OMRON

SETUP MANUAL

F250 Vision Sensor

This manual provides information on system hardware and installation. Be sure to read this manual first.

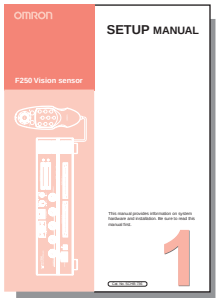
1

Cat. No. SCHB-736B

Operating Procedures and Reference Manuals

Connect

Wire



Setup Manual

This manual provides information for the correct and safe application of the F250, including procedures from checking package contents and installation to connections and wiring. It also provides information on F250 and peripheral device functionality and specifications.

Install software

Set conditions

Test/Measure

Output to external device

Operation Manual (CD-ROM)

(Packed with the Application Software.)

This manual explains basic operations, such as installing the Applications Software, setting up inspection processes, and communicating with external devices.

INTRODUCTION

Thank you for your purchase of this F250-C50/C55 Vision Sensor (hereinafter referred to as the Controller). This manual explains how to use the Controller. Please observe the following points when using the Controller.

- Please read and understand this manual thoroughly before using the Controller so that it is not used incorrectly.
- Please keep this manual at hand so that you can refer to it at any time.

Setup Manual

Vision Sensor F250

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Table of Contents

Read and Understand this Manual

Please read and understand this manual before storing, installing, programming, operating, maintaining, or disposing of the products. Please consult your OMRON representative if you have any questions or comments.

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the product in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

Meanings of Signal Words

The following signal words are used in this manual.

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Meanings of Alert Symbols

The following alert symbols are used in this manual.

	Indicates the possibility of explosion under specific conditions.
	Indicates the possibility of injury by high temperature under specific conditions.

Alert statements in this Manual

The following alert statements apply to the products in this manual. Each alert statement also appears at the locations needed in the manual to attract your attention.

⚠ WARNING

Do not disassemble the Controller, apply pressure to the controller that would deform its shape, or incinerate the controller.

A lithium battery is built into the Controller and it may combust, explode, or burn if not treated properly.

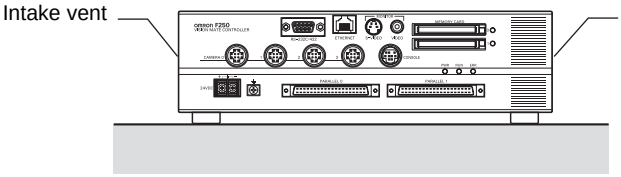
Do not short circuit, attempt to charge, disassemble, apply pressure that would deform, or incinerate the lithium battery.

The lithium battery may start a fire, explode, or burn if not treated properly.

⚠ CAUTION

Install the Controller so that air can flow freely through its cooling vents.

If the vents are blocked, heat will build up in the Controller and may cause burns.



Regulations and Standards

The Controller complies with the EC Directive and EN standard below.

1.EC Directive

EMC Directive:No. 89/336/EEC

2.EN Standards (European Standards)

EN 61326: 1997/Annex A+A1: 1998 (EMI: Class A)+A2: 2001

Precautions for Safe Use

Please observe the following precautions for safe use of the products.

Installation Environment

- Do not use the product in environments where it can be exposed to inflammable/explosive gas.
- Do not install the product close to high-voltage devices and power devices in order to secure the safety of operation and maintenance.
- Make sure to tighten all installation screws securely.

Power Supply and Wiring

- Make sure to use the product with the power supply voltage specified by this manual.
- Use a power supply cable and crimp terminals of the specified size.Do not simply connect the twisted ends of the wires directly to the terminal block.
- Keep the power supply wires as short as possible (Max. 10 m).
- Use a DC power supply with countermeasures against high voltages (safe extra low-voltage circuits on the secondary side).

p.28

- Ground the Controller's ground terminal to less than 100 Ω.
- Use a grounding point that is as close as possible and keep the ground wire as short as possible.
- Wire the Controller to the ground with a separate ground wire.To avoid grounding problems, do not share the ground wire with any other devices or wire the ground to the building's steel framing.
- Confirm wiring again before the turning on the power .

Other

- Do not attempt to dismantle, repair, or modify the Controller.
- If you suspect an error or malfunction, stop using the Controller immediately, turn OFF the power supply, and consult your OMRON representative.
- Do not touch fluorescent or halogen lights while the power is ON or immediately after the power is turned OFF.
- Dispose of this product as industrial waste.

Precautions for Correct Use

Please observe the following precautions to prevent failure to operate, malfunctions, or undesirable effects on product performance.

Installation of the Controller

Install the Controller in a place that meets the following conditions:

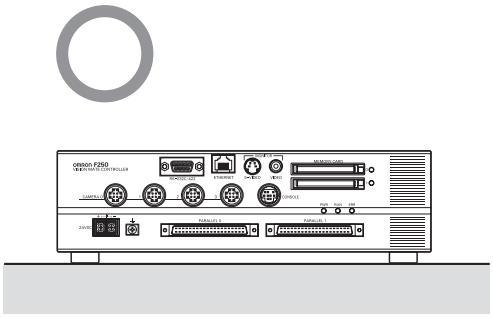
- Surrounding temperature of 0 to +50°C
- No rapid changes in temperature (place where dew does not form)
- Relative Humidity of between 35 to 85%
- No presence of corrosive or flammable gases
- Place free of dust, salts and iron particles
- Place free of vibration and shock
- Place out of direct sunlight
- Place where it will not come into contact with water, oils or chemicals

Orientation of Controller

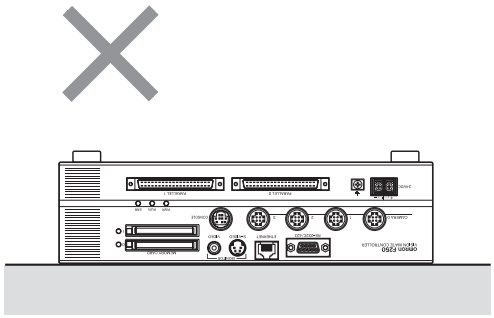
To improve heat dissipation, install the Controller in the following orientation only.

For proper air flow, provide at least 20 mm of clearance above the Controller and at least 50 mm of clearance on both sides.

- Horizontal Installation

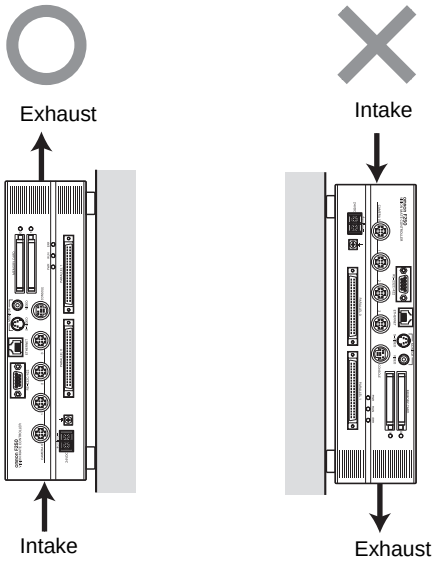


Do not install the Controller upside down as shown in the following diagram.



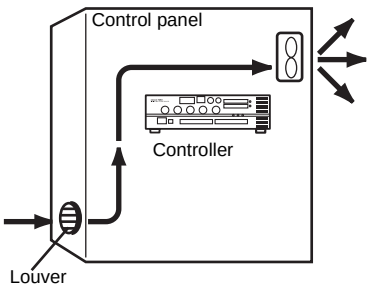
- Vertical Installation

The Controller can be installed vertically with the air intake at the bottom and exhaust at the top.



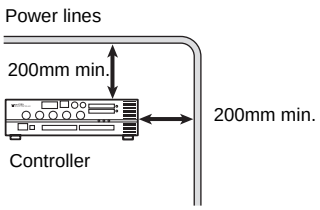
Ambient temperature

- For proper air flow, provide at least 20 mm of clearance above the Controller and at least 50 mm of clearance on both sides.
- Do not install the Controller immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
- Do not let the ambient operating temperature exceed 50°C (122°F).
- Provide a forced-air fan cooling or air conditioning if the ambient temperature is near 50°C (122°F) so that the ambient temperature never exceeds 50°C (122°F).



Noise resistance

- Do not install the Controller in a cabinet containing high-voltage equipment.
- Do not install the Controller within 200 mm of power cables.



Component Installation and Handling

OMRON Components

Use a Camera, Camera Cable, and Console designed specifically for the Controller.

Connecting Cables

Always turn OFF the Controller's power before connecting or disconnecting a camera or cable.

Handling the Camera

The Camera's case is connected to the 0V line in the internal circuits. Observe 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 ferrite core attached to the F150-VS or F160-VSR □□ Camera Cable.

Optical axis of a special camera

The center of the optical axis varies with the camera used. Therefore, when installing the camera, always check the center of the image displayed on the monitor.

Securing the Video Monitor

(When Using the Recommended F150-M09)

Observe the following precautions to prevent noise interference, because the video monitor case 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.

Touching Signal Lines

To prevent damage from static electricity, use a wrist strap or another device for preventing electrostatic discharges when touching terminals or signal lines in connectors.

Handling the Memory Card

- To prevent damage from static electricity, do not touch the Memory Card directly while it is installed in the Controller.
- To remove a Memory Card, turn OFF the power supply to the Card (using the menu command) or turn OFF the Controller. Press the eject button to eject the Card.The Memory Card or the Controller itself may be damaged if a Memory Card is removed while power is being supplied. (The power supply is stopped using the menu)

NOTICE

Application Software Precautions

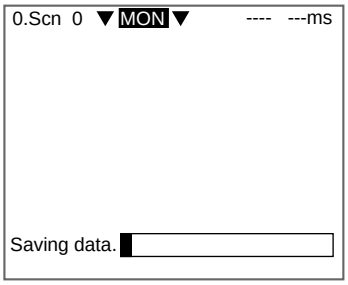
It will not be possible to start the Setup Menu if you change the contents of the Memory Card after installing it in a personal computer or other device.

Never change the contents of the Card with operations such as the following:

- Changing file names
- Moving or deleting files
- Overwriting data
- Formatting

Turning OFF the Power

Do not turn OFF the power while a message is being displayed indicating that processing is being performed.Data in memory will be corrupted, and the Controller may not operate correctly the next time it is started.



Using the RESET Signal

Do not use the RESET input immediately after power is turned ON.When using the RESET input to synchronize startup timing, wait at least 1 second after the Controller's power supply is turned ON before turning ON the RESET signal.

Replacing the Battery

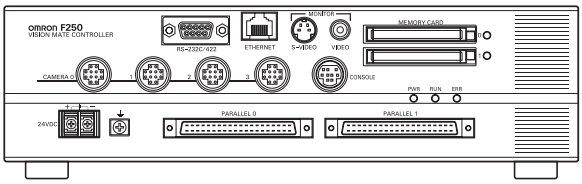
The Controller is equipped with a battery that backs up the clock.When the battery is low, the message "BATTERY LOW" will be displayed on the monitor at startup.The battery must be replaced when this message is displayed.Return the Controller to your OMRON dealer for service. (The battery is not user-serviceable.)

- The battery will last approximately 7 years.

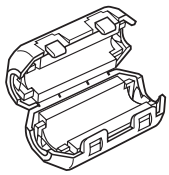
Confirming Package Contents

Check the contents of the package as soon as you receive the Controller.
It is extremely rare for components to be missing, but contact the nearest OMRON representative if any of the following items are missing.

- Controller Qty.: 1

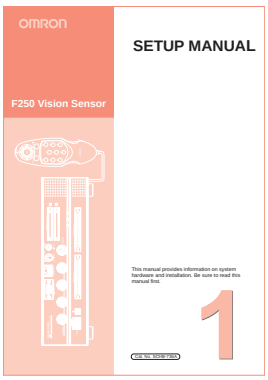


- Ferrite core for F150-KP Console or F160-KP Console Qty.: 1
- Ferrite core for F150-VM Monitor Cable Qty.: 1



* The ferrite core is supplied only with models that support CE.
It is not necessary to install it in models that do not support CE.
Please contact any of our branches or sales offices for further details.

- Manual
  Setup Manual (this manual) Qty.: 1



CHECK!

The Operation Manual (on CD-ROM) is packed with the Application Software.

Editor's Note

Visual Aids

Indicates information required to take full advantage of the functions and performance of the product. Incorrect application methods may result in the loss of damage or damage to the product. Read and follow all precautionary information.

Indicates points that are important in using product functions or in application procedures.

Indicates where to find related information.

Indicates information helpful in operation, such as the definition of terms.

Product Availability

Some of the products listed may not be available in some countries. Please contact your nearest OMRON sales office by referring to the addresses provided at the back of this manual.

SECTION 1
Features

Vision Sensor

Vision Sensors work in place of the human eye to perform inspections by processing images using cameras. The visual inspections can be automated and complicated inspections can be performed accurately at high speeds.

The OMRON Vision Sensor helps create production lines with a highly efficient inspection system, which is important to meet current demands for small-lot, variable-product production, produce greater added-value, and improve product quality.

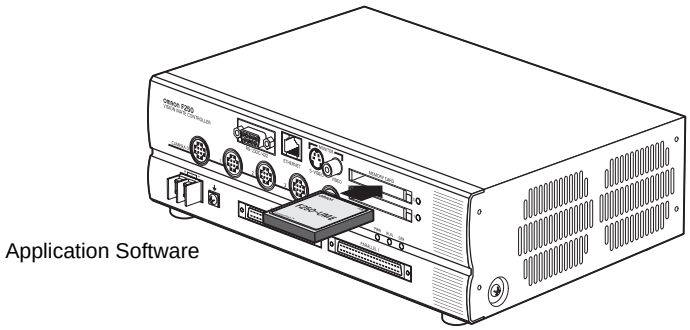
Using the Vision Sensor yields a high return on investments by ensuring the following benefits:

- Repetitive work is reduced.
- More complicated, more precise inspections are possible.
- Inspection data management is easier (CIM, GMP, ISO9000).
- Working hours can be shortened.
- Less 3-D work (difficult, dirty, dangerous) is required.
- Work can be performed by less experienced staff.

F250 Features

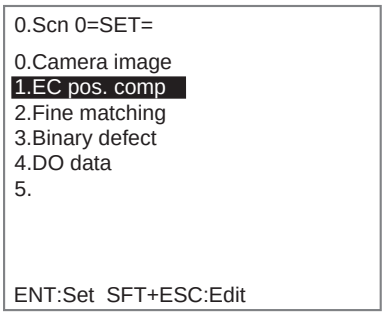
Application software (sold separately) is installed in the controller and used.
Inspection conditions can be set simply and flexibly using the flow-chart system.

First, install the processing items necessary for inspection from the application software.



Application Software

Processing items can be freely combined on the menu.

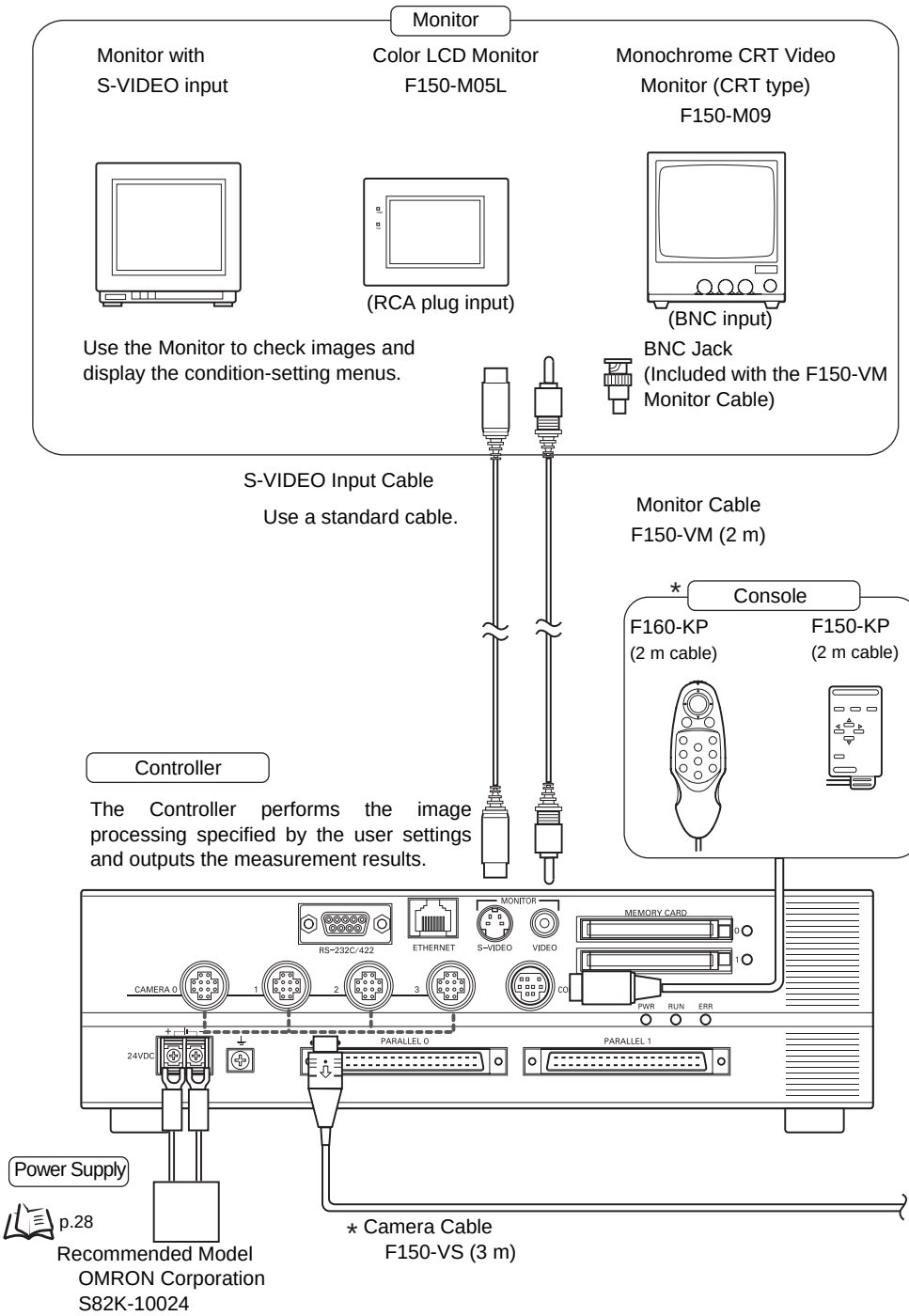


SECTION 2
Installation and Connections

Basic System Configuration

The following diagram shows the basic system configuration.

NOTICE Some of the components shown in the configuration diagram are special OMRON products that cannot be substituted with comparable devices. The use of other products may result in damage. (These items are indicated with an asterisk.)



* Camera

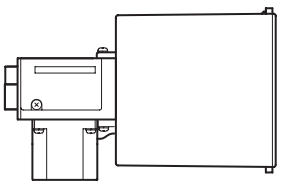
The Camera captures images of the measurement objects.
Up to 4 Cameras can be connected to one Controller.

CHECK!

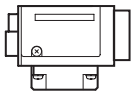
If F150-□□□ or F160-□□□ Cameras are being used, the connected Cameras must belong to the same series, i.e., they must have the same model number prefix (F150 or F160).

Double-speed Cameras

Camera with Intelligent Lighting
F160-SLC20 (20 mm field of vision)
F160-SLC50 (50 mm field of vision)



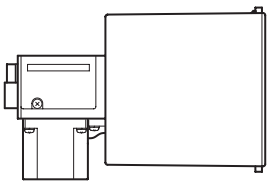
Camera Only
F160-S1
F160-S2



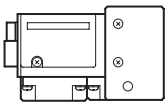
Use the Camera by itself when the field of vision of the F160-SLC□0 does not match the size of the measurement object A standard CCTV lens and light source will be needed.

F150 Cameras

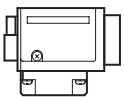
Camera with Intelligent Lighting
F150-SLC20 (20 mm field of vision)
F150-SLC50 (50-mm field of vision)



Camera with Light
F150-SL20A (20 mm field of vision)
F150-SL50A (50-mm field of vision)



Camera Only
F150-S1A



Use the Camera by itself when the field of vision of the F150-SLC□0 does not match the size of the measurement object A standard CCTV lens and light source will be needed.

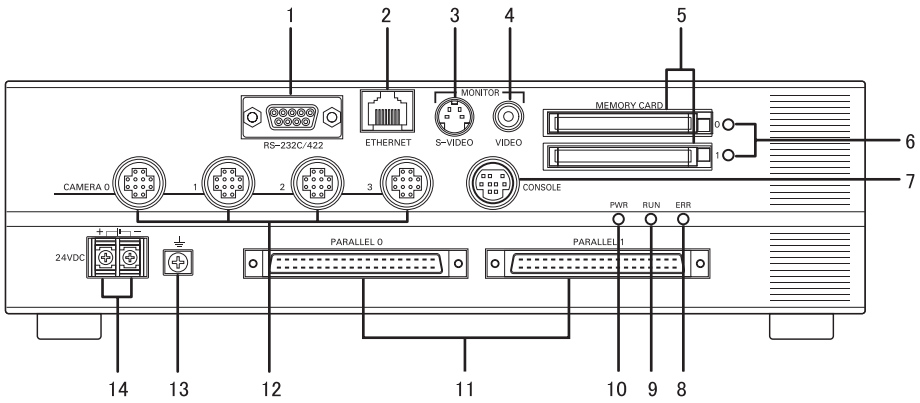
CHECK!

F300-series Cameras can also be connected. Up to four Cameras can be connected, but they must all have the same model number.

Camera type	Camera Cable
F300-S	F160-VSR4
F300-S2R	F160-VSR3
F300-S3DR	
F300-S4R	

Details on parameter settings p.78

Component Names and Functions



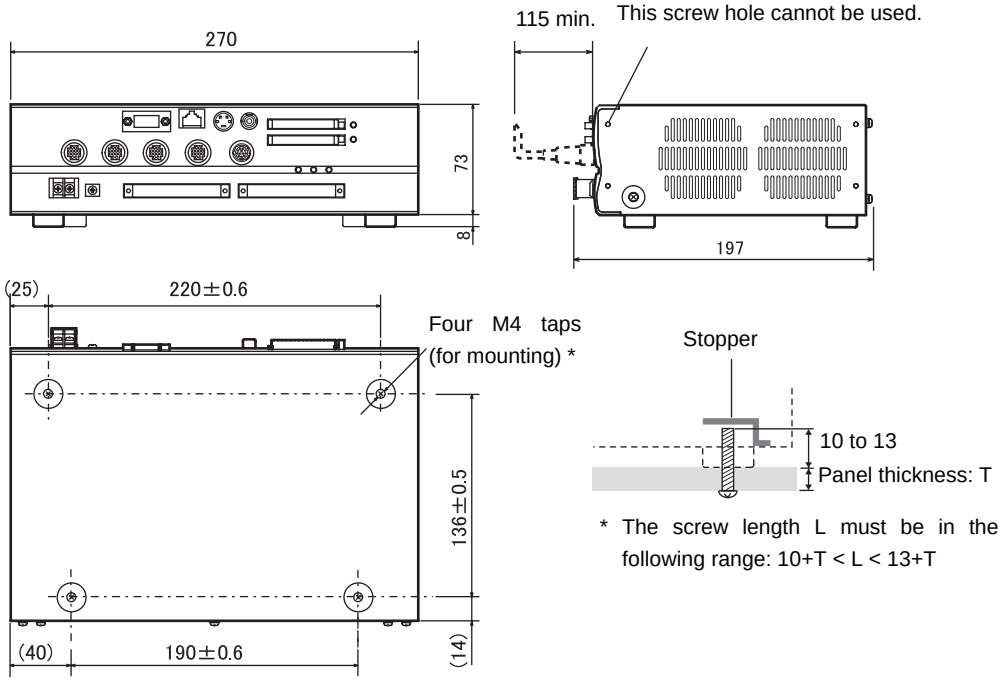
Pin	Name	Function
1	RS-232C/RS-422 Connector	Connects the Controller to an external device such as a personal computer or PLC.
2	Ethernet Connector (10BASE-T)	Connects the Controller to a personal computer. (Can be used with F250-UME Application Software version 1.10 or higher.)
3	Monitor Connector (S-VIDEO Output)	Connects to a monitor with an S-VIDEO input.
4	Monitor Connector (Composite Video Output)	Connects to a monitor.
5	Memory Card Slots 0 and 1	Memory Cards such as the Application Software Memory Card can be inserted in these slots.
6	Memory Card Indicators 0 and 1	Lit when power is being supplied to the corresponding Memory Card. (The Memory Card must not be inserted or removed when this indicator is lit.)
7	Console Connector	Connects the Controller to a Console.
8	ERROR Indicator	Lit when an error has occurred.
9	RUN Indicator	Lit while the Controller is in Run Mode.
10	POWER Indicator	Lit while power is ON.
11	Parallel Connectors 0 and 1	Connect the Controller to external devices such as a sync sensor or PLC.
12	Camera Connectors 0 to 3	Connect to the Cameras.
13	Ground Terminal	Connects to the ground wire.
14	Power Supply Terminals	Connect to the DC power supply.

Mounting the Controller

There are two ways to mount the Controller: horizontal mounting, or vertical mounting.

▪ Dimensions

(Unit:mm)



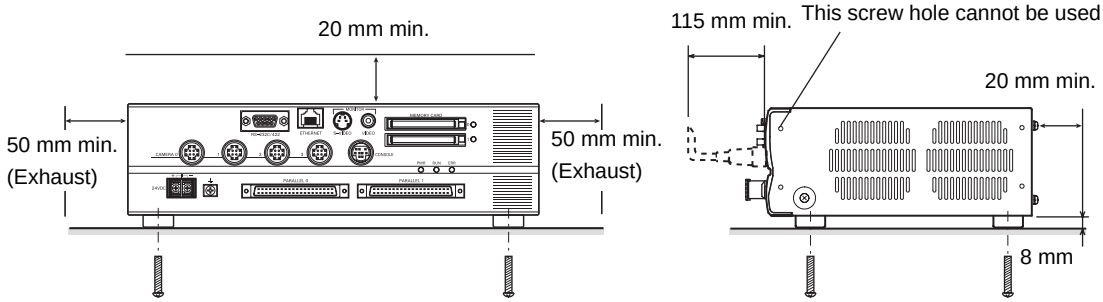
* The screw length L must be in the following range: 10+T < L < 13+T

CHECK!

Use the correct screw length. If the screw extends more than 13 mm past the panel, the stopper may bend and contact the Controller's internal PC board.

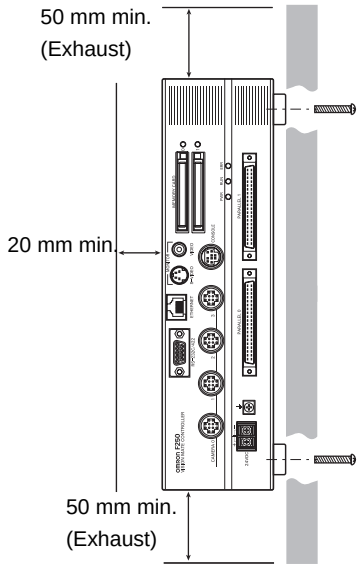
Horizontal Mounting

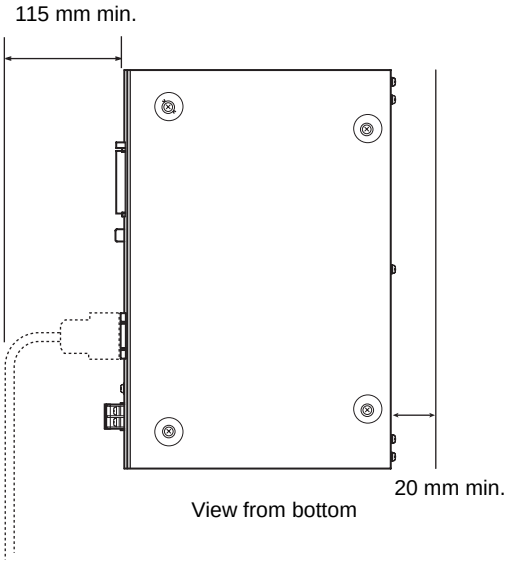
For proper air flow, provide at least 20 mm of clearance from the top of the Controller and at least 50 mm of clearance from the sides (next to the intake and exhaust vents).



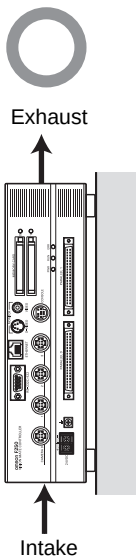
Vertical Mounting

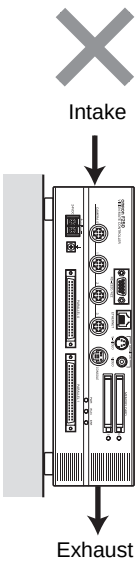
For proper air flow, provide at least 20 mm of clearance from the top of the Controller and at least 50 mm of clearance from the sides (next to the intake and exhaust vents).





NOTICE The Controller must be installed with the air intake side down and the air exhaust side up.





Connecting Peripheral Devices

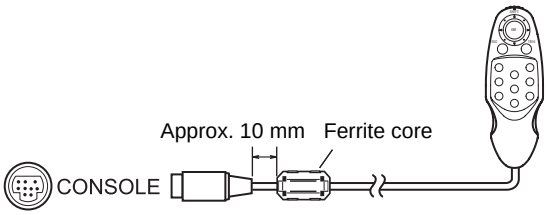
This section shows how to connect peripheral devices to the Controller.

NOTICE Always turn OFF the power supply before connecting or disconnecting a peripheral device's cable.The peripheral device may be damaged if it is connected while the power is ON.

NOTICE The various connectors on the Controller are capped when the Controller is shipped. When a connector is not being used, leave the cap in place or replace the cap to protect against dust, dirt, and static electricity.

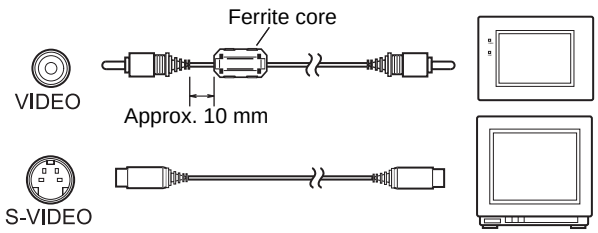
Connecting a Console

Connect the Console to the Controller's CONSOLE connector.An F160-KP or F150-KP Console can be connected.Install the provided ferrite core (*) onto the cable, positioning the ferrite core about 10 mm from the Controoler-side connector.



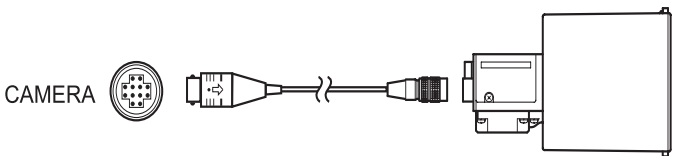
Connecting a Monitor

Connect the monitor cable to the Controller's MONITOR connector.Install the provided ferrite core onto the F150-VM Monitor Cable, positioning the ferrite core (*) about 10 mm from the Controller-side connector.
The S-VIDEO and VIDEO outputs can be used simultaneously.



Connecting a Camera

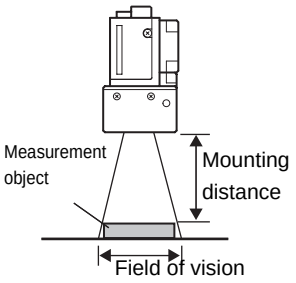
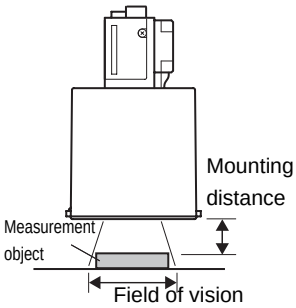
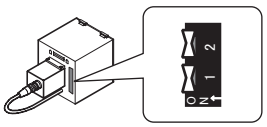
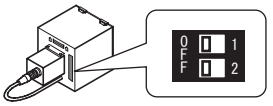
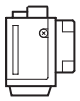
Connect the camera cable to the Controller's Camera connector.



* The ferrite core is supplied only with models that support CE. It is not necessary to install it in models that do not support CE. Please contact any of our branches or sales offices for further details.

Camera with Light

The Camera with Light is a special Camera that has a special lens and light source already attached.The light source and lens are contained in a single unit, so installation is very simple. Just mount the Camera at the proper distance from the measurement object and it is ready to use.

<table>
<tr><th colspan="2" rowspan="2">Item</th><th colspan="3">Field of vision and distance to object</th><th rowspan="2">Lighting precautions</th></tr>
<tr><th>Field of</th><th>Mounting</th><th>Relationship between Camera</th></tr>
<tr><td rowspan="2">Camera with Light</td><td>F150-SL20A</td><td>20 mm
×
20 mm</td><td>61 to
71 mm</td><td rowspan="2"> 
</td><td rowspan="2">None in particular</td></tr>
<tr><td>F150-SL50A</td><td>50 mm
×
50 mm</td><td>66 to
76 mm</td></tr>
<tr><td rowspan="2">Camera with Intelligent Lighting</td><td>F150-SLC20
F160-SLC20</td><td>20 mm
×
20 mm</td><td>15 to
25 mm</td><td rowspan="2"> 
</td><td>Use with DIP switch pins 1 and 2 both set to OFF.
 
</td></tr>
<tr><td>F150-SLC50
F160-SLC50</td><td>50 mm
×
50 mm</td><td>16.5 to
26.5 mm</td><td>Use with DIP switch pins 1 and 2 both set to OFF.
 
</td></tr>
<tr><td>Camera Only</td><td>F150-S1A
F160-S1
F160-S2</td><td colspan="3">Determine the required field of vision based on the size of the measurement object and select an appropriate CCTV lens (C mount).
  </td><td>Provide a light source appropriate for the measurement object.</td></tr>
</table>

CHECK!

Observe the following precautions when using a Camera with Light or Camera with Intelligent Lighting.

- The lens has a fixed focal point.The actual field of vision and focal point vary from lens to lens, so adjust the distance to the measurement object after replacing the lens or camera.
- The camera mounting distance is an approximate value.Mount the Camera so that the distance to the measurement object can be adjusted easily.

If the object size and field of vision are incompatible, use a standard CCTV lens and light source.

p.30

Power Supply and Ground

Wire the power supply and the ground to their respective terminals. Tighten the screws to a torque of between 0.49 N·m. After wiring, confirm that the wiring is correct.

Crimp Terminals and Cables

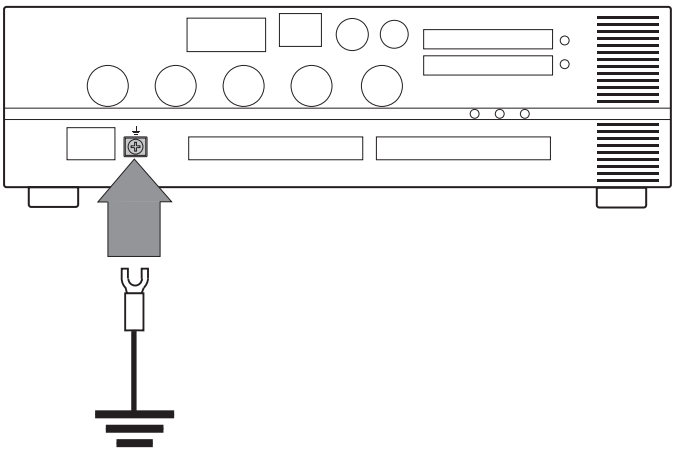
The terminal block uses M3 terminal screws.
Use appropriate crimp terminals for M3 screws, as shown below.

Recommended Model

	Manufacturer	Item	Applicable wire
Forked 	J.S.T. Mfg Co., Ltd.	V1.25-N3A	1.31 to 1.65 mm² (AWG 16 to AWG 15)
Round 	J.S.T. Mfg Co., Ltd.	V1.25-MS3	

Ground (Earth) Wiring

Always connect a ground wire to the Controller's ground terminal.To avoid grounding problems, do not share the ground wire with any other devices or wire the ground to the building's steel framing.
Use a grounding point that is as close as possible and keep the ground wire as short as possible.



Ground to 100 Ω or less.

Wiring the Power Supply

Wire the Power Supply Unit independently of other devices.In particular, keep the power supply wired separately from inductive loads.
Use a power supply that meets the following specifications.

Condition

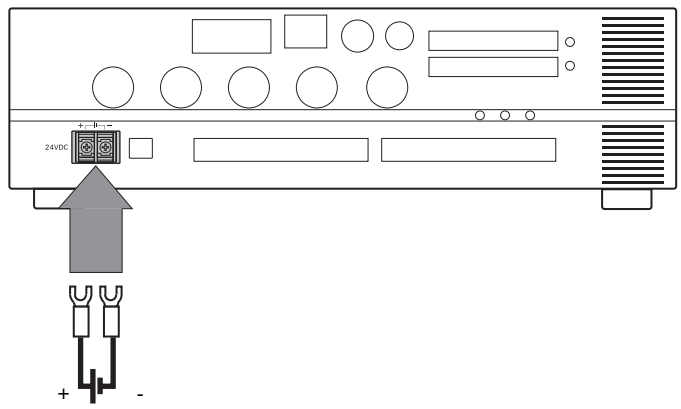
Output current	Power supply voltage
3.7A min.	24 VDC +10%, -15%

Recommended Model

Manufacturer	Item
OMRON Corporation	S82K-10024

CHECK!

Use a DC power supply with countermeasures against high voltages (safe extra low-voltage circuits on the secondary side).
If the system must meet UL standards, use a UL class II power supply.



24VDC

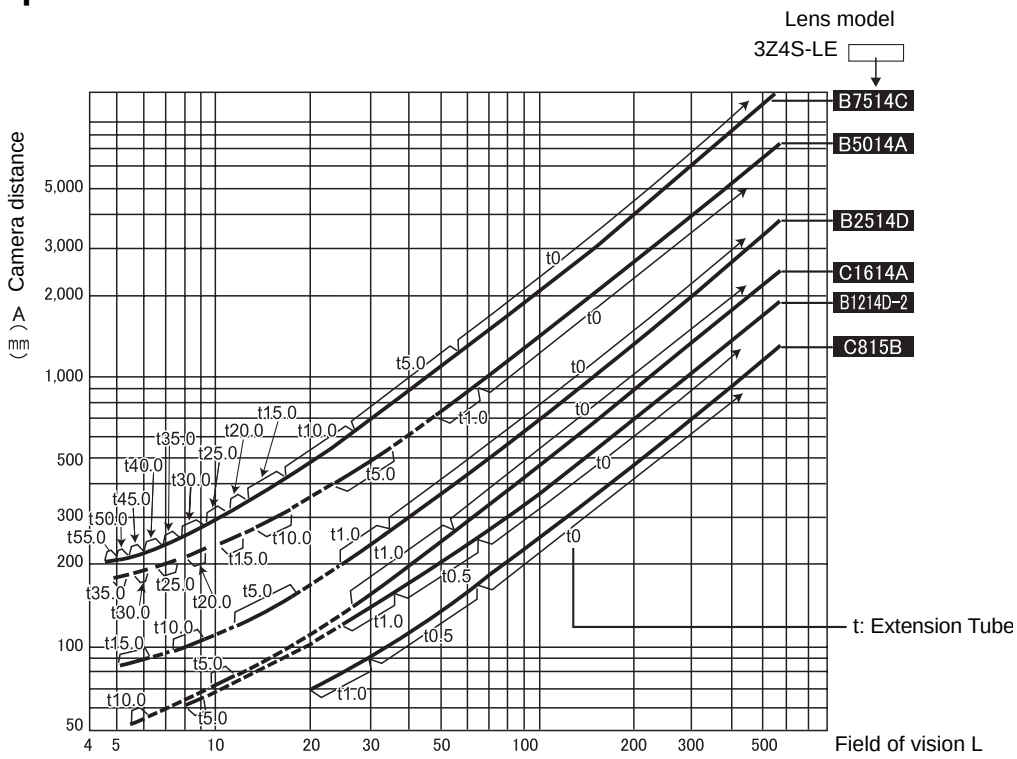
- Keep the power supply line as short as possible (less than 10 m).
- After wiring, replace the protective cover on the power supply terminals.

SECTION 3
Lenses, Lighting, and Memory Cards

CCTV Lenses

When using a Camera without a light (F150-S1A, F160-S1 or F160-S2), refer to the following graph to select the appropriate Lens and Extension Tube. The lens will differ depending on the size of the measurement object and the distance from the Camera.

Optical Chart

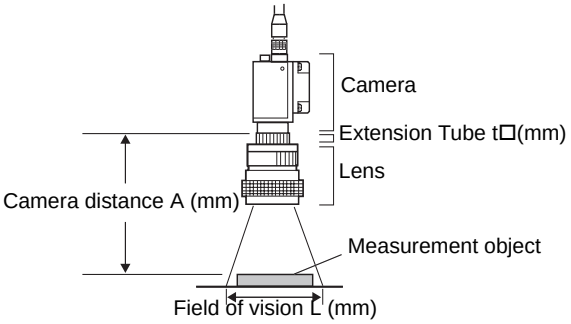


Understanding the above chart

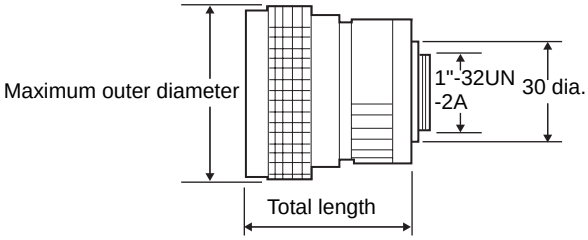
The X axis of the graph shows field of vision L (mm), and the Y axis shows the camera distance A (mm). The curves on the graph show the relationship between the field of vision and camera distance for each CCTV lens. The values are significantly different for each lens, so double-check the model of the lens before using the graph.The "t" values indicate the lengths of the Extension Tubes.The value "t0" shows the case where an Extension Tube is not needed and the value "t5.0" shows the case where a 5 mm Extension Tube is used.

Example:

When a 3Z4S-LE C1614A CCTV Lens is being used and a field of vision of 40 mm is needed at the measurement object, a camera distance of 200 mm and 1 mm Extension Tube are required.



Lenses and Lens Diameters



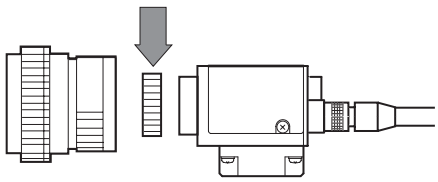
Lenses and Lens Diameters

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

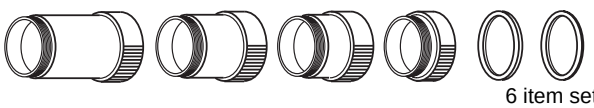
Extension Tube

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

Extension Tube



Extension Tube

Item	Maximum outer diameter	Length
3Z4S-LE EX-C6	31 dia.	Length: 40 mm 20 mm 10 mm 5 mm 1.0 mm 0.5 mm  6 item set

NOTICE

- 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 Tube, the connection may loosen when more than one 0.5 mm or 1.0 mm Extension Tube are used together.
- Reinforcement may be required for combinations of Extension Tubes exceeding 30 mm if the Camera is subject to vibration.

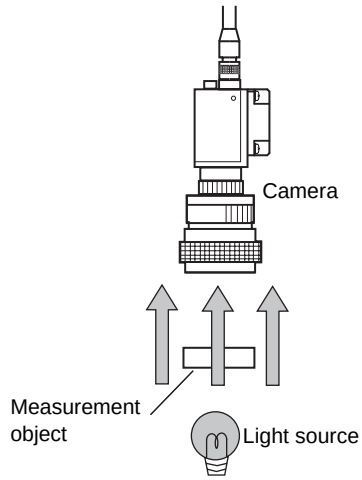
Lighting

A stable image must be obtained to ensure accurate inspection.
Use appropriate lighting for the application and the measurement object if using a Camera without a light (F150-S1A, F160-S1 or F160-S2).

Lighting Methods

Back Lighting

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

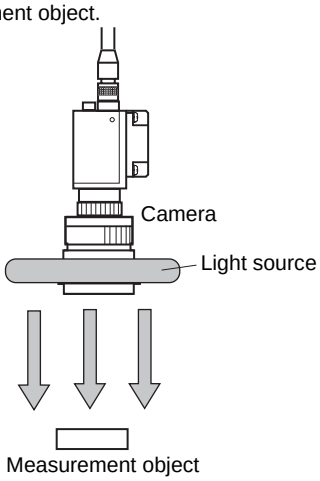


Applications: Inspection of exterior shape or positioning inspection

Reflected Lighting

Ring Lights

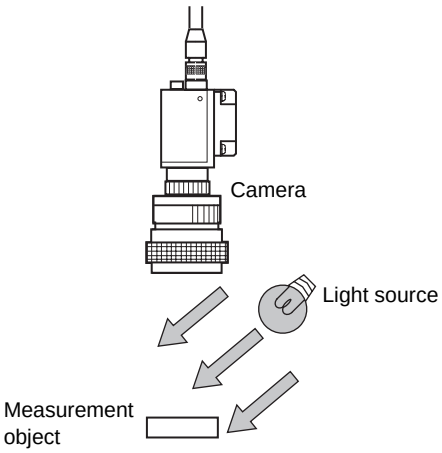
Light is shone uniformly on the measurement object.



Applications: Surface inspections

Oblique Lighting

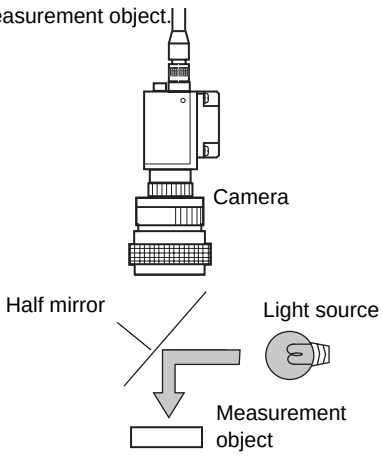
Detection can be made utilizing the difference in regular and diffuse reflected light.



Applications: Inspections for surface gloss

Coaxial Lighting

A stable image can be obtained with few shadows from uneven surfaces on the measurement object.



Applications: Surface inspections, positioning, and hole inspections of comparatively small objects

Memory Cards

Use a Memory Card to back up data such as settings and image data or increase the number of scenes when you are using the Scene Group function. Data from the Controller can be backed up in the computer just by inserting the Memory Card into the computer and copying the desired data.The following procedures also apply to the Memory Card containing the Application Software.

Recommended Model

Manufacturer	Item	Capacity
OMRON Corporation	F160-N64S (S)	64 MB
OMRON Corporation	QM300-N128S	128 MB

CHECK!

The Controller is equipped with two Memory Card slots.Use these slots for the following functions.

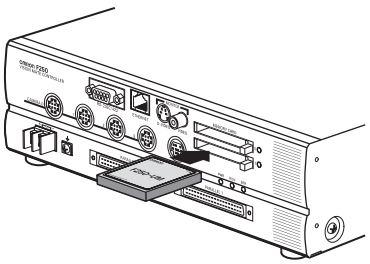
Function	Slot number
Application Software installation	Slot 0 (Use slot 0 only.)
Memory Cards for scene groups	Slot 1 (Use slot 1 only.)
Memory Cards for data backup	Either slot 0 or 1 can be used.

NOTICE

A filler card with no memory is inserted into the Controller's Memory Card slot before the Controller is shipped.Remove this filler card and install a Memory Card to use the Memory Card functions.
If Memory Cards are not being used, leave the filler card in place to prevent dust or dirt from entering the Memory Card slot.

Installing a Memory Card

1. Insert the Memory Card into the Memory Card slot.



The eject button will pop out slightly when the Memory Card is inserted properly.

Removing the Memory Card

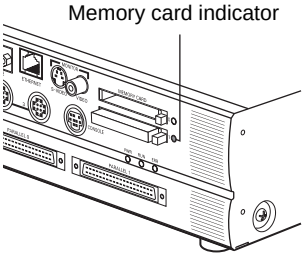
1. Turn OFF the power supply to the Memory Card or turn OFF the Controller.

Chapter 4 Additional Functions in the Operation Manual

2. Verify that the Memory Card indicator is not lit.

NOTICE Do not remove the Memory Card if the Memory Card indicator is lit. Doing so may damage the Memory Card or the Controller itself.

Memory card indicator

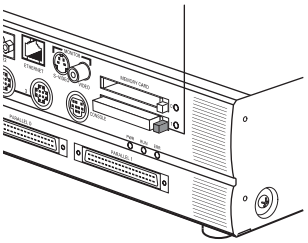


3. Press the eject button to the right of the Memory Card slot.

The Memory Card will pop out slightly.

NOTICE Do not remove the Memory Card without pressing the eject button. Doing so may damage the Controller.

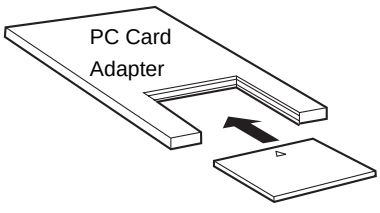
Memory card eject button



4. Pull the Memory Card straight out from the slot.

Using Memory Cards in a Personal Computer

The Memory Cards can be used in a personal computer with a PC Card drive (PCMCIA 2.0 or higher, type II compatible) or CompactFlash™ drive.
The Memory Card must be inserted into a PC Card Adapter in order to be used in a PC Card drive.



Recommended Model

Name	Manufacturer	Item
PC Card Adapter	OMRON Corporation	HMC-AP001

SECTION 4
Connecting External Devices

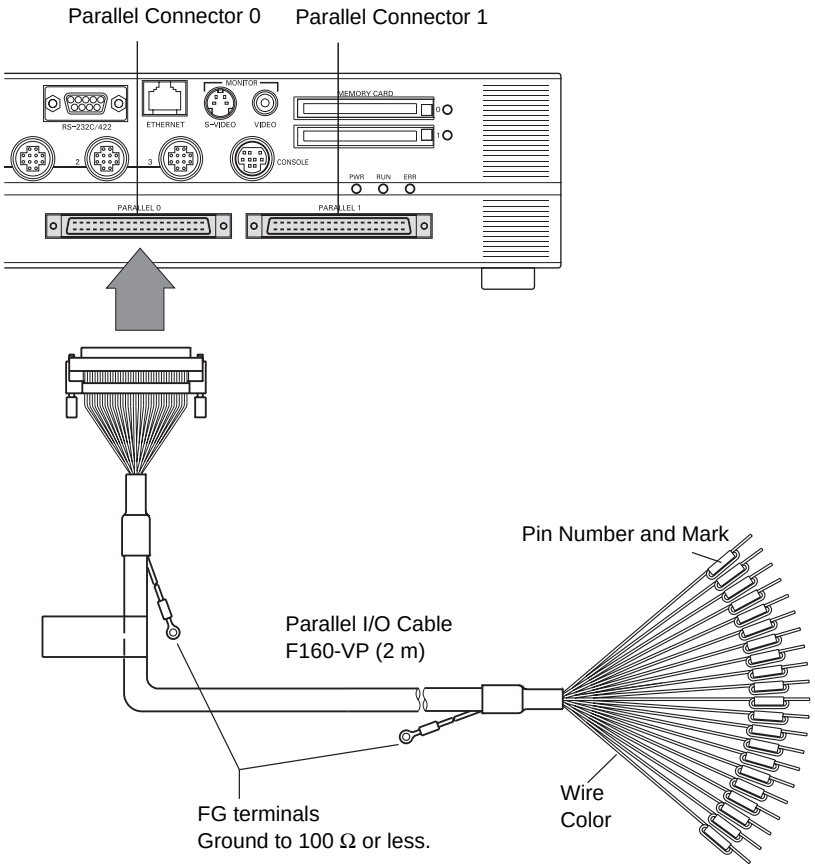
Parallel Connection Methods

This section explains how to connect I/O to the Controller through its parallel interface to input signals such as measurement triggers or output signals such as measurement results.
When you want to use the parallel interface to input commands and output measurement results, prepare a parallel I/O cable and connect it to the parallel connector.A Terminal Block can also be used to connect external devices.
Refer to the Operation Manual for details on communications settings and I/O formats.

Connection

Using a Parallel I/O Cable

Use an F160-VP Parallel I/O Cable (sold separately) to connect the Controller to external devices. Align the connectors and insert the cable's connector straight into the Controller's parallel connector. Tighten the connector's mounting screws to secure the connection.



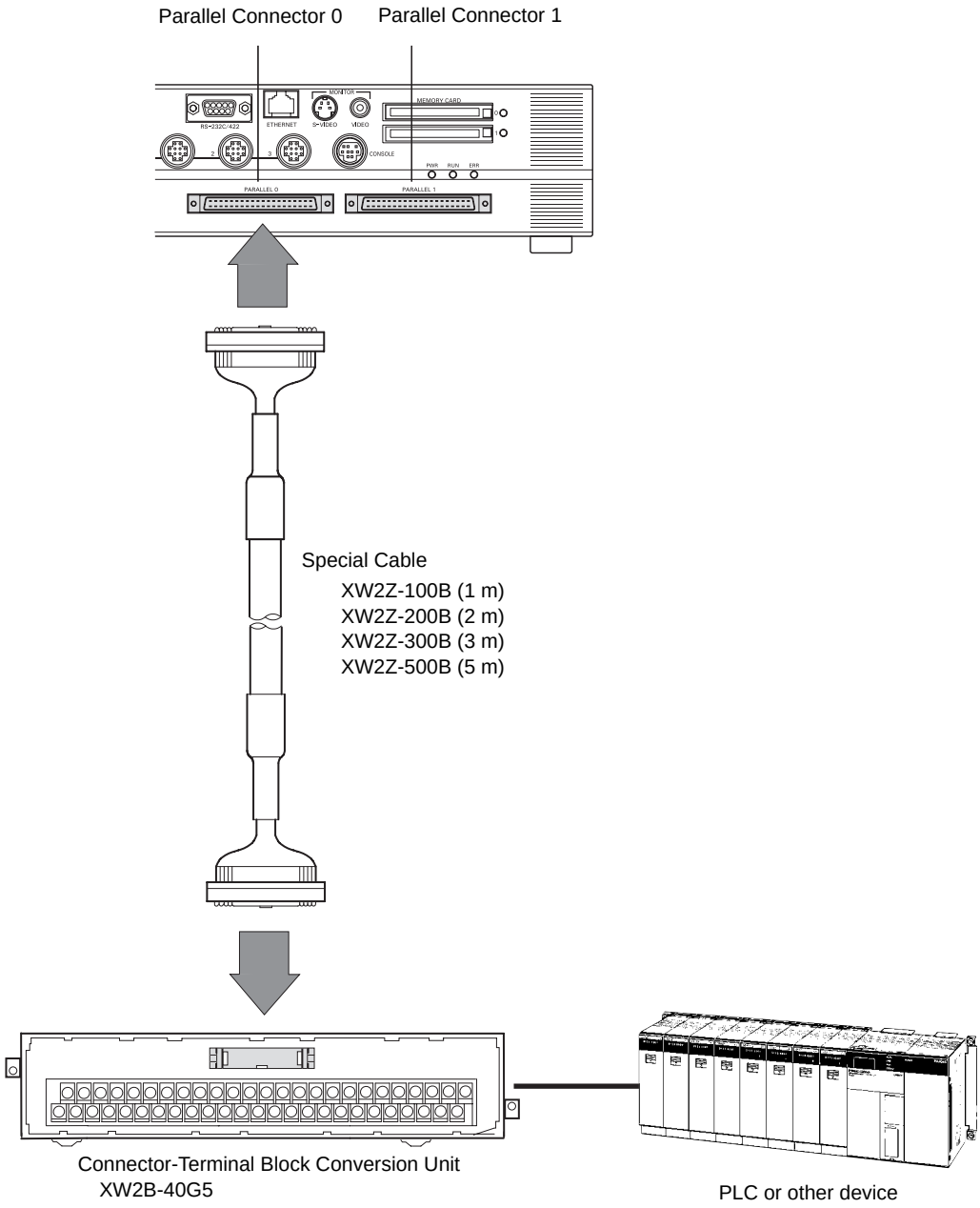
NOTICE Turn OFF the power supply before connecting or disconnecting a Parallel I/O Cable.
Peripheral devices may be damaged if the cable is connected or disconnected with the power ON.

NOTICE The parallel connectors are capped with screw-on covers when the Controller is shipped.
When a connector is not being used, leave the cover in place or replace the cover to protect against dust, dirt, and static electricity.

Using a Screw Terminal Block

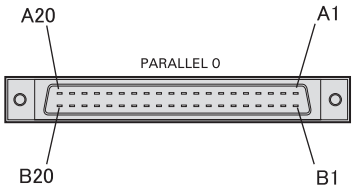
Use a Screw Terminal Block and Special Cable to connect the Controller to external devices such as PLCs.

Wiring Connector-Terminal Block Conversion Units p.40



Parallel Connector Specifications

Parallel 0



Each wire of the F160-VP Parallel I/O Cable has a unique wire-color/mark combination.

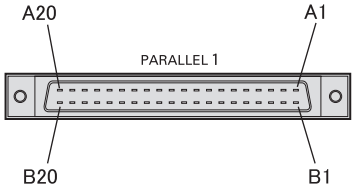
Pin	Signal	Wire Color	Mark (Black)	Function
A1	RESET	Lt. brown	■	Restarts the Controller
A2	STEP	Yellow	■	Measurement trigger signal input
A3	DI0	Green	■	Command input
A4	DI2	Gray	■	
A5	DI4	White	■	
A6	DI6	Lt. brown	■■	
A7	(Open)	Yellow	■■	(Leave open.)
A8	STGOUT0	Green	■■	Strobe trigger 0 output (See note 1.)
A9	RUN	Gray	■■	ON while in Run mode
A10	BUSY	White	■■	ON during processing
A11	OR	Lt. brown	■■■	Combined judgement result
A12	DO0	Yellow	■■■	Data output
A13	DO2	Green	■■■	
A14	DO4	Gray	■■■	
A15	DO6	White	■■■	
A16	DO8	Lt. brown	■■■■	
A17	DO9	Yellow	■■■■	
A18	DO11	Green	■■■■	
A19	DO13	Gray	■■■■	
A20	DO15	White	■■■■	

Pin	Signal	Wire Color	Mark (Red)	Function
B1	COMIN1	Lt. brown	■	Common for input signals (See note 2.)
B2	DSA	Yellow	■	Inputs data send request signals
B3	DI1	Green	■	Command input
B4	DI3	Gray	■	
B5	DI5	White	■	
B6	DI7	Lt. brown	■■	
B7	(Open)	Yellow	■■	(Leave open.)
B8	STGOUT1	Green	■■	Strobe trigger 1 output (See note 1.)
B9	ERROR	Gray	■■	ON when there is an error.
B10	GATE	White	■■	ON for the set output time
B11	COMOUT1	Lt. brown	■■■	Common for output signals (See note 3.)
B12	DO1	Yellow	■■■	Data output
B13	DO3	Green	■■■	
B14	DO5	Gray	■■■	
B15	DO7	White	■■■	
B16	COMOUT2	Lt. brown	■■■■	Common for DO0 to DO7
B17	DO10	Yellow	■■■■	Data output
B18	DO12	Green	■■■■	
B19	DO14	Gray	■■■■	
B20	COMOUT3	White	■■■■	Common for DO8 to DO15

NOTICE Do not input the RESET input immediately after turning ON the power.When using the RESET input to synchronize startup timing, wait at least 1 second after the Controller's power supply is turned ON before turning ON the RESET signal.

CHECK! Use a DC power supply with countermeasures against high voltages (safe extra low-voltage circuits on the secondary side) for the COMIN and COMOUT terminals.If the system must meet UL standards, use a UL class II power supply.

Parallel 1



Each wire of the F160-VP Parallel I/O Cable has a unique wire-color/mark combination.

Pin	Signal	Wire Color	Mark (Black)	Function
A1	(Open)	Lt. brown	■	(Leave open.)
A2	Reserve input	Yellow	■	(Leave open.)
A3	DI8	Green	■	Command input
A4	DI10	Gray	■	
A5	DI12	White	■	
A6	DI14	Lt. brown	■■	
A7	(Open)	Yellow	■■	(Leave open.)
A8	STGOUT2	Green	■■	Strobe trigger 2 output (See note 1.)
A9	Reserve outputs	Gray	■■	(Leave open.)
A10	Reserve outputs	White	■■	(Leave open.)
A11	Reserve outputs	Lt. brown	■■■	(Leave open.)
A12	DO16	Yellow	■■■	Data output
A13	DO18	Green	■■■	
A14	DO20	Gray	■■■	
A15	DO22	White	■■■	
A16	DO24	Lt. brown	■■■■	
A17	DO25	Yellow	■■■■	
A18	DO27	Green	■■■■	
A19	DO29	Gray	■■■■	
A20	DO31	White	■■■■	

Pin	Signal	Wire Color	Mark (Red)	Function
B1	COMIN2	Lt. brown	■	Common for input signals (See note 2.)
B2	Reserve input	Yellow	■	(Leave open.)
B3	DI9	Green	■	Command input
B4	DI11	Gray	■	
B5	DI13	White	■	
B6	DI15	Lt. brown	■■	
B7	(Open)	Yellow	■■	(Leave open.)
B8	STGOUT3	Green	■■	Strobe trigger 3 output (See note 1.)
B9	Reserve outputs	Gray	■■	(Leave open.)
B10	Reserve outputs	White	■■	(Leave open.)
B11	COMOUT4	Lt. brown	■■■	Common for output signals (See note 3.)
B12	DO17	Yellow	■■■	Data output
B13	DO19	Green	■■■	
B14	DO21	Gray	■■■	
B15	DO23	White	■■■	
B16	COMOUT5	Lt. brown	■■■■	Common for DO16 to DO23
B17	DO26	Yellow	■■■■	Data output
B18	DO28	Green	■■■■	
B19	DO30	Gray	■■■■	
B20	COMOUT	White	■■■■	Common for DO24 to DO31

*1 This is a signal that is used when the strobe device is connected to the Controller.
Each Camera has its own strobe trigger output as shown in the following table.

Strobe trigger output	signal
Camera 0	STGOUT0 (Pin A8 of parallel connector 0)
Camera 1	STGOUT1 (Pin B8 of parallel connector 0)
Camera 2	STGOUT2 (Pin A8 of parallel connector 1)
Camera 3	STGOUT3 (Pin B8 of parallel connector 1)

Connecting a Strobe Device p.79

*2 COMIN1 is the common for A1 to A6 and B2 to B6 on parallel 0.
COMIN2 is the common for A3 to A6 and B3 to B6 on parallel 1.

*3 COMOUT1 is the common for A8 to A11 and B8 to B10 on parallel 0.
COMOUT4 is the common for A8 and B8 on parallel 1.

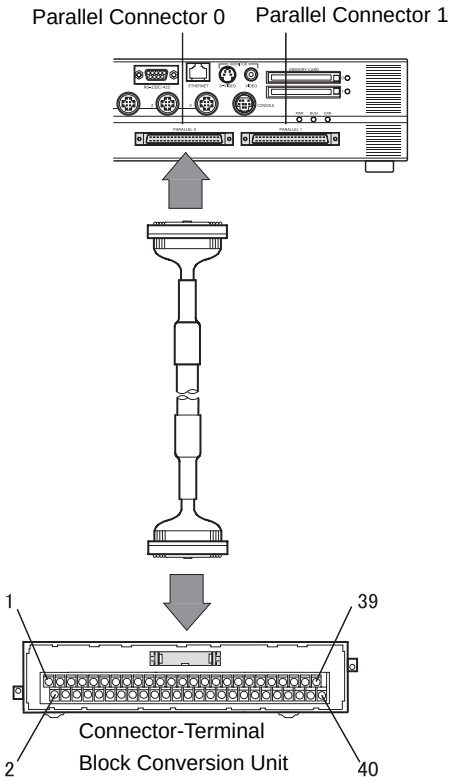
Wiring Connector-Terminal Block Conversion Units

Connector-Terminal Block Conversion Unit

Manufacturer	Item
OMRON Corporation	XW2B-40G5

Special Cable

Manufacturer	Item
OMRON Corporation	XW2Z-100B (1 m)
	XW2Z-200B (2m)
	XW2Z-300B (3m)
	XW2Z-500B (5m)



▪ Connecting to Parallel Connector 0

Conversion Unit Terminal	Signal
1	RESET
3	STEP
5	DI0
7	DI2
9	DI4
11	DI6
13	(Open)
15	STGOUT0
17	RUN
19	BUSY
21	OR
23	DO0
25	DO2
27	DO4
29	DO6
31	DO8
33	DO9
35	DO11
37	DO13
39	DO15

Conversion Unit Terminal	Signal
2	COMIN1
4	DSA
6	DI1
8	DI3
10	DI5
12	DI7
14	(Open)
16	STGOUT1
18	ERROR
20	GATE
22	COMOUT1
24	DO1
26	DO3
28	DO5
30	DO7
32	COMOUT2
34	DO10
36	DO12
38	DO14
40	COMOUT3

▪ Connecting to Parallel Connector 1

Conversion Unit Terminal	Signal
1	(Open)
3	Reserve input
5	DI8
7	DI10
9	DI12
11	DI14
13	(Open)
15	STGOUT2
17	Reserve outputs
19	Reserve outputs
21	Reserve outputs
23	DO16
25	DO18
27	DO20
29	DO22
31	DO24
33	DO25
35	DO27
37	DO29
39	DO31

Conversion Unit Terminal	Signal
2	COMIN2
4	Reserve input
6	DI9
8	DI11
10	DI13
12	DI15
14	(Open)
16	STGOUT3
18	Reserve outputs
20	Reserve outputs
22	COMOUT4
24	DO17
26	DO19
28	DO21
30	DO23
32	COMOUT5
34	DO26
36	DO28
38	DO30
40	COMOUT6

Functions of each signal p.38, p.39

Making a Parallel I/O Cable

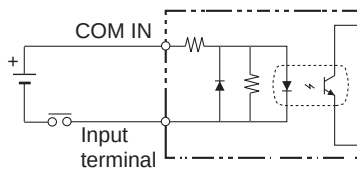
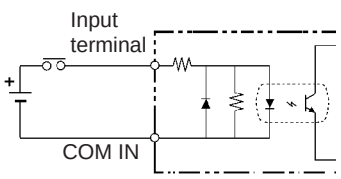
A parallel I/O cable can be assembled using the following connector and cover or equivalent components.Keep the cable length less than 30 m.

	Manufacturer	Item
Connector	Fujitsu	FCN-361J040-AU
Cover	Fujitsu	FCN-360C040-B

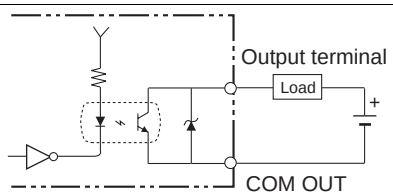
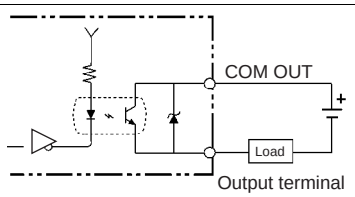
CHECK! Double-check the connector wiring for mistakes before turning ON the power supply for the first time.

I/O Specifications

Input Specifications

Item	Specification	
Model	F250-C50 (NPN mode)	F250-C55 (PNP mode)
Input voltage	12 to 24 VDC ±10%	
ON current *1	5 to 15 mA	
ON voltage *1	8.8 V max.	
OFF current *2	0.1 mA max.	
OFF voltage *2	4.5 V min.	
ON delay	RESET input: 10 ms max. Other inputs: 0.5 ms max	
OFF delay	RESET input: 15 ms max. Other inputs: 0.7 ms max.	
Internal circuits		

Output Specifications

Item	Specification	
Model	F250-C50 (NPN mode)	F250-C55 (PNP mode)
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		

NOTICE Do not exceed the maximum load current specified for the Controller.

*1 ON Current/ON Voltage
This refers to the current or voltage values needed to shift from the OFF→ON state.
The ON voltage value is the potential difference between each of the input terminals and COM IN.

*2 OFF Current/OFF Voltage
This refers to the current or voltage values needed to shift from the ON→OFF state.
The OFF voltage value is the potential difference between each of the input terminals and COM IN.

Connecting through the Serial Interface

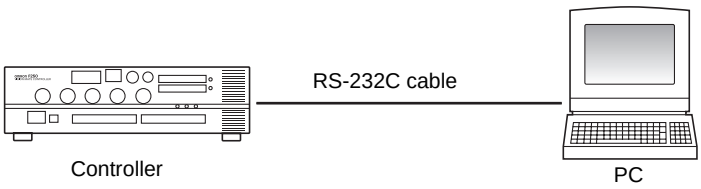
The Controller's serial interface (RS-232C/RS-422 connector or Ethernet connector) can be used to input signals such as measurement triggers or output signals such as measurement results.Additionally, data that has been set in the Controller can be backed up in a personal computer. The connection method is explained here.

Refer to Section 6 Communicating with External Devices in the Operation Manual for details on communications settings and I/O formats.

RS-232C/RS-422 Connections

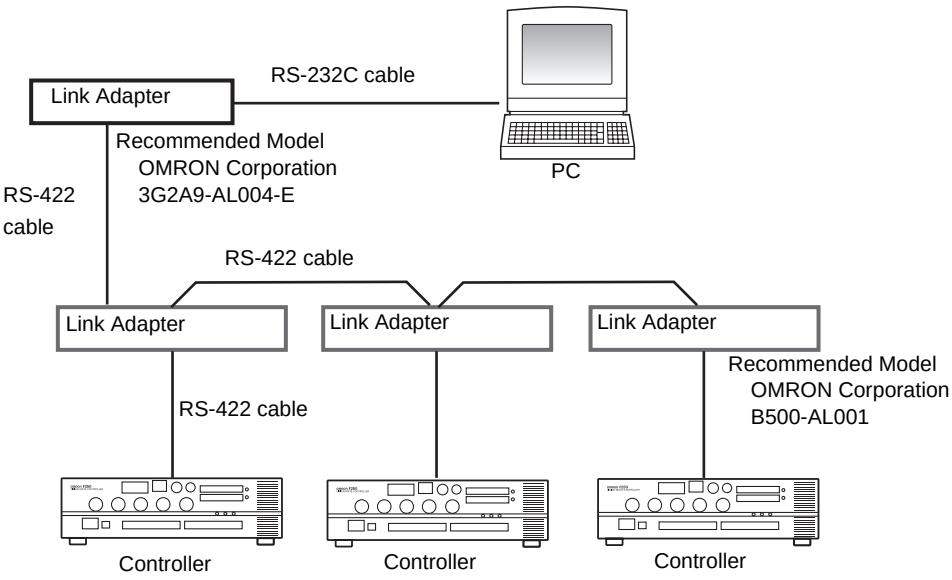
Connection Examples

- 1:1 Connection (Normal, Menu Operation)



- Multi-drop Connection (Normal)

  Communications between one computer and several Controllers (at most 31 Controllers) is possible using Link Adapters.



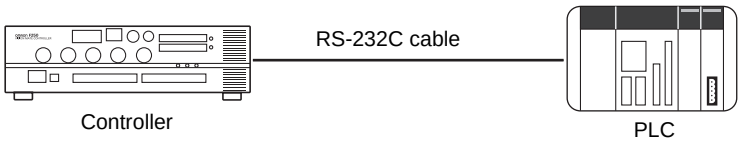
CHECK!

When 3G2A9-AL004-E Link Adapters are being used, termination must be set to ON in the last node in the line and the node must be terminated as follows:

Connect 220 Ω (1/2 W min.) between RDA(-) and RDB(+).

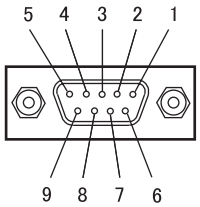
Connect 220 Ω (1/2 W min.) between SDA(-) and SDB(+).

- 1:1 Connection (Host Link)



Connector

The Controller's RS-232C/RS-422 Connector is a 9-pin D-SUB female connector.
The pin allocation is shown below.



Pin	Signal	Function
1	FG	Protective frame ground
2	SD	For RS-232C
3	RD	For RS-232C
4	NC	Not connected
5	RDB(+)	For RS-422
6	RDA(-)	For RS-422
7	SDB(+)	For RS-422
8	SDA(-)	For RS-422
9	GND	Signal ground

A parallel I/O cable can be assembled using the following connector and cover or equivalent components.

Recommended Model

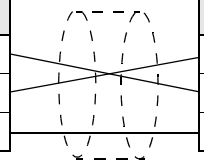
	Manufacturer	Item
Plug	OMRON Corporation	XM2A-0901
Hood	OMRON Corporation	XM2S-0911

Wiring

Keep the cable length less than 15m.

▪ RS-232C

Controller			External device	
Signal	Pin		Pin	Signal
SD	2		*	SD
RD	3		*	RD
GND	9		*	GND

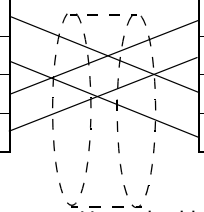


RS/CS control cannot be used.

Use only shielded cable.

▪ RS-422

Controller			External device	
Signal	Pin		Pin	Signal
RDB(+)	5		*	RDB(+)
RDA(-)	6		*	RDA(-)
SDB(+)	7		*	SDB(+)
SDA(-)	8		*	SDA(-)

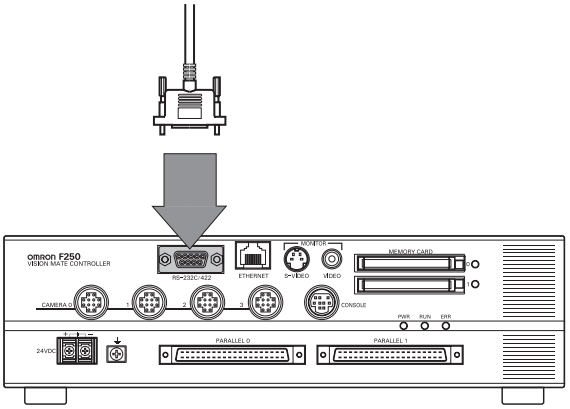


Use only shielded cable.

* Pin numbers on the external device will depend on the device being connected.
Refer to the manual for the personal computer or PLC being connected.

Connection Methods

Align the connectors and insert the cable's connector straight into the place. Tighten the connector's mounting screws to secure the connection.



NOTICE Turn OFF the power supply before connecting or disconnecting a Cable.
Peripheral devices may be damaged if the cable is connected or disconnected with the power ON.

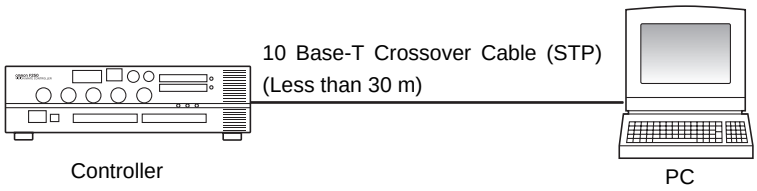
NOTICE The various connectors on the Controller are capped when the Controller is shipped.
When a connector is not being used, leave the cover in place or replace the cover to protect against dust, dirt, and static electricity.

Ethernet Connection

Connection Examples

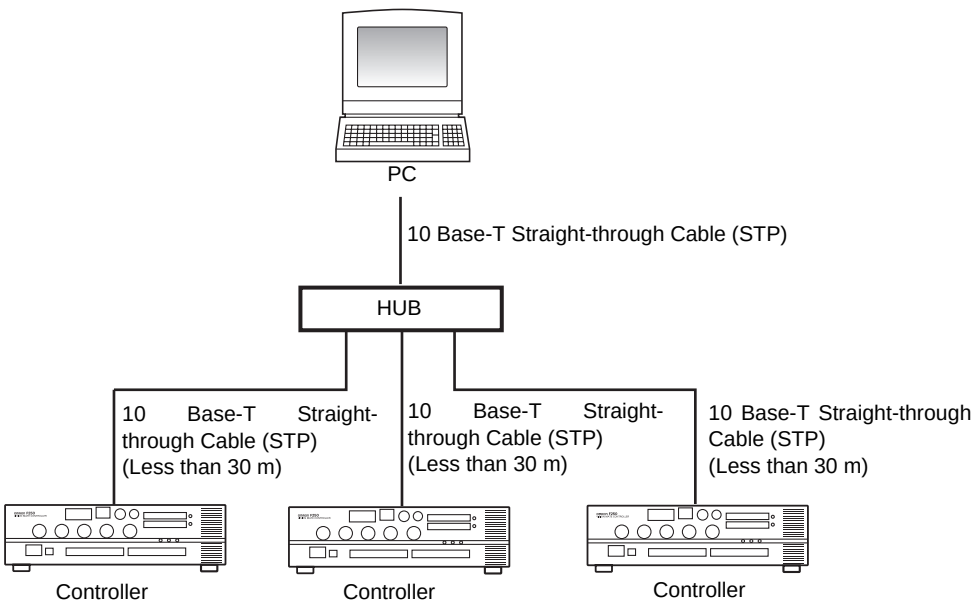
1:1 Connection

Use a Shielded (STP) 10 Base-T Crossover Cable to make the 1:1 connection.
The cable length must be less than 30 m.



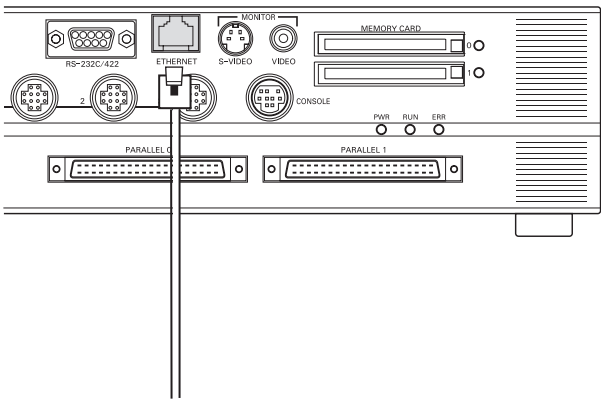
1:N Connection

A Hub can be used to communicate with two or more Controllers from a single computer.
Use Shielded (STP) 10 Base-T Straight-through Cables to make the 1:N connections.
The cable length between the Controllers and the Hub must be less than 30 m.



Connection Methods

Align the connector with the socket and press the connector straight into place.



NOTICE Turn OFF the power supply before connecting or disconnecting Cable.
Peripheral devices may be damaged if the cable is connected or disconnected with the power ON.

NOTICE The various connectors on the Controller are capped when the Controller is shipped.
When the Ethernet interface isn't used, leave the cap in place or replace the cap to protect against dust, dirt, and static electricity.

CHECK! Setting the Controller's IP Address and Subnet Mask.

Chapter 6 Communicating with External Devices in the Operation Manual

SECTION 5
Troubleshooting and Maintenance

Troubleshooting

This section lists probable corrections for common hardware problems. Please check all of the following items before requesting repairs.

Connection Errors

Problem	Probable cause	Reference
The POWER indicator is not lit.	• The Power Supply is not connected properly. • The supply voltage is not 24 VDC +10%/-15%.	p.28
The Video Monitor is blank.	• The power to the Video Monitor is not ON. • The Monitor Cable is not connected properly. • The Video Monitor is malfunctioning. • When using an LCD Monitor, the power supply capacity is insufficient.	p.25
The Video Monitor image is not clear.	• There is electrical noise entering from the power supply or cables. • The Monitor Cable is not connected properly.	–
Cannot make key inputs from the Console.	• The Console Cable is not correctly connected.	p.25
Camera images do not appear on the screen (for Cameras with Light Source)	• The Camera Cable is not correctly connected. • The lighting cable is not properly connected to the Camera.	p.25
Camera images do not appear on the screen (when a standard CCTV lens and lighting are used)	• The lens cap has not been removed. • The Camera Cable is not correctly connected. • The lens iris is opened or closed too far. • The shutter speed is not suitable. • The lighting method is not suitable.	p.25 p.32

Connection Errors (continued)

Problem	Probable cause	Reference
The indicators do not turn ON. (for Cameras with Light Source)	• The lighting cable is not correctly connected to the Camera. • Power is not being supplied to the Controller. • When using a Camera with Intelligent Lighting, the DIP switch pins are not set to 0. • When using Intelligent Lighting with the F160-S2 camera model, the number of input lines is not set to 484.	p.28 p.26 Operation Manual

Menu Operation Errors

Problem	Probable cause	Reference
The measurement results are not displayed on the Video Monitor.	• The Controller is not in Monitor or Run mode.	Operation Manual

Parallel Interface Errors

Problem	Probable cause	Reference
Trigger signals (input signals) are not received.	• The cables are not correctly wired. • The signal line is disconnected. The status of communications can be checked with the I/O monitor. • The Controller is not in Monitor or Run mode.	p.36 Operation Manual
Signals cannot be output externally.	• The trigger signal has not been input. • The cables are not correctly wired. • The signal line is disconnected. The status of communications can be checked with the I/O monitor. • The Controller is not in Run mode.	p.36 Operation Manual

Serial Interface (RS-232C/RS-422) Errors

Problem	Probable cause	Reference
No communications are possible.	• The cables are not correctly wired. • The Controller's communications specifications do not match those of the external device. • The communications mode was not selected under [System settings/Communication/Serial]. Select [Normal], [Host link], or [Menu] in the Communications (Serial) menu. The status of communications can be checked with the I/O monitor.	p.43 Operation Manual
The Unit operates well initially, but after a while there is no response from the Controller.	• The reception buffer on the external device (e.g., computer) is full. Check that settings allow the data to be properly received.	–
Cannot perform menu operations from the computer.	• The communications mode was not set to Menu in the [System settings/Communication/Serial].	Operation Manual
Data cannot be saved.	• The Controller's communications specifications do not match those of the external device. • The flow control is turned OFF under [System settings/Communication/Normal].	Operation Manual

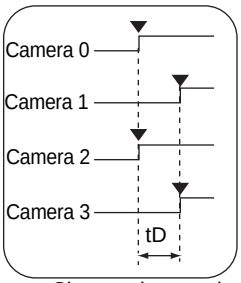
Serial Interface (Ethernet) Errors

Problem	Probable cause	Reference
No communications are possible.	• A 10 Base-T Crossover Cable is not being used for a 1:1 connection. • 10 Base-T Straight-through Cables are not being used for the 1:N connections. Power is not being supplied to the HUB, the settings are incorrect, or the connections are incorrect. • The personal computer's IP Address and Subnet Mask settings are not correct or the settings are duplicated in another device. • The Controller's IP Address and Subnet Mask settings are not correct or the settings are duplicated in another device. • The IP Address set for the Controller in the computer's communications software is incorrect. • The communications mode was not set to [Normal] or [Menu] in the [System settings/Communication/Serial]. The status of communications can be checked with the I/O monitor. • The Controller is being accessed by another computer. • Communications are being affected by a noise source (such as a power line) that is too close to the Controller or communications cables. • Communications are not set for a TELNET connection (TCP/IP, port 23) in the computer's communications software.	p.47 Operation Manual
The Unit operates well initially, but after a while there is no response from the Controller.	• The reception buffer on the external device (e.g., computer) is full. Check that settings allow the data to be properly received.	–
The response from the Controller is slow. (It takes too long to transfer data and errors occur.)	• The IP Address of the Controller or computer is duplicated in another device. • Communications are being affected by a noise source (such as a power line) that is too close to the Controller or communications cables. • The network's communications load is too heavy. • The computer's processing load is too heavy. (A program that requires a lot of processing capacity is being run simultaneously.)	Operation Manual

Problem	Probable cause	Reference
Cannot perform menu operations from the computer.	• The communications mode was not set to Menu in the [System settings/Communication/Serial].	Operation Manual

Q&A

Cameras

Questions	Answers
Are the shutter trigger pulses synchronized when more than one camera is connected?	The shutter trigger pulses are not synchronized for the F160-S1, F160-S2 and F150-S1A. The timing is offset so that light from other Cameras does not enter.The offset depends on the model of Camera that is used.  ▼: Shutter trigger pulses ON F160-S1 F160-S2: tD=Approx. 500 µs F150-S1A: tD=Approx. 1 ms If a strobe is used, the strobe trigger signals are also offset in the same way as the shutter trigger pulses. The shutter trigger pulses are synchronized for other Cameras, i.e., there is no offset.
Can more than one internally synchronized Cameras be connected?	No.Only one internally syncronized Camera can be connected, and it must be connected to Camera connector 0.
Can the F150-LT10A Light be connected to the F160-S1 or the F160-S2 Camera?	Yes, it can be connected and the following Lenses are available. • Lens with 20 mm field of vision: F150-LE20 • Lens with 50 mm field of vision: F150-LE50

Memory Cards

Questions	Answers
Can either of the Memory Card slots be used?	Only the following two functions have restrictions in the slot that can be used. Insert the memory card in the specified slot in the following cases. • Starting the Setup Menu: Slot 0 only • Switching scene groups: Slot 1 only Either slot can be used for all other functions (outputting results to a Memory Card, saving scene data, etc.).

Cabling Errors

Questions	Answers
A recommended OMRON RS-232C cable is not being used.	One of the following OMRON cables can be used. Select a cable that works with the device being connected. Connecting to a PC/AT or compatible computer (9-pin connector) • XW2Z-200S-V (2 m) • XW2Z-500S-V (5 m) Connecting to a SYSMAC device (9-pin connector) • XW2Z-200T (2 m) • XW2Z-500T (5 m)
Can a commercially available cable be used instead of the R150-VM Monitor Cable?	Yes, as long as it's a pin jack cable (with a yellow connector) for video signal connection.

Maintenance

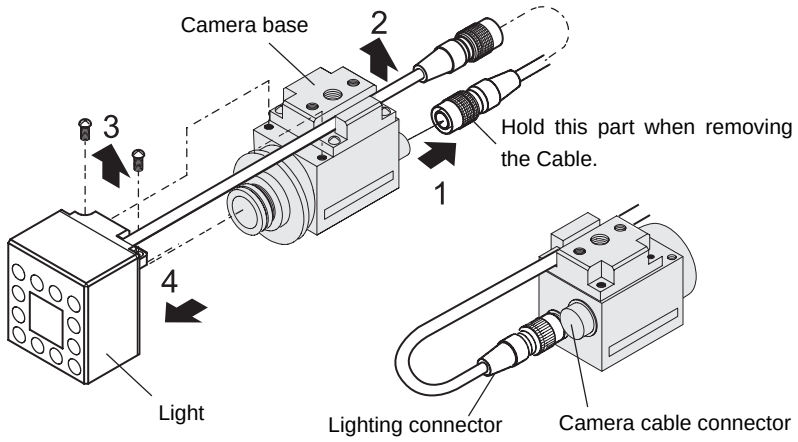
Replacing the Light

- The Light will gradually lose brightness over time (about 20% loss after 1,500 hours of use). Replace the Light after about 1,500 hours of use.
- Replace the Light if it is damaged or not fully functional.

F150-SL20A/SL50A

Light model	Remark
F150-LT10A	The F150-LT10A cannot be connected to the older F150-S1 Camera.

▪ Removing the Light



1. Disconnect the light cable from the light connector on the back of the Camera.

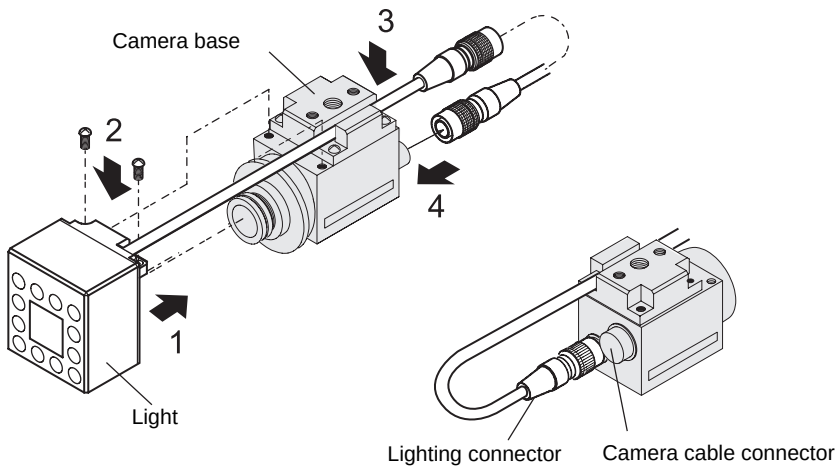
2. Remove the light cable from the slot in the camera base.

3. Remove the two screws securing the Light.

4. Remove the Light from the Camera.

NOTICE Do not disassemble the Lens.

- Installing the Light



1. Mount the Light on the Camera.

2. Screw in the two screws that secure the Light.

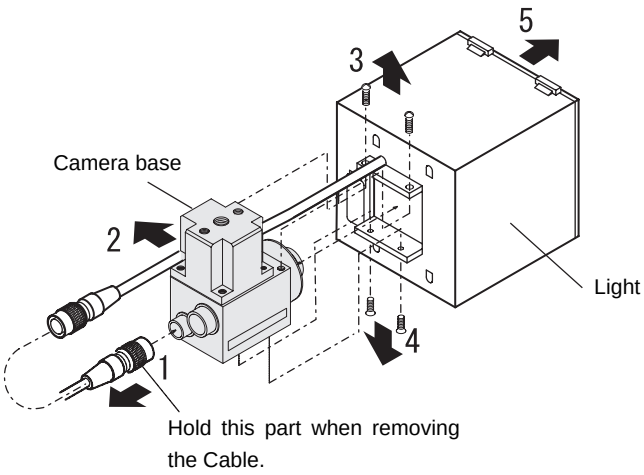
3. Place the light cable in the slot in the camera base.

4. Connect the light cable to the light connector on the back of the Camera.

F150-SLC20/SLC50 or F160-SLC20/SLC50

Field of vision	Light model
20 mm	F150-LTC20
50 mm	F150-LTC50

▪ Removing the Light



1. Disconnect the light cable from the light connector on the back of the Camera.

2. Remove the light cable from the slot in the camera base.

3. Remove the two screws securing the Light.

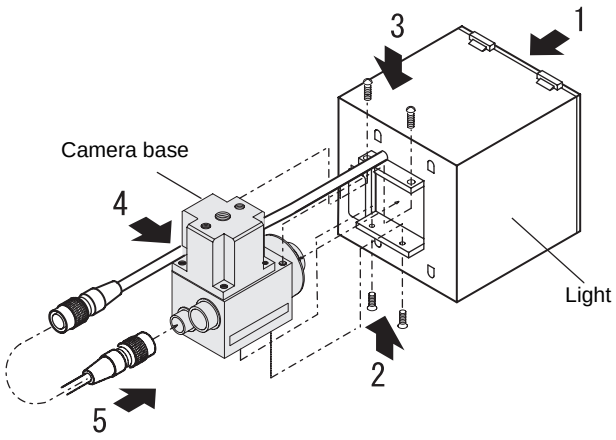
4. Remove the two screws securing the Light.

5. Remove the Light from the Camera.

NOTICE Do not disassemble the Lens.

CHECK! When you want to use the Camera alone without connecting an Intelligent Lighting, use M2 × 3 screws in the bottom of the Camera instead of the long screws removed in step 4.
The screws removed in step 3 are not needed.

- Installing the Light



1. Mount the Light on the Camera.

2. Screw in the two screws that secure the Light.

3. Screw in the two screws that secure the Light.

4. Place the light cable in the slot in the camera base.

5. Connect the light cable to the light connector on the back of the Camera.

Regular Inspections

To maintain the Controller in the best condition, perform the following regularly.

- Clean the Lens and LED lights with a lens-cleaning wipe or blow off dust with an aerosol air sprayer.
- Lightly wipe off dirt with a soft cloth.

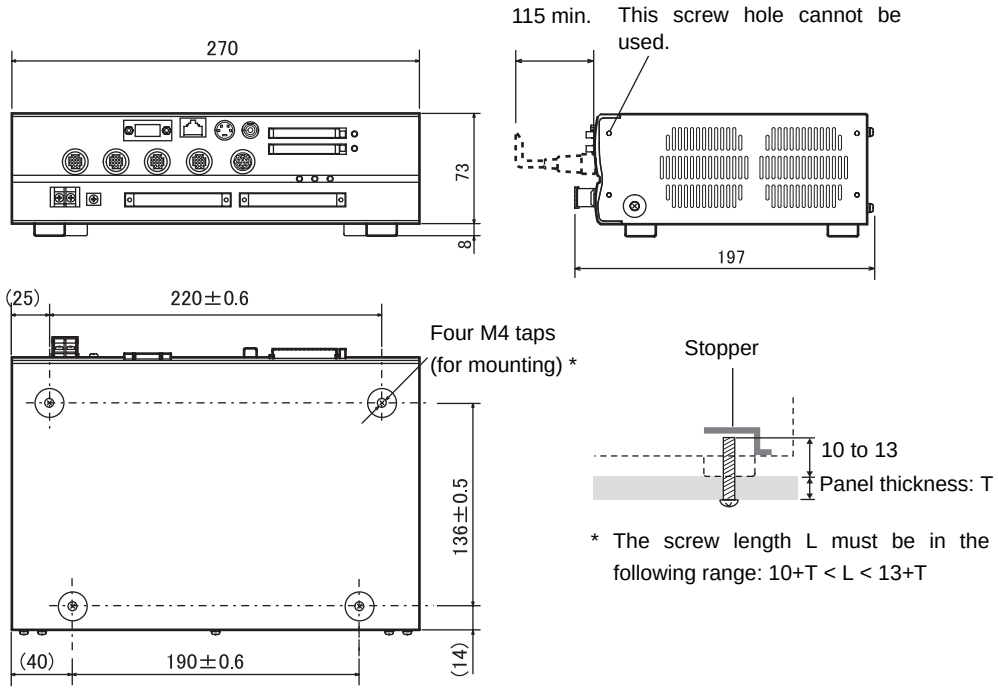
Inspection point	Details	Tools required
Power supply	The voltage measured at the power supply terminals must be 24 VDC +10%/-15%.	Circuit tester
Ambient temperature	The operating ambient temperature inside the cabinet must be between 0 and 50°C.	Thermometer
Ambient humidity	The operating ambient humidity inside the cabinet must be between 35% and 85%.	Hygrometer
Installation	Each component must be firmly secured. The Cameras must be firmly secured. Mount the Lens on the Camera.	Phillips screwdriver
LED lights	All indicators must light when the power is turned ON. • Verify that a through-image is displayed. • When using an Intelligent Lighting, verify that the light level settings are set to their maximum values.	—

NOTICE
- Turn OFF the power and take safety precautions before conducting inspections.
- Do not use thinners or benzene to clean the Controller.

Specifications

Controller
F250-C50/C55

(Unit:mm)



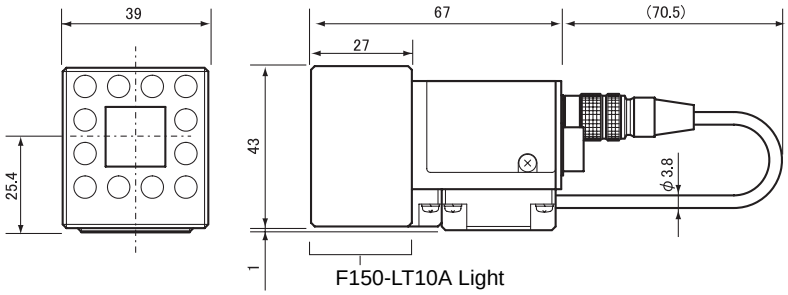
* The screw length L must be in the following range: 10+T < L < 13+T

Specification

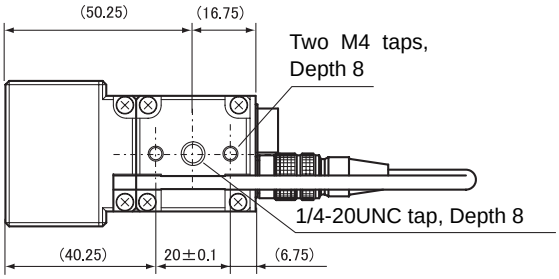
Model	F250-C50	F250-C55
Input/Output type	NPN	PNP
Power supply	20.4 to 26.4 VDC	
Current consumption	Approx. 3.0 A max	
Insulation resistance	20 MΩ min. between all DC external terminals and GR terminal (100 VDC Megger, with internal surge absorber removed)	
Dielectric strength	1,000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed)	
Leakage current	10mA max.	
Noise resistance	2,000 V; pulse width: 50 ns; rise time: 5 ns (pulse) Burst continuation time: 15 ms; Period: 300 ms	
Vibration resistance	10 to 150 Hz; half-amplitude: 0.1 mm; maximum acceleration: 15 m/s², 10 times for 8 minutes each in 3 directions.	
Shock resistance	150 m/s², 3 times each in 6 directions	
Ambient temperature	Operating: 0 to 50°C (with no condensation) Storage: -25 to 65°C (with no condensation)	
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)	
Ambient environment	No corrosive gases	
Ground	Class 1 (Ground resistance 100 Ω max.)	
Degree of protection	IEC60529 IP20 (in-panel)	
Case material	SECC-T	
Battery life	Approximately 7 years when used 24 hours/day.	
Weight	Approx. 3.1 kg (Controller only)	

Camera with Light
F150-SL20A/SL50A

(Unit:mm)

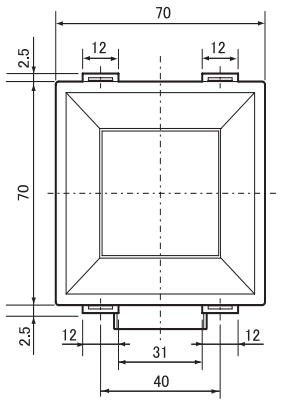


F150-LT10A Light

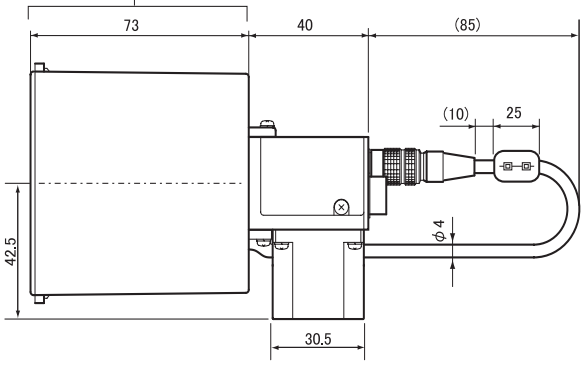


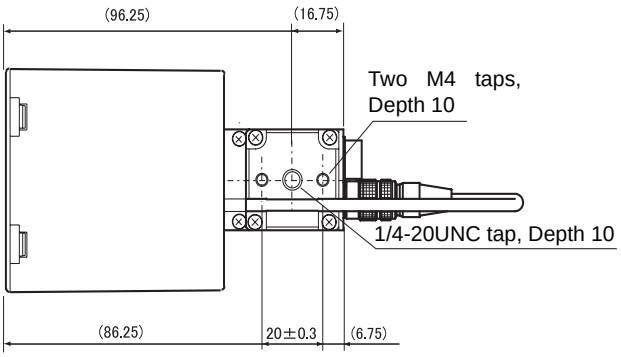
Camera with Intelligent Lighting
F150-SLC20

(Unit:mm)



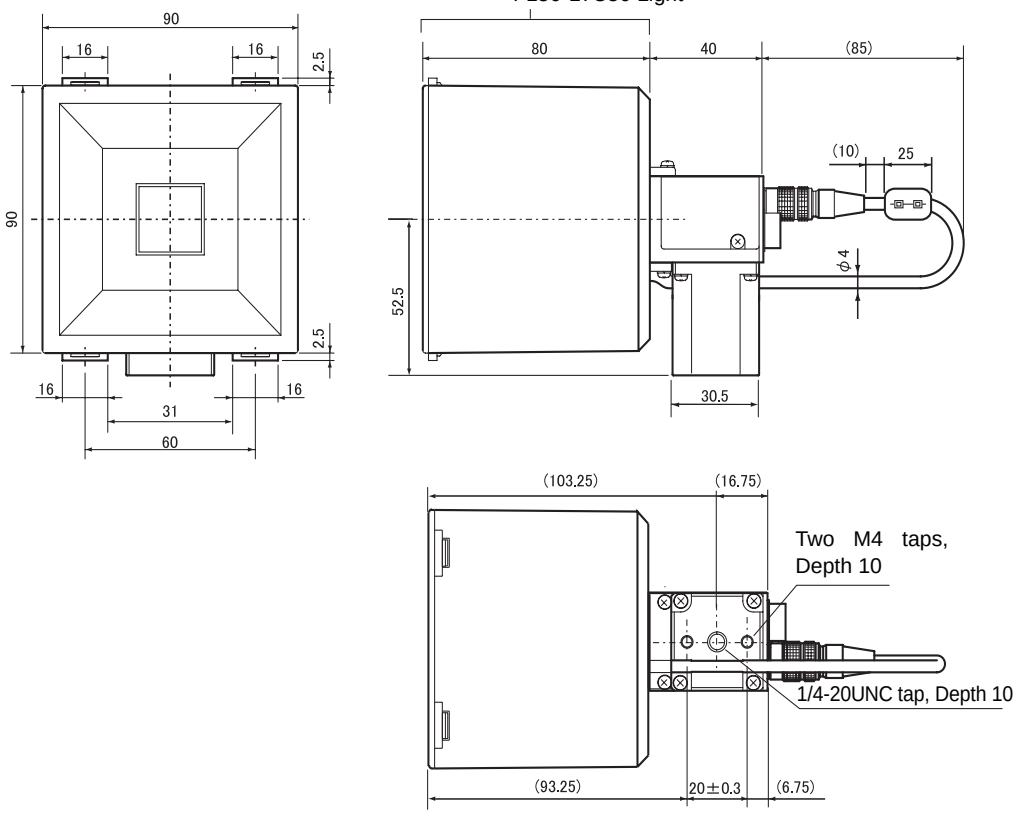
F150-LT20 Light





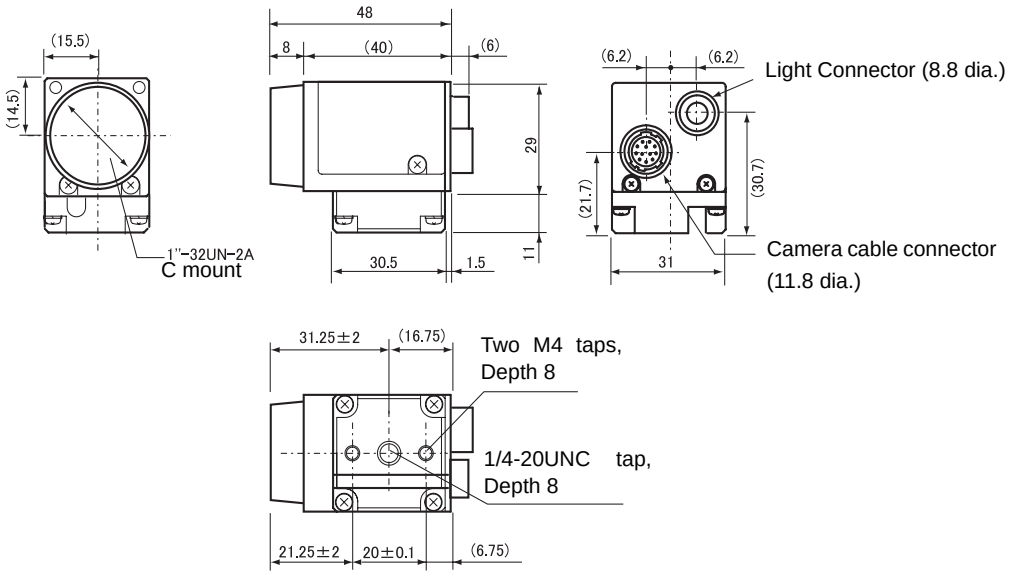
Camera with Intelligent Lighting
F150-SLC50

(Unit:mm)



Camera Only
F150-S1A

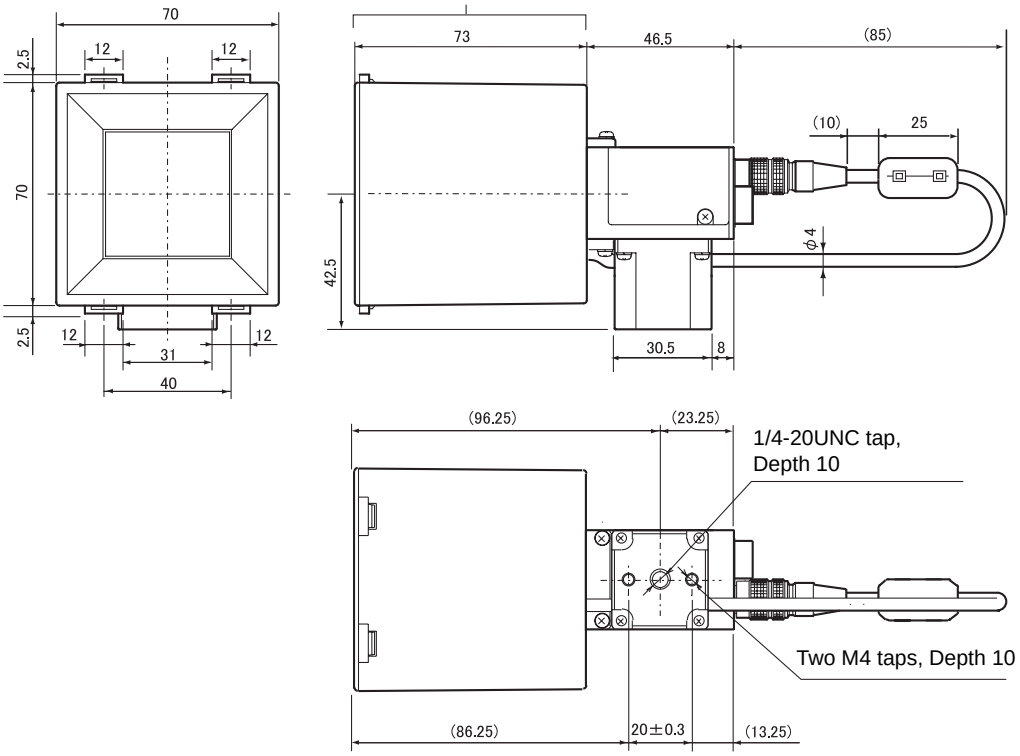
(Unit:mm)



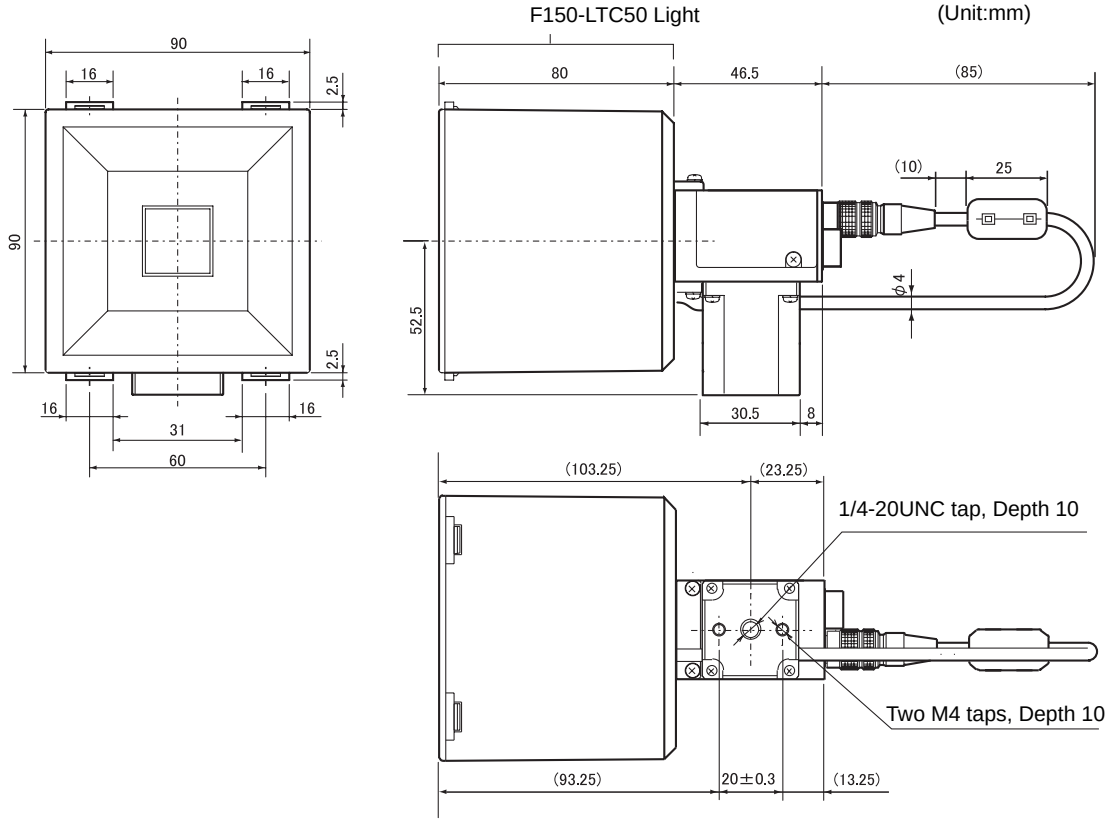
Camera with Intelligent Lighting
F160-SLC20

F150-LT20 Light

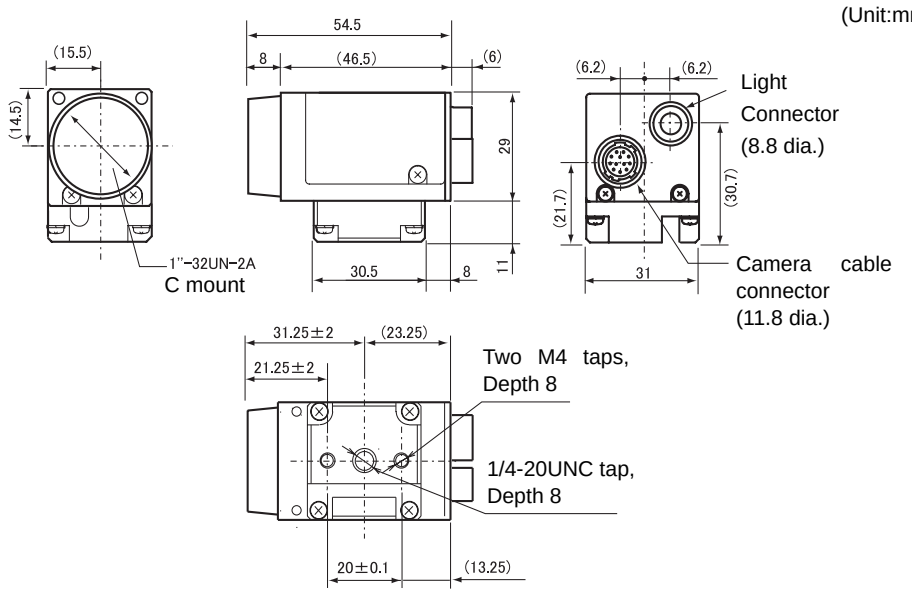
(Unit:mm)



Camera with Intelligent Lighting
F160-SLC50



Camera Only
F160-S1/F160-S2



Cameras

Specification

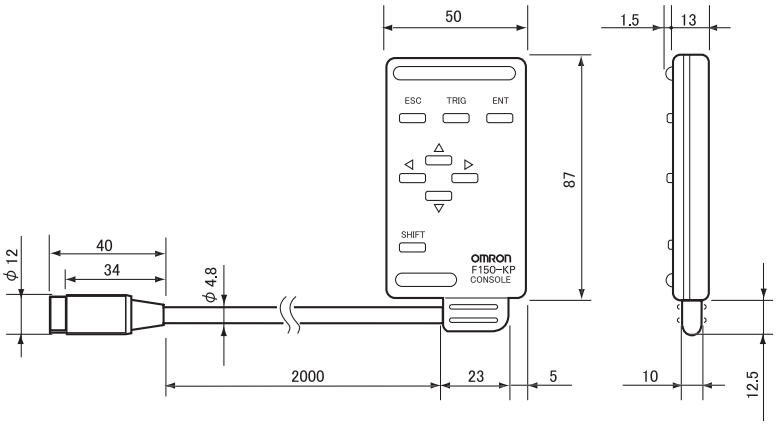
	F150 -SL20A	F150 -SL50A	F150 -SLC20	F150 -SLC50	F160 -SLC20	F160 -SLC50	F160 -S1	F160 -S2	F150 -S1A
Current consumption	1.4W max.		2.4W max.		3.4W max.	4.4W max.	1.7W max.		1.2W max.
Vibration resistance	10 to 150 Hz; half-amplitude: 0.35 mm; maximum acceleration: 50 m/s^2, 10 times for 8 minutes each in 3 directions.								
Shock resistance	150 m/s^2, 3 times each in 6 directions								
Ambient temperature	Operating: 0 to 50°C (with no condensation) Storage: -25 to 60°C (with no condensation)								
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)								
Ambient environment	No corrosive gases								
Camera materials	Cover: Galvanized steel sheet metal Case: Die-cast aluminum alloy Camera mounting base: Fiber-reinforced plastic (black)								
Light materials	Case: ABS Transparent cover: PC						—		
Weight	Approx. 135 g	Approx. 135 g	Approx. 280 g	Approx. 370 g	Approx. 285 g	Approx. 375 g	Approx. 85g		Approx. 80g

Characteristics

	F150 -SL20A	F150 -SL50A	F150 -SLC20	F150 -SLC50	F160 -SLC20	F160 -SLC50	F160 -S1	F160 -S2	F150 -S1A
Camera Characteristics									
Picture element	1/3" Interline CCD (reading all pixels)								
Effective pixels	659 × 494 (H × V)								
Synchronization	External sync. via horizontal sync signal								
Shutter speed (Electronic shutter)	F150-series: 1/100 s, 1/500 s, 1/2000 s, 1/10000 s F160-series: 1/120 s, 1/200 s, 1/500 s, 1/1000 s, 1/2000 s, 1/4000 s, 1/8000 s, 1/20000 s								
Partial scanning	Disable							Enable	Disable
Lens mounting	C mount								
Lens Characteristics									
Lens model	F150 -LE20	F150 -LE50	F150 -LE20	F150 -LE50	F150 -LE20	F150 -LE50	—		
Method	Fixed focal point, fixed iris								
Brightness	F2.8								
Focal length	13 mm	6.1 mm	13 mm	6.1 mm	13 mm	6.1 mm			
Light Characteristics									
Light model	F150-LT10A		F150 -LTC20	F150 -LTC50	F150 -LTC20	F150 -LTC50	—		
Light source	Red LED (Peak emission wavelength: 680 nm)		Red and green LED combination (Peak emission wavelengths: 660 nm and 570 nm)						
Light emission method	Pulse emission (synchronized with the camera shutter)								
Mounting distance	61 to 71 mm	66 to 76 mm	15 to 25 mm	16.5 to 26.5 mm	15 to 25 mm	16.5 to 26.5 mm	Depends on lens being used.		
Field of vision	20 mm × 20 mm	50 mm × 50 mm	20 mm × 20 mm	50 mm × 50 mm	20 mm × 20 mm	50 mm × 50 mm			

Console
F150-KP

(Unit:mm)

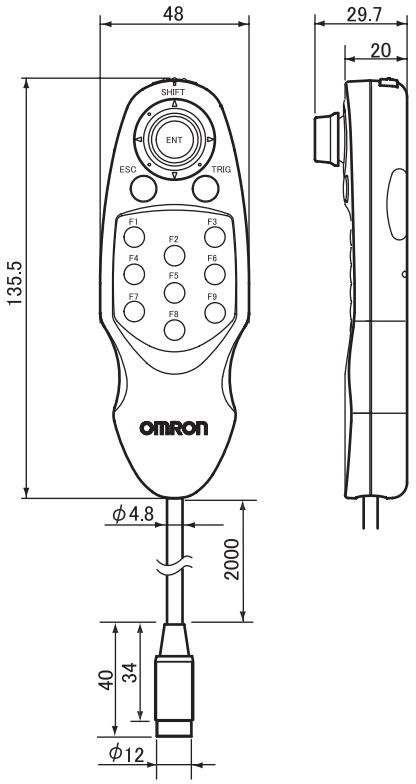


Specification

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

Console
F160-KP

(Unit:mm)

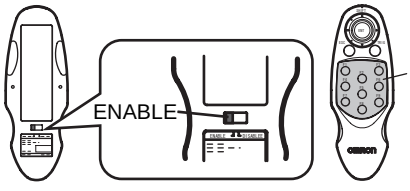


Specification

Current consumption	Approx. 10mA
Vibration resistance	10 to 150 Hz; half-amplitude: 0.35 mm; maximum acceleration: 50 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 (with no condensation) Storage: -25 to 65°C (with no condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Degree of protection	IEC60529 IP20 (in-panel)
Minimum bending radius	75mm
Materials	Body: ABS Cable sheathing: Heat-resistant PVC Connector: PC and PBT
Weight	Approx. 160g

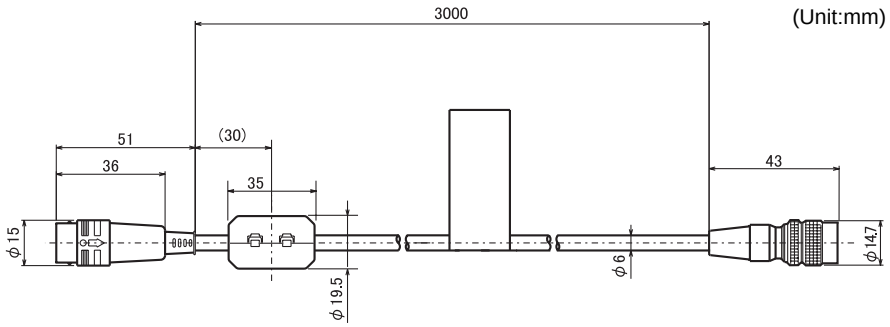
CHECK!

The switch on the back of the F160-KP must be set to "ENABLE".



These keys will be disabled if the switch is set to "DISABLE".

Camera Cable (For F150-S□, F160-S□ Cameras)
F150-VS



Specification

Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm; 4 times for 8 minutes each in 3 directions
Shock resistance	196m/s², 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C (with no condensation) Storage: -25 to 65°C (with no condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Materials	Cable sheathing: Heat-resistant PVC Connector: Fiberglass-reinforced PC and PBT
Minimum bending radius	75mm
Weight	Approx. 170g

Controller Connector	
Signal	Pin
Power	1
GND	2
GND	3
VIDEO GND	4
VD	5
ESCNT1	6
VIDEO	7
HD	8
SCAN	9
ESCNT2	10
INDEX	11
TRG	12
Shell	-

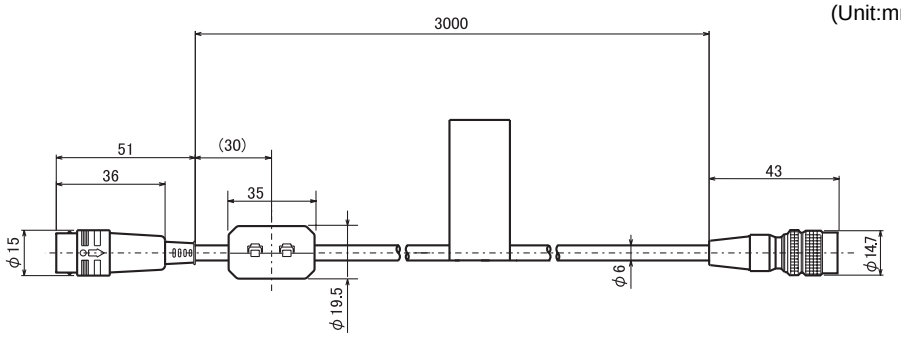
Connector model
Hirose PR17A-13P-12PC
(equivalent part)

Camera Connector	
Pin	Signal
1	GND
2	Power
3	GND
4	VIDEO
5	VIDEO GND
6	HD
7	(Open)
8	ESCNT1
9	ESCNT2
10	INDEX
11	TRG
12	SCAN
-	Shell

Connector model
Hirose HR10A-10P-12S
(equivalent part)

Camera Cable (For F300-S2R/S3DR/S4R Cameras)
F160-VSR3

(Unit:mm)



Specification

Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm; 4 times for 8 minutes each in 3 directions
Shock resistance	196m/s², 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C (with no condensation) Storage: -25 to 65°C (with no condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Materials	Cable sheathing: Heat-resistant PVC Connector: Fiberglass-reinforced PC and PBT
Minimum bending radius	75mm
Weight	Approx. 170g

Controller Connector	
Signal	Pin
Power	1
GND	2
GND	3
VIDEO GND	4
VD	5
ESCNT1	6
VIDEO	7
HD	8
SCAN	9
ESCNT2	10
INDEX	11
TRG	12
Shell	-

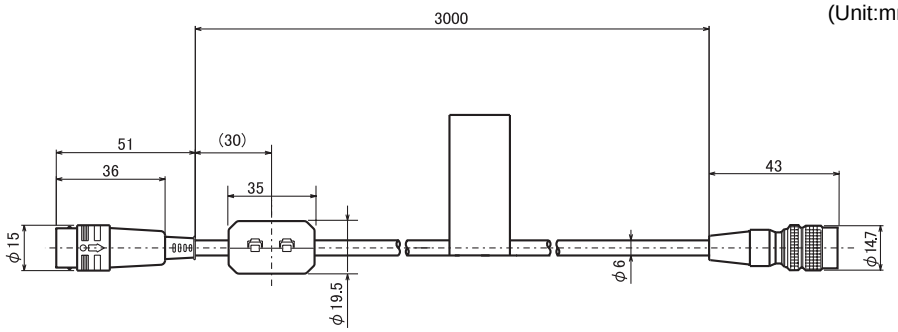
Connector model
Hirose PR17A-13P-12PC
(equivalent part)

Camera Connector	
Pin	Signal
1	GND
2	Power
3	VIDEO GND
4	VIDEO
5	HD GND
6	HD
7	VD
8	GND
9	-
10	INDEX(SI)
11	TRG
12	VD GND
-	Shell

Connector model
Hirose HR10A-10P-12S
(equivalent part)

Camera Cable (For F300-S Cameras)
F160-VSR4

(Unit:mm)



Specification

Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm; 4 times for 8 minutes each in 3 directions
Shock resistance	196m/s², 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C (with no condensation) Storage: -25 to 65°C (with no condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Materials	Cable sheathing: Heat-resistant PVC Connector: Fiberglass-reinforced PC and PBT
Minimum bending radius	75mm
Weight	Approx. 170g

Controller Connector	
Signal	Pin
Power	1
GND	2
GND	3
VIDEO GND	4
VD	5
ESCNT1	6
VIDEO	7
HD	8
SCAN	9
ESCNT2	10
INDEX	11
TRG	12
Shell	-

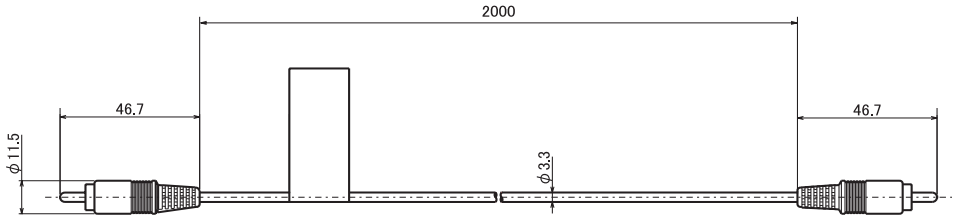
Connector model
Hirose PR17A-13P-12PC
(equivalent part)

Camera Connector	
Pin	Signal
1	GND
2	Power
3	VIDEO GND
4	VIDEO
5	HD GND
6	HD
7	VD
8	GND
9	-
10	INDEX(SI)
11	Power
12	VD GND
-	Shell

Connector model
Hirose HR10A-10P-12S
(equivalent part)

Monitor Cable
F150-VM

(Unit:mm)

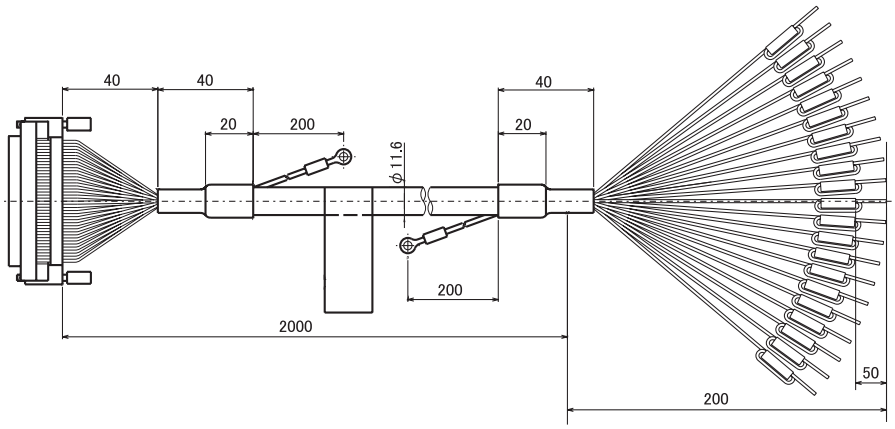


Specification

Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm; 4 times for 8 minutes each in 3 directions
Shock resistance	196m/s^2, 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C (with no condensation) Storage: -25 to 65°C (with no condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Materials	Cable sheathing: Super flame retardant PVC Connector: PVC
Minimum bending radius	50mm
Weight	Approx. 40g
Accessories	BNC Jack Adapter

Parallel I/O Cable
F160-VP

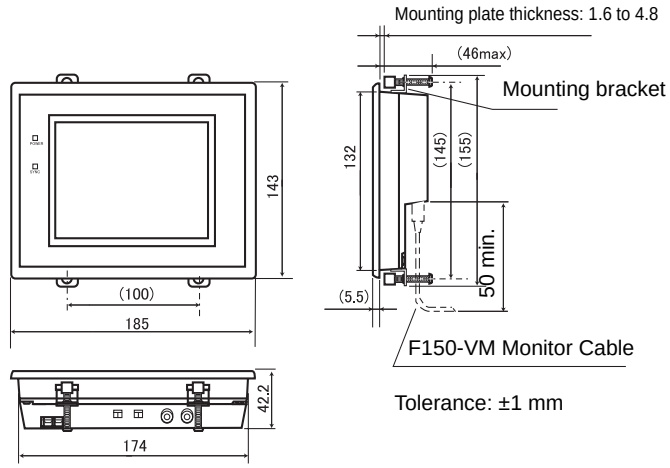
(Unit:mm)



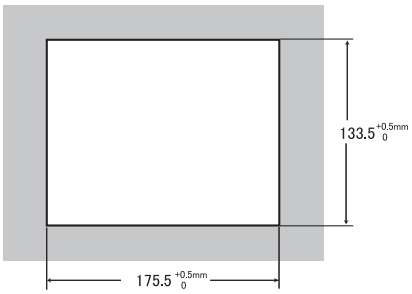
Specification

Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm; 4 times for 8 minutes each in 3 directions
Shock resistance	196m/s^2, 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C (with no condensation) Storage: -25 to 65°C (with no condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Materials	Cable sheathing: Heat-resistant PVC Connector: Polyester resin
Minimum bending radius	120mm
Weight	Approx. 340g

LCD Color Monitor
F150-M05L



Panel opening dimensions



Specification

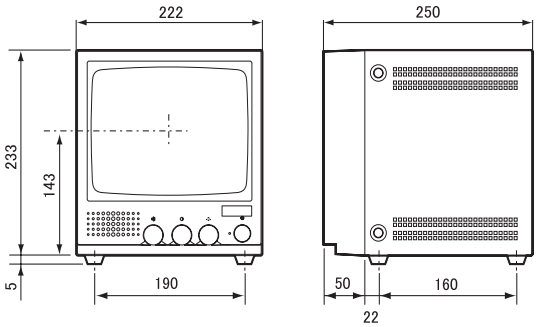
Power supply voltage	20.4 to 26.4 VDC
Current consumption	700mA max.
Vibration resistance	10 to 150 Hz; half-amplitude: 0.1 mm; maximum acceleration: 15 m/s², 10 times for 8 minutes each in 3 directions.
Shock resistance	150 m/s², 3 times each in 6 directions
Ambient temperature	Operating: 0 to 50°C (with no condensation) Storage: -25 to 65°C (with no condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Degree of protection	IEC60529 IP20 (in-panel)
Materials	Case: ABS/PC Display surface: PMMA (Acrylic)
Weight	Approx. 610g
Accessories	Four mounting brackets

Characteristics

Panel size	5.5 inches (111.36 83.52 mm (H × V))
Panel type	TFT color liquid crystal
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/m² (typical)
Backlight	Cold cathode fluorescent light
Response speed	60 ms max.
Input signal	NTSC composite video (1.0 V/75Ω termination)

Video Monitor
F150-M09

(Unit:mm)



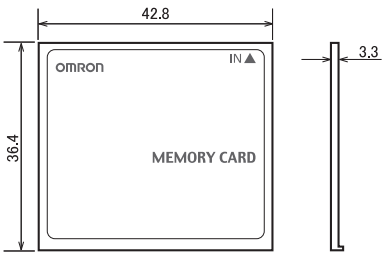
Specification

Power supply voltage	85 to 264 VAC, 50/60 Hz
Current consumption	20 W max.
Vibration resistance	5 to 100 Hz; 0.16 mm full-amplitude or acceleration of 7.35 m/s^2 (whichever is smaller), 6 times for 10 minutes each in 3 directions
Ambient temperature	Operating:-10° to +50° Storage:-20° to +65° (with no condensation)
Ambient humidity	Operating and storage: 10% to 90% (with no condensation)
Ambient environment	No corrosive gases
Materials	Front: ABS plastic Metal part: SECC (galvanized steel sheet)
Weight	Approx. 4.5kg

Characteristics

CRT size	9 inch (164 × 123 mm (H × V))
CRT type	Monochrome CRT
Resolution	800 TV lines min. (at center)
Method	Number of scanning lines: 600 Horizontal frequency: 15.75 kHz Field frequency: 60 Hz
I/O impedance	75Ω, high impedance (selectable)
I/O level and polarity	Composite image signal:1 V (peak to peak) Image: 0.7 V (peak to peak), positive Synchronization: 0.3 V (peak to peak), negative
Input signal	NTSC composite video (1.0 V/75 Ω termination)

Memory Cards
F160-N64S(S)
QM300-N128S

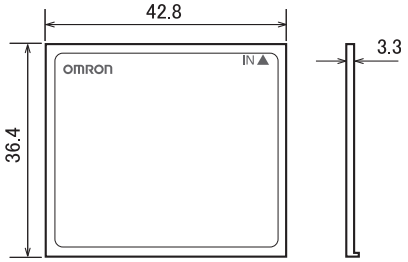


(Unit:mm)

Specification

Ambient temperature	Operating: 0 to 60°C (with no condensation) Storage: -25 to 85°C (with no condensation)
Ambient humidity	Operating and storage: 8% to 95% (with no condensation)
Ambient environment	No corrosive gases
Life expectancy	300,000 overwrite operations
Number of pins	50 pins
Weight	Approx. 15g

Application Software
F250-UME



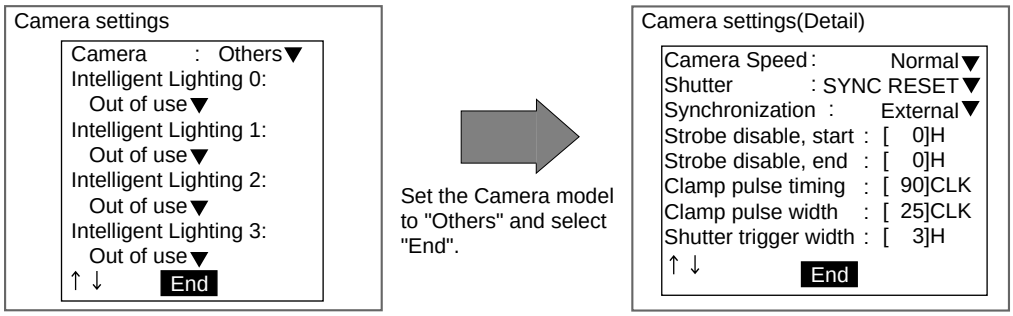
(Unit:mm)

Specification

Ambient temperature	Operating: 0 to 60°C (with no condensation) Storage: -25 to 85°C (with no condensation)
Ambient humidity	Operating and storage: 8% to 95% (with no condensation)
Ambient environment	No corrosive gases
Life expectancy	300,000 overwrite operations
Number of pins	50 pins
Weight	Approx. 15g

F300-Series Camera Parameters

Detailed parameter settings are required when a Camera other than an F150-S1A, F160-S1 or F160-S2 is connected. Make the following settings when using an F300-Series Camera.
The Camera settings window is displayed at startup and can be displayed at other times by selecting [Camera settings] from the System Menu.



Camera	Camera speed	Shutter	Synchro-nization	Strobe disable		Shutter speed *1	Clamp pulse		Shutter trigger pulse		External VD Sync	Image read Y timing
				Start	End		Timing	Width	Width	Polarity		
F300-S	Standard	OFF	External Sync	6	8	(None)	90	25	(*2)	Positive	OFF	–
F300-S2R	Standard	SYNC NON RESET	External Sync	-8	-6	1/1000	90	25	7	Negative	OFF	–
				-2	0	1/2000						
				-2	0	1/4000						
				-2	0	1/10000						
F300-S3DR	Standard	SYNC NON RESET	External Sync	-10	-8	1/1000	90	25	7	Negative	OFF	–
				-2	0	1/2000						
				3	5	1/4000						
				5	7	1/10000						
F300-S4R	Standard	SYNC NON RESET	External Sync	-16	-14	1/1000	90	25	7	Negative	OFF	–
				-11	-9	1/1500						
				-8	-6	1/2000						
				-6	-4	1/3000						
				-5	-3	1/4000						
				-3	-1	1/6000						
				-3	-1	1/8000						
				-2	0	1/10000						
				-2	0	1/30000						
				-2	0	1/50000						

*1: The shutter speed is set in the Camera itself.

*2: Set the shutter trigger pulse width to match the strobe's specifications only when a strobe is being used.

–: These settings are ignored.

Connecting a Strobe Device

Use the camera's corresponding strobe trigger output signal (STGOUT0 to STGOUT3) to control the strobe flash timing.

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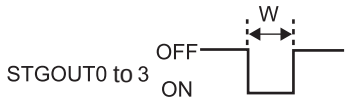
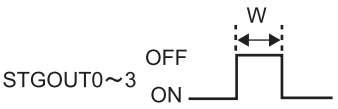
Check the strobe device's specifications and set the appropriate "Shutter trigger polarity" and "Shutter trigger width" in the Camera settings (Detail) Menu.The Camera settings (Detail) window is displayed at startup and can be displayed at other times by selecting Camera settings from the System Menu.

Strobe specifications	Shutter trigger polarity	Shutter trigger width
When the flash is synchronized to the OFF-to-ON transition of the strobe trigger signal 	Positive	The "shutter trigger width" setting determines the pulse width W. Can be set to match the strobe's specifications. When using a Double-speed Camera: W = Shutter trigger width setting (H) × 32 µs (1H = 32 µs) When using a Camera other than a Double-speed Camera: W = Shutter trigger width setting (H) × 63 µs (1H = 63 µs) Note: Depending upon the timing, W may have an error of up to 1H.
When the flash is synchronized to the ON-to-OFF transition of the strobe trigger signal 	Negative	

Combining an OMRON Camera and Strobe

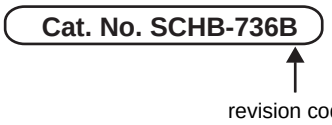
The following table shows the timing polarity.
Use a strobe that is compatible with this timing.

Camera	Shutter trigger polarity	Shutter trigger width	
F150-S1A	Positive	3H (1H = 63 µs)	*
F160-S1	Positive	3H (1H = 32 µs)	*
F160-S2			
F300-S	Positive	Can be set to match the	
F300-S2R	Negative	7H (1H = 63 µs)	
F300-S3DR			
F300-S4R			

* The window used to change the shutter trigger polarity and shutter trigger pulse will not be displayed when an F150-S1A, F160-S1 or F160-S2 Camera is connected, but the STGOUT0 to STGOUT3 signals will be output with the polarity and width shown in the table above.

Revision History

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



Revision	Date	Revised content
A	October 01	Original production
B	February 03	Camera Model F160-S2 addition
B	December 03	Remove trademark from graphics on page 77