

Cat. No. Z132-E1-02

**F150-2**

**Vision Sensor**

**Manual 1:  
SETUP MANUAL**

**OMRON®**



# **F150-2**

# **Vision Sensor**

## **Setup Manual**


*Revised May 2004*





## 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.

|   |   |
|---|---|
|  | <b>High Temperatures</b><br>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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# About this Manual:

This manual describes the hardware for the F150 Vision Sensor 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. |
|--|---|----------|
| <b>1: Setup Manual</b>                 | Provides information on system hardware and installation. <b>Be sure to read this manual first.</b>   | Z132     |
| <b>2: Auto Menu Operation Manual</b>   | Describes operation of the F150 using the Auto Menu. The Auto Menu enables the simplest operation based on registered images of acceptable and unacceptable products. | Z133     |
| <b>3: Expert Menu Operation Manual</b> | Describes operation of the F150 using the Expert Menu. The Expert Menu enables application of all F150 capabilities, including setting region images and criteria.    | Z134     |

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

**Section 1 Before Installing** describes the precautions that must be taken when installing and operating the F150 Vision Sensor.

**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 Connection** describes how to connect the RS-232C port.

**Section 5 CompoBus/D Connections** describes how to connect the F150-C10E-2-DRT Vision Sensor as a CompoBus/D Slave and provides information such as connector pin allocations, node number settings, and baud rate settings.

**Section 6 Troubleshooting** lists the errors that may occur, along with their probable causes and remedies.

**Section 7 Maintenance** provides information on maintenance and inspection.

**Section 8 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 Vision Sensor.


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


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# 1 Safety Precautions


 **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** Cover the terminal blocks with the Terminal Block Protection Covers.


 **Caution** 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.


 **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 Vision Sensor.

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  - 1-1-1 F150 Components . . . . . 2
  - 1-1-2 Installation Site . . . . . 2
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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:

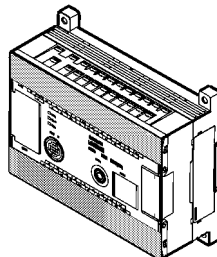
- 1 Ambient temperatures outside of 0 to 40°C for the F300-M09 Video Monitor (recommended monitor) or outside of 0 to 50°C for all other F150 components
- 2 Condensation due to rapid temperature fluctuations
- 3 Relative humidities outside 35% to 85%
- 4 Corrosive or flammable gases
- 5 Dust, salt, or 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:

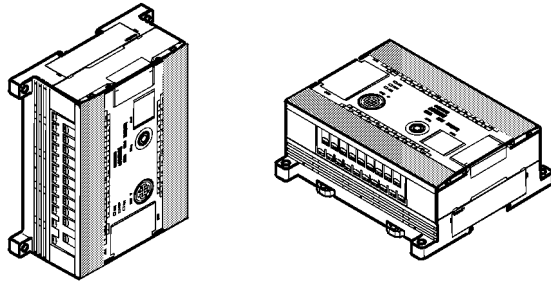
**CORRECT**





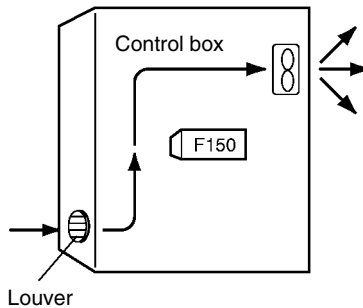
Do not install the Controller in the orientations shown in the following diagram.

**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.

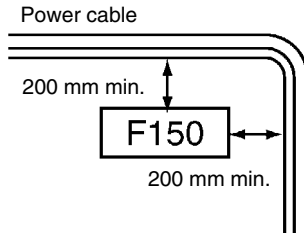


**Noise Resistance**

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.



**F150-C10E-2-DRT (CompoBus/D Model)**

- 1 Since the product is defined as built-in type, install the product inside the control panel.
- 2 Do not apply external forces exceeding 50 N to CompoBus/D connectors. When wiring communications cables, remove the connectors from the F150.
- 3 Before setting the DIP switch or connecting cables, turn OFF the Programmable Controller, F150, and the communications power supply.
- 4 Observe the following precautions when wiring communications cables.
  - a) Separate communications cables from power lines or high-tension lines.
  - b) Do not bend communications cables.
  - c) Do not pull on communications cables with excessive force.
  - d) Do not place heavy objects on communications cables.
  - e) Be sure to route communications cables within ducts.

**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.

### F150-C10E-2 F150-C15E-2

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

### F150-C10E-2-DRT

|  |   |
|--|---|
| 1 F150 Vision Mate Controller                                    | 1 |
| 2 Setup Manual (this manual)                                     | 1 |
| 3 Auto Menu Operation Manual                                     | 1 |
| 4 Expert Menu Operation Manual                                   | 1 |
| 5 CompoBus/D Connector (MSTB2.5/5-STF-5.08AU by Phoenix Contact) | 1 |

## 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

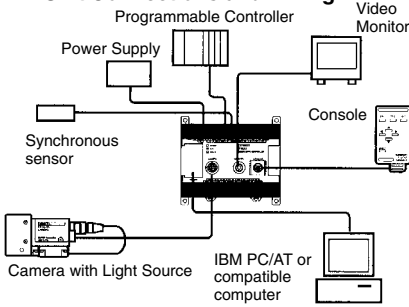
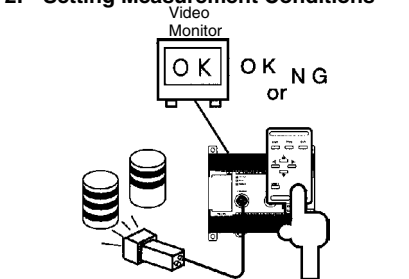
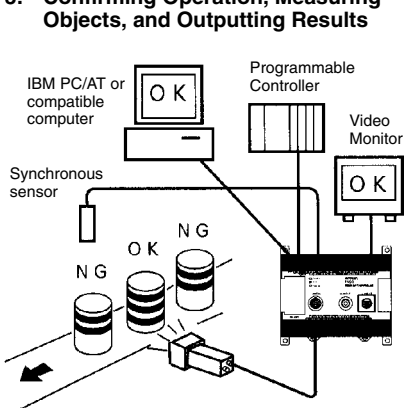
## Product Introduction

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

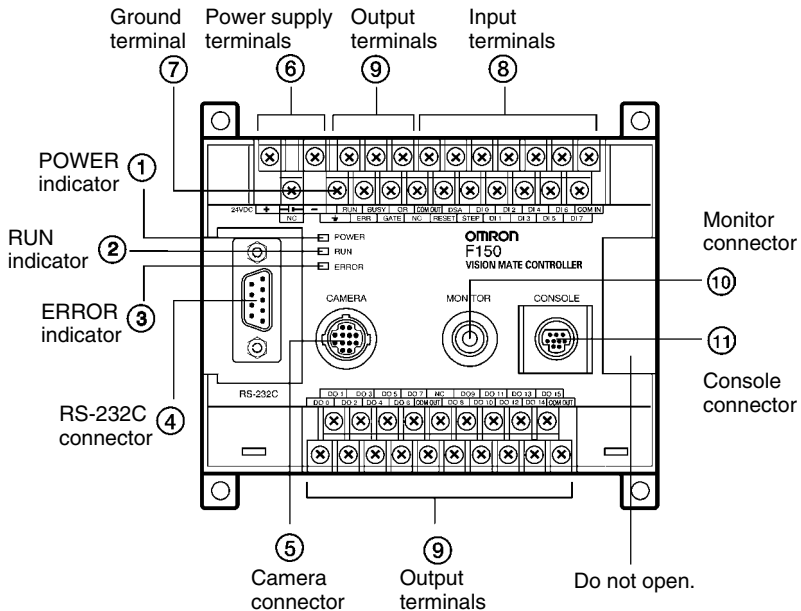
The following table shows the basic steps that must be performed to use the F150.

| Step  | Manual  |
|---|---|
| <p><b>1: Unit Connections and Wiring</b></p>  <p>Programmable Controller</p> <p>Power Supply</p> <p>Video Monitor</p> <p>Synchronous sensor</p> <p>Console</p> <p>Camera with Light Source</p> <p>IBM PC/AT or compatible computer</p> | <p>Setup Manual</p>   |
| <p><b>2: Setting Measurement Conditions</b></p>  <p>Video Monitor</p> <p>OK or NG</p> <p>OK NG or</p>   | <p><b>Easy Operation:</b><br/>Auto Menu<br/>Operation Manual</p> <p><b>Advanced Operation:</b><br/>Expert Menu<br/>Operation Manual</p> |
| <p><b>3: Confirming Operation, Measuring Objects, and Outputting Results</b></p>  <p>IBM PC/AT or compatible computer</p> <p>Programmable Controller</p> <p>Video Monitor</p> <p>Synchronous sensor</p> <p>OK NG</p> <p>OK NG</p>    |   |

## 2-2 Component Names and Functions

The following diagram shows the terminals, connectors, and indicators on the F150-C10E-2 and F150-C15E-2 Vision Mate Controller.

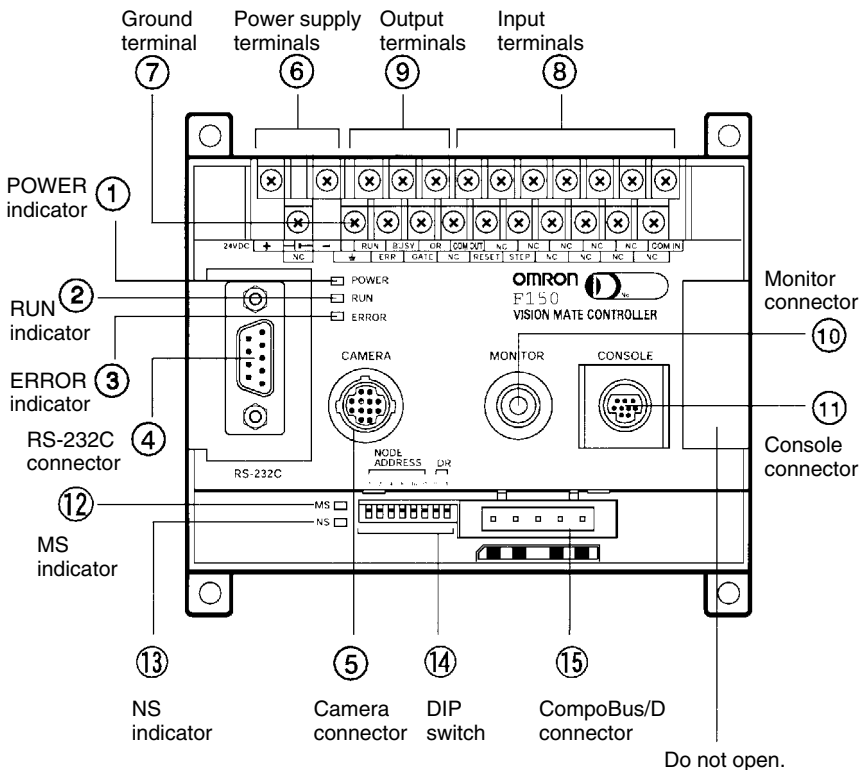
### F150-C10E-2 F150-C15E-2



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

**F150-C10E-2-DRT**

The F150-C10E-2-DRT can operate as a CompoBus/D Slave.





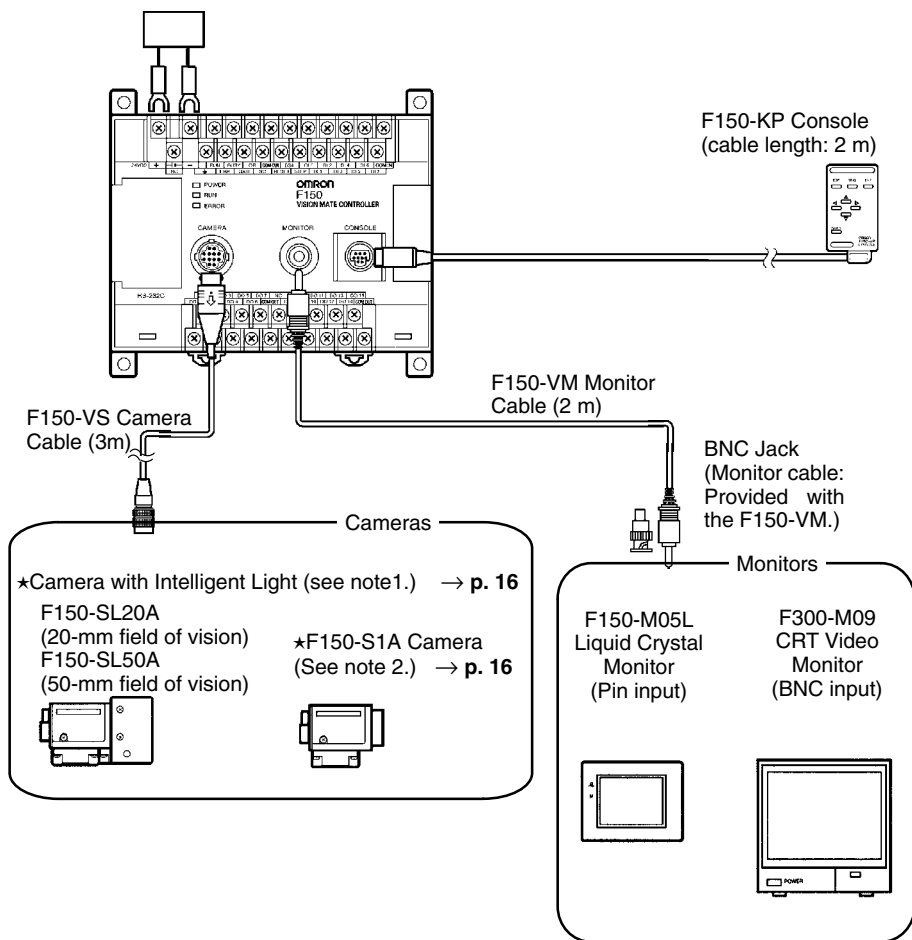
- 
- ① **POWER Indicator**  
Lit while power is ON.
  - ② **RUN Indicator**  
Lit in RUN mode.
  - ③ **ERROR Indicator**  
Lit when an error occurs.
  - ④ **RS-232C Connector**  
Connects the F150 to a computer, Programmable Controller, or other external device.
  - ⑤ **Camera Connector**  
Connects to the Camera.
  - ⑥ **Power Supply Terminals**  
Wired to the power supply.
  - ⑦ **Ground Terminal**  
Wired to the ground.
  - ⑧ **Input Terminals**  
Wired to external devices, such as synchronous sensors or inputs from a Programmable Controller.
  - ⑨ **Output Terminals**  
Wired to external devices, such as synchronous sensors or outputs to a Programmable Controller.
  - ⑩ **Monitor Connector**  
Connects to the video monitor.
  - ⑪ **Console Connector**  
Connects to the Console.
  - ⑫ **MS (Module Status) Indicator**  
Indicates the status of the F150 in CompoBus/D communications. Lit in green when the F150 is operating normally.
  - ⑬ **NS (Network Status) Indicator**  
Indicates the status of the network in CompoBus/D communications. Lit in green when the network is operating normally.
  - ⑭ **DIP Switch**  
Used to set the node address and baud rate.
  - ⑮ **CompoBus/D Connector**  
Connects the communications cable of the CompoBus/D network.

## 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.14.  
(OMRON's S82K-01524 and S82K-05024 recommended.)



**Note** 1. F150-SL Cameras are the same as F150-S1A Cameras except that they have a lens and a light attached.

- If the field of vision is too small, use the F150-S1A Camera with a normal CCTV lens and light. → p. 17

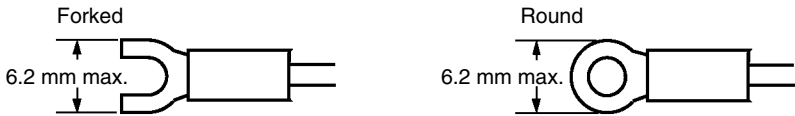
## 2-4 Power Supply and Ground

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. After wiring, confirm that wiring and screw tightening have been done properly.

**Caution** Cover the terminal blocks with the Terminal Block Protection Covers.

### 2-4-1 Crimp Terminals and Cables

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



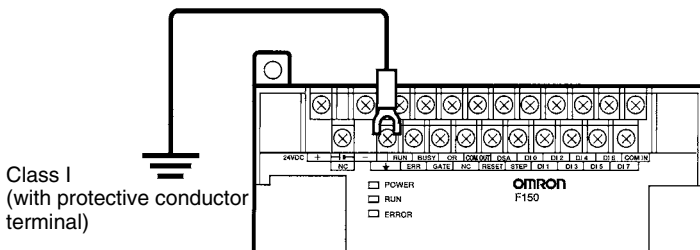
**Applicable wire size:** Insulated wire of 1.31 to 1.65 mm<sup>2</sup> (AWG16 to AWG15)

### 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

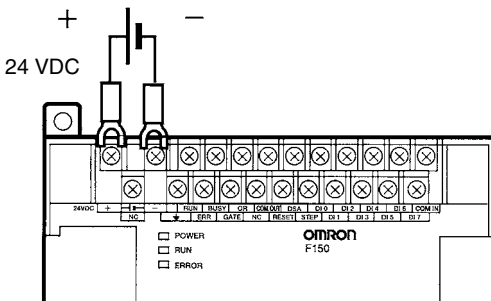
**Caution** Use a DC power supply with safe extra low-voltage circuits on the secondary side.

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 $+10\%/-15\%$ |

Use a power supply that meets the following specifications when connecting an F150 and an F150-M05L LCD Monitor to a single power supply. We recommend using OMRON's S82K-05024 Power Supply.

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



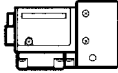
- Note**
1. Wire the Power Supply Unit independently of other devices. In particular, keep the power supply wired separately from inductive loads.
  2. Keep the power supply cable as short as possible (less than 10 m).
  3. If UL recognition is required, use a UL class II power supply.

## 2-5 Cameras with Lights

The Cameras with Lights are special cameras with a lens and light attached. The light and lens are a single unit and are thus compact and easy to mount.

### Cameras with F150-LT10A Light

The F150-SL20A and F150-SL50A are F150-S1A Cameras that are shipped with a lens and light attached.



| Field of vision | Model      |
|-----------------|------------|
| 20 mm           | F150-SL20A |
| 50 mm           | F150-SL50A |

### Camera Only

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



| Camera | Model    |
|--------|----------|
| Camera | F150-S1A |



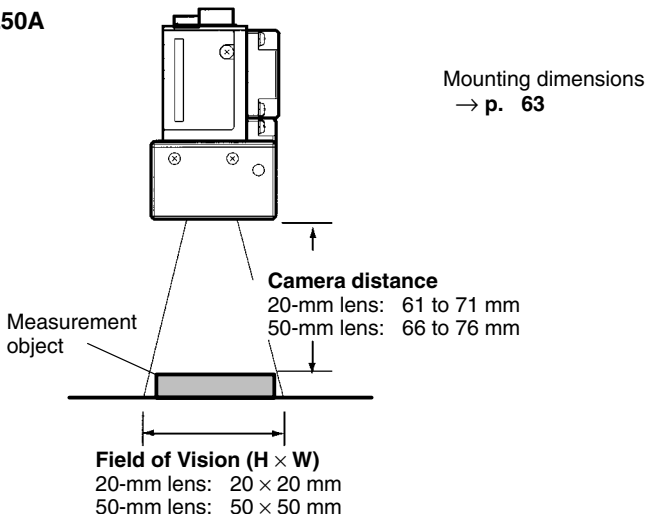
**Caution** The F150-S1A Camera must be used with the F150. Using other Cameras can damage the F150 or the Camera.

### Distance from Measurement Object

The Camera must be mounted at a distance from the measurement object where it can correctly view the object. The lens focus is fixed and the distance must be adjusted each time the lens or Camera is changed because the field of vision and focus vary from lens to lens.

The camera's set distance is an approximate value. The camera's mounting allows it to be adjusted slightly nearer to or farther from the object.

#### F150-SL20A/SL50A

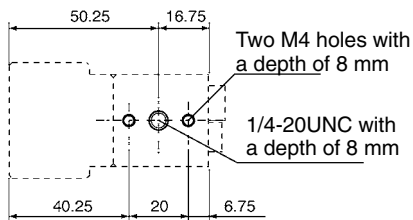


### Mounting the Camera

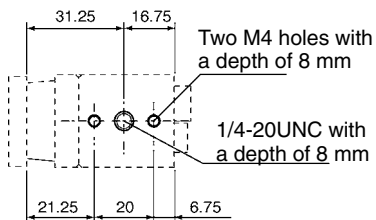
The specified camera distance is only an approximation. Mount the Camera so that it can be adjusted to either side of the specified distance from the measurement object.

Unit: mm

#### Camera with Light Source



#### Camera



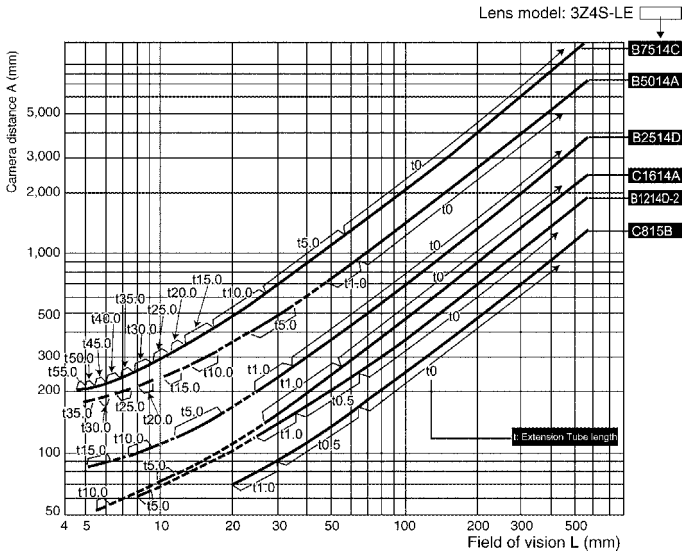
If the object size and field of vision are incompatible, attach a standard CCTV lens and light to the Camera. → p. 17

## 2-6 CCTV Lens

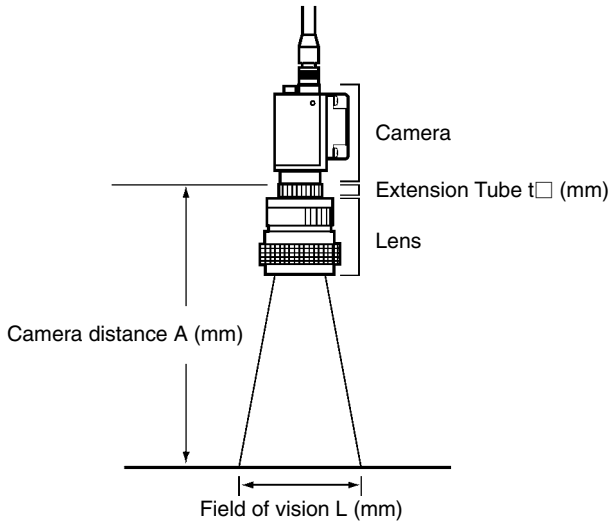
When using a F150-S1A Camera (without a light), refer to the following graph to select the appropriate Lens and Extension Tube. The lens will differ depending on the size of the measurement object and the distance from the Camera.

### 2-6-1 Optical Chart

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



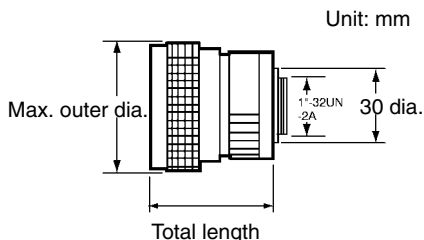
The X axis of the graph shows field of vision L (mm), and the Y axis shows the camera distance A (mm). The curves on the graph indicate different lenses, and the "t" values indicates the lengths of the Extension Tubes.





## 2-6-2 Lens

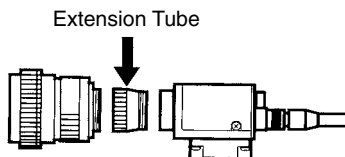
| Lens             | Focal length | Bright-ness | Maximum outer diameter | Total length | Filter size  |
|------------------|--------------|-------------|------------------------|--------------|--------------|
| 3Z4S-LE C418DX   | 4.8 mm       | F1.8        | 40.5-mm dia.           | 35.5 mm      | ---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



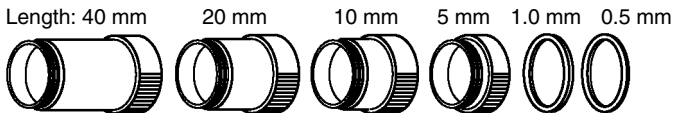
## 2-6-3 Extension Tubes

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<br>0.5 mm, 1 mm, 5 mm,<br>10 mm, 20 mm, and<br>40 mm |



## 2-7 Lighting

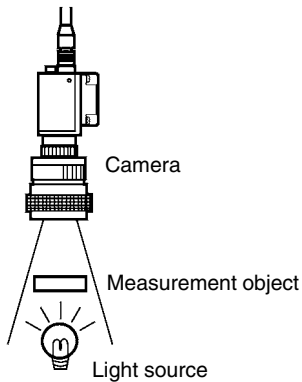
A stable image must be obtained to ensure accurate inspection. Use appropriate lighting for the application and the measurement object if using the F150-S1A Camera.

### 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

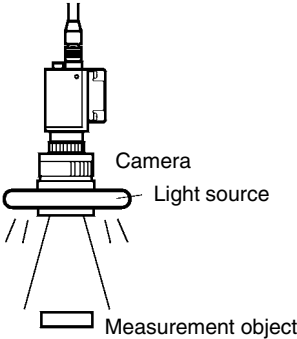


**Reflected Lighting**

**Ring Lights**

Light is shone uniformly on the measurement object.

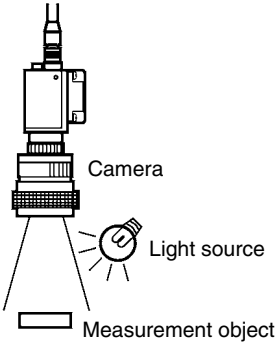
**Applications:** Surface inspections



**Oblique Lighting**

Detection can be made utilizing the difference in regular and dif-fuse reflected light.

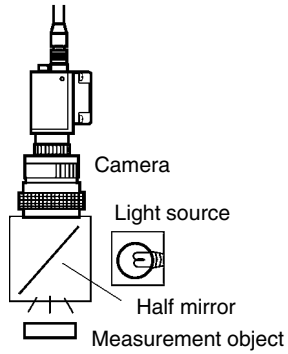
**Applications:** Inspections for surface gloss



**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

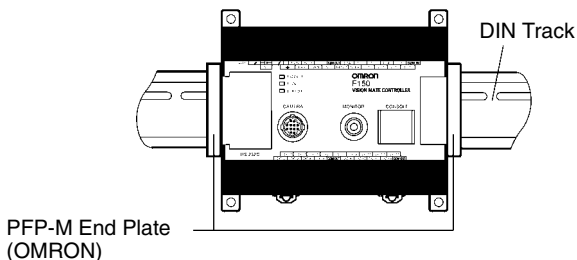


## 2-8 Mounting the Controller

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.

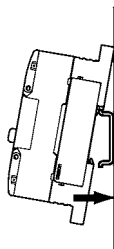


The following DIN Tracks are available from OMRON.

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

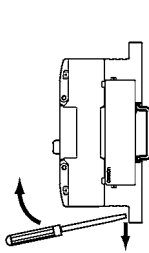
### Mounting the Controller

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.



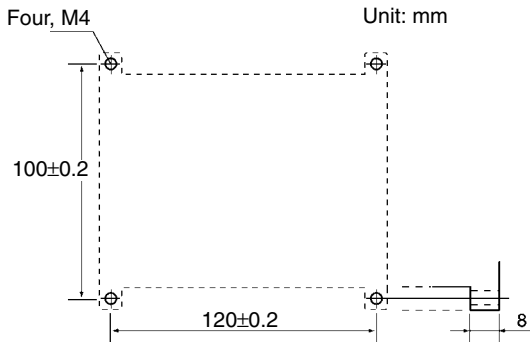
**Removing the Controller**

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.

|     |                                  |    |
|-----|----------------------------------|----|
| 3-1 | Terminal Block Application ..... | 26 |
| 3-2 | Crimp Terminals and Cables ..... | 26 |
| 3-3 | Specifications .....             | 27 |
| 3-4 | Terminals .....                  | 28 |

## 3-1 Terminal Block Application

The following table shows the functions that can be performed by the F150-2 using the terminal blocks. Refer to the *Auto Menu* and *Expert Menu Operation Manuals* for communications settings and I/O formats.

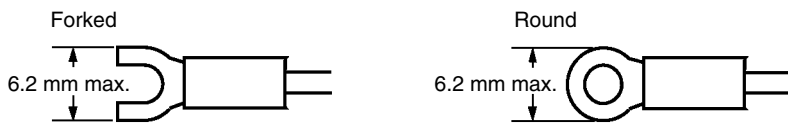
## 3-2 Crimp Terminals and Cables

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.

Confirm that wiring and tightening have been done properly.

Use a cable length not exceeding 30 m.

 **Caution** Cover the terminal blocks with the Terminal Block Protection Covers.



**Applicable wire size:** Insulated wire of 1.31 to 1.65 mm<sup>2</sup> (AWG16 to AWG15)



### 3-3 Specifications

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

#### Input Specifications

| Item              | F150-C10E-2, F150-C10E-2-DRT<br>(NPN model)    | F150-C15E-2<br>(PNP model) |
|-------------------|--|----------------------------|
| 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.<br>Others: 0.5 ms max. |                            |
| OFF delay         | RESET input: 15 ms max.<br>Others: 0.7 ms max. |                            |
| Internal circuits |  |                            |

#### Output Specifications

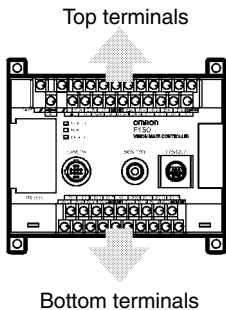
| Item                | F150-C10E-2, F150-C10E-2-DRT<br>(NPN model) | F150-C15E-2<br>(PNP model) |
|---------------------|---|----------------------------|
| Output voltage      | 12 to 24 VDC $\pm 10\%$                     |                            |
| Load current        | 45 mA max.                                  |                            |
| 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.

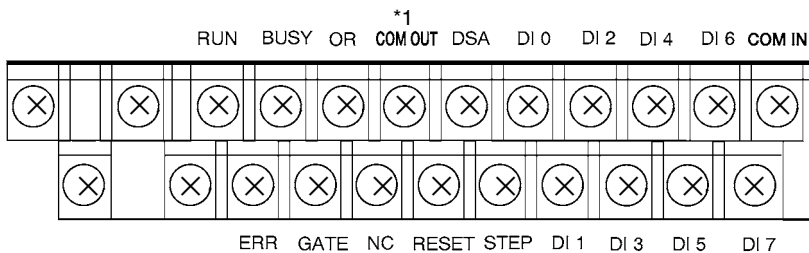
### 3-4 Terminals

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

#### F150-C10E-2 F150-C15E-2

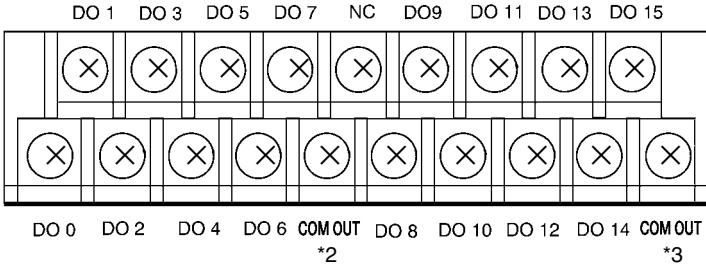


#### Top Terminals



| 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 F150-2  |
| 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

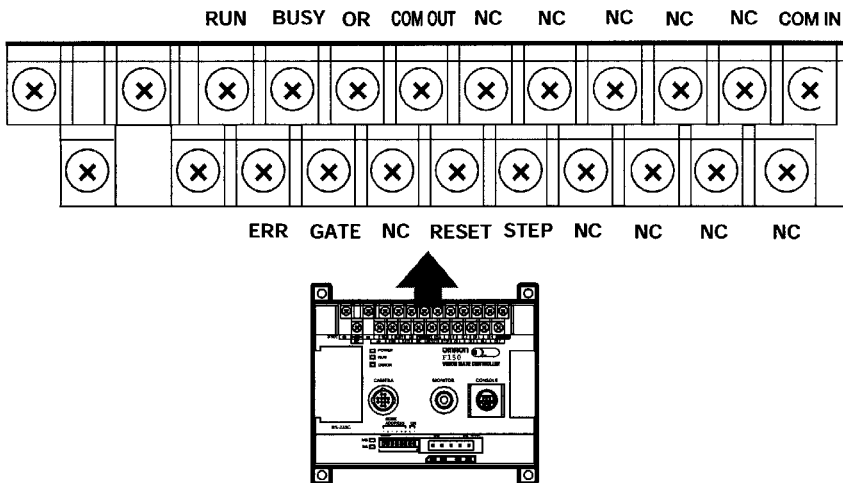


| Name/Application |                            | Name/Application |                            |
|------------------|----------------------------|------------------|----------------------------|
| DO 1             | Measurement results output | DO 0             | Measurement results output |
| DO 3             |                            | 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 input the RESET input immediately after turning ON the power. When using RESET input to synchronize execution timing, wait at least 1 s after turning ON the F150-2 power supply before turning ON the RESET terminal.

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

**F150-C10E-2-DRT**



| Name/Application |               | Name/Application |               |
|------------------|---------------|------------------|---------------|
| RUN              |               | ERR              | Error output  |
| BUSY             |               | GATE             |               |
| OR               |               | NC               | Not connected |
| COM OUT          |               | RESET            | Resets F150-2 |
| NC               | Not connected | STEP             |               |
| NC               |               | NC               | Not connected |
| NC               |               | NC               |               |
| NC               |               | NC               |               |
| NC               |               | NC               |               |
| COM IN           |               | ---              |               |

**! Caution** Do not input the RESET input immediately after turning ON the power. When using RESET input to synchronize execution timing, wait at least 1 s after turning ON the F150-2 power supply before turning ON the RESET terminal.

**! 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.

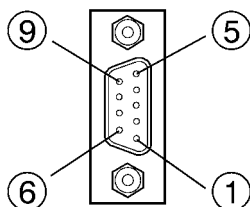
|     |                                |    |
|-----|--------------------------------|----|
| 4-1 | RS-232C Port Application ..... | 32 |
| 4-2 | Connector .....                | 32 |
| 4-3 | Wiring .....                   | 33 |
| 4-4 | Connection .....               | 34 |

## 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.

## 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   |

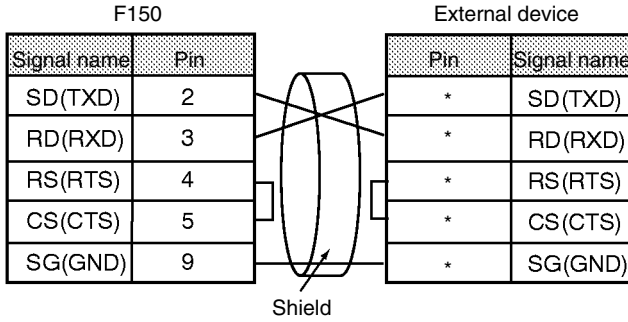
The following plug and hood are recommended and are available from OMRON.

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

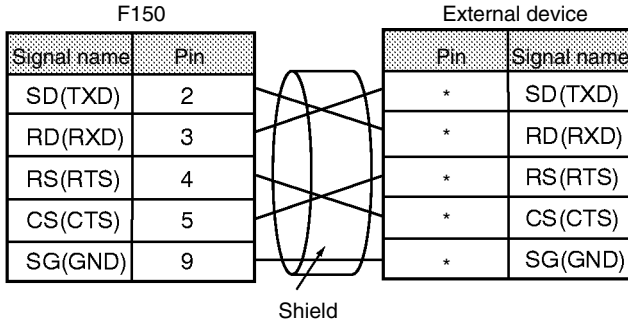
# 4-3 Wiring

Use only shielded RS-232C cable.

## Standard Connections



## Connections for RS/CS Control

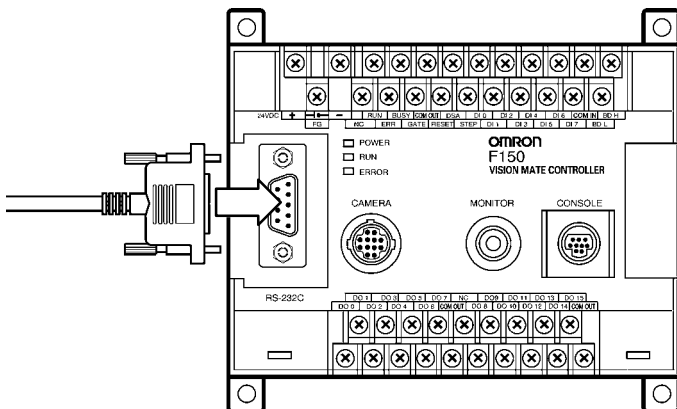


**Note** Pin numbers on the external device will depend on the device being connected. Refer to the manual for the device being connected.

# 4-4 Connection

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

**Caution** Always turn OFF the power supply before connecting or disconnecting cables. Peripheral devices can be damaged if connected or disconnected with the power supply turned ON.



**Note** Always tighten the connector screws.



# SECTION 5

## CompoBus/D Connections

This section describes how to connect the F150-C10E-2-DRT Vision Sensor as a CompoBus/D Slave and provides information such as connector pin allocations, node number settings, and baud rate settings.

Refer to the *CompoBus/D (DeviceNet) Operation Manual (W267-E1-4)* for details on CompoBus/D communications specifications.

Refer to the *Auto Menu Operation Manual* or *Expert Menu Operation Manual* for details on setting the Vision Sensor's communications specifications and changing the I/O format.

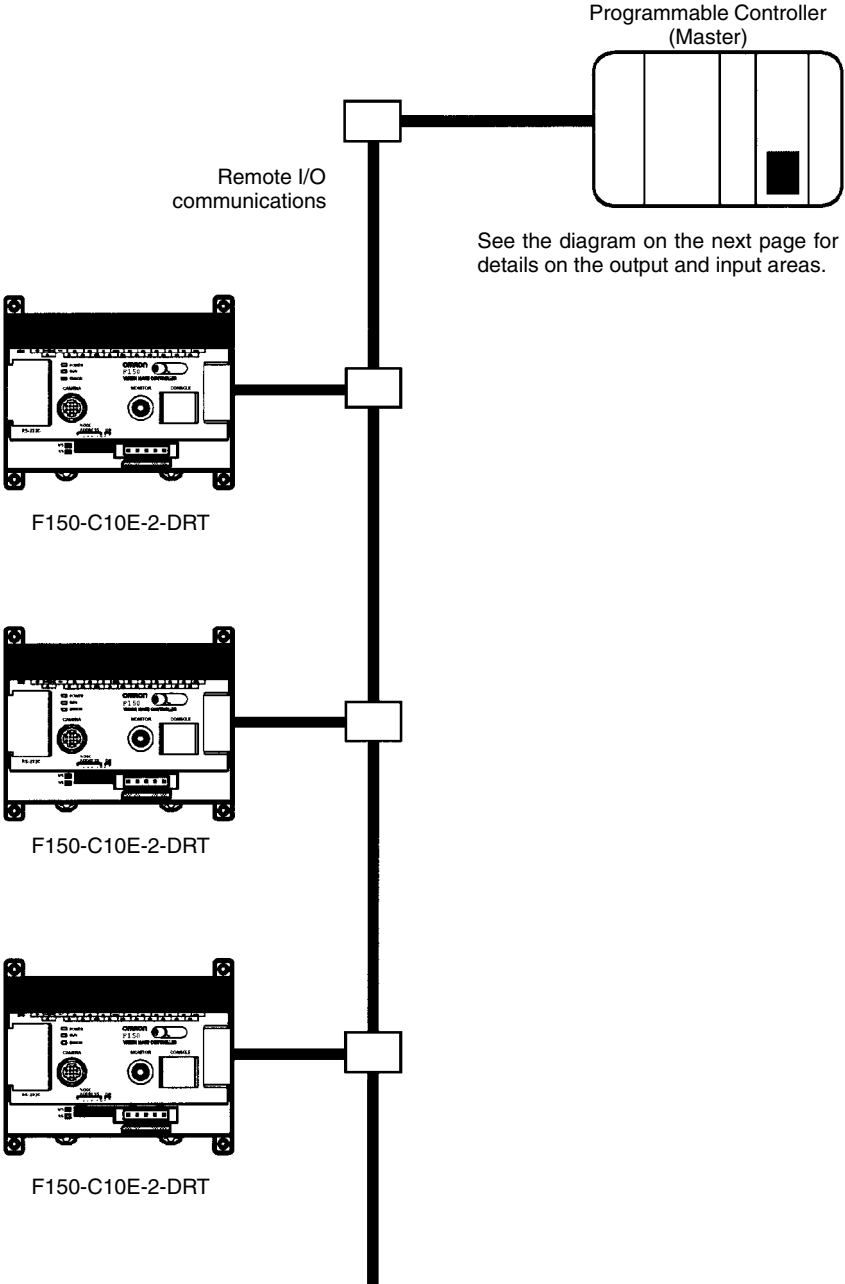
|     |                                     |    |
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## 5-1 Overview

CompoBus/D is a multi-bit, multi-vendor network that conforms to DeviceNet open field network specifications. The F150-C10E-2-DRT Vision Sensor operates as a CompoBus/D Slave and data is automatically transferred between the Slave and Master by remote I/O communications.

The number of I/O bytes handled by the Vision Sensor depends upon the communications specifications settings, so be sure to set the Vision Sensor's communications specifications before registering the Master's scan list.

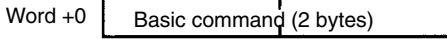
Refer to the *Auto Menu Operation Manual* or *Expert Menu Operation Manual* for details on setting the Vision Sensor's communications specifications and changing the I/O format.



**Output Area**

Write commands are directed to the F150 in this area. The number of bytes in the area depends upon the input mode (basic or expand) that is selected.

Basic

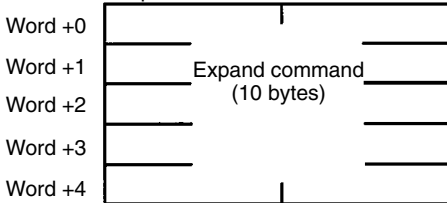


Only a few words are occupied.

Commands such as the measurement and scene change commands can be used.

(Only basic mode can be used with the Auto Menu.)

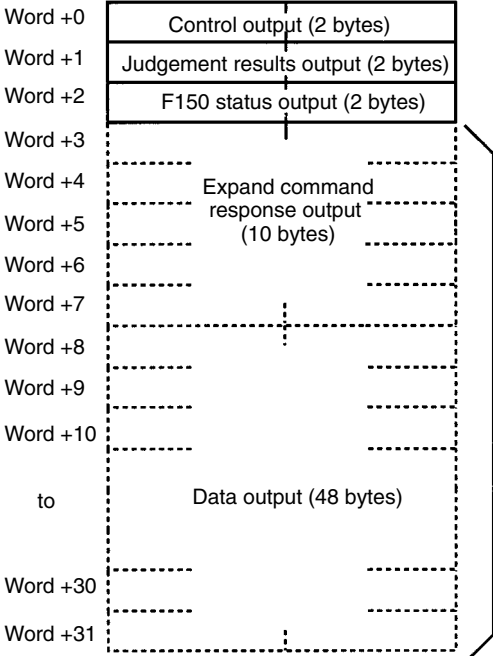
Expand



A variety of commands other than the measurement command can be used, such as parameter setting and reading commands. Various F150's functions can be used.

**Input Area**

The measurement results (execution results) from the F150 are output to this area.



These outputs can be enabled or disabled. When the “expand command response output” is disabled, the data output will be shifted up to word +3.

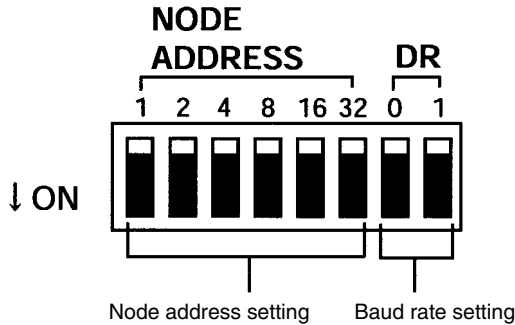
## 5-2 Communications Specifications

| Item  |             | Specification   |
|---|-------------|---|
| Communications protocol                             |             | DeviceNet   |
| Supported connections (see note 1) (communications) |             | Master-Slave: Remote I/O communications and explicit message/communications                                       |
| Connection formats (see note 2)                     |             | Multi-drop and T-branch connections can be combined (for trunk or drop lines)                                     |
| Baud rate   |             | 125K bps, 250K bps, or 500K bps (Set on the DIP switch.)  |
| Communications media                                |             | Special 5-conductor cable (2 signal lines, 2 power lines, 1 shield)   |
| Communications distances                            | 500K bps    | Network length: 100 m max. (see note 3)<br>Drop line length: 6 m max.<br>Total drop line length: 39 m max.        |
|   | 250K bps    | Network length: 250 m max. (see note 3)<br>Drop line length: 6 m max.<br>Total drop line length: 78 m max.        |
|   | 125K bps    | Network length: 500 m max. (see note 3)<br>Drop line length: 6 m max.<br>Total drop line length: 156 m max.       |
| Communications power supply                         |             | 11 to 25 VDC  |
| Node number   |             | 0 to 63 (Set on the DIP switch.)  |
| Words used in Master (see note 4)                   | Output area | 1 word (2 bytes) or 5 words (10 bytes) (Set to 1 word when shipped.)  |
|   | Input area  | 3 words (6 bytes), 8 words (16 bytes), 27 words (54 bytes), or 32 words (64 bytes) (Set to 3 words when shipped.) |
| Error control checks                                |             | CRC error check   |

- Note**
1. Only remote I/O communications are supported in the Vision Sensor's Auto Menu and Expert Menu. Explicit message communications are not supported.
  2. A terminator must be connected at each end of the trunk line.
  3. These values are valid when thick cable is used for the trunk line. The maximum network length is 100 m max. when thin cable is used.
  4. Set the number of words in the Menu. Reset the entire network after changing these settings.

## 5-3 DIP Switch Settings

The node address and baud rate are set on the DIP switch. Be sure to turn OFF the power supply (including the communications power supply) before changing DIP switch settings.

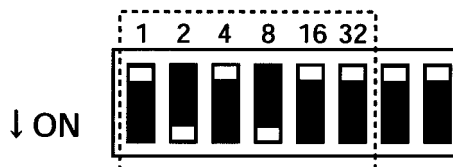


**Note** Set the same baud rate on all nodes (Master and Slaves) in the network. If the F150 is not set to the correct baud rate, it will be unable to participate in the network and communications errors may occur in communications between nodes with correct node address settings.

### Node Address Setting (0 to 63)

Set the node address in binary with pins 1 through 6. These pins have values of 1, 2, 4, 8, 16, and 32 (left to right). The node address is set to 0 when the Sensor is shipped.

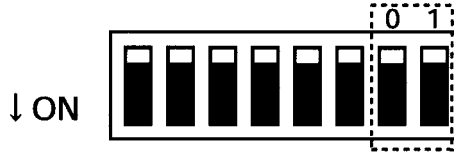
The following diagram shows the node address set to 10. The pins with values 2 and 8 are turned ON.



**Baud Rate Setting (125K bps, 250K bps, or 500K bps)**

Pins 7 and 8 set the baud rate as shown in the following diagrams.

- 125K bps (factory setting)



- 250K bps

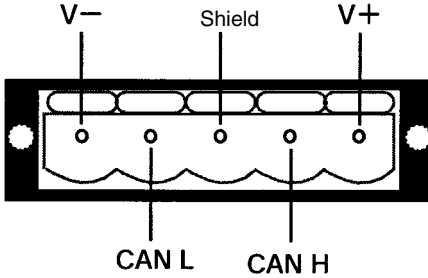
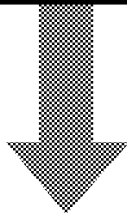
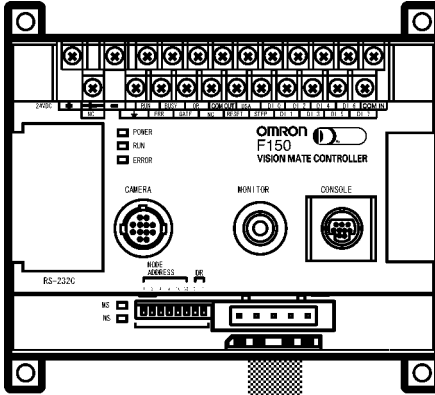


- 500K bps





# 5-4 Connector Pin Allocation



| Name   | Function                   | Color |
|--------|----------------------------|-------|
| V-     | Power supply line (-)      | Black |
| CAN L  | Communications data (Low)  | Blue  |
| Shield | Shield                     | ---   |
| CAN H  | Communications data (High) | White |
| V+     | Power supply line (+)      | Red   |

Refer to the *CompoBus/D (DeviceNet) Operation Manual* for details on assembling a communications cable.

- Note**
1. Turn OFF the power supply before connecting or disconnecting the cable. Peripheral devices may be damaged if the cable is connected or disconnected with the power ON.
  2. Securely tighten the connector screws.

## 5-5 LED Indicators

The status of CompoBus/D communications is indicated by the MS and NS indicators.

### **MS (Module Status) Indicator**

The MS indicator shows the status of node (F150) itself. The indicator will be lit green when the F150 is operating normally.

### **NS (Network Status) Indicator**

The NS indicator shows the status of network. The indicator will be lit green when the network is operating normally.

**Note** The MS and NS indicators are lit in green or red. The status of these indicators (lit, flashing, or not lit) can be used to determine what error has occurred.

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## 5-6 Multi-vendor Applications

Use the Vision Sensor's specifications as well as the Device Protocol and Object Mounting information shown in the following tables when the F150-C10E-2-DRT is connected to another company's Master.

### **Device Protocol**

|                           |  |   |
|---------------------------|--|---|
| General data              | Compatible DeviceNet Specifications    | Volume I - Release 2.0<br>Volume II - Release 2.0 |
|                           | Vendor name                            | OMRON Corporation, vendor ID = 47                 |
|                           | Device type                            | Generic, protocol number = 0                      |
|                           | Product code                           | 203   |
| Physical conformance data | Network current consumption            | 55 mA max.  |
|                           | Connector type                         | Open plug   |
|                           | Physical insulation                    | Yes   |
|                           | Supported indicators                   | Module, Network                                   |
|                           | MAC ID setting                         | DIP switch  |
|                           | Default MAC ID                         | 0   |
|                           | Baud rate setting                      | DIP switch  |
|                           | Supported baud rates                   | 125K bps, 250K bps, and 500K bps                  |
| Communications data       | Predefined Master/Slave connection set | Group 2 only server                               |
|                           | Dynamic connection support (UCMM)      | No  |
|                           | Explicit message fragmentation support | Yes   |

## Object Mounting

### Identity Object (0x01)

|              |           |               |
|--------------|-----------|---------------|
| Object class | Attribute | Not supported |
|              | Service   | Not supported |

| Item            |           | ID content                | Get (read) | Set (write) | Value                |
|-----------------|-----------|---------------------------|------------|-------------|----------------------|
| Object instance | Attribute | 1 Vendor                  | Yes        | No          | 47                   |
|                 |           | 2 Product type            | Yes        | No          | 0                    |
|                 |           | 3 Product code            | Yes        | No          | 203                  |
|                 |           | 4 Revision                | Yes        | No          | 2.1                  |
|                 |           | 5 Status (bits supported) | Yes        | No          | Bit 0 and bit 10     |
|                 |           | 6 Serial number           | Yes        | No          | Unique for each Unit |
|                 |           | 7 Product name            | Yes        | No          | F150-C10E-2          |
|                 |           | 8 State                   | No         | No          | ---                  |

| Item            |         | DeviceNet service       | Parameter option |
|-----------------|---------|-------------------------|------------------|
| Object instance | Service | 05 Reset                | No               |
|                 |         | 0E Get_Attribute_Single | No               |

### Message Router Object (0x02)

|                               |           |               |
|-------------------------------|-----------|---------------|
| Object class                  | Attribute | Not supported |
|                               | Service   | Not supported |
| Object instance               | Attribute | Not supported |
|                               | Service   | Not supported |
| Vendor specification addition |           | No            |

### DeviceNet Object (0x03)

| Item            |           | ID content | Get (read) | Set (write) | Value            |
|-----------------|-----------|------------|------------|-------------|------------------|
| Object instance | Attribute | 1 Revision | Yes        | No          | 02 (hexadecimal) |

| Item         |         | DeviceNet service       | Parameter option |
|--------------|---------|-------------------------|------------------|
| Object class | Service | 0E Get_Attribute_Single | No               |

| Item            |           | ID content                 | Get (read) | Set (write) | Value            |
|-----------------|-----------|----------------------------|------------|-------------|------------------|
| Object instance | Attribute | 1 MAC ID                   | Yes        | No          | ---              |
|                 |           | 2 Baud rate                | Yes        | No          | ---              |
|                 |           | 3 BOI                      | Yes        | No          | 00 (hexadecimal) |
|                 |           | 4 Bus Off counter          | Yes        | No          | ---              |
|                 |           | 5 Allocation information   | Yes        | No          | ---              |
|                 |           | 6 MAC ID switch changed    | No         | No          | ---              |
|                 |           | 7 Baud rate switch changed | No         | No          | ---              |
|                 |           | 8 MAC ID switch value      | No         | No          | ---              |
|                 |           | 9 Baud rate switch value   | No         | No          | ---              |

| Item            |         | DeviceNet service                       | Parameter option |
|-----------------|---------|---|------------------|
| Object instance | Service | 0E Get_Attribute_Single                 | No               |
|                 |         | 4B Allocate_Master/Slave_Connection_Set | No               |
|                 |         | 4C Release_Master/Slave_Connection_Set  | No               |

**Assembly Object (0x04)**

|              |           |               |
|--------------|-----------|---------------|
| Object class | Attribute | Not supported |
|              | Service   | Not supported |

| Item              | Section       | Information | Max. number of instances |
|-------------------|---------------|-------------|--------------------------|
| Object instance 1 | Instance type | Static I/O  | 1                        |

| Item              |           | Content                     | Get (read) | Set (write) | Value |
|-------------------|-----------|-----------------------------|------------|-------------|-------|
| Object instance 1 | Attribute | 1 Number of Members in List | No         | No          | ---   |
|                   |           | 2 Members List              | No         | No          | ---   |
|                   |           | 3 Data                      | Yes        | Yes         | ---   |

| Item              |         | DeviceNet service       | Parameter option |
|-------------------|---------|-------------------------|------------------|
| Object instance 1 | Service | 0E Get_Attribute_Single | No               |
|                   |         | 10 Set_Attribute_Single | No               |

**Connection Object (0x05)**

|              |                                   |               |
|--------------|-----------------------------------|---------------|
| Object class | Attribute                         | Not supported |
|              | Service                           | Not supported |
|              | Max. number of active connections | 1             |

| Item              | Section            | Information      | Max. number of instances |
|-------------------|--------------------|------------------|--------------------------|
| Object instance 1 | Instance type      | Explicit Message | 1                        |
|                   | Production trigger | Cyclic           | ---                      |
|                   | Transport type     | Server           | ---                      |
|                   | Transport class    | 3                | ---                      |

| Item                       |           | ID content                         | Get (read) | Set (write) | Value              |
|----------------------------|-----------|------------------------------------|------------|-------------|--------------------|
| Object instance 1          | Attribute | 1 State                            | Yes        | No          | ---                |
|                            |           | 2 Instance type                    | Yes        | No          | 00 (hexadecimal)   |
|                            |           | 3 Transport class trigger          | Yes        | No          | 83 (hexadecimal)   |
|                            |           | 4 Produced connection ID           | Yes        | No          | ---                |
|                            |           | 5 Consumed connection ID           | Yes        | No          | ---                |
|                            |           | 6 Initial comm. characteristics    | Yes        | No          | 21 (hexadecimal)   |
|                            |           | 7 Produced connection size         | Yes        | No          | FE00 (hexadecimal) |
|                            |           | 8 Consumed connection size         | Yes        | No          | FE00 (hexadecimal) |
|                            |           | 9 Expected packet rate             | Yes        | Yes         | ---                |
|                            |           | 12 Watchdog time-out action        | Yes        | Yes         | One of 01, 03      |
|                            |           | 13 Produced connection path length | Yes        | ---         | 0000               |
|                            |           | 14 Produced connection path        | Yes        | No          | ---                |
|                            |           | 15 Consumed connection path length | Yes        | No          | 0000               |
|                            |           | 16 Consumed connection path        | Yes        | No          | ---                |
| 17 Production inhibit time | Yes       | No                                 | ---        |             |                    |

| Item              |         | DeviceNet service       | Parameter option |
|-------------------|---------|-------------------------|------------------|
| Object instance 1 | Service | 05 Reset                | No               |
|                   |         | 0E Get_Attribute_Single | No               |
|                   |         | 10 Set_Attribute_Single | No               |

| Item              | Section            | Information | Max. number of instances |
|-------------------|--------------------|-------------|--------------------------|
| Object instance 2 | Instance type      | Polled I/O  | 1                        |
|                   | Production trigger | Cyclic      | ---                      |
|                   | Transport type     | Server      | ---                      |
|                   | Transport class    | 2           | ---                      |

| Item                       |           | ID content                         | Get (read) | Set (write) | Value  |
|----------------------------|-----------|------------------------------------|------------|-------------|--|
| Object instance 2          | Attribute | 1 State                            | Yes        | No          | ---  |
|                            |           | 2 Instance type                    | Yes        | No          | 01 (hexadecimal)   |
|                            |           | 3 Transport class trigger          | Yes        | No          | 82 (hexadecimal)   |
|                            |           | 4 Produced connection ID           | Yes        | No          | ---  |
|                            |           | 5 Consumed connection ID           | Yes        | No          | ---  |
|                            |           | 6 Initial comm. characteristics    | Yes        | No          | 01 (hexadecimal)   |
|                            |           | 7 Produced connection size         | Yes        | No          | See note 1.  |
|                            |           | 8 Consumed connection size         | Yes        | No          | See note 2.  |
|                            |           | 9 Expected packet rate             | Yes        | Yes         | ---  |
|                            |           | 12 Watchdog time-out action        | Yes        | No          | 00   |
|                            |           | 13 Produced connection path length | Yes        | No          | 0000 (No inputs)<br>0600 (With inputs)                       |
|                            |           | 14 Produced connection path        | Yes        | No          | No data (no inputs)<br>20_04_24_01_<br>30_03 (with inputs)   |
|                            |           | 15 Consumed connection path length | Yes        | No          | 0000 (no outputs)<br>0600 (with outputs)                     |
|                            |           | 16 Consumed connection path        | Yes        | No          | No data (no outputs)<br>20_04_24_01_<br>30_03 (with outputs) |
| 17 Production inhibit time | Yes       | No                                 | 00         |             |  |

- Note**
1. Indicates the number of input bytes used by the Slave. The leftmost and rightmost bytes are reversed. (For example, the produced connection size = 4000 when 64 bytes are used.)
  2. Indicates the number of output bytes used by the Slave. The leftmost and rightmost bytes are reversed. (For example, the consumed connection size = 4000 when 64 bytes are used.)

| Item              |         | DeviceNet service       | Parameter option |
|-------------------|---------|-------------------------|------------------|
| Object instance 2 | Service | 05 Reset                | No               |
|                   |         | 0E Get_Attribute_Single | No               |
|                   |         | 10 Set_Attribute_Single | No               |

| Item              | Section            | Information     | Max. number of instances |
|-------------------|--------------------|-----------------|--------------------------|
| Object instance 3 | Instance type      | Bit strobed I/O | 1                        |
|                   | Production trigger | Cyclic          | ---                      |
|                   | Transport type     | Server          | ---                      |
|                   | Transport class    | 2               | ---                      |

| Item                       |           | ID content                         | Get (read) | Set (write) | Value              |
|----------------------------|-----------|------------------------------------|------------|-------------|--------------------|
| Object instance 3          | Attribute | 1 State                            | Yes        | No          | ---                |
|                            |           | 2 Instance type                    | Yes        | No          | 01 (hexadecimal)   |
|                            |           | 3 Transport class trigger          | Yes        | No          | 82 (hexadecimal)   |
|                            |           | 4 Produced connection ID           | Yes        | No          | ---                |
|                            |           | 5 Consumed connection ID           | Yes        | No          | ---                |
|                            |           | 6 Initial comm. characteristics    | Yes        | No          | 02 (hexadecimal)   |
|                            |           | 7 Produced connection size         | Yes        | No          | See note.          |
|                            |           | 8 Consumed connection size         | Yes        | No          | 0800 (hexadecimal) |
|                            |           | 9 Expected packet rate             | Yes        | Yes         | ---                |
|                            |           | 12 Watchdog time-out action        | Yes        | No          | 00                 |
|                            |           | 13 Produced connection path length | Yes        | No          | 0600               |
|                            |           | 14 Produced connection path        | Yes        | No          | 20_04_24_01_30_03  |
|                            |           | 15 Consumed connection path length | Yes        | No          | 0000               |
|                            |           | 16 Consumed connection path        | Yes        | No          | No data            |
| 17 Production inhibit time | Yes       | No                                 | 00         |             |                    |

**Note** Indicates the number of input bytes used by the Slave. The left-most and rightmost bytes are reversed. (For example, the produced connection size = 0800 when 8 bytes are used.)  
 With the bit-strobed interface, the maximum produced connection size is 8 bytes. A produced connection size of 8 bytes (0800) will be used if a higher value has been set for the number of input bytes with the user MPU; the set value will be used if it is 8 bytes or less.

| Item              |         | DeviceNet service       | Parameter option |
|-------------------|---------|-------------------------|------------------|
| Object instance 3 | Service | 05 Reset                | No               |
|                   |         | 0E Get_Attribute_Single | No               |
|                   |         | 10 Set_Attribute_Single | No               |



# SECTION 6

## Troubleshooting

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

|     |                                     |    |
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| 6-1 | Connection Errors .....             | 52 |
| 6-2 | Errors during Menu Operation .....  | 52 |
| 6-3 | Terminal Block Errors .....         | 52 |
| 6-4 | RS-232C Communications Errors ..... | 53 |
| 6-5 | LED Indicators .....                | 54 |

## 6-1 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.                                  |
|   | When using an LCD Monitor, the power supply capacity is insufficient. |
| 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.                                    |
|   | 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.                         |

## 6-2 Errors during Menu Operation

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

## 6-3 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 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 F150 is not in Run mode.            |

## 6-4 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 <b>System/Communications settings</b>.</p> <p>Select <b>Normal</b>, <b>Host link</b>, or <b>Menu operations</b> under <b>RS-232C/Operating mode</b>.</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 <b>System/Communications settings/Menu operations</b> .  |

## 6-5 LED Indicators

| Indicator Status |                | Condition   | Remarks   |   |
|------------------|----------------|---|---|---|
| MS               | NS             |   |   |   |
| Lit green        | Lit green      | Remote I/O communications in progress.              | Communications are operating normally.  |   |
|                  | OFF            | Node number duplication check in progress.          | Check for the following problems and restart the F150. <ul style="list-style-type: none"> <li>• Are the baud rate settings the same on the Master and F150?</li> <li>• Are the cable lengths (trunk and branch lines) within specifications?</li> </ul> |   |
|                  | Flashing green | Waiting for connection to be established by Master. | <ul style="list-style-type: none"> <li>• Are any cables loose or broken?</li> <li>• Is there a terminator on each end of the trunk line?</li> <li>• Is there excessive noise in the network?</li> </ul>   |   |
|                  | Lit red        | Lit red   | Node number duplication   | Change the node number settings to eliminate the duplication and then restart the entire CompoBus/D network.  |
|                  |                |   | Bus off occurred. (Communications stopped due to excessive data errors.)  | Check for the following problems and restart the F150. <ul style="list-style-type: none"> <li>• Are the baud rate settings the same on the Master and F150?</li> <li>• Are the cable lengths (trunk and branch lines) within specifications?</li> </ul> |
| Flashing red     | Flashing red   | Communications timeout occurred.                    | <ul style="list-style-type: none"> <li>• Are any cables loose or broken?</li> <li>• Is there a terminator on each end of the trunk line?</li> <li>• Is there excessive noise in the network?</li> </ul>   |   |
| Lit red          | OFF            | Watchdog timer error occurred in the F150.          | The F150 is faulty. Replace the F150.   |   |
| Flashing red     | OFF            | Incorrect setting on the DIP switch or elsewhere.   | Check the switch settings and restart the F150.   |   |

# **SECTION 7**

## **Maintenance**

This section provides information on maintenance and inspection.

|     |   |    |
|-----|---|----|
| 7-1 | Maintenance Parts and Replacement ..... | 56 |
| 7-2 | Regular Inspections .....               | 57 |

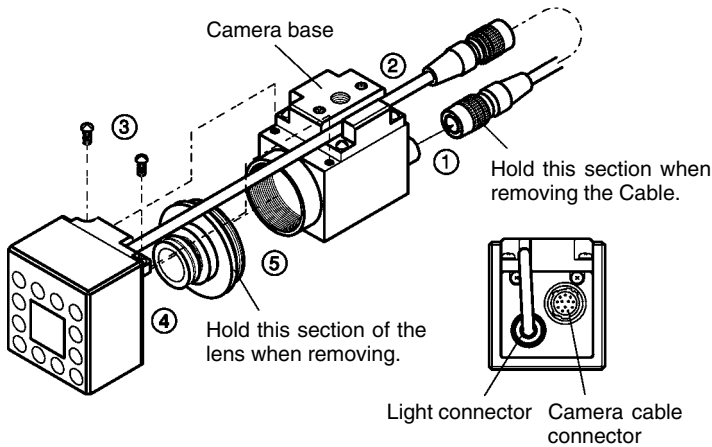
## 7-1 Maintenance Parts and Replacement

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.


## 7-2 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.<br>Each cable connector must be correctly inserted and locked.<br>The Cameras must be firmly secured.<br>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 8

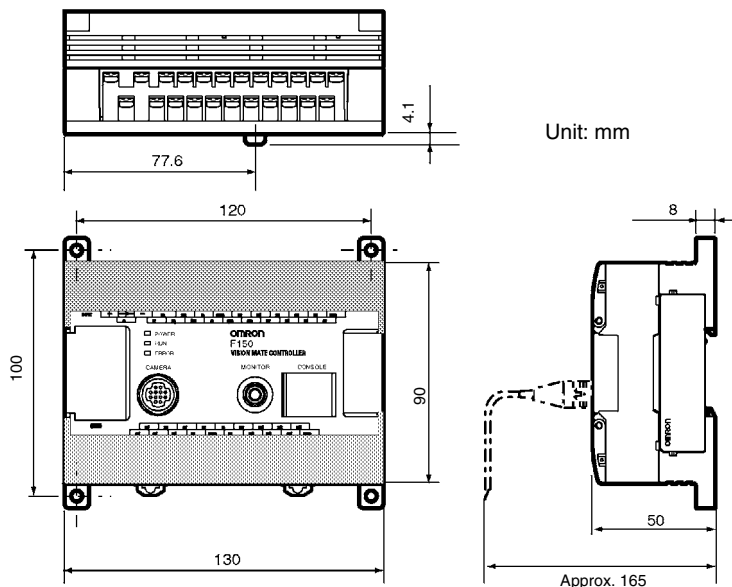
## Specifications

This section provides the specifications of the F150 components.

|     |                                   |    |
|-----|-----------------------------------|----|
| 8-1 | F150 Vision Mate Controller ..... | 60 |
| 8-2 | K150-KP Console .....             | 62 |
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| 8-5 | F150-LT10A Light .....            | 65 |
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| 8-8 | LCD Monitor .....                 | 68 |

# 8-1 F150 Vision Mate Controller

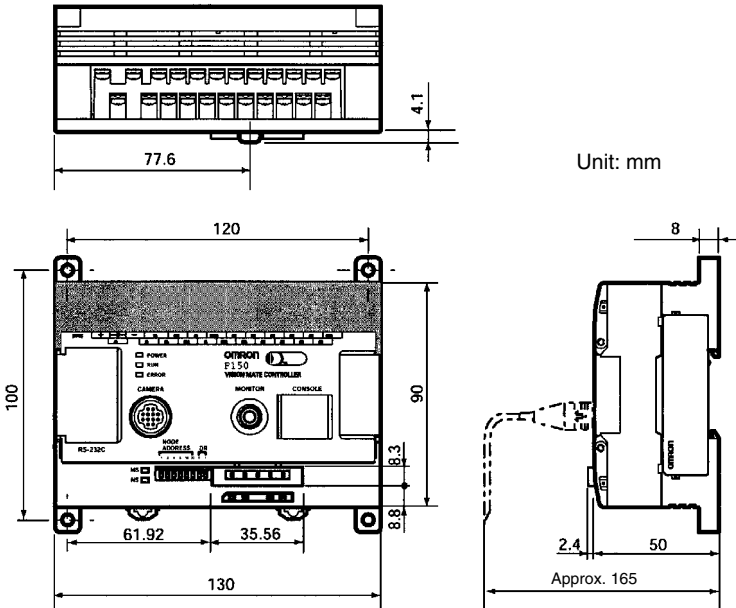
F150-C10E-2, F150-C15E-2



| Item                  | Specification  |             |
|-----------------------|--|-------------|
| Model                 | F150-C10E-2  | F150-C15E-2 |
| Input/Output type     | NPN  | PNP         |
| Supply voltage        | 24 VDC (+10%, -15%)  |             |
| Current consumption   | Approx. 0.5 A  |             |
| Insulation resistance | 20 M $\Omega$ 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 $\mu$ s/ 1 $\mu$ s; rising time: 1 ns (pulse)  |             |
| Vibration resistance  | 10 to 150 Hz; half-amplitude: 0.5 mm; maximum acceleration: 70 m/s <sup>2</sup> , 4 times for 8 minutes each in 3 directions |             |
| Shock resistance      | 200 m/s <sup>2</sup> , 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 (without cable)  |             |

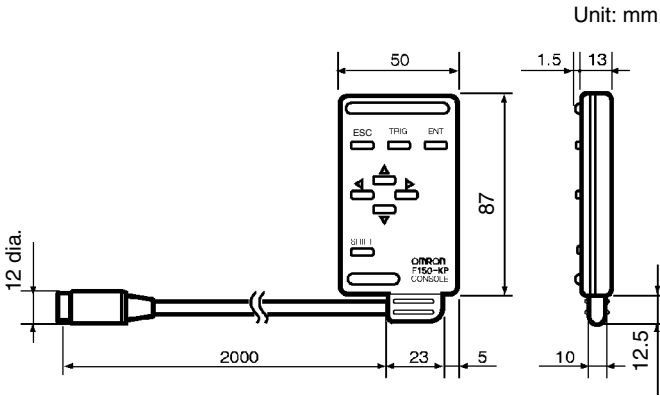
F150-C10E-2-DRT

The F150-C10E-2-DRT can operate as a CompoBus/D Slave.



| Item                  | Specification  |
|-----------------------|--|
| Supply voltage        | 24 VDC (+10%, -15%)  |
| Current consumption   | Approx. 0.5 A  |
| Insulation resistance | 20 MΩ min. between all DC external terminals and GR terminal (at 100 VDC, with internal surge absorber removed)              |
| Dielectric strength   | 1,000 VAC, 50/60 Hz between all DC external terminals and GR terminal (with internal surge absorber removed)                 |
| Leakage current       | 10 mA max.   |
| Noise resistance      | 1500 Vp-p; pulse width: 0.1μs/ 1μs; rising time: 1 ns (pulse)  |
| Vibration resistance  | 10 to 150 Hz; half-amplitude: 0.5 mm; maximum acceleration: 70 m/s <sup>2</sup> , 4 times for 8 minutes each in 3 directions |
| Shock resistance      | 200 m/s <sup>2</sup> , 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 (without cable)  |

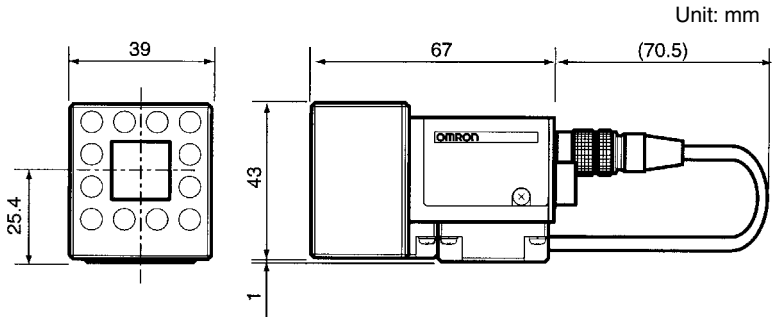
# 8-2 K150-KP Console



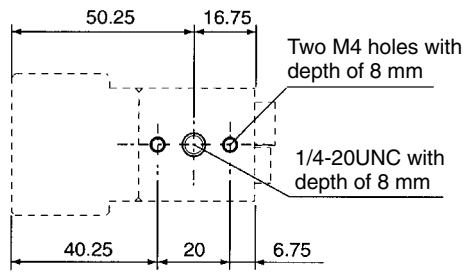
| Item                   | Specification                         |
|------------------------|---------------------------------------|
| Vibration resistance   | 10 to 150 Hz; half-amplitude: 0.15 mm |
| Shock resistance       | 196 m/s <sup>2</sup>                  |
| Ambient temperature    | 0 to 50 °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. 135 g                         |

# 8-3 Cameras

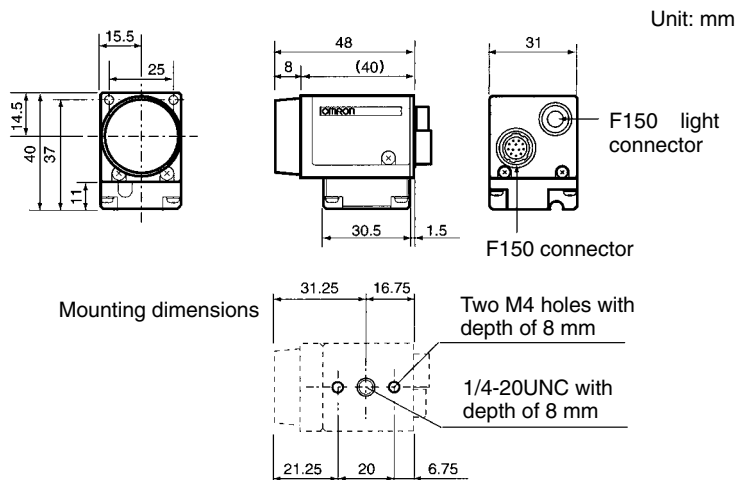
## F150-SL20A/SL50A (Camera with an F150-LT10A Light)



Mounting dimensions



F150-S1A 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 <sup>2</sup> , 4 times for 8 minutes each in 3 directions |
| Shock resistance     |                          | 200 m/s <sup>2</sup> , 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, 1/2000 s, 1/10000 s  |
| Lens mounting        |                          | C mount  |
| Weight               | Camera with Light Source | F150-SL20A/SL50A: Approx. 135 g  |
|                      | Camera only              | Approx. 70 g   |

## 8-4 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<br>LE50: 50 mm × 50 mm |
| Focal distance      | LE20: 13 mm<br>LE50: 6.1 mm                |
| Camera distance     | LE20: 61 to 71 mm<br>LE50: 66 to 76 mm     |

## 8-5 F150-LT10A Light

| Item                  | Specification  |
|-----------------------|--|
| Supply voltage        | 12 VDC   |
| Current consumption   | Approx. 10 mA  |
| Insulation resistance | 20 M $\Omega$ 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 <sup>2</sup> , 4 times for 8 minutes each in 3 directions |
| Shock resistance      | 200 m/s <sup>2</sup> , 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  |

## 8-6 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 <sup>2</sup> , 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   |

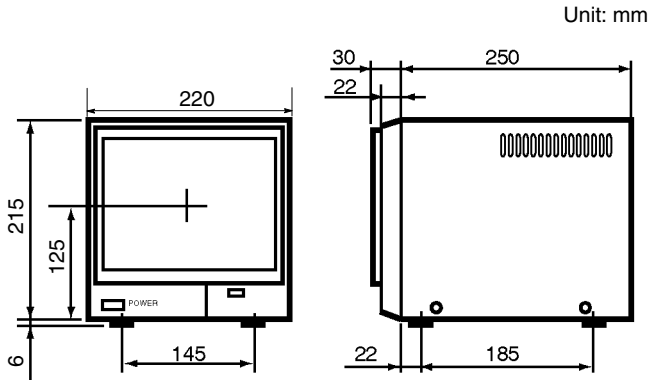
### F150-VM Monitor Cable

| 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 <sup>2</sup> , 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   |



# 8-7 F300-M09 Video Monitor

This is the recommended monitor and is available from OMRON.



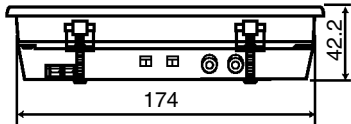
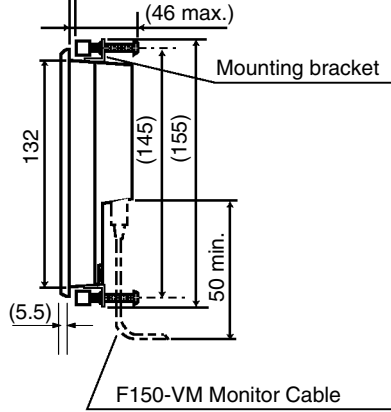
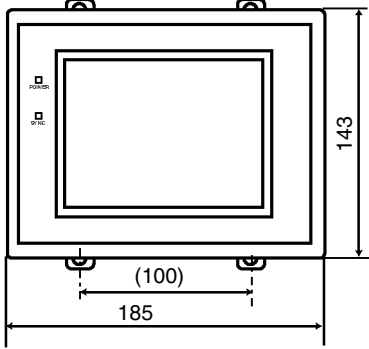
| Item                   | Specification  |
|------------------------|--|
| Supply voltage         | 100 VAC  |
| Current consumption    | Approx. 300 mA   |
| Vibration resistance   | 10 to 150 Hz; half-amplitude: 0.15 mm, 4 times for 8 minutes each in 3 directions          |
| Shock resistance       | 196 m/s <sup>2</sup> , 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<br>Horizontal frequency: 15.75 kHz<br>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<br>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   |

# 8-8 LCD Monitor

F150-M05L

Unit: mm

Mounting plate thickness: 1.6 to 4.8

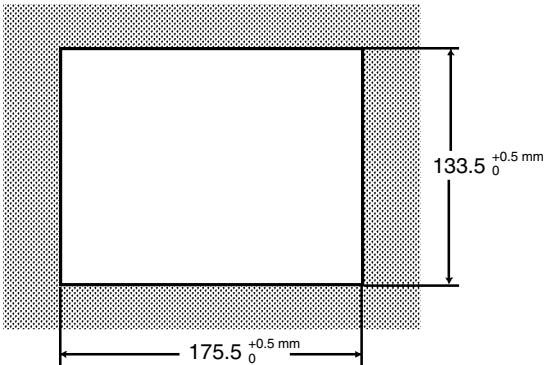


F150-VM Monitor Cable

Tolerance:  $\pm 1$  mm

The dimensions in parentheses are provided for reference.

Panel opening dimensions



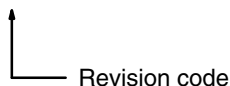
| Item                 | Specification   |
|----------------------|---|
| Supply voltage       | 24 VDC (+10%/−15%)  |
| Power consumption    | 15 W max.   |
| Current consumption  | 700 mA max.   |
| Vibration resistance | 10 to 150 Hz; half-amplitude: 0.1 mm, 10 times for 8 minutes each in 3 directions |
| Shock resistance     | 150 m/s <sup>2</sup> , 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  |
| Panel size           | 5.5 inches  |
| Panel type           | TFT   |
| Resolution           | 320 × 240 dots  |
| Image pitch          | 0.348 × 0.348 mm (H × V)  |
| Image size           | 111.36 × 83.52 mm (H × V)   |
| Contrast             | 83:1 (typical)  |
| Viewable angle       | 25° up/down and 50° left/right (with a contrast ratio > 10)                       |
| Luminance            | 250 cd/m <sup>2</sup> (typical)   |
| Backlight            | Cold cathode fluorescent light  |
| Response speed       | 60 ms max.  |
| Input signal         | NTSC composite video (1.0 V/75 Ω termination)                                     |
| Weight               | Approx. 1 kg  |



# Revision History

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

Cat. No. Z132-E1-02



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             | May 1999      | Original production   |
| 1A            | February 2000 | <p>Changes were made on the following pages:</p> <p><b>Thought the manual:</b> "F150-2" changed to "F150" and "Warnings" changed to "Cautions."</p> <p><b>Page v:</b> "Electric Shock" information removed.</p> <p><b>Page ix:</b> Manual numbers changed.</p> <p><b>Pages 9, 11 :</b> "PLC" changed to "Programmable Controller."</p> <p><b>Page 12:</b> Graphics added and changes made to model numbers.</p> <p><b>Page 13:</b> Change to description of ground resistance.</p> <p><b>Pages 13, 26:</b> Change to wire size information.</p> <p><b>Page 14:</b> Information on power supplies added.</p> <p><b>Page 14-16:</b> Major changes to 2-5.</p> <p><b>Page 16, 19:</b> Changes to model numbers.</p> <p><b>Page 18:</b> Extension tube graphic changed.</p> <p><b>Page 27:</b> Minor changes to graphics.</p> <p><b>Pages 29, 30:</b> Changes to cautionary information.</p> <p><b>Page 52:</b> Information added to first table. Information on Camera, lighting, and monitor errors added.</p> <p><b>Page 57:</b> "RH" deleted from table.</p> <p><b>Page 60:</b> "Input" added to table.</p> <p><b>Pages 60, 61, 62, 64, 65, 66, 67:</b> "Single amplitude" changed to "half-amplitude."</p> <p><b>Page 62:</b> Minor change to graphic. Weight information changed.</p> <p><b>Page 63:</b> Major changes to 8-3.</p> <p><b>Page 64:</b> Weight information removed.</p> <p><b>Page 67:</b> Dimension added to graphic.</p> <p><b>Page 68:</b> Information on Monitor added.</p> |
| 02            | May 2004      | <p><b>Page ix:</b> Suffixes removed from catalog numbers.</p> <p><b>Page 14:</b> Information added to note 2.</p> <p><b>Page 17:</b> Figure changed.</p> <p><b>Page 26:</b> Information added before caution.</p>   |







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