

F150

Visual Inspection System

Manual 1:

SETUP MANUAL

OMRON

F150 Visual Inspection System


Setup Manual


Revised January 2001


Notice:



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

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

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

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

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

	Electric Shock Indicates particular circumstances which, if not avoided, could result in electric shock.
	High Temperatures Indicates particular circumstances which, if not avoided, could result in heat burns.

Visual Aids

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

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

→ Indicates pages where additional information can be found.

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

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

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About this Manual:

This manual describes the hardware for the F150 Visual Inspection System and how to install the components, and it includes the sections described below. This is one of three manuals used to operate the F150. 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.	Z124-E1-1B
2: Auto Menu Operation Manual	Describes operation of the F150 using the Auto Menu. The Auto Menu enables the simplest operation for OK/NG outputs based on registered images of acceptable and unacceptable products.	Z125-E1-1
3: Expert Menu Operation Manual	Describes operation of the F150 using the Expert Menu. The Expert Menu enables application of all F150 capabilities, including setting region images and criteria, and outputting OK/NG terminal signals or RS-232C measurement values.	Z126-E1-1A

Please read the above manuals carefully and be sure you understand the information provided before attempting to install or operate the F150.

Section 1 Precautions describes the precautions that must be taken when installing and operating the F150 Visual Inspection System.

Section 2 Product Introduction provides an overview of F150 application and describes the wiring, Cameras, optical lenses, lighting modes, and light guides used in the F150 System. It also describes how to mount the Vision Mate Controller to DIN Track or to a flat surface.

Section 3 Terminal Blocks describes how to connect the terminal blocks.

Section 4 RS-232C Connections describes how to connect the RS-232C port.

Section 5 Troubleshooting lists the errors that may occur, along with their probable causes and remedies.

Section 6 Maintenance provides information on maintenance and inspection.

Section 7 Specifications provides the specifications of the F150 components.



WARNING

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


PRECAUTIONS

This section provides general precautions for using the F150 Visual Inspection System.


The information contained in this section is important for the safe and reliable application of the F150 Visual Inspection System. You must read this section and understand the information contained before attempting to set up or operate a F150 Visual Inspection System.

1 Safety Precautions	x
2 General Precautions	xi


1 Safety Precautions

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





 **WARNING** Use DC power supplies with safe extra low-voltage circuits on the secondary side for the main F150 power supply and power supplies for the terminal blocks. Excessively high voltages can result in electric shock.





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





 **Caution** Do not use the F150 in environments with flammable or explosive gases.


 **Caution** Install the F150 away from high-voltage equipment or motors to ensure safety during operation and maintenance.


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


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

 **Caution** Be sure to securely tighten the screws when mounting F150 components.

 **Caution** Do not dismantle, repair or modify any F150 components.

 **Caution** Dispose of F150 components as industrial waste.

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

 **Caution** Do not turn OFF the power while a message is being displayed indicating that processing is being performed. Data in memory will be destroyed, and the F150 may not operate correctly the next time it is started.

2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

SECTION 1

Before Installing

This section describes the precautions that must be taken when installing and operating the F150 Visual Inspection System.

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1-1 Installation Precautions

The F150 is highly reliable and resistant to most environmental factors. The following guidelines, however, must be followed to ensure reliability and optimum use of the F150.

1-1-1 F150 Components

Be sure to use the Camera, Camera Cable, and Console designed for the F150.

- 1 F150-S1 Camera
- 2 F150-VS Camera Cable
- 3 F150-KP Console

1-1-2 Installation Site

Do not install the F150 in locations subject to the following conditions:

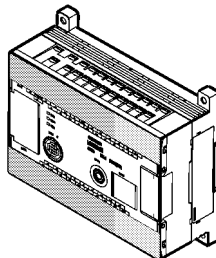
- 1 Ambient temperatures outside of 0 to 40°C for the F300-M09 Video Monitor (recommended monitor) or outside of 0 to 50°C for all other F150 components
- 2 Condensation due to rapid temperature fluctuations
- 3 Relative humidities outside 35% to 85%
- 4 Corrosive or flammable gases
- 5 Dust, salt, or iron particles
- 6 Direct vibration or shock
- 7 Direct sunlight
- 8 Water, oil, or chemical fumes or spray

1-1-3 Installation

Orientation of Controller

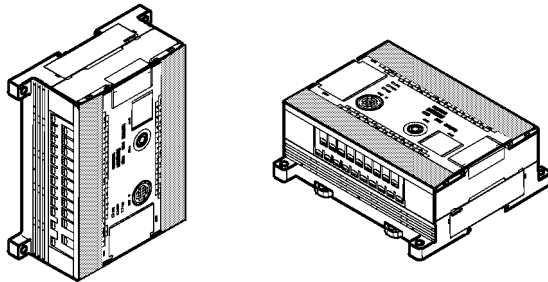
To improve heat dissipation, install the Controller in the following orientation only:

CORRECT



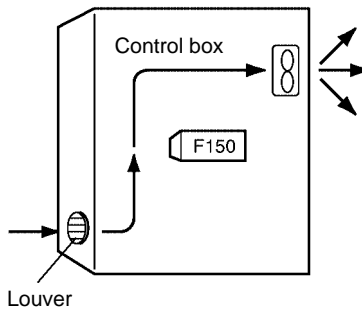
Do not install the Controller in the orientations shown in the following diagram.

INCORRECT



Ambient Temperature

- 1 Maintain a minimum clearance of 50 mm above and below F150 components to improve air circulation.
- 2 Do not install F150 components immediately above strong heat sources, such as heaters, transformers, or large-capacity resistors.
- 3 Do not let the ambient operating temperature exceed 50°C.
- 4 Provide a forced-air fan or air conditioning if the ambient temperature might exceed 50°C.

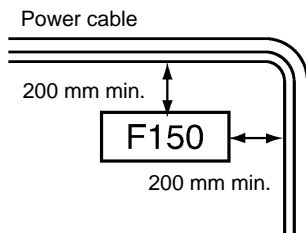


Noise Resistance

Use the following measures to help increase noise resistance.

- 1 Do not install F150 components in a cabinet containing high-voltage equipment.

- 2 Do not install the F150 components within 200 mm of power cables.



Operation and Maintenance Precautions

- 1 Keep F150 components away from high-voltage equipment or motors to ensure safety during operation and maintenance.
- 2 Install F150 components at a height that allows operation of the Console while monitoring with the Video Monitor.

1-1-4 Cables

Always turn OFF the power before connecting or disconnecting cables.

1-1-5 Camera

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

- 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.

1-1-6 Video Monitor

(When using the recommended F300-M09)

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

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

1-2 Confirming Package Contents

Check the contents of the package as soon as you receive the F150. Contact the nearest OMRON representative if any of the following items are missing.

- 1 F150-C10E Vision Mate Controller
- 2 Setup Manual (this manual)
- 3 Auto Menu Operation Manual
- 4 Expert Menu Operation Manual

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.

SECTION 2

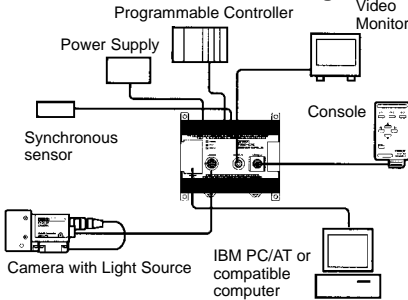
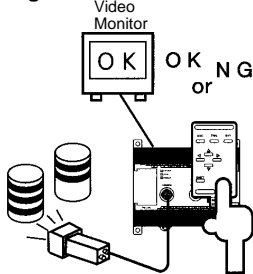
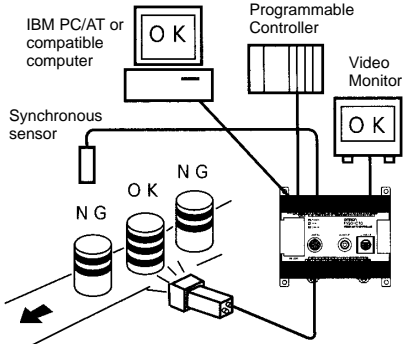
Product Introduction

This section provides an overview of F150 application and describes the wiring, Cameras, optical lenses, lighting modes, and light guides used in the F150. It also describes how to mount the Vision Mate Controller to DIN Track or to a flat surface.

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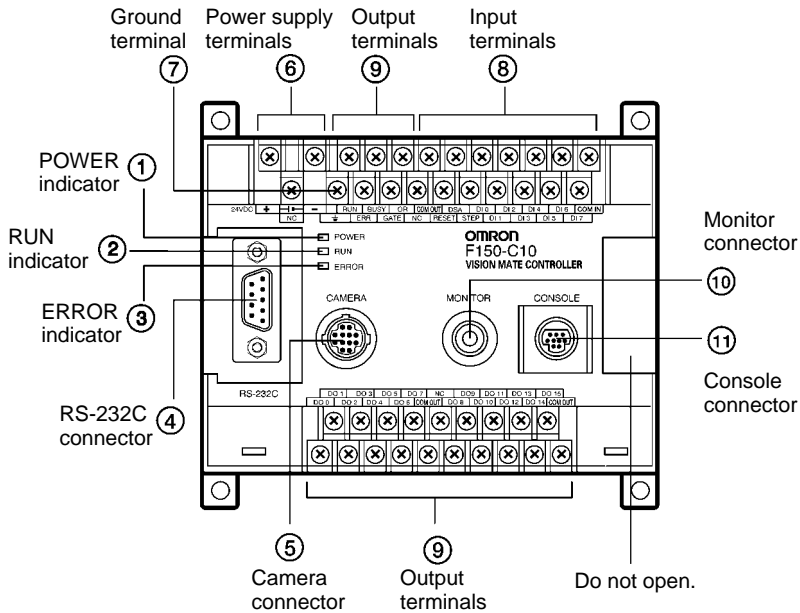
2-1 Overview of F150 Application

The following table shows the basic steps that must be performed to use the F150.

Step	Manual
<p>1: Unit Connections and Wiring</p> 	<p>Setup Manual</p>
<p>2: Setting Measurement Conditions</p> 	<p>Easy Operation: Auto Menu Operation Manual</p> <p>Advanced Operation: Expert Menu Operation Manual</p>
<p>3: Confirming Operation, Measuring Objects, and Outputting Results</p> 	

2-2 Component Names and Functions

The following diagram shows the terminals, connectors, and indicators on the F150-C10E Vision Mate Controller.



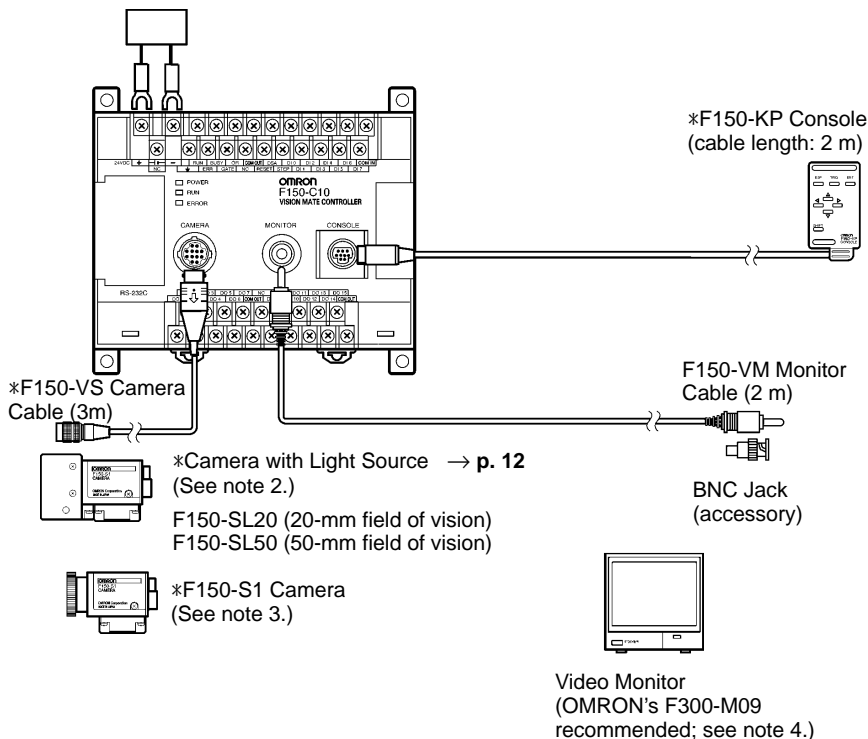
- | | |
|--|--|
| <p>1 POWER Indicator
Lit while power is ON.</p> <p>2 RUN Indicator
Lit in measurement mode.</p> <p>3 ERROR Indicator
Lit when an error occurs.</p> <p>4 RS-232C Connector
Connects the F150 to a computer, PLC, or other external device.</p> <p>5 Camera Connector
Connects to the Camera.</p> <p>6 Power Supply Terminals
Wired to the power supply.</p> | <p>7 Ground Terminal
Wired to the ground.</p> <p>8 Input Terminals
Wired to external devices, such as synchronous sensors or inputs from a PLC.</p> <p>9 Output Terminals
Wired to external devices, such as synchronous sensors or outputs to a PLC.</p> <p>10 Monitor Connector
Connects to the video monitor.</p> <p>11 Console Connector
Connects to the Console.</p> |
|--|--|

2-3 Connections

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

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

Power Supply → p. 12
(OMRON's S82K-01524 recommended.)



- Note**
1. *Components marked with an asterisk are specially designed for the F150. Other products cannot be used.
 2. F150-SL Cameras are the same as F150-S1 Cameras except that they have a lens and a light attached.
 3. If the field of vision is too small, use the F150-S1 Camera with a normal CCTV lens and light. → p. 14
 4. Use an NTSC monitor with an external video input terminal.

2-4 Power Supply and Ground

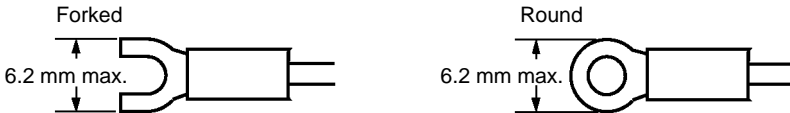
Wire the power supply and the ground to the top terminal block, and tighten the screws to a torque of between 0.5 and 0.6 N·m.

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



2-4-1 Crimp Terminals and Cables

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



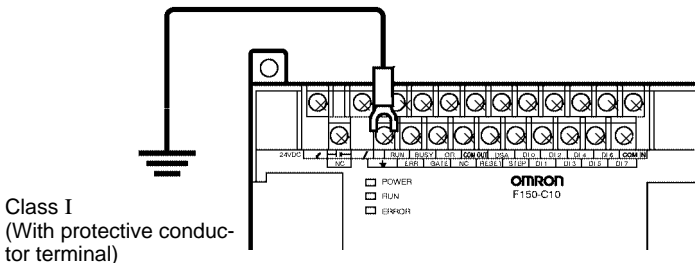
Applicable wire size: Insulated wire of 1.31 to 1.65 mm² (AWG16 to AWG15)

2-4-2 Protective Conductor (Earth) Wiring

Wire the ground as shown in the following diagram.

! Caution Use an appropriate ground. An insufficient ground can affect F150 operation or result in damage to F150 components.

- To avoid damage to the equipment, do not share the protective conductor wiring with any other devices nor wire the protective conductor terminal to the girder. Be sure to wire the protective conductor of the equipment independently.
- Keep the ground line as short as possible.



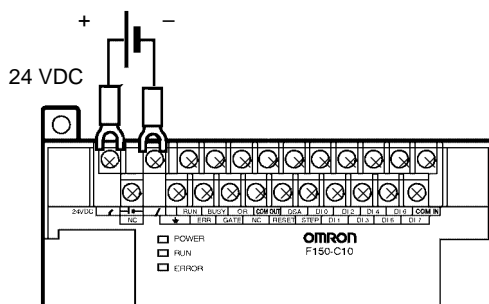
2-4-3 Wiring the Power Supply

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



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

Item	Specification
Output current	0.6 A min.
Power supply voltage	24 VDC +10%/-15%



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

2-5 Cameras

The Cameras are designed for the F150. The F150-SL20 and F150-SL50 Cameras have a lens and light attached. The light and lens are a single unit and are thus compact and easy to mount.

Cameras with Light Source

Field of vision	Model
20 mm	F150-SL20
50 mm	F150-SL50

Camera

The same Camera is also available without a lens and light so that other CCTV lenses and lights can be used. Use C-mount lenses.

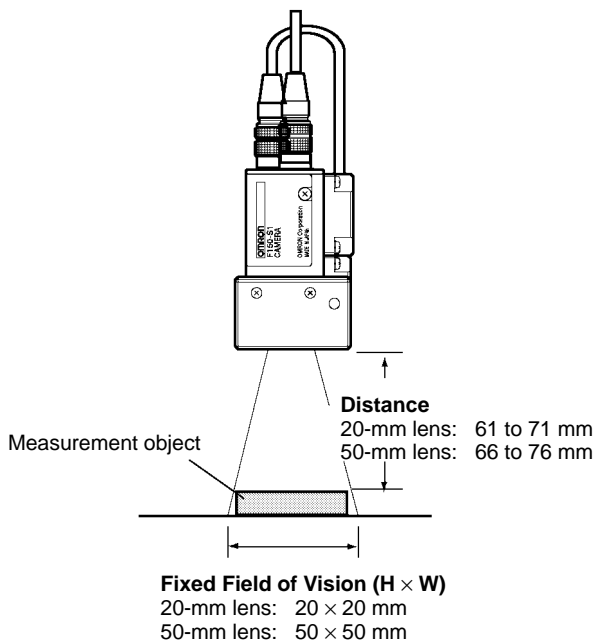
Camera	Model
F150 Camera	F150-S1

Caution The F150 Cameras listed above must be used. Using other Cameras can damage F150 components or the Camera.

Distance from Measurement Object

Note The Camera's field of vision is fixed, and the Camera must be mounted at a distance from the measurement object where it can correctly view the object.

If the field of vision of the Camera is too small for the object being measured, use the Camera with a normal CCTV lens and light. → p. 14



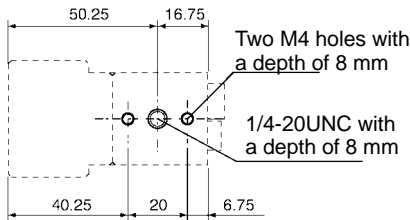
Note Since the field of vision and focal point vary depending on the lens, adjust the setting distance whenever the lens or Camera is replaced.

Mounting the Camera

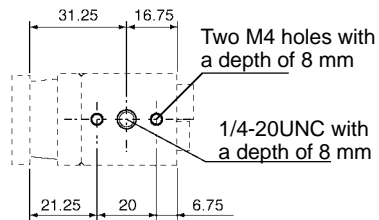
The specified camera distance is only an approximation. Mount the Camera so that it can be adjusted to either side of the specified distance from the measurement object.

Unit: mm

Camera with Light Source



Camera

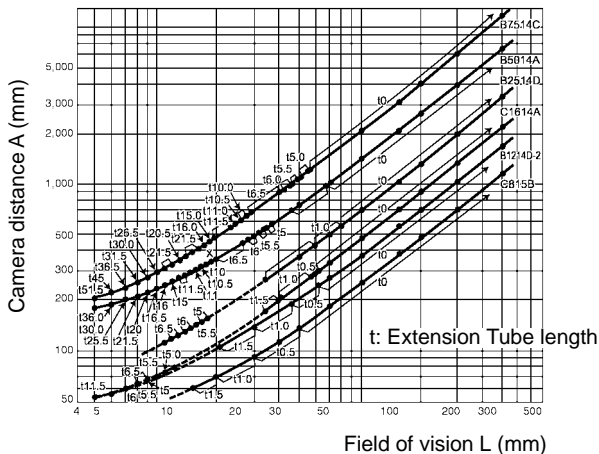


2-6 CCTV Lens

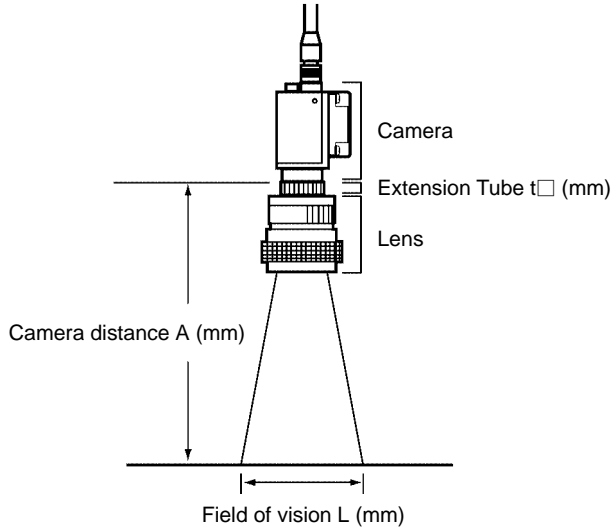
When using a F150-S1 Camera (without a light), refer to the following graph to select the appropriate Lens and Extension Tube. The lens will differ depending on the size of the measurement object and the distance from the Camera.

2-6-1 Optical Chart

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

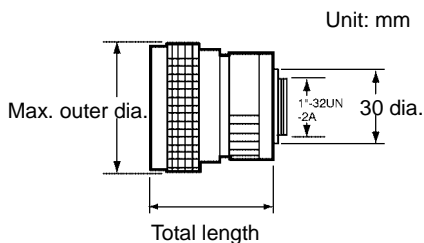


The X axis of the graph shows field of vision L (mm), and the Y axis shows the camera distance A (mm). The curves on the graph indicate different lenses, and the "t" values indicates the lengths of the Extension Tubes.



2-6-2 Lens

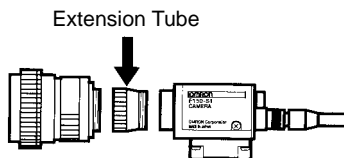
Lens	Focal length	Bright-ness	Maximum outer diameter	Total length	Filter size
3Z4S-LE C418DX	4.8 mm	F1.8	40.5-mm dia.	35.5 mm	---
3Z4S-LE B618CX	6.5 mm	F1.8	48-mm dia.	42 mm	
3Z4S-LE C815B	8.5 mm	F1.5	42-mm dia.	40 mm	M40.5 × P0.5
3Z4S-LE B1214D-2	12.5 mm	F1.4	42-mm dia.	50 mm	
3Z4S-LE C1614A	16.0 mm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



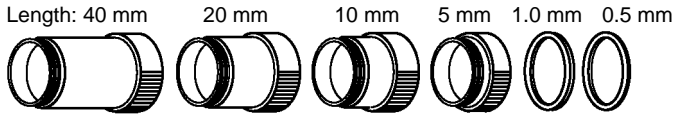
2-6-3 Extension Tubes

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

- Note**
- 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.



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



2-7 Lighting

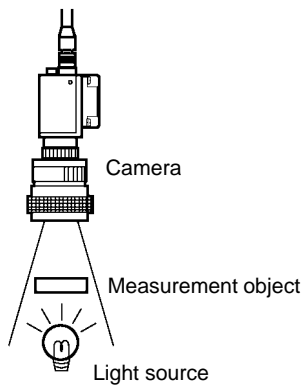
A stable image must be obtained to ensure accurate inspection. Use appropriate lighting for the application and the measurement object if using the F150-S1 Camera.

2-7-1 Lighting Methods

Back Lighting

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

Applications: Inspection of exterior shape or positioning inspection

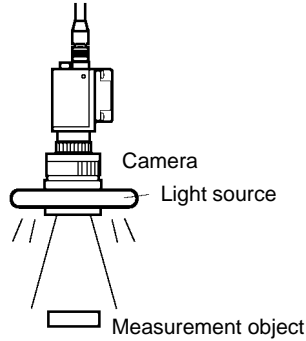


Reflected Lighting

Ring Lights

Light is shone uniformly on the measurement object.

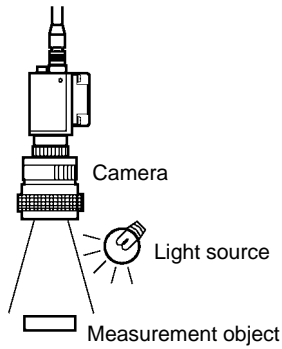
Applications: Surface inspections



Oblique Lighting

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

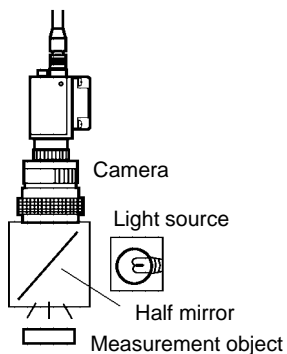
Applications: Inspections for surface gloss



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

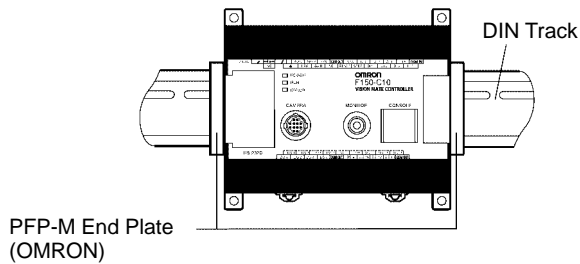


2-8 Mounting the Controller

The Vision Mate Controller can be mounted to DIN Track or a flat surface.

2-8-1 Mounting to DIN Track

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

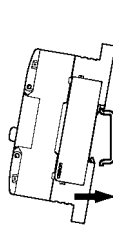


The following DIN Tracks are available from OMRON.

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

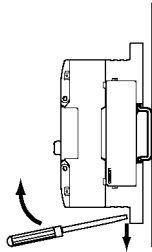
Mounting the Controller

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.



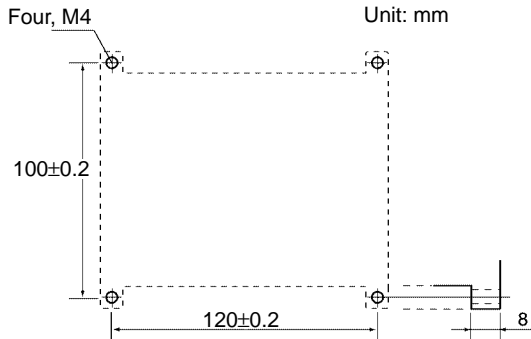
Removing the Controller

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



2-8-2 Mounting on a Flat Surface

Mount the Controller using the holes and dimensions shown in the following diagram.



! Caution Do not use screw-locking materials that contain ingredients harmful to ABS or polycarbonate resins. The Controller will be damaged.

SECTION 3

Terminal Blocks

This section describes how to connect the terminal blocks.

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3-1 Terminal Block Application

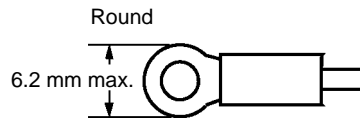
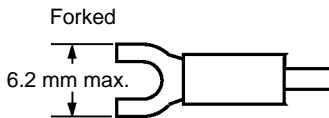
The following table shows the functions that can be performed by the F150 using the terminal blocks. Refer to the *Auto Menu* and *Expert Menu Operation Manuals* for communications settings and I/O formats.

Menu	Measurement command inputs	Overall evaluation outputs	Region evaluation outputs
Auto Menu	Yes	Yes	No
Expert Menu	Yes	Yes	Yes

3-2 Crimp Terminals and Cables

The terminal block uses M3 terminal screws. Use appropriate crimp terminals for M3 screws, as shown below. Tighten the screws to a torque of between 0.5 and 0.6 N·m.

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



Applicable wire size: Insulated wire of 1.31 to 1.65 mm² (AWG16 to AWG15)

3-3 Specifications

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



Input Specifications

Item	Specification
Input voltage	12 to 24 VDC $\pm 10\%$
ON current	3 to 15 mA
ON voltage	8.8 V max.
OFF current	0.1 mA max.
OFF voltage	4.5 V min.
ON delay	RESET input: 10 ms max. Others: 0.5 ms max.
OFF delay	RESET input: 15 ms max. Others: 0.7 ms max.
Internal circuits	

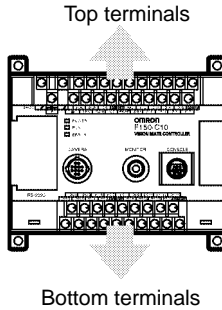
Output Specifications

Item	Specification
Output voltage	12 to 24 VDC $\pm 10\%$
Load current	45 mA max.
ON residual voltage	2 V max.
OFF leakage current	0.1 mA max.
Internal circuits	

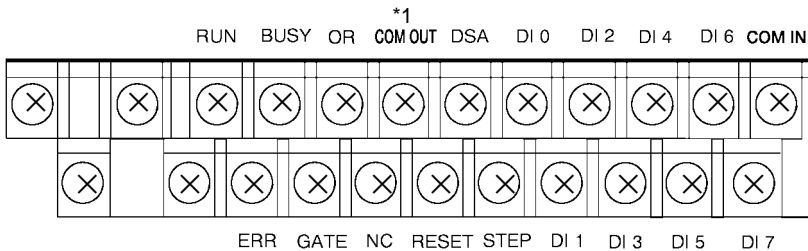
Note If UL recognition is required, use a UL class II power supply.

3-4 Terminals

The terminals on the terminal blocks are assigned as shown in the following diagrams and tables.

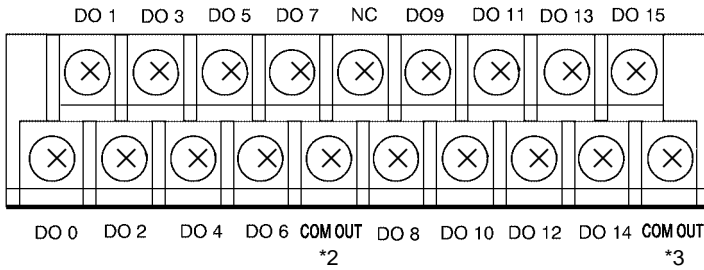


Top Terminals



Name/Application		Name/Application	
RUN		ERR	Error output
BUSY		GATE	
OR		NC	Not connected
COM OUT (*1)	For RUN, ERR, BUSY, GATE, and OR	RESET	Resets F150
DSA	Command inputs	STEP	
DI 0		DI 1	Command inputs
DI 2		DI 3	
DI 4		DI 5	
DI 6		DI 7	
COM IN		---	

Bottom Terminals



Name/Application		Name/Application	
DO 1	Measurement results output	DO 0	Measurement results output
DO 3		DO 2	
DO 5		DO 4	
DO 7		DO 6	
NC	Not connected	COM OUT (*2)	For DO 0 to DO 7
DO 9	Measurement results output	DO 8	Measurement results output
DO 11		DO 10	
DO 13		DO 12	
DO 15		DO 14	
---		COM OUT (*3)	For DO 8 to DO 15

Caution Do not reverse the connections of the signal terminals and COM terminals.

SECTION 4

RS-232C Connection

This section describes how to connect the RS-232C port.

4-1	RS-232C Port Application	30
4-2	Connector	30
4-3	Wiring	31
4-4	Connection	32

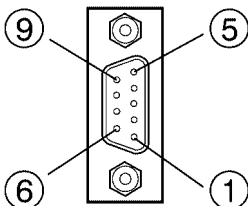
4-1 RS-232C Port Application

The following table shows the functions that can be performed by the F150 via the RS-232C port. Refer to the *Auto Menu* and *Expert Menu Operation Manuals* for communications settings, I/O formats, and operating procedures.

Menu	Menu Operations	Measurement command inputs		Measurement results outputs or evaluation outputs		Data Backup
		Normal	Host Link	Normal	Host Link	
Auto Menu	Yes	No	No	No	No	Yes
Expert Menu	Yes	Yes	Yes	Yes	Yes	Yes

4-2 Connector

Use an appropriate 9-pin D-SUB female connector. The pin numbers and names are shown below.



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

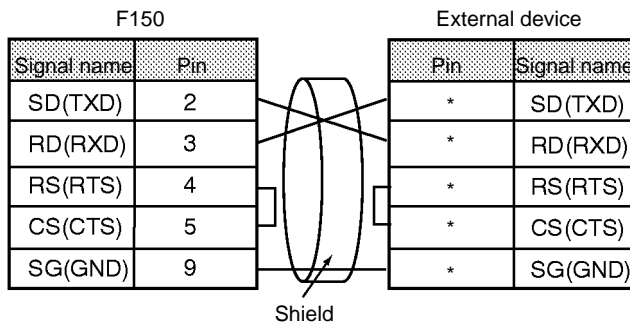
The following plug and hood are recommended and are available from OMRON.

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

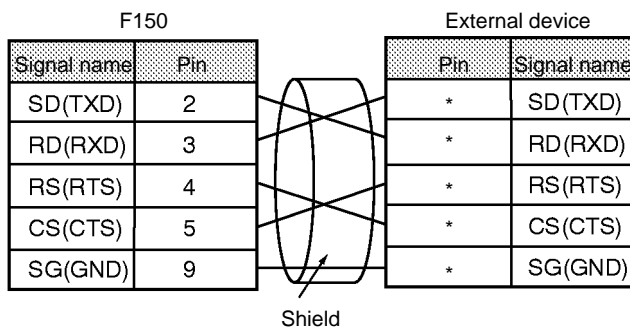
4-3 Wiring

Use only shielded RS-232C cable.

Standard Connections



Connections for RS/CS Control



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

SECTION 5

Troubleshooting

This section lists the errors that may occur, along with their probable causes and remedies.

5-1	Connection Errors	34
5-2	Errors during Menu Operation	34
5-3	Terminal Block Errors	34
5-4	RS-232C Communications Errors	35

5-1 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 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.
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 normal CCTV lens and lighting is used).	The lens cap has not been removed.
	The Camera Cable is not properly connected.
	The lens diaphragm is opened or closed too far.
	The shutter speed is not suitable (for Expert Menu operation only).
	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.
	There is no power supply to the F150.
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.

5-2 Errors during Menu Operation

Problem	Probable cause
The measurement results are not displayed on the Video Monitor.	The F150 is not in Monitor or Measurement mode.

5-3 Terminal Block Errors

Problem	Probable cause
Trigger signals (input signals) are not received.	The cables are not correctly wired.
	The signal line is disconnected.
	The F150 is not in Monitor or Measurement 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 F150 is not in Measurement mode.

5-4 RS-232C Communications Errors

Problem	Probable cause
No communications are possible.	The cables are not correctly wired.
	The communications specifications do not match those of the external device.
	<p>The communications mode was not selected under System/Communications settings.</p> <p>Select Normal, Host link, or Menu operations under RS-232C/Operating mode.</p>
The Unit operates well initially, but after a while there is no response from the F150.	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 via RS-232C.	The communications mode was not selected as System/Communications settings/Menu operations .

SECTION 6

Maintenance

This section provides information on maintenance and inspection.

6-1	Maintenance Parts and Replacement	38
6-2	Regular Inspections	39

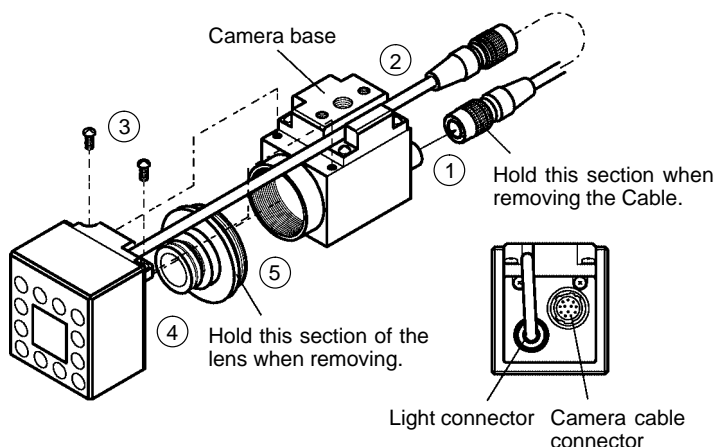
6-1 Maintenance Parts and Replacement

Maintenance parts of the F150 are shown in the following table.

Part	Model No.
20-mm Lens (20 mm × 20 mm)	F150-LE20
50-mm Lens (50 mm × 50 mm)	F150-LE50
Light	F150-LT10

- Note**
1. The Light will gradually lose illumination if used for long periods (approx. 20% loss after 1,500 hours of use). Replace the Light after approx. 1,500 hours of use.
 2. Replace the Light if it is partially damaged or not fully functioning.

Replacing the Lens or 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 M3 × 6 screws securing the Light.
- 4 Remove the Light from the Camera.
- 5 Remove the Lens from the camera mount.

- Note** Follow these steps in the reverse order to mount the Lens and Light.


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


6-2 Regular Inspections

To maintain the F150 in the best condition, perform the following regularly.

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

Inspection point	Details	Tools required
Power supply	The voltage measured at the power supply terminals on the terminal block must be 24 VDC $+10\%$ / -15% .	Circuit tester
Ambient temperature	The operating ambient temperature inside the cabinet must be between 0 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. 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.	---

 **Caution** Turn OFF the power and take safety precautions before conducting inspections. Electrical shock can result from attempting safety inspections with the power turned ON.

 **Caution** Do not use thinners or benzene. They will damage F150 components.

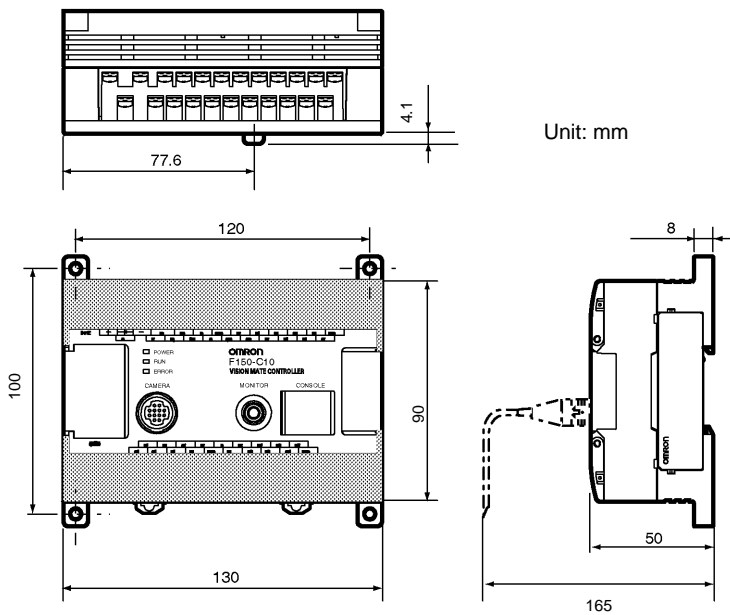
SECTION 7

Specifications

This section provides the specifications of the F150 components.

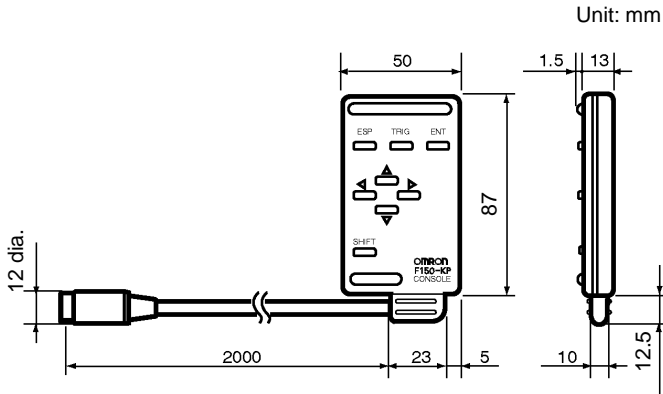
7-1	F150-C10E Vision Mate Controller	42
7-2	K150-KP Console	43
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7-4	F150-LE20/50 Lens	46
7-5	F150-LT10 Light	46
7-6	Cables	47
7-7	F300-M09 Video Monitor	48

7-1 F150-C10E Vision Mate Controller



Item	Specification
Supply voltage	24 VDC (+10%, -15%)
Current consumption	Approx. 0.5 A
Insulation resistance	20 M Ω min. between all DC external terminals and GR terminal (at 100 VDC, with internal surge absorber removed)
Dielectric strength	1,000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed)
Leakage current	10 mA max.
Noise resistance	1500 Vp-p; pulse width: 0.1 μ s/ 1 μ s; rising time: 1 ns (pulse)
Vibration resistance	10 to 150 Hz; half-amplitude: 0.5 mm; maximum acceleration: 70 m/s ² , 4 times for 8 minutes each in 3 directions
Shock resistance	200 m/s ² , 3 times each in 6 directions
Ambient temperature	0 to 50 °C
Ambient humidity	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Storage temperature	-25 to 65 °C
Protection class	Class I (with protective conductor terminal)
Degree of protection	IEC60529 IP20 (in-panel)
Weight	Approx. 390 g

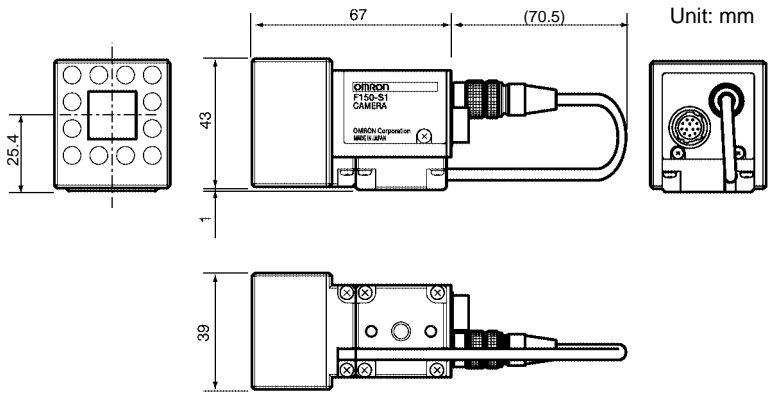
7-2 K150-KP Console



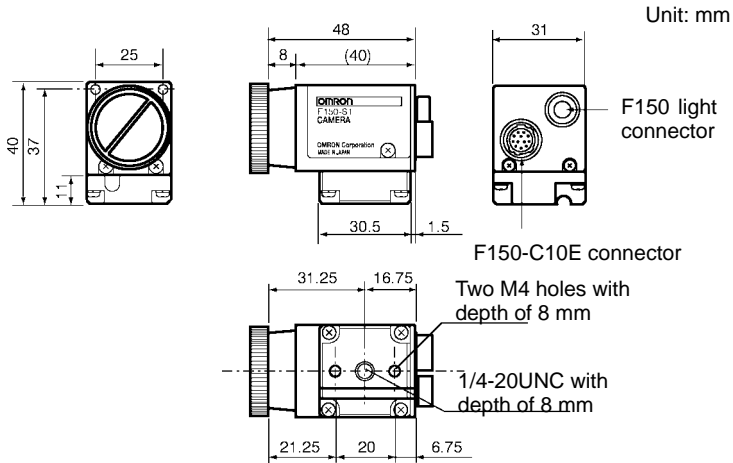
Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm
Shock resistance	196 m/s ²
Ambient temperature	0 to 50 °C
Ambient humidity	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Storage temperature	-25 to 65 °C
Degree of protection	IEC60529 IP20 (in-panel)
Length	2 m
Minimum bending radius	75 mm
Weight	Approx. 240 g (without cable)

7-3 Cameras

F150-SL20/SL50 Camera with Light Source



F150-S1 Camera



Item	Specification
Supply voltage	12 VDC
Current consumption	Approx. 160 mA
Vibration resistance	10 to 150 Hz; half-amplitude: 0.5 mm; maximum acceleration: 70 m/s ² , 4 times for 8 minutes each in 3 directions
Shock resistance	200 m/s ² , 3 times each in 6 directions
Ambient temperature	0 to 50 °C
Ambient humidity	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Storage temperature	-25 to 60 °C
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: 1/100 s, 1/500 s, 1/2,000 s, 1/10,000 s (Default: 1/2,000 s)
Lens mounting	C mount
Weight	Camera with Light Source: Approx. 135 g Camera only: Approx. 70 g

7-4 F150-LE20/50 Lens

Item	Specification
Ambient temperature	0 to 50 °C
Ambient humidity	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Storage temperature	-25 to 65 °C
System	Fixed focus, fixed diaphragm
Brightness	LE20/50: F2.8
Field of vision	LE20: 20 mm × 20 mm LE50: 50 mm × 50 mm
Focal distance	LE20: 13 mm LE50: 6.1 mm
Camera distance	LE20: 61 to 71 mm LE50: 66 to 76 mm

7-5 F150-LT10 Light

Item	Specification
Supply voltage	12 VDC
Supply voltage fluctuation	10.8 to 13.2 VDC (including ripple)
Current consumption	Approx. 10 mA
Insulation resistance	20 M Ω min. between all DC external terminals and case (at 100 VDC)
Dielectric strength	1,000 VAC, 50/60 Hz between all DC external terminals and case
Leakage current	10 mA max.
Vibration resistance	10 to 150 Hz; half-amplitude: 0.5 mm; maximum acceleration: 70 m/s ² , 4 times for 8 minutes each in 3 directions
Shock resistance	200 m/s ² , 3 times each in 6 directions
Ambient temperature	0 to 50 °C
Ambient humidity	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Storage temperature	-25 to 65 °C
Light elements	LEDs
Lighting system	Pulse

7-6 Cables

F150-VS Camera Cable

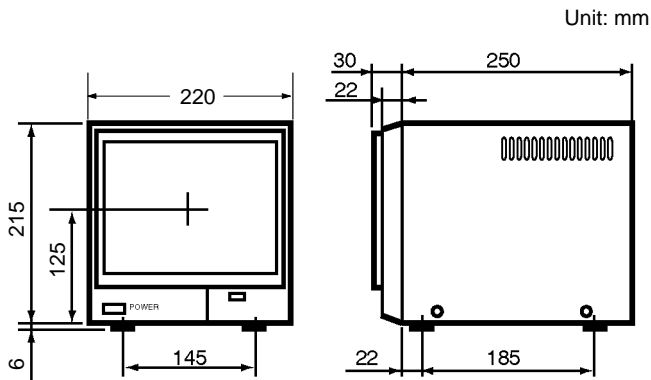
Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s ² , 3 times each in 6 directions
Ambient temperature	0 to 50 °C
Ambient humidity	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Storage temperature	-25 to 65 °C
Length	3 m
Minimum bending radius	75 mm

F150VM Monitor Cable

Item	Specification
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s ² , 3 times each in 6 directions
Ambient temperature	0 to 50 °C
Ambient humidity	35% to 85% (with no condensation)
Ambient environment	No corrosive gases
Storage temperature	-25 to 65 °C
Length	2 m
Minimum bending radius	50 mm

7-7 F300-M09 Video Monitor

This is the recommended monitor and is available from OMRON.

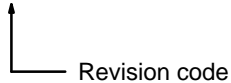


Item	Specification
Supply voltage	100 VAC
Current consumption	Approx. 300 mA
Vibration resistance	10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions
Shock resistance	196 m/s ² , 3 times each in 6 directions
Ambient temperature	0 to 40 °C
Ambient humidity	10% to 90% (with no condensation)
Ambient environment	No corrosive gases
Storage temperature	-25 to 65 °C
System	Number of scanning lines: 525 Horizontal frequency: 15.75 kHz Field frequency: 60 Hz
I/O impedance	75 Ω, high impedance (selectable)
I/O level and polarity	Image: 0.7 V (peak to peak), positive Synchronization: 0.3 V (peak to peak), negative
Screen size	123 × 164 (H × W), monochrome (light-holding)
Resolution	700 TV lines min. (at center)
Weight	Approx. 5.8 kg

Revision History

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

Cat. No. Z124-E1-1B



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

Revision code	Date	Revised content
1	July 1998	Original production
1A	January 1999	Pages 20 to 22: <i>2-7-2 Fluorescent Light Sources</i> and <i>2-7-3 Optical Fiber Light Sources</i> removed.
1B	January 2001	<p>Cover: ISO mark removed.</p> <p>Page 11 : Grounding indication in the graphic corrected.</p> <p>Page 25: Graphic in the bottom table corrected.</p> <p>Page 38: Numbering in the graphic corrected.</p> <p>Pages 42, 43, 45, 46, 47, 48: "single amplitude" changed to "half-amplitude".</p> <p>Page 44: Camera height corrected from 25.5 to 25.4.</p> <p>Page 48: Horizontal dimension added to the graphic.</p>