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V530-R150E-3, V530-R150EP-3 2-Dimensional Code Reader (Fixed Type)

Operation Manual

Produced August 2001

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Notice:

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

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

⚠**DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠**WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠**Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

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-3 (input/output type: NPN) and V530-R150EP-3 (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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Hyper Terminal was developed by Hilgraeve Inc. of the US and is a registered trademark of Microsoft Corporation

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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 Camera replacement procedures and 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.

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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.

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1 Safety Precautions



- 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.
- Do not use the V530-R150 in environments with flammable or explosive gases.
- Install the V530-R150 away from high-voltage equipment or motors to ensure safety during operation and maintenance.
- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals.
- Cover the terminal blocks with the Terminal Block Protection covers.
- 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.
- Use the power supply cables and crimp terminals of specified sizes.
- Use at the power supply voltages specified in this manual.
- Double-check all wiring and switch settings before turning ON the power supply.
- Be sure to securely tighten the screws when mounting V530-R150 components.
- Do not dismantle, repair or modify any V530-R150 components.
- Dispose of V530-R150 components as industrial waste.
- To prevent damage from static electricity, use a wrist strap or another device for preventing electrostatic charges when touching terminals or signal line.
- 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.
- Keep the power supply cable as short as possible (10 m max.).
- Do not allow foreign matter, such as metal filings or liquids, to enter the openings of the V530-R150.

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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.

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 F150-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

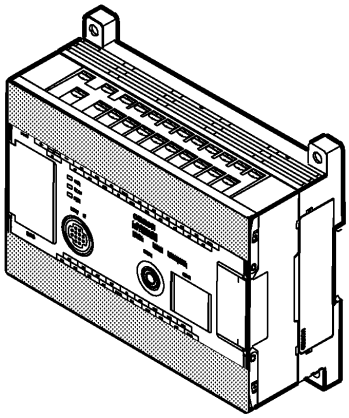
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Installation

Orientation of Controller

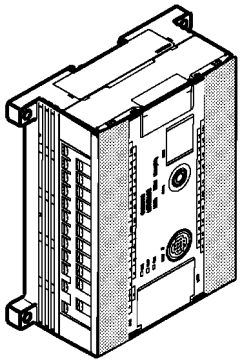
To improve heat dissipation, install the controller in the following orientation only:

CORRECT

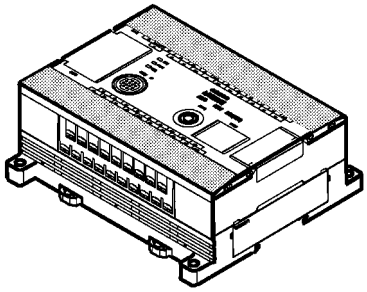


Do not install the controller in the orientations shown in the following diagram.

INCORRECT



INCORRECT

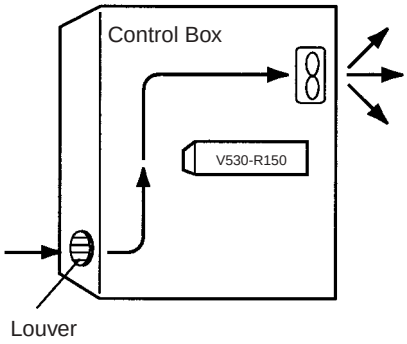


Ambient Temperature

- 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.

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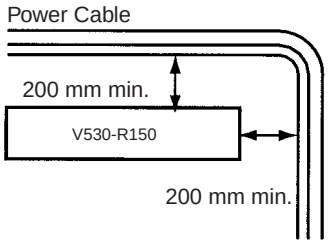
- Provide a forced-air fan or air conditioning if the ambient temperature might exceed 50°C.



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.

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Video Monitor

(When using the recommended F150-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. Ensure a margin of at least four cells around both data matrix and QR codes except for QR codes in Pattern mode. A margin of only one cell is sufficient with QR codes in Pattern mode.
- 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

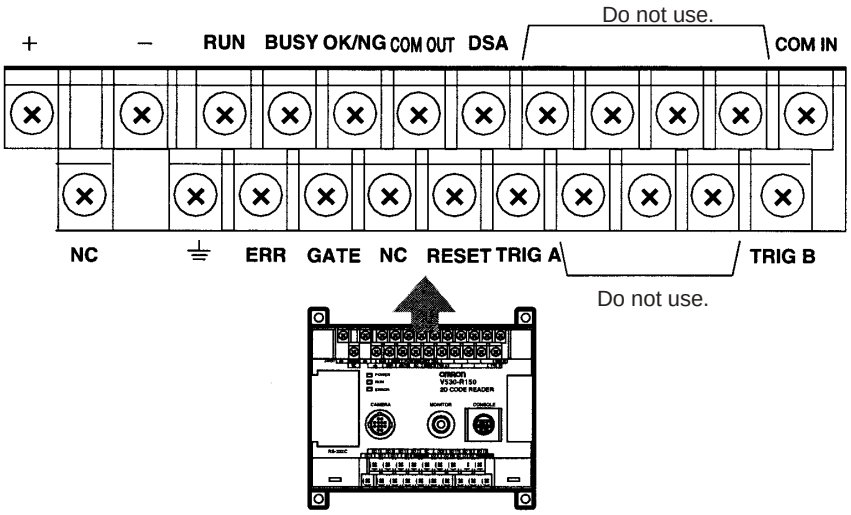
Do not use RESET input immediately after power is turned ON.

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.

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Terminals

Do not connect anything to the terminals with no names.



Directives and Standards

The V530-R150 conforms to the following directives and standards.

1. EC Directives
   EMC Directive: No. 89/336/EEC
2. EN Standards (European Standards)
   EN61326: 1997/Annex A + A1: 1998 (EMI: Class A)
   EN61000-6-2: 1999, EN50081-2: 1993

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)

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SECTION 1
Features

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

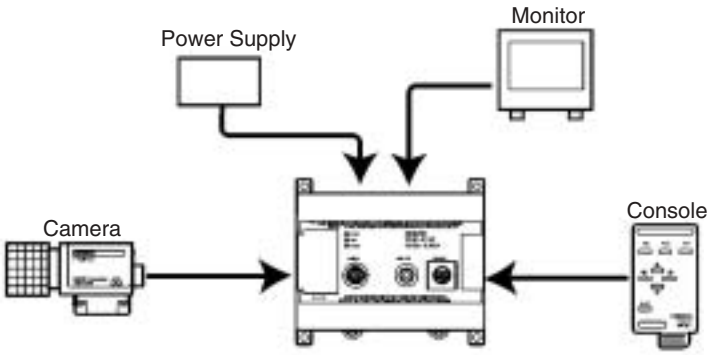
1-1 Overview of V530-R150 Application 2
1-2 Functions 4
1-3 Trigger Inputs and Outputs. 9

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1-1 Overview of V530-R150 Application

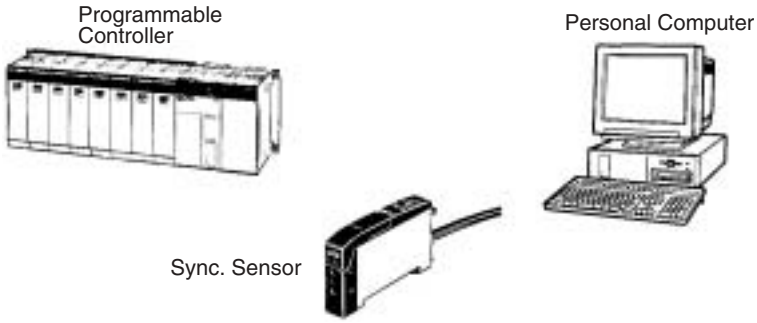
The following illustrations show configurations and typical applications for the V530-R150.

Unit Connections and Wiring



Refer to *SECTION 2 Installation* for detailed descriptions.

Connections for Peripheral Devices

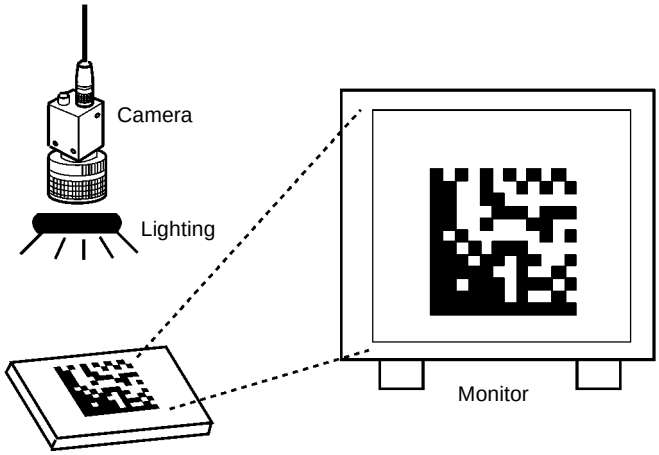


Refer to *SECTION 3 Terminal Blocks* and *SECTION 4 RS-232C* for detailed descriptions.

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Displaying Images

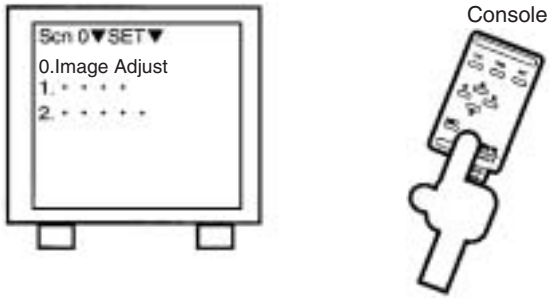
Switch to through image and adjust the focus, camera setting distance, and lighting.



Refer to *2-4 Cameras, 2-5 CCTV Lens*, *2-6 Lighting*, and *2-7 Two-camera Unit* for detailed descriptions.

Setting Reading Conditions

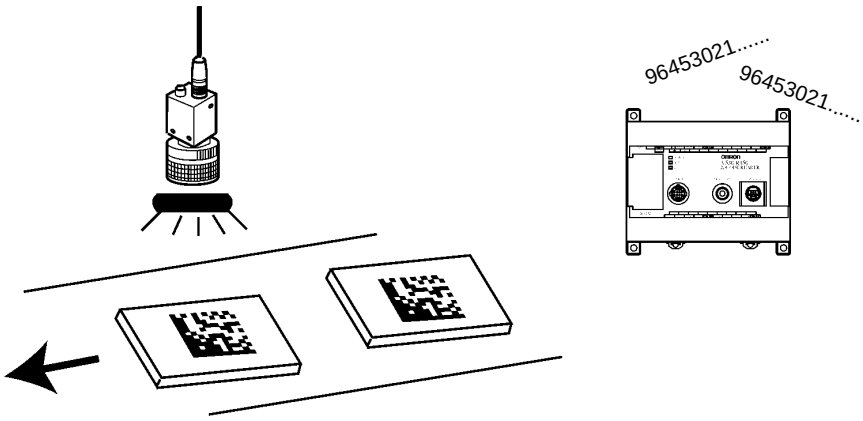
Operate the Console while checking menus on the Monitor.



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

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Performing Reading



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

1-2 Functions

Reading Specifications

Reading is possible for both QR Code and Data Matrix in either Normal or Pattern mode. Usually, the Normal mode can be used. Use the Pattern mode for codes with poor marking quality or codes made up of dots. (Refer to the table below.)

Reading code	QR Code (model 1, 2) 	Data Matrix 
Matrix size	21 x 21 cell to 41 x 41 cell (Versions 1 to 6)	• ECC200 10 x 10 cell to 64 x 64 cell, 8 x 18 cell to 16 x 48 cell • ECC000, 050, 080, 100, or 140 9 x 9 cell to 25 x 25 cell
Readable direction	360 degrees (All directions)	
Resolution	Vary according to magnification and features of the lens to be used. (See note.)	
Reading region		
Reading depth		

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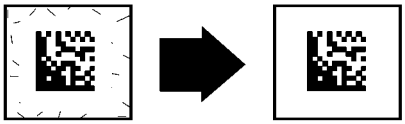
Note Adjust the field of vision to be at least five pixels per cell.
Pixel number is measured by ***SET/Image Analysis/Measure Length***.
→ **page 176**

Shutter Speed

Select a shutter speed that is appropriate for the speed of the workpiece.
→ **page 126**

Filtering

The image can be processed with the filtering function to enhance edges and reduce background noise.
→ **page 127 to page 130**



Light Level Adjustment

If an Intelligent Light Source is connected, the lighting area and light level can be adjusted from the V530-R150.
→ **page 131**

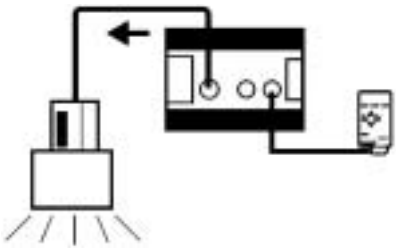
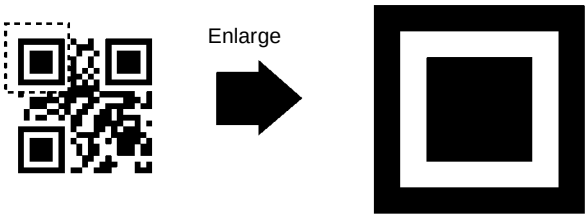


Image Analysis

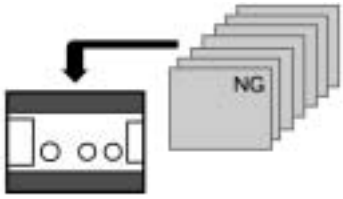
The image analysis function makes it easy to determine the cause of error when reading is NG judgment.
→ **page 172 to page 182**



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Store Images

Up to 24 images can be stored in memory.
The images can be used to check what kind of errors have occurred. The stored images will be cleared when the power goes OFF, so the images must be backed up in the computer if you want to save them long term.
→ **page 202**



Easy Process Switching

Up to 10 different sets of reading conditions can be set with the Scene function. Each set of reading conditions is called a “scene”. You can switch the reading process just by switching the scene.
→ **page 219**

Using 2 Cameras

If an F150-A20 Two-camera Unit is used, two Cameras can be connected to one V530-R150.
→ **page 26**

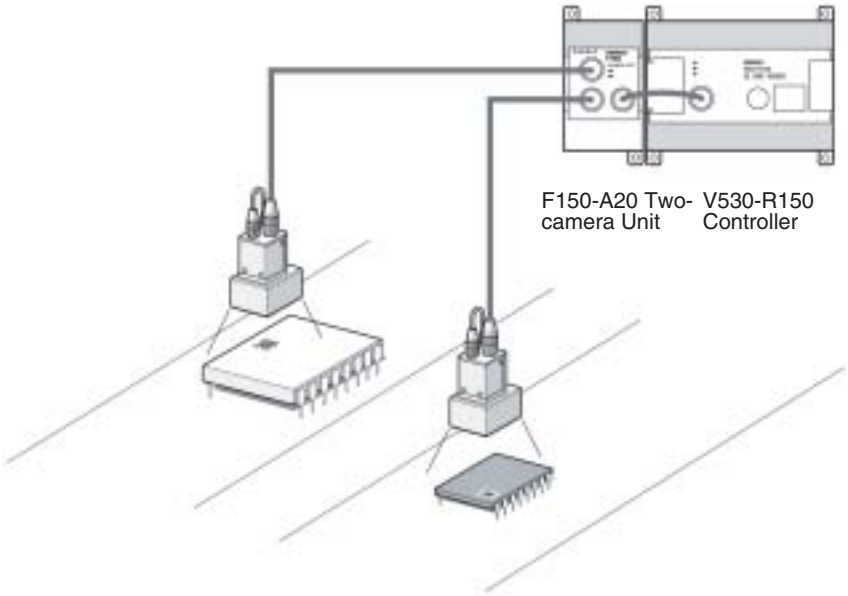
Note

1. Change the Camera Unit to “F150-A20” in advance in the ***SYS/ Device settings*** menu and switch the camera mode in the menu’s initial screen. → **page 120 and page 210**
2. There is a function to prevent interference between two Intelligent Light Sources. When Cameras with Intelligent Light Sources are connected, set a time difference in the lighting (Camera 0 → Camera 1) so each Camera’s light doesn’t affect the other Camera.

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Example 1: Reading Two Lines with a Single Controller

A single F150-A20 can read two kinds of 2-dimensional codes.

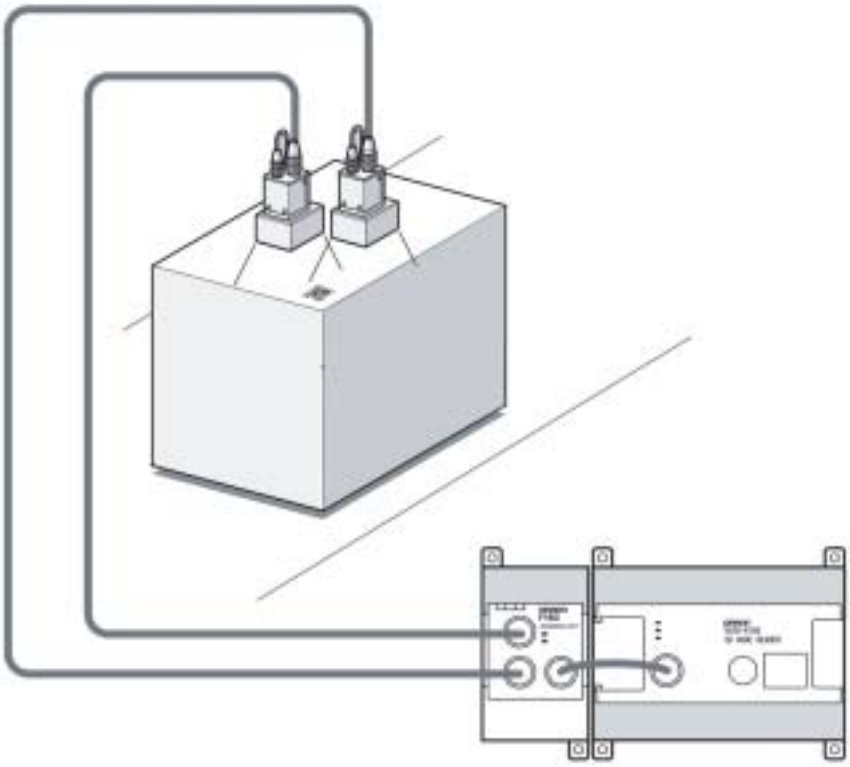


Note The F150-A20 cannot process the two images from two Cameras simultaneously. Set reading conditions so that each process is processed with separate screens.

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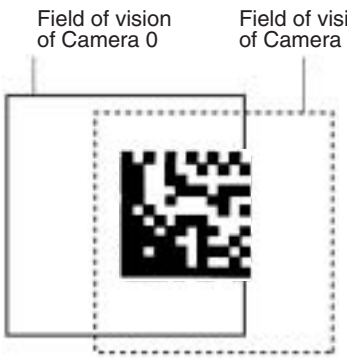
Example 2: Increasing the Field of Vision

The F150-A20 can be used for applications where it is difficult to position the object in a single Camera's field of vision.



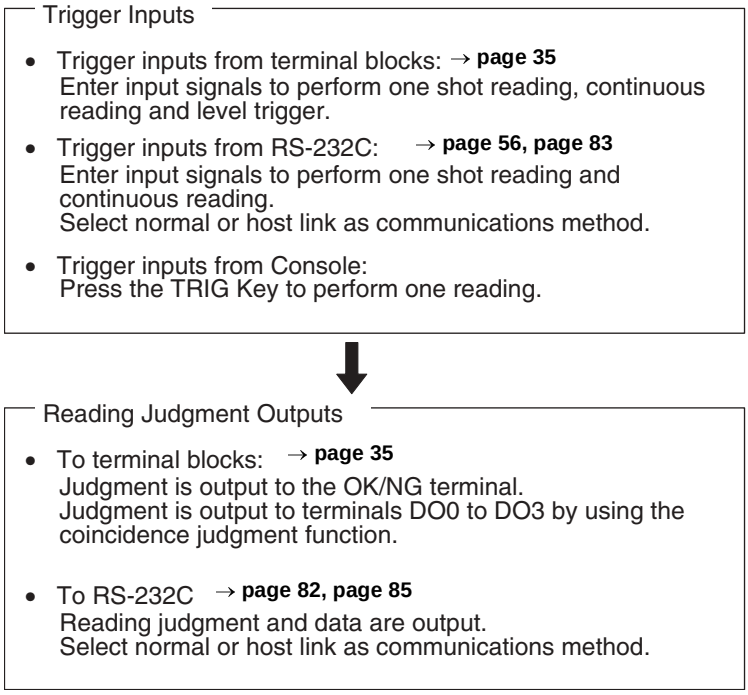
F150-A20 Two-camera Unit

V530-R150 Controller



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1-3 Trigger Inputs and Outputs



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SECTION 2
Installation

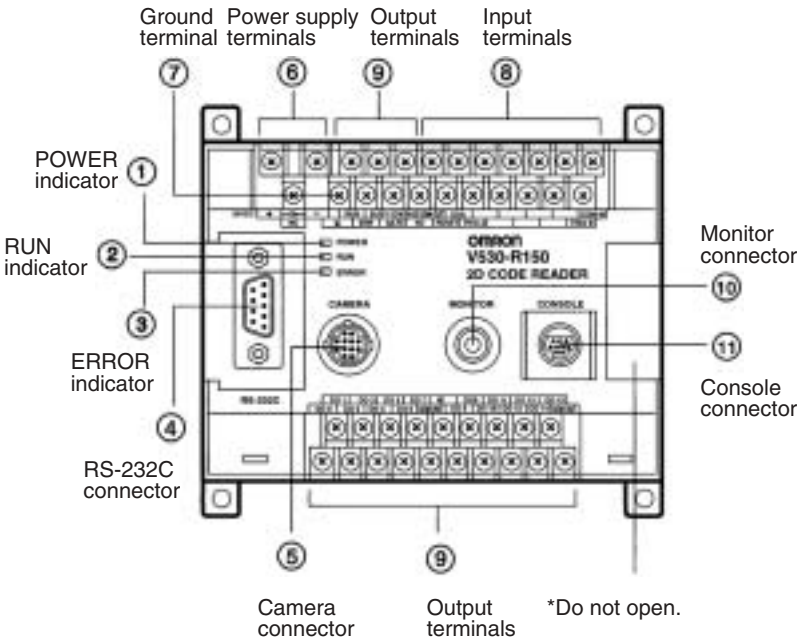
This section describes the different parts of the V530-R150 2-Dimensional Code Reader, and details the connections and other procedures necessary for installation.

2-1 Component Names and Functions 12
2-2 Connections 13
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2-3-1 Crimp Terminals and Cables 16
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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.

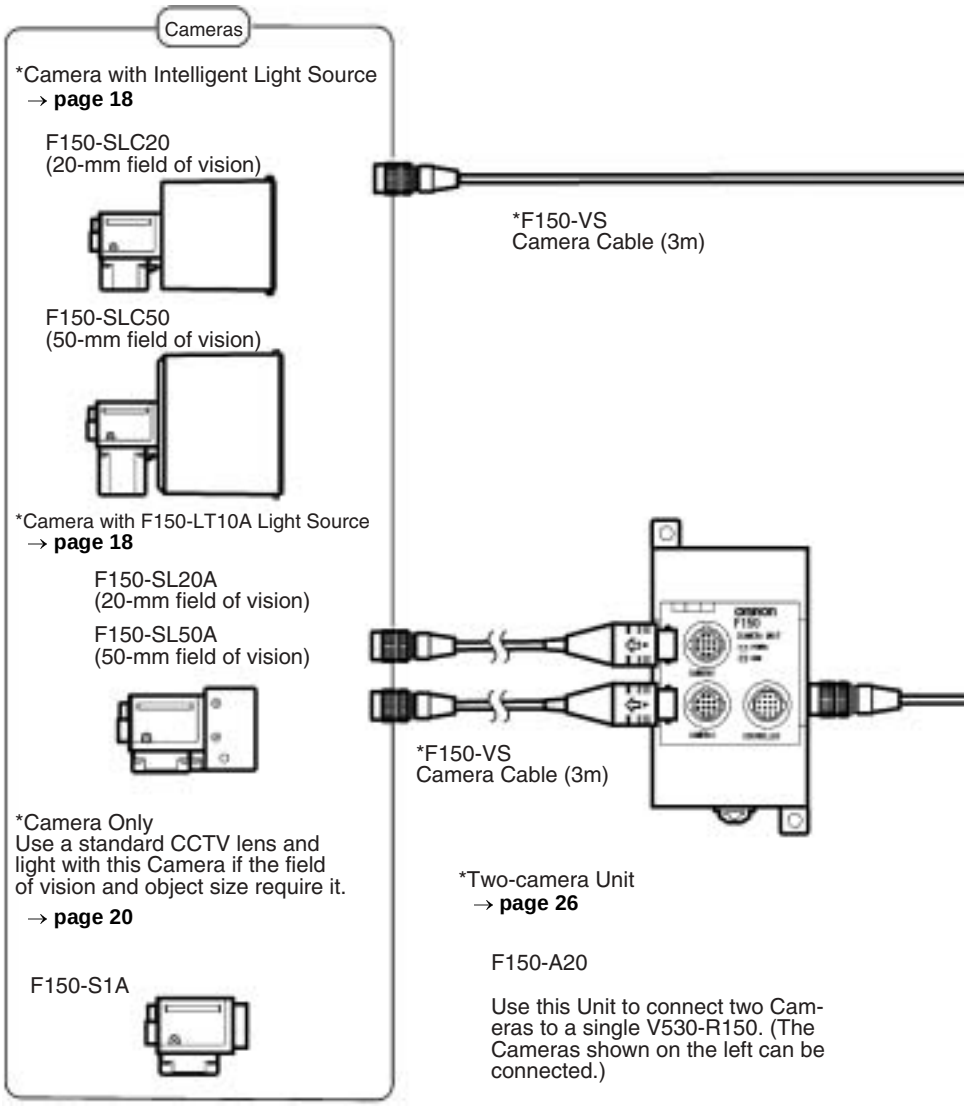
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2-2 Connections

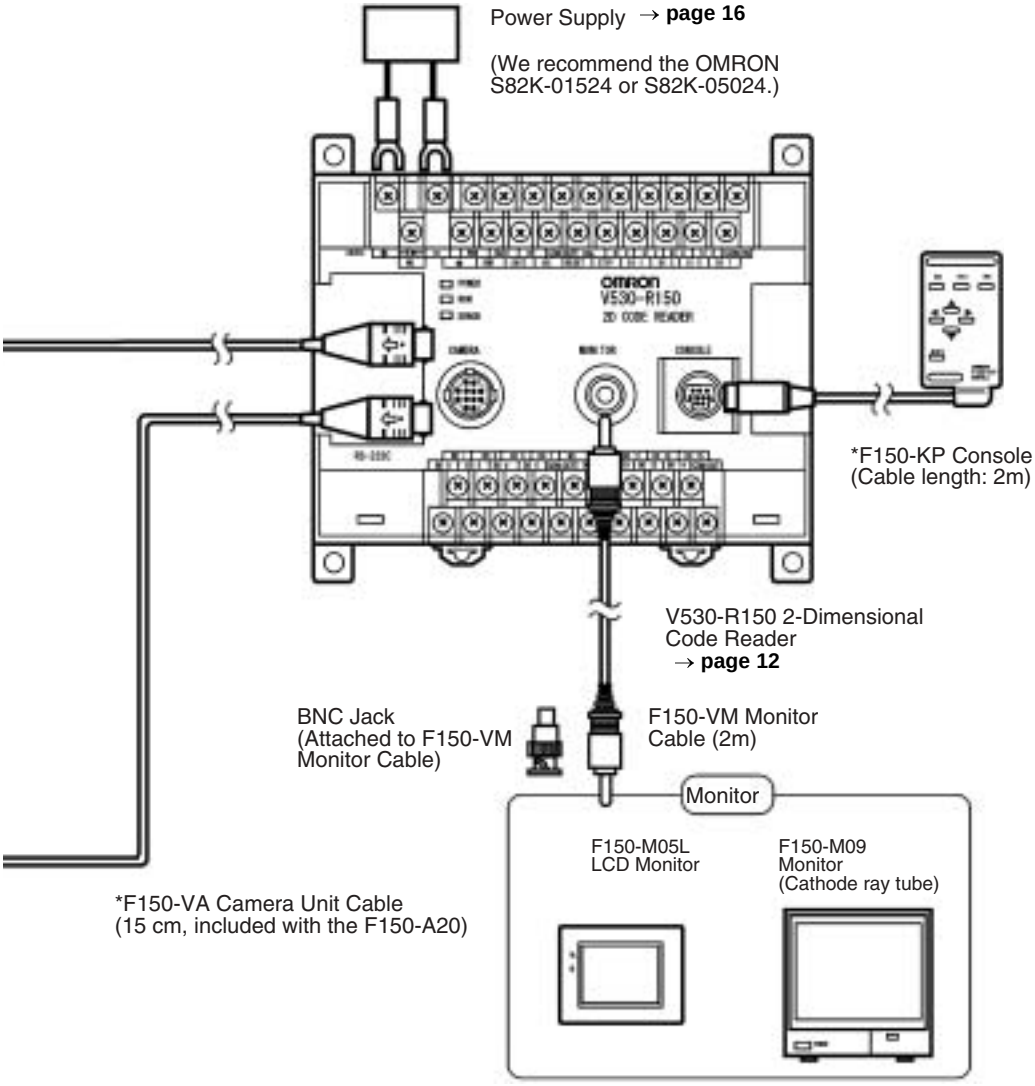
⚠ **Caution** Components marked with an asterisk are specially designed for the V530-R150. Other products cannot be used. (Using other products may damage other components in the system.)

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

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Note

1. Turn OFF the power to the V530-R150 before connecting or disconnecting cables. Connecting or disconnecting cables with power turned ON can damage peripheral devices.
2. When using an F150-A20 Two-camera Unit, turn OFF the power to both the V530-R150 and Two-camera Unit before connecting or disconnecting cables.

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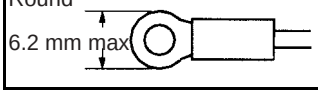
2-3 Power Supply and Ground

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.

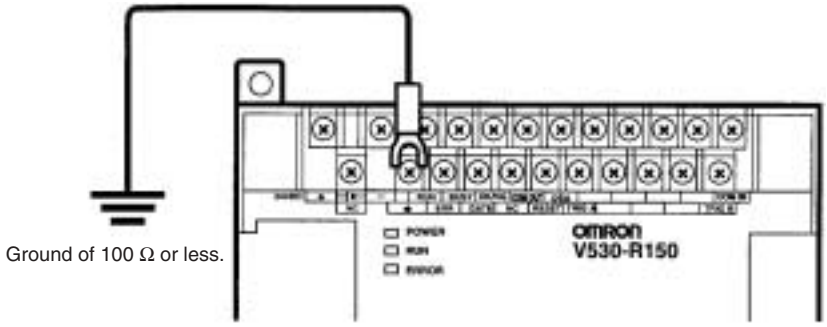
⚠ **Caution** Cover the terminal blocks with the Terminal Block Protection Covers. Uncovered terminal blocks can result in electric shock.

2-3-1 Crimp Terminals and Cables

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

Terminal	Maker	Model No.	Wire size
Forked  6.2 mm max.	J.S.T. Mfg. Co., Ltd.	V1.25-N3A	1.31 to 1.65 mm^2
Round  6.2 mm max.	J.S.T. Mfg. Co., Ltd.	V1.25-MS3	

2-3-2 Protective Conductor (Earth) Wiring



Note

1. Use an appropriate ground (100 Ω max.). 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.

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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.

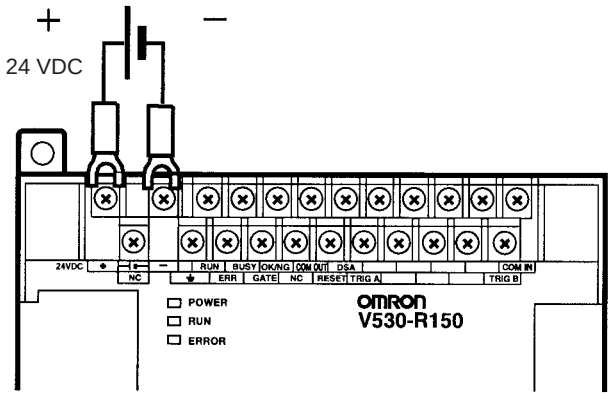
Power supply

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 (10 m max.).
3. If UL recognition is required, use a UL class II power supply.

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2-4 Cameras

2-4-1 Cameras with Light Sources

The Cameras with Light Sources are special cameras with a lens and light source attached. The light source and lens are a single unit and are thus compact and easy to mount. The Camera must be mounted at a distance from the measurement object where it can correctly view the object.

The lens focus is fixed and the distance must be adjusted each time the lens or Camera is changed because the field of vision and focus vary from lens to lens.

Also, the camera's working distance is an approximate value. Mount the camera so that it can be adjusted slightly nearer to or farther from the object.

Note

1. Determine which Camera is appropriate based on the size of the code, as shown in the following table.

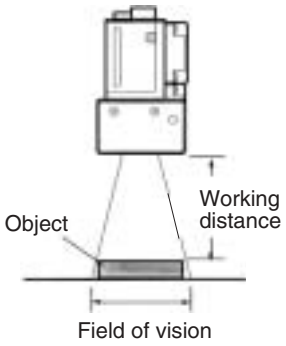
Field of vision	Appropriate code size
20 mm × 20 mm	About 10 mm square
50 mm × 50 mm	About 25 mm square

2. Use the following guidelines for the code's matrix size.
   - QRCode 21 × 21 (version 1) to 33 × 33 (version 4)
   - DataMatrix 10 × 10 to 26 × 26
3. If the object size and field of vision are incompatible, use a standard CCTV lens and light source with a F150-S1A Camera. → **page 20**

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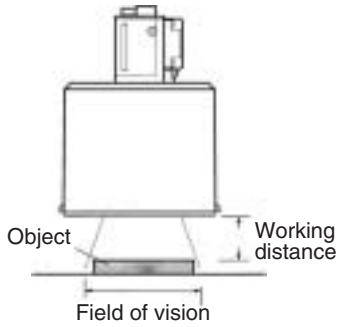
Cameras with F150-LT10A Light Source

Field of vision	Working distance	Model
20 mm × 20 mm	61 to 71 mm	F150-SL20A
50 mm × 50 mm	66 to 76 mm	F150-SL50A



Cameras with Intelligent Light Source

Field of vision	Working distance	Model
20 mm × 20 mm	15 to 25 mm	F150-SLC20
50 mm × 50 mm	16.5 to 26.5 mm	F150-SLC50



The Intelligent Light Sources have a DIP switch with two pins. Set both pins to OFF.

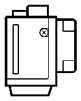
F150-SLC20 F150-SLC50



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2-4-2 Camera Only

If the object size and field of vision are incompatible, use a standard CCTV lens and light source with a F150-S1A Camera. Use C-mount lenses.



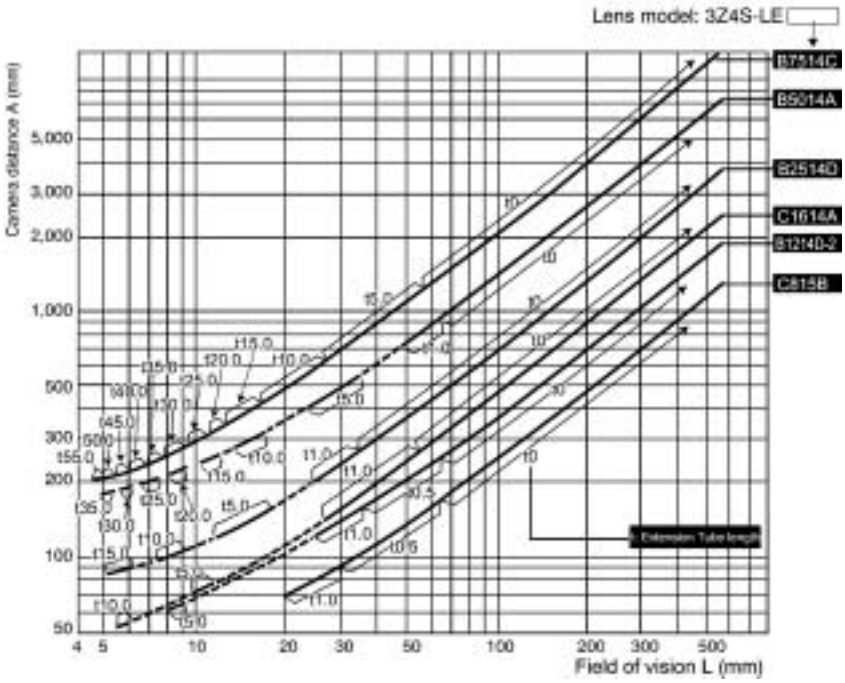
Camera	Model
Camera	F150-S1A

Note Use lighting that is appropriate for the object being measured.

2-5 CCTV Lens

When using a F150-S1A Camera, refer to the following graph to select the appropriate Lens and Extension Tube. The lens required will differ depending on the size of the object and its distance from the Camera.

Optical Chart



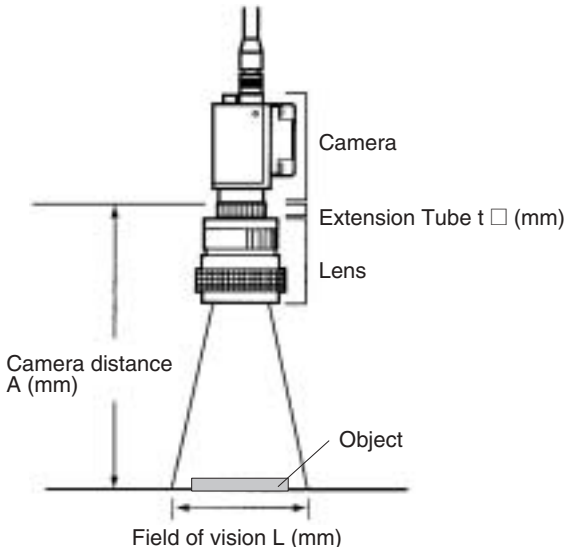
Using the Optical Chart

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 indicate the lengths of the required

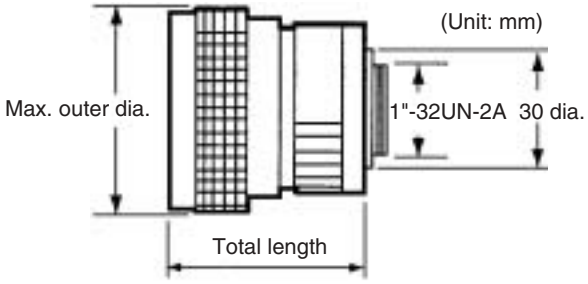
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Extension Tubes. A value of “t0” indicates no Tube is required and “t5.0” indicates a 5 mm Tube is required.

For example when a 30mm field of vision is required at the working distance and a 3Z4S-LE B2514D Lens is being used, use a 1-mm Extension Tube and a working distance of 250 mm.



Lens

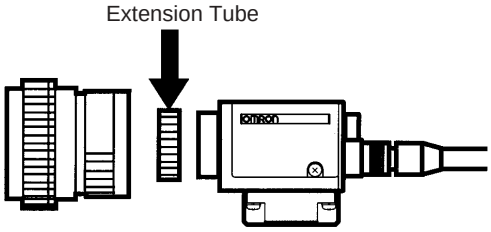


	Focal length	Brightness	Max. outer diameter	Total length	Filter size
3Z4S-LE C418DX	4.8 mm	F1.8	40.5 mm dia.	35.5 mm	---
3Z4S-LE B618CX-2	6.5 mm	F1.8	48 mm dia.	42 mm	
3Z4S-LE C815B	8.5 mm	F1.5	42 mm dia.	40 mm	M40.5 × P0.5
3Z4S-LE B1214D-2	12.5 mm	F1.4	42 mm dia.	50 mm	
3Z4S-LE C1614A	16.0 mm	F1.4	30 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

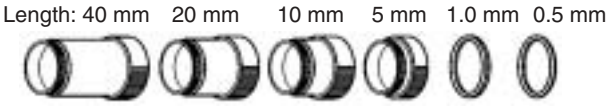
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Extension Tubes

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



(Set of 6 tubes)

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.

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2-6 Lighting

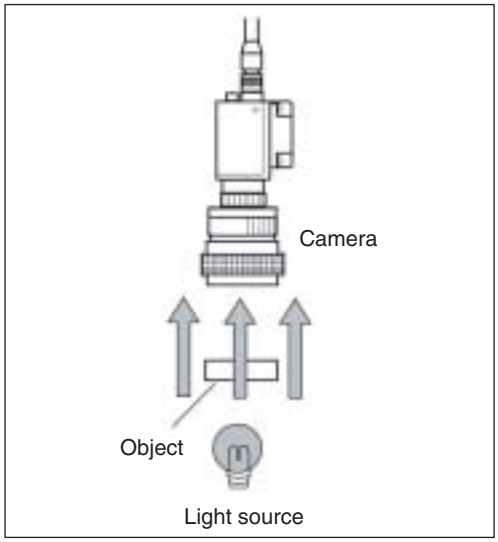
A stable image must be obtained to ensure accurate inspection.
Use appropriate lighting for the application and the reading object.

Lighting Methods

Back Lighting

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

Applications: Reading codes on transparent objects such as sheet glass



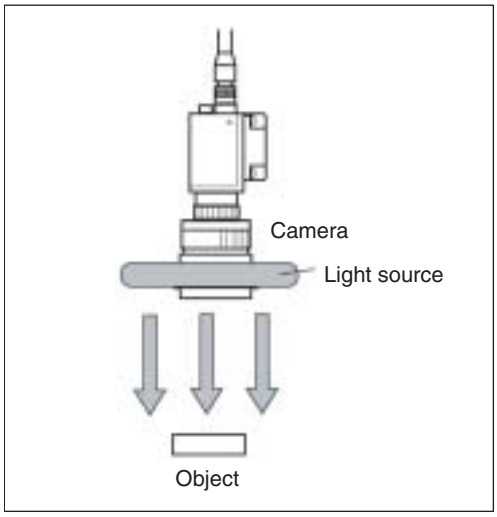
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Reflected Lighting

Ring Lighting

Objects can be illuminated shone uniformly.

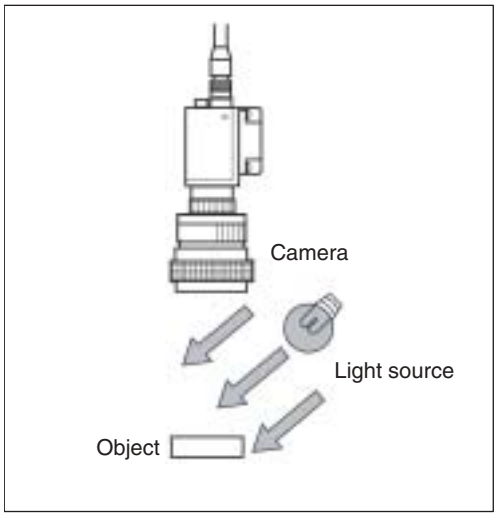
Applications: Paper labels and relatively large objects



Oblique Lighting

Detection is made by distinguishing regular and diffuse reflected light.

Applications: Relatively small objects

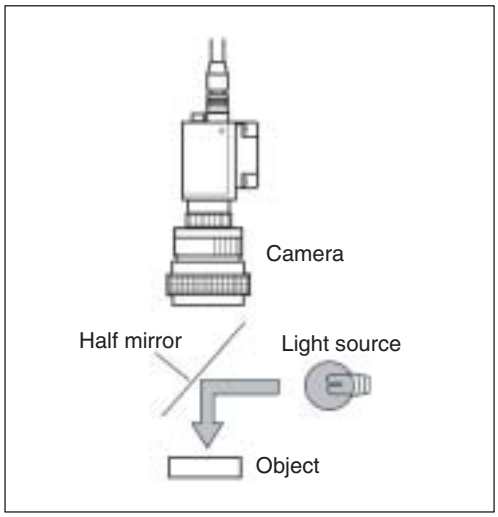


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Coaxial Lighting

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

Applications: Reading codes from objects with highly reflective surfaces such as semiconductor wafers



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2-7 Two-camera Unit

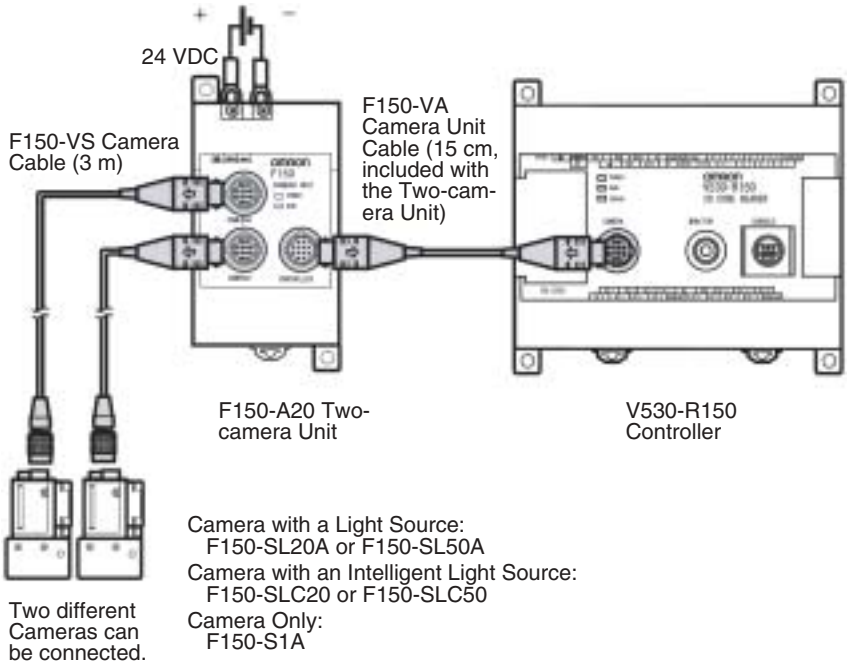
When the F150-A20 Two-camera Unit is used, two cameras can be connected to a single V530-R150 and images can be received at the same time.

Note If the V530-R150 and the Two-camera Unit are not turned ON simultaneously, be sure to turn ON the Two-camera Unit first. Images might not be received properly if the V530-R150 is turned ON first.

Power Supply

Connect a 24-VDC power supply. The Two-camera Unit requires the same kind of crimp connectors and wire as the V530-R150's power supply connection.

System Configuration



Note Turn OFF the power to all of the system devices before connecting or disconnecting cables. Connecting or disconnecting cables with power turned ON can damage the devices.

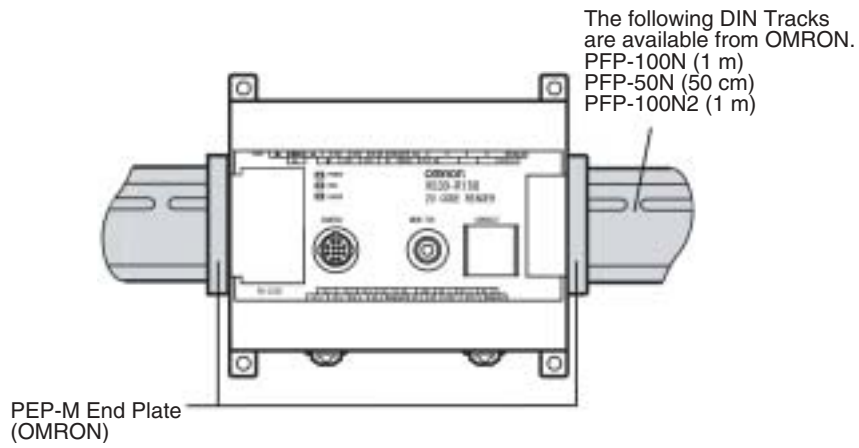
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2-8 Mounting the V530-R150

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

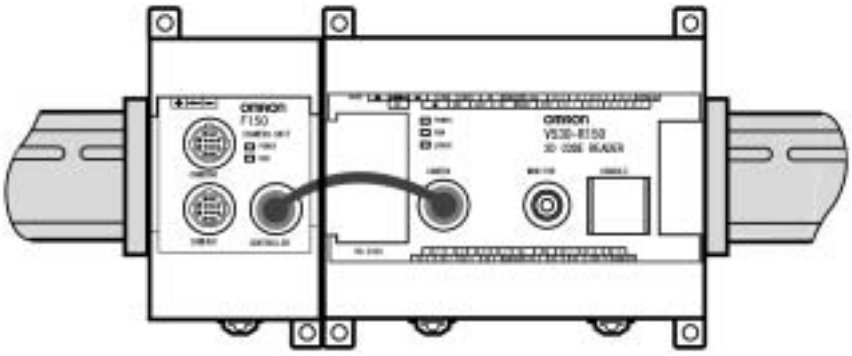
2-8-1 Mounting to DIN Track

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



Connecting a Two-camera Unit

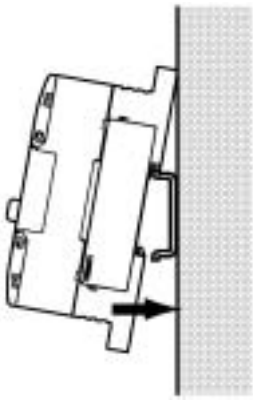
The Camera Unit Cable is 15 cm long. Mount the Two-camera Unit just to the left of the V530-R150.



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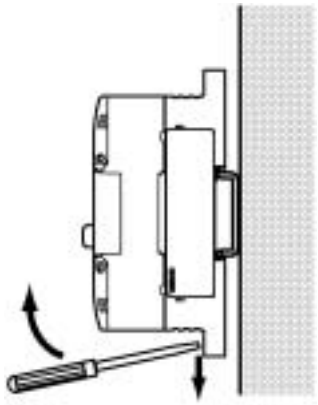
Mounting the V530R150

Hook the V530-R150 into the DIN Track as shown in the diagram and then press in at the bottom until the V530-R150 locks into place.



Removing the V530-R150

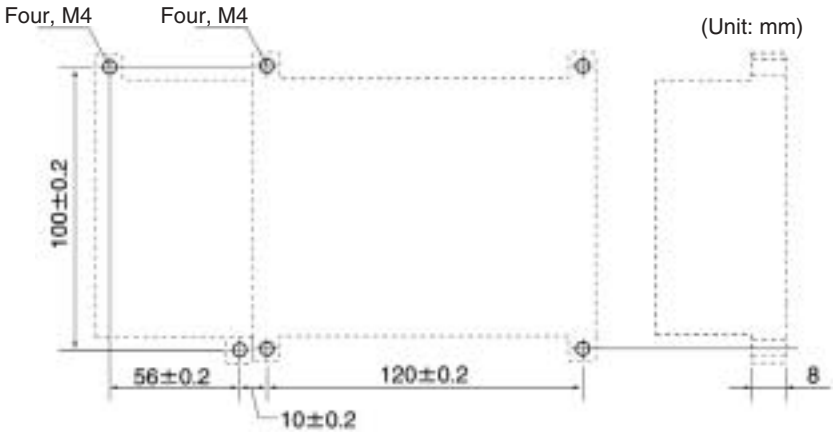
Use a screwdriver to pull the hook down and then pull out the V530-R150 from the bottom.



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2-8-2 Mounting on a Flat Surface

Two-camera Unit V530-R150



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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.

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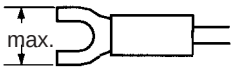
3-1 Specifications

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.

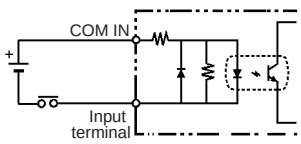
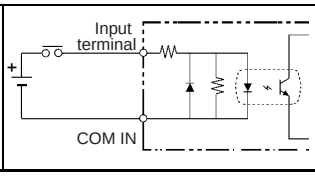
Terminal Dimensions

Terminal	Maker	Model No.	Wire size
Forked 6.2 mm max. 	J.S.T. Mfg. Co., Ltd.	V1.25-N3A	1.31 to 1.65 mm^2
Round 6.2 mm max. 	J.S.T. Mfg. Co., Ltd.	V1.25-MS3	

3-1-2 Specifications

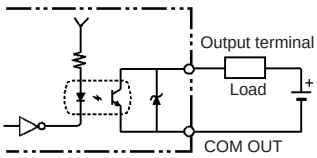
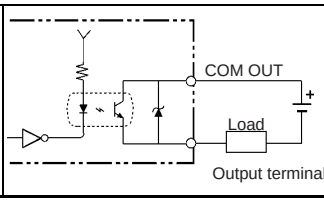
⚠ **Caution** Use a DC power supply with safe extra low-voltage circuits on the secondary side.

Input Specifications

Item	V530-R150E-3 (NPN model)	V530-R150EP-3 (PNP model)
Input voltage	12 to 24 VDC ±10%	
ON current	5 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		

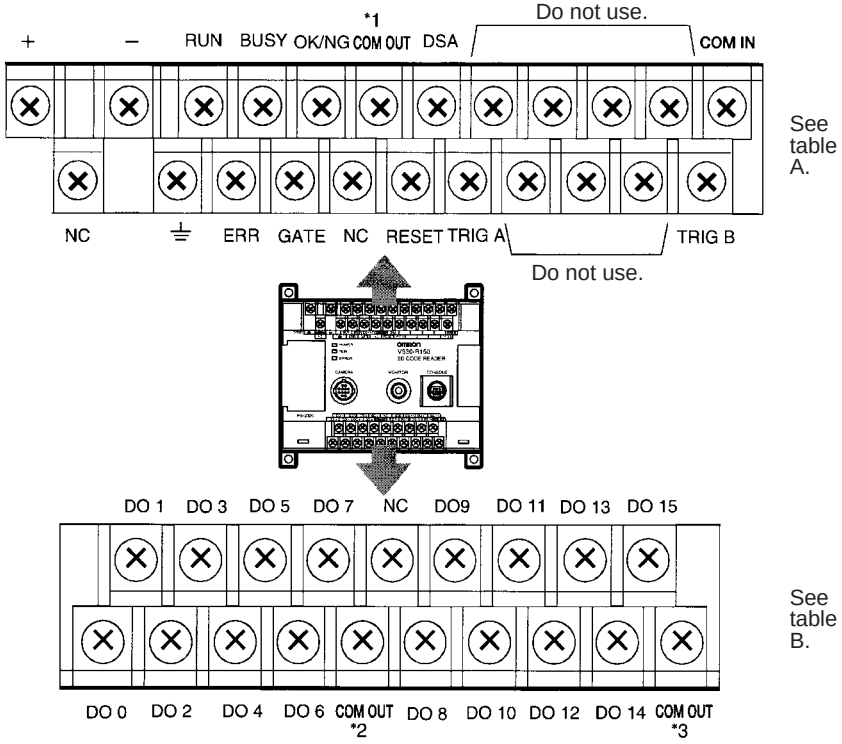
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Output Specifications

Item	V530-R150E-3 (NPN model)	V530-R150EP-3 (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



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

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
		TRIG A	Trigger input (One shot mode)
DSA	Do not use	TRIG B	Trigger input (Continuous or Level Trigger mode)
COM IN			

Table B

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

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.

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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. → **page 161, page 169, page 139, page 155**

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.
→ **page 199**

The reading accuracy and number of retry settings are disabled for the TRIG B input.

Trigger Mode	Detail
Continuous mode (Default setting)	Performs continuous reading while the TRIG B terminal is ON.
Level trigger mode	Repeats reading while the TRIG B terminal is ON until reading judgement is OK (readable). An NG will be output if reading is not successfully completed before TRIG B goes OFF.

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.

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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. → **page 199**

DO0 to DO3 Terminals

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

How to set coincidence judgment function → **page 145**

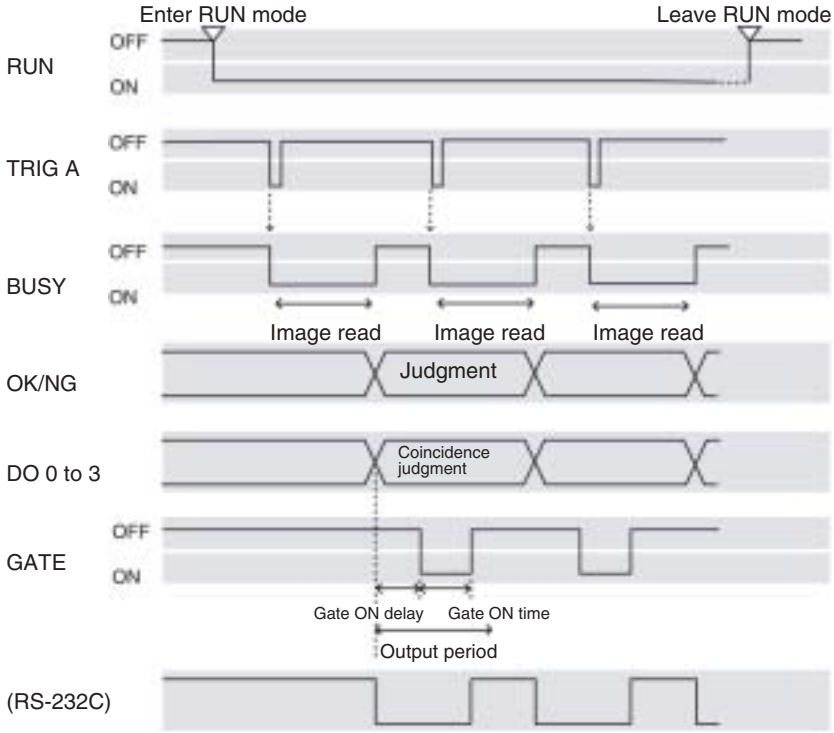
Coincident with registered data 0: DO0 terminal turns ON.
Coincident with registered data 1: DO1 terminal turns ON.
Coincident with registered data 2: DO2 terminal turns ON.
Coincident with registered data 3: DO3 terminal turns ON.

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.

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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.

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Output Terminals

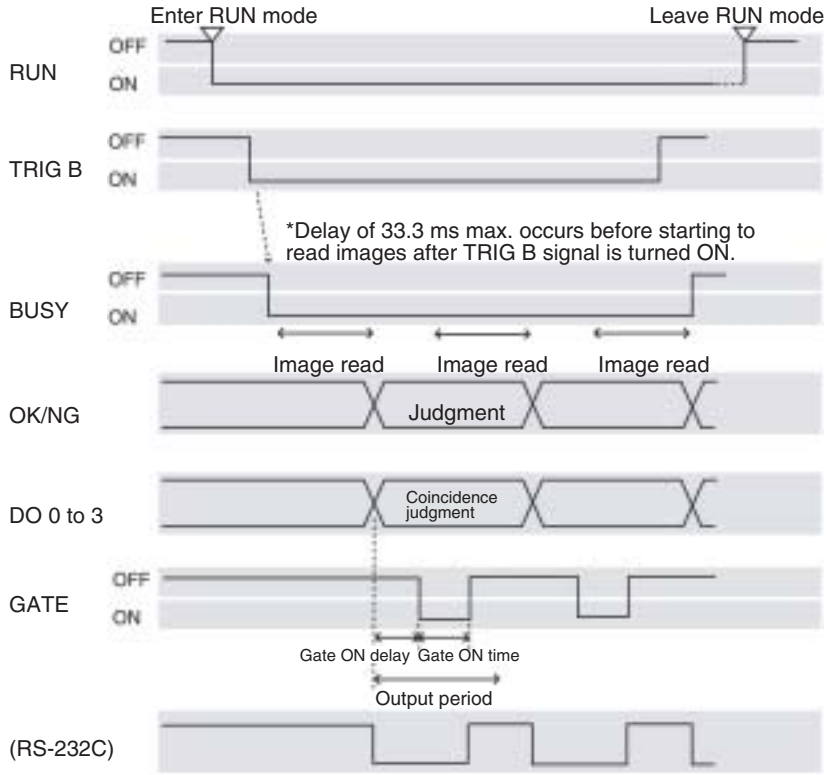
Terminal	Function
RUN	Turns ON during RUN mode.
BUSY	Shows that the V530-R150 is reading an image, changing settings, etc. Do not input the next command while the BUSY signal is ON. Otherwise, the commands input during command execution or processing may not be properly executed.
OK/NG	Outputs the judgment 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 longer than the gate ON delay plus the gate ON time, but shorter than the duration of the reading (TRIG A input). If the cycle is longer than the TRIG A input time, 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. → **page 199**

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.

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3-3-2 Continuous Mode



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

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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, the commands input during command execution or processing 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 longer than the gate ON delay plus the gate ON time, but shorter than the duration of the reading. If the cycle is longer than the duration of the reading, 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. → **page 199**

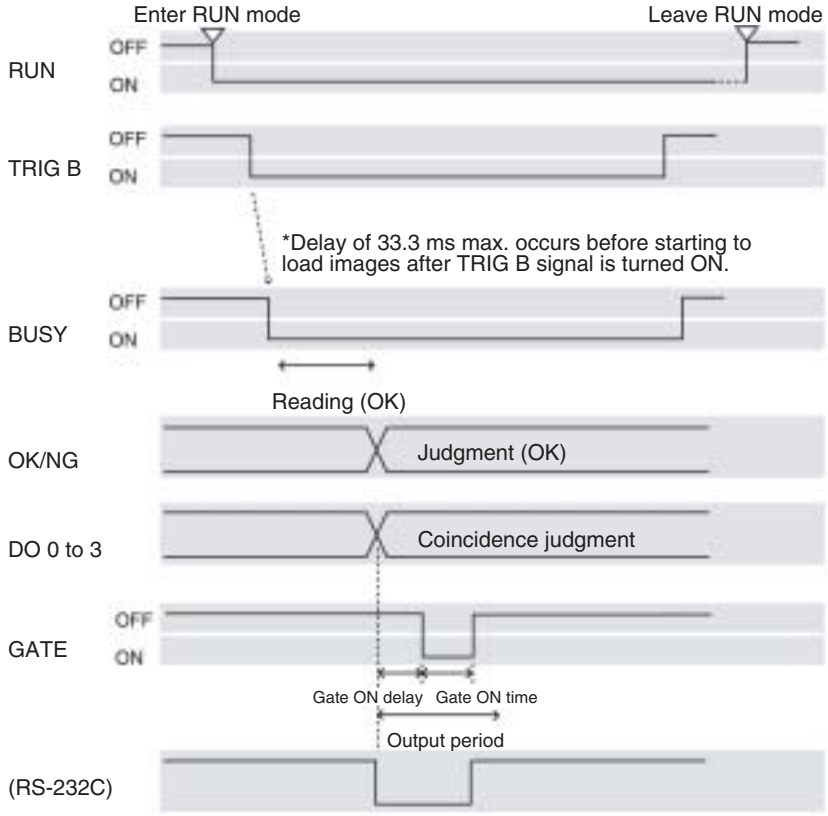
Input Terminals

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

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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

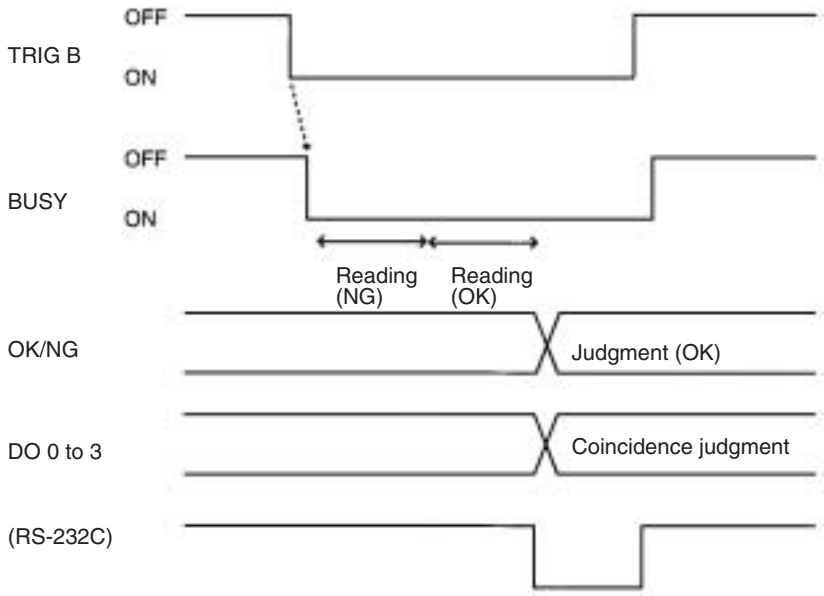
The same as continuous mode.

Input Terminals

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

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OK judgment obtained after repeated reading:

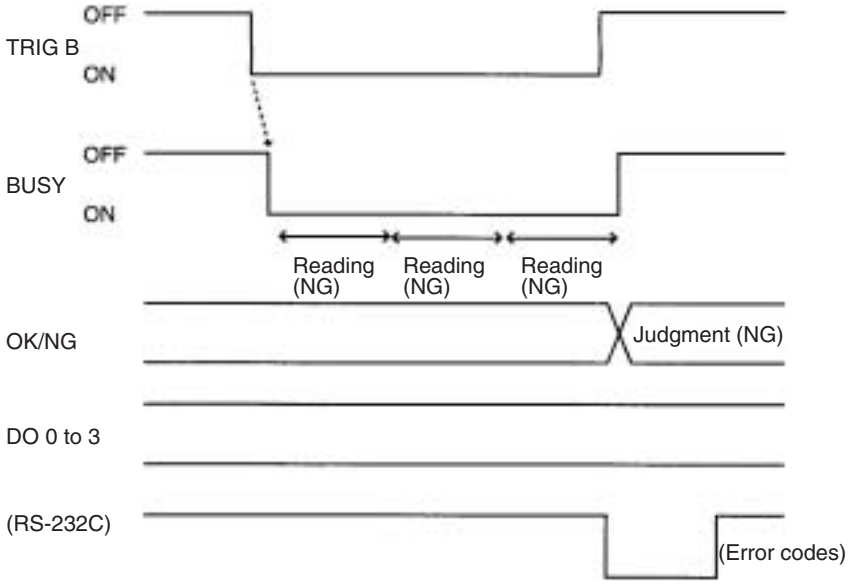


Note The output time to RS-232C will vary according to the data volume and baud rate.

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NG judgment after repeated reading:

NG is output when TRIG B is turned OFF.



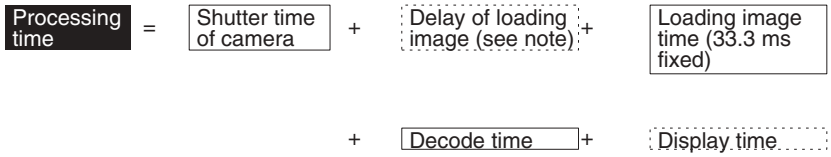
Note The output time to RS-232C will vary according to the data volume and baud rate.

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3-4 System Examination

Processing Time Calculation

Processing time (reading time) is calculated as follows:



Note A delay of 33.3 ms max. 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.

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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 × 21 (Version 1)	160 ms
29 × 29 (Version 3)	200 ms
41 × 41 (Version 6)	260 ms

Data Matrix (Normal Mode)

Matrix size	Processing time
10 × 10	180 ms
14 × 14	190 ms
26 × 26	250 ms
64 × 64	450 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.

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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.

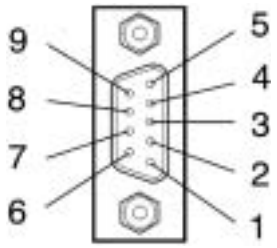
4-1 Specifications 48
4-1-1 Connector 48
4-1-2 Wiring 49
4-1-3 Connection 50
4-2 Communication Settings 51
4-2-1 Normal Communications Mode 51
4-2-2 Host Link 52
4-3 Trigger Inputs and Output Format 56
4-3-1 Normal 56
4-3-2 Communications Mode: Host Link 83
4-4 FCS Calculation 88
4-5 Connection Examples 89
4-5-1 Connection Examples for Programmable Controller (Normal) 89
4-5-2 PLC Connection Examples (Host Link) 91
4-5-3 Computer Connection Examples (Normal) 93
4-5-4 Multi-drop Connection Examples (Normal) 94

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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

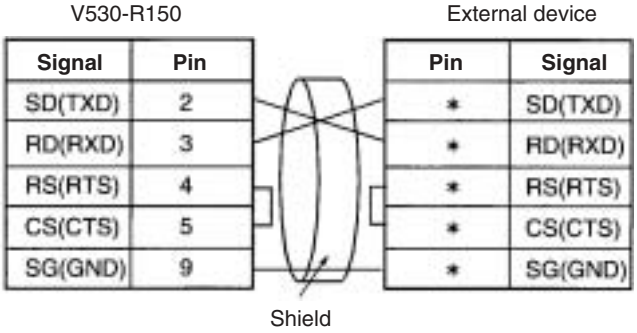
Pin	Signal	Name
1	FG (GND)	Frame ground
2	SD (TXD)	Send Data
3	RD (RXD)	Receive Data
4	RS (RTS)	Request to Send
5	CS (CTS)	Clear to Send
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	SG (GND)	Signal ground

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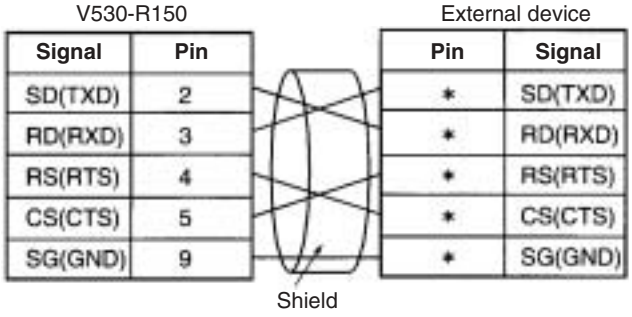
4-1-2 Wiring

Only use a shielded RS-232C cable.

Standard Connections



Connections for RS/CS Control

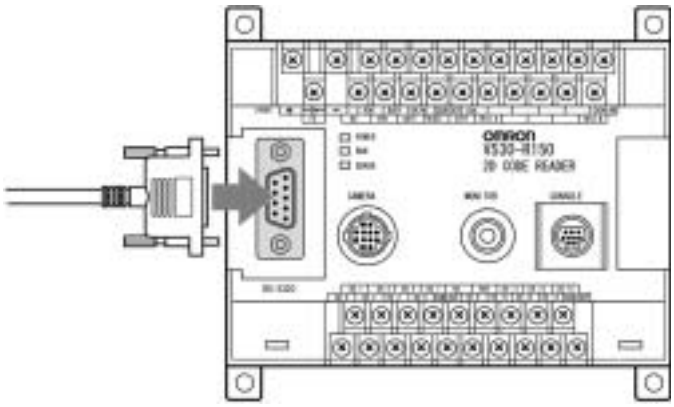


Note Pin numbers will depend on the external device being connected. Refer to the manual for the external device.

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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.

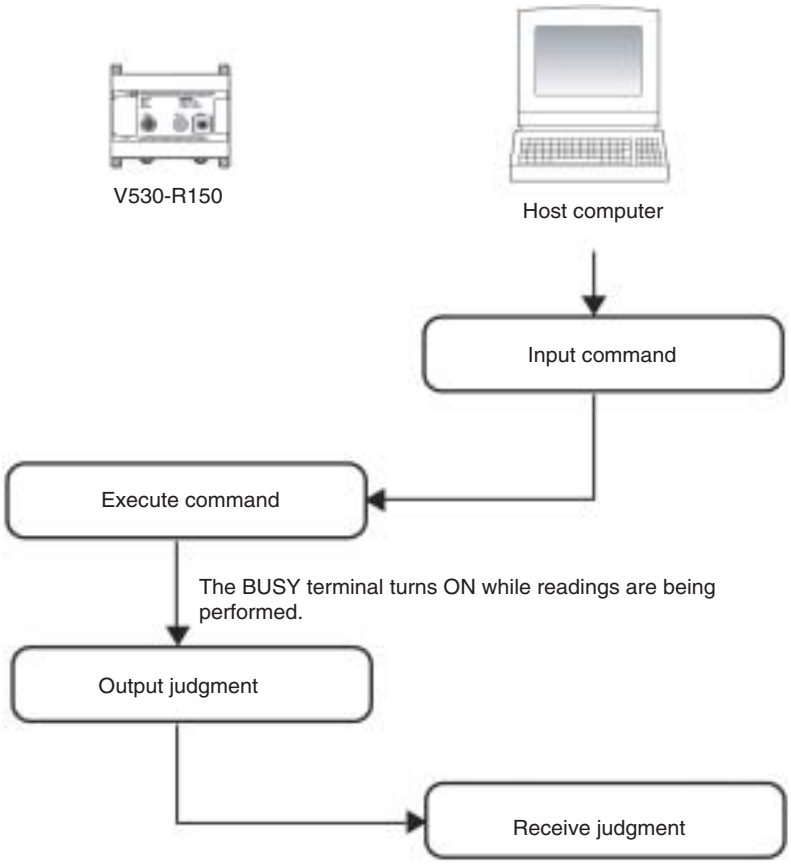
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4-2 Communication Settings

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 → **page 194**

I/O via the RS-232C Port

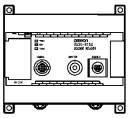


A timeout error occurs if there is no response from the host computer within the set time when RS/CS or Xon/off is selected for flow control, and it is assumed that the line is broken or the computer is not working correctly. An ERR (error) message appears on the screen, and the error terminal turns ON.

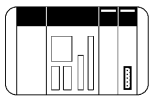
Program example → **page 93**

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TRIG A Signal as Reading Trigger

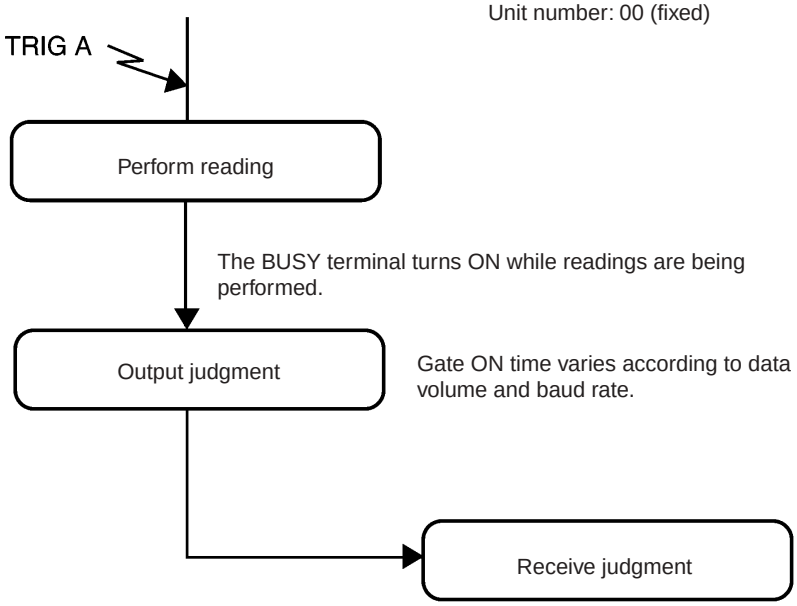


V530-R150



Programmable Controller

Unit number: 00 (fixed)



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 and it is assumed that the line is broken or the computer is not working correctly. An error message appears on the screen, and the ERR (error) terminal turns ON.

Program example → **page 90**

4-2-2 Host Link

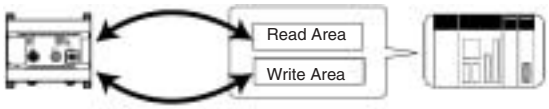
Select Host Link for the communications mode to communicate in Host Link format with a Programmable Controller or other host device via the RS-232C port.

Communications method setting menu → **page 194**

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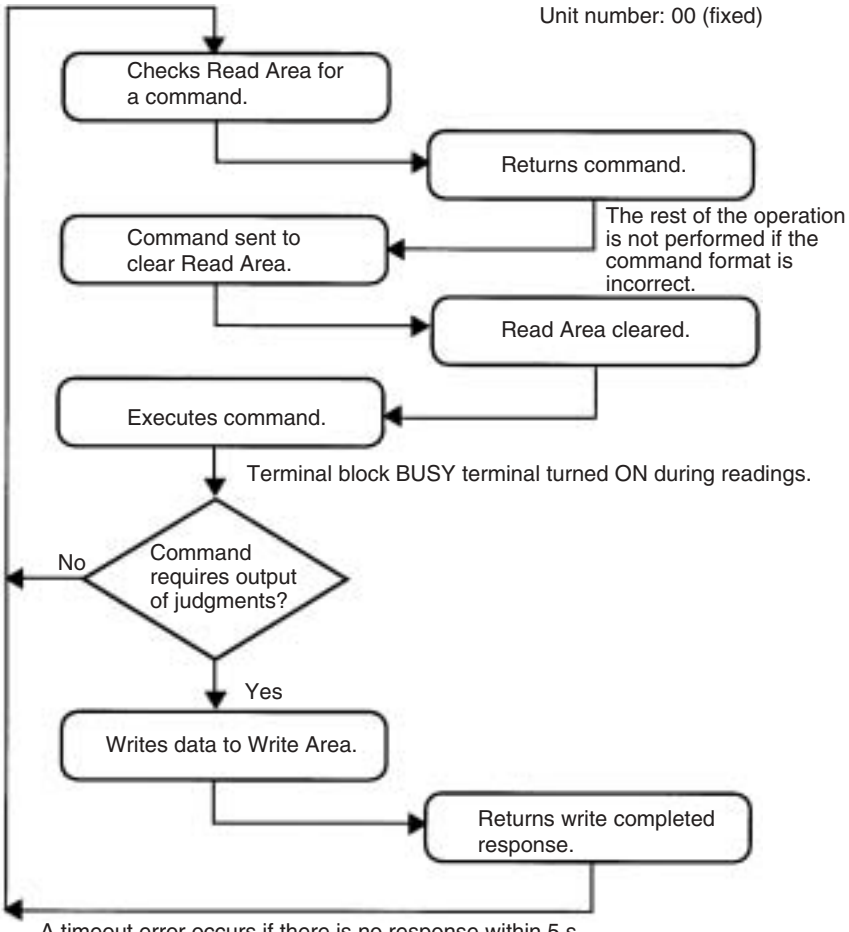
I/O via the RS232C Port

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.



V530-R150 Programmable Controller

Unit number: 00 (fixed)



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.

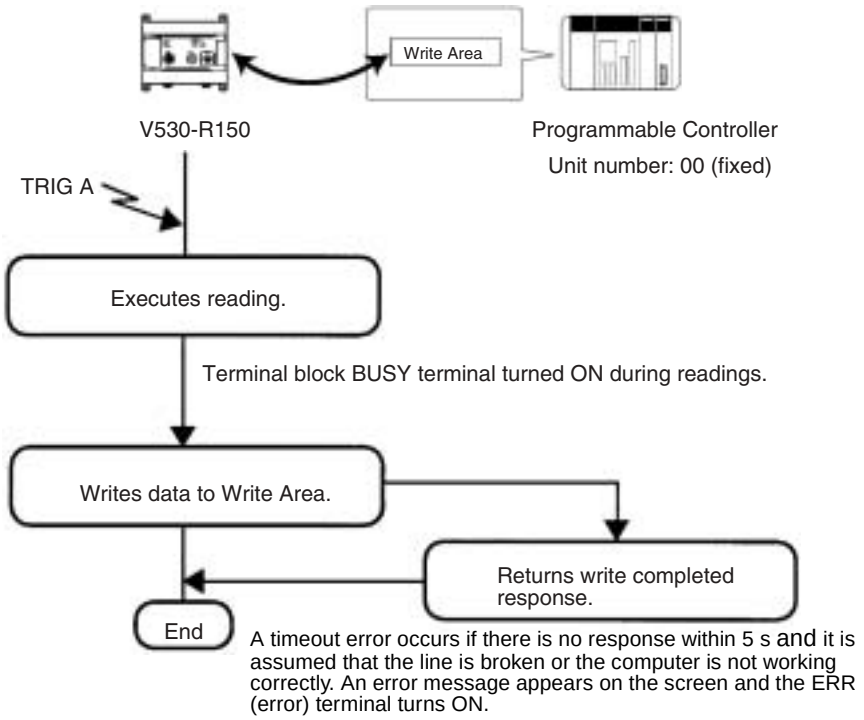
Program example → **page 92**

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TRIG A Signal as Reading Trigger

The trigger is used to cause the V530-F150 to read data and the data is written to the Programmable Controller.

Set the Read Area to “None.”

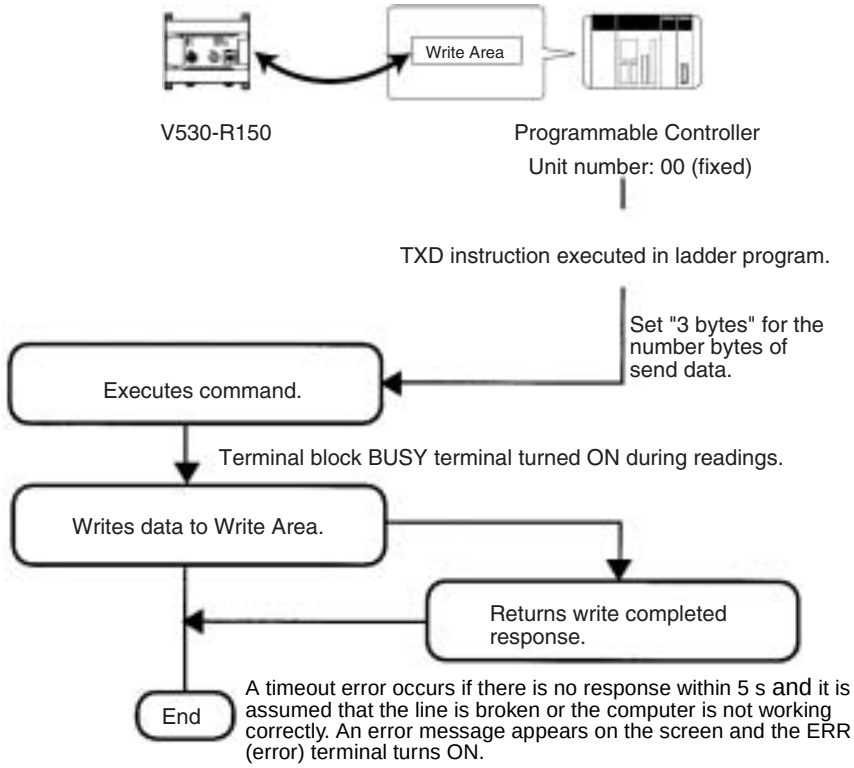


Note Time the input of TRIG A considering the image processing time and data output time, allowing sufficient leeway. An error will occur is the next input occurs before communications have been completed.

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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 The V530-R150 executes the command and writes the results of processing to the Programmable Controller. If TXD instructions are to be used to send commands, set the Read Area to "None."



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4-3 Trigger Inputs and Output Format

4-3-1 Normal

Commands

1:1 Connection

Function	Command	Page
One Shot Reading	@GL	page 59
Polling	@RD	page 59
Polling with Digit Position Specification	@RL	page 59
Start Continuous Reading	@GC	page 60
Stop Continuous Reading	@SC	page 60
QR Code Teaching	@TQ	page 60
Data Matrix Teaching	@TD	page 60
Load Scene Data (XMODEM)	@CL	page 61
Save Scene Data (XMODEM)	@CS	page 61
Load System and Scene Data (XMODEM)	@AL	page 62
Save System and Scene Data (XMODEM)	@AS	page 62
Load Image Data (XMODEM)	@BL	page 63
Save Image Data (XMODEM)	@BS	page 63
Read Scene Number	@SN	page 64
Change Scene Number	@SN	page 64
Save Settings	@SV	page 64
Monitor Display	@DL	page 65
Delete Monitor Display	@DD	page 65
Read Measurement Time	@MT	page 66
Change Display	@DC	page 66
Change Mode	@MC	page 67
Change Camera Mode	@CC	page 67
Read Version Information	@VR	page 68
Read System Data	@SR	page 68
Write System Data	@SW	page 70
Read Scene Data	@CR	page 71
Write Scene Data	@CW	page 77
Read Light Level Settings	@LR	page 78
Write Light Level Settings	@LW	page 79

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1:N (Multi-drop) Connections

Function	Command	Page
One Shot Reading	@GL	page 80
Polling	@RD	page 80
QR Code Teaching	@MQ	page 80
Data Matrix Teaching	@MD	page 81
Read Scene Number	@MS	page 81
Switch Scene	@MS	page 81

Error Codes

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
E200	Timeout error

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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	
E200	Timeout error

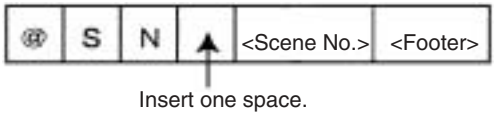
- Pattern Mode

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	

Input Format

Input the commands in ASCII code. Characters can be input in either upper-case or lower-case. The scene number command is shown below as an example. A blank box indicates that a space must be inserted.

Example format



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One Shot Reading (@GL) 1:1 Connection

Reading ends when the reading is correctly performed (OK). When the reading is not correctly performed (NG), reading continues to be performed for the number of retries specified in the setting conditions.

Send

@	G	L	<Footer>

Receive Refer to the explanation of the output format.
→ **page 82**

An error will occur if menu items are not registered.

<Header>	E	R	<Footer>

Polling (@RD) 1:1 Connection

Outputs the most recent reading data.

Send

@	R	D	<Footer>

Receive Refer to the explanation of the output format.
→ **page 82**

An error will occur if reading has not been performed since the menu items were registered.

<Header>	E	R	<Footer>

Polling with Digit Position (@RL) 1:1 Connection

Outputs the data in the specified digits.

Only the reading data will be output. Other data such as the number of digits, position, and angle will not be output.

Send

@	R	L		<Start position>		<End position>	<Footer>

Receive Refer to the explanation of the output format.
→ **page 82**

An error will occur if reading has not been performed since the menu items were registered.

<Header>	E	R	<Footer>

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

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

Send

Starts reading.

@	G	C	<Footer>

Receive Refer to the explanation of the output format.
→ **page 82**

Send

Stops continuous reading.

@	S	C	<Footer>

QR Code Teaching (@TQ) 1:1 Connection

Performs teaching in QR Code (normal) mode. If the reading judgement is OK, the optimum settings will be registered automatically. If the reading judgement is NG, the settings will not be updated.

Perform teaching on a freeze image.

Send

@	T	Q		<Symbol color>	<Footer>

Set the symbol color to either B or W. (B specifies black and W specifies white.)

Receive Refer to the explanation of the output format.
→ **page 82**

Note The timeout time is fixed at 10 s when teaching. A timeout error will be output if the reading judgement is NG. In this case, check the code conditions and execute the @TQ command again.

Data Matrix Teaching (@TD) 1:1 Connection

Performs teaching in Data Matrix (normal) mode. If the reading judgement is OK, the optimum settings will be registered automatically. If the reading judgement is NG, the settings will not be updated. Automatically discriminates between EC200 and EC000 to EC140 based on the matrix size.

Perform teaching on a freeze image.

Send

@	T	D		<Matrix size>	<Footer>

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Set the matrix size in 2 or 4 digits. Use two digits when the matrix is square, i.e., "@TD 10" if the matrix is 10×10. Use four digits when the matrix is rectangular, i.e., "@TD 1648" if the matrix is 16×48. Refer to *Appendix C* for tables listing the matrix sizes.

Receive Refer to the explanation of the output format.
→ **page 82**

Note The timeout time is fixed at 10 s when teaching. A timeout error will be output if the reading judgement is NG. In this case, check the code conditions and execute the @TD command again.

Load Scene Data (@CL) 1:1 Connection

Loads the scene data. The data transfer is performed with XMODEM (–CRC or SUM) protocol. (The XMODEM (–1K) protocol is not supported.)

The V530-R150 sends the character string "READY" to the external device when the V530-R150 has completed its initialization. Wait for the "READY" string to be received at the external device before starting the data transfer.

Send

@	C	L	<Footer>

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

Save Scene Data (@CS) 1:1 Connection

Saves the scene data. The data transfer is performed with XMODEM (–CRC or SUM) protocol. (The XMODEM (–1K) protocol is not supported.)

Send

@	C	S	<Footer>

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

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"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

Load System and Scene Data (@AL) 1:1 Connection

Loads the system and scene data. The data transfer is performed with XMODEM (–CRC or SUM) protocol. (The XMODEM (–1K) protocol is not supported.)

The V530-R150 sends the character string "READY" to the external device when the V530-R150 has completed its initialization. Wait for the "READY" string to be received at the external device before starting the data transfer.

Send

@	A	L	<Footer>

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

Save System and Scene Data (@AS) 1:1 Connection

Saves the system and scene data. The data transfer is performed with XMODEM (–CRC or SUM) protocol. (The XMODEM (–1K) protocol is not supported.)

Send

@	A	S	<Footer>

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

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Load Image Data (@BL) 1:1 Connection

Loads the image data. The data transfer is performed with XMODEM (–CRC or SUM) protocol. (The XMODEM (–1K) protocol is not supported.)

The V530-R150 sends the character string “READY” to the external device when the V530-R150 has completed its initialization. Wait for the “READY” string to be received at the external device before starting the data transfer.

Send

@	B	L		<Memory number>	<Footer>

The two-digit memory number specifies the destination for the image data being loaded. For example, the command “@BL 03” specifies memory number 3.

Receive “OK” indicates that the command was executed correctly:

<Header>	O	K	<Footer>

“ER” indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

Save Image Data (@BS) 1:1 Connection

Saves the image data. The data transfer is performed with XMODEM (–CRC or SUM) protocol. (The XMODEM (–1K) protocol is not supported.)

Send

@	B	S		<Memory number>	<Footer>

The two-digit memory number specifies the memory location containing the image data to be saved. For example, the command “@BS 03” specifies memory number 3.

Receive “OK” indicates that the command was executed correctly:

<Header>	O	K	<Footer>

“ER” indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

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Read Scene Number (@SN) 1:1 Connection

Outputs the scene number (0 to 9) of the scene being displayed.

Send

@	S	N	<Footer>

Receive The scene number is returned if the command was executed correctly:

<Header>	<Scene number>	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

Change Scene Number (@SN) 1:1 Connection

Changes the scene being displayed.

Send

@	S	N		<Scene number>	<Footer>

Specify the desired scene number (0 to 9).

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

Save Settings (@SV) 1:1 Connection

Saves the system data and all of the scene data to the V530-R150's flash memory.

Send

@	S	V	<Footer>

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

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"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

Monitor Display (@DL) 1:1 Connection

Switches the display image to "Through," and displays the specified region.

Send

@	D	L		<X1>		<Y1>		<X2>		<Y2>	<Footer>

Specify the region's upper left corner with coordinates (X1, Y1) and the lower right corner with coordinates (X2, Y2).

Allowed range for X coordinates: $0 \leq X \leq 511$
Allowed range for Y coordinates: $0 \leq Y \leq 483$

Example: @DL 100 100 200 200

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

Delete Monitor Display (@DD) 1:1 Connection

Deletes the region that was displayed with the @DL command.

Send

@	D	D	<Footer>

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

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Read Measurement Time (@MT) 1:1 Connection

Reads the most recent read-processing time.

Send

@	M	T	<Footer>

Receive The 5-digit processing time (00000 to 99999 ms) is returned if the command was executed correctly.

<Header>	<Processing time>	<Footer>

A value of 99999 will be returned if the actual processing time exceeds 99,999 ms. A value of 00000 will be returned if the processing time could not be read.

Example: A value of 00230 will be returned when the most recent processing time was 230 ms.

Change Display (@DC) 1:1 Connection

Changes the image display status.

Send

@	D	C		<Display code>		<Footer>

Set the display code to 0 to specify Through display or 1 to specify Freeze display.

Through display: 0
Freeze display: 1

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

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Change Mode (@MC) 1:1 Connection

Changes the mode to Monitor mode or Run mode.

Send

@	M	C		<Mode>		<Footer>

Set the mode to 0 to specify Monitor mode or 1 to specify Run mode.

Monitor mode: 0
Run mode: 1

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

Change Camera Mode (@CC) 1:1 Connection

Changes the camera mode when a Two-camera Unit is being used.

Send

@	C	C		<Camera mode>		<Footer>

Set the camera mode to 0 to specify Camera 0, 1 to specify Camera 1, or 2 to specify two-camera switching.→ **page 121**

Mode	Camera mode setting
Camera 0	0
Camera 1	1
Two-camera switching	2

Receive "OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

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Read Version Information (@VR) 1:1 Connection

Reads the system's version information.

Send

@	V	R	<Footer>

Receive The version information is returned if the command was executed correctly:

<Header>	<Version>	<FCS>	<Footer>

Example version information:

V530-R150 Ver3.00 2001/04/01 12:00

Read System Data (@SR) 1:1 Connection

Reads the specified system data.

Send

Set the parameter number (1 to 34) to read the corresponding system data.

@	S	R		<Parameter number>		<Footer>

Receive The system data is returned if the command was executed correctly:

<Header>	<System data>	<FCS>	<Footer>

The following table shows the data that is read for each parameter number.

Number	System data		
1	RS-232C	Baud rate	0: 2,400, 1: 4,800, 2: 9,600, 3: 19,200, 4: 38,400 (bps)
2		Data length	0: 7 bits, 1: 8 bits
3		Parity	0: None, 1: Odd, 2: Even
4		Stop bits	0: 1 bit, 1: 2 bits
5		Header	0: None, 1: STX, 2: ESC
6		Footer	0: CR, 1: LF, 2: CR+LF, 3: ETX
7		FCS	0: OFF, 1: ON
8		Mode	0: Normal, 1: Host Link, 2: 3964, 3: 3964R
9	Normal (No-protocol)	Flow control	0: None, 1: RS/CS, 2: Xon/Xoff
10		Timeout	001 to 120 s (See note 1.)

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Number	System data		
11	Host Link	Read source data area	0: IR/CIO, 1: HR, 2: LR, 3: DM, 4: None
12		Start address	0000 to 9995 (See note 2.)
13		Write destination data area	0: IR/CIO, 1: HR, 2: LR, 3: DM, 4: None
14		Start address	0000 to 9996 (See note 2.)
15		PLC mode check	0: ON, 1: OFF
16	Terminal block	Trigger mode	0: Continuous, 1: Level trigger
17		Output polarity	0: ON for NG, 1: ON for OK
18		Output period	000020 to 100000 in 100-μs units (See note 3.)
19		Gate ON delay	00010 to 10000 in 100-μs units (See note 4.)
20		Gate ON time	00010 to 10000 in 100-μs units (See note 4.)
21	Output settings	Attach number of digits	0: OFF, 1: ON
22		Attach center coordinates	0: OFF, 1: ON
23		Attach rotational angle	0: OFF, 1: ON
24		Polling	0: OFF, 1: ON
25		Data region specification function	0: OFF, 1: ON
26		Start position	001 to 999 (See note 1.)
27		End position	001 to 999 (Must be greater than the start position. See note 1.)
28	Image storage method	Image storage	0: None, 1: Only NG, 2: All
29	Startup mode	Start scene	0 to 9
30		Start mode	0: SET, 1: MON, 2: RUN
31	Error method	BUSY input	0: OFF, 1: ERR ON
32	Device settings	Two-camera Unit	0: Out of use, 1: F150-A20
33		Camera 0 Intelligent Light Source	0: Out of use, 1: F150-SLC20, 2: F150-SLC50
34		Camera 1 Intelligent Light Source	0: Out of use, 1: F150-SLC20, 2: F150-SLC50

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Number	System data		
35	3964(R)	Character delay time	10 to 655350 in 10-ms units.
36		Acknowledge delay time	10 to 655350 in 10-ms units.
37		Setup attribute count	1 to 255
38		Transfer attribute count	1 to 255
39		Master/Slave	0: Master, 1: Slave

Note
1. The data is output in 3 digits.
2. The data is output in 4 digits.
3. The data is output in 6 digits.
4. The data is output in 5 digits.

Write System Data (@SW) 1:1 Connection

Writes the specified system data to the specified parameter.

Send

Set the desired parameter number (1 to 34) to and setting. Refer to *Read System Data (@SR)* for a table showing details on the system data settings. → **page 68**

@	S	W		<Parameter no.>		<Setting>		<Footer>

Receive

“OK” indicates that the command was executed correctly:

<Header>	O	K	<Footer>

“ER” indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

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Read Scene Data (@CR) 1:1 Connection

Reads the settings data for the scene that is currently being displayed. To read the settings data for another scene, first change the screen number with the Change Scene Number command and then execute this command. → **page 64**

Model settings cannot be made for scenes set to QR Code (Pattern) or Data Matrix (Pattern). Register a special model.
Refer to the table on the indicated page for details on each mode's settings data.

Send

@	C	R	<Footer>

Receive

The settings data that is returned depends on the mode that has been registered.

QR Code (Normal) Registered

<Header>	Q	N		(1)	(2)	-----	(15)	(16)	<FCS>	<Footer>

Settings
(See table on page 72.)

QR Code (Pattern) Registered

<Header>	Q	P		(1)	(2)	-----	(17)	(18)	<FCS>	<Footer>

Settings data
(See table on page 73.)

Data Matrix (Normal) Registered

<Header>	D	N		(1)	(2)	-----	(19)	(20)	<FCS>	<Footer>

Settings data
(See table on page 74.)

Data Matrix (Pattern) Registered

<Header>	D	P		(1)	(2)	-----	(16)	(17)	<FCS>	<Footer>

Settings data
(See table on page 76.)

Nothing Registered

<Header>	N	O	T	H	I	N	G	<FCS>	<Footer>

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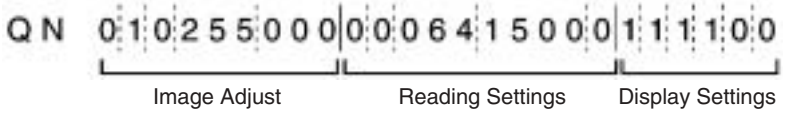
Settings Data for QR Code (Normal)

Number	Settings data for QR Code (Normal)			Digit(s)
1	Image Adjust	Shutter Speed	0: 1/100 s, 1: 1/500 s, 2: 1/2,000 s, 3: 1/10,000 s	Digit 1
2		Filtering	0: OFF, 1: Weak Smoothing, 2: Strong Smoothing, 3: Enhance Edges	Digit 2
3		Filtering Retry	0: OFF, 1: ON	Digit 3
4		BGS Level Upper Limit	001 to 255 (See note 1.)	Digits 4 to 6
5		BGS Level Lower Limit	000 to 254 (See note 1.)	Digits 7 to 9
6	Reading Settings	Symbol Color	0: Black, 1: White	Digit 10
7		Right & Left Reverse	0: OFF, 1: ON, 2: Auto	Digit 11
8		Gray Edge Value	001 to 127 (See note 1.)	Digits 12 to 14
9		Timeout	0200 to 2000 ms (See note 2.)	Digits 15 to 18
10		Number of Retries	0 to 9	Digit 19
11	Display Settings	Reading Data	0: OFF, 1: ON	Digit 20
12		Detail Data	0: OFF, 1: ON	Digit 21
13		Finder Pattern	0: OFF, 1: ON	Digit 22
14		Cell Position	0: OFF, 1: ON	Digit 23
15		Font Size	0: ×1, 1: ×4	Digit 24
16		Display Image	0: Normal, 1: Binary	Digit 25

Note 1. The data is output in 3 digits.

2. The data is output in 4 digits.

The following diagram shows the structure of the 25 digits that contain settings 1 through 16. (The contents are example data settings.)



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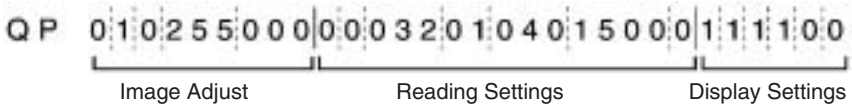
Settings Data for QR Code (Pattern)

Number	Settings data for QR Code (Pattern)			Digit(s)
1	Image Adjust	Shutter Speed	0: 1/100 s, 1: 1/500 s, 2: 1/2,000 s, 3: 1/10,000 s	Digit 1
2		Filtering	0: OFF, 1: Weak Smoothing, 2: Strong Smoothing, 3: Enhance Edges	Digit 2
3		Filtering Retry	0: OFF, 1: ON	Digit 3
4		BGS Level Upper Limit	001 to 255 (See note 1.)	Digits 4 to 6
5		BGS Level Lower Limit	000 to 254 (See note 1.)	Digits 7 to 9
6	Reading Settings	Symbol Color	0: Black, 1: White	Digit 10
7		Right & Left Reverse	0: OFF, 1: ON, 2: Auto	Digit 11
8		Gray Edge Value	001 to 127	Digits 12 to 14
9		Pixel Skipping	01 to 20 (See note 2.)	Digits 15 to 16
10		Correlation	001 to 100 (See note 1.)	Digits 17 to 19
11		Timeout	0200 to 2000 ms (See note 3.)	Digits 20 to 23
12		Number of Retries	0 to 9	Digit 24
13	Display Settings	Reading Data	0: OFF, 1: ON	Digit 25
14		Detail Data	0: OFF, 1: ON	Digit 26
15		Finder Pattern	0: OFF, 1: ON	Digit 27
16		Cell Position	0: OFF, 1: ON	Digit 28
17		Font Size	0: ×1, 1: ×4	Digit 29
18		Display Image	0: Normal, 1: Binary	Digit 30

Note

1. The data is output in 3 digits.
2. The data is output in 2 digits.
3. The data is output in 4 digits.

The following diagram shows the structure of the 30 digits that contain settings 1 through 18. (The contents are example data settings.)



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Settings Data for Data Matrix (Normal)

Number	Settings data for Data Matrix (Normal)			Digit(s)
1	Image Adjust	Shutter Speed	0: 1/100 s, 1: 1/500 s, 2: 1/2,000 s, 3: 1/10,000 s	Digit 1
2		Filtering	0: OFF, 1: Weak Smoothing, 2: Strong Smoothing, 3: Enhance Edges	Digit 2
3		Filtering Retry	0: OFF, 1: ON	Digit 3
4		BGS Level Upper Limit	001 to 255 (See note 1.)	Digits 4 to 6
5		BGS Level Lower Limit	000 to 254 (See note 1.)	Digits 7 to 9
6	Reading Settings	Symbol Color	0: Black, 1: White, 2: Auto	Digit 10
7		Right & Left Reverse	0: OFF, 1: ON, 2: Auto	Digit 11
8		Code Size 1	00 to 30 (See note 2.)	Digits 12 to 13
9		Code Size 2	00 to 31 (See note 3.)	Digits 14 to 15
10		Free Finder Length	0: OFF, 1: ON	Digit 16
11		Length of Finder	050 to 480 (See note 1.)	Digits 17 to 19
12		Background Cut	0: Weak, 1: Middle, 2: Strong	Digit 20
13		Timeout	0200 to 2000 ms (See note 4.)	Digits 21 to 24
14		Number of Retries	0 to 9	Digit 25
15	Display Settings	Reading Data	0: OFF, 1: ON	Digit 26
16		Detail Data	0: OFF, 1: ON	Digit 27
17		Finder Pattern	0: OFF, 1: ON	Digit 28
18		Cell Position	0: OFF, 1: ON	Digit 29
19		Font Size	0: ×1, 1: ×4	Digit 30
20		Display Image	0: Normal, 1: Binary	Digit 31

Note 1. The data is output in 3 digits.

2. Code Size 1

EC200		EC000 to 140
00: 10 x 10 01: 12 x 12 02: 14 x 14 03: 16 x 16 04: 18 x 18 05: 20 x 20 06: 22 x 22 07: 24 x 24 08: 26 x 26 09: 32 x 32 10: 36 x 36	11: 40 x 40 12: 44 x 44 13: 48 x 48 14: 52 x 52 15: 64 x 64 16: 8 x 18 17: 8 x 32 18: 12 x 26 19: 12 x 36 20: 16 x 36 21: 16 x 48	22: 9 x 9 23: 11 x 11 24: 13 x 13 25: 15 x 15 26: 17 x 17 27: 19 x 19 28: 21 x 21 29: 23 x 23 30: 25 x 25

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3. Code Size 2

EC200		EC000 to 140
00: None	11: 36 x 36	23: 9 x 9
01: 10 x 10	12: 40 x 40	24: 11 x 11
02: 12 x 12	13: 44 x 44	25: 13 x 13
03: 14 x 14	14: 48 x 48	26: 15 x 15
04: 16 x 16	15: 52 x 52	27: 17 x 17
05: 18 x 18	16: 64 x 64	28: 19 x 19
06: 20 x 20	17: 8 x 18	29: 21 x 21
07: 22 x 22	18: 8 x 32	30: 23 x 23
08: 24 x 24	19: 12 x 26	31: 25 x 25
09: 26 x 26	20: 12 x 36	
10: 32 x 32	21: 16 x 36	
	22: 16 x 48	

4. The data is output in 4 digits.

The following diagram shows the structure of the 31 digits that contain settings 1 through 20. (The contents are example data settings.)



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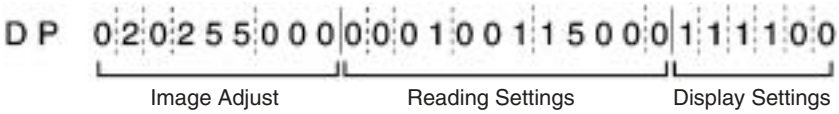
Settings Data for Data Matrix (Pattern)

Number	Settings data for Data Matrix (Pattern)			Digit(s)
1	Image Adjust	Shutter Speed	0: 1/100 s, 1: 1/500 s, 2: 1/2,000 s, 3: 1/10,000 s	Digit 1
2		Filtering	0: OFF, 1: Weak Smoothing, 2: Strong Smoothing, 3: Enhance Edges	Digit 2
3		Filtering Retry	0: OFF, 1: ON	Digit 3
4		BGS Level Upper Limit	001 to 255 (See note 1.)	Digits 4 to 6
5		BGS Level Lower Limit	000 to 254 (See note 1.)	Digits 7 to 9
6	Reading Settings	Symbol Color	0: Black, 1: White	Digit 10
7		Right & Left Reverse	0: OFF, 1: ON, 2: Auto	Digit 11
8		Pixel Skipping	01 to 20 (See note 2.)	Digits 12 to 13
9		Correlation	001 to 100 (See note 1.)	Digits 14 to 16
10		Timeout	0200 to 2000 ms (See note 3.)	Digits 17 to 20
11		Number of Retries	0 to 9	Digit 21
12	Display Settings	Reading Data	0: OFF, 1: ON	Digit 22
13		Detail Data	0: OFF, 1: ON	Digit 23
14		Finder Pattern	0: OFF, 1: ON	Digit 24
15		Cell Position	0: OFF, 1: ON	Digit 25
16		Font Size	0: ×1, 1: ×4	Digit 26
17		Display Image	0: Normal, 1: Binary	Digit 27

Note

1. The data is output in 3 digits.
2. The data is output in 2 digits.
3. The data is output in 4 digits.

The following diagram shows the structure of the 27 digits that contain settings 1 through 17. (The contents are example data settings.)



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Write Scene Data (@CW) 1:1 Connection

Writes the settings data for the scene that is currently being displayed. To write the settings data for another scene, first change the screen number with the Change Scene Number command and then execute this command. → **page 64**

Model settings cannot be made for scenes set to QR Code (Pattern) or Data Matrix (Pattern). Register a special model.
Refer to the table on the indicated page for details on each mode's settings data.

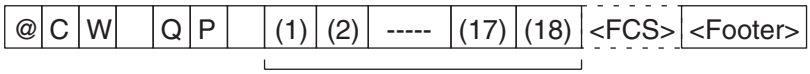
Send

The required settings data depends on the mode.

Changing QR Code (Normal)



Changing QR Code (Pattern)



Changing Data Matrix (Normal)



Changing Data Matrix (Pattern)



Receive

"OK" indicates that the command was executed correctly:



"ER" indicates that the command was not executed correctly:



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Read Light Level Settings (@LR) 1:1 Connection

Reads the light levels set for the specified Camera's Intelligent Light Source.

Send

@	L	R		<Camera number>	<Footer>

Set the camera number to 0 or 1.

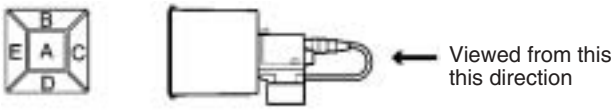
Receive

If the command was executed correctly, the light level settings will be returned. There are 5 settings in the F150-SLC20 Intelligent Light Source and 8 settings in the F150-SLC50 Intelligent Light Source.

F150-SLC20 Specified

<Header>	(A)	(B)	(C)	(D)	(E)	<FCS>	<Footer>

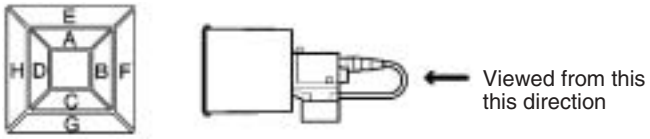
The light level settings for areas A to E can range from 0 to 7; a value of 0 is OFF and 7 is the maximum brightness.



F150-SLC50 Specified

<Header>	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	<FCS>	<Footer>

The light level settings for areas A to H can range from 0 to 7; a value of 0 is OFF and 7 is the maximum brightness.



Command Execution Incorrect

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

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Write Light Level Settings (@LW) 1:1 Connection

Changes the light level settings for the specified Camera's Intelligent Light.

Send

The command format depends on the Intelligent Light Source that is being used. There are 5 settings in the F150-SLC20 Intelligent Light Source and 8 settings in the F150-SLC50 Intelligent Light Source.

F150-SLC20 Specified

@	L	W		<Camera no.>		(A)	(B)	(C)	(D)	(E)	<Footer>

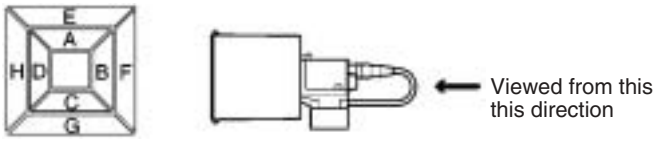
Set the camera no. to 0 or 1 and set the light level for each area. The light level settings for areas A to E can range from 0 to 7; a value of 0 is OFF and 7 is the maximum brightness.



F150-SLC50 Specified

@	L	W		<Camera no.>		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	<Footer>

Set the camera no. to 0 or 1 and set the light level for each area. The light level settings for areas A to H can range from 0 to 7; a value of 0 is OFF and 7 is the maximum brightness.



Receive

"OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

"ER" indicates that the command was not executed correctly:

<Header>	E	R	<Footer>

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One Shot Reading (@GL) 1:N Connection

Uses a trigger to read from the V530-R150 with the specified unit number. Reading ends when the reading is correctly performed (OK). When the reading is not correctly performed (NG), reading continues to be performed for the number of retries specified in the setting conditions.

The reading data will not be output until the Polling Instruction (@RD Command) is sent.

Send Set the unit number (00 to 31) of the desired V530-150.

@	G	L		<Unit number>	<Footer>

Receive Refer to the explanation of the output format.
→ **page 82**

Polling (@RD) 1:N Connection

Outputs the reading data of the V530-R150 with the specified unit number.

Send Set the unit number (00 to 31) of the desired V530-150.

@	R	D		<Unit number>	<Footer>

Receive Refer to the explanation of the output format.
→ **page 82**

QR Code Teaching (@MQ) 1:N Connection

Performs teaching in QR Code (normal) mode. If the reading judgement is OK, the optimum settings will be registered automatically. If the reading judgement is NG, the settings will not be updated.

Send Set the unit number (00 to 31) of the desired V530-150.
Set the symbol color to either B or W. (B specifies black and W specifies white.)

@	M	Q		<Unit number>		<Symbol color>	<Footer>

Receive Refer to the explanation of the output format.
→ **page 82**

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Data Matrix Teaching (@MD) 1:N Connection

Performs teaching in Data Matrix (normal) mode. If the reading judgement is OK, the optimum settings will be registered automatically. If the reading judgement is NG, the settings will not be updated. Automatically discriminates between EC200 and EC000 to EC140 based on the matrix size.

Send

Set the unit number (00 to 31) of the desired V530-150.
Set the matrix size in 2 or 4 digits. Use two digits when the matrix is square, i.e., "@TD 10" if the matrix is 10×10. Use four digits when the matrix is rectangular, i.e., "@TD 1648" if the matrix is 16×48. Refer to *Appendix C* for tables listing the matrix sizes.

@	M	D		<Unit number>		<Matrix size>	<Footer>

Receive

Refer to the explanation of the output format.
→ **page 82**

Read Scene Number (@MS) 1:N Connection

Outputs the scene number (0 to 9) of the scene being displayed.

Send

Set the unit number (00 to 31) of the desired V530-150.

@	M	S		<Unit number>	<Footer>

Receive

The data is output from the V530-150 without using the Polling Command.

<Header>	<Unit number>	<Scene number>	<Footer>

Change Scene Number (@MS) 1:N Connection

Changes the scene being displayed.

Send

Set the unit number (00 to 31) of the desired V530-150.
Set the desired scene number (0 to 9).

@	M	S		<Unit number>		<Scene number>	<Footer>

Receive

The data is output from the V530-150 without using the Polling Command.

"OK" indicates that the command was executed correctly:

<Header>	O	K	<Footer>

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"ER" indicates that the command was not executed correctly:

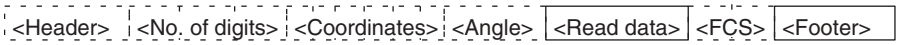


Output Format of Reading data

The following diagrams show the output format used when outputting reading data. There is a setting in the communications specifications setting menu that selects whether or not the Polling Command will be used to control output timing. → **page 199**

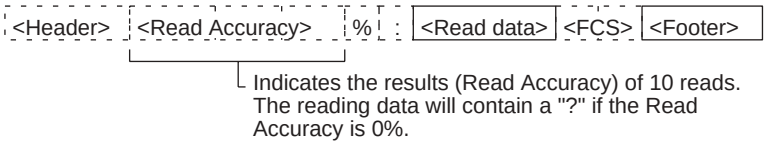
Output Formats for a 1:1 Connection

- Reading OK

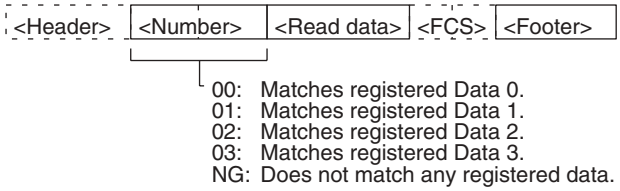


The data items in the dashed-lines can be included or omitted from the output format with settings in the communications specifications setting menu. → **page 199**

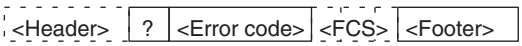
- Read Accuracy ON



- Judge Coincidence Function ON



- Reading NG



Output Formats for 1:N Connections

The output formats for 1:N connections are identical to those for 1:1 connections except that the unit number (00 to 31) is included after the header.



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4-3-2 Communications Mode: Host Link

Command Table

Command Code	Function	Page
10	One Shot Reading	page 85
11	Start Continuous Reading	page 85
12	Stop Continuous Reading	page 85
20	Switch to the Specified Scene Number	page 86
21	Increment the Current Scene Number by One	page 86
22	Decrement the Current Scene Number by One	page 86
23	Read the Current Scene Number	page 87

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.

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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
E200	Timeout error

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	
E200	Timeout error

- 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	

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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.

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- 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 "–."

Increment the Scene Number (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

Decrement the Scene Number (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

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Read the Current Scene Number (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)

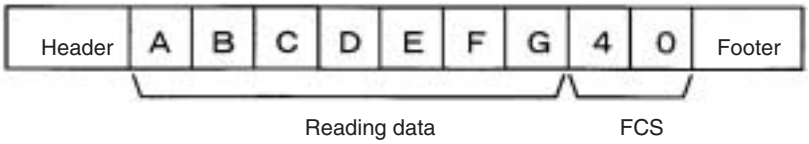
Write flag switches between [0 0 0 0] ←→ [1 1 1 1] each time data is output. Monitor the flag to confirm whether reading judgment has been written.

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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)*. → **page 265**

(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

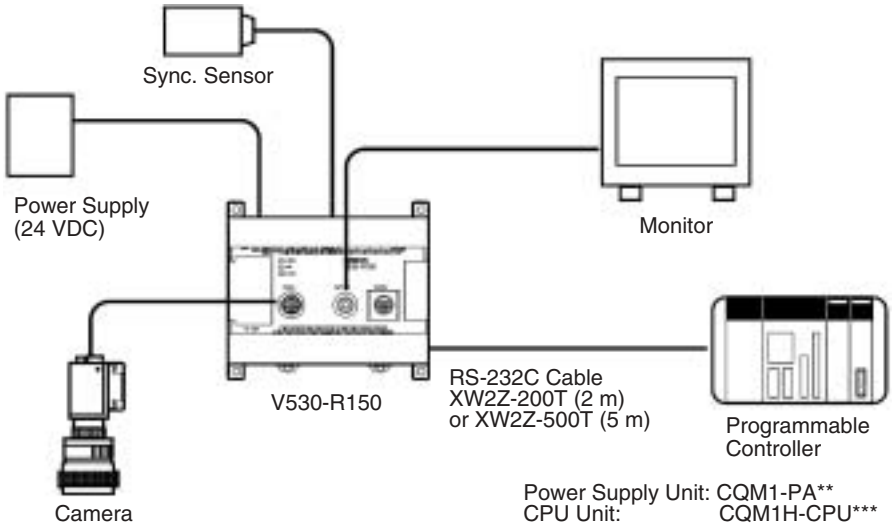
Converted into hexadecimal and used as ASCII codes.

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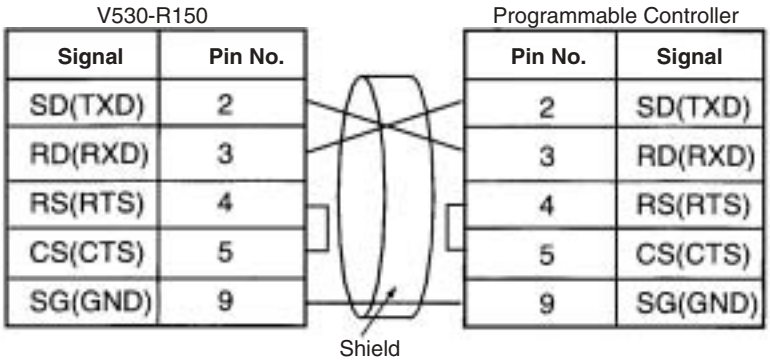
4-5 Connection Examples

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

System Configuration



Cable Wiring (XW2Z-200T (2 m) or XW2Z500T (5 m))



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Communication Settings

- V530-R150 → **page 194**

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

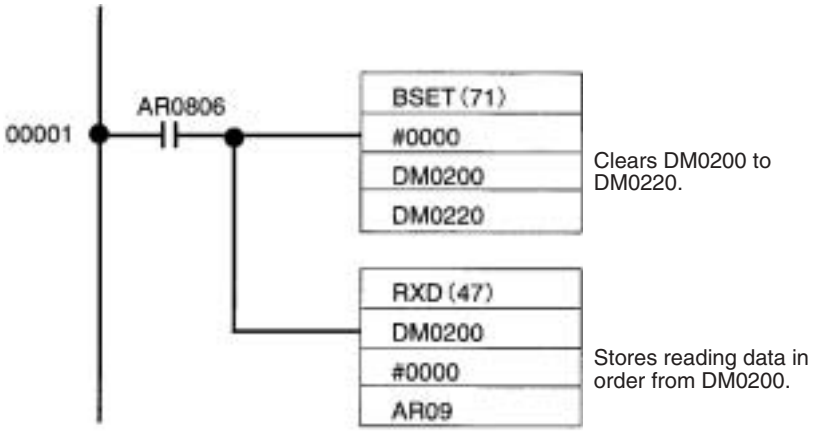
- Programmable Controller:
  Turn OFF the DIP switch of CQM1H.
  Set DM6645 to [1001], DM6646 to [0904], DM6648 to [1000] and DM6649 to [0D00].
  Match communication settings with the V530-R150. Refer to the operation manual for CQM1H for the ways to change the setting.

Program Examples

This is an example of a program in which a Programmable Controller (CQM1H) receives the data which is read at a V530-R150.

1,2,3...

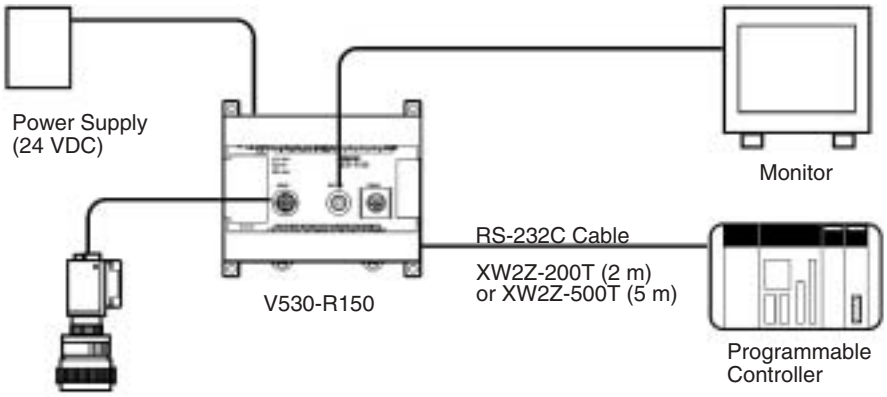
1. Set the reading conditions of the V530-R150 and set the reading mode to RUN mode.
2. The synchronous sensor or trigger input of the console sends the reading trigger to the V530-R150.
   → The V530-R150 reads the code and outputs data.
3. The data received from the CQM1H is saved in order from the highest digit in DM0200 from the first bit.



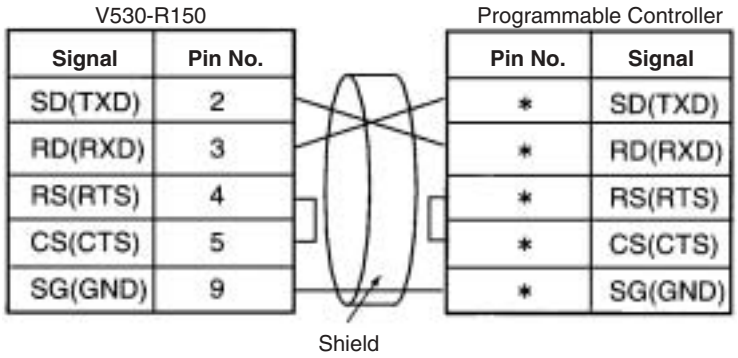
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4-5-2 PLC Connection Examples (Host Link)

System Configuration



Cable Wiring (XW2Z200T (2 m) or XW2Z500T (5 m))



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

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Communication Settings

- V530-R150 Settings → **page 194 and page 196**

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	DM
	Begin read word	0100
	Write area	DM
	Begin write word	0110

- Programmable Controller Settings

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	

Program Examples

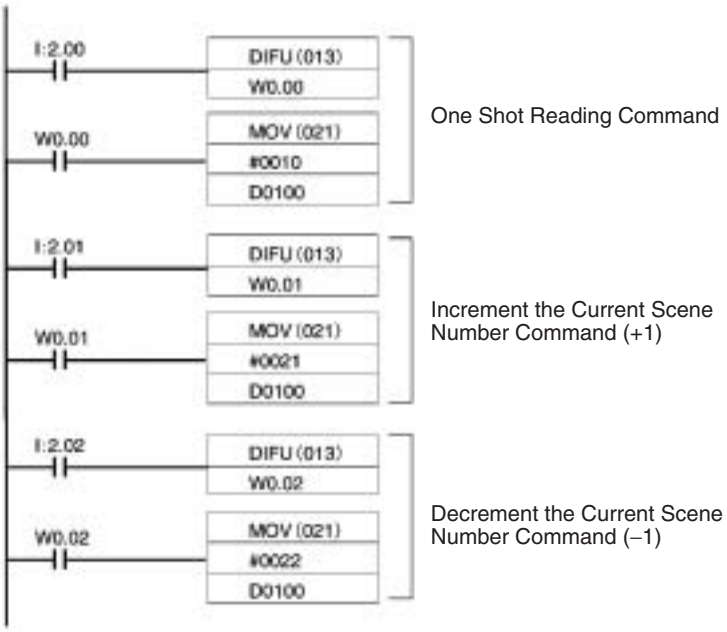
This program inputs a One Shot Reading Command to the Programmable Controller's DM. The V530-R150 references this command and reads the data. The reading data is written to the specified words in the Programmable Controller.

1,2,3...

1. Set the reading conditions of the V530-R150 and set the reading mode to RUN mode.
2. Set the Start Reading Command in DM0100 of the Programmable Controller.
   → The V530-R150 reads codes, sets the Write Flags in DM0110, and writes the reading data to DM words beginning with DM0111.

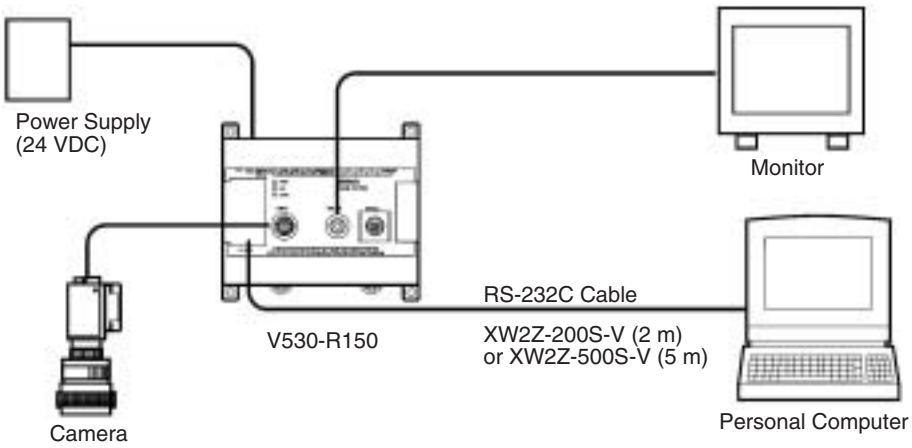
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3. Check whether or not data has been written by checking the status of the Write Flags in DM0110. Each time that data is written, the Write Flags are switched between “0000” and “1111”.



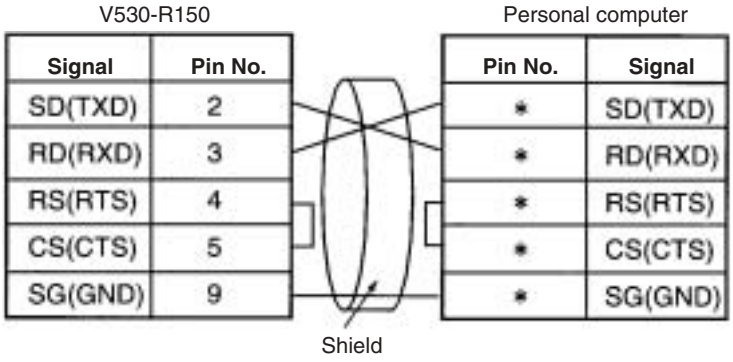
4-5-3 Computer Connection Examples (Normal)

System Configuration



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Cable Wiring (XW2Z-200S-V (2 m) or XW2Z-200S-V (5 m))



(*) 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***.
→ **page 194**

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 Multi-drop Connection Examples (Normal)

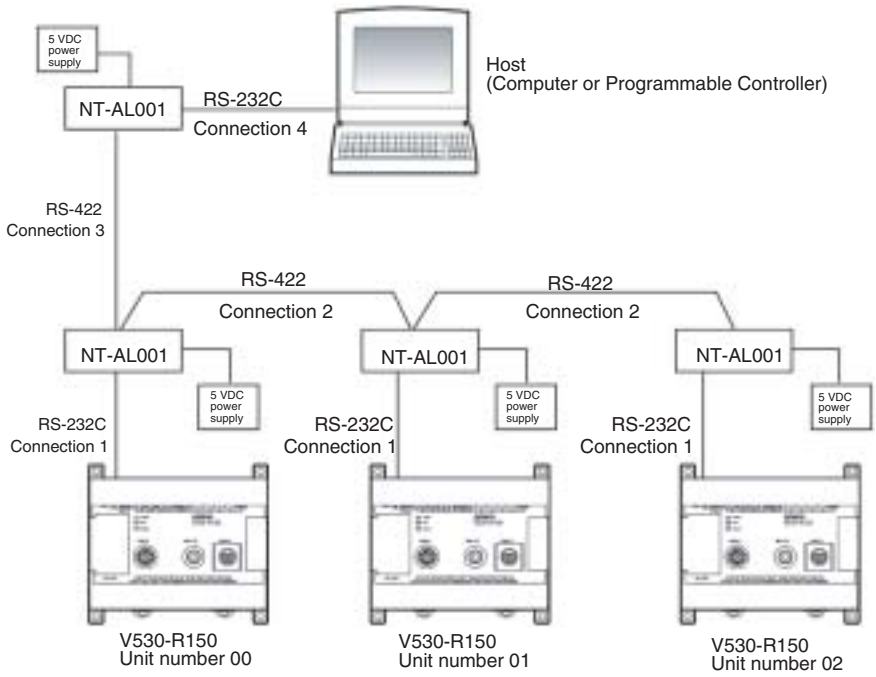
Details on the procedure for connecting an RS-232C/RS-422(485) converter and performing communications with several V530-R150s from one host (computer or Programmable Controller) are given here. Unit numbers 00 to 31 can be set for the V530-R150. All communications data between the host includes unit numbers, and commands will be ignored by V530-R150s whose unit numbers differ from those contained in the command data. Communications data formats for multi-drop 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.

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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 NT-AL001 that is connected to the host are different from the settings for the other NT-AL001s. Both settings are given in the following table.

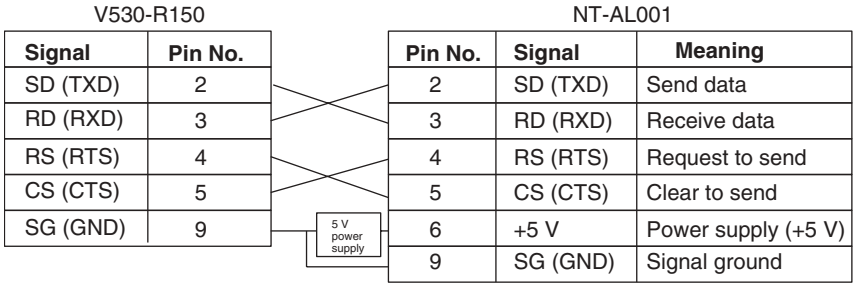
NT-AL001	Setting
NT-AL001 connected to the host	Pin 1: ON (always ON)
	Pin 2: ON (terminating resistance)
Other NT-AL001s (connected to the V530-R150s)	Pin 1: ON (always ON)
	Pin 6: ON (RS control)

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Cable Wiring

Connection 1

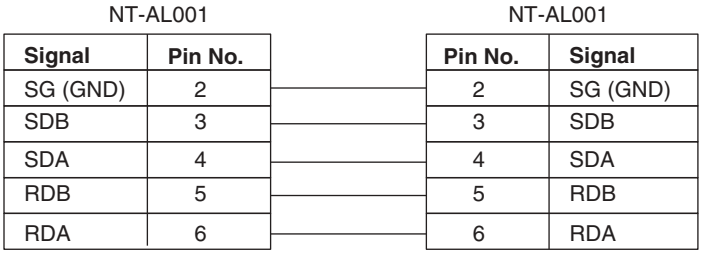
The wiring required between V530-R150s and NT-AL001s is shown below.



V530-R150		NT-AL001		
Signal	**Pin No.**	**Pin No.**	**Signal**	**Meaning**
SD (TXD)	2	2	SD (TXD)	Send data
RD (RXD)	3	3	RD (RXD)	Receive data
RS (RTS)	4	4	RS (RTS)	Request to send
CS (CTS)	5	5	CS (CTS)	Clear to send
SG (GND)	9	6	+5 V	Power supply (+5 V)
		9	SG (GND)	Signal ground

Connection 2

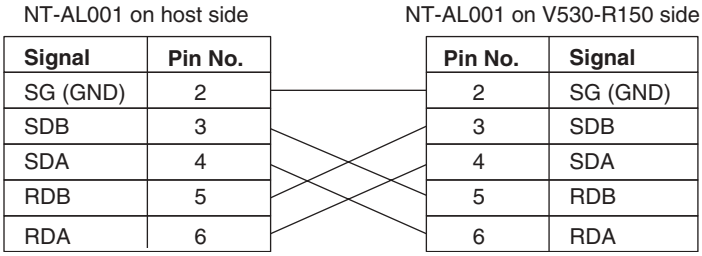
The wiring required between NT-AL001s is shown below.



NT-AL001		NT-AL001	
Signal	**Pin No.**	**Pin No.**	**Signal**
SG (GND)	2	2	SG (GND)
SDB	3	3	SDB
SDA	4	4	SDA
RDB	5	5	RDB
RDA	6	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.

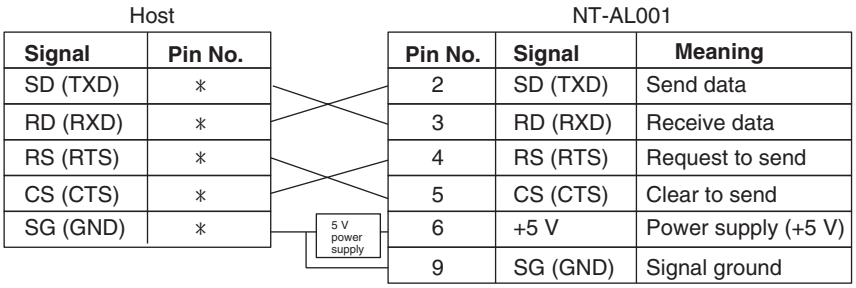


NT-AL001 on host side		NT-AL001 on V530-R150 side	
Signal	**Pin No.**	**Pin No.**	**Signal**
SG (GND)	2	2	SG (GND)
SDB	3	3	SDB
SDA	4	4	SDA
RDB	5	5	RDB
RDA	6	6	RDA

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Connection 4

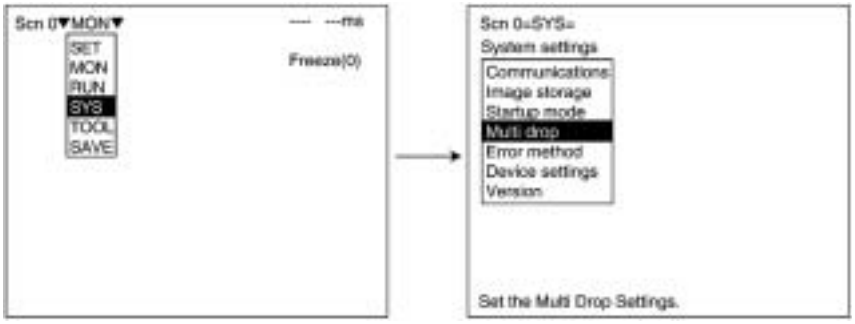
The wiring required between the host and the NT-AL001 is shown below.



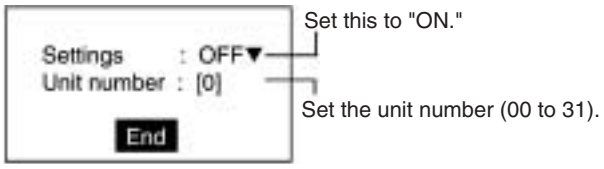
Signal	Pin No.		Pin No.	Signal	Meaning
SD (TXD)	*		2	SD (TXD)	Send data
RD (RXD)	*		3	RD (RXD)	Receive data
RS (RTS)	*		4	RS (RTS)	Request to send
CS (CTS)	*		5	CS (CTS)	Clear to send
SG (GND)	*		6	+5 V	Power supply (+5 V)
			9	SG (GND)	Signal ground

V530-R150 Settings

1,2,3... 1. Go into system mode and select ***Multi drop***.



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



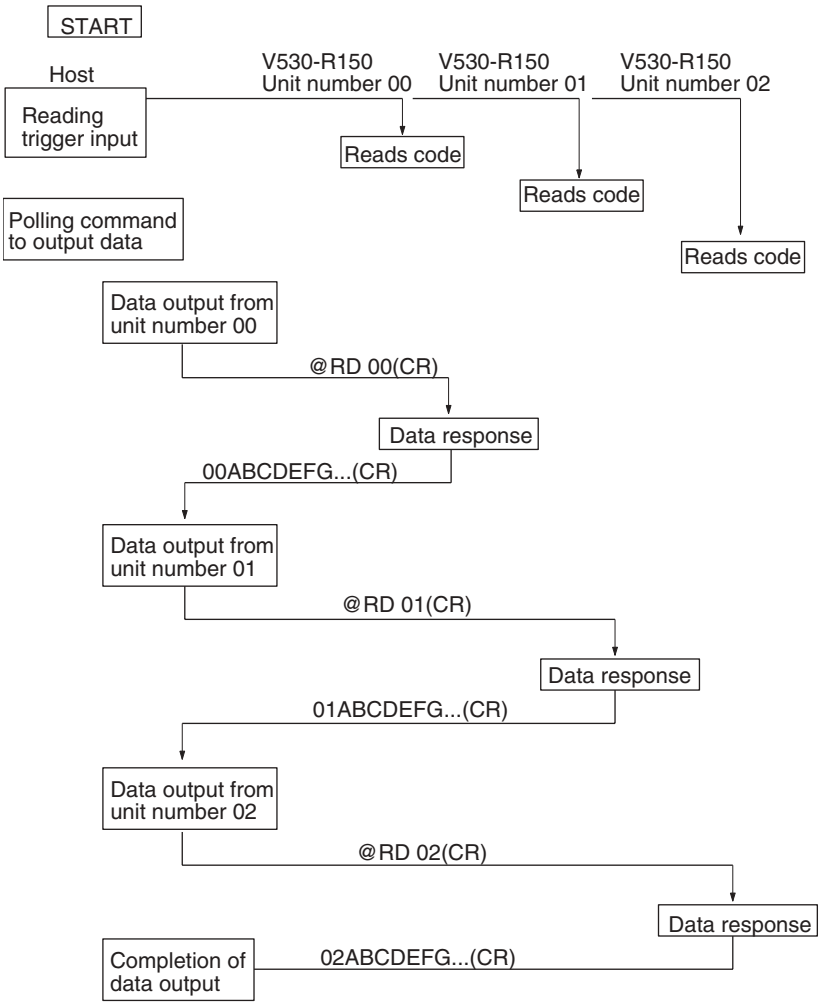
3. Select ***End***.

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.

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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.



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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*.

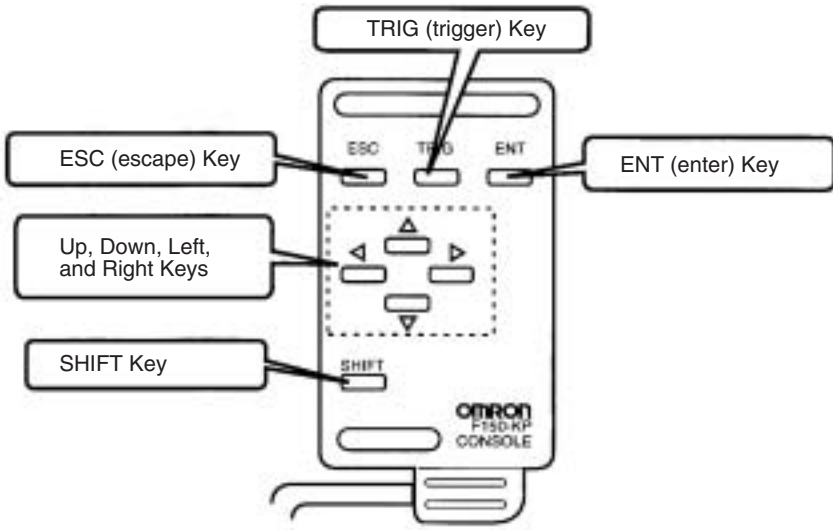
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5-3 STEP 2 Setting Reading Conditions 104
5-4 STEP 3 Checking Reading. 112
5-5 STEP 4 Starting Code Reading 114
5-6 STEP 5 Quitting 115

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5-1 Menu Operations

Console

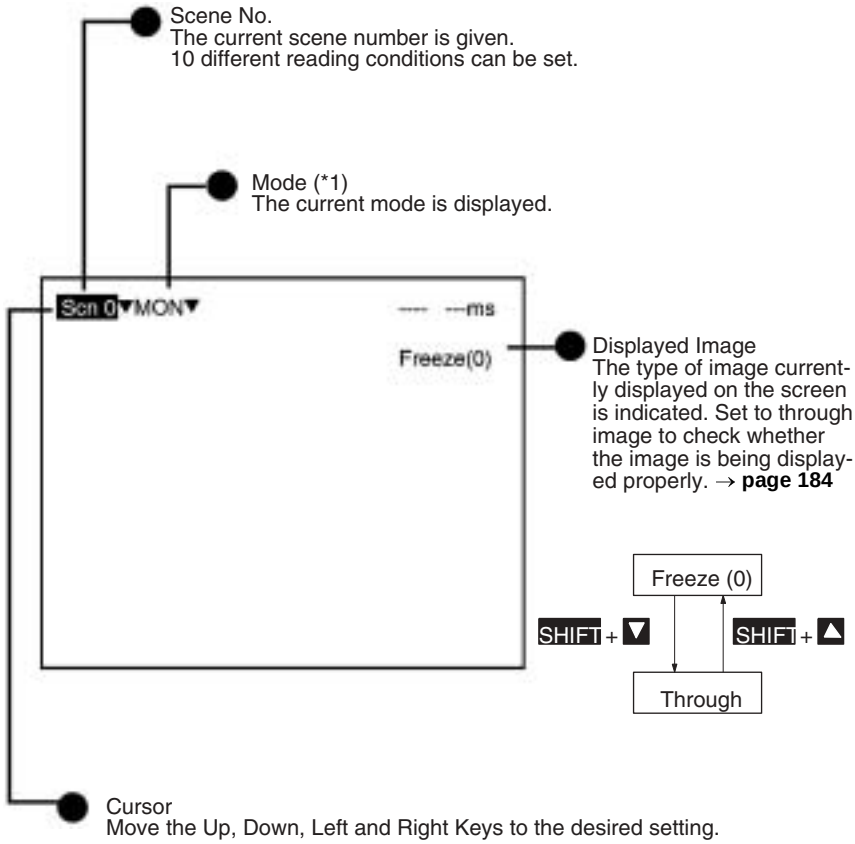
The Console is used to perform menu operations. Be sure to familiarize yourself with Console operations before actually using the menus.



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.

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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 via RS-232C or the terminal block.
SYS (System)	Used to set system conditions such as communications specifications.
TOOL (Tool)	Used to back up setting data or image data to a computer.
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.

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5-2 STEP 1 Starting

Procedure

1,2,3...

1. Be sure that the basic system components have been connected correctly. → **page 13**
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.

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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. → **page 18, page 20, page 23**



Startup Mode

The V530-R150 is equipped with a “startup mode” function that sets the startup scene number and mode (SET, RUN, or MON) that will be displayed when the power is turned ON. If the V530-R150 starts in MON (monitor) mode, codes can be read immediately with trigger inputs so the daily startup of operation will be easier and more efficient. → **page 204**

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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.

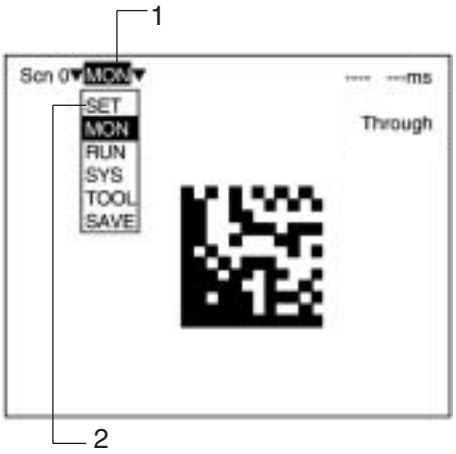
Note This section only describes the functions necessary for basic operations. Many other functions are available and these functions are described in *SECTION 6 Functions and Operations*.

Procedure

1,2,3...

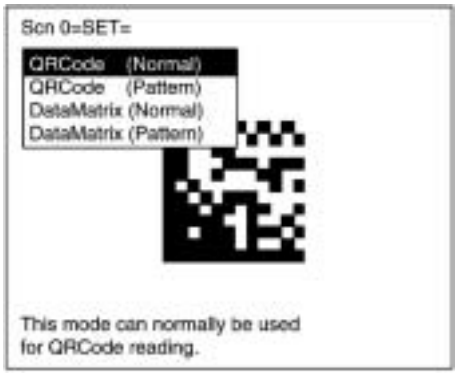
1. Move the cursor to ***MON*** (monitor) using the Right Key and press the ENT Key.

   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.



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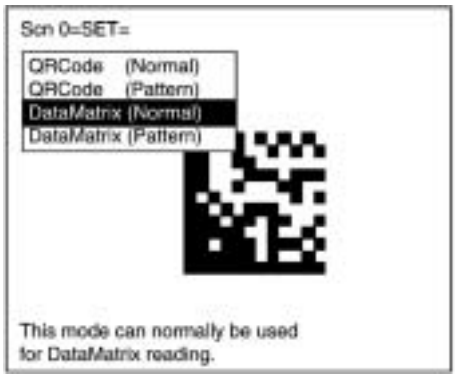
When using Data Matrix Reading, proceed to *Data Matrix Reading* below.

When using QR Code Reading, proceed to *QR Code Reading* on page 108.

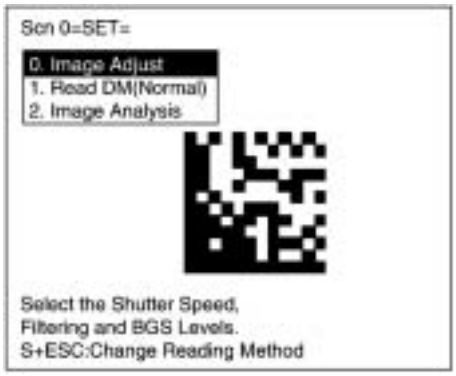
Data Matrix Reading

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.

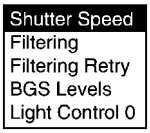
3 Select ***DataMatrix (Normal)***. The following screen will be displayed.



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



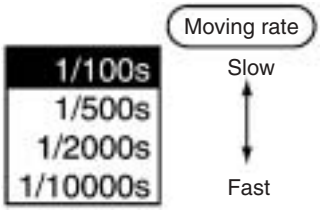
5 Select ***Shutter Speed***.



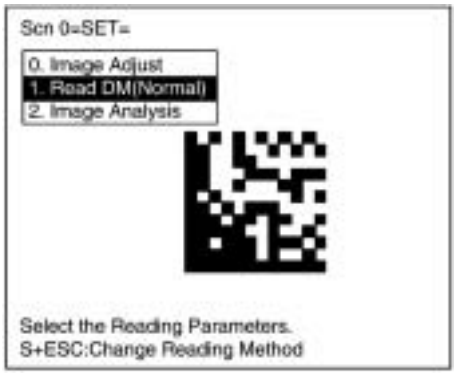
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6 Select the shutter speed according to the movement of the reading object.

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 4.



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



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



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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.



Matrix size	ECC
10×10 to 64×64 8×18 to 16×48	For ECC200
9×9 to 25×25	For ECC000 through ECC140

The ECC is set automatically when the matrix size is selected.

10 Press the ESC Key once to go back to the window shown in step 7.

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



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

Parameters are set based on the data obtained with this reading.



The obtained parameters are displayed. These parameters are registered as reading conditions.

In RUN mode, only the read data (ABCDE12345 in this example) is output to RS-232C.

Note The parameters are registered based on the first data that is read. If reading is performed successfully, the teaching function will automatically turn OFF. To repeat the teaching 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)***. → **page 139**

If the results of the read is NG, the teaching function will remain ON. To turn it OFF, go to the screen shown in step 8, select ***Reading Settings (Manual)***, and press the ENT Key. The teaching function will turn OFF when the screen for manual reading of settings is entered.

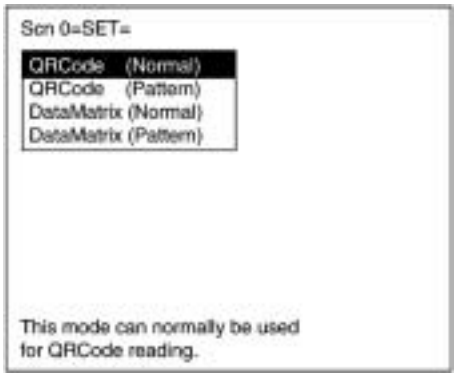
13 This completes the settings.

QR Code Reading

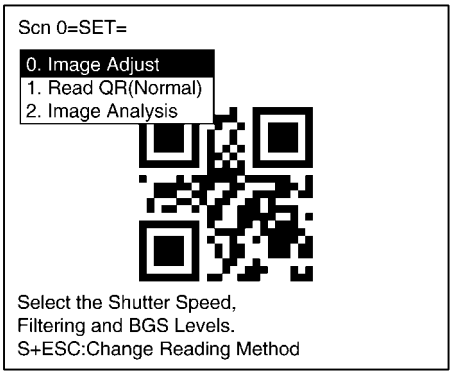
Select the required shutter speed and symbol color. The other reading conditions can be set using the teaching function. Using the teaching function, a reading is performed on the reading object and, based on this, parameters are set automatically.

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



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



5. Select ***Shutter Speed***.

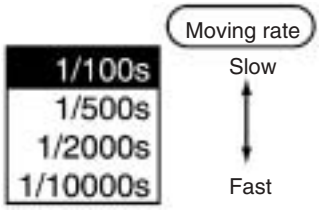


6. Select the shutter speed according to the movement of the reading object.

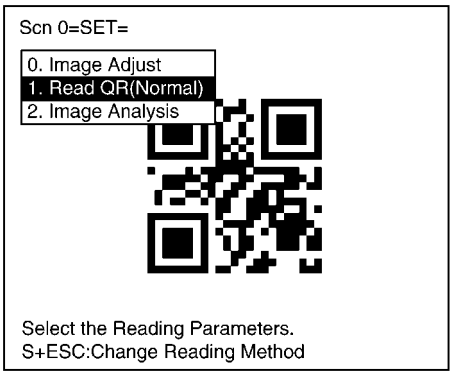
   Press the ENT Key to set the shutter speed. The display will return to the window shown in step 5.

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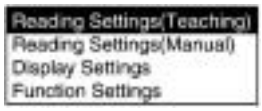
Press the ESC Key once to go back to the window shown in step 4.



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.

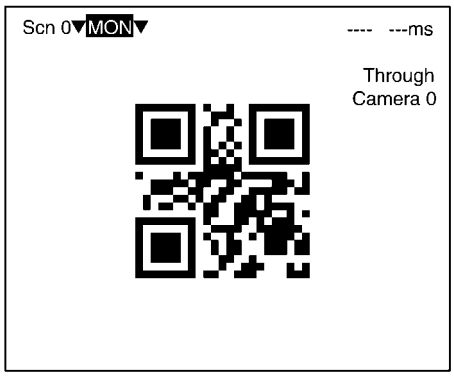


White: White symbol printed on black base.

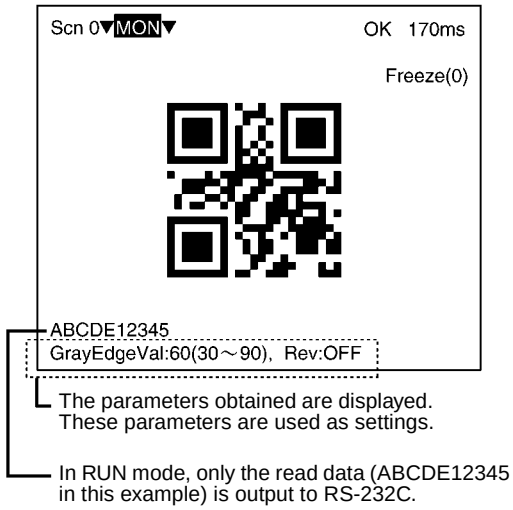


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10. Press the ESC Key once to go back to the window shown in step 7.
11. Press the ESC Key once more to return to MON (monitor) mode.



12. Press the TRIG Key on the Console to perform one reading.
    Parameters are set based on the data obtained with this reading.



Note If reading is performed successfully, the teaching function will automatically turn OFF. To repeat the teaching 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)***. → **page 161**

If reading is not performed correctly, the teaching function will stay ON. To turn the teaching function OFF, select ***Reading Settings***

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(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.

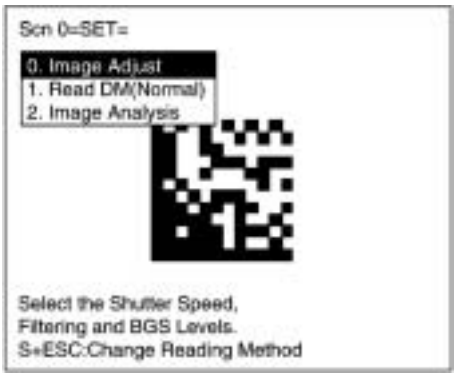
5-4 STEP 3 Checking Reading

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

1,2,3...

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



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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 on troubleshooting when reading is not performed correctly, refer to *9-1 Improving Reading*. → **page 248**

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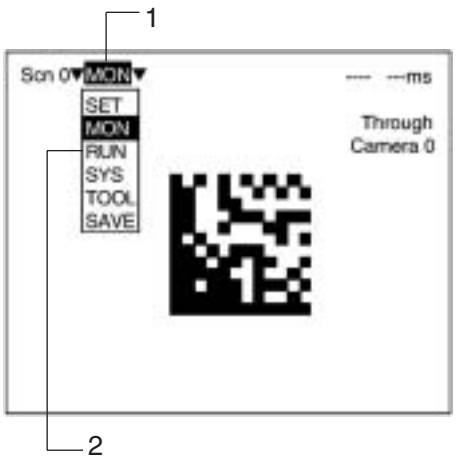
5-5 STEP 4 Starting Code Reading

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

Procedure

1,2,3...

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.



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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. → **page 213**

Procedure

1,2,3...

1. Basic screen is displayed.

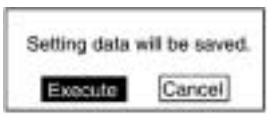


2. Select ***MON*** (monitor) and press the ENT Key.



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.



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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.

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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.

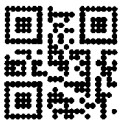
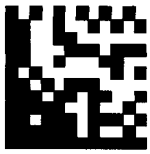
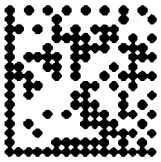
6-1 SET (Setting) Mode 118
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6-1 SET (Setting) Mode

6-1-1 Menu Registration

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

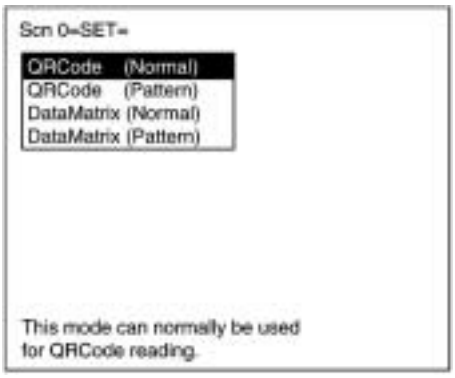
Menu	Contents
QR Code (Normal)	This mode can normally be used for QR Code reading. 
QR Code (Pattern)	Try this mode when reading codes of poor marking quality or codes made up of dots, or any other codes for which stable reading is not possible. Images of finder patterns (the symbols in 3 of the corners) are registered as the model, and the position of codes is determined by searching for these images.  **Note** The code can be read as long as the image is not at an angle of more than ±10° from the registered model.
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 as the model, and the position of codes is determined by searching for this image.  **Note 1:** The code can be registered as the model in any of four directions (0°, 90°, 180°, or 270°). The code can be read as long as the image is not at an angle of more than ±10° from the registered model. **Note 2:** 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 cells around the code.

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Procedure

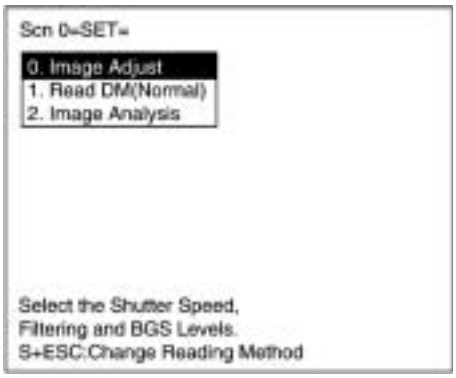
1,2,3... 1. Enter the ***SET*** mode.

The following items will be displayed.



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

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



The initial screen for the selected menu will be displayed.

Note Press the SHIFT + ESC Keys to return to the screen in step 1.

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6-1-2 Using a Two-camera Unit

When a Two-camera Unit will be used, change the settings in the ***SYS/Device settings*** menu in advance.
→ **page 210**

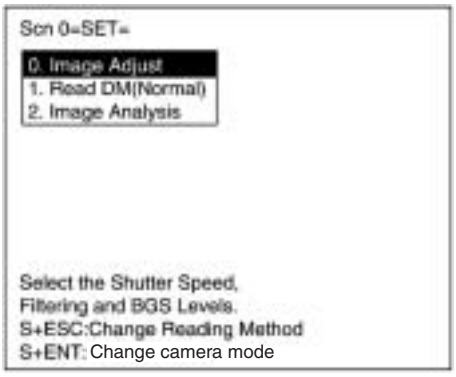
Procedure

1,2,3...

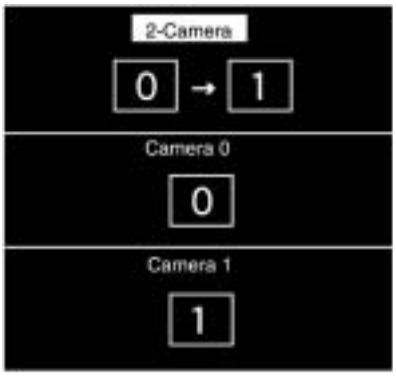
1. Press the SHIFT + ENT Keys while the menu's initial screen is displayed.

   The SHIFT + ENT input will not be received if the Camera Unit has not been set to "F150-A20" in the ***SYS/Device settings*** menu.

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



2. Use the Up/Down Keys to select the desired camera mode and press ENT.



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Camera Mode

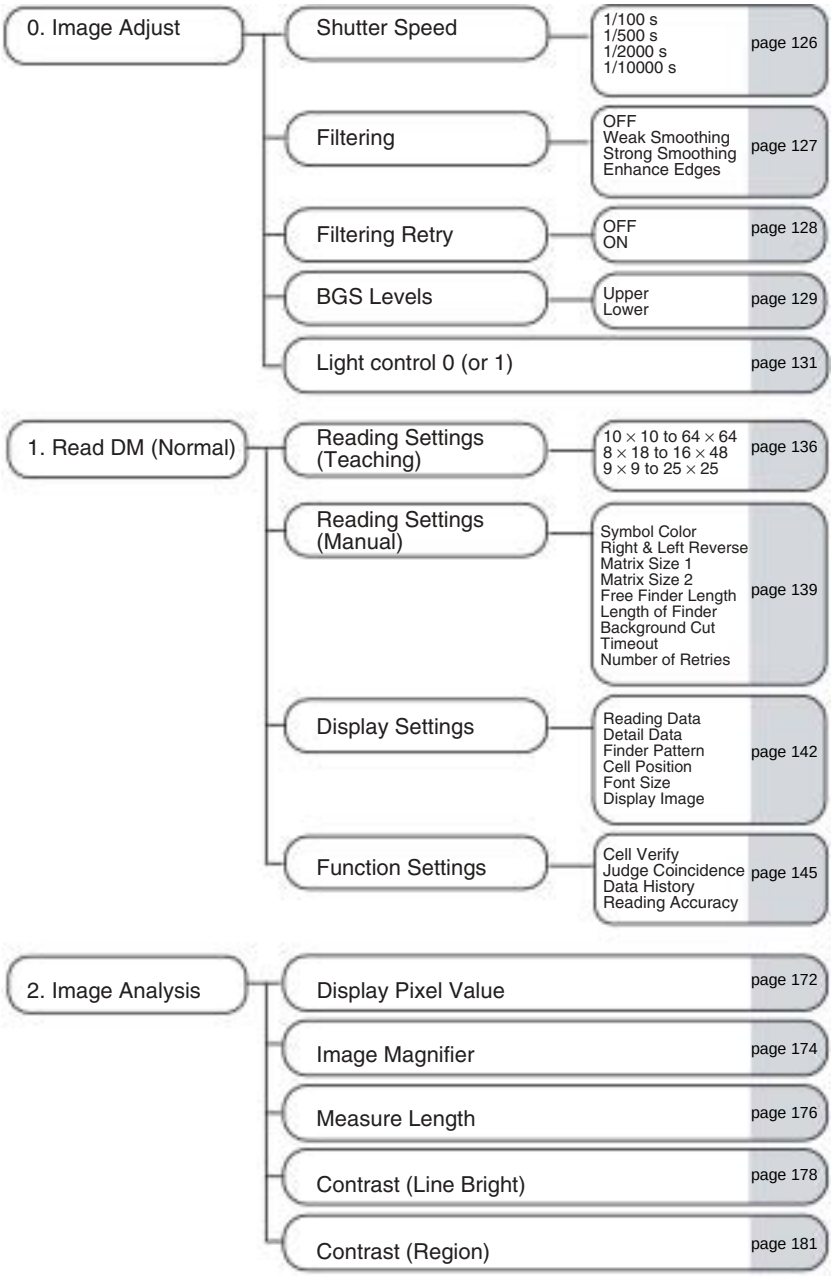
Camera mode	Screen image	Explanation
Two-camera switching		The images from the two cameras are input at the same time with each trigger input. The image from camera 0 is read first. If the code is not read in camera 0's image, camera 1's image is read. Both cameras' fields of vision are used, so this camera mode is appropriate when reading codes that are difficult to position.
Camera 0		The image from camera 0 is input and read with each trigger input. The image from camera 1 will not be input, even if camera 1 is connected.
Camera 1		The image from camera 1 is input and read with each trigger input. The image from camera 0 will not be input, even if camera 0 is connected.

6-1-3 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 table.

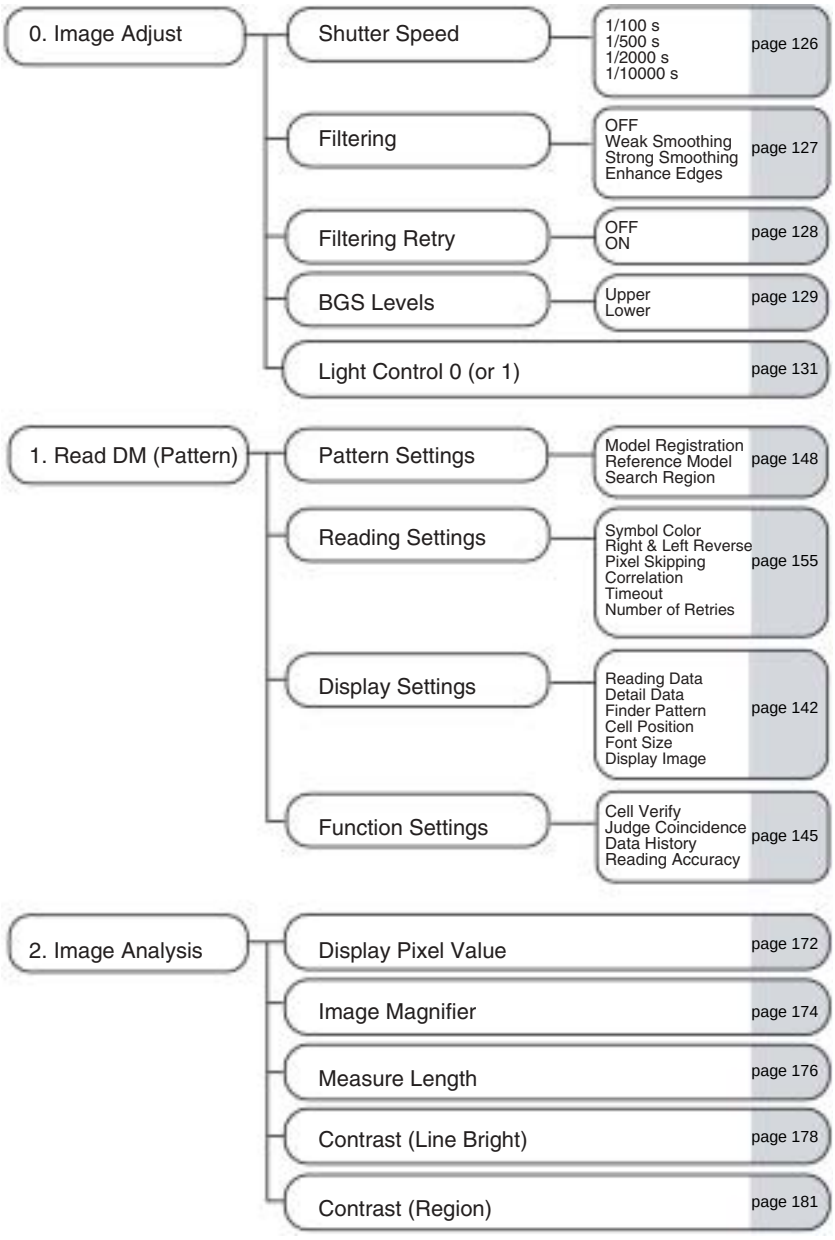
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Data Matrix Code Reading in Normal Mode



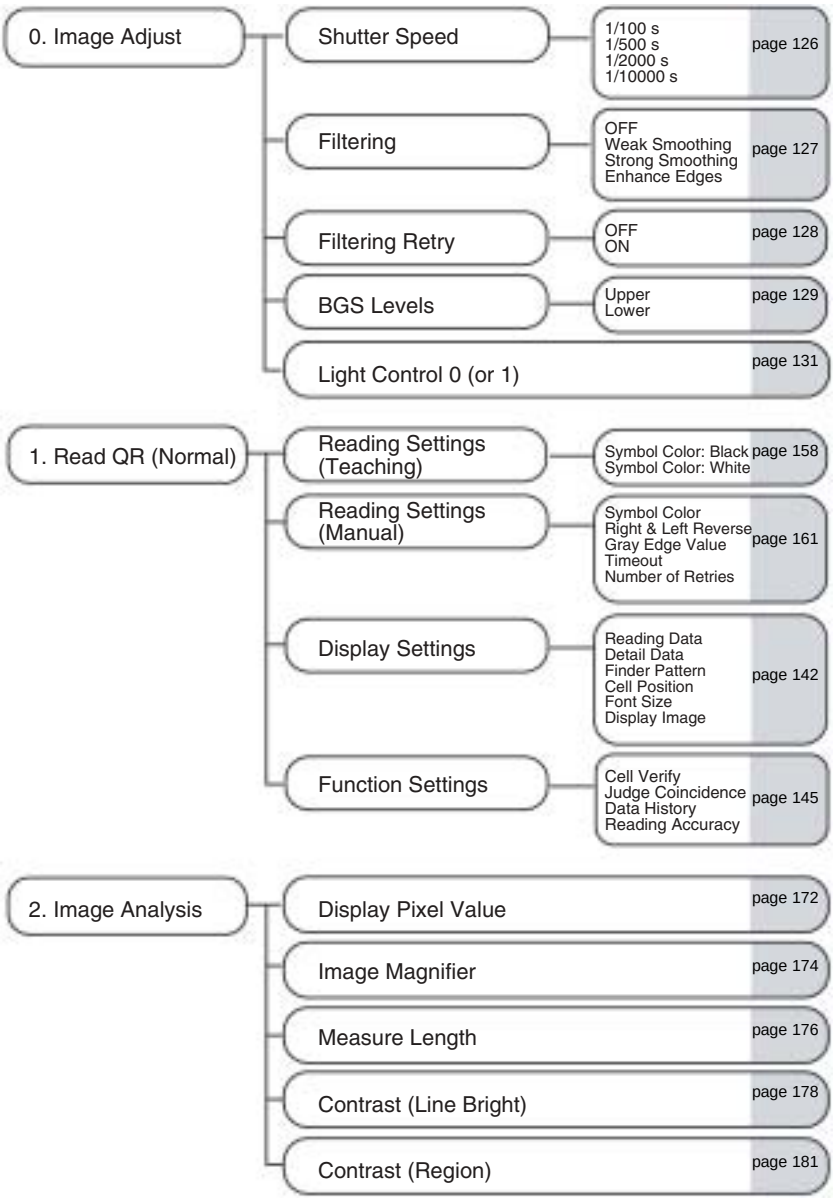
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Data Matrix Code Reading in Pattern Mode



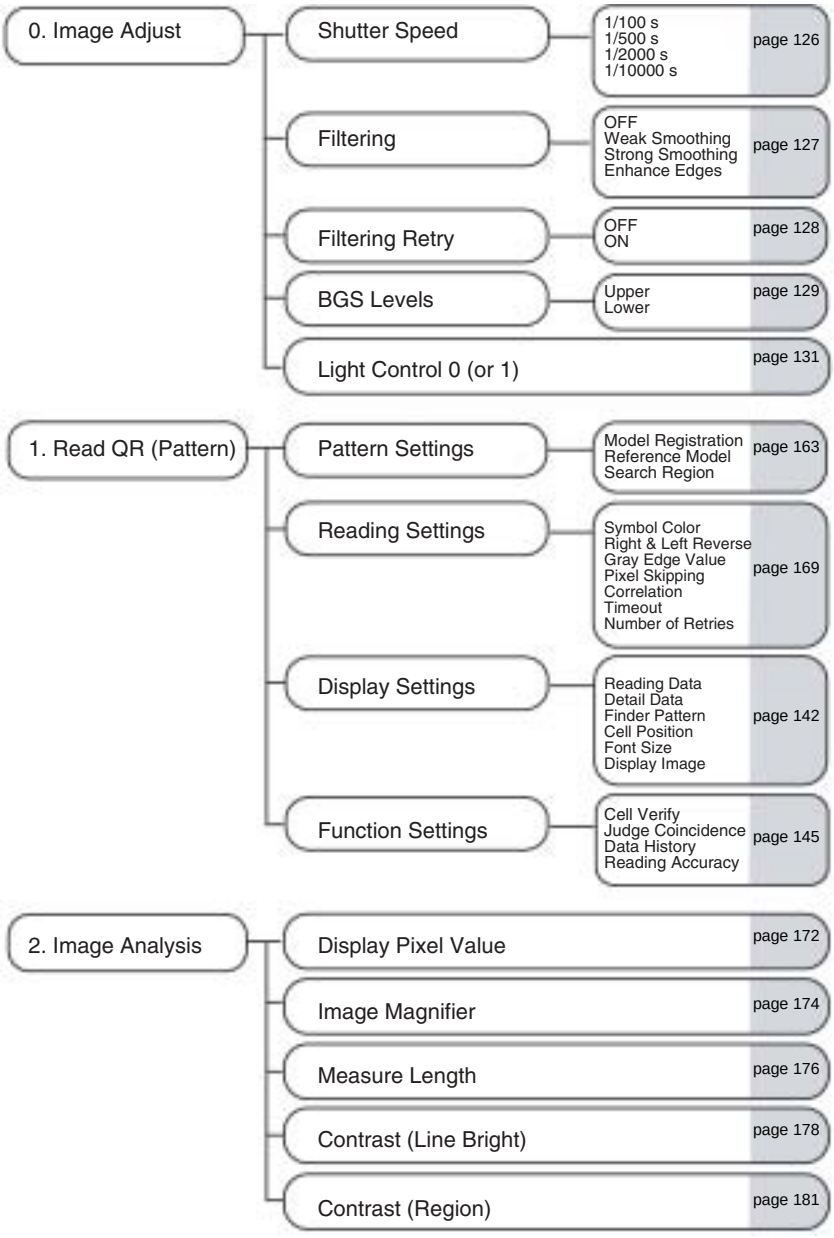
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QR Code Reading in Normal Mode



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QR Code Reading in Pattern Mode



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6-1-4 Image Adjust

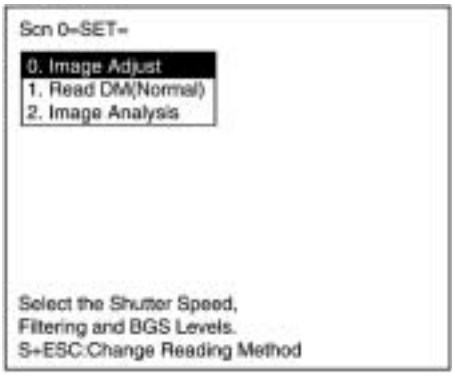
0. Image Adjust — **Shutter Speed**

The shutter speed can be adjusted to a value appropriate for the speed of the objects with the codes.

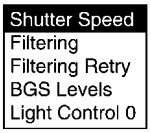
Procedure

1,2,3...

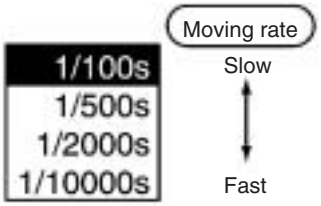
1. Select ***0. Image Adjust***.



2. Select ***Shutter Speed***.



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



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0. Image Adjust — **Filtering**

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

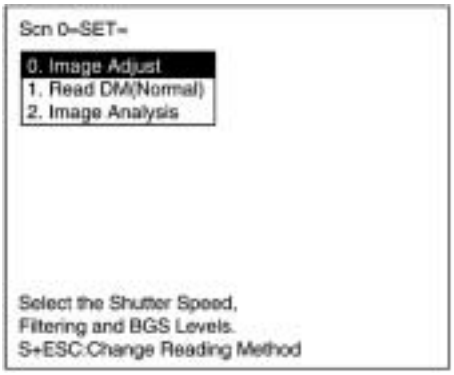
Filtering selection	Function
OFF	No filtering is performed.
Smoothing	The effects of noise are suppressed to produce a smooth image. The strength of the smoothing can be selected (strong or weak).
Enhance Edges	Borders between light and dark areas are enhanced.

Note It is recommended that ***Weak Smoothing*** be selected as the filtering method to eliminate noise effects. Turn ON the ***Filtering Retry*** setting to read codes made up of dots more effectively.

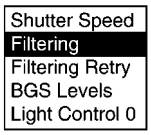
Procedure

1,2,3...

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



2. Select ***Filtering***.



3. Select an appropriate filtering method while viewing the image.
   Press the ENT Key to validate the setting.



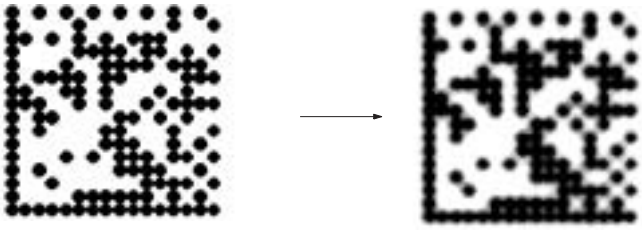
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0. Image Adjust — **Filtering Retry**

If this setting is turned ON, the filtering process selected with ***Image Adjust/Filtering*** 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.

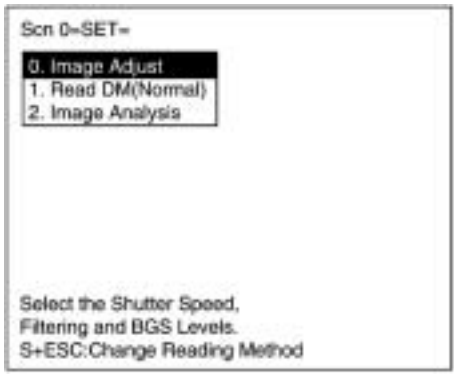
Note This setting has no effect If filtering has been disabled by selecting "OFF" for the ***Image Adjust/Filtering*** setting.
→ **page 127**

Example: Image obtained when smoothing is performed twice.

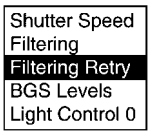


Procedure

1,2,3... 1. Select ***0. Image Adjust***.



2. Select ***Filtering Retry***.



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



0. Image Adjust — **BGS Levels**

Densities lower than the set lower limit will be converted to 0 (i.e., areas with densities lower than that value 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

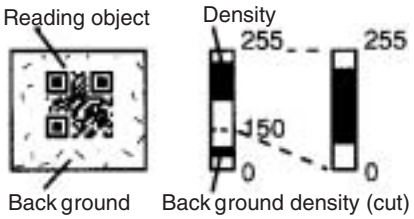
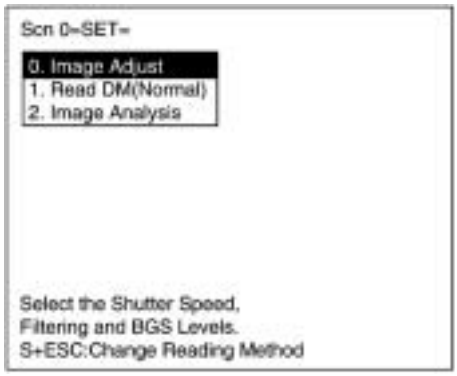


Image areas with densities of 149 or lower will not be read and the density will be changed to 0.

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

Procedure

1,2,3... 1. Select ***0. Image Adjust***.



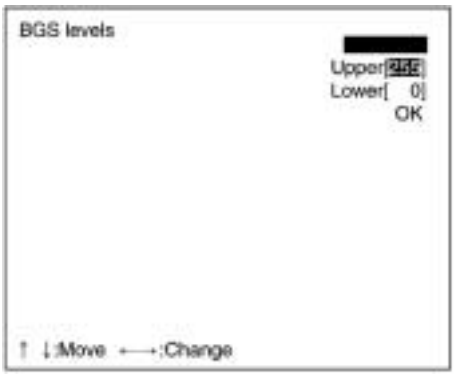
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2. Select ***BGS Levels***.



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.

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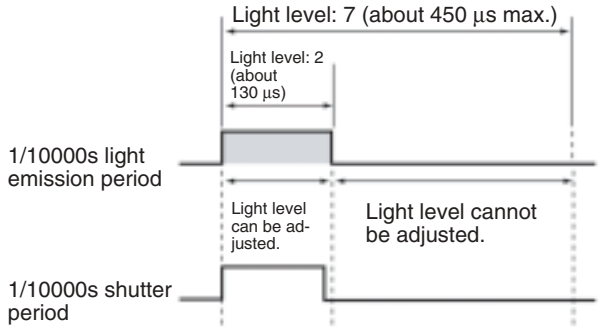
0. Image Adjust — **Light Control 0 (or 1)**

When a Camera with an Intelligent Light Source is connected, the light level can be adjusted from the V530-R150.

Light Control 0 is the lighting for Camera 0 and Light Control 1 is the lighting for Camera 1. Change the settings in the ***SYS/Device settings*** menu in advance to indicate that an Intelligent Light Source is being used. → **page 210**

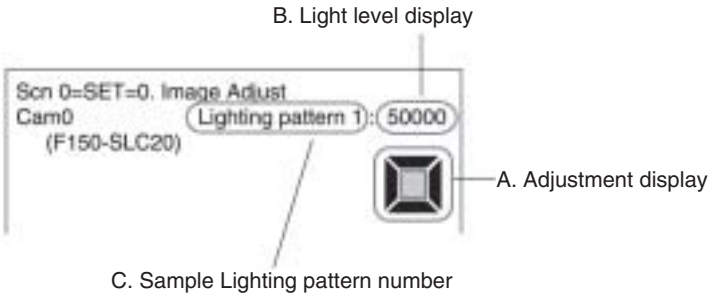
Note When the shutter speed is 1/10000s, the brightness of the light might not change even when the light level is adjusted. Synchronize pulse flashes from the Intelligent Light Source with the shutter speed and adjust the pulse width to control the light level.

When the shutter speed is 1/2000s, the light pulse width is 450 μs and the light level can be adjusted to a maximum value of 7.
When the shutter speed is at the fastest 1/10000s setting, the light pulse width is 130 μs so the light level can be adjusted up to 2. Any settings higher than 2 are ineffective. (The light level will not change with higher settings.)

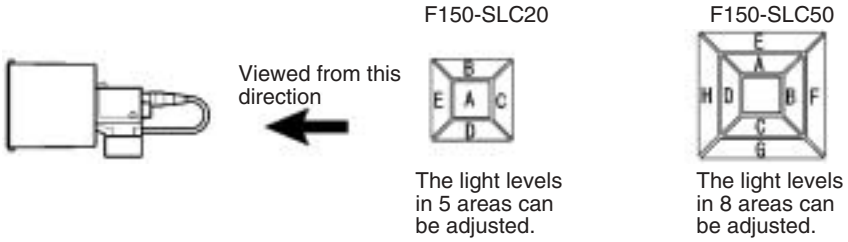


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Intelligent Lighting Adjustment Screen



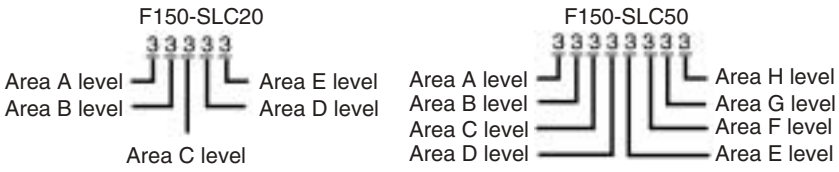
A. Adjustment Display



Note The measurement location is displayed in a bold box and the brightness varies depending on the light level settings.
→ **page 133**

Light Level Display

The light level setting for each area is shown in a separate digit of the 5-digit or 8-digit number. The light level settings range from 0 to 7; a value of 0 is OFF and 7 is the maximum brightness.



C. Sample Lighting Patterns

There are 15 sample lighting patterns registered. One of these sample patterns can be used or custom pattern can be created by setting the light level for each area.

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Method 1: Using a Sample Lighting Pattern

There are 15 sample lighting patterns registered, so the best lighting pattern can be selected just by switching through the pattern numbers and determining which pattern gives the sharpest image. The sample pattern number can be switched by pressing the SHIFT Key together with the Left or Right Key.

■: Lit (maximum light level)
□: Not lit

F150-SLC20

Pattern	Light levels	Pattern	Light levels	Pattern	Light levels
1	50000 	6	00707 	11	00007 
2	03333 	7	22727 	12	51111 
3	07777 	8	07000 	13	52222 
4	07070 	9	00700 	14	17777 
5	27272 	10	00070 	15	27777 

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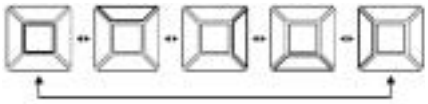
F150-SLC50

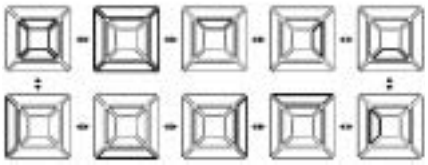
Pattern	Light levels	Pattern	Light levels	Pattern	Light levels
1	77777777 	6	70707070 	11	00070000 
2	44440000 	7	07070707 	12	00007000 
3	77770000 	8	70000000 	13	00000700 
4	00004444 	9	07000000 	14	00000070 
5	00007777 	10	00700000 	15	00000007 

Method 2: Adjusting Light Levels Individually

The light level for each area can be set independently between 0 and 7. (0 is OFF and 7 is the brightest.) After selecting one of the sample patterns, the light level in each area can be fine-tuned if necessary. Select the desired area with the Left/Right Keys and adjust the area's light level with the Up/Down Keys.

The following diagrams show the order in which the areas are selected with the Left/Right Keys.

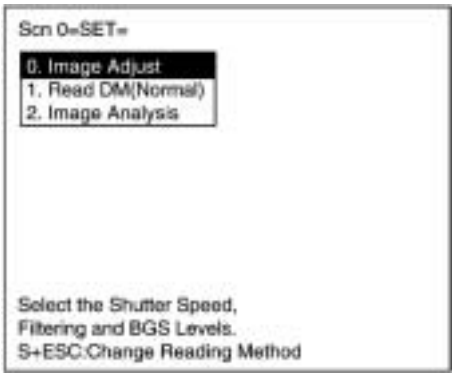
F150-SLC20 

F150-SLC50 

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Procedure

1,2,3... 1. Select ***0. Image Adjust***.



2. Select ***Light Control 0*** (or ***1***).

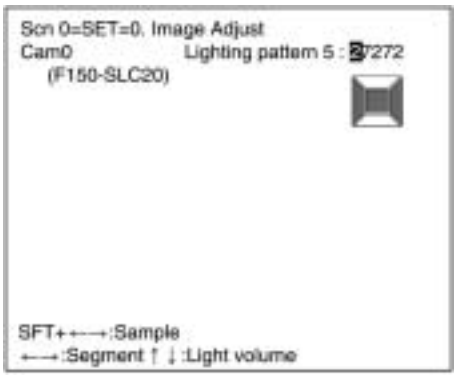


3. Change the light level settings.

   Press the SHIFT Key together with the Left or Right Key to select the desired lighting pattern.

   Press the Left/Right Keys to select the lighting area to be adjusted.

   Press the Up/Down Keys to adjust the area's light level.



4. Press the ENT Key to validate the setting.

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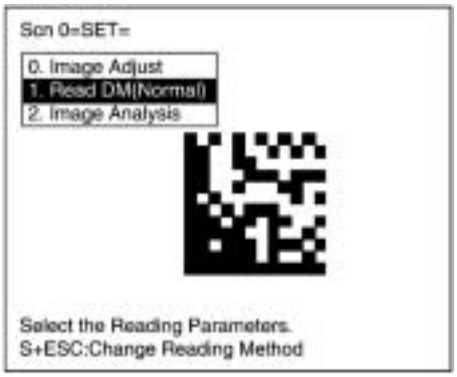
6-1-5 Read DM (Normal)

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

1,2,3... 1. Select ***Read DM (Normal)***.



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



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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.



Code size	ECC
10 x 10 to 64 x 64 8 x 18 to 16 x 48	ECC200
9 x 9 to 25 x 25	ECC000 to ECC140

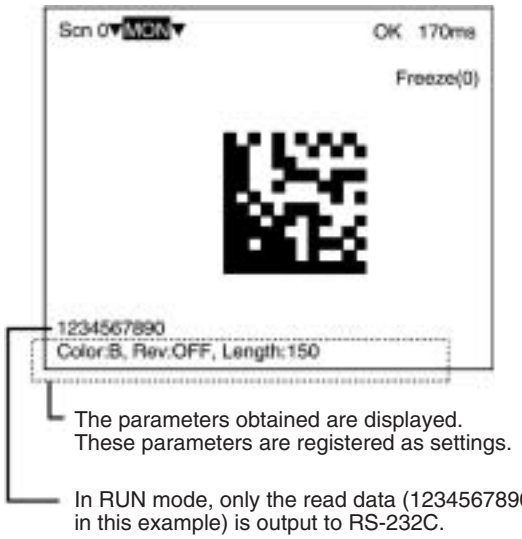
   The ECC will be set automatically when the matrix size is selected.

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.



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



Note 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)***. → **page 139**

If reading is not performed correctly (NG), 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.

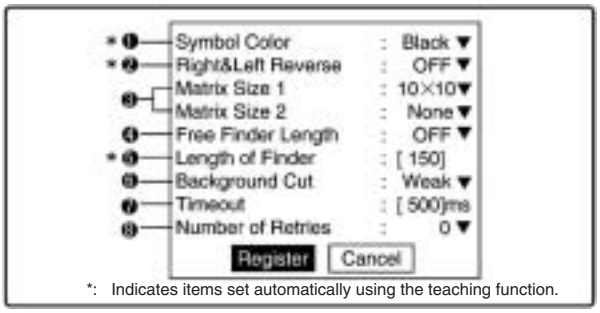
Note If the teaching operation is not successful, measure the length of finder pattern using ***Image Analysis/Measure Length*** and set this value for length of the finder pattern in ***Reading Settings (Manual)***, and then repeat the teaching operation.

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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 as long as or longer than the value set as the "Length of Finder" will be detected and reading performed.



1,2,3... 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.

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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. The processing time is longer with the Auto setting than it is with the ON and OFF settings.

3. Select the matrix size. It is possible to set 1 or 2 matrix sizes.

10 x 10 to 64 x 64 8 x 18 to 16 x 48	ECC200
9 x 9 to 25 x 25	ECC000 to ECC140
None (Can be set for matrix size 2 only.)	Use this setting when there is only 1 type of code being read.

(Default setting: Matrix size 1: 10 x 10, Matrix size 2: None)

4. Use Free Finder Length when there are several different sizes of reading codes, with large differences in the length of the finder patterns.

ON	Finder patterns as long or longer than the value set for the length of the finder pattern (step 6) will be detected and reading performed.
OFF (Default setting)	Use this setting when the matrix size and the length of the finder pattern are a fixed size.

5. 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. → **page 136**
When Free Finder Length (step 4) is set to ON, set the minimum length of the reading codes as the value of the length of the finder pattern.
6. 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.)
7. Set the timeout time for decode processing of a single image read. (Setting range: 200 to 2,000 ms; Default setting: 500 ms.)

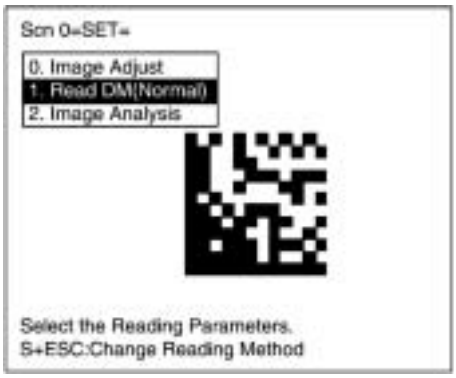
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8. Select the number of retries to be made if the reading is NG. (0 to 9; Default setting: 0.) Reading will be executed for the specified number of retries.

Normal Procedure

1,2,3...

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.

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6-1-6 Display Settings

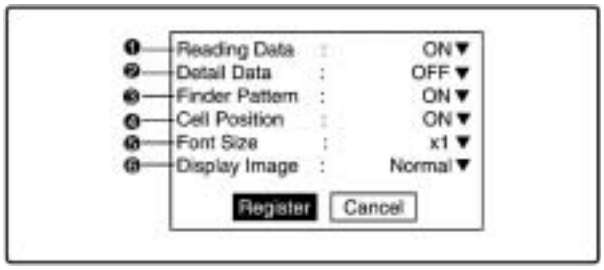
1. Read QR (Normal) — **Display Settings**

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.



❶ Specifies whether or not to display reading data on the screen.

ON (default)	Display the reading data.
OFF	Do not display the reading data.

❷ Specifies whether or not to display the code's detailed data on the screen.

ON	Detailed data about the code will be displayed such as the number of pixels per cell.
OFF (default)	Do not display detailed data.

❸ Specifies whether or not to display the Finder Pattern position on the screen.

ON (default)	A cross cursor will be displayed at the Finder Pattern position.
OFF	Do not display the Finder Pattern position.

Note When the ***Function Settings/Cell Verify*** setting is set to ***Verify***, that setting takes precedence and this Finder Pattern position setting is invalid.

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❹ Specifies whether or not to display the Cell Position on the screen.

ON (default)	A cross cursor will be displayed at the position identified as the cell.
OFF	Do not display the cell's position.

Note When the ***Function Settings/Cell Verify*** setting is set to ***Verify***, that setting takes precedence and this Cell Verify position setting is invalid.

❺ Specifies the font size that will be used when reading data is displayed on the screen.

×1 (default)	The data will be displayed in the standard font size.
×4	The data will be displayed in a font size that is 4× larger than the standard size, unless there are more than 64 characters. If there are more than 64 characters, the data will be displayed in the standard font size even if this setting is set to ×4. (The Read Accuracy and Data History information will be displayed in ×4 font size if they are being displayed.)

Note Data other than the reading data (such as the detail data) are not affected by this setting and will always be displayed in the standard font size.

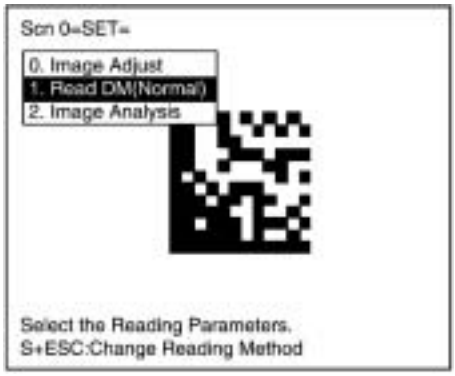
❻ Specifies the type of image that will be displayed on the screen.

Normal (default)	Displays the image read from the camera.
Binary	Displays a binary image with the threshold value used for decoding as the threshold value. This display can be used to check which white parts and black parts of the code that the V530-R150 identified in the image read from the Camera.

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Procedure

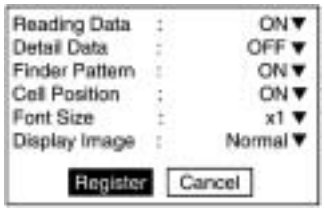
1,2,3... 1. Select ***Read*****.



2. Select ***Display Settings***.



3. Set the items as required.



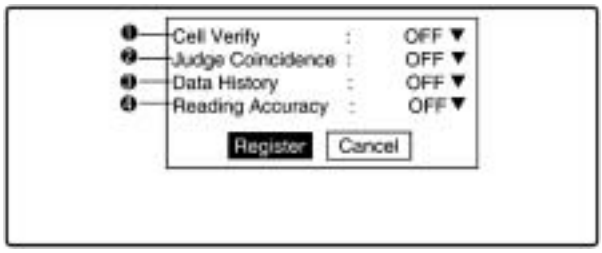
4. Select ***Register*** to validate the settings and leave this window.

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6-1-7 Function Settings

1. Read QR (Normal) — **Function Settings**
1. Read DM (Normal) — **Function Settings**
1. Read QR (Pattern) — **Function Settings**
1. Read DM (Pattern) — **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.

1,2,3...

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: Do not check for matches. (Default setting)

   Clr Data: The registered data is cleared.

   Note When this function is used, the ***Display Settings/Finder Pattern*** and ***Display Settings/Cell Position*** settings are 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***.

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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 the terminal block (DO0 to DO3) and RS-232C (Normal).
When outputting to the terminal block, data 0 to 3 are output to DO0 to DO3.
When outputting to the RS-232C interface, the data numbers are attached to the output format.

OFF: No judgement is performed. (Default setting)

Clr Data: The registered data is cleared.

3. This function displays the data from the start of reading to the end.

ON: The following 4 items are counted and displayed. If the data is saved to flash memory, the count PVs will be retained even if the power is turned OFF.
*Total number of reads
*Read Accuracy (OK reads ÷ Total reads)
*Number of OK reads
*Error code

OFF: The data history is not displayed. Select OFF to reset the data history. (Default setting)

4. This function displays the Reading Data and the Read Accuracy.

ON: Ten reads are performed for a single trigger input. The Read Accuracy and the Reading Data for the tenth read are displayed on the screen and output through RS-232C with normal (no protocol) communications.

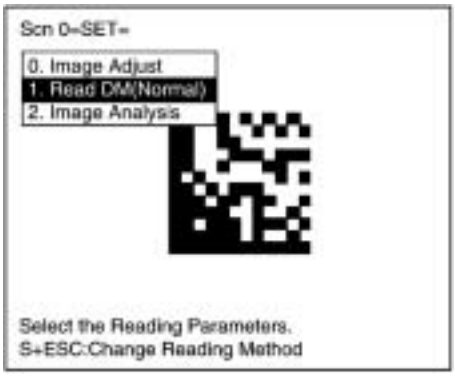
OFF: The Read Accuracy is not displayed. (Default setting)

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Procedure

1,2,3...

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



2. Select ***Function Settings***.



3. Set the items as required.



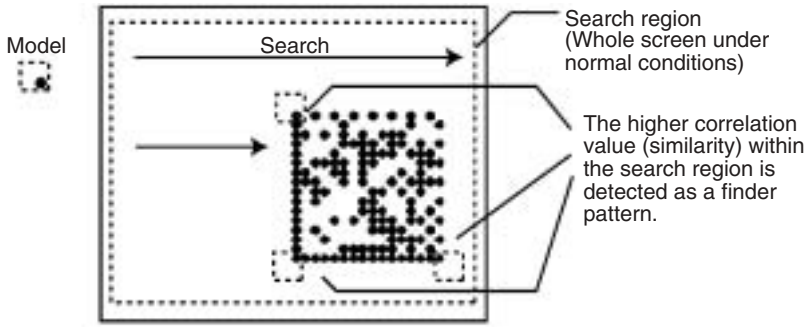
4. Select ***Register*** to validate the settings and leave this window.

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6-1-8 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

1. A code can be registered as the model with a direction of 0°, 90°, 180°, 270°, or 4 directions (0°, 90°, 180°, or 270°). Codes can be read as long as they are within ±10° of the registered model. The “4 directions” setting results in a longer processing time than the other settings.

				
0°	90°	180°	270°	4 directions (0°, 90°, 180°, or 270°)

2. 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.

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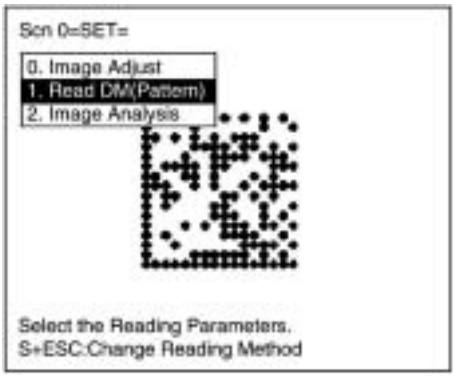
Model Registration

Use the following procedure to register models of finder patterns.

Procedure

1,2,3...

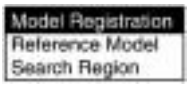
1. Select ***Read DM (Pattern)***.



2. Select ***Pattern Settings***.



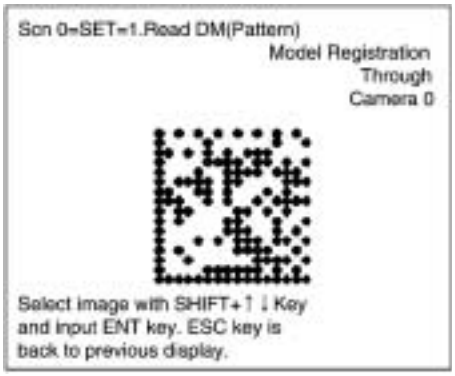
3. Select ***Model Registration***.



4. The display image can be changed by pressing the SHIFT Key together with the Up/Down Keys.

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Display the image to be used in model registration.
→ **page 184**



5. Press the ENT Key to validate the selection.
6. Select the matrix size.



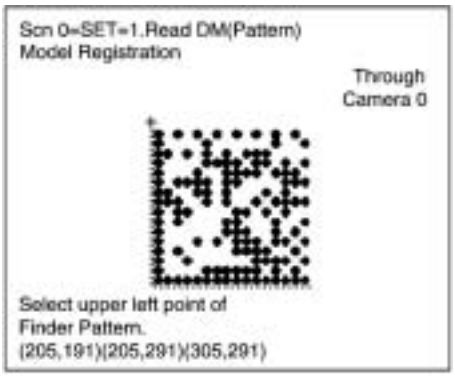
Matrix size	ECC
10 x 10 to 64 x 64 8 x 18 to 16 x 48	ECC200
9 x 9 to 25 x 25	ECC000 to ECC140

The ECC will be set automatically when the matrix size is selected.

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7. Draw the Finder Pattern to fit the code.

   Specify the three end points on the pattern. Move the arrow cursor with the Up/Down/Left/Right Keys and press the ENT Key to confirm the position.



8. Select the code's direction. (The "4 directions" setting results in a longer processing time than the other settings.)

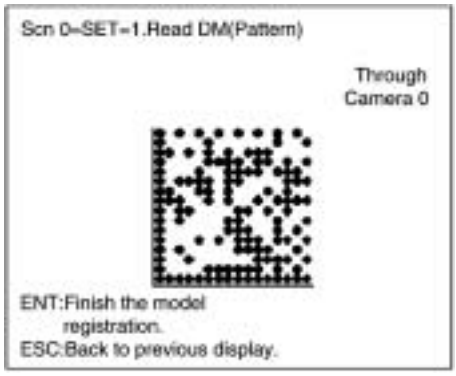


				
0°	90°	180°	270°	4 directions (0°, 90°, 180°, or 270°)

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9. Press the ENT Key to complete the model registration.

   To correct the last two steps, press the ESC Key and redo steps 7 and 8.



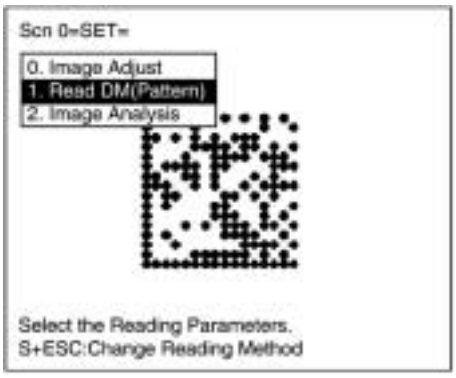
Note Go to ***Reference Model***, and check that models, including background, are registered in 3 places.

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

1,2,3... 1. Select ***Read DM (Pattern)***.

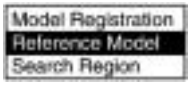


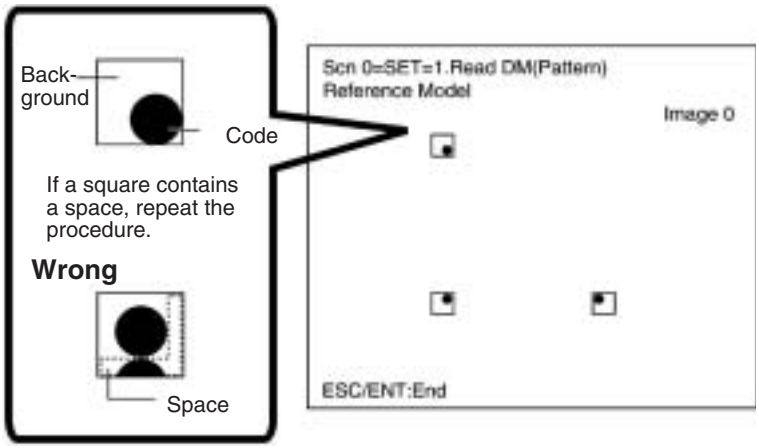
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2. Select ***Pattern Settings***.



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





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

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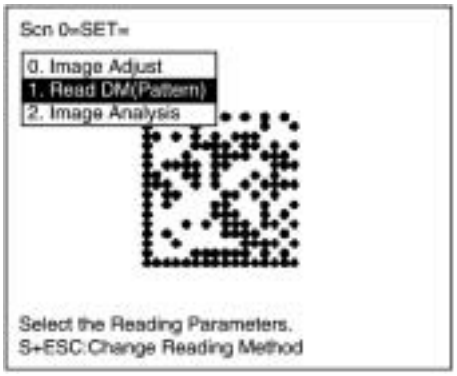
Search Region

Specify the range over which to search for the model.

Procedure

1,2,3...

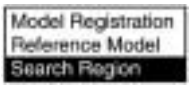
1. Select ***Read DM (Pattern)***.



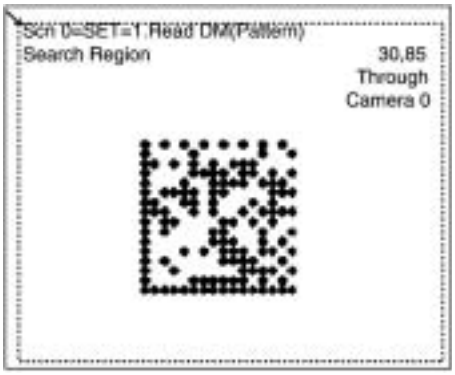
2. Select ***Pattern Settings***.



3. Select ***Search Region***.



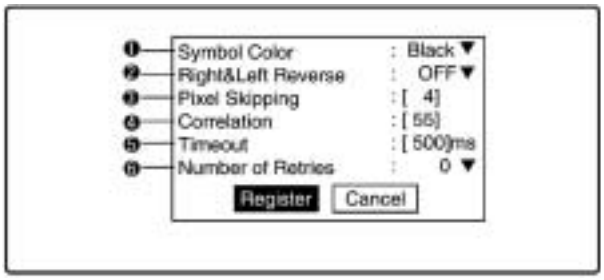
4. Draw a square over the region to be searched. Under normal conditions, draw the whole screen.



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1. Read DM (Pattern) — Reading Settings

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



1,2,3... 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.

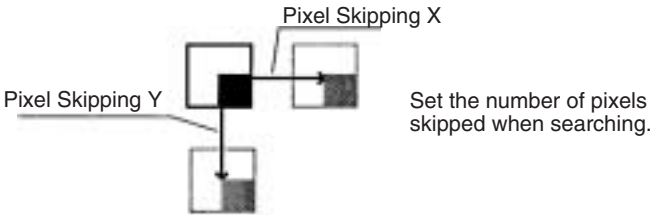
ON	For reading an image after reflection, or through the back of a transparent material, such as glass.
OFF (Default setting)	For normal reading (from the front of the object)

Note If a rectangular matrix size (8×18 to 16×48) is being used, Right & Left Reversing will not be performed even if this setting is ON.

3. Change the pixel skipping parameters used to search for a model. (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.

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After changing the setting, perform a search to confirm whether the search can be performed correctly.



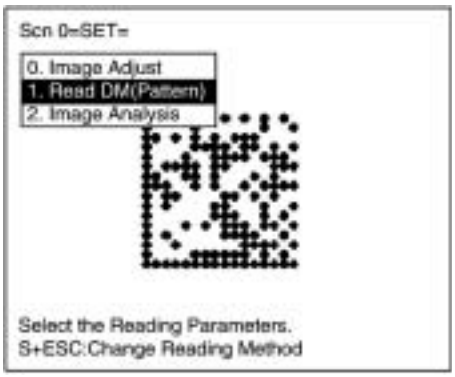
4. Set the correlation threshold value for detecting finder patterns. Correlation values equal to or higher than the threshold are detected. (1 to 100; Default setting: 55.)
5. Set the timeout time for decode processing of a single image read. (200 to 2,000 ms; Default setting: 500 ms.)
6. Select the 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.)

Note If ***Display Settings/Finder Pattern*** is set to ON, whether finder patterns can be detected or not can be confirmed on the screen. → **page 142**

- If nothing is detected, decrease the correlation threshold value and the pixel skipping parameter and check the model image.
- If too many places are detected, increase the correlation value and pixel skipping parameter.

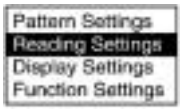
Procedure

1,2,3... 1. Select ***DM (Pattern)***.



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2. Select ***Reading Settings***.



3. Set the items as required.



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

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6-1-9 Read QR (Normal)

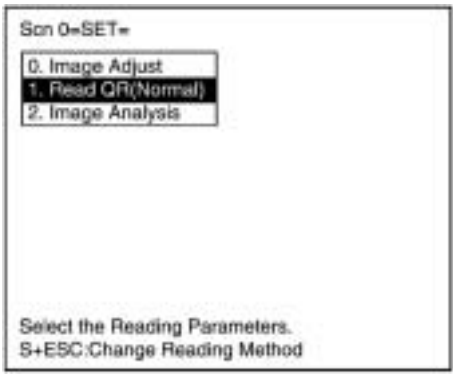
1. Read QR (Normal) — **Reading Settings (Teaching)**

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

1,2,3...

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



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



3. Select the required symbol color.

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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.



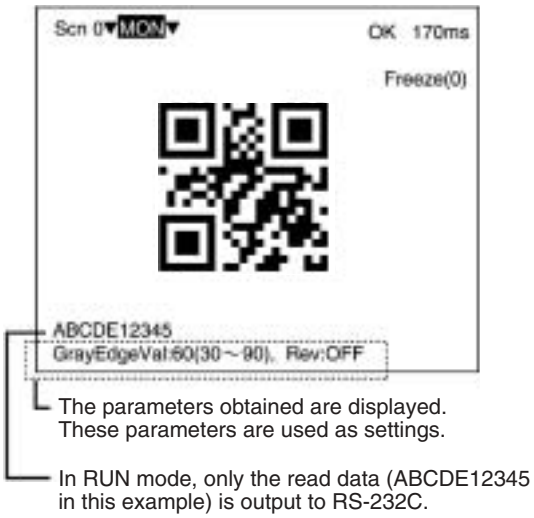
Black	Black symbol printed on white base.
White	White symbol printed on black base.

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.



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



Note 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.

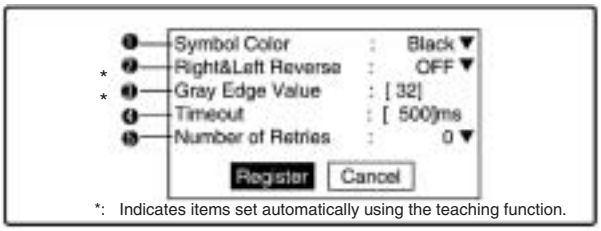
It is possible to view and, if necessary, change the parameter setting in ***Reading Settings (Manual)***.
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If reading is not performed correctly (NG), the teaching function will stay ON. To turn the teaching function OFF, select ***Reading Settings (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.

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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.



1,2,3... 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)
Auto	Automatically judges whether left/right reversal is required. Use this setting when the codes are mixed with some reversed and some not reversed. The processing time is longer than the time required with the ON or OFF setting.

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. → **page 158**

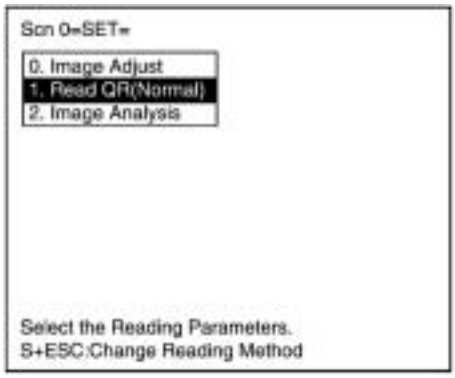
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4. Set the timeout time for decode processing of a single image read. (Setting range: 200 to 2,000 ms; default setting: 500 ms.)
5. Select the number of times reading is repeated in the event of incorrect reading. A fresh image will be obtained and reading performed for the number of times specified. (Setting range: 0 to 9; default setting: 0.)

Normal Procedure

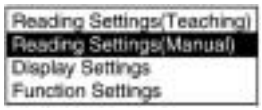
1,2,3...

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

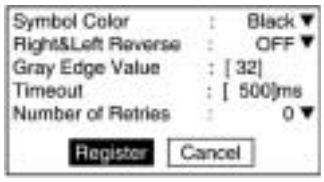


2. Select ***Reading Settings (Manual)***.

   The parameters will be displayed.



3. Edit the parameters as required.



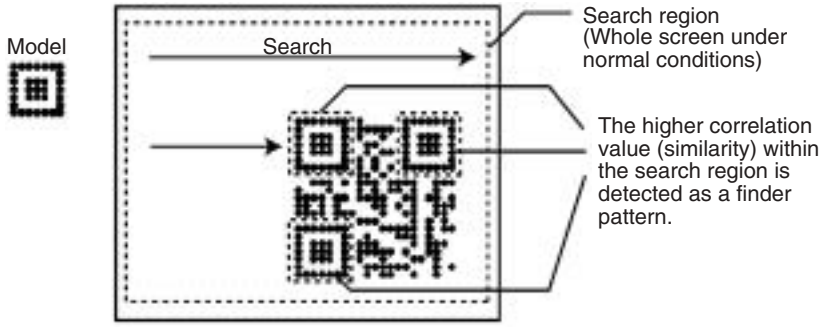
4. Select ***Register***.

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6-1-10 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.



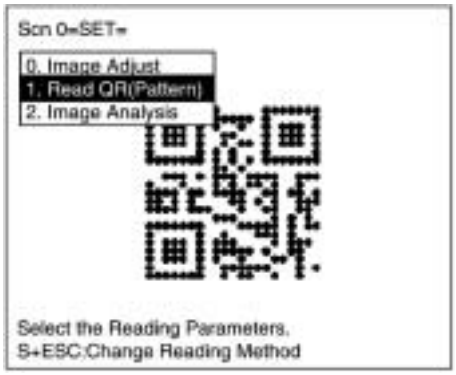
Note The code can be read as long as it is not tilted more than ±10° from the registered model.

Model Registration

Use the following procedure to register models of finder patterns.

Procedure

1,2,3... 1. Select ***Read QR (Pattern)***.

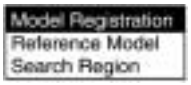


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2. Select ***Pattern Settings***.

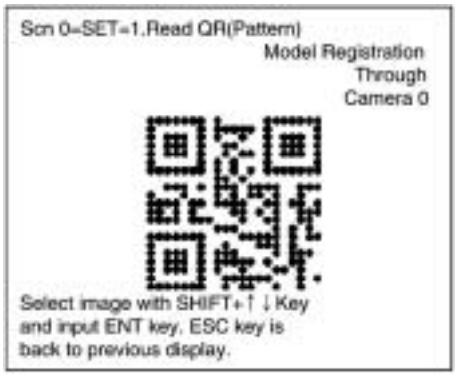


3. Select ***Model Registration***.



4. The display image can be changed by pressing the SHIFT Key together with the Up or Down Key.

   Display the image to be used in model registration.
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5. Press the ENT Key to validate the selection.
6. Select the QR Code version.

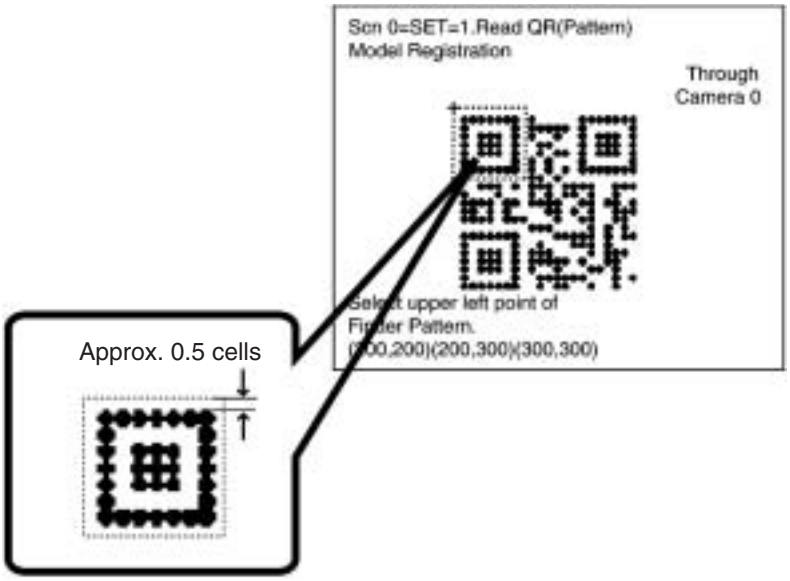


7. Draw a square over the region to be registered as a model.

   Specify three points on the square: the top-left corner, bottom-left corner, and bottom-right corner. Move the arrow cursor with the

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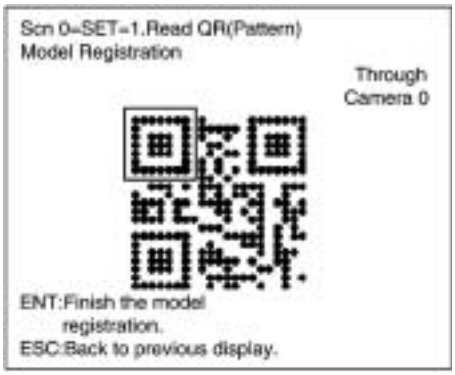
Up/Down/Left/Right Keys and press the ENT Key to confirm the position.



Note Register a finder pattern with a margin of approx. 0.5 cells around the edges.

8. Press the ENT Key to complete the model registration.

   To correct the last two steps, press the ESC Key and redo steps 6 and 7.



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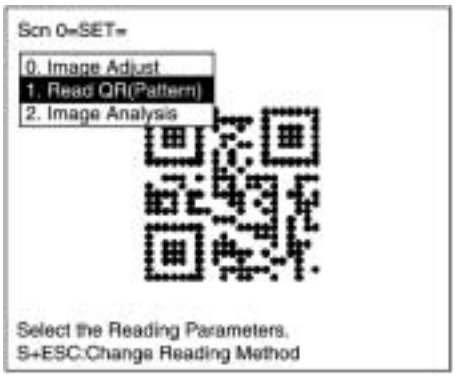
Reference Model

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

1,2,3...

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



2. Select ***Pattern Settings***.

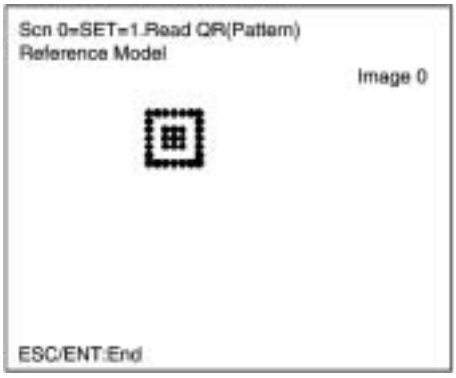


3. Select ***Reference Model***.



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The model image will be displayed.



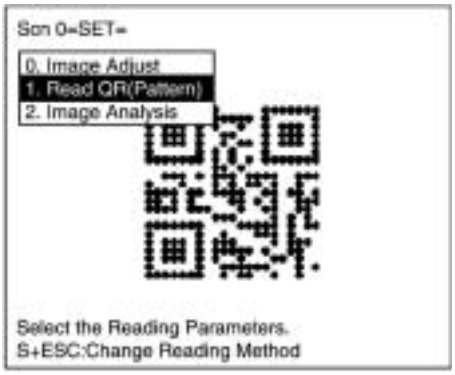
4. Press the ENT or ESC Key to leave this screen.

Search Region

Specify the range over which to search for the model.

Procedure

1,2,3... 1. Select ***Read QR (Pattern)***.



2. Select ***Pattern Settings***.



3. Select ***Search Region***.



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



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

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



1,2,3... 1. Select the color of symbol.

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

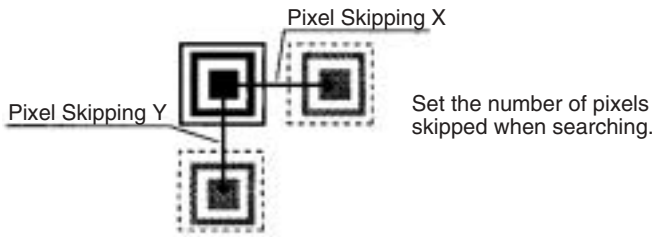
2. Select whether Right & Left Reverse of QR Codes is necessary.

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)
Auto	Reflection is determined automatically. Use this setting when images are mixed. Processing time will be longer than for ON or OFF.

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. 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.

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After changing the setting, perform a search to confirm whether the search can be performed correctly.



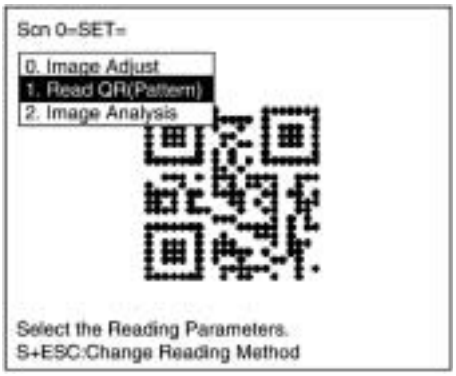
5. Set the correlation threshold value for detecting finder patterns. Correlation values equal to or higher than the threshold are detected. (Setting range: 1 to 100; default setting: 30.)
6. Set the timeout time for decode processing of a single image read. (Setting range: 200 to 2,000 ms; default setting: 500 ms.)
7. 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.)

Note If ***Display Settings/Finder Pattern*** is set to ON, whether finder patterns can be detected or not can be confirmed on the screen. → **page 142**

- If nothing is detected, decrease the correlation threshold value and the pixel skipping parameter and check the model image.
- If too many places are detected, increase the correlation value and pixel skipping parameter.

Procedure

1,2,3... 1. Select ***Read QR (Pattern)***.

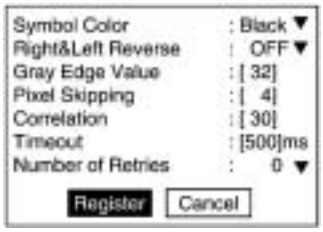


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2. Select ***Reading Settings***.



3. Set the items as required.



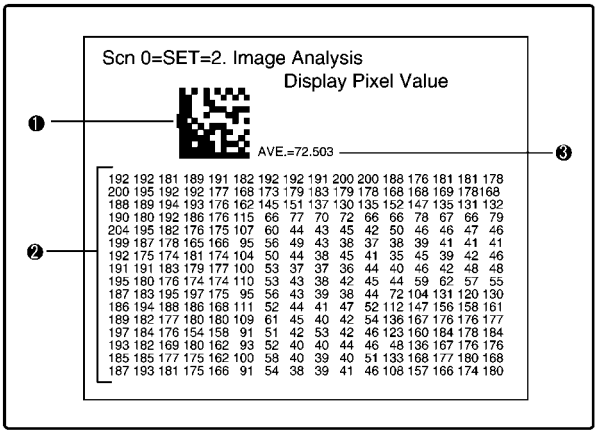
4. Select ***Register*** to validate the settings and close the window.

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6-1-11 Image Analysis

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

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



1,2,3...

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.
3. The average density for the specified area is displayed.

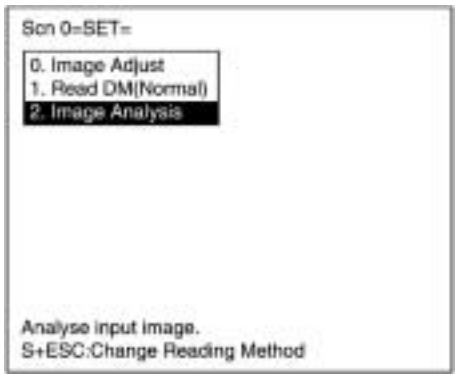
Note Analysis is not performed on through images.

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Procedure

1,2,3...

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



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

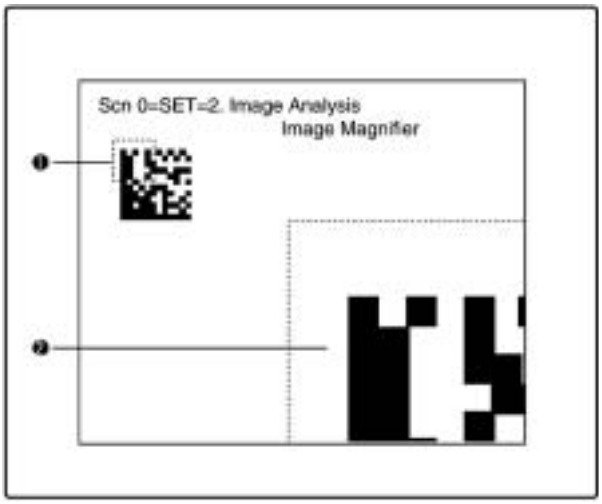


3. Move to the required area by using the Up/Down/Left/Right Keys.
   The density information will be displayed.
   Press the SHIFT Key at the same time to move faster.
4. Press the ESC Key to leave this screen.

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2. Image Adjust — **Image Magnifier**

Magnifies the image in a specified area.



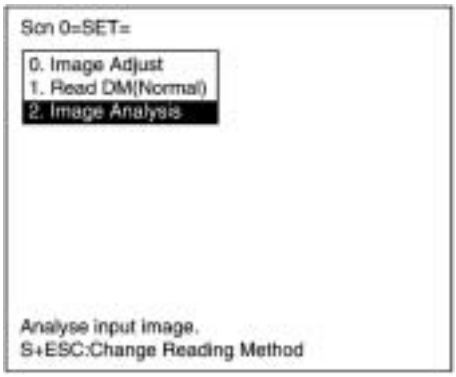
1,2,3... 1. The specified area is 32 x 32 pixels (fixed).
Use the Up/Down/Left/Right Keys to move to the position to be magnified.
Press the SHIFT Key at the same time to move faster.

2. The image in the specified area is magnified.

Note Analysis is not possible for through images.

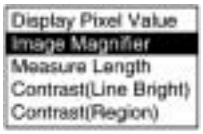
Procedure

1,2,3... 1. Select ***2.Image Analysis***.



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2. Select ***Image Magnifier***.

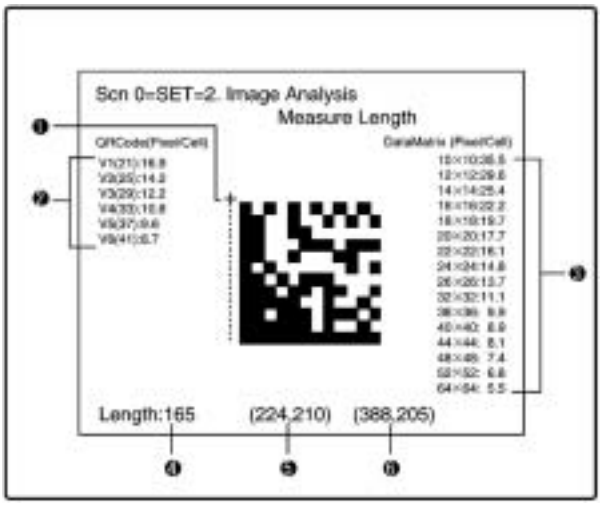


3. Move to the specified area using Up/Down/Left/Right Keys.
   Press the SHIFT Key at the same time to move faster.
4. Press the ENT Key.
   A magnified image is displayed within a dotted frame.
5. Press the ESC Key to leave this screen.

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2. Image Analysis — **Measure Length**

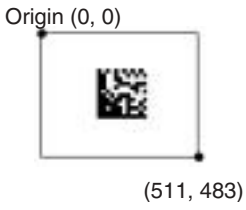
Measures the size of cells in pixels.
For stable reading, adjust the field of vision to be at least five pixels per cell.



1,2,3...

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 29.6.

   Note This information is not displayed if a rectangular matrix size (8×18 to 16×48) is being used.
4. The length of dashed line 1 is displayed in pixels.
5. The coordinates of the starting point of dashed line 1 are displayed. (The screen's top-left corner is the origin.)
6. The coordinates of the end point of dashed line 1 are displayed. (The screen's top-left corner is the origin.)

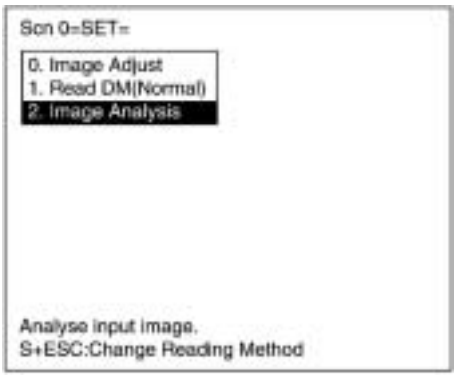


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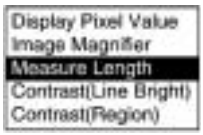
Procedure

1,2,3...

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.

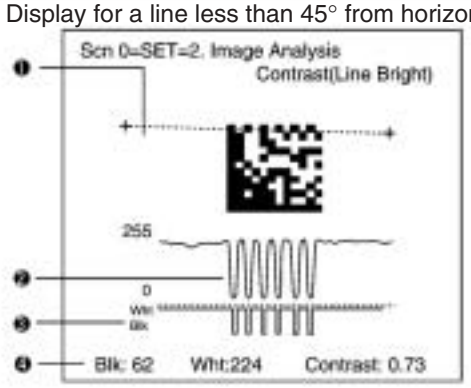
5. Press the ESC Key to leave this screen.

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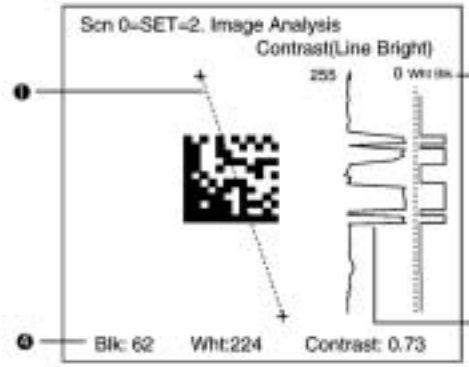
2. Image Analysis — **Contrast (Line Bright)**

The Contrast (Line Bright) function can be used to check variables such as the contrast between the code and background, as well as the contrast between the code's white cells and black cells. The lower the contrast, the less stable the measurements will be, so adjust the lighting and settings if the contrast is too low.

- Display for a line less than 45° from horizontal



- Display for a line more than 45° from horizontal



1,2,3...

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.
4. The average density of white cells, average density of black cells, and contrast (relative to gray edge value) are displayed. The con-

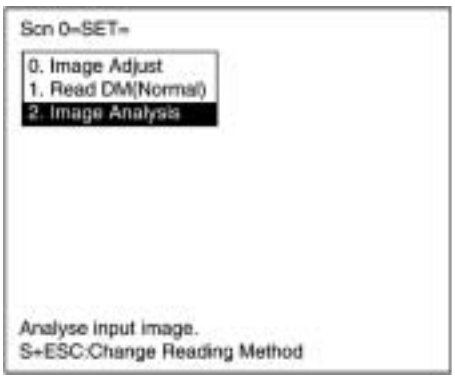
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trast ranges from 0.00 to 1.00, with higher values indicating higher contrast and lower values indicating lower contrast.

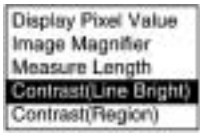
Note Analysis is not performed on through images.

Procedure

1,2,3... 1. Select ***2. Image Analysis***.



2. Select ***Contrast (Line Bright)***.



3. Set the gray edge level for black and white judgment (1 to 255) and select ***Register***.



Press the ENT Key to move the cursor so that the gray edge value can be input. Use the Left/Right Keys to move between digits and use the Up/Down Keys to change the value of the digits.

The Line Bright window will be displayed after the gray edge value is registered.

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

The average density of white cells, average density of black cells, and contrast will be displayed.

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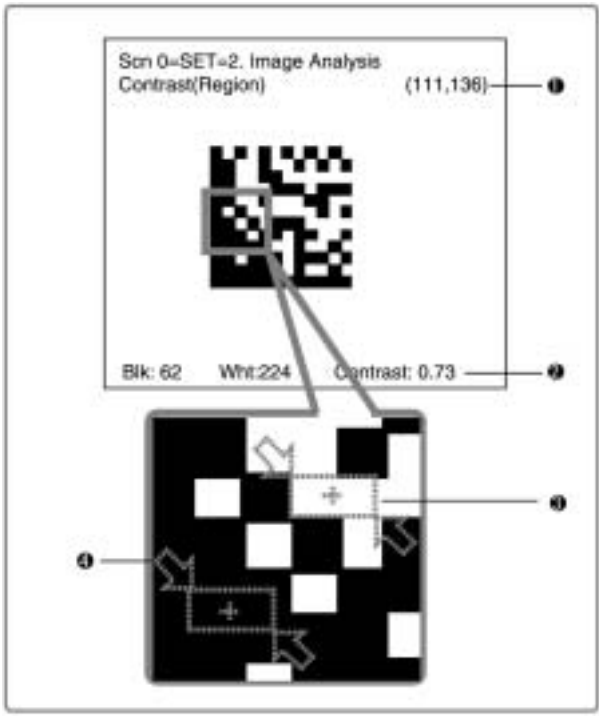
6. To change the line, press the ESC Key and repeat steps 4 and 5 as required.
7. Press the ESC Key to leave this screen.

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2. Image Analysis — **Contrast (Region)**

The Contrast (Region) function can be used to check variables such as the contrast between the code and background, as well as the contrast between the code's white cells and black cells. The contrast will be displayed for the specified white cell region and black cell region.

The lower the contrast, the less stable the measurements will be, so adjust the lighting and settings if the contrast is too low.



1,2,3...

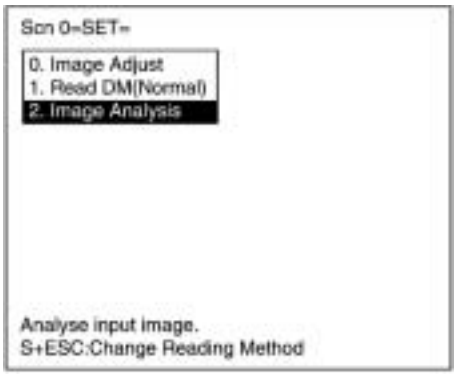
1. The coordinates of the cursor are displayed.
2. The average density of white cells, average density of black cells, and contrast (relative to gray edge value) are displayed. The contrast ranges from 0.00 to 1.00, with higher values indicating higher contrast and lower values indicating lower contrast.
3. Specify the desired white cell region.
4. Specify the desired black cell region.

Note Analysis is not performed on through images.

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Procedure

1,2,3... 1. Select ***2. Image Analysis***.



2. Select ***Contrast (Region)***.



3. Move the cross cursor with the Up/Down/Left/Right Keys and press the ENT Key when the cursor is at the top-left corner of the desired white cell. Press the SHIFT Key together with the above keys to move the cursor faster.
4. Move the cross cursor with the Up/Down/Left/Right Keys and press the ENT Key when the cursor is at the bottom-right corner of the desired white cell.
5. Specify the desired black cell in the same way as the white cell was specified. (Refer to steps 3 and 4.)

   The average density of the black cell, average density of the white cell, and contrast will be displayed.
6. Press the ENT Key to return to the menu in step 2.

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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

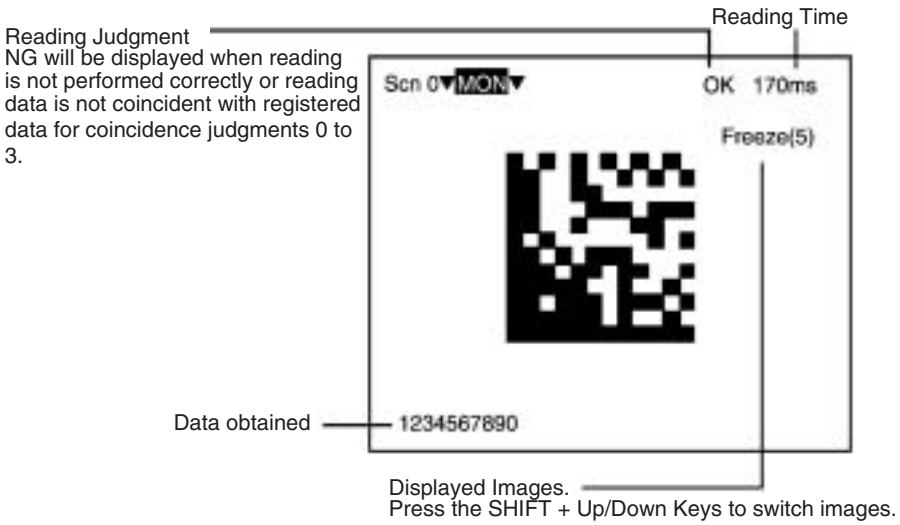
1,2,3...

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 → **page 35**
   - RS-232C → **page 56, page 83**

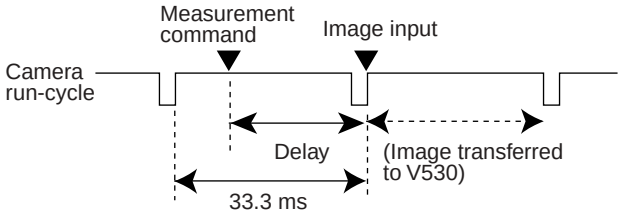


Note The light will become dimmer gradually as it is used, so adjust the reading conditions periodically. If an Intelligent Light Source is

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being used, the light will be about 20% dimmer after 1,500 hours of operation.

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 a through image is displayed, the number of the camera from which it was read is also displayed. When reading is performed on through images, a delay of 33.3 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. → **page 202**
Image 0	An image after filtering according to the settings in ***0. 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.)

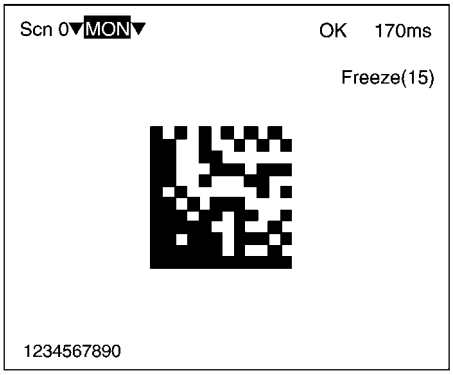
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Displays Vary with the Settings of Read****/Display Settings

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.
The displayed contents will vary depending on the code.



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QR Code (Normal or Pattern Mode)

Item		Contents
Normal	**Pattern**	
Symbol Color		Displays the Symbol Color setting.
Right & Left Reverse		Displays the Right & Left Reverse setting.
Gray Edge Value		Displays the Gray Edge Value setting.
---	Pixel Skipping	Displays the Pixel Skipping setting.
---	Correlation	Displays the Correlation setting.
---	Version	Displays the QR Code's Version setting.
Timeout		Displays the Timeout Time setting.
Number of Retries		Displays the Number of Retries setting.
FP Position		Displays the Finder Pattern's coordinates.
Angle of Finder		Displays the code's angle.
Model		Displays the model contents read from the code.
Version		Displays the QR code's version read from the code.
Error Correction Level		Displays the error correction level read from the code.
Thresh Value		Displays the threshold value from decoding.
Pixel/Cell		Displays the pixel/cell contents read from the code.
Error Correction		Displays the number of error corrections during decoding.

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Data Matrix (Normal or Pattern Mode)

Item		Contents
Normal	**Pattern**	
ECC Level		Displays the ECC setting that was set automatically when the code size was selected.
Symbol Color		Displays the Symbol Color setting.
Right & Left Reverse		Displays the Right & Left Reverse setting.
Matrix Size		Displays the Matrix Size setting.
Free Finder Length	---	Displays the Free Finder Length setting.
Finder Length	---	Displays the Length of Finder setting.
Background Cut	---	Displays the Background Cut setting.
---	Pixel Skip-ping	Displays the Pixel Skipping setting.
---	Correlation	Displays the Correlation setting.
Timeout		Displays the Timeout Time setting.
Number of Retries		Displays the Number of Retries setting.
L End Point		Displays the Finder Pattern's end point coordinates.
Angle of Finder		Displays the code's angle.
Length of Finder		Displays the finder pattern length from decoding.
Thresh Value		Displays the threshold value from decoding.
ECC Level		Displays the ECC Level from decoding.
Pixel/Cell		Displays the pixel/cell contents read from the code.
Error Correction		Displays the number of error correction blocks from decoding.

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When *Finder Pattern* is ON:

A cross cursor will be displayed at the position recognized as a finder pattern.
However, the finder pattern position is not displayed when the ***Function Settings/Cell Verify*** setting is set to Verify.

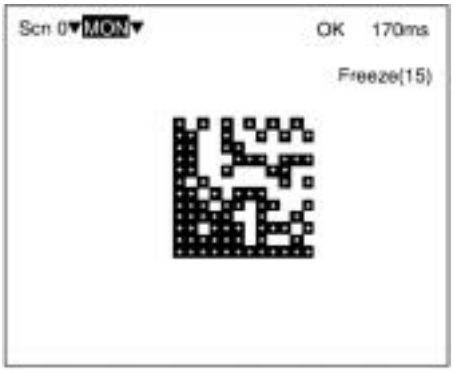
Example



When *Cell Position* is ON:

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

Example



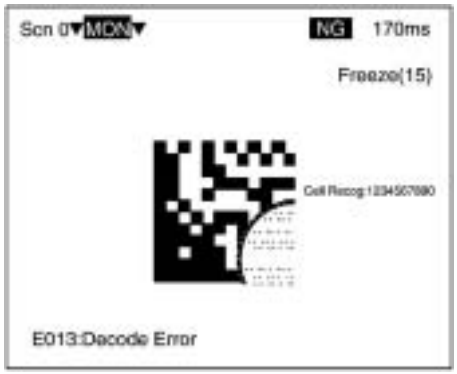
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Displays Vary with the Settings of Read****/Function Settings

When *Cell Verify* is set to Verify:

The data will be verified with reference data and the cross cursor will be displayed at a different position. The result of the Cell Verify function will take precedence and be displayed even when the ***Display Settings/Cell Position*** or ***Display Settings/Finder Pattern*** is ON.

Example



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

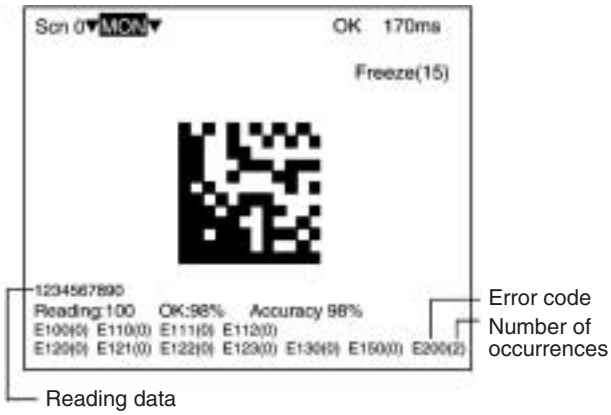


Even if the reading is OK, if there is no match with data 0 to 3, "NG," followed by the read data will be displayed.

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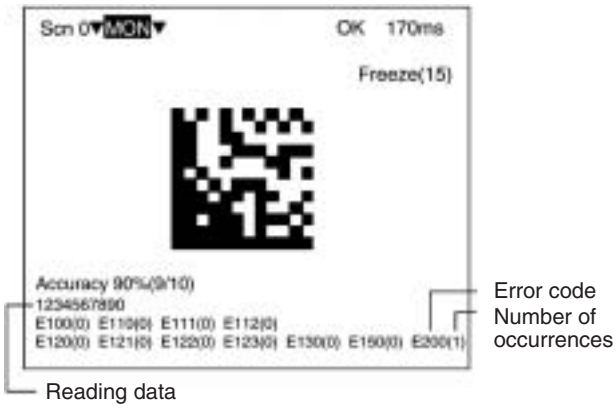
When *Data History* is ON:

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 because 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. The most recent error code will be displayed if the Reading Accuracy is 0%.
Turn OFF the Judge Coincidence and Data History functions because they cannot be used together with the Reading Accuracy function.



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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 *page 183 MON (Monitor) Mode*. → **page 183**

Procedure

1,2,3...

1. Select RUN Mode.



2. Input reading trigger.

Commands

- Console
  One reading is performed by pressing the TRIG Key once.
- Terminal Block → **page 35**
- RS-232C → **page 56, page 83**

Output Format

- Terminal Block → **page 35**
- RS-232C → **page 82, page 85**

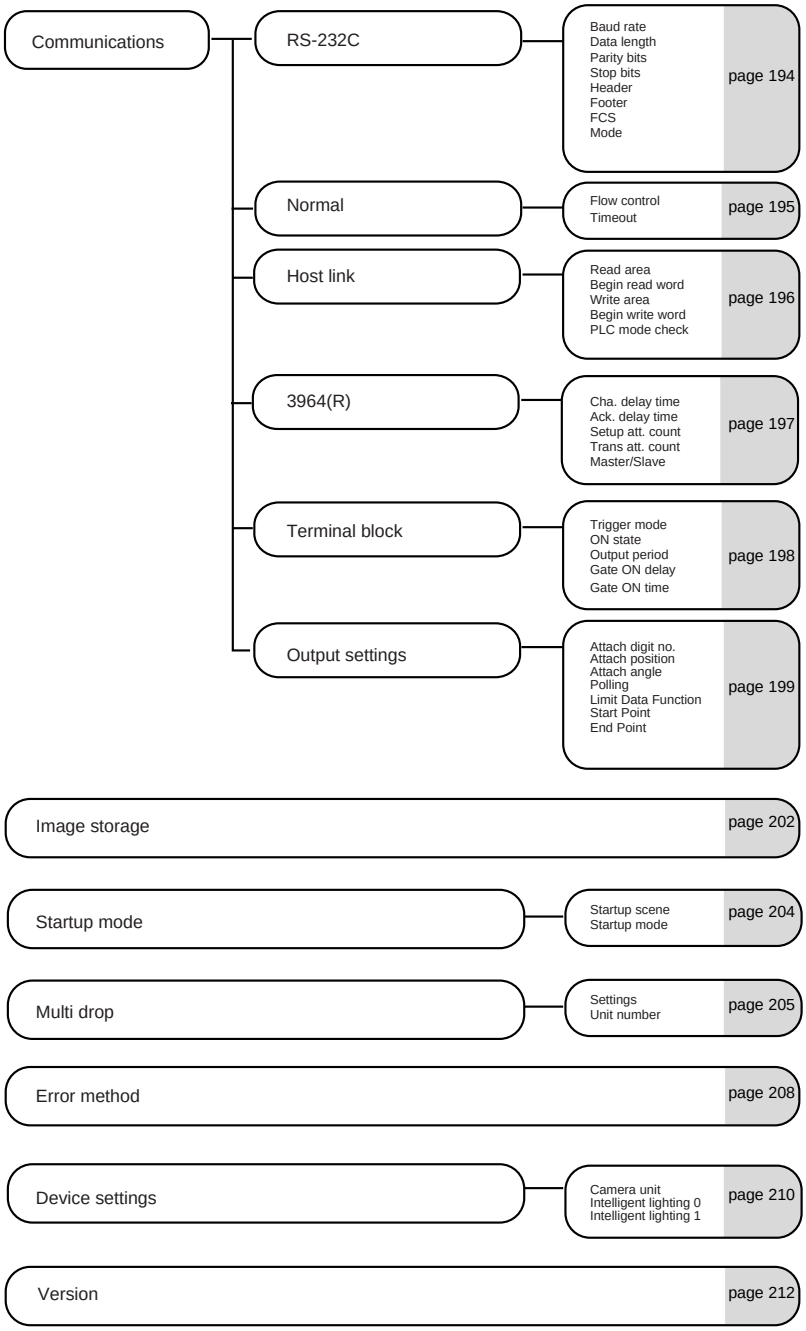
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6-4 System

6-4-1 Menu Tree

For explanations of the various operations, refer to the pages given in the following table.

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6-4-2 Communications Method

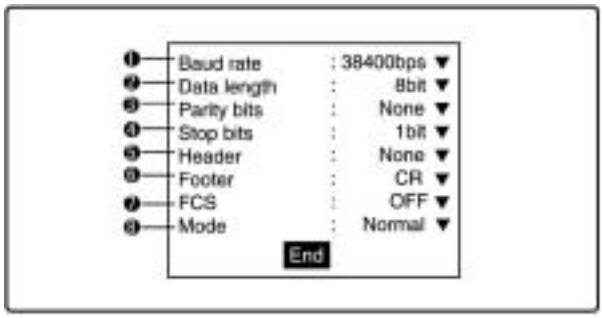
SYS — Communications

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



1,2,3...

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, ETX. (Default setting: CR)
7. Select OFF or ON. (Default setting: OFF)
8. Select Normal, Host link, 3964, or 3964R (Default setting: Normal)

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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.

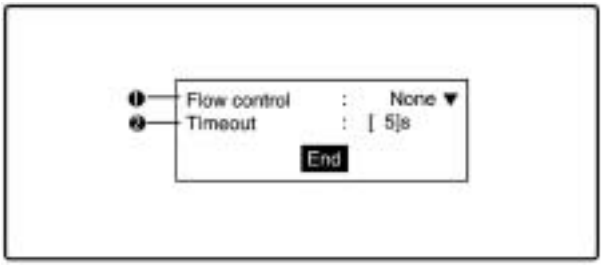


MON (Monitor) Mode

Receives command inputs, but the reading results are not output.

RUN Mode

Possible to input commands and output the reading results.



1,2,3...

1. Select whether the status of the external device will be checked while communicating.

   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)

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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.

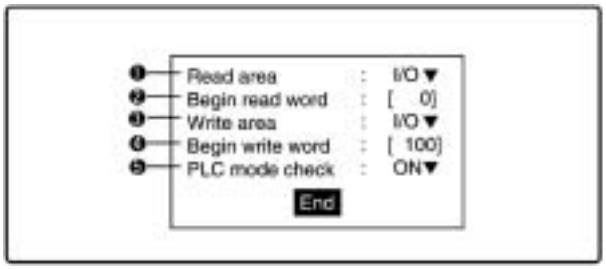


MON (Monitor) Mode

Receives command inputs, but the reading results are not output.

RUN Mode

Possible to input commands and output the reading results.



1,2,3...

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 None is set, the TXD instruction and terminal block inputs will still be accepted. (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. Select whether to check the Programmable Controller's operating mode.

   ON: Checks the mode of the Programmable Controller in MON (monitor) and RUN modes. Reading does not start unless the Programmable Controller is in MONITOR mode. Error messages are displayed. (Default setting)

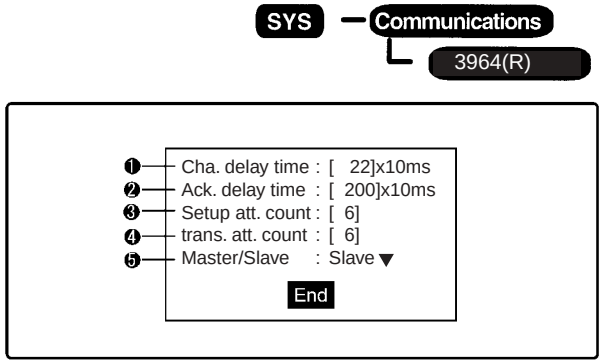
   OFF: When the V530R150 is in Monitor or Run mode, it sends a mode change command to the Programmable Controller to

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forcibly switch the Programmable Controller to MONITOR mode.

3964(R)

The 3964(R) procedure controls data transmission via a point-to-point connection between a Siemens product and a communications partner.



1,2,3...

1. The character delay time defines the maximum amount of time permitted between two incoming characters within a message frame.
   Select 20 ms to 655350 ms in 10-ms increments.

   The shortest character delay time depends on the baud rate.

300 bits/s	60 ms
600 bits/s	40 ms
1200 bits/s	30 ms
2400 to 76800 bits/s	20 ms

   (Default setting: 220 ms)

2. The acknowledgment delay time defines the maximum amount of time permitted for the partner's acknowledgment to arrive during connection setup (time between STX and partner's DLE acknowledgment) or release (time between DLE ETX and partner's DLE acknowledgment).
   Select 20 ms to 655350 ms in 10-ms increments.

   The shortest acknowledgment delay time (ADT) depends on the baud rate.

300 bits/s	60 ms
600 bits/s	40 ms
1200 bits/s	30 ms
2400 to 76800 bits/s	20 ms

   (Default setting: 2000 ms)

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3. This parameter defines the maximum number of attempts the product is allowed in order to establish a connection.

   Select 1 to 255.

   (Default setting: 6)

4. This parameter defines the maximum number of attempts permitted to transfer a message frame (including the first one) in the event of an error.

   Select 1 to 255.

   (Default setting: 6)

5. With the 3964(R) procedure, one communications partner must be assigned a higher priority and the other partner, a lower priority.
   The master has a higher priority.
   The slave has a lower priority.

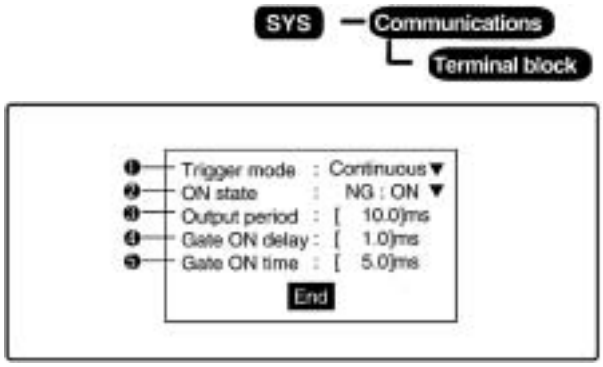
   Select Master or Slave.

   (Default setting: Slave)

Note

1. In the 3964R mode, “@GC” and “@SC” commands cannot use.
   “@GC”: Start continuous reading
   “@SC”: Stop continuous reading
2. In the 3964R mode, TRIG_B (Continuous Trigger mode) cannot be used.

Terminal Block



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1,2,3...

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.

NG: ON (Default)	The OK/NG terminal is turned ON for an NG reading.
OK: ON	The OK/NG terminal is turned ON for an OK reading.

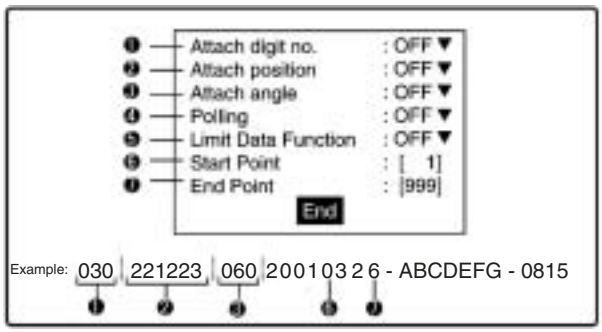
3. Set the output period for reading judgment. Set a value between 2.0 and 10000.0 ms that is greater than the rising time + output time, and less than the reading interval. If the cycle is longer than the reading interval, the output timing will fall behind as the readings are repeated.
(The default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

Output Settings



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These settings determine how data will be output through RS-232C (Normal) communications.

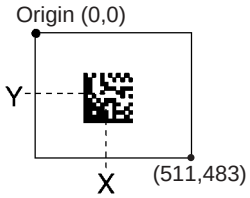


1,2,3...

1. Select whether or not to include the number of digits of Reading Data. Select OFF or ON. (Default setting: OFF)

   The number of digits are shown in bytes. A letter or a number is 1 digit. If the position and/or angle are attached, those digits will be included in the total number of digits of Reading Data.

2. Select whether or not to include the position (X,Y coordinates) of the 2-dimensional code that was read. Select OFF or ON. (Default setting: OFF)



3. Select whether or not to include the angle of the 2-dimensional code that was read. Select OFF or ON. (Default setting: OFF)



4. When the V530-R150 is connected with a 1:1 connection, select whether or not to use the Polling Command to control the timing of Reading Data outputs. Select OFF or ON. (Default setting: OFF)

   ON: The Reading Data will not be output until the Polling Command is input

   OFF: The Reading Data will be output immediately after it is read.

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Note If polling is turned ON, RS-232C and terminal block data (DO0 to DO3) will not be output until the polling command is received.

5. Select whether or not to output just a part of the Reading Data. Select OFF or ON. (Default setting: OFF)

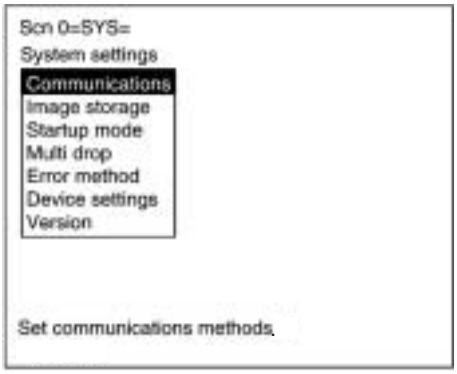


6. When the Limit Data Function is set to ON, specify the start point (digit 1 to 999). The start point does not include the data specified in steps 1, 2, and 3.
(Default setting: 1)

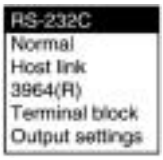
7. When the Limit Data Function is set to ON, specify the end point (digit 1 to 999). The end point does not include the data specified in steps 1, 2, and 3.
(Default setting: 999)

Procedures for RS232C, Normal, Host Link, Terminal Block, and Data Output Settings

1,2,3... 1. Select ***Communications***.



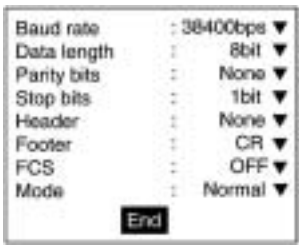
2. Select ***RS-232C***, ***Normal***, ***Host link***, ***Terminal block***, or ***Data Output Settings***.



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3. Set each item.

(e.g.) RS-232C



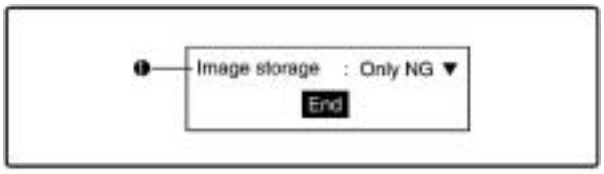
4. Select ***End*** before leaving this screen.

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. → **page 213**



1,2,3... 1. Select the conditions to store reading images.

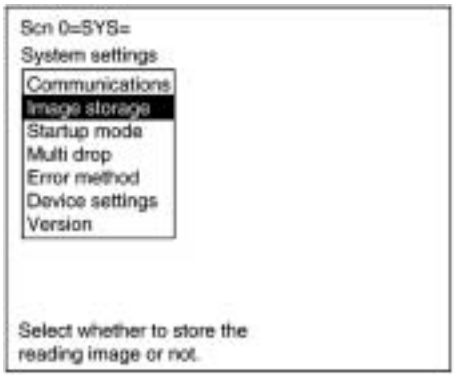
None	No images are stored.
Only NG (Default setting)	Only NG (unreadable) images are stored. (See note.)
All	All images are stored regardless of readable or unreadable.

Note The most recently read image will be stored, regardless of the judgement result.

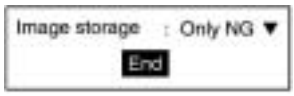
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Procedure

1,2,3... 1. Select ***Image storage***.



2. Select the conditions.



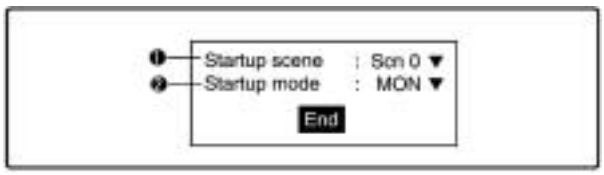
3. Select ***End*** before leaving this screen.

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6-4-4 Startup Mode

SYS — Startup mode

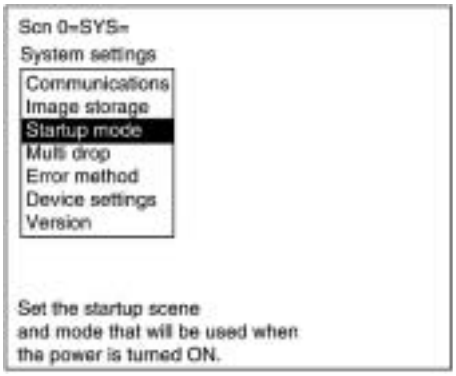
Sets the scene number and mode to be displayed when the power is turned ON.
If the V530-R150 is set to start in RUN mode for the scene where the desired reading conditions are registered, reading can be started by simply turning the power ON.



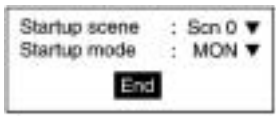
1,2,3... 1. Select the startup scene number. (0 to 9; Default setting: 0)
2. Select the startup mode. (SET, MON, or RUN; Default setting: MON)

Procedure

1,2,3... 1. Select ***Startup mode***.



2. Select the startup scene number and startup mode.



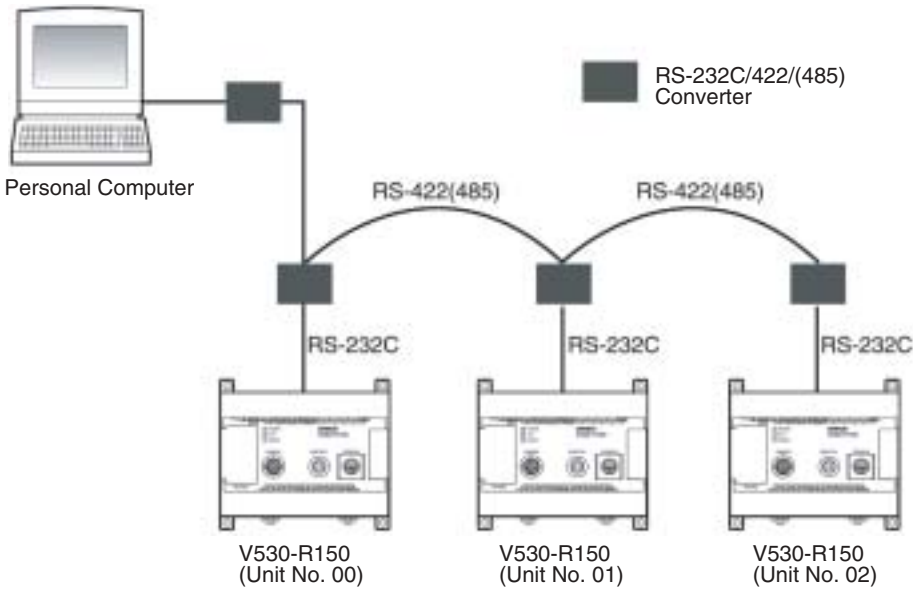
3. Select ***End*** before leaving this screen.

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6-4-5 Multi Drop

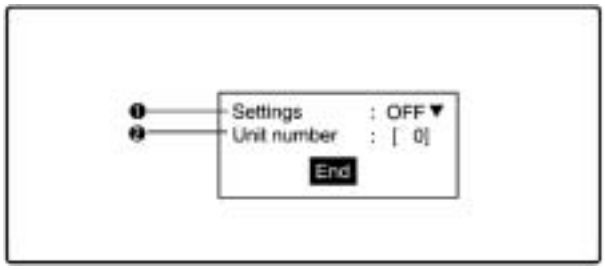
SYS — Multi drop

One host (personal computer or Programmable Controller) can communicate with more than one V530-R150 by connecting the RS-232C/RS-422/(485) converter (32 max.).
The unit number is attached to the prefix of all communication data so, set a different unit number for each V530-R150.
A V530-R150 will not respond to a command with a different unit number.
The multi drop function is used only when the communications method is normal.



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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.



1,2,3... 1. Select whether or not multi-drop connections are being used.

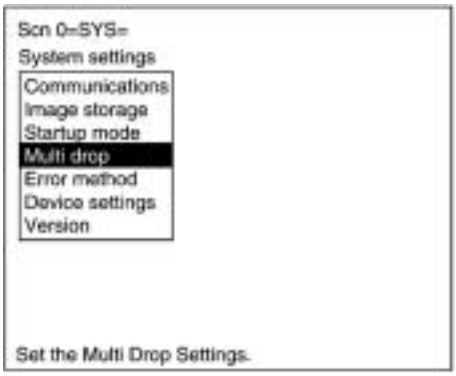
OFF (Default setting)	Multi-drop connections are not being used.
ON	Multi-drop connections are being used. When this setting is ON, results are not output through RS-232C even if read processing is performed. The results will be output when a Send Data Instruction (Polling Command) is sent from the host.

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; Default setting: 0)

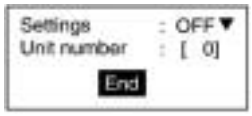
Procedure

1,2,3... 1. Select ***Multi drop***.



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2. Set each item.



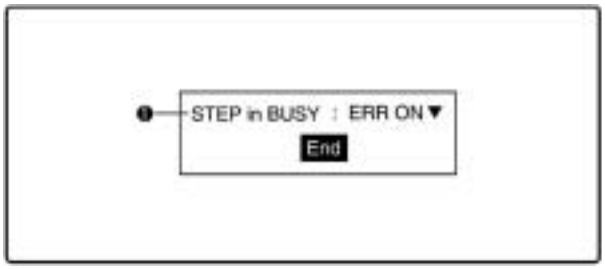
3. Select ***End*** before leaving this screen.

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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.

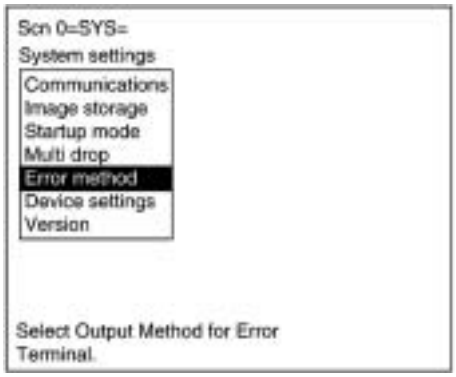


1,2,3... 1. Specify the ERR terminal operation.

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.

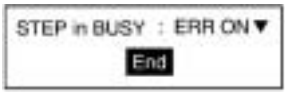
Procedure

1,2,3... 1. Select ***Error method***.



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2. Select the error method.

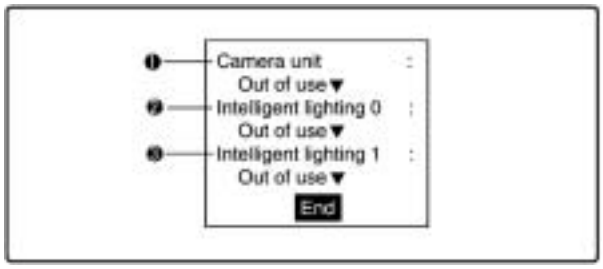


3. Select ***End*** to leave this screen.

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6-4-7 Device Settings

Change the Device Settings with this menu when a Two-camera Unit or Intelligent Light Source is connected.



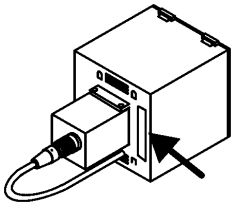
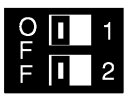
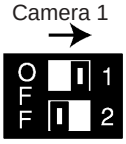
1,2,3... 1. Specify whether or not a Two-camera Unit is being used.

Out of use (Default setting)	A Two-camera Unit is not being used.
F150-A20	An F150-A20 Two-camera Unit is being used.

2. 3. Specify whether or not an Intelligent Light Source is being used on Camera 0 or Camera 1.

Out of use (Default setting)	An Intelligent Light Source is not being used.
F150-SLC20	An F150-SLC20 Intelligent Light Source is being used.
F150-SLC50	An F150-SLC50 Intelligent Light Source is being used.

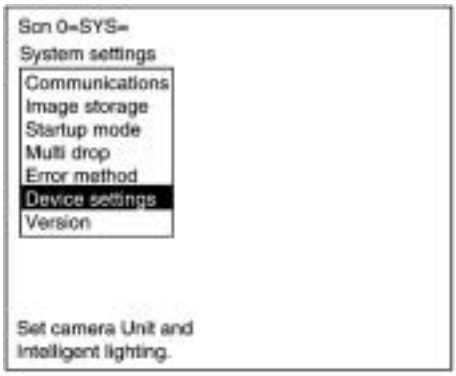
Note The Intelligent Light Source has a DIP switch that is used to set its unit number. Set the unit number to 0 if the Light Source is attached to Camera 0; set the unit number to 1 if the Light Source is attached to Camera 1.

Location of DIP switch	F150-SLC20	F150-SLC50
	Connect to Camera 0  Connect to Camera 1  Push up pin 1.	Connect to Camera 0  Connect to Camera 1  Move pin 1 to the right.

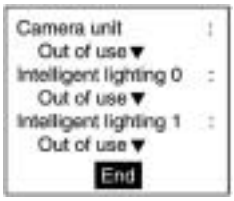
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Procedure

1,2,3... 1. Select ***Device settings***.



2. Specify which device(s) are connected.



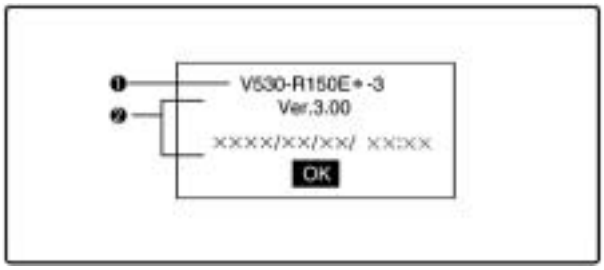
3. Select ***End*** to leave this screen.

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6-4-8 Version

SYS — Version

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



1,2,3...

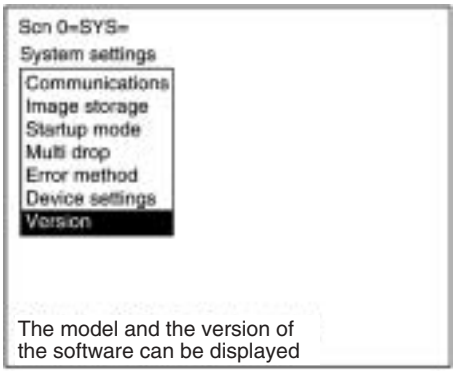
1. The model is displayed.
2. The version and production date of the software are displayed.

Procedure

1,2,3...

1. Select ***Version***.

   The version information is displayed.



2. Select ***OK*** to leave this screen.

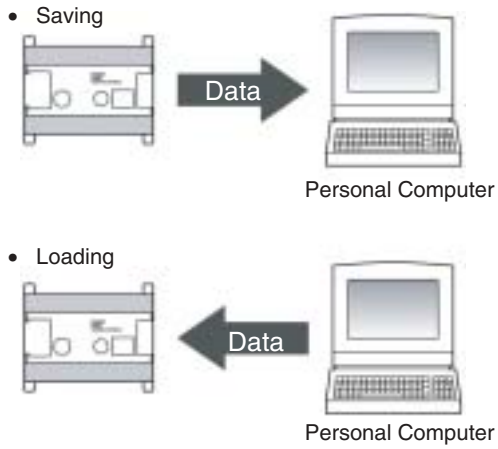


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6-5 Computer Data Backup (Tool Menu)

The following four kinds of setting data can be backed up to a personal computer. 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.

Data	Contents
System data	Back up all of the system settings to a personal computer.
Scene data	Back up the items set in SET mode for each scene to a personal computer.
System + scene data	Back up system data and scene data 0 to 9 to a personal computer.
Image data	Back up stored images to a personal computer in the BMP format (*.BMP).The images can be displayed on most personal computers as BMP is a standard 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.

Operation Examples for Personal Computers

This section describes data transfer using the Hyper Terminal provided on Windows 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. The XMODEM(-1K) protocol is not supported.

Note Never input the reset signal or turn OFF the power when processing messages for saving or loading operations are displayed.

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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

1,2,3...

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 bits
Parity bits	None
Stop bits	1 bit
Footer	CR

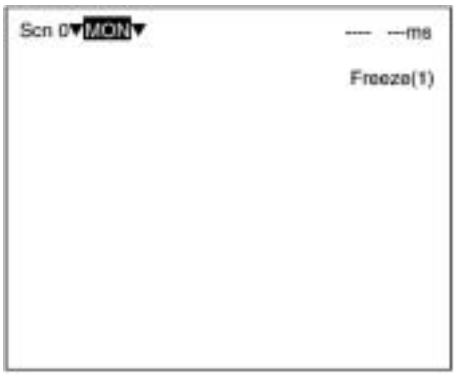
3. Start the Hyper Terminal program on the computer and make the following communication settings.

   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 bits
Parity bits	None
Stop bits	1 bit
Flow control	None (XMODEM protocol is used, so flow control is not performed.)

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4. Once the computer preparations have been completed, display the Monitor mode or Run mode screen.



5. Move the cursor to ***RUN*** or ***MON*** and press the ENT Key.

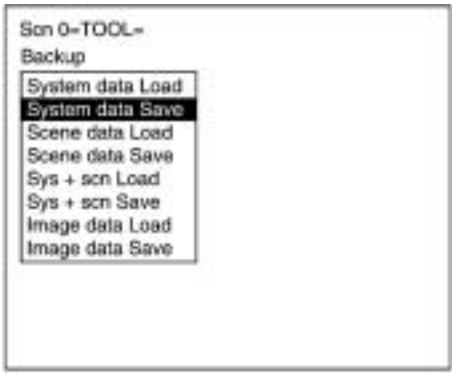
   The mode selection menu will be displayed.

6. Select ***TOOL*** from the menu.

   The Backup operations menu will be displayed.

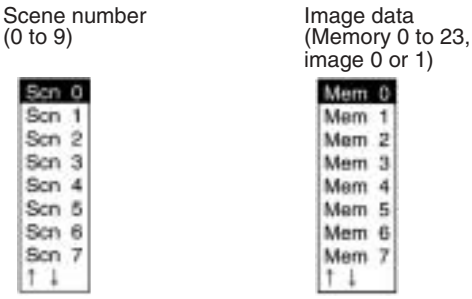


7. Select the kind of data to back up. (In this case, system data is being saved to the computer.)

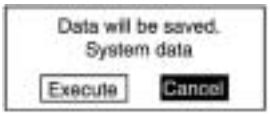


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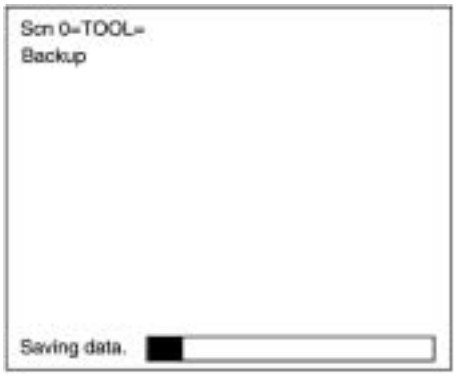
8. If scene data or image data is being transferred, select the desired scene number or memory number.



9. A confirmation message will be displayed. Select Execute to save the data. In this example, the system data is being saved.



The screen that shows the progress of the data transfer will be displayed.



10. Select ***Transfer/Receive File*** from the computer's Hyper Terminal menu.
11. Specify a destination directory where the file will be saved.
12. Use ***Xmodem*** protocol.
13. Select ***Receive*** and input the filename. The data will be transferred from the V530-R150 to the computer.

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

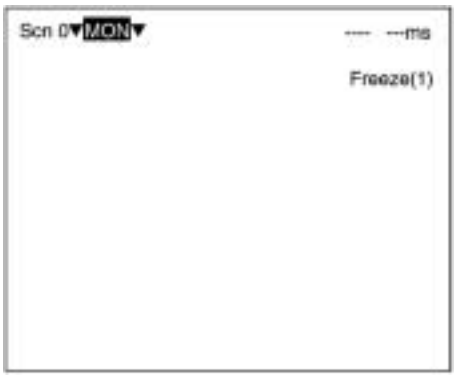
Procedure

1,2,3...

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.
3. Select the file to be loaded.
4. Use ***Xmodem*** protocol.
5. Select ***Send***.

   The data transfer screen will be displayed.
6. Once the computer preparations have been completed, display the Monitor mode or Run mode screen.
7. Move the cursor to ***RUN*** or ***MON*** and press the ENT Key.

   The mode selection menu will be displayed.



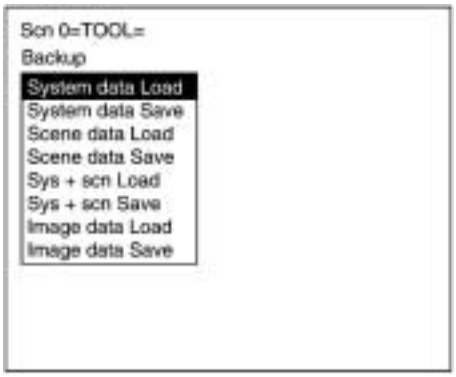
8. Select ***TOOL*** from the menu.

   The Backup operations menu will be displayed.



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9. Select the kind of data to load. (In this case, system data is being loaded from the computer.)

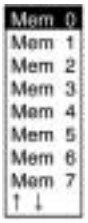


10. If scene data or image data is being transferred, select the desired scene number or memory number.

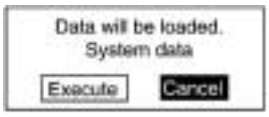
Scene number (0 to 9)



Image data (Memory 0 to 23, image 0 or 1)



11. A confirmation message will be displayed. Select Execute to load the data. The data will be transferred from the computer to the V530-R150. (In this example, the system data is being loaded.)



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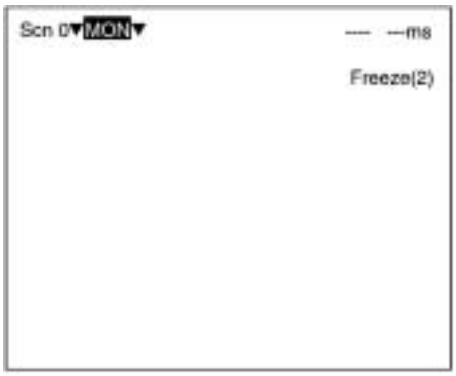
6-6 Scenes

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

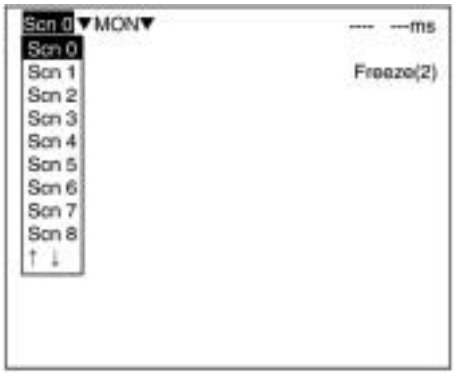
Procedure

1,2,3...

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.)

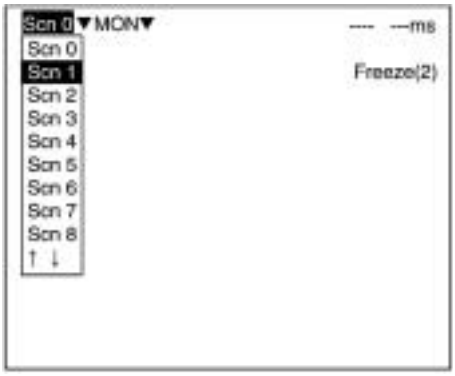
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Copying Scene Data

Procedure

1,2,3...

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

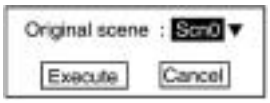


2. Select ***Copy***.



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***.

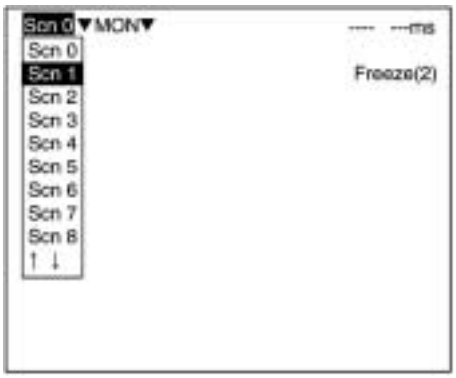
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Clearing Scene Data

Procedure

1,2,3...

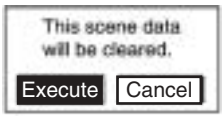
1. Move the cursor to the scene number to be cleared and press the SHIFT + ESC Keys.



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



3. Select ***Execute***.



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6-7 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 will be lost if it is not saved to flash memory.

Procedure

1,2,3...

1. Display the basic screen.

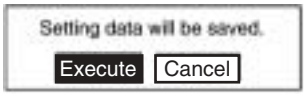


2. Move the cursor to ***MON*** (monitor) and press ENT.



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

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



Note

1. While data is being saved, the ON status of terminal block output terminals will be maintained.
2. 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.

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SECTION 7
Maintenance

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

7-1 Maintaining and Replacing Light Sources 224
7-1-1 F150-SL20A/SL50A Maintenance 224
7-1-2 F150-SLC20/SLC50 Maintenance. 226
7-2 Regular Inspections 228

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7-1 Maintaining and Replacing Light Sources

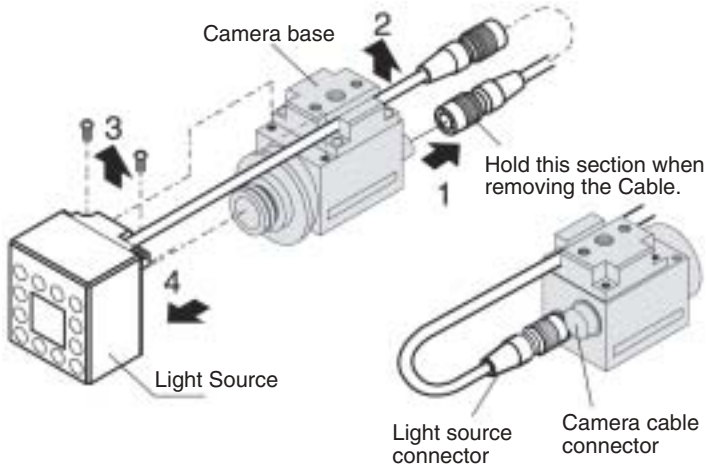
- The Light Source will gradually become dimmer as it is used (approx. 20% dimmer after 1,500 hours of operation). Replace the Light Source after approx. 1,500 hours of use.
- Replace the Light Source if it is partially damaged or not fully functioning.

7-1-1 F150-SL20A/SL50A Maintenance

Part	Model number
Light Source	F150-LT10A (See note.)

Note The F150-LT10A Light Source cannot be connected to the older F150-S1 Cameras.

Removing the Light Source



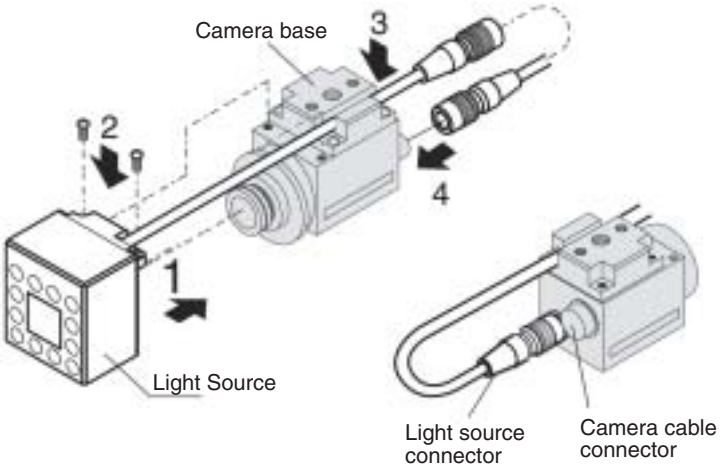
1,2,3...

1. Disconnect the light source cable from the light source connector on the back of the Camera.
2. Remove the light source cable from the slot in the camera base.
3. Remove the two screws securing the Light Source.
4. Remove the Light Source from the Camera.

⚠ **Caution** Do not disassemble the Lens.

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Installing the Light Source



1,2,3...

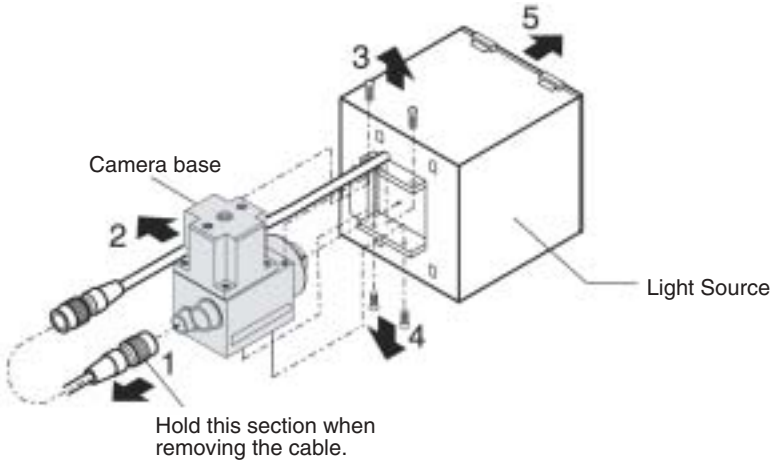
1. Mount the Light Source on the Camera.
2. Replace the two screws that secure the Light Source.
3. Insert the light source cable in the slot in the camera base.
4. Connect the light source cable to the light source connector on the back of the Camera.

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7-1-2 F150-SLC20/SLC50 Maintenance

Part	Field of vision	Model number
Light Source	20 mm	F150-LTC20
	50 mm	F150-LTC50

Removing the Light Source



1,2,3...

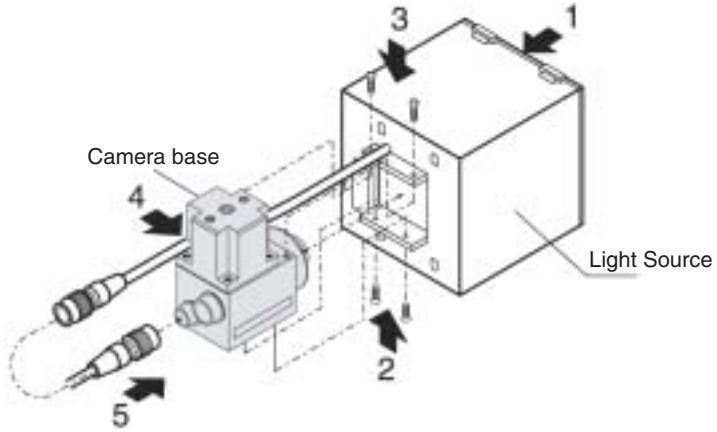
1. Disconnect the light source cable from the light source connector on the back of the Camera.
2. Remove the light source cable from the slot in the camera base.
3. Remove the top two screws securing the light source.
4. Remove the bottom two screws securing the light source.
5. Remove the light source from the Camera.

⚠ **Caution** Do not disassemble the Lens.

Note When the Camera is being used without the Intelligent Light Source, the top screws shown in step 3 are not needed and the bottom two screws shown in step 4 will be too long and won't fit the Camera. Use two M2 × 3 screws for the bottom screws instead.

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Installing the Light Source



1,2,3...

1. Mount the Light Source on the Camera.
2. Replace the bottom two screws that secure the Light Source.
3. Replace the top two screws that secure the Light Source.
4. Insert the light source cable in the slot in the camera base.
5. Connect the light source cable to the light source connector on the back of the Camera.

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7-2 Regular Inspections

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 and 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.

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SECTION 8
Specifications/Dimensions

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

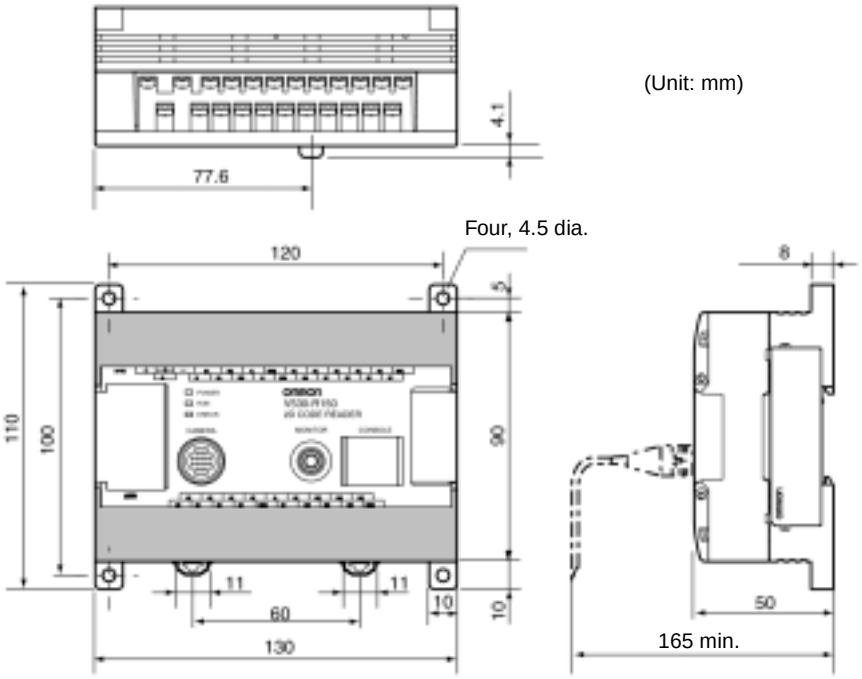
8-1 2-Dimensional Code Reader 230
8-2 Console 232
8-3 Camera 233
8-3-1 Camera Only 233
8-3-2 Cameras with Intelligent Light Sources 234
8-3-3 Cameras with Light Sources 236
8-4 Cables 238
8-5 Two-camera Unit 240
8-6 Camera Unit Cable 242
8-7 Video Monitor 243
8-8 LCD Monitor 244

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8-1 2-Dimensional Code Reader

V530-R150

(Unit: mm)



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Specifications

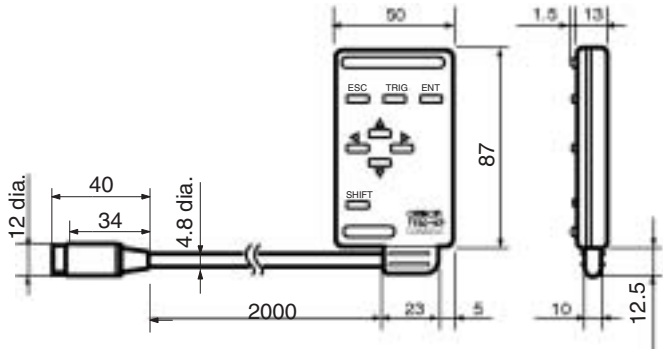
Supply voltage	20.4 to 26.4 VDC (including ripple)
Current consumption	Approx. 0.5 A
Insulation consumption	20 MΩ min. between all DC external terminals and GR terminal (at 100 VDC, with internal surge absorber removed.)
Dielectric strength	1,000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed.)
Leakage current	10 mA max.
Noise resistance	1500 Vp-p; pulse width: 0.1 μs/1 μs; rising time: 1 ns 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	200 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
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)

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8-2 Console

F150-KP

(Unit: mm)



Specifications

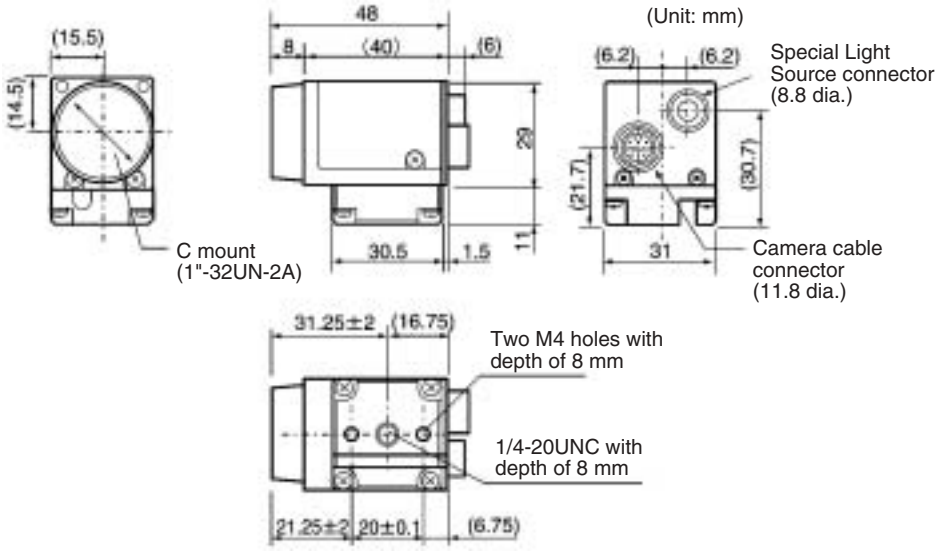
Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s^2, 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C; storage: –25 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 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

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8-3 Camera

8-3-1 Camera Only

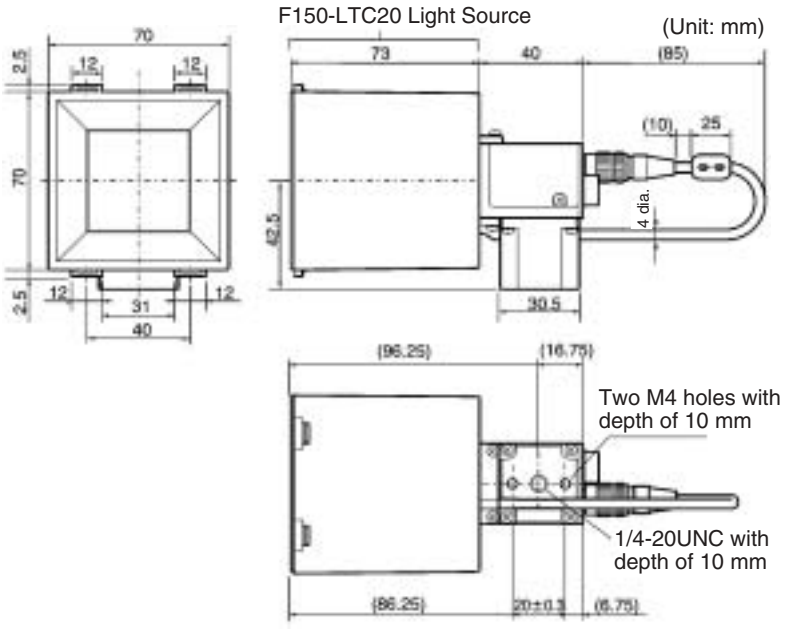
F150-S1A



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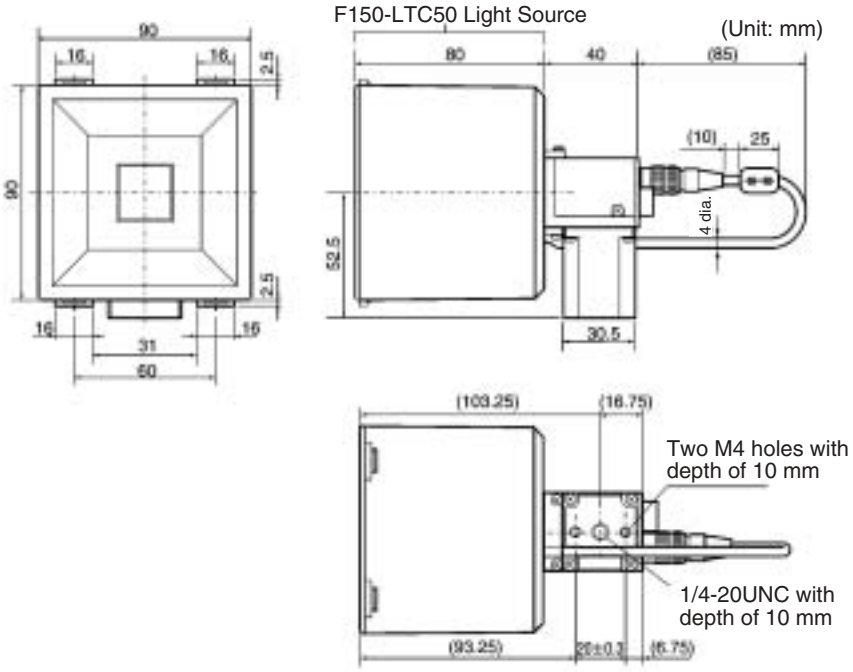
8-3-2 Cameras with Intelligent Light Sources

F150-SLC20



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F150-SLC50

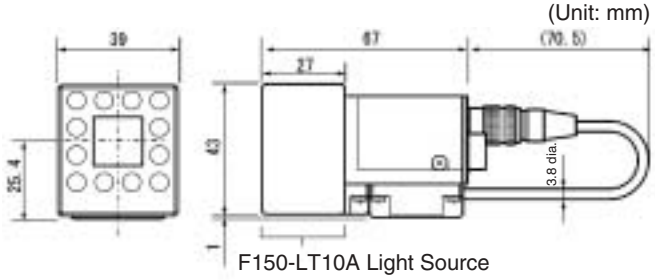


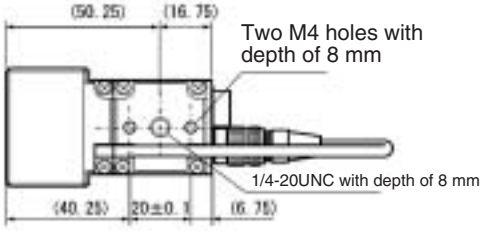
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8-3-3 Cameras with Light Sources

F150-SL20A/SL50A

(Unit: mm)





Specifications

	F150-SL20A	F150-SL50A	F150-SLC20	F150-SLC50	F150-S1A
Supply voltage	12 VDC				
Current consumption	110 mA max.		200 mA max.		100 mA max.
Vibration resistance	10 Hz to 150 Hz; half-amplitude: 0.35 mm (Max. acceleration: 50 m/s^2) 10 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 alloy (ADC 12) Mounting base: Bakelite containing cloth (black)				
Material of light source section	Case: ABS Transparent aperture: PC				---
Weight	Approx. 135 g	Approx. 135 g	Approx. 280 g	Approx. 370 g	Approx. 80 g

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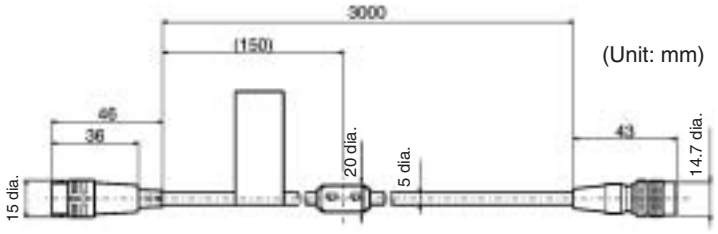
Performance

		F150-SL20A	F150-SL50A	F150-SLC20	F150-SLC50	F150-S1A
Camera	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				
Lens	Model number	F150-LE20	F150-LE50	F150-LE20	F150-LE50	---
	System	Fixed focus, fixed diaphragm				
	Brightness	F2.8				
	Focal distance	13 mm	6.1 mm	13 mm	6.1 mm	
Light Source	Model number	F150-LT10A		F150-LTC20	F150-LTC50	---
	Light source	Red LED (Peak wavelength: 680 nm)		Red and green LED combination (Peak wavelengths: 660 nm and 570 nm)		
	Emission method	Pulse emission (emission synchronized with camera shutter)				
Working distance		61 to 71 mm	66 to 76 mm	15 to 25 mm	16.5 to 26.5 mm	(Depends on the lens)
Field of vision		20 mm x 20 mm	50 mm x 50 mm	20 mm x 20 mm	50 mm x 50 mm	

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8-4 Cables

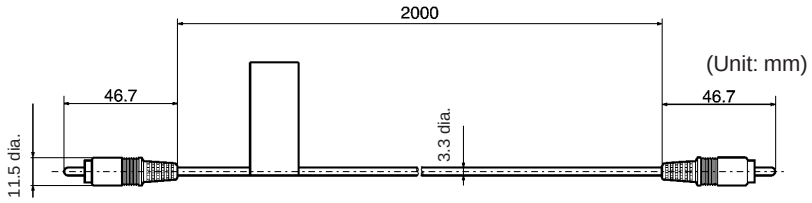
F150-VS Camera Cable



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 sheathing: Heat-resistant vinyl chloride Connector: PBT, Fiberglass-reinforced PC
Minimum bending radius	75 mm
Weight	Approx. 170 g

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F150VM Monitor Cable

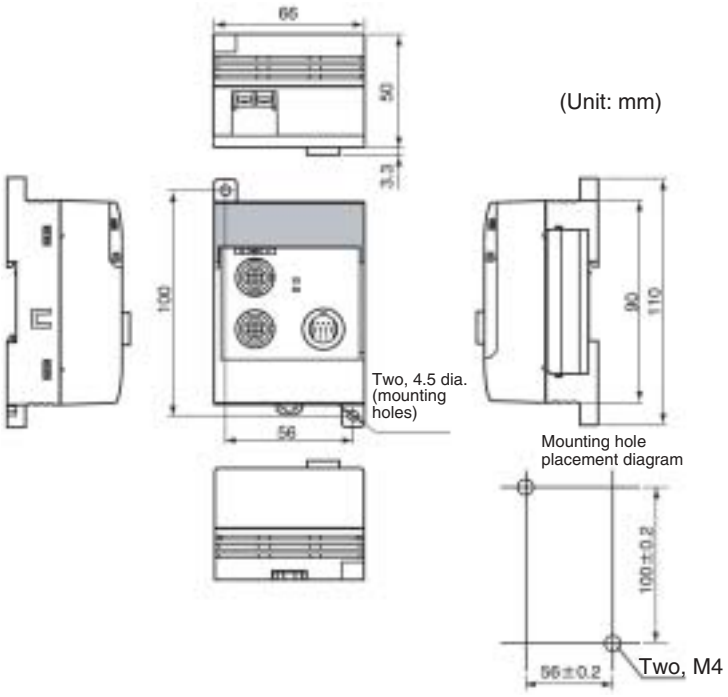


Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s^2, 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C; storage: –25 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Material	Cable shield: Ultra flame-resistant vinyl chloride Connector: PVC
Minimum bending radius	50 mm
Weight	Approx. 40 g
Accessories	BNC Jack Adapter

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8-5 Two-camera Unit

F150-A20



(Unit: mm)

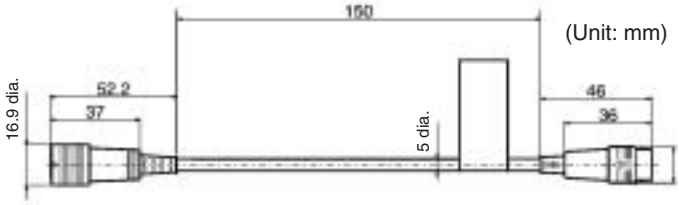
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Item	Specification
Supply voltage	20.4 to 26.4 VDC
Power consumption	Approx. 0.3 A
Vibration resistance	10 to 150 Hz; half-amplitude: 0.35 mm (approx. 50 m/s^2 max. acceleration), 10 times for 8 minutes each in 3 directions
Shock resistance	150 m/s^2, 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
Degree of protection	IEC60529 IP20
Case material	ABS/PC
Max. number of Cameras	2
Compatible Cameras	F150-S1A, F150-SL20A/SL50A, and F150-SLC20/SLC50 (The light level of the F150-SLC20/SLC50 can be controlled from the V530-R150.)
Compatible Controller	V530-R150
Image memory	Two images (one from camera 0 and one from camera 1)
Image capture	Simultaneous capture from the two cameras (Prevent mutual light interference when using the F150-SL20A/SL50A and F150-SLC20/SLC50.)
Camera modes	2 camera mode (switchable) or 1 camera mode
Weight	Approx. 220 g (Two-camera Unit only)

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8-6 Camera Unit Cable

F150-VA



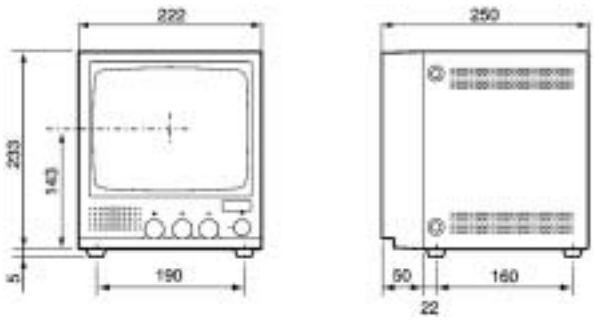
Item	Specification
Vibration resistance	10 Hz to 150 Hz; half-amplitude: 0.35 mm (max. acceleration: 50 m/s^2) 10 times for 8 min. in each 3 directions
Shock resistance	150 m/s^2, 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C; storage: –25 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Material	Cable sheathing: Heat-resistant vinyl chloride Connector: PBT, Fiberglass-reinforced PC
Minimum bending radius	35 mm
Weight	Approx. 20 g

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8-7 Video Monitor

F150-M09

(Unit: mm)

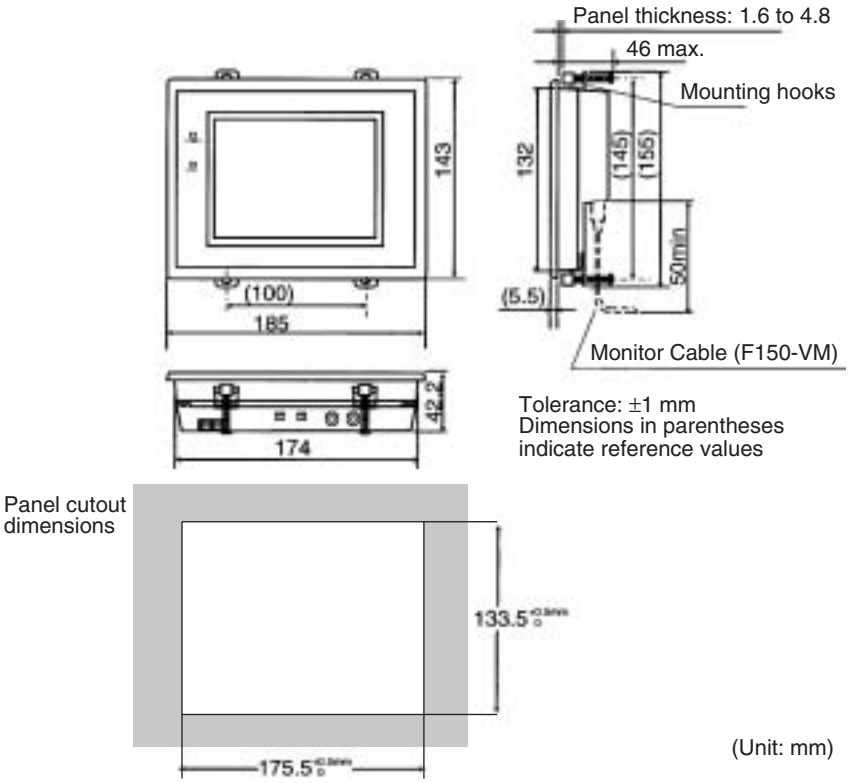


Item	Specification
Supply voltage	85 to 264 VAC, 50/60 Hz
Power consumption	20 W max.
Vibration resistance	5 to 100 Hz, 6 times for 10 minutes each in 3 directions; 0.16-mm full-amplitude or 7.35 m/s^2 acceleration (whichever is smaller)
Ambient temperature	Operating: –10 to 50°C; storage: –20 to +65°C (with no icing or condensation)
Ambient humidity	Operating/storage: 10% to 90% (with no condensation)
Ambient environment	No corrosive gases
Material	Front section: ABS plastic Metal section: SECC (galvanized steel sheet)
CRT size	9 inches; 164 x 123 mm (H x V)
CRT type	Monochrome CRT (light holding)
Resolution	800 TV lines min. (at center)
System	Number of scanning lines:600 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. 4.5 kg

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8-8 LCD Monitor

F150-M05L



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Item	Specification
Supply voltage	20.4 to 26.4 VDC
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
Degree of protection	IEC60529 IP20
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
Accessories	Four mounting hooks

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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.

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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. → **page 184**
Lighting	Use appropriate lighting for the application and the read object. The reading accuracy can be improved significantly by changing the lighting. → **page 23**
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.

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9-1-3 Condition Settings

Confirm the following settings.

Item	Possible problem	Countermeasures
Menus	Is the correct menu selected?	Choose the menu appropriate for the code to be read. → **page 118**
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 • Matrix size (for Data Matrix (Normal) mode) • Length of Finder (for Data Matrix (Normal) mode) • Version (for QR Code (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 page 253 to page 256.

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

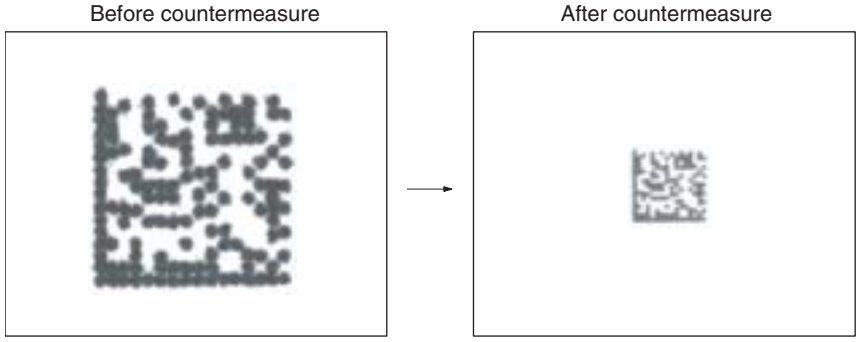
Try the following countermeasures to improve reading of codes made up of dots, in Normal mode (QR Code or Data Matrix).

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 (***0. Image Adjust/Filtering***). The influence of dots can be further reduced by turning ON the Filtering Retry function with ***0. Image Adjust/Filtering Retry***.

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- Try reading in Pattern mode (QR Code or Data Matrix).

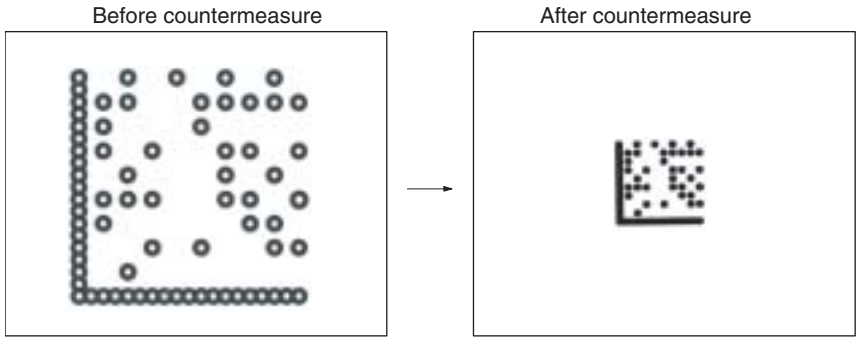


Hollowing of Dots

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 (***0. Image Adjust/Filtering***).
- The influence of hollowing can be decreased by adjusting the BGS levels (***0. Image Adjust/BGS Levels***).



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Direct Marking (White Code on Black Background)

Try the following countermeasures for codes created using direct marking.

Countermeasures

- Use the smoothing function in ***0. Image Adjust/Filtering***. The smoothing function can be made even more effective by using ***0. Image Adjust/Filtering Retry***.
- For Data Matrix reading in Normal mode, set ***Read DM (Normal)/Reading Settings (Manual)/Background Cut*** to medium or strong.
- Change the setting in ***0. Image Adjust/BGS Levels*** to increase the lower limit of the BGS level (making the background uniformly black).



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Lighting

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

Countermeasure

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

Before countermeasure



Ring lighting

→

After countermeasure



Coaxial lighting

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9-2 Error Codes and Countermeasures

9-2-1 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 part of the 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.)	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.
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.

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Error Code	Description	Countermeasures
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.
E200	Timeout error	Decoding was not performed within the timeout time. • Perform teaching or register the pattern again to change and improve the settings. • Set a longer timeout time.

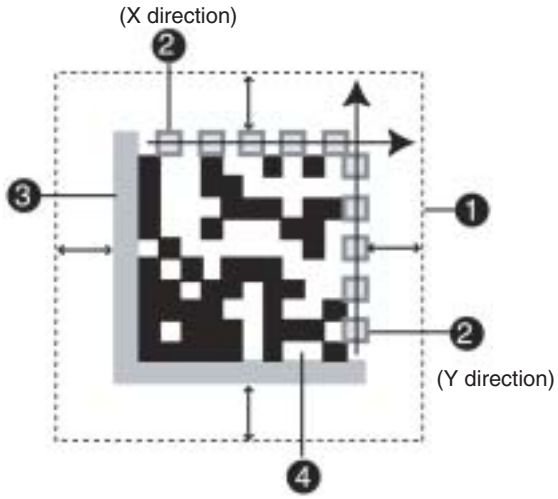
Common Check Items for Error Codes E120 to E122

Check the gray edge value in ***Reading Settings (Manual)***.
Use the ***2. Image Analysis/Contrast (Line Bright)*** function to check 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 if reading is OK 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



1,2,3...

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. An area other than 1 to 3 contains the data.

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9-2-2 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 threshold 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 Matrix size. Re-register the model. • Model registration may not have been performed in the optimum way. Re-register the model with reference to page 152.
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 threshold 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 152.
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 threshold 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 152.

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Error Code	Description	Countermeasures
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 152. • The cell recognition coordinates may be incorrect. Adjust the field of vision so that the code image is larger and re-enter the settings.
E200	Timeout error	Decoding was not performed within the timeout time. • Perform teaching or register the pattern again to change and improve the settings. • Set a longer timeout time.

Common Check Items for Error Codes E160 to E182

- Check that the code is not rotated at an angle of more than ±10° when compared to the registered model.
- Check that the Matrix size is set correctly.
- Check that the model has been registered correctly using the ***Reference Model*** procedure given on page 152.

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9-2-3 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 monitor correctly. • Check the printing of the reading code. Three finder patterns in corners 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 monitor can be checked under ***2. Image Analysis/Measure Length***.
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.

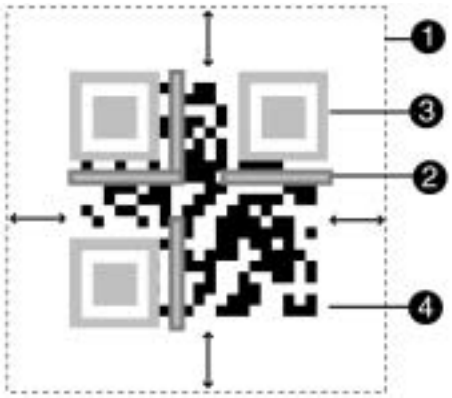
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Error Code	Description	Countermeasures
E030	Pattern search NG	As a result of the pattern search, 32 or more proposed finder patterns were found. Make sure the image is displayed on the monitor correctly and check the registered mode.
E200	Timeout error	Decoding was not performed within the timeout time. • Perform teaching or register the pattern again to change and improve the settings. • Set a longer timeout time.

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



1,2,3...

1. A margin of 4 or more cells around the code is required.
   (A margin of only 1 cell is sufficient for QR codes in pattern mode.)
2. Format information of the code. (There are four.)
3. Finder patterns (Symbols in three corners)
4. An area other than 1 to 3 contains the data.

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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 are not displayed when using a Camera with a Light Source.

- The camera cable is not properly connected.
- The light source cable is not properly connected to the Camera.

Camera images are not displayed when using a standard CCTV lens and light source.

- 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 LED light sources do not turn ON when using a Camera with a Light Source.

- The light source cable is not correctly connected to the Camera.
- Power is not being supplied to the V530-R150.
- When using an Intelligent Light Source:
  The unit number is not set correctly on the Light Source's DIP switch.
  If a Two-camera Unit is being used, set the unit number to 0 on the Camera 0's Light Source and set the unit number to 1 on the Camera 1's Light Source.

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.

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The images on the monitor are recognized but codes 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.

Two-camera Unit Errors

The LED Indicators do not light.

- The Power Supply is not connected correctly.
- The power supply voltage is below the allowed range (20.4 to 26.4 VDC).
- The Two-camera Unit is not connected to the V530-R150.

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 of the V530-R150 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.

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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.

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Appendix A

ASCII Codes

Character	Data (Hexa-decimal No.)	Character	Data (Hexa-decimal No.)	Character	Data (Hexa-decimal No.)	Character	Data (Hexa-decimal 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

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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
```


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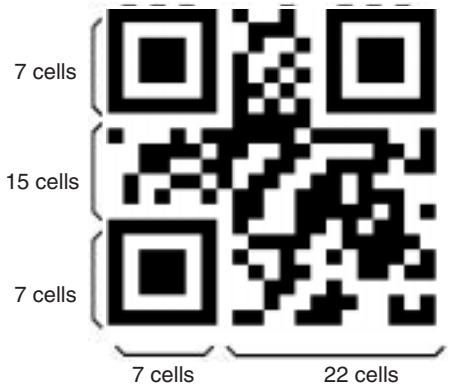
Appendix C

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.



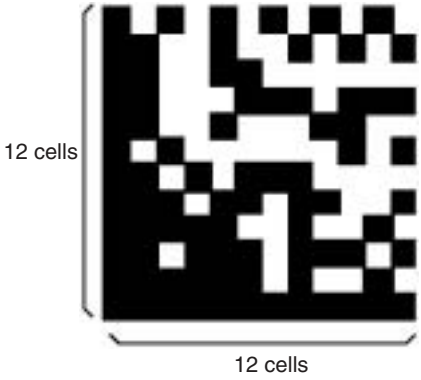
Matrix size (Version)	Error correction level	Data capacity		Matrix size (Version)	Error correction level	Data capacity	
		Num. Cap.	Alpha Num. Cap.			Num. Cap.	Alpha Num. Cap.
21 × 21 (Version 1)	L (7%)	41	25	**33 × 33 (Version 4)**	L (7%)	187	114
	M (15%)	34	20		M (15%)	149	90
	Q (25%)	27	16		Q (25%)	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

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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 12 × 12 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
32 × 32	124	91
36 × 36	172	127
40 × 40	228	169
44 × 44	288	214
48 × 48	348	259
52 × 52	408	304
64 × 64	560	418
8 × 18	10	6
8 × 32	20	13
12 × 26	32	22
12 × 36	44	31

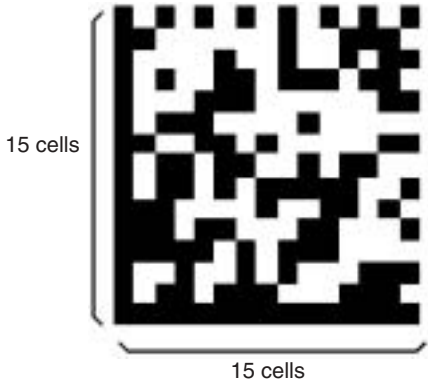
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Matrix size	Maximum data capacity	
	Num. Cap.	Alpha Num. Cap.
16 × 36	64	46
16 × 48	98	72

Data Matrix (ECC100-140)

The relation between matrix size (number of cells) and data capacity is shown in the table below.

The following diagram shows an ECC100 data matrix (matrix size: 15 × 15.)



- ECC000

Matrix size	Maximum data capacity	
	Num. Cap.	Alpha Num. Cap.
9 × 9	3	2
11 × 11	12	8
13 × 13	24	16
15 × 15	37	25
17 × 17	53	35
19 × 19	72	48
21 × 21	92	61
23 × 23	115	76
25 × 25	140	93

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- ECC050

Matrix size	Maximum data capacity	
	Num. Cap.	Alpha Num. Cap.
11 × 11	1	1
13 × 13	10	6
15 × 15	20	13
17 × 17	32	21
19 × 19	46	30
21 × 21	61	41
23 × 23	78	52
25 × 25	97	65

- ECC080

Matrix size	Maximum data capacity	
	Num. Cap.	Alpha Num. Cap.
13 × 13	4	3
15 × 15	13	9
17 × 17	24	16
19 × 19	36	24
21 × 21	50	33
23 × 23	65	43
25 × 25	82	54

- ECC100

Matrix size	Maximum data capacity	
	Num. Cap.	Alpha Num. Cap.
13 × 13	1	1
15 × 15	8	5
17 × 17	16	11
19 × 19	25	17
21 × 21	36	24
23 × 23	47	31
25 × 25	60	40

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- ECC140

Matrix size	Maximum data capacity	
	Num. Cap.	Alpha Num. Cap.
17 × 17	2	1
19 × 19	6	4
21 × 21	12	8
23 × 23	17	11
25 × 25	24	16

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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.
Normally a margin of at least 4 cells must be provided around the code. Codes can be read with a margin of 1 cell only when the QR Code (Pattern) mode is used.



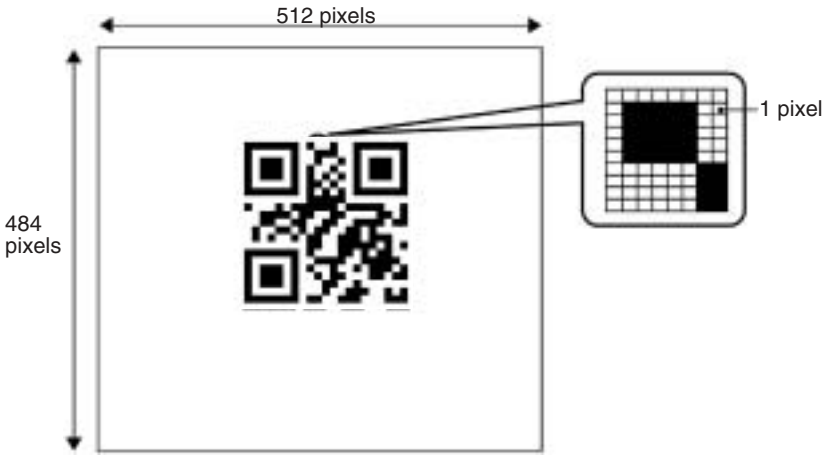
Error Correction

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.)

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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 ***2. Image Analysis/Measure Length***. → **page 176**



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.”

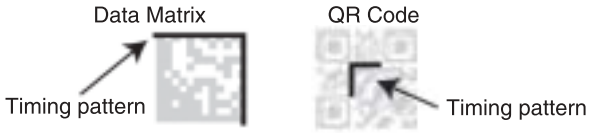
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Cell

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.



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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).

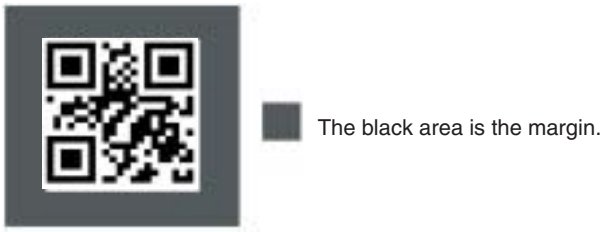
Marking Methods

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. Normally a margin of at least 4 cells must be provided around 2-dimensional codes. When the QR Code (Pattern) mode is used, a margin of 1 cell is acceptable.



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Appendix E

Version Information

Data Compatibility

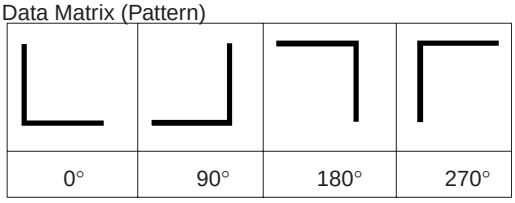
The software version for this V530-R150E-3/EP-3 is “Ver. 3.00.” Scene data and system data for the V530-R150E-2/EP-2 (version 2.□□) cannot be used.

Changes from Version 2.□□ to Version 3.00

The following table lists functions in the V530-R150E-3/EP-3 (Version 3.00) that are different from the V530-R150E-2/EP-2 (Version 2.□□).

Change	Description
Increased number of compatible Data Matrix versions	Data Matrix versions ECC000, ECC050, ECC080, ECC100, and ECC140 can be decoded. → **page 4, page 268, page 269**
Increased number of compatible ECC200 Data Matrix sizes	Square matrix sizes 10×10 to 64×64 and rectangular matrix sizes 8×18 to 16×64 can be used. → **page 4, page 267**
A Two-camera Unit can be connected	Two Cameras can be connected to a single V530-R150. → **page 6, page 26**
Cameras with Intelligent Light Sources can be connected	Cameras with Intelligent Light Sources can be connected, so light levels can be adjusted from the V530-R150. → **page 18, page 131**
Increased number of commands that can be input from RS-232C	Commands have been added that allow reading conditions and system conditions to be changed from a host computer. → **page 56**
An explanation of each process is displayed	A message explaining each process is displayed on the monitor so even first-time users can easily understand the operations. → **page 104**
Added a timeout function	A timeout time can be set for all reading modes. The read operation will be cancelled automatically if it exceeds the timeout time. → **page 161, page 169, page 139, page 155**
Binary images can be displayed	Binary images can be displayed on the monitor using the decoding threshold setting as the threshold value. This function can be used to check the white and black cells that the V530-R150 actually recognized in the code read from the camera. → **page 142**

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Change	Description
Increased the number of directions that a code can be registered as a model in the Data Matrix (Pattern) mode	Data Matrix (Pattern)  → **page 148**
Individual white cell and black cell regions can be specified for contrast measurements	The contrast between the code and the background or the contrast between the code's white and black cells can be checked by specifying particular white cell and black cell regions. → **page 181**
Added a footer code to the RS-232C communications specifications	The ETX footer code was added to allow communications with OMRON NT-series Programmable Terminals → **page 194**
The data output format in normal (no-protocol) RS-232C communications can be changed	The output format can be customized. For example, just part of the Reading Data can be output or other information such as the code position and angle can be included in the output. → **page 199**

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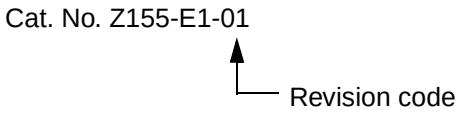
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Revision History

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
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