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Cat. No. Z170-E1-02E

F160-2
Vision Sensor

Manual 1:
SETUP MANUAL

OMRON

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F160-2 Vision Sensor

Manual 1: Setup Manual

Revised August 2015

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Notice:

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

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

⚠ **DANGER** Indicates an imminently hazardous situation which, if not avoided, is likely to result in serious injury or may result in death. Additionally there may be severe property damage.

⚠ **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.

OMRON Product References

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Visual Aids

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

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

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

Precaution 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.

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

TwoCamera Indicates information required when using a 2-camera system.

SeeAlso Indicates where to find related information.

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

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About this Manual:

This manual describes the hardware for the F160 Vision Sensor and how to install the components, and it includes the sections described below. This is one of four manuals used to operate the F160. Refer to the following table for the contents of each manual.

Manual	Contents	Cat. No.
1: Setup Manual	Provides information on system hardware and installation. **Be sure to read this manual first.**	Z170
2: Conversational Menu Operation Manual	Describes operation of the F160 using the Conversational Menus. The Conversational Menus enable the simplest operation based on registered images of acceptable and unacceptable products.	Z171
3: Expert Menu Operation Manual	Describes operation of the F160 using the Expert Menus. The Expert Menu enable application of all F160 capabilities, including setting region images and criteria.	Z173
4: Communications Reference Manual	Describes the communications settings and communications protocol used to transfer data through the parallel interface or serial interface.	Z172

Please read the above manuals carefully and be sure you understand the information provided before attempting to install or operate the F160.

Section 1 ***Introduction*** describes the precautions that must be taken when installing and operating the F160 Vision Sensor.

Section 2 ***Installation and Connections*** shows a basic F160 system configuration and explains how to install the F160 and connect it to a power supply and peripheral devices.

Section 3 ***Lenses, Lighting, and Memory Cards*** describes how to select and use these components most effectively.

Section 4 ***Connecting External Devices*** describes how to connect external devices through a parallel interface (the I/O terminals or I/O connector) or serial interface (the RS-232C/RS-422 connector).

Section 5 ***Troubleshooting and Maintenance*** provides tables to help identify and correct hardware errors that may occur with the F160 as well as information on maintenance and periodic inspections.

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

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PRECAUTIONS

This section provides general precautions for using the F160 Vision Sensor.

The information contained in this section is important for the safe and reliable application of the F160 Vision Sensor. You must read this section and understand the information contained before attempting to set up or operate an F160 Vision Sensor.

1 General Safety Precautions xii
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3 Regulations and Standards. xiv

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1 General Safety Precautions

Battery Precautions

⚠ WARNING Do not disassemble the F160, apply pressure to the F160 that would deform its shape, or incinerate the F160. A lithium battery is built into the F160 and it may combust, explode, or burn if not treated properly.

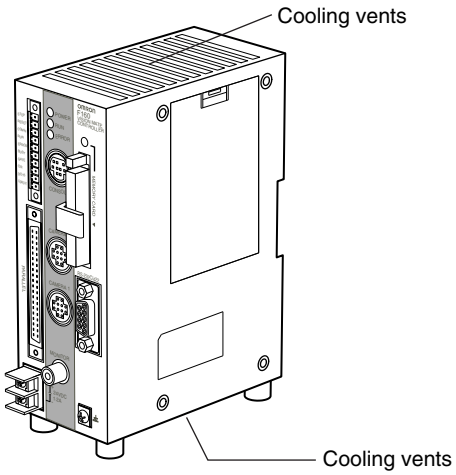
⚠ WARNING Do not short circuit, attempt to charge, disassemble, apply pressure that would deform, or incinerate the lithium battery. The lithium battery may start a fire, explode, or burn if not treated properly.

Installation Environment Precautions

⚠ Caution Do not use the F160 in environments with flammable or explosive gases.

⚠ Caution Install the F160 away from high-voltage devices and moving machinery to allow safe access during operation and maintenance.

⚠ Caution Do not block the F160's cooling vents.



Before the F160 is shipped, a protective label is attached to the top of the F160 to cover the cooling vents. This label prevents wire strands from falling into the F160 during wiring, so it must not be removed until wiring is completed. The label must be removed after wiring to allow proper cooling during operation.

⚠ Caution Be sure to securely tighten the screws when mounting the F160.

Power Supply and Wiring Precautions

⚠ Caution Use the F160 with the power supply voltages specified in this manual.

⚠ Caution Use the wire and crimp terminals of the proper sizes as specified in this manual. Do not connect the power supply wires by just twisting stranded wire and connecting directly to the terminals.

⚠ Caution Use a DC power supply with countermeasures against high-voltage spikes (safe extra low-voltage circuits on the secondary side).

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Note

1. Keep the power supply wires as short as possible (10 m max.).
2. Ground the F160's ground terminal to less than 100 Ω.
3. Use a grounding point as close as possible to the F160 and keep the ground line as short as possible.
4. Wire the F160 to the ground with a separate ground wire. To avoid grounding problems, do not share the ground wiring with any other devices or ground the F160 to the building's steel framing/plumbing.

- Check the wiring once again prior to turning ON the power.

Other Precautions

⚠ **Caution** Do not attempt to dismantle, repair, or modify the F160.

⚠ **Caution** Do not touch fluorescent or halogen lights while the power is ON or immediately after the power is turned OFF. These lights get very hot and can cause burns.

⚠ **Caution** If you suspect an error or malfunction, stop using the F160 immediately, turn OFF the power supply, and consult your OMRON representative.

Note Dispose of the F160 as industrial waste.

2 Special or Critical Applications

When the F160 will be used in one of the conditions or applications listed below, allow extra safety margins in ratings and functions, add extra safety features such as fail-safe systems, and consult your OMRON representative.

- Operating conditions or environments which are not described in the manual
- Nuclear power control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement equipment, or safety equipment
- Other systems, machines, and equipment that may have a serious influence on lives and property and require extra safety features

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3 Regulations and Standards

The F160 complies with the international regulations and standards below.

1. EC Regulations
   EMC Directive: No.2004/108/EC
2. EN Standards (European Standards)
   EN61326-1
   Electromagnetic environment : Industrial electromagnetic environment
   (EN/IEC 61326-1 Table 2)
   Also, the following condition is applied to the immunity test of this product.
   : If the level of disturbance of the video is that with characters on the monitor are readable, the test is pass.
3. TRACEABILITY INFORMATION:
   Importer in EU:
   Omron Europe B.V.
   Wegalaan 67-69
   2132 JD Hoofddorp,
   The Netherlands

   Manufacture:
   Omron Corporation,
   Shiokoji Horikawa, Shimogyo-ku, Kyoto 600-8530 JAPAN
4. The following notice applies only to products that carry the CE mark:

   Notice:
   This is a class A product. In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.
5. Notice for Korea Radio Law

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SECTION 1
Introduction

This section describes the precautions that must be taken when installing and operating the F160 Vision Sensor.

1-1 Installation Precautions 2
1-1-1 Controller Installation 2
1-1-2 Component Installation and Handling. 3
1-2 Confirming Package Contents 5
1-3 Product Availability 6

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1-1 Installation Precautions

The F160 is highly reliable and resistant to most environmental factors. The following guidelines, however, must be followed to ensure reliability and optimum use of the F160.

⚠ **Caution** Read the *Precautions* section before proceeding with installation or operation.

1-1-1 Controller Installation

Installation Site

Do not install the F160 in locations subject to the following conditions:

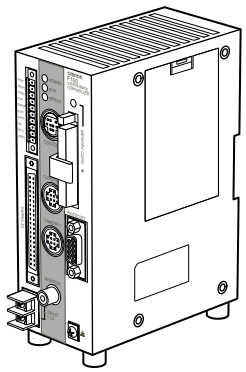
1,2,3...

1. Ambient temperatures outside of the 0 to 50°C (32 to 122°F) range
2. Rapid temperature fluctuations (likely to cause condensation)
3. Relative humidities outside of the 35% to 85% range
4. Presence of corrosive or flammable gases
5. Presence of dust, salt, or iron particles
6. Direct vibration or shock
7. Direct sunlight
8. Water, oil, or chemical fumes or spray

Orientation of Controller

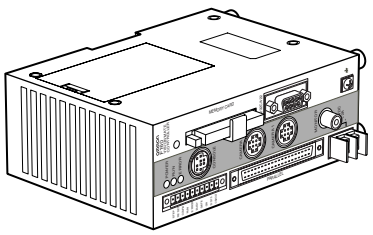
To improve heat dissipation, install the Controller in the following orientation only:

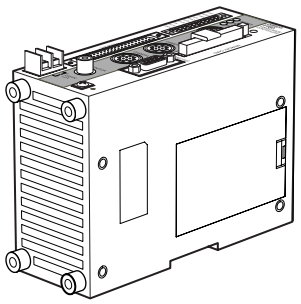
CORRECT



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

INCORRECT



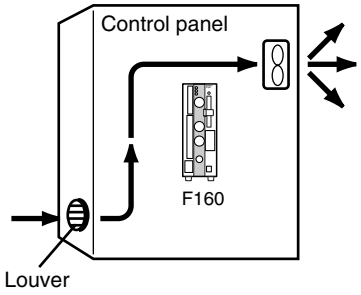


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Ambient Temperature

1,2,3...

1. Maintain a minimum clearance of 50 mm above and below the F160 to improve air circulation.
2. Do not install the F160 immediately above significant heat sources, such as heaters, transformers, or large-capacity resistors.
3. Do not let the ambient operating temperature exceed 50°C (122°F).
4. 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).

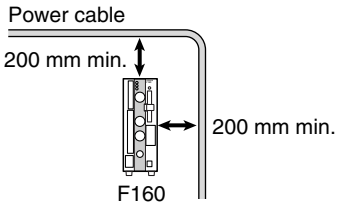


Noise Resistance

Use the following measures to help increase noise resistance.

1,2,3...

1. Do not install the F160 in a cabinet containing high-voltage equipment.
2. Do not install the F160 within 200 mm of power cables.



1-1-2 Component Installation and Handling

OMRON Components

Use a Camera, Camera Cable, and Console designed specifically for the F160.

Connecting Cables

Always turn OFF the F160'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.

1,2,3...

1. Do not ground the Camera.
2. Do not remove the base attached to the Camera.
3. Do not remove the core attached to the F150-VS Camera Cable.

Camera Optical Axis

The optical axis center of each Camera varies slightly. Confirm that the image is centered on the monitor when connecting the Camera.

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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.

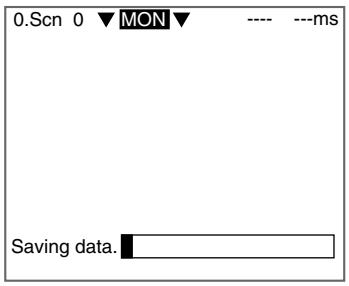
Removing the Memory Card

Before removing a Memory Card, stop the power supply to the Card or turn OFF the F160. The Memory Card or the F160 itself may be damaged if a Memory Card is removed while power is being supplied.

(Stop the power supply to the Memory Card from the menu.)

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 F160 may not operate correctly the next time it is started.



Using the RESET Signal

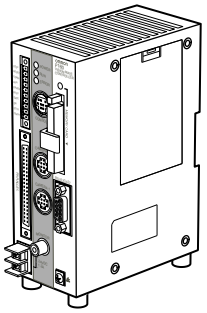
Do not use the RESET input immediately after power is turned ON. When using the RESET input to synchronize startup timing, wait at least 1 second after the F160's power supply is turned ON before turning ON the RESET signal.

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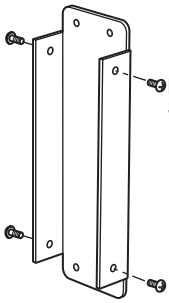
1-2 Confirming Package Contents

Check the contents of the package as soon as you receive the F160. It is extremely rare for components to be missing, but contact the nearest OMRON representative if any of the following items are missing.

1,2,3... 1. F160 Vision Mate Controller Qty.: 1

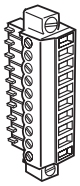


2. Mounting Bracket (for rear surface mounting)

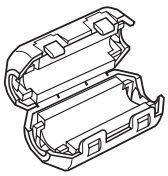


Bracket: Qty: 1
Screws (M3 x 6): Qty: 4

3. Connector for I/O Terminals Qty.: 1
(Phoenix Contact model MC1.5/10-STF-3.5)



4. Ferrite Core for F150-VM Monitor Cable Qty.: 1



5. Setup Manual (this manual) Qty.: 1
6. *Conversational Menu Operation Manual* Qty.: 1
7. *Expert Menu Operation Manual* Qty.: 1
8. Communications Reference Qty.: 1

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1-3 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.

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SECTION 2
Installation and Connections

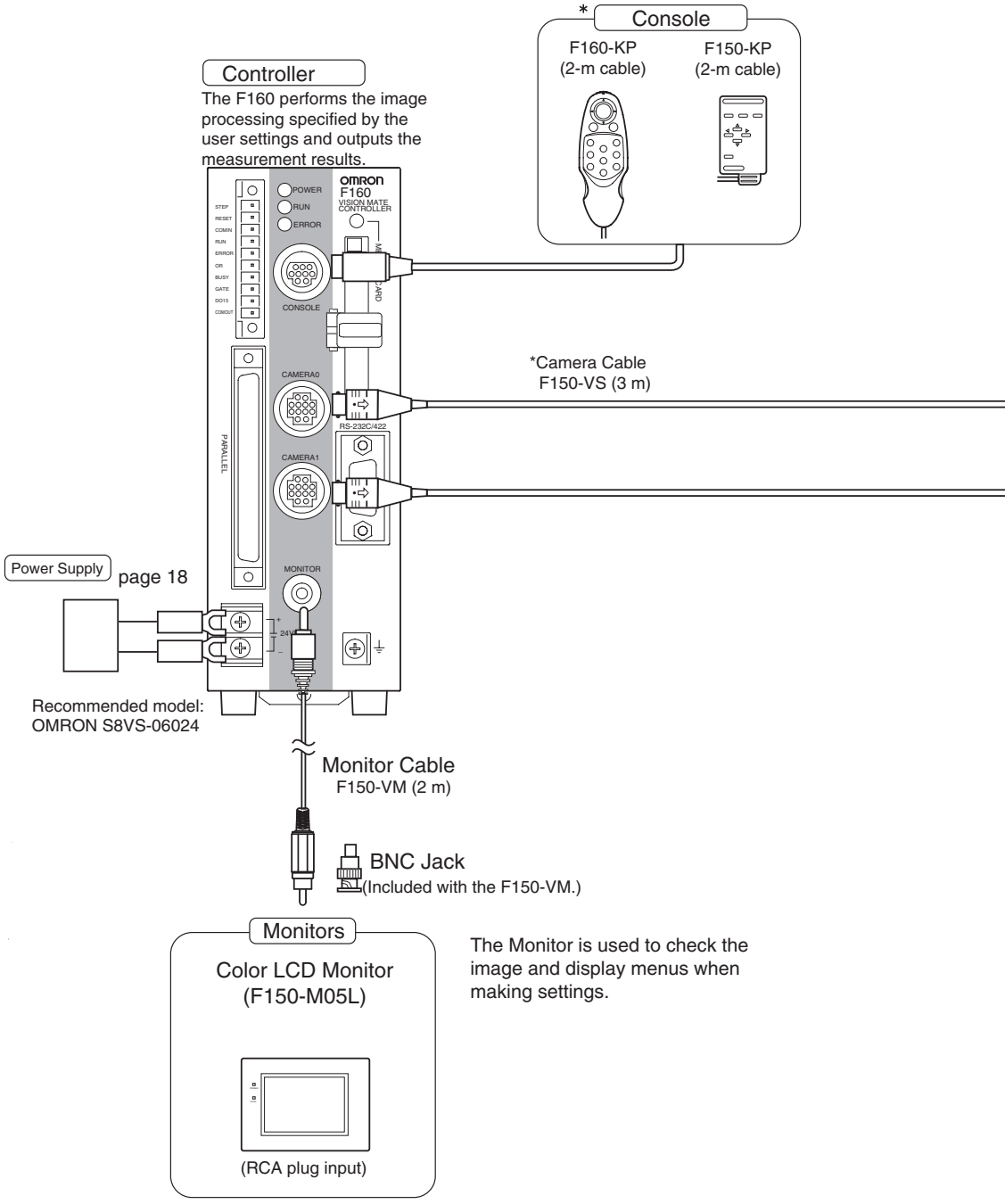
This section shows a basic F160 system configuration and explains how to install and wire the F160.

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2-2 Component Names and Functions 10
2-3 Mounting the Controller 11
2-3-1 DIN Track Mounting 11
2-3-2 Rear Surface-mounting 12
2-3-3 Side Surface-mounting 14
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2-4 Connecting Peripheral Devices 15
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2-1 Basic System Configuration

Precaution The following diagram shows the basic F160 system configuration. Some of the components shown in the configuration diagram are special OMRON products that cannot be substituted with comparable devices. These items are indicated with an asterisk.

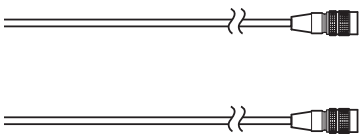


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* Cameras

Images of measurement objects are obtained using Cameras. Up to 2 Cameras can be connected to an F160, but the 2 Cameras can be used with the Expert Menu only. Just 1 Camera can be used with the Conversational Menu.

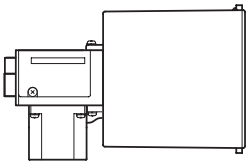
CHECK! Two different models of Camera can be connected as long as the Cameras are of the same type. (The model number prefix (F150 or F160) indicates the Camera's type, so two Cameras can be connected together if they have the same prefix.)



● Double-speed Cameras

Camera with Intelligent Lighting

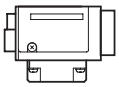
F160-SLC20 (20-mm field of vision)
F160-SLC50 (50-mm field of vision)



Camera Only

Use the Camera by itself when the field of vision of the Camera with Intelligent Light does not match the size of the measurement object. A standard CCTV lens and light source will be needed.

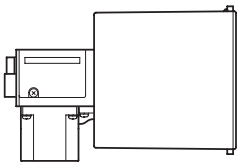
F160-S2



● F150 Cameras

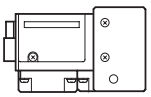
Camera with Intelligent Lighting

F150-SLC20 (20-mm field of vision)
F150-SLC50 (50-mm field of vision)



Camera with Light

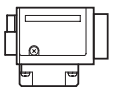
F150-SL20A (20-mm field of vision)
F150-SL50A (50-mm field of vision)



Camera Only

Use the Camera by itself when the field of vision of the Camera with Intelligent Light does not match the size of the measurement object. A standard CCTV lens and light source will be needed.

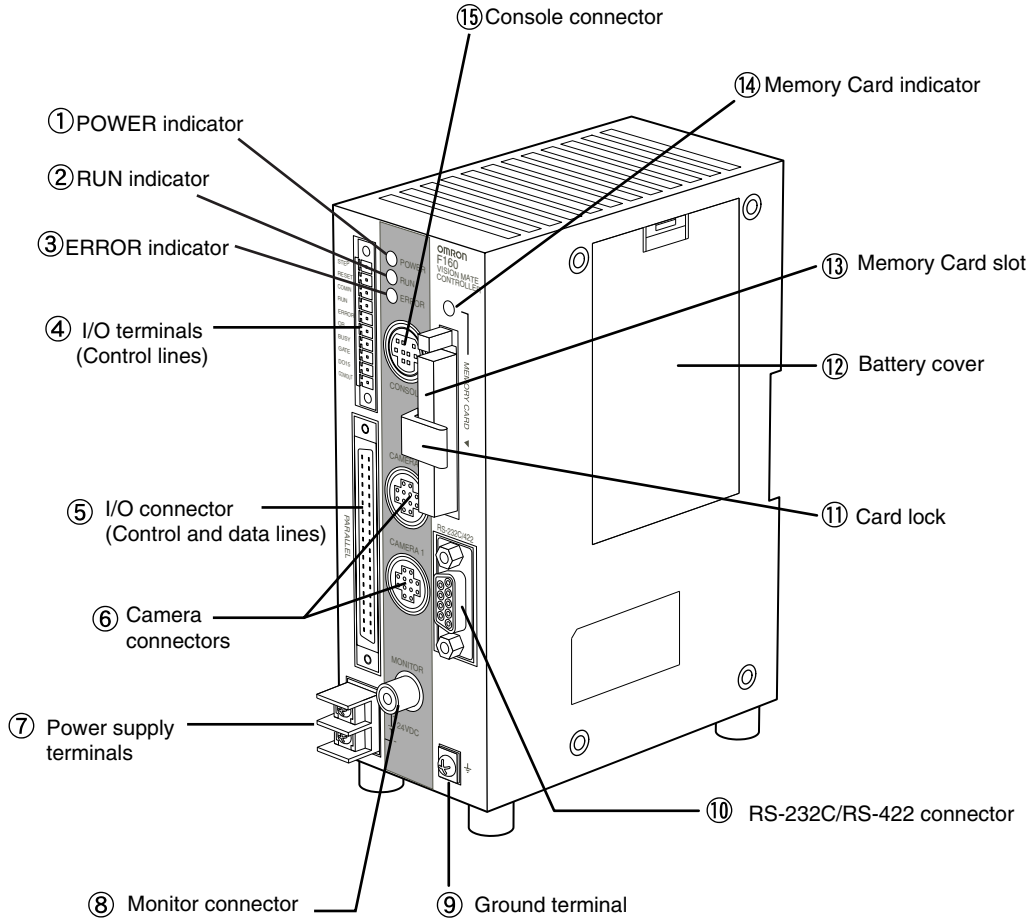
F150-S1A



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2-2 Component Names and Functions

The following diagram shows the F160 Vision Mate Controller's major external components.



1. Lit while power is ON.
2. Lit while the F160 is in Run Mode.
3. Lit when an error has occurred.
4. Connects the F160 to external devices such as a sync sensor or PLC.
5. Connects the F160 to external devices such as a sync sensor or PLC.
6. Connects to the Camera(s).
7. Connects to the power supply.
8. Connects to the monitor.
9. Connects to the ground wire.
10. Connects the F160 to an external device such as a personal computer or PLC.
11. This lock secures the Memory Card so that it does not disconnect unintentionally from vibration.
12. Covers the compartment that contains the F160's battery.
13. This slot receives the Memory Card.

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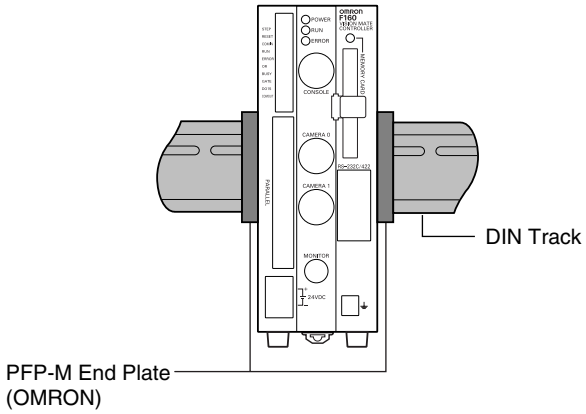
14. Lit when power is being supplied to the Memory Card. (The Memory Card must not be inserted or removed when this indicator is lit.)
15. Connects the F160 to a Console.

2-3 Mounting the Controller

There are four ways to mount the Vision Mate Controller: DIN Track mounting, rear surface-mounting, side surface-mounting, or bottom surface-mounting.

2-3-1 DIN Track Mounting

The Vision Mate Controller can be easily mounted to or removed from 35-mm DIN Track.

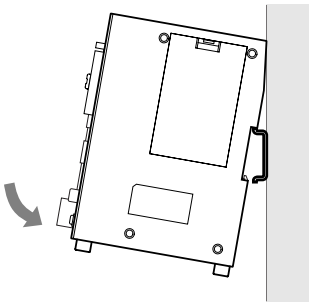


The following DIN Tracks are available from OMRON.

Model	Length
PFP-100N	1 m
PFP-50N	50 cm
PFP-100N2	1 m

Mounting the Controller

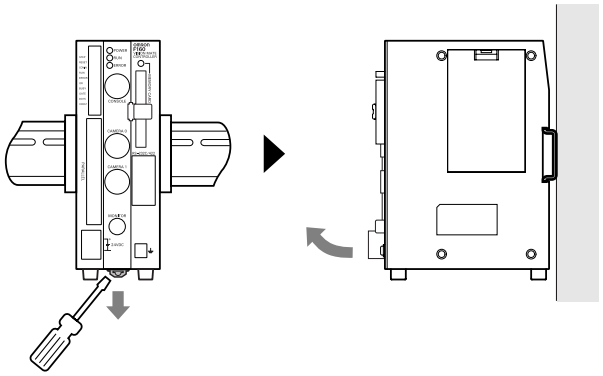
Hook the Controller into the DIN Track as shown in the diagram and then press in at the bottom until the Controller locks into place.



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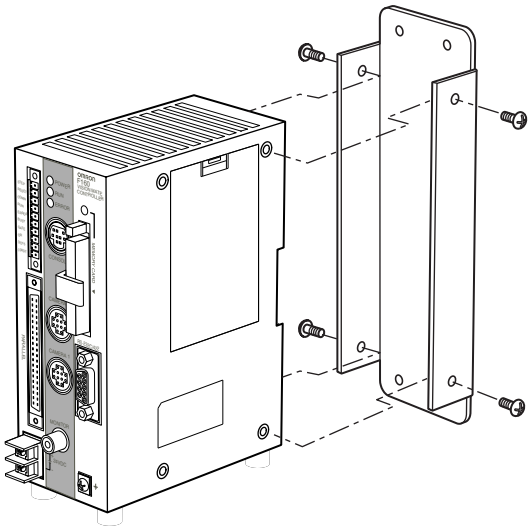
Removing the Controller

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



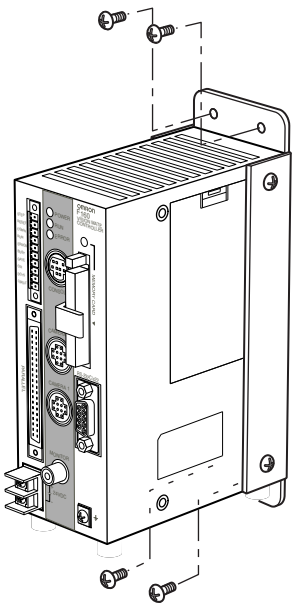
2-3-2 Rear Surface-mounting

1. Attach the mounting bracket to the F160 Controller using the four machine screws (M3 × 6) included with the bracket.



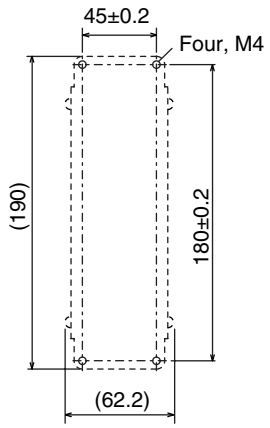
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2. Fasten the F160 Controller and Mounting Bracket to the mounting surface with four M4 screws.



Use the holes and dimensions shown in the following diagram.

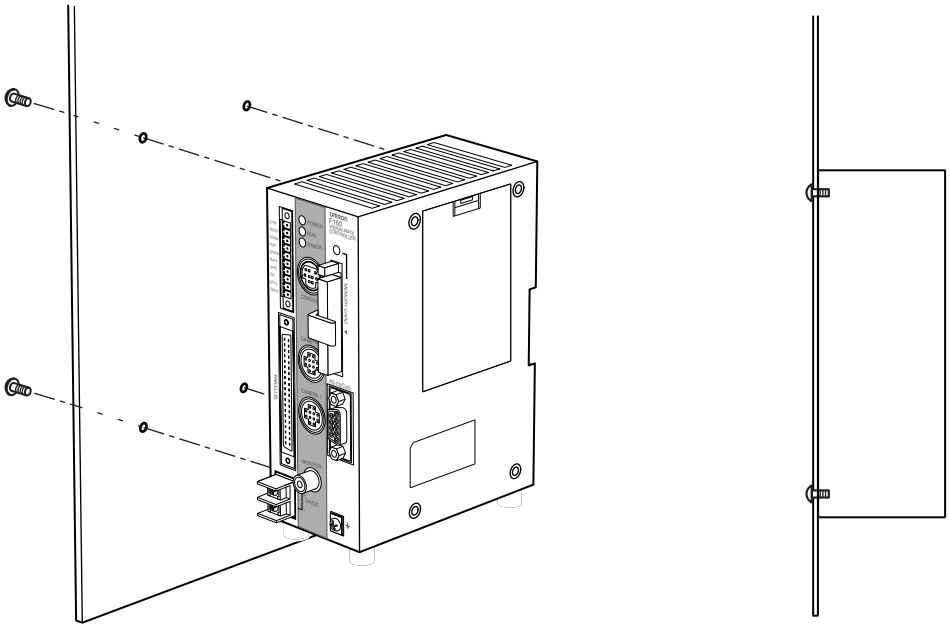
Unit: mm



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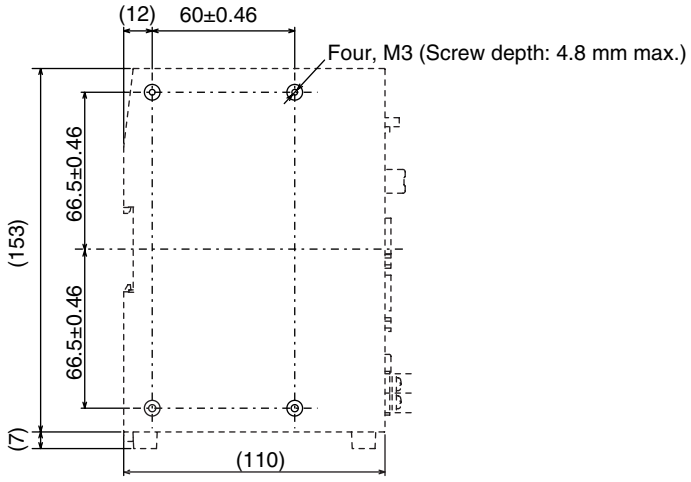
2-3-3 Side Surface-mounting

The F160 Controller can be side-mounted directly to a panel as shown in the following diagram.



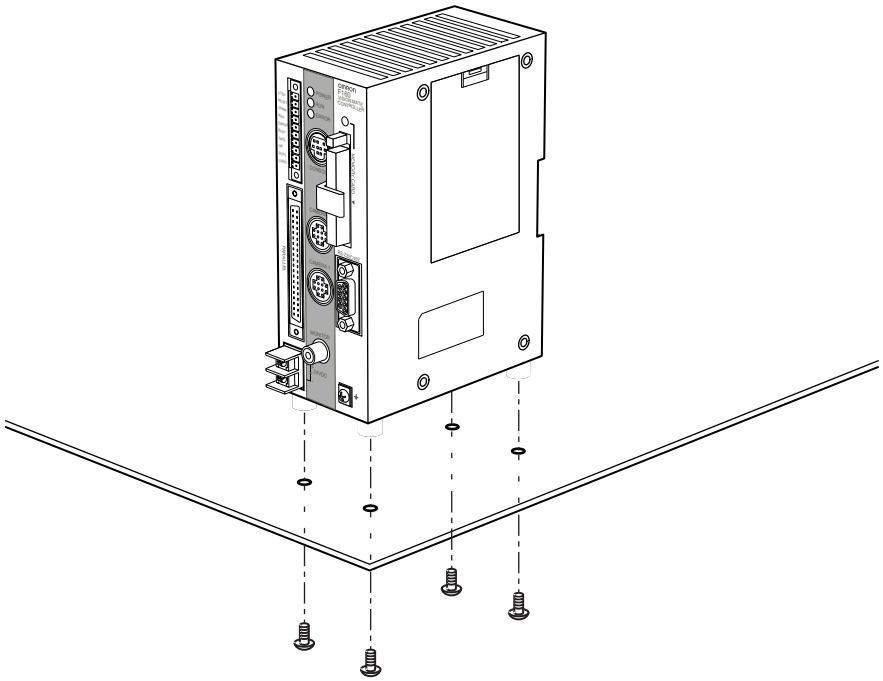
Use the holes and dimensions shown in the following diagram.

Unit: mm



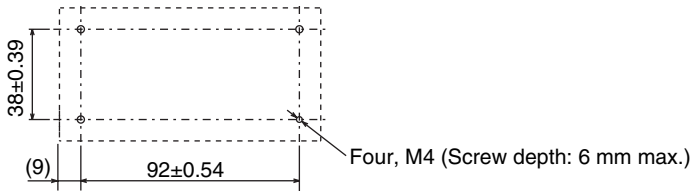
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2-3-4 Bottom Surface-mounting



Use the holes and dimensions shown in the following diagram.

Unit: mm



2-4 Connecting Peripheral Devices

This section shows how to connect peripheral devices to the F160.

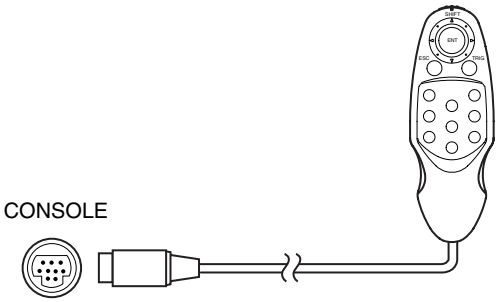
Precaution Always turn OFF the power supply before connecting or disconnecting a peripheral device's cable. The peripheral device may be damaged if it is connected while the power is ON.

At the time of delivery, a cap is mounted to all of the connectors. To prevent the penetration of dust and dirt and to protect against static electricity, leave the caps on unused connectors.

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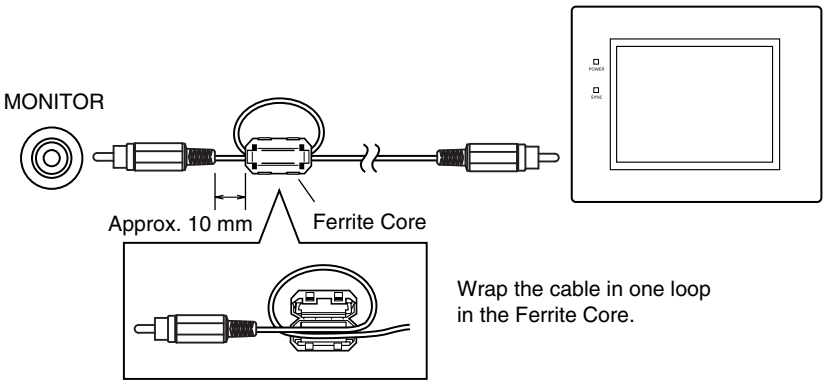
2-4-1 Connecting a Console

Connect the Console to the F160's CONSOLE connector. An F160-KP or F150-KP Console can be connected.



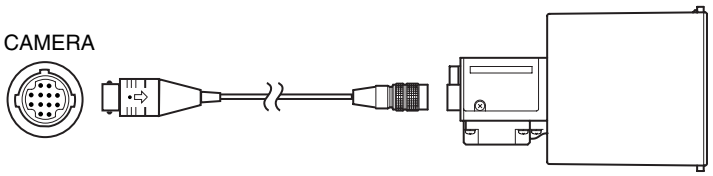
2-4-2 Connecting a Monitor

Connect the monitor cable to the F160's MONITOR connector, and attach the enclosed Ferrite Core to the monitor cable. The Ferrite Core should be attached to the cable approximately 10 mm from the MONITOR connector.



2-4-3 Connecting a Camera

Connect the camera cable to the F160's CAMERA connector.



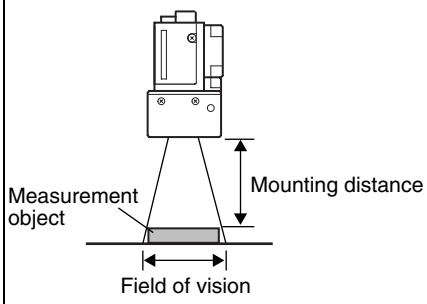
Note The connector is capped when the F160 is shipped. When not using the connector, leave the cap in place to protect against dust, dirt, and static electricity.

2-5 Overview of Available Cameras

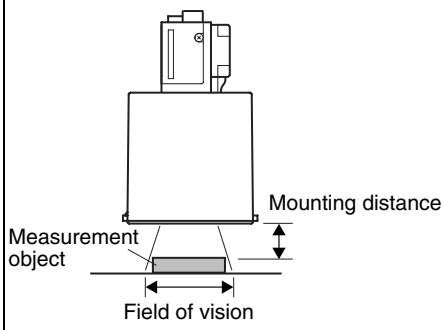
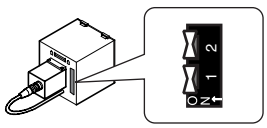
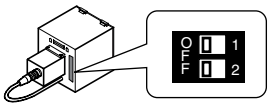
The F160 Camera with Light is a special F160 Camera that has a special lens and light source already attached. The light source and lens are contained in a single unit, so installation is very simple. Just mount the Camera at the proper distance from the measurement object and it is ready to use.

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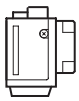
Camera with Light

Item	F150-SL20A	F150-SL50A
Field of vision	20 mm × 20 mm	50 mm × 50 mm
Mounting distance	61 to 71 mm	66 to 76 mm
Relationship between Camera and object		
Lighting precautions	None in particular	

Camera with Intelligent Lighting

Item	F150-SLC20 or F160-SLC20	F150-SLC50 or F160-SLC50
Field of vision	20 mm × 20 mm	50 mm × 50 mm
Mounting distance	15 to 25 mm	16.5 to 26.5 mm
Relationship between Camera and object		
Lighting precautions	Use with DIP switch pins 1 and 2 both set to OFF. 	Use with DIP switch pins 1 and 2 both set to OFF. 

Camera Only

Item	F150-S1A or F160-S2
Field of vision and distance to object	Determine the required field of vision based on the size of the measurement object and select an appropriate CCTV lens (C mount). 
Lighting precautions	Provide a light source appropriate for the measurement object.

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

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- 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 listed in the following tables 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.

SeeAlso page 22

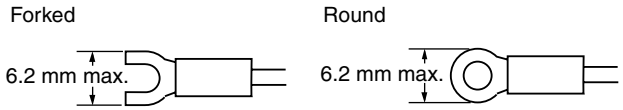
2-6 Power Supply and Ground

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.

2-6-1 Crimp Terminals and Cables

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

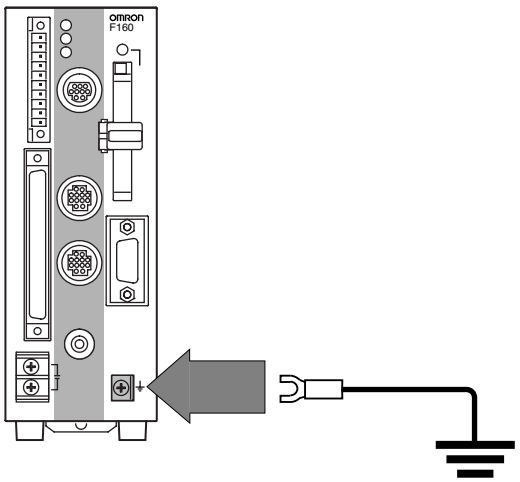


Applicable wire size: Insulated wire of 1.31 to 1.65 mm^2 (AWG16 to AWG15)

2-6-2 Ground (Earth) Wiring

Always connect a ground wire to the F160'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.

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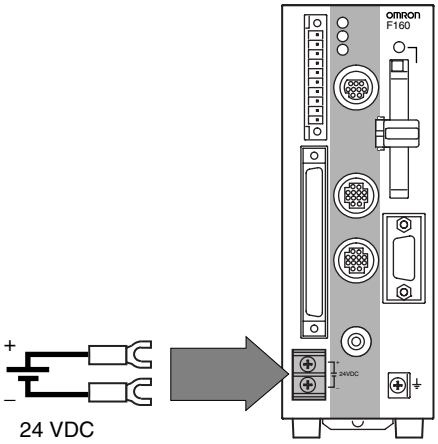
2-6-3 Wiring the Power Supply

Wire the Power Supply Unit independently of other devices. In particular, keep the power supply wired separately from inductive loads. Also, keep the power supply wiring as short as possible (less than 10 m).

Use a power supply that meets the following specifications. We recommend using OMRON's S8VS-06024 Power Supply.

Item	Specification
Output current	1.6 A min.
Power supply voltage	24 VDC $^{+10\%}/_{-15\%}$

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.



⚠ Caution After wiring, replace the protective cover on the power supply terminals.

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SECTION 3
Lenses, Lighting, and Memory Cards

This section provides additional information on CCTV lenses, lighting, and Memory Cards.

3-1 CCTV Lenses. 22
3-1-1 Optical Chart 22
3-1-2 Lenses and Lens Diameters. 23
3-1-3 Extension Tubes 24
3-2 Lighting 24
3-2-1 Lighting Methods 24
3-3 Memory Card. 26
3-3-1 Installing a Memory Card 27
3-3-2 Removing the Memory Card. 27
3-3-3 Using Memory Cards in a Personal Computer 28

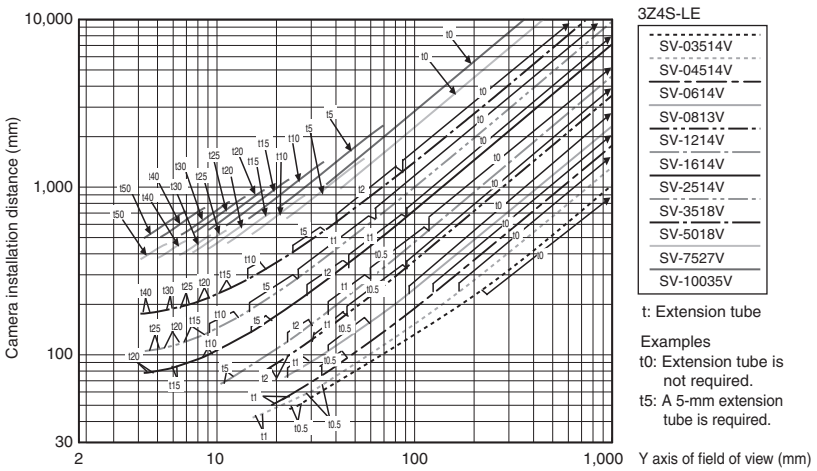
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3-1 CCTV Lenses

When using a Camera without a light (F150-S1A 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.

3-1-1 Optical Chart

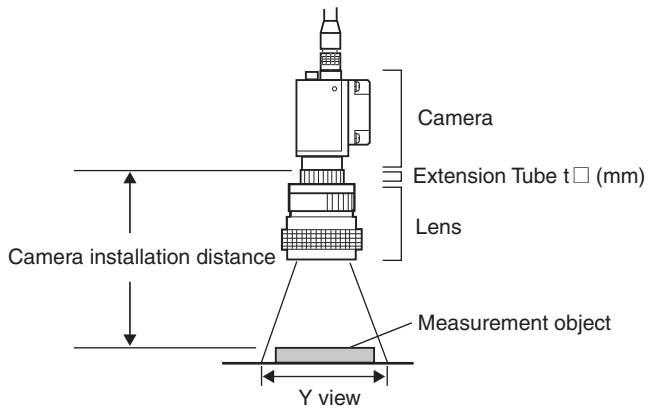
The values in the following chart are approximations, and the Camera must be adjusted after it is mounted.



The horizontal axis of the diagram indicates the Y field of view (mm), and vertical axis indicates camera installation distance (mm) or working distance (mm). This diagram shows the relationship between the field of view of lenses and the installation distance for different types. Make sure to verify the lens type when checking the graph as the field of view value is different for each type. Points such as "t5.0" on the graph correspond to the thickness of the extension tube used. "t0" is used if an extension tube is not necessary, and "t5.0 is used if a 5 mm extension tube is used.

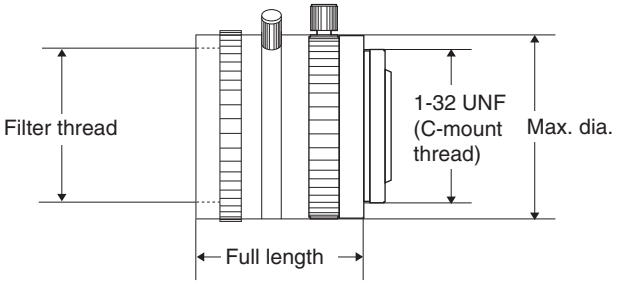
Example

If you use a 3Z4S-LE SV-2514V CCTV Lens for a measurement object that requires field of view of 40 mm, the camera installation distance must be 300 mm and a 2 mm extension tube is required.



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3-1-2 Lenses and Lens Diameters

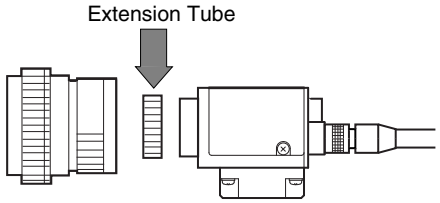


Lens	Focal length	Brightness	Maximum outer diameter	Full length	Filter size
3Z4S-LE SV-03514V	3.5mm	F1.4	29.5mm	30.4mm	---
3Z4S-LE SV-04514V	4.5mm	F1.4	29.5mm	29.5mm	---
3Z4S-LE SV-0614V	6.20 mm	F1.4	29 mm	30.0 mm	M27 P0.5
3Z4S-LE SV-0813V	8.05 mm	F1.3	28 mm	34.0 mm	M25.5 P0.5
3Z4S-LE SV-1214V	12.43 mm	F1.4	29 mm	29.5 mm	M27 P0.5
3Z4S-LE SV-1614V	16.34 mm	F1.4	29 mm	24.0 mm	M27 P0.5
3Z4S-LE SV-2514V	25.17 mm	F1.4	29 mm	24.5 mm	M27 P0.5
3Z4S-LE SV-3518V	34.75 mm	F1.8	29 mm	33.5 mm (WD: ∞) to 37.5 mm (WD: 300 mm)	M27 P0.5
3Z4S-LE SV-5018V	47.97 mm	F1.8	32 mm	37.0 mm (WD: ∞) to 39.4 mm (WD: 1000 mm)	M30.5 P0.5
3Z4S-LE SV-7527V	76.71 mm	F2.7	32 mm	42.0 mm (WD: ∞) to 44.4 mm (WD: 1000 mm)	M30.5 P0.5
3Z4S-LE SV-10035V	95.4 mm	F3.5	32 mm	43.9 mm (WD: ∞) to 46.3 mm (WD: 1000 mm)	M30.5 P0.5

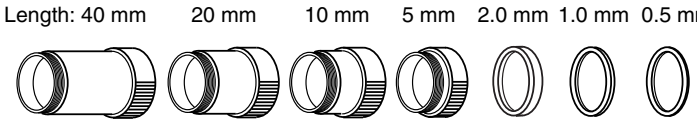
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3-1-3 Extension Tubes

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 seven tubes to achieve the required length.



Model	Maximum outer diameter	Length
3Z4S-LE SV-EXR	31 dia.	Set of 7 tubes 0.5 mm, 1.0 mm, 2.0 mm, 5 mm, 10 mm, 20 mm, and 40 mm



Precaution

- Do not use the 0.5-mm, 1.0-mm, and 2.0-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, 1.0-mm, or 2.0-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.

3-2 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 or F160-S2).

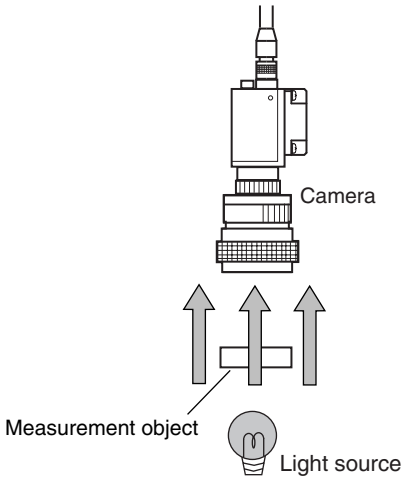
3-2-1 Lighting Methods

Back Lighting

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

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Applications: Inspection of exterior shape or positioning inspection

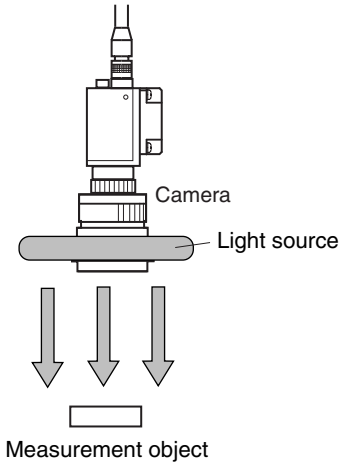


Reflected Lighting

Ring Lights

Light is shone uniformly on the measurement object.

Applications: Surface inspections

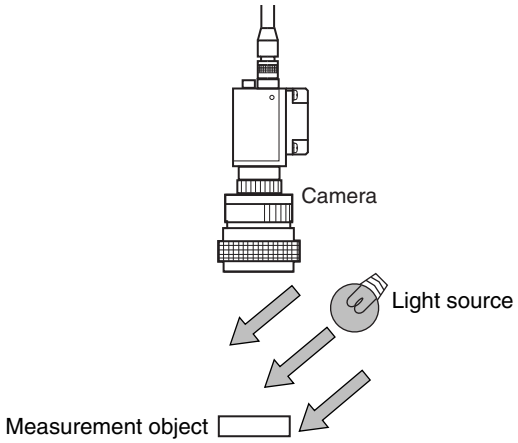


Oblique Lighting

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

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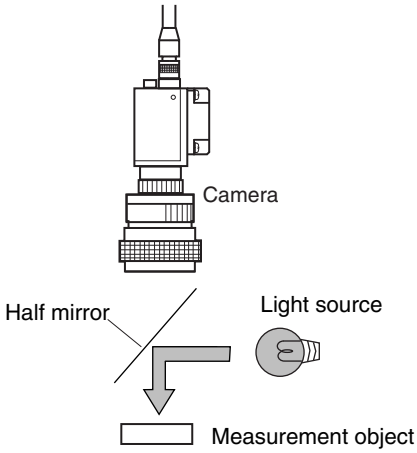
Applications: Inspections for surface gloss



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



3-3 Memory Card

Use a Memory Card to backup data such as settings and image data or increase the number of scenes when you are using the Scene Group function. Data from the F160 can be backed up in a personal computer just by inserting the Memory Card into the computer and copying the desired data.

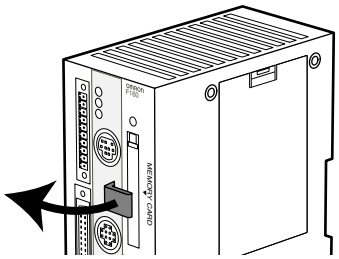
We recommend the OMRON F160-N256S (256 MB) Memory Card.

CHECK A filler card with no memory is inserted into the F160's Memory Card slot before the F160 is shipped. Remove this filler card and install a Memory Card to use this function.
If Memory Card is not being used, leave the filler card in place to prevent dust or dirt from entering the Memory Card slot.

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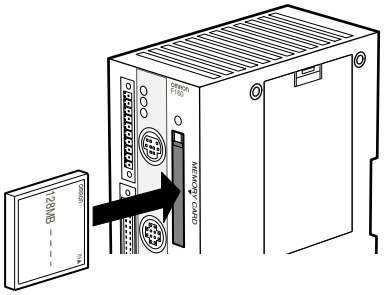
3-3-1 Installing a Memory Card

1. Open the Memory Card slot's card lock.

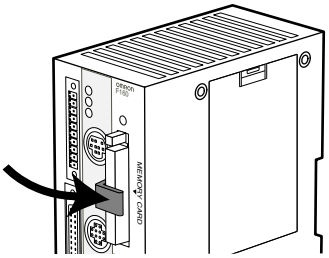


CHECK Do not force the lock open; lift the latch gently.

2. Insert the Memory Card.



3. Close the card lock to secure the Memory Card.

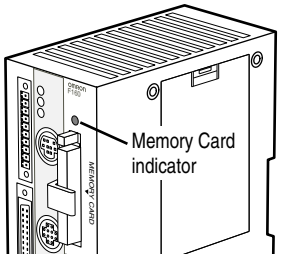


3-3-2 Removing the Memory Card

1. Stop the power supply to the Memory Card or turn OFF the F160.

SeeAlso Refer to the *Conversational Menu Operation Manual* or the *Expert Menu Operation Manual* for details on turning OFF the power supply to the Memory Card.

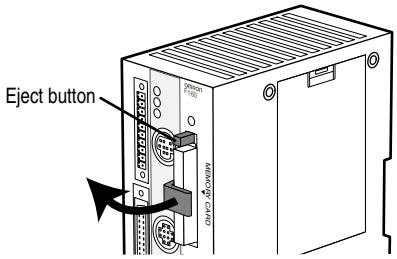
2. Verify that the Memory Card indicator is not lit.



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Precaution Do not remove the Memory Card if the Memory Card indicator is lit. Doing so may damage the Memory Card or the F160 itself.

3. Open the card lock.

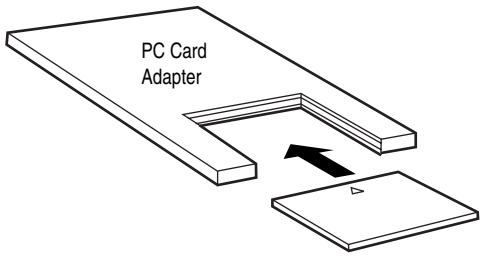


4. Press the eject button over the Memory Card slot.
5. Pull the Memory Card straight out from the slot.

3-3-3 Using Memory Cards in a Personal Computer

The F160's Memory Cards can be used in a personal computer with a PC Card drive (PCMCIA 2.0 or higher, type II compatible) or “Compact Flash” drive.

The Memory Card must be inserted into a PC Card Adapter in order to be used in a PC Card drive. We recommend the OMRON HMC-AP001 PC Card Adapter.



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SECTION 4
Connecting External Devices

This section describes how to connect external devices through a parallel interface (the I/O terminals or I/O connector) or serial interface (the RS-232C/RS-422 connector).

4-1 Connecting through the Parallel Interface 30
4-1-1 I/O Terminal Connections 30
4-1-2 I/O Connector Connections 31
4-1-3 I/O Specifications 33
4-2 Connecting through the Serial Interface 34
4-2-1 Connection Examples 35
4-2-2 Connector 36
4-2-3 Wiring 36
4-2-4 Connection 37

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4-1 Connecting through the Parallel Interface

This section explains how to connect I/O to the F160 through its parallel interface to input signals such as measurement triggers or output signals such as measurement results.

Either the I/O terminals or I/O connector can be used for the parallel interface. The I/O terminals and I/O connector cannot be used simultaneously.

I/O Terminals

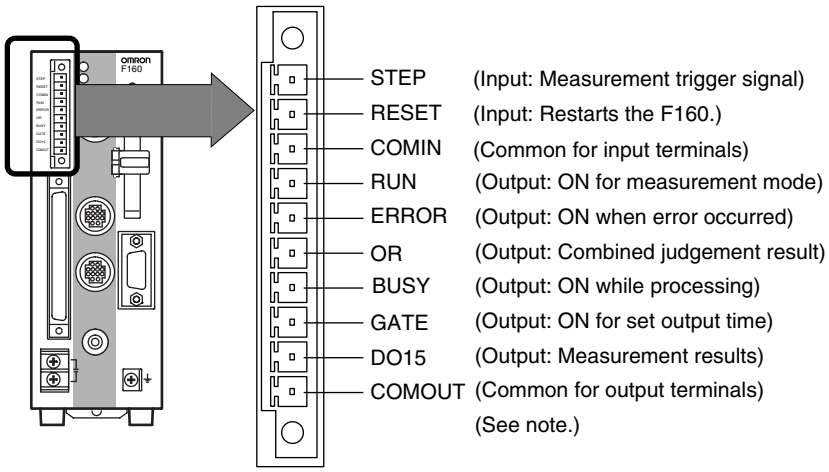
When the required control signals are being connected to the I/O terminals, attach the control wires to the included connector (Phoenix MC1.5/10-STF-3.5) and then insert the connector into the F160.

I/O Connector

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 I/O connector. Refer to the *Communications Reference Manual* for details on communications settings and I/O formats.

4-1-1 I/O Terminal Connections

Wire the cable carrying the control signals to the connector that was included with the F160 and insert the connector into the F160. The following diagram shows the I/O allocation of the F160's I/O terminals. Just wire the terminals that are needed.



Note

1. COMOUT is connected to COMOUT1 and COMOUT3 of the I/O connector.
2. Use wire of cross-sectional area 0.14 to 1.5 mm^2 (AWG 24 to AWG 16) with a cable length not exceeding 30 m.

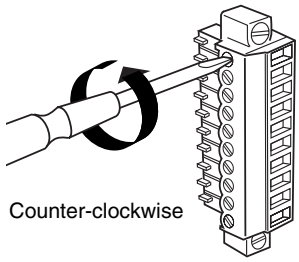
Precaution Do not input the RESET input immediately after turning ON the power. When using RESET input to synchronize startup timing, wait at least 1 s after turning ON the F160's power supply before turning ON the RESET signal.

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

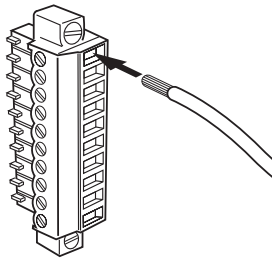
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Wiring the Connector

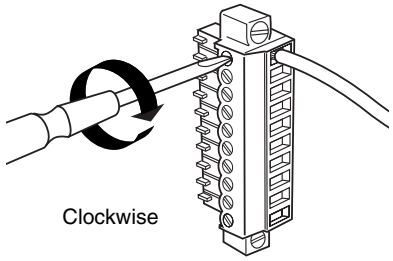
1. Use a flat-blade precision screwdriver to loosen the connector's set screw.



2. Insert the signal wire.



3. Tighten the set screw to secure the wire. Tighten to a torque of 0.22 to 0.25 N•m.



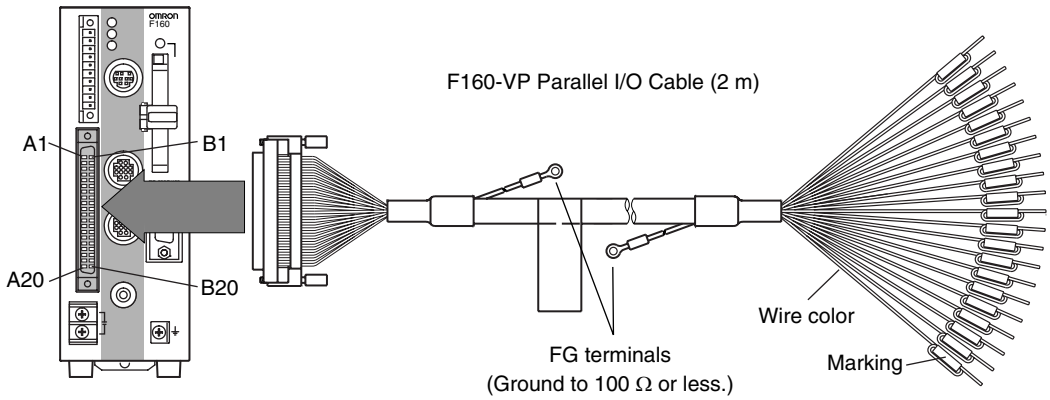
4. Insert the connector into the F160.
5. Tighten the connector's mounting screws. Tighten to a torque of 0.22 to 0.25 N•m.

4-1-2 I/O Connector Connections

Use an F160-VP Parallel I/O Cable (sold separately) to connect to the F160's I/O connector. Align the connectors and insert the cable's connector straight

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into the F160's I/O connector. Tighten the connector's mounting screws to secure the connection.



Precaution

- Turn OFF the power supply before connecting or disconnecting the Parallel I/O Cable. Peripheral devices may be damaged if the cable is connected or disconnected with the power ON.
- A cover is screwed onto the connector when the F160 is shipped. When not using the I/O connector, leave the cover in place to protect against dust, dirt, and static electricity.

Pin	Signal	Wire color	Marking	Function
A1	RESET	Light brown	■ (black)	Restarts the F160.
A2	STEP	Yellow	■ (black)	Measurement trigger signal input
A3	DI0	Green	■ (black)	Command input
A4	DI2	Gray	■ (black)	
A5	DI4	White	■ (black)	
A6	DI6	Light brown	■■ (black)	
A7	DI8	Yellow	■■ (black)	
A8	STGOUT0	Green	■■ (black)	Strobe trigger 0 output (See note 1.)
A9	RUN	Gray	■■ (black)	ON while in Run Mode
A10	BUSY	White	■■ (black)	ON during processing
A11	OR	Light brown	■■■ (black)	Combined judgement result
A12	DO0	Yellow	■■■ (black)	Data output
A13	DO2	Green	■■■ (black)	
A14	DO4	Gray	■■■ (black)	
A15	DO6	White	■■■ (black)	
A16	DO8	Light brown	■■■■ (black)	
A17	DO9	Yellow	■■■■ (black)	
A18	DO11	Green	■■■■ (black)	
A19	DO13	Gray	■■■■ (black)	
A20	DO15	White	■■■■ (black)	
B1	COMIN	Light brown	■ (red)	Common for input signals
B2	DSA	Yellow	■ (red)	Data send request signal input
B3	DI1	Green	■ (red)	Command input
B4	DI3	Gray	■ (red)	
B5	DI5	White	■ (red)	
B6	DI7	Light brown	■■ (red)	
B7	DI9	Yellow	■■ (red)	

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Pin	Signal	Wire color	Marking	Function
B8	STGOUT1	Green	■■ (red)	Strobe trigger 1 output (See note 1.)
B9	ERROR	Gray	■■ (red)	ON when an error occurred.
B10	GATE	White	■■ (red)	ON for the set output time.
B11	COMOUT1	Light brown	■■■ (red)	Common for control signals (See note 2.)
B12	DO1	Yellow	■■■ (red)	Data output
B13	DO3	Green	■■■ (red)	
B14	DO5	Gray	■■■ (red)	
B15	DO7	White	■■■ (red)	
B16	COMOUT2	Light brown	■■■■ (red)	Common for DO0 to DO7
B17	DO10	Yellow	■■■■ (red)	Data output
B18	DO12	Green	■■■■ (red)	
B19	DO14	Gray	■■■■ (red)	
B20	COMOUT3	White	■■■■ (red)	Common for DO8 to DO15

Note

1. Use the STGOUT0 or STGOUT1 signal when you want to connect a strobe device to the F160.

SeeAlso For details, refer to page 61.

2. Pins A8 to A11 and B9 to B10 are for control signals.

Precaution Do not input the RESET input immediately after turning ON the power. When using RESET input to synchronize startup timing, wait at least 1 s after turning ON the F160's power supply 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 terminal. If the system must meet UL standards, use a UL class II power supply.

Making a Parallel I/O Cable

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

Component	Manufacturer	Model number
Connector	Fujitsu	FCN-361J040-AU
Cover	Fujitsu	FCN-360C040-B

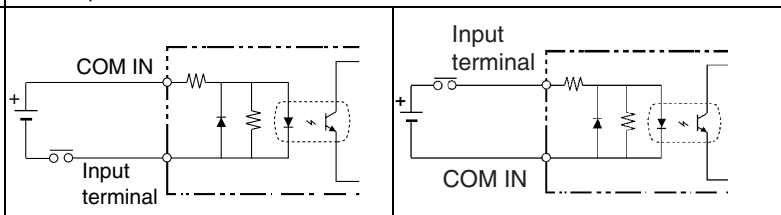
CHECK Double-check the connector wiring for mistakes before turning ON the power supply for the first time.

4-1-3 I/O Specifications

Input Specifications

Item	Specification	
Model	F160-C10E (NPN mode)	F160-C15E (PNP mode)
Input voltage	12 to 24 VDC ±10%	
ON current (See note 1.)	5 to 15 mA	
ON voltage (See note 1.)	8.8 V max.	
OFF current(See note 2.)	0.1 mA max.	
OFF voltage(See note 2.)	4.5 V min.	
ON delay	RESET input: 10 ms max. Other inputs: 0.5 ms max.	

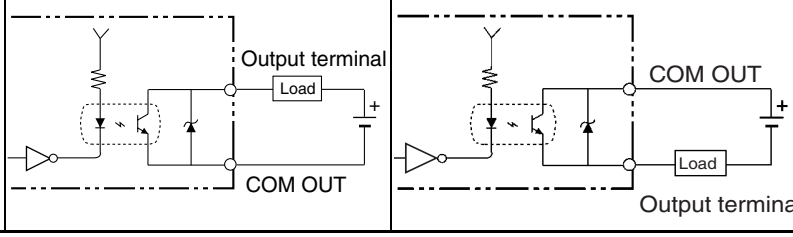
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Item	Specification
OFF delay	RESET input: 15 ms max. Other inputs: 0.7 ms max.
Internal circuits	

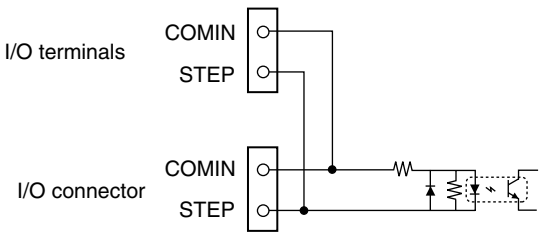
Note

1. The ON current/voltage is the value of the current/voltage that changes the status from OFF to ON. The value of the ON voltage is the potential difference between COM IN and each input terminal.
2. The OFF current/voltage is the value of the current/voltage that changes the status from ON to OFF. The value of the OFF voltage is the potential difference between COM IN and each input terminal.

Output Specifications

Item	Specification	
Model	F160-C10E (NPN mode)	F160-C15E (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		

CHECK The I/O contacts are shared by the I/O terminals and I/O connector. The following diagram shows the wiring diagram for the STEP signal as an example.



4-2 Connecting through the Serial Interface

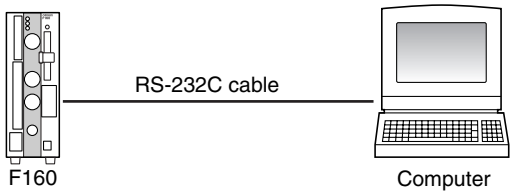
The F160's serial interface (RS-232C/RS-422 connector) can be used to connect input signals such as measurement triggers or output signals such as measurement results. Additionally, data that has been set in the F160 can be backed up in a personal computer.

Refer to the *Communications Reference Manual* for details on communications settings and I/O formats.

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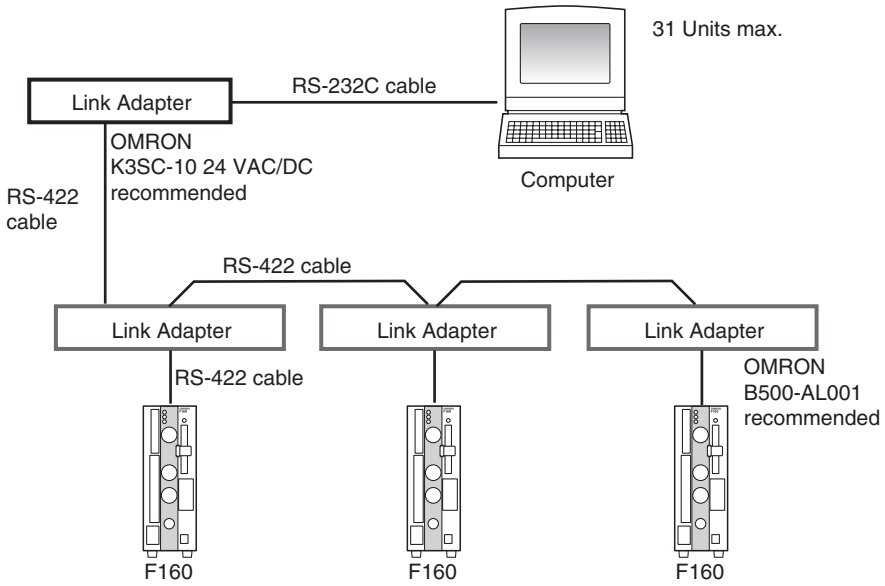
4-2-1 Connection Examples

1:1 Connection (No-protocol, Menu Operation)

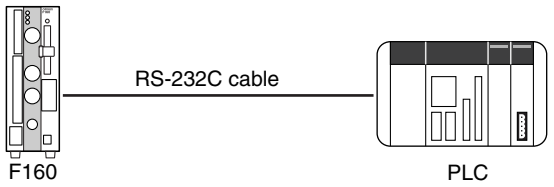


Multi-drop Connection (No-protocol)

Communications between one computer and several F160s is possible using Link Adapters.



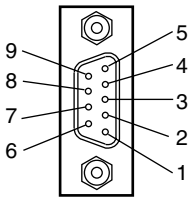
1:1 Connection (Host Link)



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4-2-2 Connector

The F160's RS-232C/RS-422 Connector is a 9-pin D-SUB female connector. The pin allocation is shown below.



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

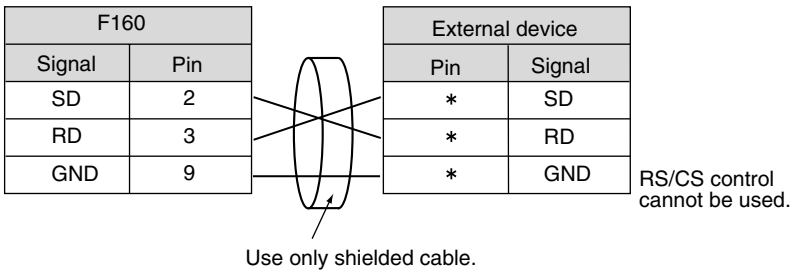
The following plug and hood are recommended and are available from OMRON.

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

4-2-3 Wiring

The maximum cable length is 15 m for RS-232C or RS-422

RS-232C Wiring



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RS-422 Wiring

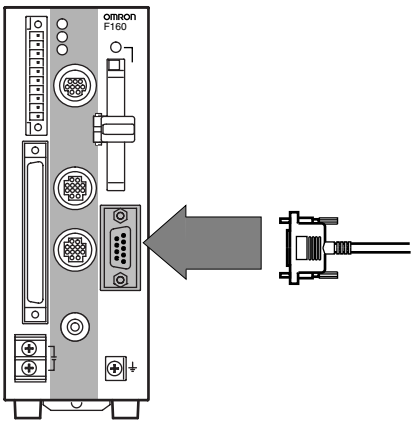
F160		External device	
Signal	Pin	Pin	Signal
RDB	5	*	RDB
RDA	6	*	RDA
SDB	7	*	SDB
SDA	8	*	SDA

Use only shielded cable.

Note 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.

4-2-4 Connection

Align the connector with the socket and press the connector straight into place. Tighten the two mounting screws to secure the connector.



Precaution

- Always turn OFF the power supply before connecting or disconnecting cables. The peripheral device may be damaged if connected or disconnected with the power supply turned ON.
- The connector is capped when the F160 is shipped. When not using the serial interface, leave the cap in place to protect against dust, dirt, and static electricity.

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SECTION 5
Troubleshooting and Maintenance

This section provides tables to help identify and correct hardware errors that may occur with the F160 as well as information on maintenance and periodic inspections.

5-1 Troubleshooting 40
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5-1 Troubleshooting

5-1-1 Connection Errors

Problem	Probable cause
The POWER indicator is not lit.	The Power Supply is not connected properly.
	The supply voltage is not 24 VDC $^{+10\%}/_{-15\%}$.
The Monitor is blank.	The power to the Monitor is not ON.
	The Monitor Cable is not connected properly.
	The Monitor is malfunctioning.
	The power supply capacity is insufficient.
The Video Monitor image is not clear.	There is electrical noise entering from the power supply or cables.
	The Monitor Cable is not correctly connected.
Cannot make key inputs from the Console.	The Console Cable is not correctly connected.
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.
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 properly connected.
	The lens iris is opened or closed too far.
	The shutter speed is not suitable.
	The lighting method is not suitable.
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 F160.
	When using a Camera with Intelligent Lighting, the DIP switch pins are not set to 0.
	When using an F160-S2 Camera with Intelligent Lighting, the number of lines is not set to 484.

5-1-2 Menu Operation Errors

Problem	Probable cause
The measurement results are not displayed on the Monitor.	The F160 is not in Monitor or Run mode.

5-1-3 Parallel Interface Errors

Problem	Probable cause
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 F160 is not in Monitor or Run mode.
Signals cannot be output externally.	The trigger signal has not been input.
	The cables are not correctly wired.
	The signal line is disconnected. The status of communications can be checked with the I/O monitor.
	The F160 is not in Run mode.

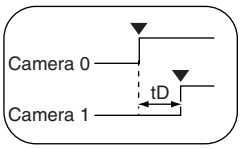
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5-1-4 Serial Interface Errors

Problem	Probable cause
No communications are possible.	The cables are not correctly wired.
	The F160's communications specifications do not match those of the external device.
	The communications mode was not selected under ***System/Communications settings/Serial***. Select ***Normal***, ***Host link***, or ***Menu operations*** under ***RS-232C/Operating mode***. (Normal is no-protocol.) The status of communications can be checked with the I/O monitor.
The Unit operates well initially, but after a while there is no response from the F160.	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 operations*** in the ***System/Communications settings/Serial*** settings.

5-2 FAQ

5-2-1 Cameras

Question	Answer
When more than one Camera is connected, is the timing of the shutter trigger pulse synchronized?	F160-S2, F150-S1 The timing is not synchronized. In order to prevent light interference from other Cameras, the timing is staggered by a displacement time (tD). The displacement time depends on the type of Camera connected. F160-S2: tD = Approx. 500 μs F150-S1: tD = Approx. 1 ms When using a strobe, the timing of the strobe trigger signal is staggered in the same way as the shutter trigger pulse.  (▼: Shutter trigger pulse turns ON) Other Cameras The timing is synchronized. There is no displacement time.
Can more than one internally synchronized Camera be connected?	No. Only one internally synchronized Camera (F200-S) can be connected. Connect it to camera connector 0. The internally synchronized Camera cannot be used in 2-line random trigger mode, which requires 2 Cameras.
Can the F150-LT10A Light be connected to the F160-S2?	Yes. In addition to the Camera and Light, provide the appropriate lens. 20-mm field of vision: F150-LE20 50-mm field of vision: F150-LE50

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5-2-2 Cables

Question	Answer
Is there a recommended RS-232C cable?	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)

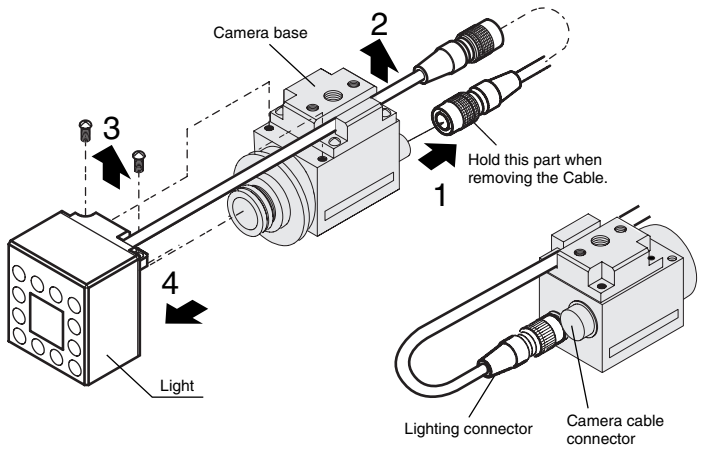
5-3 Maintenance

5-3-1 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

Use the following procedure to replace a Light with the F150-LT10A Light. (The F150-LT10A cannot be connected to the older F150-S1 Camera.)



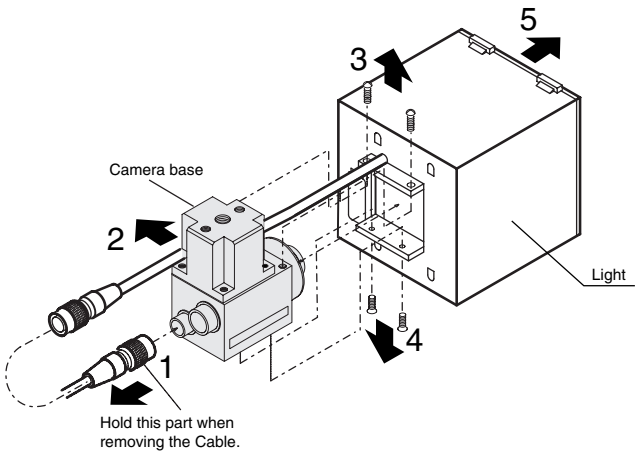
1. Disconnect the light cable from the light connector on the back of the Camera.
2. Remove the light cable from the slot in the camera base.
3. Remove the two screws securing the Light.
4. Remove the Light from the Camera.
5. Reverse steps 1 through 4 when installing the Lens and Light.

Precaution Do not disassemble the Lens. Disassembly can damage the Lens.

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F150-SLC20/SLC50 or F160-SLC20/SLC50

Use the following procedure to replace a Light with an F150-LTC20 (20-mm field of vision) or F150-LTC50 (50-mm field of vision) 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 at the top.
4. Remove the two screws securing the Light at the bottom.
5. Remove the Light from the Camera.
6. Reverse steps 1 through 4 when installing the Lens and Light.

Precaution Do not disassemble the Lens. Disassembly can damage 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.

5-3-2 Replacing the Battery

The F160 contains a battery that backs up the time and date information. When the battery is nearly discharged, the message “BATTERY LOW” will be displayed at startup. Replace the battery with an OMRON 3Z49-BAT1 Battery. Dispose of the spent battery properly.

CHECK

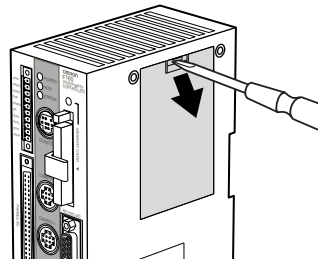
- Always turn OFF the power supply before replacing the battery.
- The F160's clock will be reset if the new battery is not connected within 2 minutes of removing the spent battery.
  If the clock is inadvertently reset, the time and date will have to be set again.

SeeAlso Refer to the *Conversational Menu Operation Manual* or the *Expert Menu Operation Manual* for details.

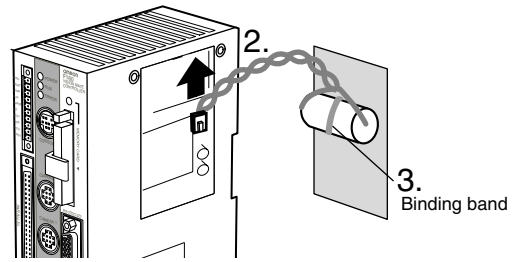
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Replacement Procedure

1. Open the battery cover on the side of the F160. The cover can be opened with a small flat-blade screwdriver.



2. The battery is mounted to the inside of the battery cover. Hold the battery connector by its base and pull it off.



3. Cut the binding band that secures the battery and remove it from the cover.
4. Reverse steps 1 through 3 to install the new battery. Use the new binding band included with the new battery to attach it to the battery cover.

⚠ **Caution** Do not short the battery terminals, recharge the battery, disassemble, crush, or dispose of the battery in fire. Doing so may cause the battery to start a fire, leak, or explode.

5-4 Regular Inspections

To maintain the F160 in the best condition, perform the following regularly.

- Clean the Lens and LED indicators 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 range	The operating ambient temperature inside the cabinet must be between 0 and 50°C.	Thermometer
Ambient humidity range	The operating ambient humidity inside the cabinet must be between 35% and 85%.	Hygrometer

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Inspection point	Details	Tools required
Installation	Each component must be firmly secured. Each cable connector must be correctly inserted and locked. The Cameras must be firmly secured. The camera lens mounts must be firmly secured.	Phillips screwdriver
Indicators	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.	---

Precaution

- Turn OFF the power and take safety precautions before conducting inspections. Electrical shock can result from attempting safety inspections with the power turned ON.
- Do not use thinners or benzene to clean the F160. They will damage F160 components.

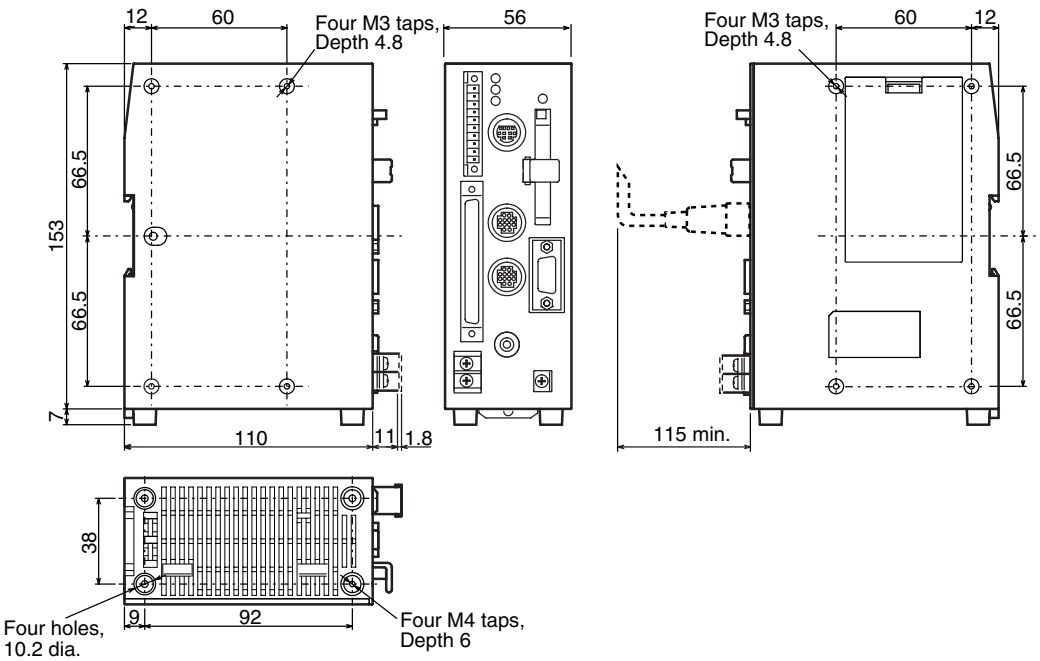
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5-5 Specifications

This section provides the specifications and dimensions of the F160 and its peripheral devices.

F160-C10E-2/C15E-2 Vision Mate Controller

Unit: mm



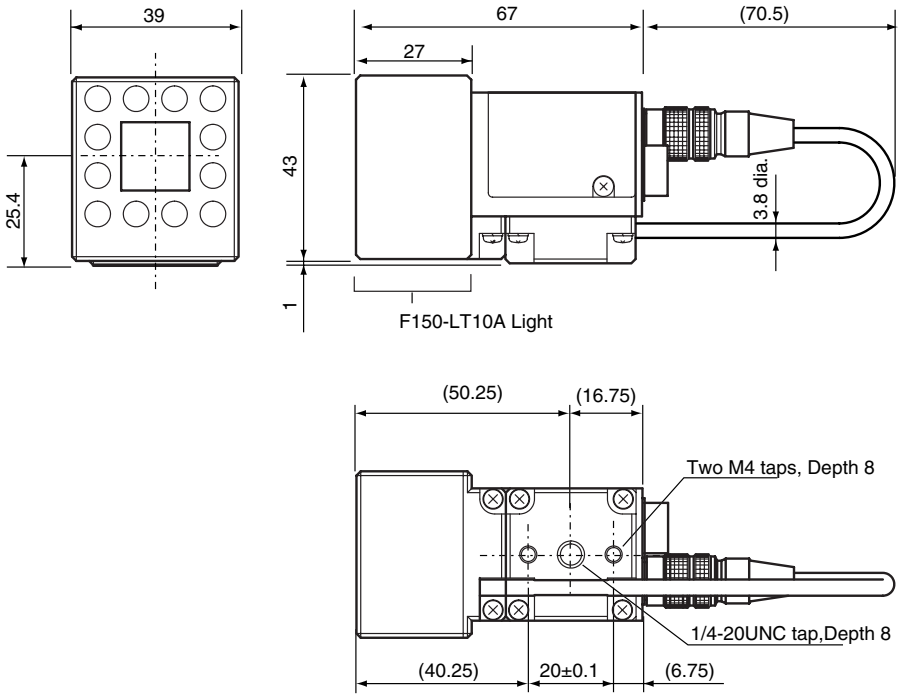
Item	Specification	
Model	F160-C10E-2	F160-C15E-2
Input/Output type	NPN	PNP
Supply voltage	20.4 to 26.4 VDC	
Current consumption	1.6 A max.	
Insulation resistance	20 M Ω min. between all DC external terminals and GR terminal (100 VDC Megger, with internal surge absorber removed)	
Dielectric strength	1,000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed)	
Leakage current	10 mA 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: 0.35 mm; maximum acceleration: 50 m/s^2, 10 times for 8 minutes each in 3 directions (except for bottom surface-mounting.)	
Shock resistance	150 m/s^2, 3 times each in 6 directions	
Ambient temperature range	Operating: 0 to 50 °C (with no condensation) Storage: -25 to 65 °C (with no condensation)	
Ambient humidity range	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	ABS/PC	
Weight	Approx. 570 g (Controller only)	

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F150 Cameras

Cameras with Light

■ **F150-SL20A/SL50A**

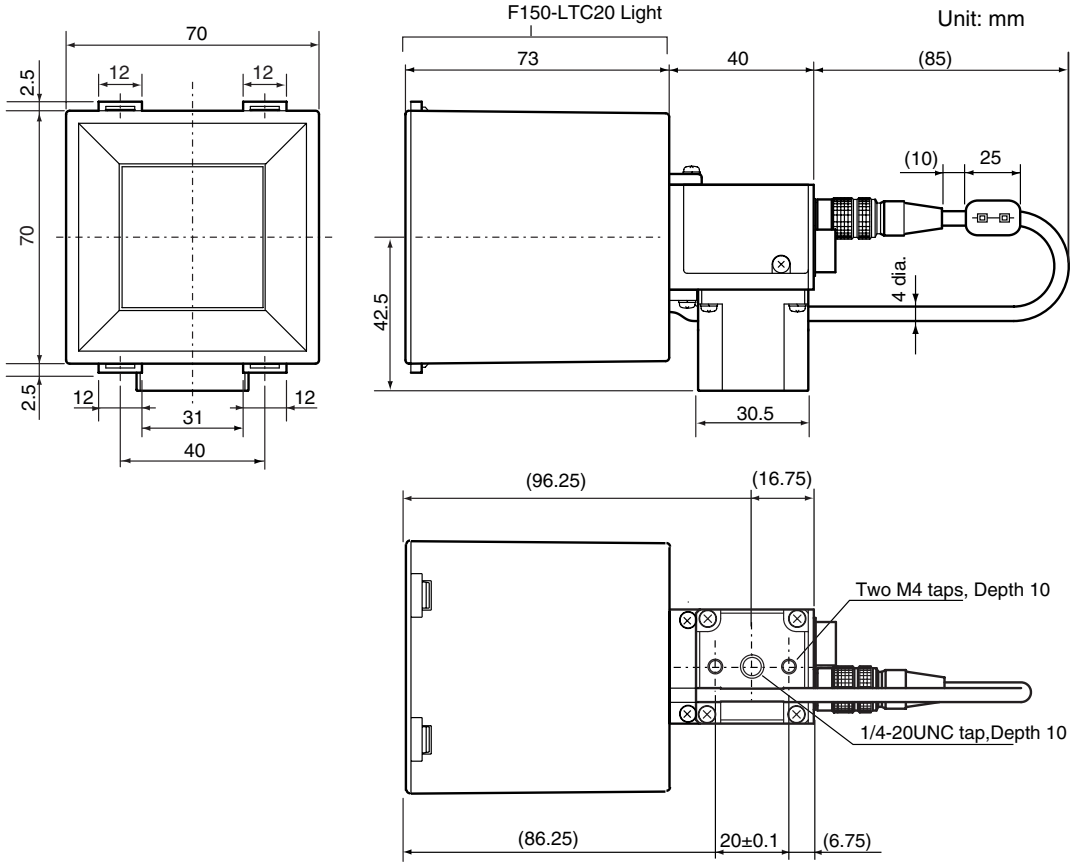


Unit: mm

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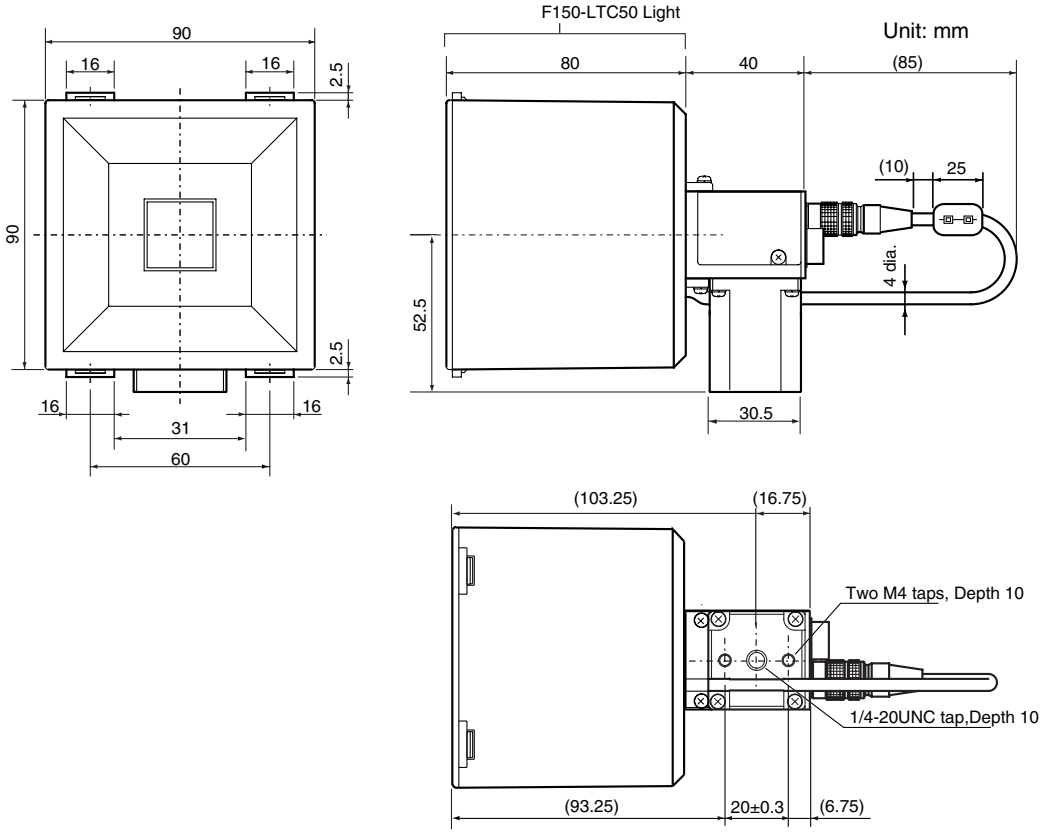
Cameras with Intelligent Lighting

■ **F150-SLC20**



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■ F150-SLC50

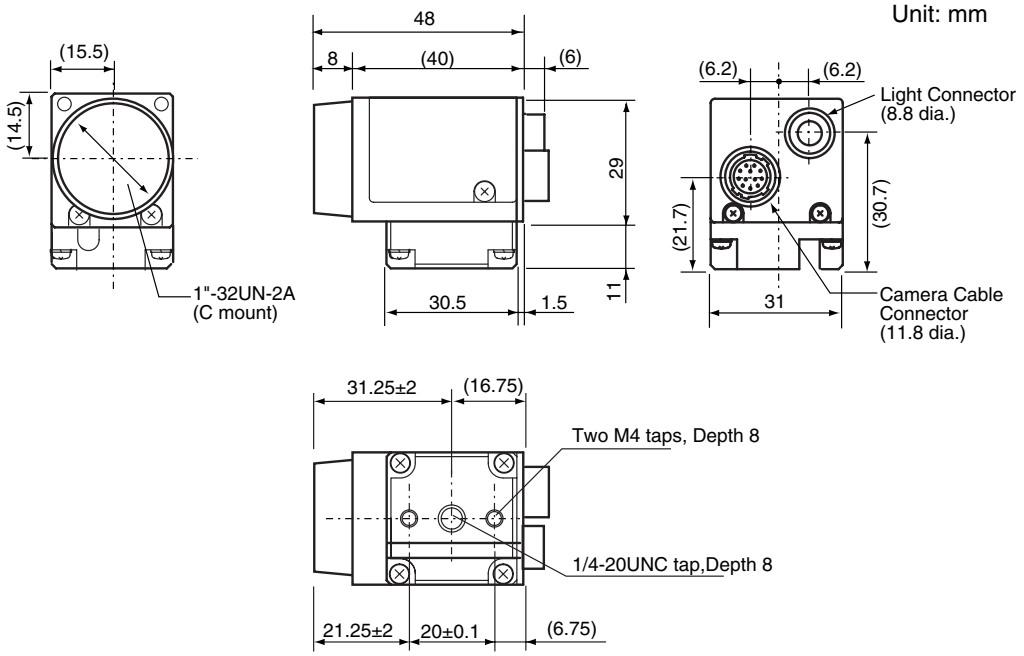


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Camera Only

■ **F150-S1A**

Unit: mm

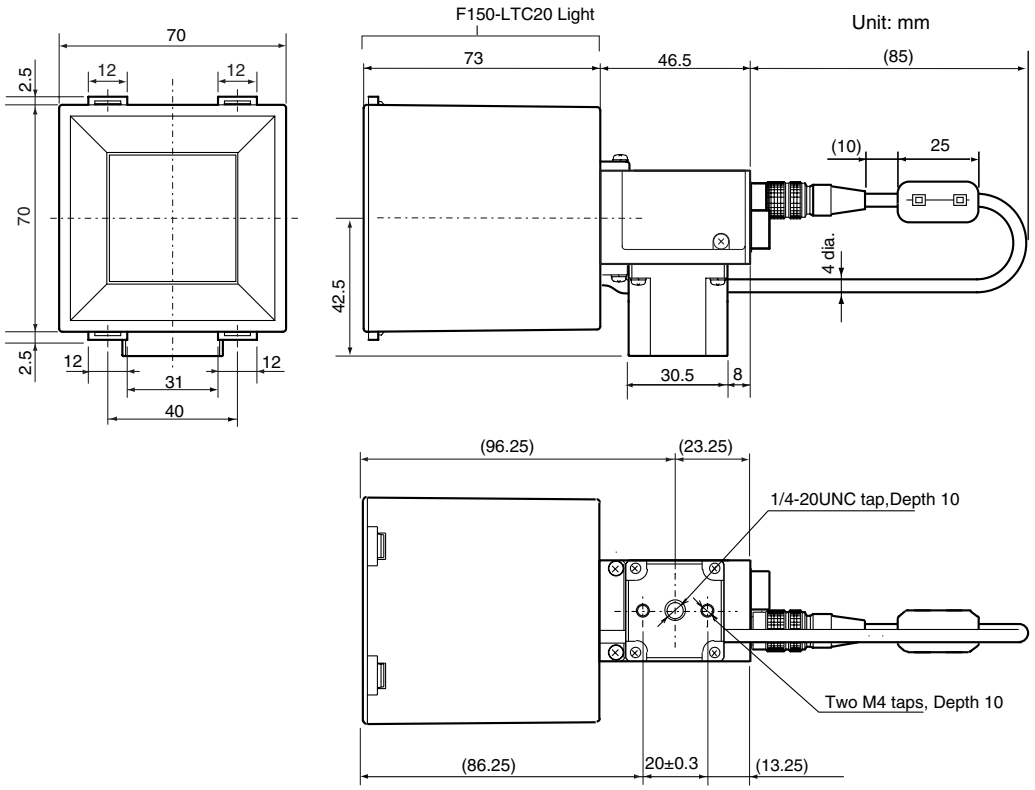


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F160 Cameras

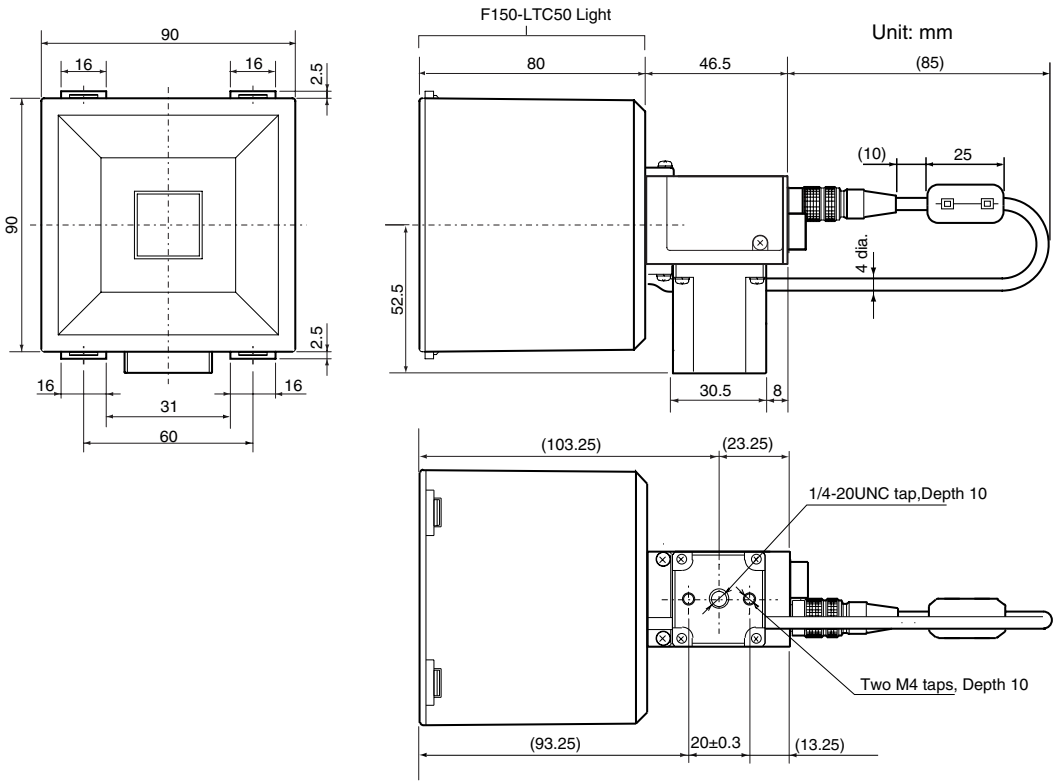
Cameras with Intelligent Lighting

■ **F160-SLC20**



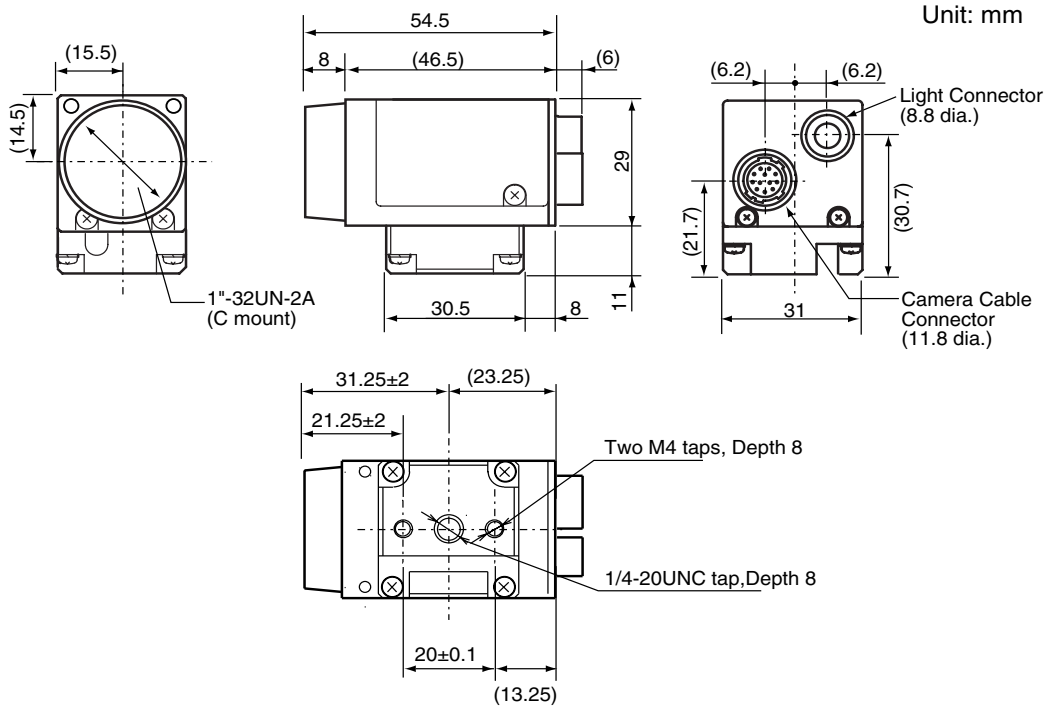
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■ **F160-SLC50**



Camera Only

■ **F160-S2**



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Camera Specifications

General Specifications

Item	Specification
Supply voltage	F150-series: 12 VDC F160-series: 13 VDC
Current consumption	F150-S1A: 100 mA max. F150-SL20A/SL50A: 110 mA max. F150-SLC20/SLC50: 200 mA max. F160-S2: 165 mA max. F160-SLC20: 260 mA max. F160-SLC50: 310 mA 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 range	Operating: 0 to 50 °C (with no condensation) Storage: -25 to 65 °C (with no condensation)
Ambient humidity range	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 (Cameras with Lights)	Case: ABS Transparent cover: PC
Weight	F150-S1A: Approx. 80 g F150-SL20A/SL50A: Approx. 135 g F150-SLC20: Approx. 280 g F150-SLC50: Approx. 370 g F160-S2: Approx. 85 g F160-SLC20: Approx. 285 g F160-SLC50: Approx. 375 g

Characteristics

■ Camera Characteristics

Item	Specification
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
Lens mounting	C mount

■ Lens Characteristics (Cameras with Lights only)

Item	Specification
Lens model	F150-SL20A: F150-LE20 F150-SL50A: F150-LE50 F150-SLC20: F150-LE20 F150-SLC50: F150-LE50 F160-SLC20: F150-LE20 F160-SLC50: F150-LE50
Method	Fixed focal point, fixed iris

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Item	Specification
Brightness	F2.8
Focal point distance	F150-SL20A: 13 mm F150-SL50A: 6.1 mm F150-SLC20:13 mm F150-SLC50: 6.1 mm F160-SLC20:13 mm F160-SLC50: 6.1 mm

■ Light Characteristics (Cameras with Lights only)

Item	Specification
Light model	F150-SL20A/SL50A: F150-LT10A F150-SLC20:F150-LTC20 F150-SLC50:F150-LTC50 F160-SLC20:F150-LTC20 F160-SLC50:F150-LTC50
Light source	F150-SL20A/SL50A: Red LED (Peak emission wavelength: 680 nm) F150-SLC20/SLC50 and F160-SLC20/SLC50: Red and green LED combination (Peak emission wavelengths: 660 nm and 570 nm)
Light emission method	Pulse emission (synchronized with the camera shutter)

■ Other Characteristics

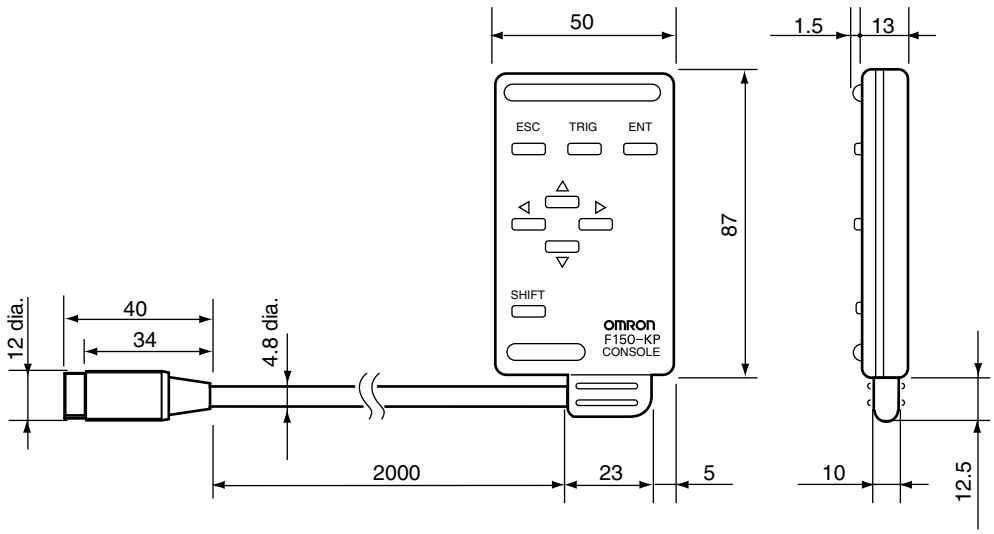
Item	Specification
Mounting distance	F150-S1A: Depends on lens being used. F150-SL20A: 61 to 71 mm F150-SL50A: 66 to 76 mm F150-SLC20: 15 to 25 mm F150-SLC50: 16.5 to 26.5 mm F160-SLC20: 15 to 25 mm F160-SLC50: 16.5 to 26.5 mm
Field of vision	F150-S1A: Depends on lens being used. F150-SL20A: 20 mm × 20 mm F150-SL50A: 50 mm × 50 mm F150-SLC20: 20 mm × 20 mm F150-SLC50: 50 mm × 50 mm F160-SLC20: 20 mm × 20 mm F160-SLC50: 50 mm × 50 mm

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Consoles

■ F150-KP Console

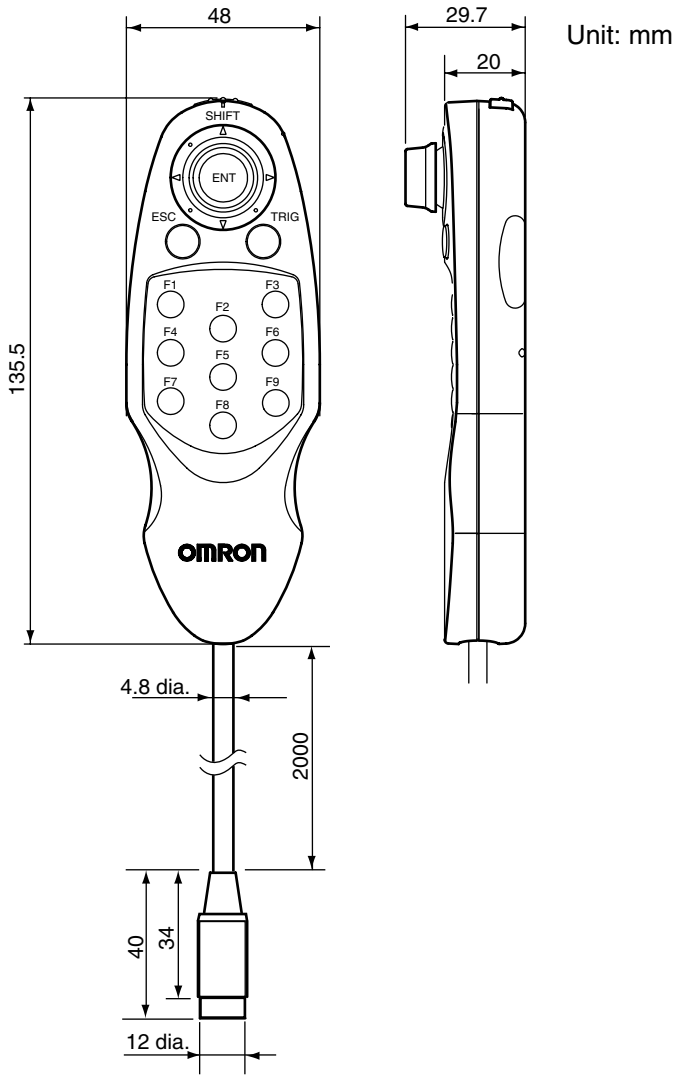
Unit: mm



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

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■ F160-KP Console

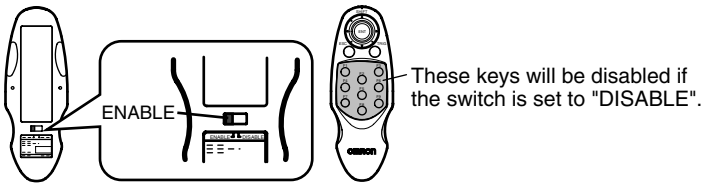


Item	Specification
Current consumption	Approx. 10 mA
Vibration resistance	10 to 150 Hz; half-amplitude: 0.35 mm; maximum acceleration: 50 m/s^2,10 times for 8 minutes each in 3 directions
Shock resistance	150 m/s^2; 3 times each in 6 directions
Ambient temperature range	Operating: 0 to 50 °C (with no condensation) Storage: -25 to 65 °C (with no condensation)
Ambient humidity range	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Degree of protection	IEC60529 IP20 (in-panel)
Minimum bending radius	75 mm

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Item	Specification
Materials	Body: ABS Cable sheathing: Heat-resistant chlorinated vinyl Connector: PC and PBT
Weight	Approx. 160 g

CHECK The switch on the back of the F160-KP must be set to “ENABLE”.



Cables

Camera Cables

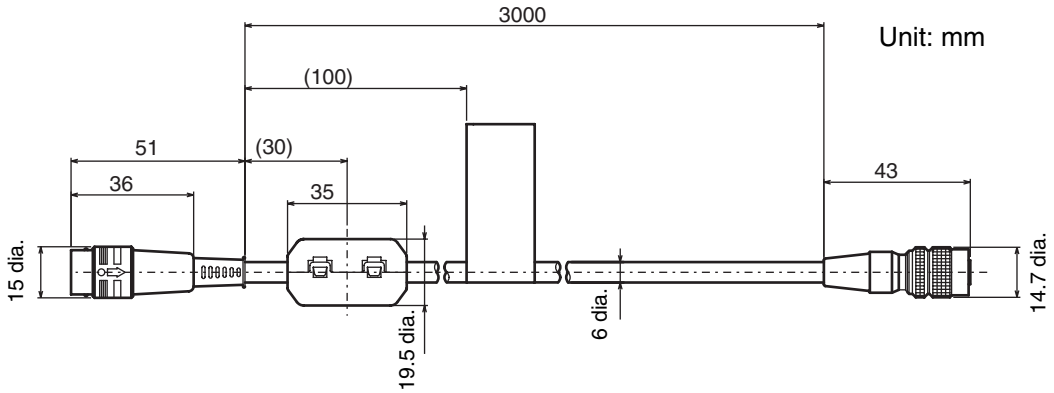
■ Camera Cable Specifications

The F150-VS Camera Cables have different dimensions and wiring, but they share the same specifications.

Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s^2, 3 times each in 6 directions
Ambient temperature range	Operating: 0 to 50 °C (with no condensation) Storage: -25 to 65 °C (with no condensation)
Ambient humidity range	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Materials	Cable sheathing: Heat-resistant chlorinated vinyl Connector: Fiberglass-reinforced PC and PBT
Minimum bending radius	75 mm
Weight	Approx. 170 g

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

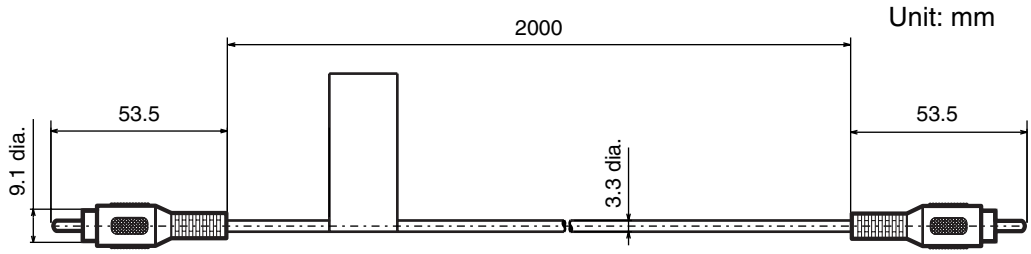


F160 Connector		Camera Connector	
Signal	Pin	Pin	Signal
Power	1	1	GND
GND	2	2	Power
GND	3	3	GND
VIDEO GND	4	4	VIDEO
VD	5	5	VIDEO GND
ESCNT1	6	6	HD
VIDEO	7	7	—
HD	8	8	ESCNT1
SCAN	9	9	ESCNT2
ESCNT2	10	10	INDEX
INDEX	11	11	TRG
TRG	12	12	SCAN
Shell			Shell

Connector model:
Hirose RP17A-13PA-12PC(71)

Connector model:
Hirose HR10A-10P-12SC(73)

F150-VM Monitor Cable



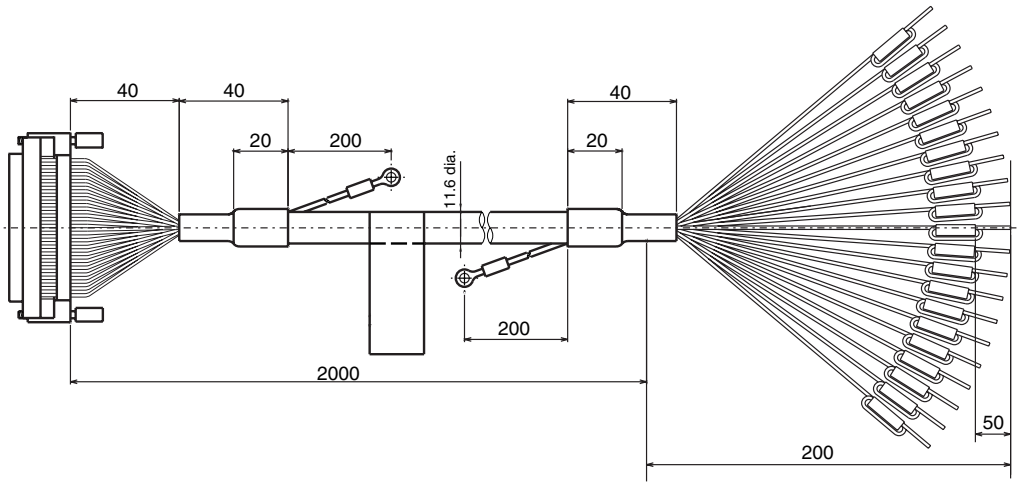
Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s^2, 3 times each in 6 directions
Ambient temperature range	Operating: 0 to 50 °C (with no condensation) Storage: -25 to 65 °C (with no condensation)

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Item	Specification
Ambient humidity range	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Materials	Cable sheathing: Heat-resistant chlorinated vinyl Connector: PVC
Minimum bending radius	50 mm
Weight	Approx. 40 g
Accessories	BNC Jack Adapter

F160-VP Parallel I/O Cable

Unit: mm

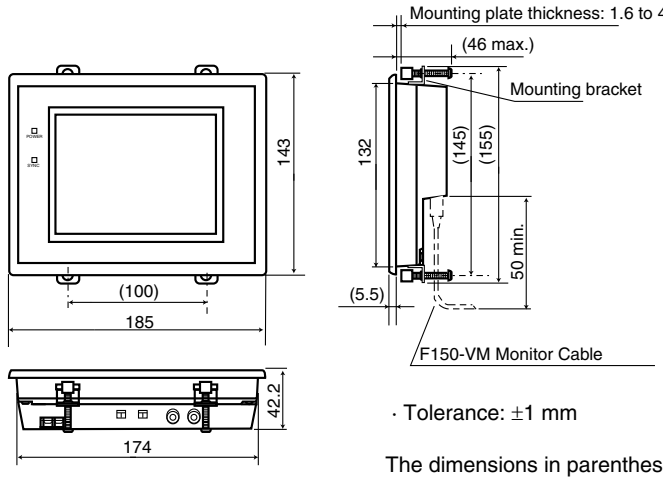


Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s^2, 3 times each in 6 directions
Ambient temperature range	Operating: 0 to 50 °C (with no condensation) Storage: -25 to 65 °C (with no condensation)
Ambient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

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F150-M05L LCD Color Monitor

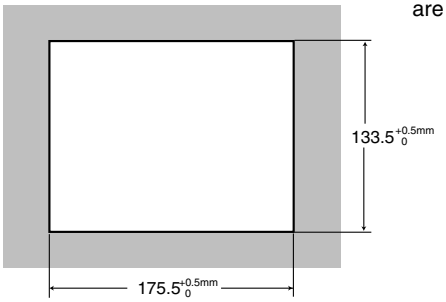
Unit: mm



· Tolerance: ±1 mm

The dimensions in parentheses are provided for reference.

Panel opening dimensions



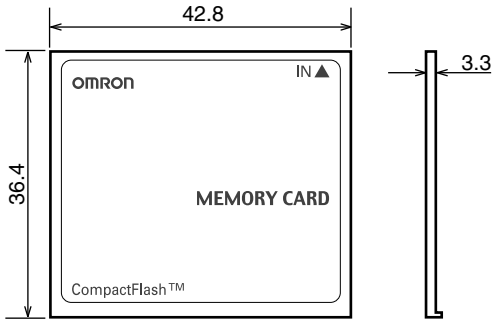
Item	Specification
Supply voltage	20.4 to 26.4 VDC
Current consumption	700 mA max.
Vibration resistance	10 to 150 Hz; half-amplitude: 0.1 mm; maximum acceleration: 15 m/s^2, 10 times for 8 minutes each in 3 directions
Shock resistance	150 m/s^2, 3 times each in 6 directions
Ambient temperature range	Operating: 0 to 50 °C (with no condensation) Storage: -25 to 65 °C (with no condensation)
Ambient humidity range	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)
Panel size	5.7 inches
Panel type	TFT color liquid crystal
Resolution	640 × 480 dots
Image pitch	0.1815 × 0.1815 mm (H × V)
Contrast	850:1 (typical)
Viewable angle	80° up/down and 60° left/right (with a contrast ratio > 10:1)
Luminance	400 cd/m^2 (typical)
Backlight	LED
Response speed	18 ms (typical)
Input signal	NTSC composite video (1.0 V/75 Ω termination)

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Item	Specification
Weight	Approx. 1 kg
Accessories	Four mounting brackets

Memory Cards

F160-N256S



Unit: mm

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

5-6 Connecting a Strobe Device

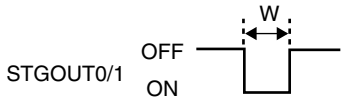
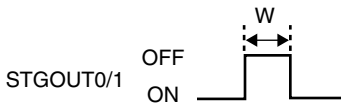
Use the I/O connector's strobe trigger outputs to control the strobe flash timing. There are two strobe trigger outputs, STGOUT0 and STGOUT1, i.e., one for each of camera 0 and camera 1.

SeeAlso Refer to page 31 for details.

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.

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CHECK The STGOUT0 and STGOUT1 signals will not be output if a Camera is connected only to camera connector 1. When using only one Camera, always connect it to camera connector 0.

Strobe specifications	Shutter trigger polarity	Shutter trigger width
STGOUT0 or STGOUT1 signal 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. 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.
STGOUT0 or STGOUT1 signal 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-S2	Positive	3H (1H = 32 μs)

Note The window used to change the shutter trigger polarity and shutter trigger pulse will not be displayed when an F150-S1A or F160-S2 Camera is connected, but the STGOUT0 and STGOUT1 signals will be output with the polarity and width shown in the table above.

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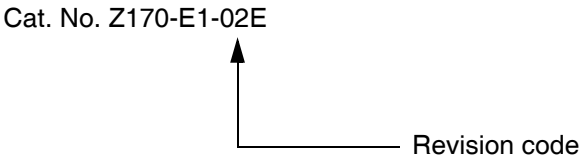
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Revision History

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



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

Revision code	Date	Revised content
01	February 2003	Original production
01A	February 2004	**Page xi:** Removed suffixes from model numbers. **Page 23:** Changed lens model, field of vision, and camera distance in example.
01B	July 2004	Changed information on warranty and limitations of liability at the front of the manual. **Page 52:** Removed “F160-S1” from heading. **Page 53:** Removed current consumption information for F160-S1 from table.
02	May 2005	Information on warranty and liability at the front of the manual updated. The following changes were also made. **Pages 3 and 40:** "Video monitor" changed to "monitor." **Page 4:** Information on securing the video monitor removed. **Page 8:** "S82K-05024" changed to "S8VS-06024" in graphic and information on video monitor removed. **Page 9:** Reference to F160-S1 and information on F200- and F300-series Cameras removed. **Pages 17, 22, 24, 41, 53, and 54:** Reference to F160-S1 removed. **Page 19:** "S82K-05024" changed to "S8VS-06024." **Page 40:** "When using an LCD Monitor" removed from cause description of "the Monitor is blank" problem. **Pages 46, 53, 55, 56, 57, 60, 61 and 64:** "Ambient temperature" and "Ambient humidity" changed to "Ambient temperature range" and "Ambient humidity range" respectively. **Page 59:** Information on F160-VSR3 Camera Cable removed. **Page 60:** Information on F160-VSR4 Camera Cable removed. **Page 63:** Information on F150-M09 Video Monitor removed. **Pages 64 to 65:** 5-6 F300 Camera Parameters removed. **Page 66:** Information on F160-S1 and F300-series Cameras removed from table.
02A	June 2006	**Pages 8, 16, and 58:** Illustrations updated. **Page 22:** Note added and graph updated. **Page 23:** Model number and camera distance changed at top of page and table replaced. **Page 26:** Memory Card model number and capacity changed. **Page 37:** Illustration corrected. **Page 57:** Camera Cable model numbers removed. **Page 61:** Memory Card model numbers changed.
02B	April 2007	**Page 22:** Deleted note at the top of page and modified optical chart. **Page 24:** Changed "six tubes" to "seven tubes" in first paragraph and modified table, graphic, and precautions to add 2.0-mm Extension Tube. **Page 35:** Changed model name of interface converter in middle graphic.
02C	December 2010	**Page xiv**: Changed Regulations and Standards. **Page 42**: Removed question and answer of cables. **Page 58**: Changed graphic of the connector and minor corrections. **Page 60**: Changed specifications of monitor.
02D	March 2012	**Page xiv**: Additions for Notice for Korea Radio Law
02E	August 2015	**Page xiv**: Additions corresponding to change of EN standard.

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