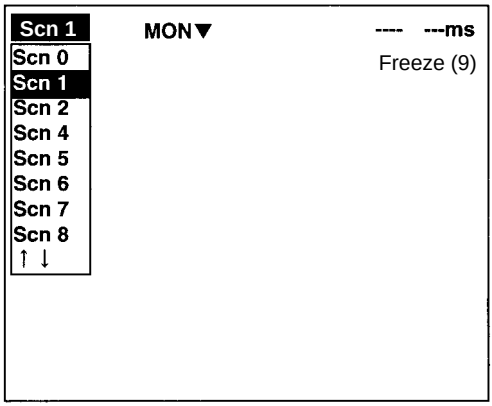


4 Select ***Execute***.

Clearing Scene Data

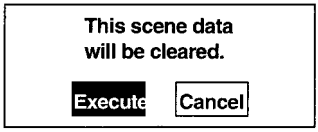
Procedure

1 Move the cursor to the scene number to be cleared and press the SHIFT + ESC Keys.



2 Select ***Clear***.
The confirmation message is displayed.

3 Select ***Execute***.

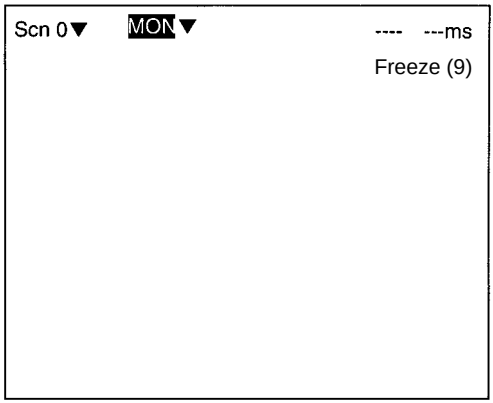


6-6 Saving to Flash Memory

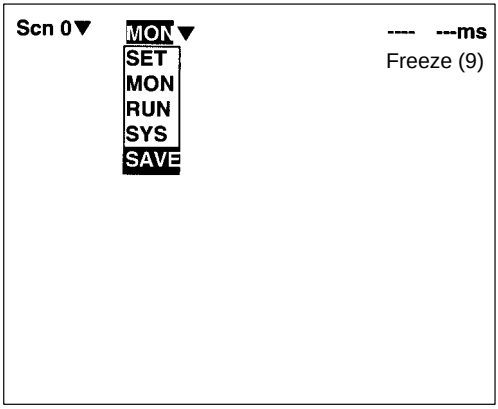
Be sure to save revised setting data to flash memory before power is turned OFF.
As the V530-R150 loads data from flash memory at startup, any new data be will lost if it is not saved to flash memory. Also, images in RAM are cleared when power is turned OFF.

Procedure

1 Display the basic screen.



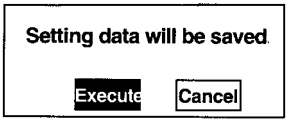
2 Move the cursor to ***MON*** (monitor) and press ENT.



3 Select ***SAVE***.

4 Select ***Execute*** when the confirmation message is displayed.

When saving is completed, the screen in step 1 appears.



Note Never input the reset signal or turn OFF the power when processing messages are displayed. Data may be lost, and the V530-R150 may not operate properly the next time it is started.

SECTION 7
Regular Inspections

This section gives basic maintenance procedures and inspection items for the V530-R150 2-Dimensional Code Reader.

To maintain the V530-R150 in the best condition, perform the following regularly.

- Lightly wipe off dirt with a soft cloth.
- Clean the lens and indicators with a cloth for a lens or air brush.

Inspection Items	Details	Required Tools
Power Supply	The voltage measured at the power supply terminals on the terminal block must be 24 VDC (+10%, –15%).	Circuit Tester
Ambient Temperature	The operating ambient temperature inside the cabinet must be between 0 to +50°C.	Thermometer
Ambient Humidity	The operating ambient humidity inside the cabinet must be between 35 to +85%.	Hygrometer
Installation	Each cable connector must be correctly inserted and locked. The cameras must be firmly secured. The camera lens mounts must be firmly secured.	Phillips screw driver

Note

1. Turn OFF the power and take safety precautions before conducting inspections.
2. Do not use thinners or benzene.

SECTION 8
Specifications/Dimensions

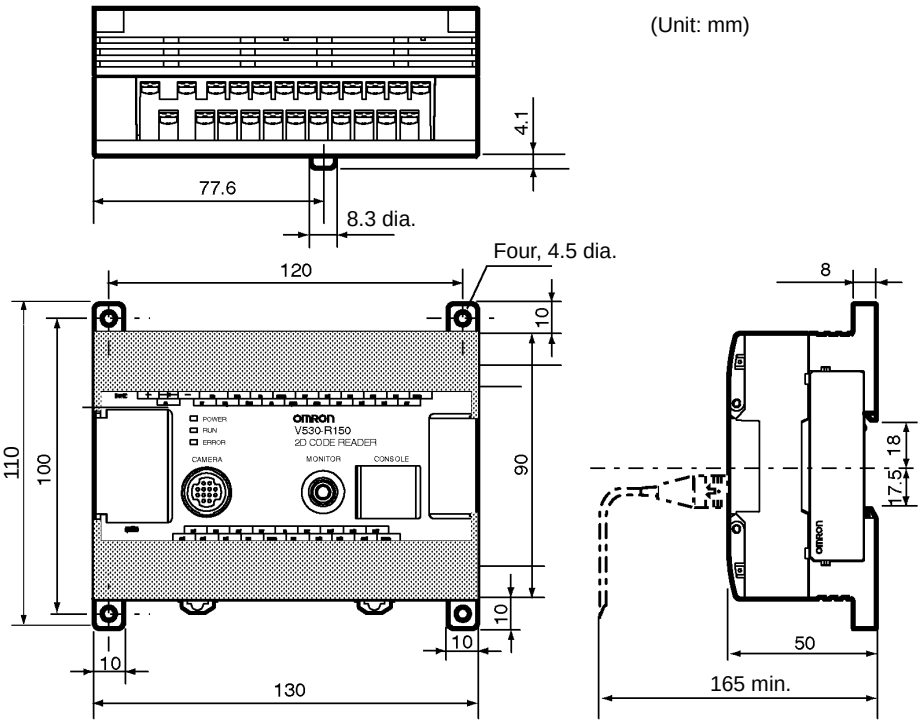
This section gives specifications and dimensions for the component parts of the V530-R150 2-Dimensional Code Reader.

8-1 V530-R150 2-Dimensional Code Reader Controller . .
8-2 Console . . . . . .
8-3 Camera . . . . . .
8-4 Cables . . . . . .
8-5 Video Monitor . . . . . .
8-6 LCD Monitor . . . . . .

8-1 V530-R150 2-Dimensional Code Reader Controller

V530-R150E-2
V530-R150EP-2

(Unit: mm)



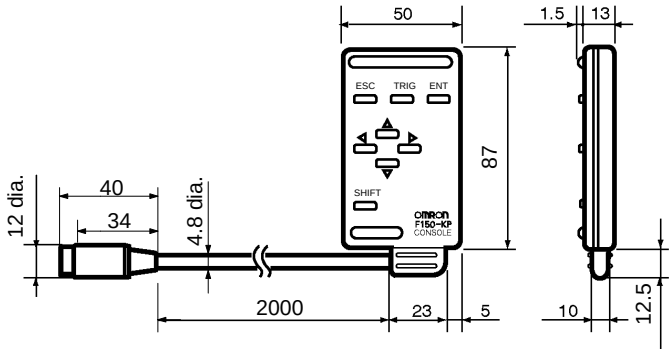
Specifications

	V530-R150E-2	V530-R150EP-2
Input/output type	NPN	PNP
Supply voltage	20.4 to 26.4 VDC (including ripple)	
Current consumption	Approx. 0.5 A	
Insulation consumption	20 MΩ min. between all DC external terminals and GR terminal (at 100 VDC, with internal surge absorber removed.)	
Dielectric strength	1,000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed.)	
Leakage current	10 mA max.	
Noise resistance (common mode)	1500 Vp-p; pulse width: 0.1 μs/1 μs; rising time: 1ns pulse	
Vibration resistance	10 Hz to 150 Hz; half-amplitude: 0.5 mm; maximum acceleration 70 m/s^2 4 times for 8 minutes each in 3 directions	
Shock resistance	200m/s^2 3 times each in 6 directions	
Ambient temperature	Operating: 0 to 50°C; storage: –25 to +65°C (with no icing or condensation)	
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)	
Ambient environment	No corrosive gases	
Protection class	Class I (with protective conductor terminal)	
Degree of protection	IEC60529 IP20 (in-panel)	
Case material	ABS/PC	
Weight	Approx. 390 g (without cable)	

8-2 Console

F150-KP

Unit: mm



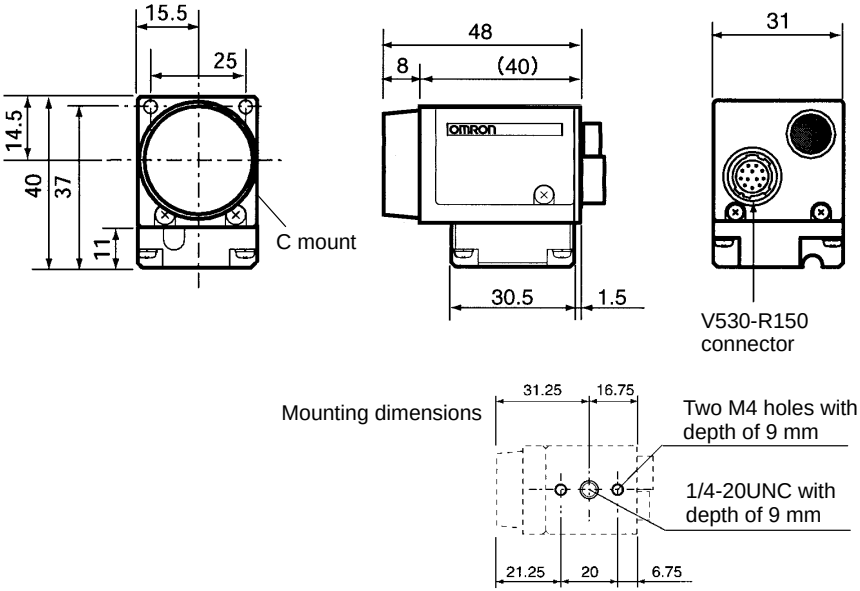
Specifications

Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s^2, 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C; storage: –25 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Degree of protection	IEC60529 IP20 (in-panel)
Minimum bending radius	75 mm
Material	Body: ABS Cable shield: Heat-resistant vinyl chloride Connector: PC, PBT
Weight	Approx. 135 g

8-3 Camera

F150-S1A

(Unit: mm)



Specifications

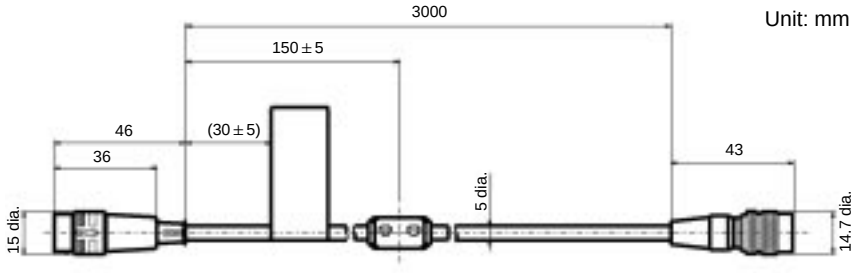
Supply voltage	12 VDC
Current consumption	Approx. 100 mA
Vibration resistance	10 Hz to 150 Hz; half-amplitude: 0.5 mm (Max. acceleration: 70 m/s^2) 4 times for 8 min. in each 3 directions
Shock resistance	150m/s^2 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C; storage: –25 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Material of camera section	Cover: Zinc-plated steel sheet, t0.6 (SECC-C) Case: Die-cast aluminum (ADC 12) Mounting base: Bakelite containing cloth (black)
Weight	Approx. 80 g

Performance

Picture element	1/3” interline CCD (reading all pixels)
Effective pixels	659 x 494 (H x V)
Synchronization	External sync. via horizontal sync signal
Shutter speed	Electronic shutter: 1/100, 1/500, 1/2000, 1/10000 sec
Lens mounting	C mount

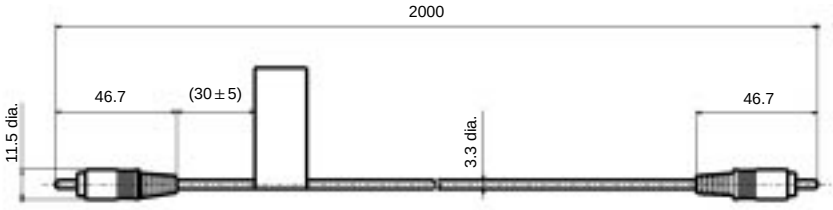
8-4 Cables

F150-VS Camera Cable



Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s^2, 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C; storage: –25 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Material	Cable shield: Heat-resistant vinyl chloride Connector: PC containing glass, PBT
Minimum bending radius	75 mm

F150-VM Monitor Cable

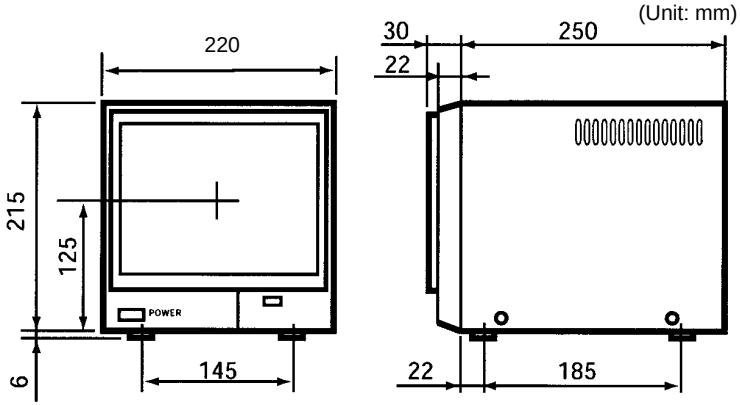


Unit: mm

Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s^2, 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C; storage: –25 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Material	Cable shield: Ultra flame-resistant vinyl chloride Connector: PVC
Minimum bending radius	50 mm

8-5 Video Monitor

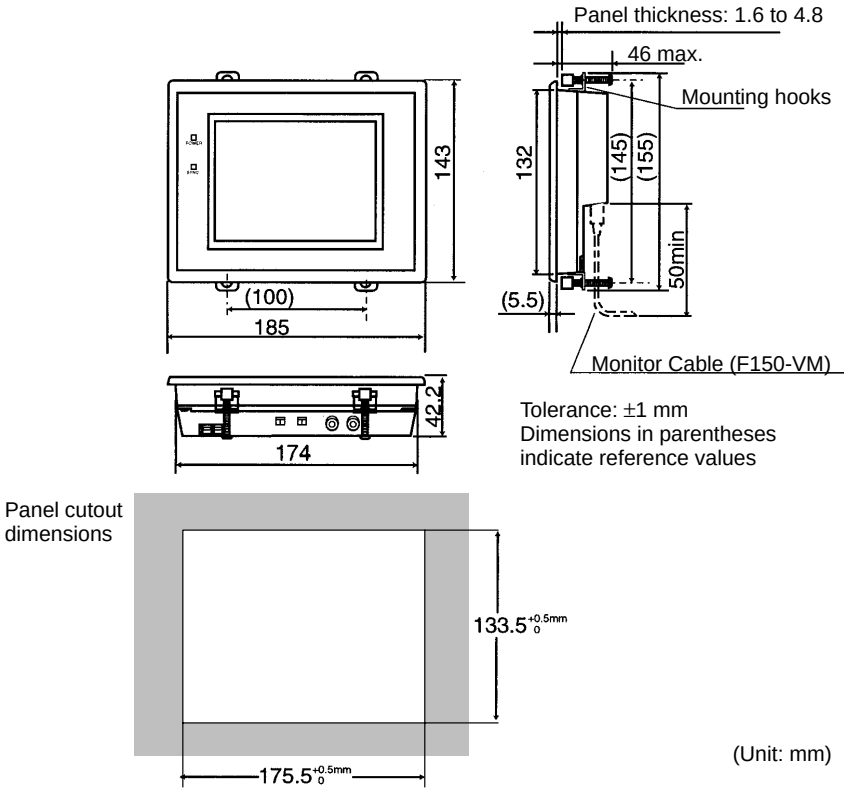
F300-M09 (OMRON)



Item	Specification
Supply voltage	90 to 110 VAC, 50/60 Hz
Power consumption	Approx. 30 W
Vibration resistance	10 to 100 Hz; double-amplitude of 2 mm or acceleration of 19.6 m/s^2 (whichever is smaller), 30 times for 1 minute each in 3 directions
Ambient temperature	Operating: 0 to 40°C; storage: –25 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 10% to 90% (with no condensation)
Ambient environment	No corrosive gases
Material	Case: ABS, zinc-plated steel sheet Display: Glass
Panel size	9 inches; 164 x 123 mm (H x V)
Panel type	CRT, monochrome (long persistence)
Resolution	700 TV lines min. (at center)
System	Number of scanning lines: 525 Horizontal frequency: 15.75 kHz Field frequency: 60 Hz
I/O impedance	75 Ω, high impedance (selectable)
I/O level and polarity	Composite video signal: 1 Vp-p Image: 0.7 Vp-p, positive Synchronization: 0.3 Vp-p, negative
Input signal	NTSC composite video (1.0 V/75 Ω termination)
Weight	Approx. 5.8 kg

8-6 LCD Monitor

F150-M05L



Item	Specification
Supply voltage	20.4 to 26.4 VDC (including ripple)
Current consumption	700 mA max.
Vibration resistance	10 to 150 Hz; half-amplitude: 0.1 mm, maximum acceleration: 15 m/s^2, 10 times for 8 minutes each in 3 directions
Shock resistance	150 m/s^2, 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C; storage: –25 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Material	Case: ABS/PC Display: PMMA (acrylic)
Panel size	5.5 inches; 111.36 × 83.52 mm (H × V)
Panel type	Liquid crystal color TFT
Resolution	320 × 240 dots
Image pitch	0.348 × 0.348 mm (H × V)
Contrast	85:1 (typical)
Viewable angle	25° up/down and 50° left/right (with a contrast ratio > 10)
Luminance	250 cd/m^2 (typical)
Backlight	Cold cathode fluorescent light
Response speed	60 ms max.
Input signal	NTSC composite video (1.0 V/75 Ω termination)
Weight	Approx. 1 kg

SECTION 9
Troubleshooting

This section details errors that may occur with the V530-R150 2-Dimensional Code Reader and gives procedures for dealing with those errors.

9-1 Improving Reading . . . . . .
9-1-1 Environment and Setup . . . . . .
9-1-2 Increasing Speed . . . . . .
9-1-3 Condition Settings . . . . . .
9-1-4 Countermeasure Examples . . . . . .
9-2 Error Codes and Countermeasures . . . . . .
9-2-1 QR Code Reading (Normal or Pattern Mode) . . . .
9-2-2 Data Matrix Reading (Normal or Pattern Mode) . .
9-2-3 Data Matrix Reading in Pattern Mode . . . . . .
9-3 Troubleshooting . . . . . .

9-1 Improving Reading

If correct reading is not performed, check the items listed below.

9-1-1 Environment and Setup

Image	Adjust the lighting and the focus to produce a suitable image. The image can be checked in real time by switching to a through image. → **p.152**
Lighting	Use appropriate lighting for the application and the reading object. The reading accuracy can be improved significantly by changing the lighting. → **p.16**
Field of vision	If the code image is too large, not all of it can be read resulting in an NG reading (because of hollowing of dots). This can be prevented by increasing the field of vision.
	If reading of a Data Matrix code made up of dots is not possible in Normal mode, try increasing the field of vision and thereby reducing the influence of dots.
	If the cell recognition coordinates are incorrect, try increasing cell recognition accuracy by decreasing the field of vision and thereby making the code image larger.
	Adjust the field of vision so that the number of pixels per cell is at least 5. For Data Matrix reading in Pattern mode, the number of pixels per cell must be at least 10.
	Try changing the lens configuration and the field of vision. Under normal conditions, it is recommended that settings are made so that the number of pixels per cell is between 7 and 12.
Margins	Normally, it is necessary to have a margin around the code of at least 4 cells. For QR Code reading in Pattern mode, however, correct reading is possible with a margin of only 1 cell.

9-1-2 Increasing Speed

Normal Mode (QR Code or Data Matrix)

Processing may be slowed down by unnecessary images in the background. Adjust the field of vision and settings in ***Image Adjust/BGS Levels*** so that unnecessary images are not included in the background. For Data Matrix reading in Normal mode, set the background cut level to medium or strong.

Pattern Mode (QR Code or Data Matrix)

The processing speed may be increased by making the changes below. These changes, however, may result in incorrect reading, so confirm correct reading operation after the changes are made.

- Make the search region smaller.
- Increase the pixel skipping parameter.

9-1-3 Condition Settings

Confirm the following settings.

Item	Possible problem	Countermeasures
Menus	Is the correct menu selected?	Chose the menu appropriate for the code to be read. → **p.90**
Reading	Has a finder pattern been detected? (This can be confirmed on the monitor by turning ON ***Display Settings/Finder Pattern***.) Has cell recognition been performed properly? (Cell positions can be confirmed on the monitor by turning ON ***Display Settings/Cell Verify***.)	Reading accuracy can be improved by adjusting the following items: Field of vision Lighting Smoothing settings BGS levels
Settings	Check that the following items match the code being read: • Symbol color • Right & Left Reverse • Code size (for Data Matrix reading in Normal mode) • Length of Finder (for Data Matrix reading in Normal mode) • Version (for QR Code reading in Pattern mode)	Match the settings on the left to the reading code.
Other	Check error codes.	Take countermeasures according to the error codes listed on pages 202 to 208.

9-1-4 Countermeasure Examples

The following are only a selection of examples of possible countermeasures. Reading operation will not necessarily be improved by performing the following operations and so execute a reading to confirm correct operation.

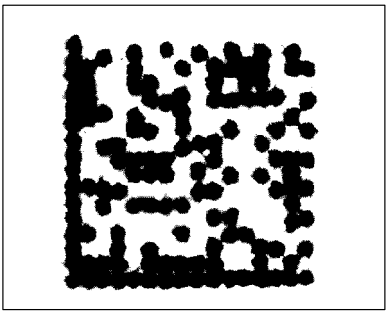
Dot Codes

Try the following countermeasures to improve reading of codes made up of dots, in Normal mode (QR Code or Data Matrix).

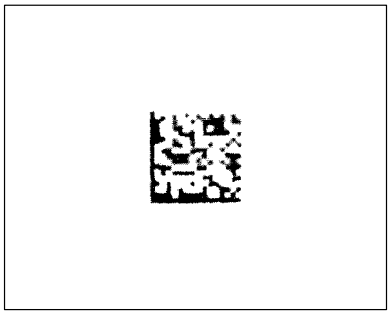
Countermeasures

- The influence of dots can be reduced by increasing the field of vision and thereby decreasing the size of the code image.
- The influence of dots can be reduced using the smoothing function. For Data Matrix reading in Normal mode, the influence of dots can be further reduced by turning ON Filtering Retry.
- Try reading in Pattern Mode.

Before countermeasure



After countermeasure



Hollowing of Dots

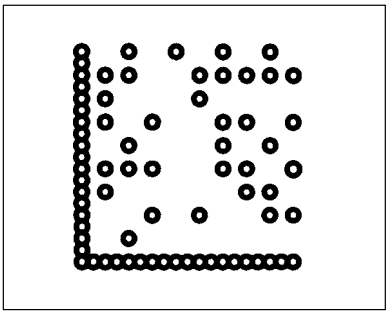
Try the following countermeasures when dots appear “hollowed,” i.e., the centers of dot images are white.

Countermeasures

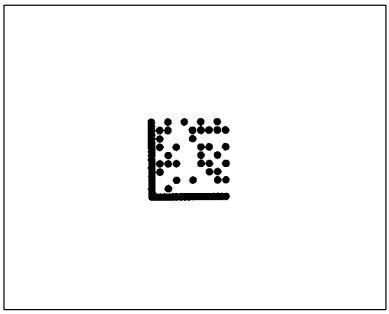
- The influence of hollowing can be decreased by increasing the field of vision and thereby decreasing the size of the code image.
- The influence of hollowing can be decreased using the smoothing function.

- The influence of hollowing can be decreased by adjusting the BGS levels.

Before countermeasure



After countermeasure

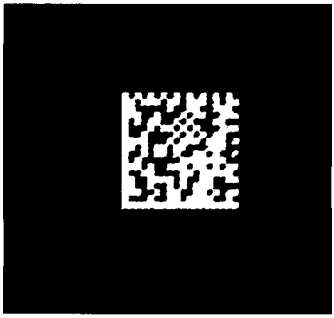


Direct Marking (White Code on Black Background)

Try the following countermeasures for codes created using direct marking.

Countermeasures

- Use the smoothing function. For Data Matrix reading in Normal mode, turn ON ***Image Adjust (DM)/Filtering Retry***, and set ***Read DM (Normal)/Background Cut*** to medium or strong.
- Increase the lower limit of the BGS level (making the background uniformly black).



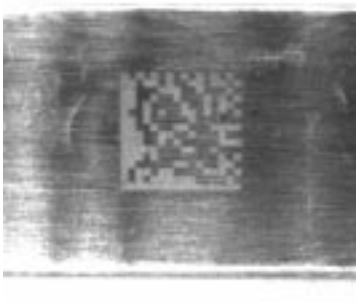
Lighting

Try the following countermeasure when performing reading for a code created by direct marking on stainless steel.

Countermeasure

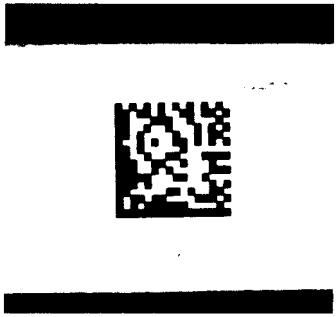
- Improve reading accuracy by using the optimum lighting for the reading object.

Before countermeasure



Ring lighting

After countermeasure



Coaxial lighting

9-2 Error Codes and Countermeasures

9-2-1 QR Code Reading (Normal or Pattern Mode)

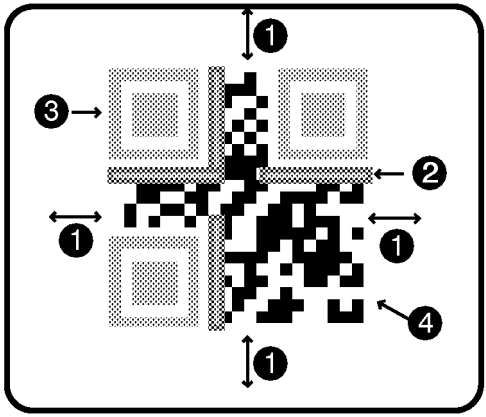
Error Code	Description	Countermeasures
E000	No finder patterns detected	No finder patterns were detected. • Make sure that the image is displayed on the screen correctly. • Check the printing of the reading code. Three finder patterns in a corner may be stained or damaged.
E001	Finder pattern detection error (Two patterns were not detected.)	Only one finder pattern was detected. (The other two patterns were not detected.) • Check the printing of the reading code. Two finder patterns may be stained or damaged. • The position of finder patterns can be confirmed on the monitor when ***Display Settings/Finder Pattern*** is turned ON.
E002	Finder pattern detection error (One pattern was not detected.)	Only two finder patterns were detected. (One pattern was not detected.) • One finder pattern may be stained or damaged. • The position of finder patterns can be confirmed on the monitor when ***Display Settings/Finder Pattern*** is turned ON.
E003	Finder pattern detection error (The relative positioning is incorrect.)	Three finder patterns were detected. However, the relative positioning of the three finder patterns is incorrect. • The code may be bent or part of the finder patterns may be stained or damaged. • The position of finder patterns can be confirmed on the monitor when ***Display Settings/Finder Pattern*** is turned ON.
E004	Finder pattern detection error (4 or more finder patterns were detected.)	Too many finder patterns (4 or more) were detected. • Some of the finder patterns may be stained or damaged. • The position of finder patterns can be confirmed on the monitor when ***Display Settings/Finder Pattern*** is turned ON.
E010	Decode error (Tentative version calculation error)	Finder patterns may be bent. Make sure that the image is loaded and at least 5 pixels per cell are displayed. • The number of pixels of any section on a screen can be checked under ***Image Analysis/Measure Length***.

Error Code	Description	Countermeasures
E011	Decode error (Format information error)	"Format information" in QR Codes may be stained or damaged. (Refer to the figure below.)
E012	Decode error	"Version information" in QR Codes is not correct.
E013	Decode error (Cell recognition error)	Codes were restored to correct errors, but not decoded correctly. Data of QR Codes may be stained or damaged.
E020	Decode error (No definition error)	The printing is in a special format and not defined for the V530-R150 (connection mode, etc.). Change the printing format.
E030	Pattern search NG	As a result of the pattern search, 32 or more proposed finder patterns were found. Make sure the image is displayed on the monitor correctly and check the registered mode.

Confirming Pixels Per Cell

When ***Display Settings/Detail Data*** is turned ON, the number of pixels per cell is displayed together with detail information if reading is OK. When reading is NG, confirm the number of pixels per cell under ***2. Image Analysis/Measure Length***.

QR Codes



1 A margin of 4 or more cells around the code is required.

2 Format information of the code. (There are four.)

3 Finder patterns (Symbols in three corners)

4 Parts other than 1 to 3 are data.

9-2-2 Data Matrix Reading (Normal or Pattern Mode)

Error Code	Description	Countermeasures
E100	Finder pattern detection error (No candidate finder patterns)	No finder patterns were detected. • Make sure that the image is displayed on the monitor correctly. • Check the printing of the reading code. The L-shaped finder pattern may be stained or damaged.
E110	Finder pattern detection error (No finder patterns were detected.)	No finder patterns were detected. • Make sure that the image is displayed on the monitor correctly. • Check the printing of the reading code. The L-shaped finder pattern may be stained or damaged.
E111	Finder pattern detection error (Only one finder pattern was detected.)	Only one line of finder patterns was detected. • Make sure the image is displayed on the monitor correctly. Check the printing of the reading code. • One of the L-shaped finder patterns may be stained or damaged. • The position of finder patterns can be confirmed on the monitor when ***Display Settings/Finder Pattern*** is turned ON.
E112	Finder pattern detection error (The relative positioning is incorrect.)	Two finder patterns (two lines) were detected. However, the relative positioning of the patterns is incorrect. • The codes may be bent or part of the finder patterns may be stained or damaged. • The L length (the length of finder patterns) set may be too long. Parameters can be set automatically using the teaching function.
E120	Decode error (Timing pattern detection error)	Check the printing of the reading codes. • The timing patterns in the X or Y directions may be stained or damaged. • The matrix size may not be set correctly. The L length (the length of finder patterns) set may be too short. Parameters can be set automatically using the teaching function.

Error Code	Description	Countermeasures
E121	Decode error (Timing pattern detection error in X direction)	Check the printing of the reading code. • The timing pattern in the X direction may be stained or damaged. • Codes may be bent.
E122	Decode error (Timing pattern detection error in Y direction)	Check the printing of the reading code. • The timing pattern in the Y direction may be stained or damaged. • Codes may be bent.
E123	Decode error (Cell recognition error)	Codes were restored to correct errors, but not decoded correctly. Part of the codes may be stained or damaged.
E150	Decode error (No definition error)	The printing is in a special format and not defined for the V530-R150. • Change the printing format. • The codes may be bent, stained, or damaged.

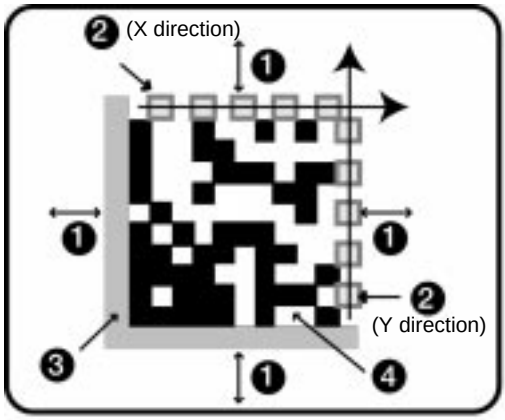
Common Check Items for Error Codes E120 to E122

Check the gray edge value in ***Reading Settings***.
Refer to ***Image Analysis/Line Bright*** for whether the value is correct.

Confirming Pixels Per Cell

When ***Display Settings/Detail Data*** is turned ON, the number of pixels per cell is displayed together with detail information in MON (monitor) or RUN mode. When reading is NG, confirm the number of pixels per cell under ***2. Image Analysis/Measure Length***.

Data Matrix



1 A margin of 4 or more cells around the code is required.

2 Timing patterns (The cross point between black and white.)

3 The L-shape in the corner is a finder pattern.

4 Parts other than 1 to 3 are data.

9-2-3 Data Matrix Reading in Pattern Mode

Error Code	Description	Countermeasures
E160	Timing pattern detection error 1 (No finder patterns were detected for models 1 or 2)	No timing pattern was detected. • The timing pattern may be stained or damaged. Check the condition of the timing pattern. • The correlation value may be too high. Decrease the correlation value. • A model may not be registered. Confirm that a model is registered. • A model may have been registered with an incorrect code size. Re-register the model.
E161	Timing pattern detection error 2 (32 or more finder patterns were detected for models 1 or 2)	Too many timing patterns (32 or more) were detected. • The correlation value may be too low. Increase the correlation value.
E170	Finder pattern detection error 1 (No finder pattern was detected for model ABC)	No finder pattern was detected. • The finder pattern may be stained or damaged. Check the condition of the finder pattern. • The correlation value may be too high. Decrease the correlation value. • A model may not be registered. Confirm that a model is registered. • A model may have been registered with an incorrect code size. Re-register the model. • Model registration may not have been performed in the optimum way. Re-register the model with reference to page 128.
E171	Finder pattern detection error 2 (32 or more finder patterns were detected for model ABC)	Too many finder patterns (32 or more) were detected. • The correlation value may be too low. Increase the correlation value. • Model registration may not have been performed in the optimum way. Re-register the model with reference to page 128.

Error Code	Description	Countermeasures
E172	Finder pattern detection error 3 (Relative positioning is incorrect for model ABC)	3 points of the finder pattern were detected. However, the relative positioning of the patterns is incorrect. • The finder pattern may be stained or damaged. Check the condition of the finder pattern. • The correlation value may be too high. Decrease the correlation value. • Model registration may not have been performed in the optimum way. Re-register the model with reference to page 128.
E180 E181 E182	Decode error	An L-shape finder pattern was detected but the data could not be decoded. • The data part of the code may be stained or damaged. Check the condition of the data part of the code. • Model registration may not have been performed in the optimum way. Re-register the model with reference to page 128. • The cell recognition coordinates may be incorrect. Adjust the field of vision so that the code image is larger and re-enter the settings.

Common Check Items for Error Codes E160 to E182

- Check that the orientation of the code is within ±10°.
- Check that the code size is set correctly.
- Check that the model has been registered correctly using the ***Reference Model*** procedure given on page 128.

9-3 Troubleshooting

Connection Errors

The power indicator is not lit.

- The power supply is not connected properly.
- The supply voltage is not 24VDC+10%/–15%.

The monitor is blank.

- The power of the monitor is not ON.
- The monitor cable is not connected properly.
- The monitor is malfunctioning.
- The power supply is not sufficient for the LCD monitor (when the LCD monitor is used).

Cannot make key inputs from the Console.

- The Console cable is not correctly connected.

Camera images do not appear on the screen.

- The lens cap has not been removed.
- The camera cable is not properly connected.
- The lens diaphragm is opened or closed too far.
- The shutter speed is not suitable.
- The lighting method is not suitable.

The images on the monitor are not clear.

- There is electrical noise entering from the power supply or cables.
- The monitor cable is not correctly connected.

The images on the monitor are hard to read.

- Refer to the entry for the error code in *9-2 Error Codes and Countermeasures*. Change the setting conditions and adjust the camera and lighting.
- If reading was performed in Normal mode, try reading in Pattern mode.

Errors During Menu Operation

The reading results are not displayed on the monitor.

- The V530-R150 is not in MON (monitor) or RUN mode.

Terminal Block Errors

Trigger signals (input signals) are not received.

- The cables are not correctly wired.

- The signal line is disconnected.
- The V530-R150 is not in MON (monitor) or RUN mode.

Signals cannot be output externally.

- The trigger signal has not been input.
- The cables are not correctly wired.
- The signal line is disconnected.
- The V530-R150 is not in RUN mode.

RS-232C Communications Errors

No communications are possible.

- The cables are not correctly wired.
- The communications specifications do not match those of the external device.
- The communications mode was not selected under ***SYS/ Communications/RS-232C***.
- The V530-R150 is not RUN mode.

The Unit operates well initially, but after a while there is no response from the V530-R150.

- The reception buffer on the external device (e.g. computer) is full. Check that settings allow the data to be properly received.

Appendix A
ASCII Codes

Character	Data (Hex-adecimal No.)	Character	Data (Hex-adecimal No.)	Character	Data (Hex-adecimal No.)	Character	Data (Hex-adecimal No.)
NUL	00	SP	20	@	40	‘	60
SOH	01	!	21	A	41	a	61
STX	02	”	22	B	42	b	62
ETX	03	#	23	C	43	c	63
EOT	04	$	24	D	44	d	64
ENQ	05	%	25	E	45	e	65
ACK	06	&	26	F	46	f	66
BEL	07	’	27	G	47	g	67
BS	08	(	28	H	48	h	68
HT	09	)	29	I	49	i	69
LF	0A	*	2A	J	4A	j	6A
VT	0B	+	2B	K	4B	k	6B
FF	0C	,	2C	L	4C	l	6C
CR	0D	–	2D	M	4D	m	6D
S0	0E	.	2E	N	4E	n	6E
S1	0F	/	2F	O	4F	o	6F
DLE	10	0	30	P	50	p	70
DC1	11	1	31	Q	51	q	71
DC2	12	2	32	R	52	r	72
DC3	13	3	33	S	53	s	73
DC4	14	4	34	T	54	t	74
NAK	15	5	35	Y	55	u	75
SYN	16	6	36	V	56	v	76
ETB	17	7	37	W	57	w	77
CAN	18	8	38	X	58	x	78
EM	19	9	39	Y	59	y	79
SUB	1A	:	3A	Z	5A	z	7A
ESC	1B	;	3B	[	5B	{	7B
FS	1C	<	3C	\	5C	|	7C
GS	1D	=	3D	]	5D	}	7D
RS	1E	>	3E	^	5E	(~)	7E
US	1F	?	3F	-	5F	DEL	7F

Appendix B
FCS Check Program Examples (BASIC)

Calculation Examples for Sending FCS

DATA$	Sample Data Line
L	Data Length
CODE$	Data Character
A	Exclusive Operation

```
100 '*****CALCULATE FCS*****
110 '*FCSSET
120 L=LEN(DATA$)
130 A=0
140 FOR J=1 TO L
150 CODE$=MID$(DATA$,J,1)
160 A=ASC(CODE$)XOR A
170 NEXT J
180 FCS$=HEX$(A)
190 IF LEN(FCS$)=1 THEN FCS$="0"+FCS$
200 RETURN
```

FCS Check Sub Routine Examples for Received Data

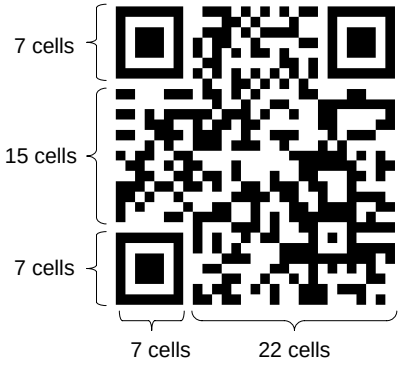
```
1000 '*****FCSHECK*****
1010 '*FCSHECK
1020 Q=0:FCSCK$="OK"
1030 PRINT RESPONSE $
1040 LENGS=LEN(RESPONSE$)–3
1050 FCSP$=MID$(RESPONSE$,LENGS+1,2) ......Response Data of FCS
1060 FOR J=1 TO LENGS .....Calculation Range of FCS
1070 Q=ASC(MID$(RESPONSE$,J,1))XOR Q
1080 NEXT J
1090 FCSD$=HEX$(Q)
1100 IF LEN(FCSD$)=1 THEN FCSD$="0"+FCSD$ .FCS calculated in a program
1110 IF FCSD$ < > FCSP$ THEN FCSCK$="ERR"
1120 PRINT "FCSD$=";FCSD$;"FCSP$=";FCSP$;
"FCSCK$=";FCSCK$; .....FCS correctly received :OK
1130 RETURN              FCS not received correctly:ERR
```

Appendix C
Data Capacity Tables

QR Code

QR Code (Model 2)

The relation between matrix size (number of cells) and data capacity is shown in the table below.
In this example, the matrix size is 29 × 29 cells.

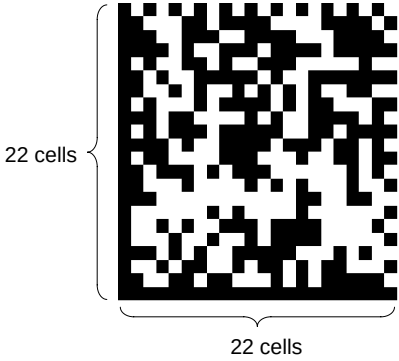


Matrix size (Version)	Error correction level	Data capacity		Matrix size (Version)	Error correction level	Data capacity	
		Num. Cap.	Alpha Num. Cap.			Num. Cap.	Alpha Num. Cap.
21 × 21 (Version 1)	L (7%)	41	25	**33 × 33 (Version 4)**	L (7%)	187	114
	M (15%)	34	20		M (15%)	149	90
	Q (25%)	27	16		Q (25%)	111	67
	H (30%)	17	10		H (30%)	82	50
25 × 25 (Version 2)	L (7%)	77	47	**37 × 37 (Version 5)**	L (7%)	255	154
	M (15%)	63	38		M (15%)	202	122
	Q (25%)	48	29		Q (25%)	144	87
	H (30%)	34	20		H (30%)	106	64
29 × 29 (Version 3)	L (7%)	127	77	**41 × 41 (Version 6)**	L (7%)	322	195
	M (15%)	101	61		M (15%)	255	154
	Q (25%)	77	47		Q (25%)	178	108
	H (30%)	58	35		H (30%)	139	84

Data Matrix

Data Matrix (ECC200)

The relation between matrix size (number of cells) and data capacity is shown in the table below.
In this example, the matrix size is 22 × 22 cells.



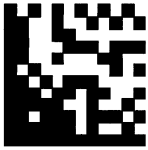
Matrix size	Maximum data capacity	
	Num. Cap.	Alpha Num. Cap.
10 × 10	6	3
12 × 12	10	6
14 × 14	16	10
16 × 16	24	16
18 × 18	36	25
20 × 20	44	31
22 × 22	60	43
24 × 24	72	52
26 × 26	88	64
8 × 32	20	13

Appendix D
Glossary

This glossary focuses on terms related to QR Codes and Data Matrix codes which are matrix-type 2-dimensional codes. There may be some parts of this glossary that do not apply to other types of 2-dimensional codes.

Data Matrix

Data Matrix codes were developed by I.D. Matrix, and are used extensively in the semiconductor and electronics industries. Data Matrix codes have a relatively large data capacity for their size. There are several different types of Data Matrix, differentiated by their error correction method. The ECC200 is the most commonly used type.



QR Code

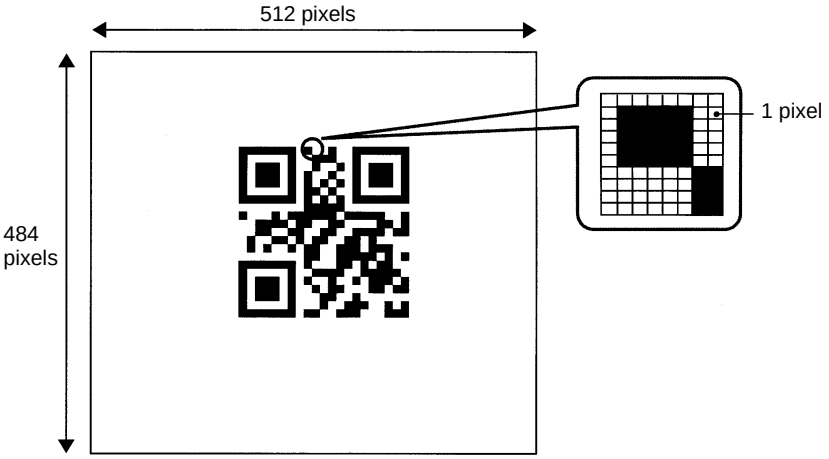
The “Quick Response Code” type is a 2-dimensional code that was developed in Japan. High-speed reading is possible with QR Codes, but the code size is quite large compared to other 2-dimensional codes.

Error Correction

This term is used to describe the function which detects and corrects errors using a special mathematical technique (commonly known as the “Reed-Solomon” method). Using this function, reading is possible, to a certain extent, for codes with poor printing quality or that are damaged. There are, however, limits on the extent to which correction is possible, and reading may not be possible for codes if the damage is extensive. There are 2-dimensional codes for which the error correction level can be selected. (For example, with QR Codes, error correction levels of 7%, 15%, 25%, or 30% are available.)

Pixel

Pixels are the points that make up images. The monitor screen is 512 pixels high and 484 pixels wide which means that the screen contains approximately 250,000 pixels. Adjust the field of vision so that the number of pixels per cell is at least 5. The number of pixels per cell can be measured in ***Image Analysis/Measure Length***.
→ **p.149**



Maximum Data Capacity

The maximum amount of data that can be stored in a code varies with the code size. In other words, if there is a large amount of data to be stored, then the code size must also be large. The maximum data capacity will also vary with the type of characters used. With QR Codes and Data Matrix codes, the numeric capacity (numbers only) is larger than the alpha numeric capacity (numbers and letters).

Right and Left Reversal

This is the term used to describe reading 2-dimensional codes marked on a transparent material from the reverse side.

Black and White Reversal

Usually, in images of 2-dimensional codes, the code itself is black and the background is white. Sometimes, however, due to the material of the reading object and the kind of lighting used, the code will appear white in the image obtained. This phenomenon is called “black and white reversal.”

Cell

These squares are the units that make up matrix-type 2-dimensional codes. Whether these cells are black or white determines the information carried by the code.

Timing Pattern

These patterns are used to determine symbol density and horizontal and vertical dimensions and thereby obtain a frame of reference for 2-dimensional codes. The timing patterns are straight lines composed of alternating black and white cells.

Version (QR Code)

The code size of QR Codes is indicated by the version. “Version 1” indicates that a QR Code contains (the minimum) 21 cells both horizontally and vertically. The larger the version number, the larger the number of cells per side.

Pattern Search

This is a method for locating finder patterns. Images of finder patterns are registered as models in advance and searches are made for similar parts of input images. The degree of similarity is expressed as a correlation value (0 to 100). The more similar the pattern, the higher the correlation value. The place with the highest correlation value out of places with a correlation value over a set threshold value is deemed to be the finder pattern. If it is not possible to detect a finder pattern, decrease this threshold value. If too many finder patterns are detected, increase this threshold value.

Finder Pattern

These are patterns used to detect the position of 2-dimensional codes. The shape of the finder patterns varies with the type of code.

Resolution

The resolution is a measure of the detail with which images are displayed. The V530-R150 can display images (via a monitor) using approximately 250,000 pixels (512 × 484). This means that if the field of vision is 512 mm × 484 mm, the resolution will be 1 (mm/pixel).

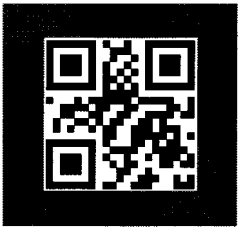
Marking Methods

There are several marking methods that can be used. The most suitable method will depend on factors such as the material of the object onto which the code is marked. The most commonly used marking devices are listed below.

- Printer
  A printer can be used to print codes onto paper and different kinds of labels.
- Laser Marker
  A laser marker can be used to mark metal objects. A laser marker can mark very finely enabling the size of 2-dimensional codes can be reduced.
- Exposure Marking
  Using exposure marking, particles are not created (unlike laser marking) and even finer marking is possible than with laser marking. Exposure marking is used with semiconductor wafers, LCD panels, and color filters that have exposure processing.

Margin

This is the empty space around 2-dimensional codes. Usually it is necessary to ensure that there is a margin around 2-dimensional codes.



The black area is the margin.

Appendix E
Version Information

Data Compatibility

The software version for this V530-R150 is “Ver. 2.00.” Scene data and system data for version 1 of the V530-R150 cannot be used.

Differences between Previous Version

Items where this version differs from the previous version are listed below.

Real-time Viewing of Adjusted Images

Shutter speed, filtering, and BGS level settings can be adjusted whilst viewing the image on the screen. → **p.98 to p.102**

Four Reading Modes

Processing items have been arranged into the following four reading modes.

- QR Code (Normal)
- QR Code (Pattern)
- Data Matrix (Normal)
- Data Matrix (Pattern)

Simply select the mode that is appropriate for the application. This feature simplifies the order of setting items thus helping to eliminate setting errors. → **p.90**

Pattern Mode

Pattern mode is now available for both QR Code reading and Data Matrix reading. Try this mode when reading codes with poor marking quality or codes made up dots. → **p.90**

Teaching Function

A teaching function has been added for easier setting. Using this function, settings such as Right & Left Reverse can be made automatically with one execution of reading operation.

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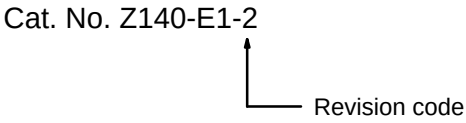
Revision History

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.

Revision code	Date	Revised content
1	March 2000	Original production
2	November 2000	**Page 10:** Grounding class changed from II to I. **Page 188:** Outer dimension of 110 added to the graphic. **Page 189:** Supply voltage indication changed and case material added to the specifications table. **Pages 190 and 191:** Graphic and specifications tables modified. **Pages 192 to 195 :** Specifications tables modified.

OMRON

Authorized Distributor:

Cat. No. Z140-E1-2

Note: Specifications subject to change without notice.

Printed in Japan
1100-1M (A)