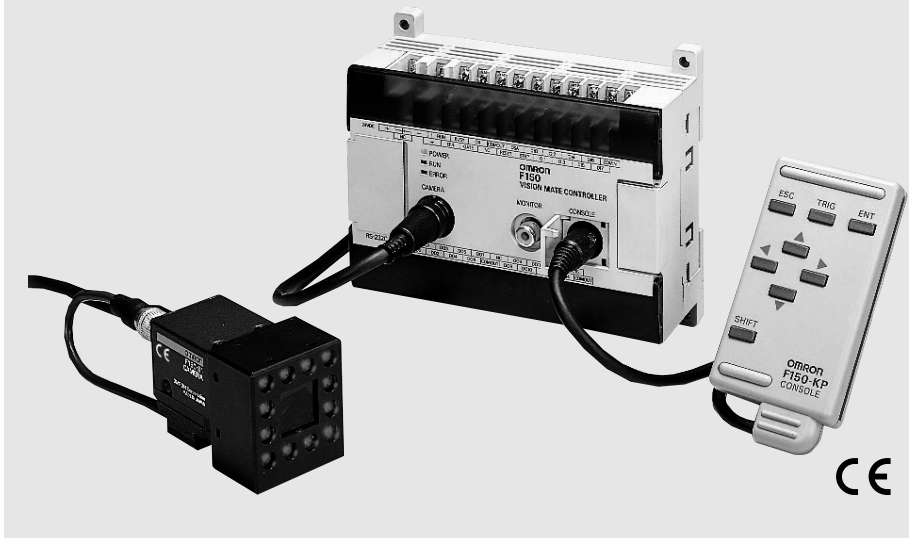Vision Sensor
F150-3

*Perform settings in a conversational manner. The dialog menu artist "talks" to you.*

F150-3

Features

Intelligent lighting

Various types of lighting control make it possible to obtain a clear, stable image suitable for the inspection. The dome shape minimizes the effects of external light and permits damage inspection. Red and green light is mixed to allow inspection of a wide range of work.

Detection of a defect

Inspection of button battery defect
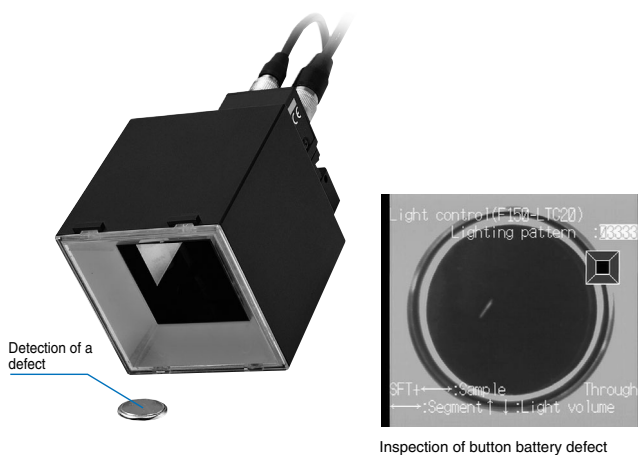
Variety of lighting methods

The direction of lighting and the brightness can be changed. Coaxial lighting is also possible with the F150-SLC20. The optimum lighting method for the work can be selected.
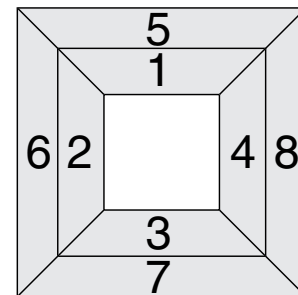
F150-SLC20
(Field of view: 20 mm)

Light intensity can be set separately to one of 8 levels for 5 illuminated areas.

```
          2
   3      1      5
     Coaxial vertical lighting
          4
```
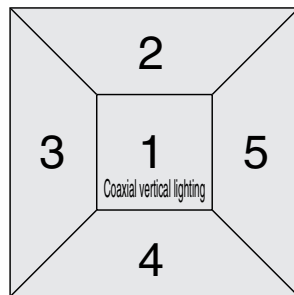
F150-SLC50
(Field of view: 50 mm)

Light intensity can be set separately to one of 8 levels for 8 illuminated areas.

```
        5
        1
   6  2        4  8
        3
        7
```

Control lighting from the menu

• The illumination area and light intensity are controlled from the controller menu. Settings can be easily changed without handling the lighting.
• The lighting is also treated as scene data, and thus can be changed along with other conditions when the model is changed.
• The controller manages the lighting setting as a digital value. This increases the reproducibility of the setting.

Features

Integrated camera and lens

Camera setup is easy because the object-imaging camera is integrated into a single unit with the lighting apparatus and lens.
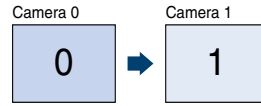
2-camera unit

We have made bi-directional, 2-line inspection easy and inexpensive.

A variety of image read-in methods

Images from two cameras can be read in at the same time. Read-in methods include successive changeover between the two cameras, and combination of the image from each camera into a single image.

Two-camera Switching

Vertical Composition
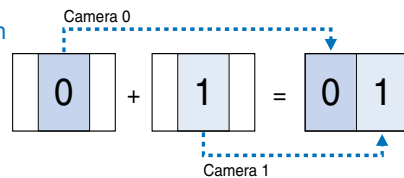
Horizontal Composition 1

Horizontal Composition 2
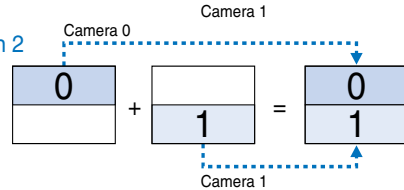
Example of application using two cameras

Inspecting Boxes From Both Side
Simultaneously inspect both sides of a box using two cameras.
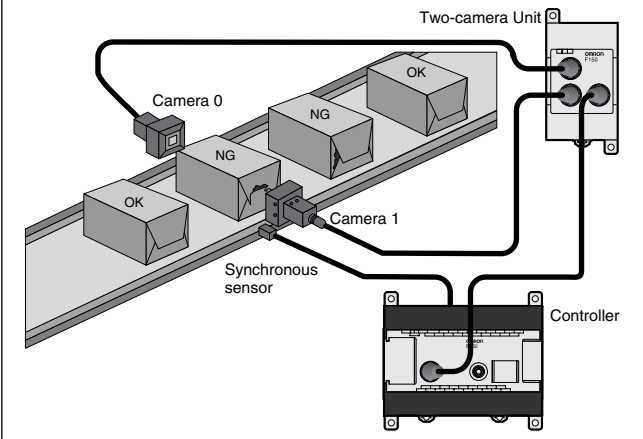
PCB Positioning
Determine the coordinates of position marks using two fields of vision.
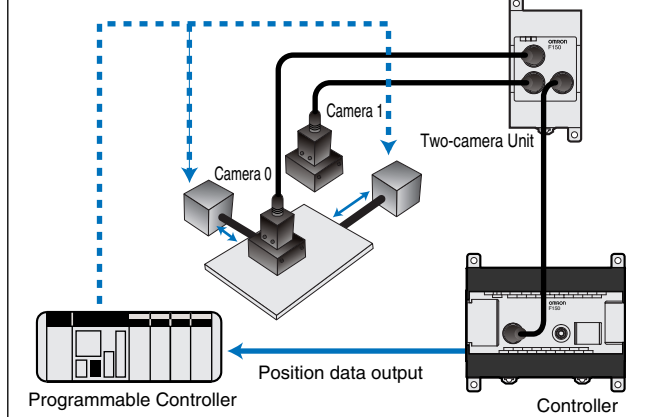
Features

Image memory function

Up to 23 inspected images can be stored*.
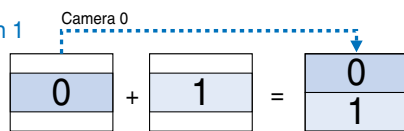
You can check the image to see what kind of defect occurred. This serves as an aid to maintaining and improving the production line.

With respect to a stored image, measurement can be repeated and measurement conditions changed. This enables a dramatic reduction in setup time during initial installation.

*Can be stored before power is turned off. Storage of all images, including "good" images, is also possible.
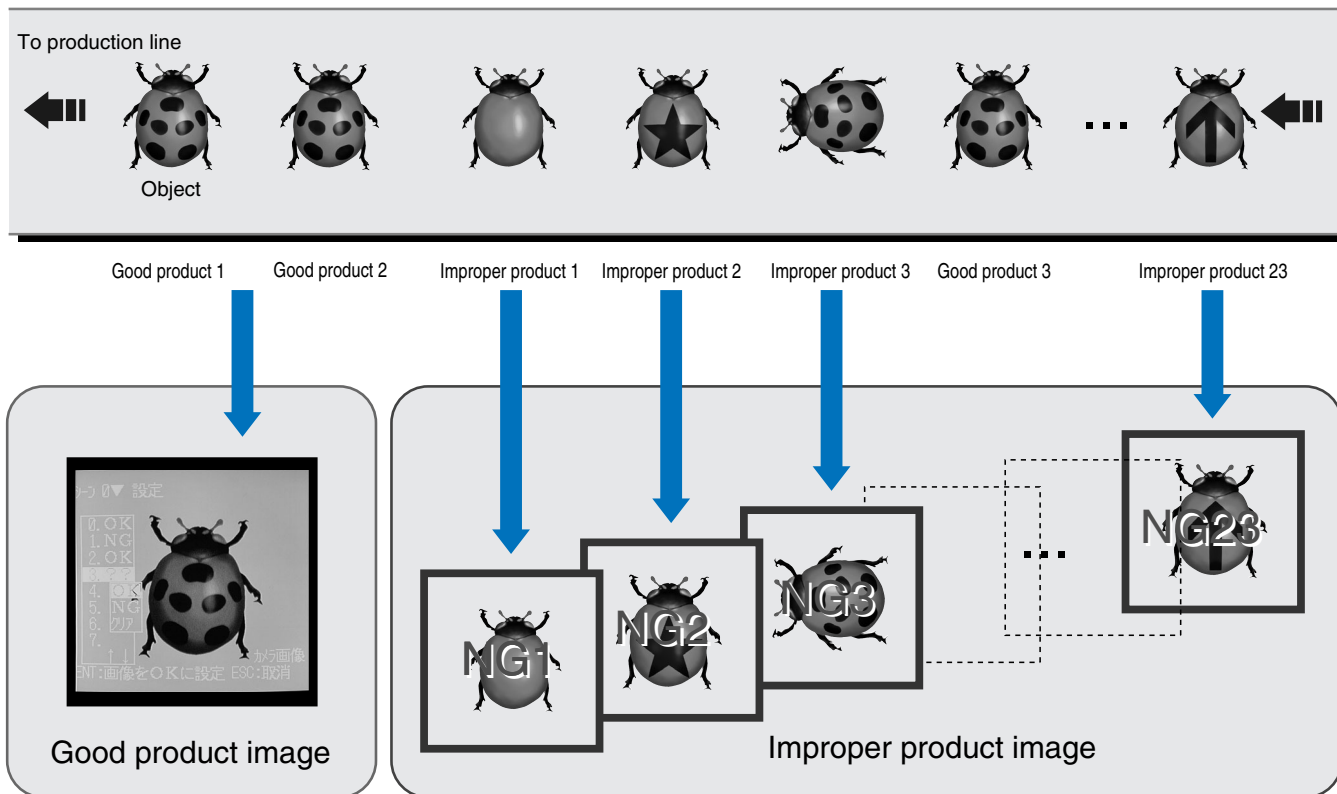
Compact frame shutter camera

- Compact with high resolution.
- An all-pixel reading method and square lattice CCD make it possible to obtain a clear and detailed image suitable for image processing.
- Equipped with an electronic shutter to handle high-speed lines.
- The shutter speed can be adjusted for each scene from the menu. Select the optimum shutter speed for the line speed and work.

Image pre-processing

- Pre-processing such as smoothing, edge enhancement, edge extraction, and background cut-off allow you to obtain the optimum image for the inspection.
- Pre-processing can be performed in real time (simultaneously with image read-in).

Original image   Edge extraction

High-precision gray search

- Position measurement at sub-pixel precision is possible using 256 graduation gray search processing. This feature is ideal for high-precision positioning applications.

Measurement of fiducial mark positions on a printed circuit board
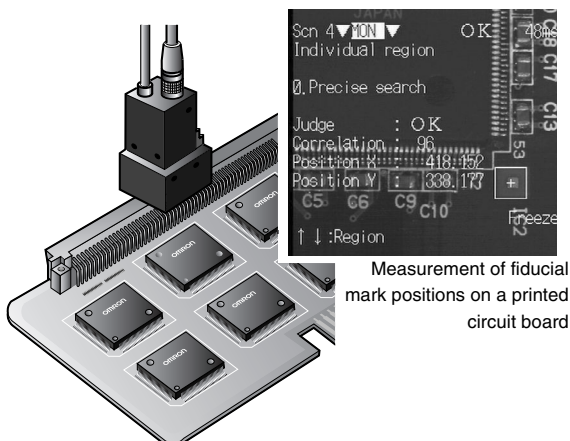
Damage/dirt inspection

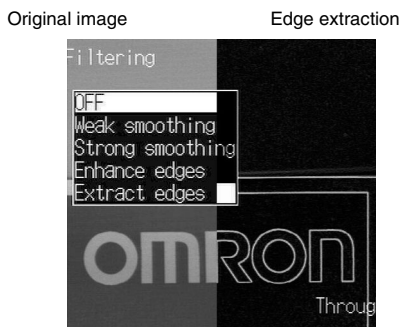- Omron's proprietary algorithm enables fast and detailed inspection for visual defects such as chips, nicks, burrs, and dirt.
- Linear, circular and rectangular areas can be set, enabling inspection for a variety of defect shapes.

Rubber packing flare inspection
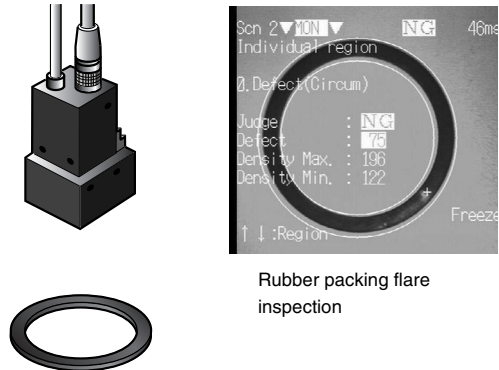
Gray edge measurement

- High-precision (sub-pixel) measurement of work edge position is possible. Ideal for width and dimension inspection.
- Includes edge number and pitch measurement functions for support of IC and connector lead inspection.

Connector pin-pitch inspection
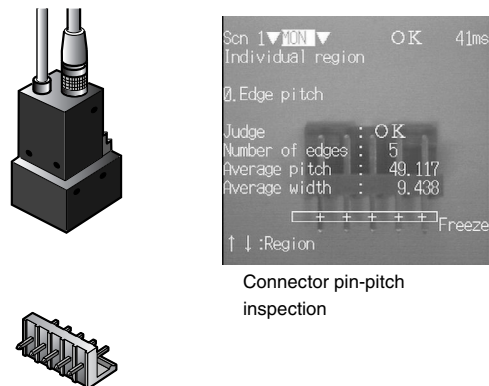
Output computation functions

- Measurement data computations such as the four arithmetical operations, minimum, maximum, distance between two points, and angle can be set from the menu.
- Up to 24 computations can be set, and decision and data output can be performed based on the computation results.

Hole-to-hole distance computation

OMRON
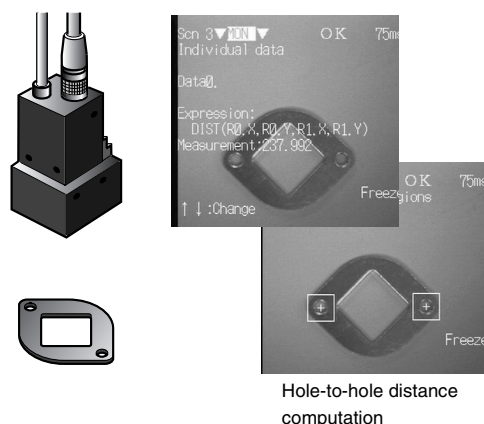
System configuration

Cameras

Camera with Intelligent Light Source:
F150-SLC20
(Field of view: 20 mm)

Camera with Intelligent Light Source:
F150-SLC50
(Field of view: 50 mm)

Camera with Light Source:
F150-SL20
(Field of view: 20 mm)
F150-SL50
(Field of view: 50 mm)

F150-S1A
Camera

When using this camera, please look at
"Cameras, lens, and lighting".

* When the size and view of a measurement item do not suit,
please use a general CCTV lens and general lighting.

Power supply

Synchronous sensor

Recommended
Power Supply:
OMRONS82K-01524
or S82K-05024

Controller
F150-C10E-3
F150-C15E-3
F150-C15E-3-DRT
F150-C15E-3-PRT

F150-KP
Console

(2 m)

Programmable
Controller

F150-VS
Camera cable (3 m)

F150-VM Video Cable
monitor cable (2 m)

Two-Camera Unit Cable
(15 cm)
(Provided with the F150-A20)

BNC Jack
(Provided with the monitor cable)

F150-A20
Two-camera
unit Note:
Use a 24-VDC
power supply.

Monitor

Color LCD Monitor
F150-M05L

Monochrome CRT
Video Monitor
F150-M09

F150-VS Camera cable (3 m)

Camera with lighting

Camera with intelligent lighting
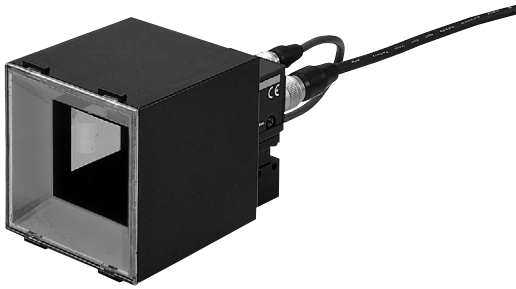
Model

Field of view: 20 mm	F150-SLC20
Field of view: 50 mm	F150-SLC50

*A lens and intelligent lighting are installed on the special camera (F150-S1A) for the F150.

Camera with lighting

Model

Field of view: 20 mm	F150-SL20A
Field of view: 50 mm	F150-SL50A

*A lens and lighting are installed on the special camera (F150-S1A) for the F150.

Distance to inspection object and field of view

The camera distance is fixed.

Fix the camera at a distance that allows correct imaging of the inspected object.

F150-SLC20

Object
Camera distance: 15mm to 25mm
Field of view (20 x 20 mm)

F150-SL20A

Object
Camera distance: 61mm to 71mm
Field of view (20 x 20 mm)

F150-SLC50

Object
Camera distance: 16.5mm to 26.5mm
Field of view (50 x 50 mm)

F150-SL50A

Object
Camera distance: 66mm to 76mm
Field of view (50 x 50 mm)
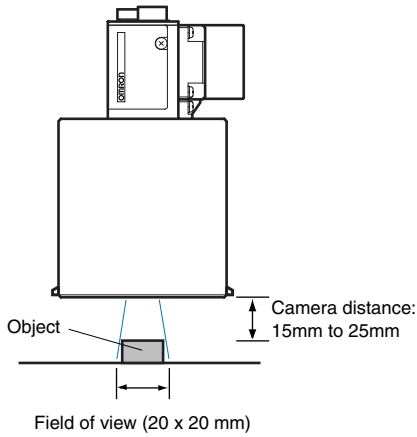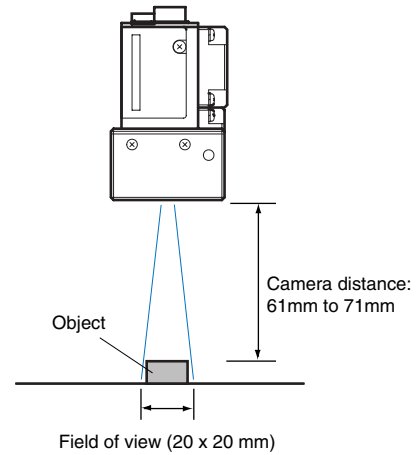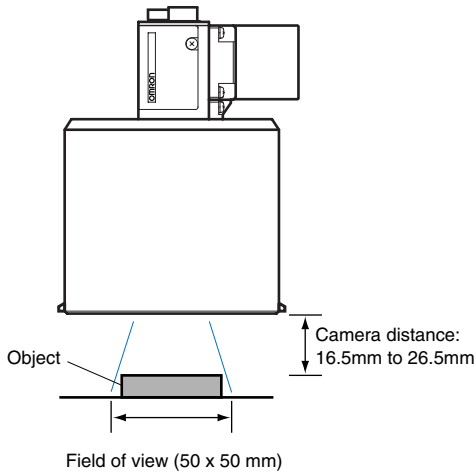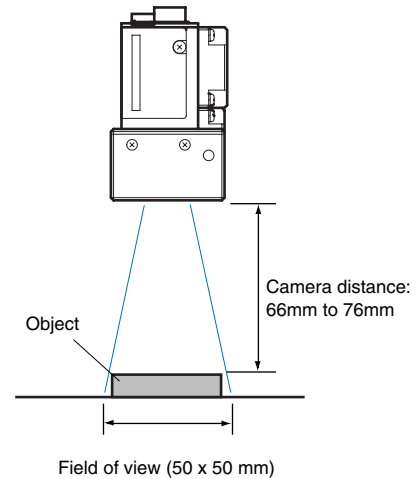
Ordering Information

Name		Model
Controller		F150-C10E-3 (NPN) F150-C15E-3 (PNP)
		F150-C10E-3-DRT (Compo Bus/D) F150-C15E-3-PRT (PROFIBUS)
Camera	Camera with intelligent lighting	F150-SLC20
		F150-SLC50
	Camera with lighting	F150-SL20A
		F150-SL50A
	Camera only	F150-S1A
2-camera unit		F150-A20
Console		F150-KP
LCD monitor		F150-M05L
Video monitor		F150-M09
Camera cable 3 m		F150-VS
Monitor cable 2 m		F150-VM

Rating/Performance

Controller: F150-C10E-3/C15E-3 and F150-C15E-3-PRT/DRT

Item	Specifications
Number of con-nected cameras	1 unit / 2 units (using the F150-A20)
Processing resolution	512 (H) x 484 (V)
Number of scenes	16 scenes (can be saved to a computer through the RS-232C)
Image memory function	Up to 23 images can be saved
Processing method	Grey Levels (256) / Binary
Image pre-processing	Smoothing, edge enhancement, edge extraction, background cut-off
Binary Levels	256 levels (per measurement area)
Position correc-tion function	Correction directions: X, Y, Detection modes: binary center of gravity / main axis angle, model position: middle point, edge position
Number of mea-surement areas	16 areas/scene
Measured data	Area center of gravity, main axis angle, dark-light correlation value, dark-light search position, defect degree, edge position, edge number, density average, relative position
Calculation functions	Four arithmetic operations, distance, maximum value / minimum value, absolute value, others
Result output	Overall decision, computation result (decision) per measurement area, measurement/computation data (RS-232C and parallel output possible)
Monitor	1 ch (supports pin jack and over-scan monitor)
RS-232C	1 ch (Dsub 9-pin, female)
CompoBus/D	1 ch (F150-C10E-3-DRT)
PROFIBUS-DP	1 ch (F150-C15E-3-PRT)
Parallel input/output	F150-C10E-3 and F150-C15E-3: Inputs: 11points, outputs: 21 points F150-C10E-3-PRT/DRT: Inputs: 1 point, outputs: 5 points (including control inputs/outputs)
Power supply voltage	20.4 to 26.4 VDC
Current consumption	Approximately 0.5 A
Ambient temperature	Operating: 0 to +50°C, storage: -25 to +65°C (no ice formation or condensation)
Ambient humidity	Operating/storage: 35 to 85% RH (with no condensation)
Weight (Packed state)	Approximately 940 g (controller: 390 g)
Accessories	Three manuals, CompoBus/D connector (DRT type only), PROFIBUS-DP connector (PRT type only)

Camera
Camera with intelligent lighting: F150-SLC20/50
Camera with lighting: F150-SLC20A/50A
Camera: F150-SL20A/50A

Item		Specifications
Camera	Image pick-up	1/3 inch CCD
	Effective pixels	659(H) x 494(V)
	Shutter function	Electronic frame shutter Shutter speed: 1/100, 1/500, 1/2000, 1/10000 sec (can be changed from the menu)
Lens	Installation distance	F150-SLC20: 15 to 25 mm, F150-SLC50: 16.5 to 26.5 mm, F150-SL20A: 61 to 71 mm, F150-SL50A: 66 to 76 mm
	Field of view	F150-SLC20/SL20A:20 mm□, F150-SLC50/SL50A:50 mm□
Lighting unit	Light source	F150-SLC20/50: Red LED - green LED mixed F150-SL20A/50A: Red LED
	Light emission method	Pulse emission (sychronized with camera shutter)
Ambient temperature		Operating: 0 to +50°C, storage: -25 to +60°C (no icing or condensation)
Ambient humidity		Operating/storage: 35 to 85% RH (with no condensation)
Weight * Unit only		F150-SLC20: Approximately 280 g F150-SLC50: Approximately 370 g F150-SL20A/50A: Approximately 135 g F150-S1A: Approximately 80 g
Accessories		Instruction manual

Two-camera unit: F150-A20

Item	Specifications
Number of connected cameras	2 units
Camera mode	Two-camera switching, vertical division composite, horizontal division composite 1/2, one camera single-stand (camera 0/1)
Supply voltage	20.4 to 26.4 VDC
Current consumption	Approximately 0.3 A
Ambient temperature	Operating: 0 to +50°C, storage: -25 to +65°C (no ice formation or condensation)
Ambient humidity	Operating/storage: 35 to 85% RH (with no condensation)
Weight * Unit only	Approx. 220 g
Accessories	Operation manual, camera unit cable (1)

Note: Can be connected to an F150-C10-3 controller.

Monitor

Item	Product name Model	LCD monitor F150-M05L	Video monitor F150-MON
Size		5.5 type	9 inches
Type		TFT color LCD	CRT monochrome
Resolution		320 x 240 dots	800TV or higher (center)
Input signal		NTSC composite video (1.0 V / 75)	
Supply voltage		20.4 to 26.4 VDC	100 to 240 VAC (-15%, +10%)
Current consumption		Approx. 700 mA	Approx. 200 mA
Ambient temperature		Operating: 0 to +50°C, storage: -25 to +65°C (no ice formation or condensation)	Operating: -10 to +50°C, storage: -20 to +65°C (no ice formation or condensation)
Ambient humidity		Operating/storage: 35 to 85% RH (no ice formation or condensation)	10 to 90–RH (No condensation)
Weight * Unit only		Approx. 1 kg	Approx. 4.5 kg
Accessories		Operation manual, clamps (4)	Instruction manual

Part Names/Functions

F150-C10E-3/F150-C15E-3
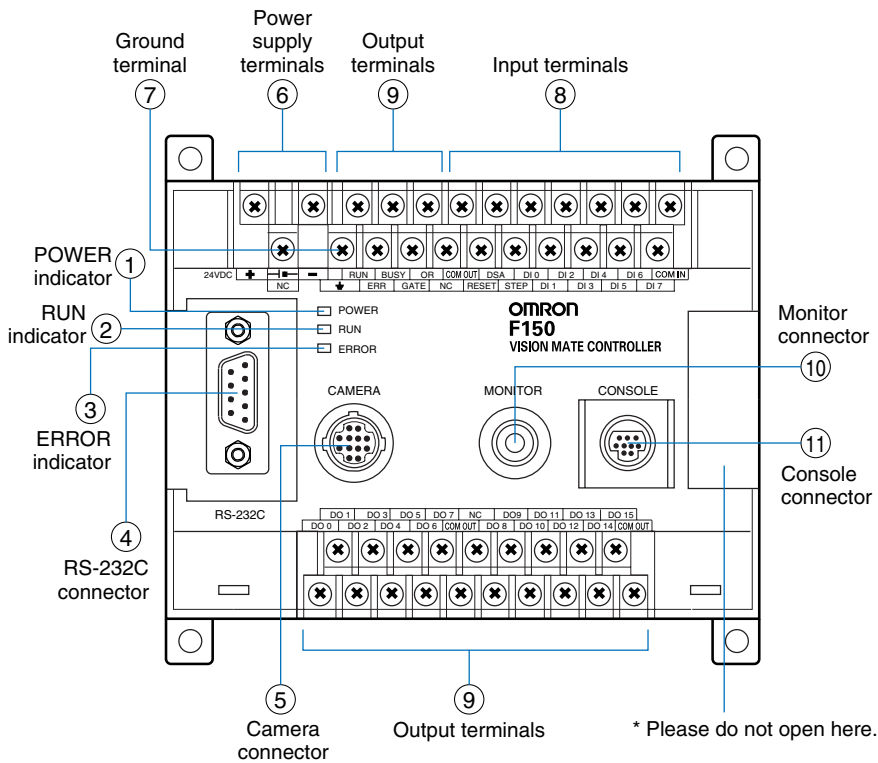
Ground terminal ⑦
Power supply terminals ⑥
Output terminals ⑨
Input terminals ⑧

POWER indicator ①
RUN indicator ②
③
ERROR indicator
④
RS-232C connector

Monitor connector ⑩
Console connector ⑪

Camera connector ⑤
Output terminals ⑨
* Please do not open here.

① Lit while power is ON.

② Lit while the F150 is in Run Mode.

③ Lit when an error has occurred.

④ Connects the F150 to external devices such as personal computers or programmable controllers.

⑤ Connects the F150 to camera or two-camera unit.

⑥ Connects to the power supply.

⑦ Connects to the ground wire.

⑧ ⑨ Connects to the F150 to external devices such as synchronous sensors or programmable controllers.

⑩ Connects to the monitor.

⑪ Connects to the console.

F150-C10E-3-DRT (CompoBus/D (DeviceNet) type)
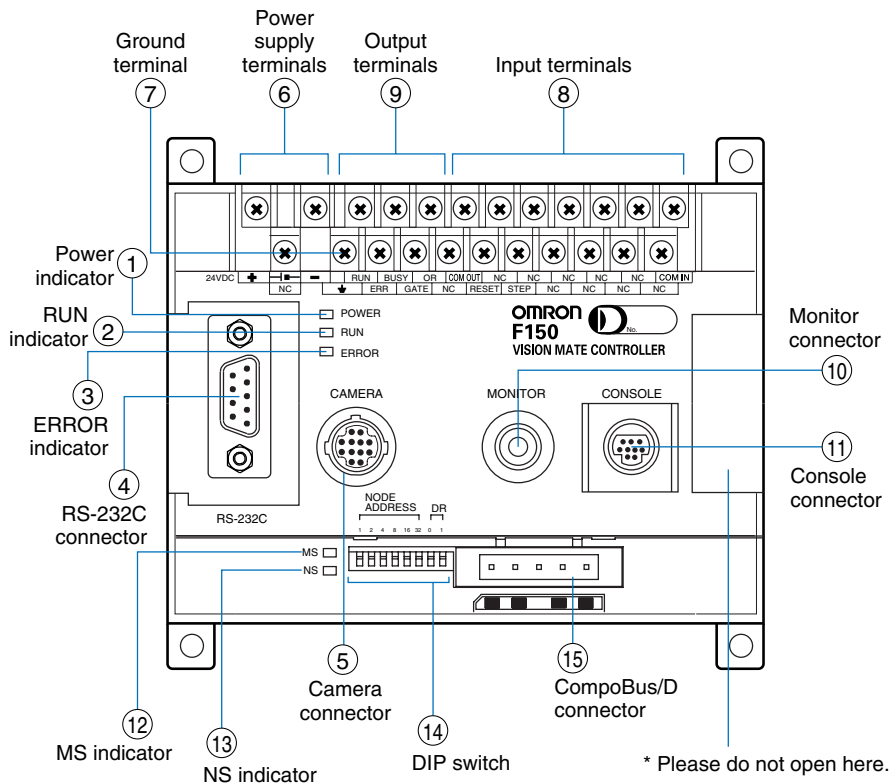
Ground terminal ⑦
Power supply terminals ⑥
Output terminals ⑨
Input terminals ⑧

Power indicator ①
RUN indicator ②
③
ERROR indicator
④
RS-232C connector

Monitor connector ⑩
Console connector ⑪

⑫ MS indicator
⑬ NS indicator
⑤ Camera connector
⑭ DIP switch
⑮ CompoBus/D connector
* Please do not open here.

① Lit while power is ON.

② Lit while the F150 is in Run Mode.

③ Lit when an error has occurred.

④ Connects the F150 to external devices such as personal computers or programmable controllers.

⑤ Connects the F150 to camera or two-camera unit.

⑥ Connects to the power supply.

⑦ Connects to the ground wire.

⑧ ⑨ Connects to the F150 to external devices such as synchronous sensors or programmable controllers.

⑩ Connects to the monitor.

⑪ Connects to the console.

⑫ Indicates the state of F150 in CompoBus/D communication.

⑬ Indicates the state of F150 in CompoBus/D communication.

⑭ Set up the node address and communication speed of CompoBus/D communication.

⑮ Connects to the communication cable of a CompoBus/D network.

F150-C15E-3-PRT (PROFIBUS-DP type)

Ground terminal ⑦
Power supply terminals ⑥
Output terminals ⑨
Input terminals ⑧

Power indicator ①
RUN indicator ②
ERROR indicator ③
RS-232C connector ④

POWER
RUN
ERROR

24VDC + ▬ ▬
NC
RUN BUSY OR COM OUT NC NC NC NC NC COM IN
ERR GATE NC RESET STEP NC NC NC NC

PROFI

OMRON
F150
VISION MATE CONTROLLER

CAMERA
MONITOR
CONSOLE

No.

Monitor connector ⑩
Console connector ⑪

RS-232C

COMM
BF

x10 x1
BUS ADDRESS

PROFIBUS-DP

Camera connector ⑤

PROFIBUS-DP connector ⑮

* Please do not open here.

PROFIBUS Communication indicator ⑫
PROFIBUS Bus Failure indicator ⑬
2 rotary switches Bus address (station address) ⑭
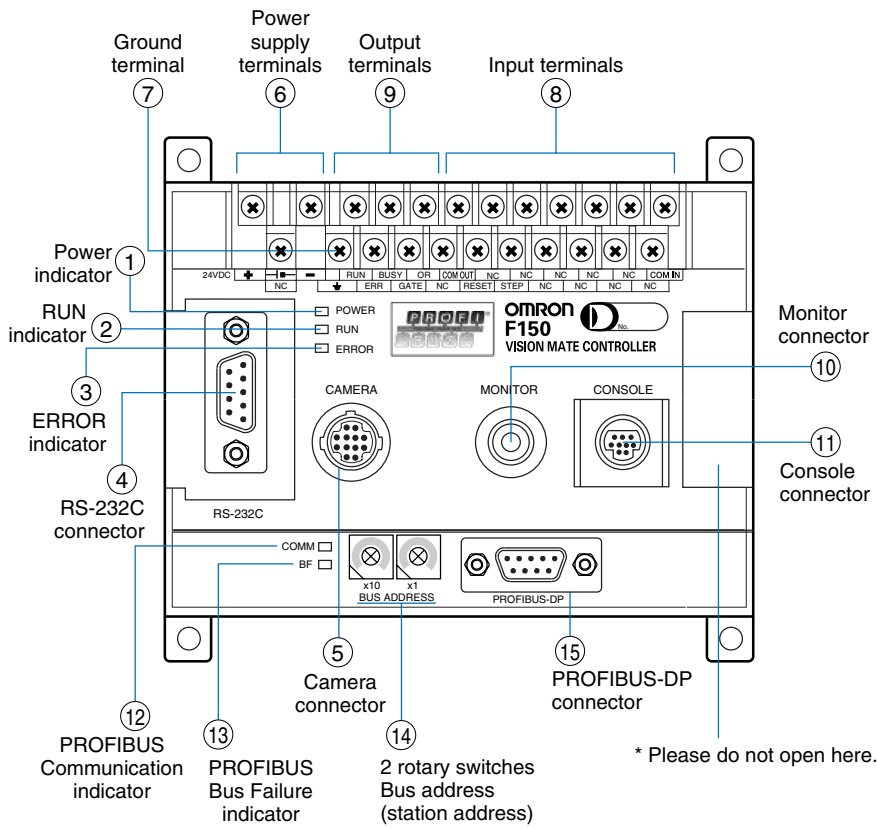
① Lit while power is ON.

② Lit while the F150 is in Run Mode.

③ Lit when an error has occurred.

④ Connects the F150 to external devices such as personal computers or programmable controllers.

⑤ Connects the F150 to camera or two-camera unit.

⑥ Connects to the power supply.

⑦ Connects to the ground wire.

⑧ ⑨ Connects to the F150 to external devices such as synchronous sensors or programmable controllers.

⑩ Connects to the monitor.

⑪ Connects to the console.

⑫ Indicates the state of F150 in PROFIBUS-DP communication.

⑬ Indicates the state of F150 in PROFIBUS-DP communication.

⑭ Set up the node address of PROFIBUS-DP communication.

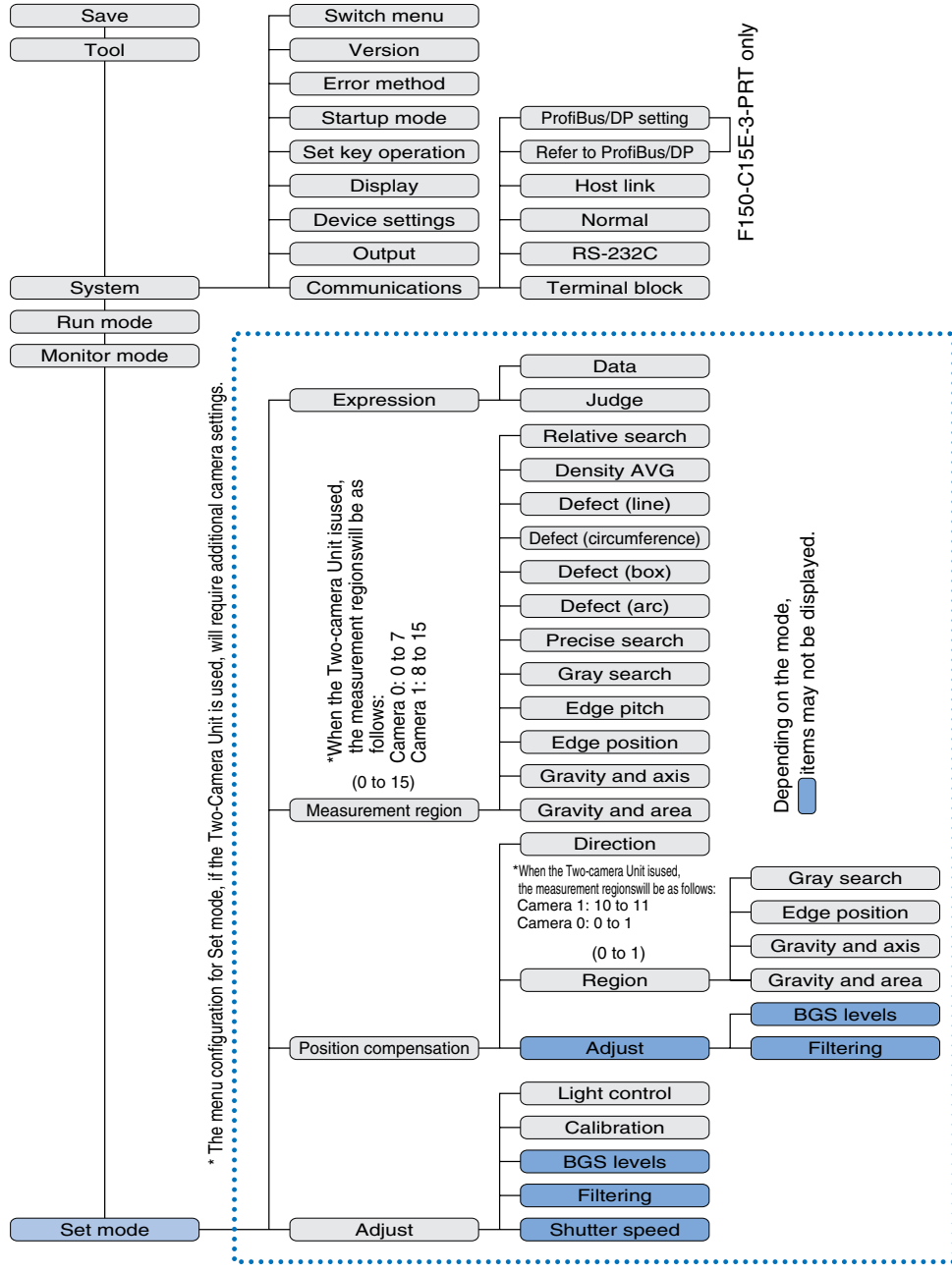⑮ Connects to the communication cable of a PROFIBUS-DP network.

F150-3

Function menu

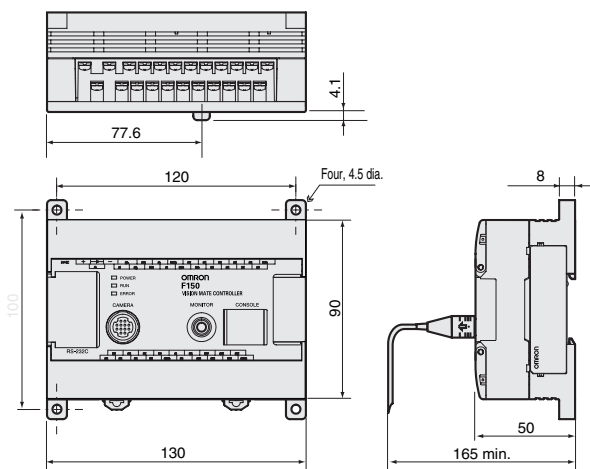## Menu structure diagram

Dialog menu

Save

Tool

System
- Switch menu
- Version
- Error method
- Startup mode
- Set key operation*
- Display
- Device settings
- Output
- Communications
  - ProfiBus/DP setting
  - Refer to ProfiBus/DP
  - Host link
  - Normal *
  - RS-232C
  - Terminal block

F150-C15E-3-PRT only

* Do not use it with a dialog menu.

Run mode

Monitor mode

Set mode
- Ref image
- Region
  - Chip/Bur
  - Position
  - Conform
  - Surface
  - Dimns'n
  - Orient'n
  - Presence
- Position
- End

Up to 16 regions can be set.

Expert menu

Save

Tool

System
- Switch menu
- Version
- Error method
- Startup mode
- Set key operation
- Display
- Device settings
- Output
- Communications
  - ProfiBus/DP setting
  - Refer to ProfiBus/DP
  - Host link
  - Normal
  - RS-232C
  - Terminal block

F150-C15E-3-PRT only

Run mode

Monitor mode

Set mode

* The menu configuration for Set mode, if the Two-Camera Unit is used, will require additional camera settings.

- Expression
  - Data
  - Judge
- Measurement region
  - Relative search
  - Density AVG
  - Defect (line)
  - Defect (circumference)
  - Defect (box)
  - Defect (arc)
  - Precise search
  - Gray search
  - Edge pitch
  - Edge position
  - Gravity and axis
  - Gravity and area

  *When the Two-camera Unit is used, the measurement region will be as follows:
  Camera 0: 0 to 7
  Camera 1: 8 to 15
  (0 to 15)

  Depending on the mode, items may not be displayed.

- Position compensation
  - Direction
  - Region
    - Gray search
    - Edge position
    - Gravity and axis
    - Gravity and area
  - Adjust
    - BGS levels
    - Filtering

  *When the Two-camera Unit is used, the measurement region will be as follows:
  Camera 1: 10 to 11
  Camera 0: 0 to 1
  (0 to 1)

- Adjust
  - Light control
  - Calibration
  - BGS levels
  - Filtering
  - Shutter speed

Dimensions (Unit: mm)

Controller

F150-C10E-3, F150-C50E-3, F150-C15E-3-PRT, F150-C10E-3-DRT

4.1
77.6
120
Four, 4.5 dia.
8
100
90
130
50
165 min.

Console

F150-KP

50
1.5 - 13
ESC   TRIG   ENT
87
SHIFT
OMRON
F150-KP
CONSOLE
12 dia.
12.5
2000
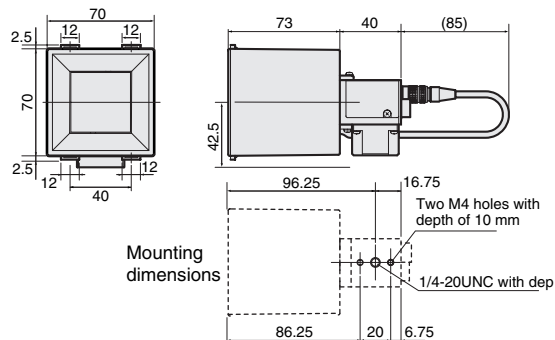23   5
10
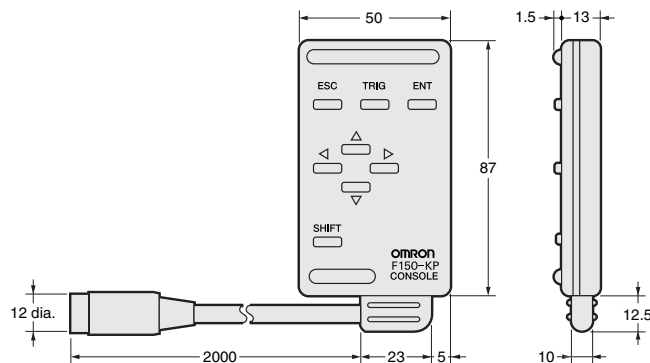
Camera

F150-SLC20 (camera with F150-LTC20 intelligent lighting)

70
2.5 12   12
70
2.5 12   12
40
73   40   (85)
42.5
96.25   16.75
Two M4 holes with depth of 10 mm
Mounting dimensions
1/4-20UNC with dep
86.25   20   6.75
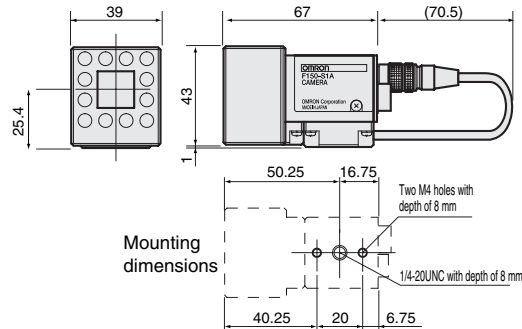
F150-SLC50 (camera with F150-LTC50 intelligent lighting)

90
16   16 2.5
90
16   16 2.5
60
80   40   (85)
52.5
103.25   16.75
Two M4 holes with depth of 10 mm
Mounting dimensions
1/4-20UNC with depth of 10 mm
93.25   20   6.75

F150-SL20A/SL50A (camera with lighting)

39
25.4
67   (70.5)
43
1
OMRON
F150-S1A
CAMERA
OMRON Corporation
50.25   16.75
Two M4 holes with depth of 8 mm
Mounting dimensions
1/4-20UNC with depth of 8 mm
40.25   20   6.75

F150-S1A (camera only)

15.5
25
14.5
40
37
11
48
8   (40)
F150-S1A
CAMERA
OMRON Corporation
MADE IN JAPAN
30.5   1.5
31
F150 light connector
F150 connector
31.25   16.75
Two M4 holes with depth of 8 mm
Mounting hole dimensions
1/4-20UNC with depth of 8 mm
21.25   20   6.75

2-camera unit

F150-A20

66

50

3.3

100

56

Two 4.5-dia.
(mounting holes)

90

110

Mounting hole
dimensions

100–0.2

56–0.2

Two M4 holes

LCD monitor

F150-M05L

Mounting plate thickness: 1.6 to 4.8

46 max. (1.81 max.) *

Mounting bracket

143

132

(145)

(155)

50min

(100)

185

(5.5)

RCA/BNC Monitor Cable

Tolerance:±1 mm

42.2

174

Panel opening
dimensions

133.5$^{+0.5mm}_{0}$

175.5

CRT monitor

F150-M09

222

250

233

143

5

190

50

22

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.