New

OMRON

Network
Vision Sensor
F500-C10-ETN
F500-C15-ETN

Sensing
•
Storage
•
Network

The F500 Supports Quality Traceability

OMRON F500 Network
VISION MATE CONTROLLER

Network

PC Software Tool
Vision Composer NET
Version upgrade with new
functionality for getting the
most out of your network.

real**i**z**i**ng

The F500 Network Vision Sensor supports everything from high-precision detection to production and quality control.

Sensing

High-precision detection with 1-million-pixel Digital Interface Camera

Storage

Large storage capacity

Network

Supports applications in IT environments

Vision Composer NET Upgrade

● Windows-based GUI.
● Strengthened Security function.
● Manage the operating status of many Controllers.

The F500 enables high-precision inspections and measurements in the factory and then goes further to support easy construction of a production and quality control system for quality traceability.

High-precision Sensing

1-million-pixel Digital Interface Camera

Clear images are obtained by greatly reducing noise in high-resolution video signals.

User Customization for Even Simpler Operation

Various applications are supported through features like flow menus that flexibly handle even complicated applications and macros that enable user programming.

A Wealth of Algorithms to Achieve High-precision Measurements

High-precision measurements are achieved through original algorithms ideal for low-contrast mark positioning, minute defect detection, and much more.

Applications Software

Build Flexible Applications

The F500 provides OMRON's new menu system called Flow Menus, which enable flexible measurements through menu settings including multiple filtering operations and conditional branches based on measurement results.

Easier to Use, Easy to Program

A Macro programming feature is provided to support measurement functions by enabling screen customization, I/O interface changes, measurement condition changes, and much more. Macros can be easily programmed using a simple text editor.

Storage for Production and Quality Control

Store inspection and measurement data for safe keeping. Provide feedback to quality control data, or analyze the data to improve quality. The stored data can be used in many ways.

Large Storage Capacity

Approximately 200 images minimum can be stored right in the Controller. Measurement images are stored without alteration for future use, such as repeating measurements to check measurement accuracy or attaching images to reports.

Remote Access and Operation across a Network

Easily achieve a production and quality control system using an IT environment that provides easy access to the production site and operating status.

Remote Access and Operation

Data such as the operating status of the Vision Sensor and images resulting from inspections can be remotely accessed. Measurements, storage, and communications can be executed independently so that measurements will not stop even during random remote access.
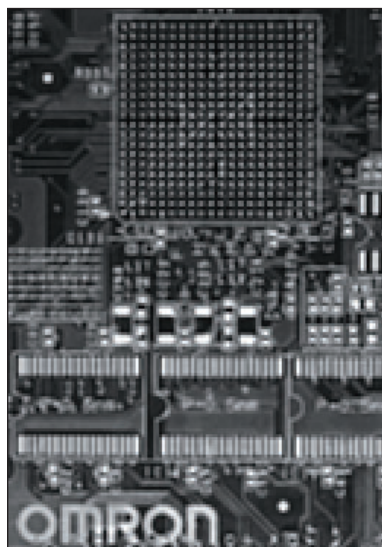
Sensing

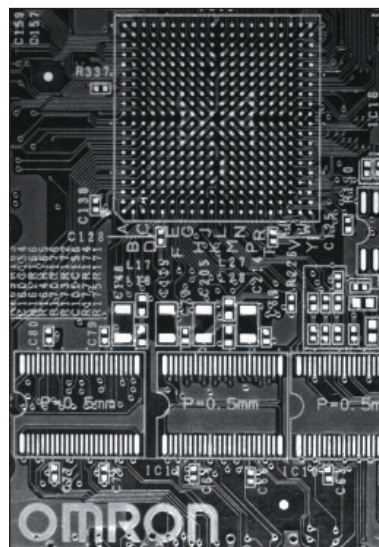## Flexible User Customization for Any Purpose

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1-million-pixel Camera

Benefits of Increased Resolution
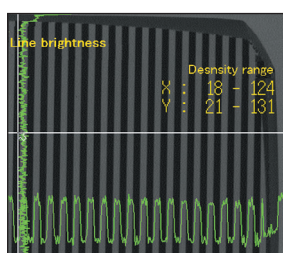

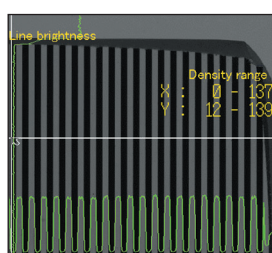250,000 pixels (previous systems)

1 million pixels

Doubling the horizontal and vertical resolutions increases total resolution by a factor of four, enabling clear images for small or complicated workpieces.

1-million-pixel Camera with Digital Interface

1-million-pixel Camera with Digital Interface

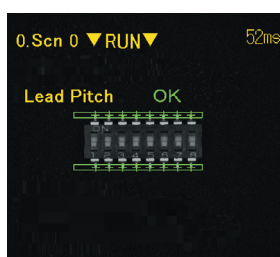Line Brightness Image from an Analog Interface Camera

Line Brightness Image from a Digital Interface Camera

The video signal noise that hurt measurement precision has been greatly reduced to enable inspections of minute foreign matter or damage as well as high-precision positioning.

Partial Scan Function

Partial Scan Function

Full Frame Reading

Partial Reading

Partial scans can be used to reduce the image reading time, which is often the bottleneck in measurement processing time.

Number of pixels read	Reading time
1024 x 1024 pixels	48.3 ms
1024 x 512 pixels	27.6 ms
1024 x 256 pixels	16.3 ms
1024 x 128 pixels	10.7 ms

# Advanced Algorithms for High-precision Measurements

Positioning

● ECM Searches

Edge code models are used for pattern searches. ECM searches are not easily affected by deformation and dirt, and can thus be very effective with low-contrast workpieces.

● EC Positioning

Model registration is not required for EC positioning. Searching is possible with shape information, such as "circle," "rectangle," or "intersection." This achieves higher precision in measurements than conventional pattern matching methods.

Reference data: Repeatability is within 1/20 pixel (OMRON test data)
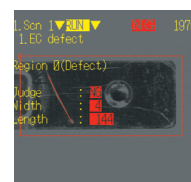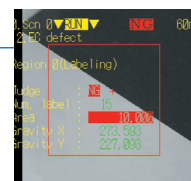
Appearance Inspections

● EC Defect

Geometric information is used to measure minute defects or low-contrast scratches in the measurement object at high precision. Stable detection is possible for applications like measuring deformation in O-rings.

● EC Circle Count

Circles are searched for based on a circle of a specified size. Stable detection is possible without undue influence by deformation or dirt.
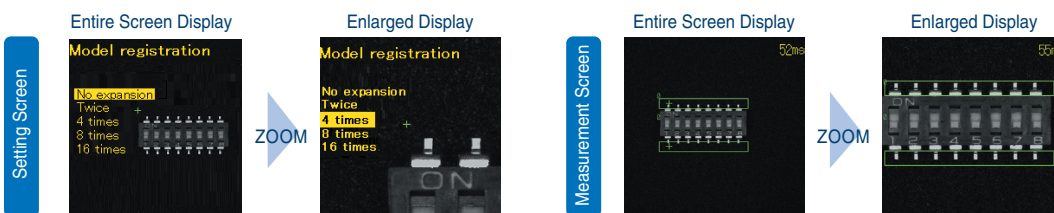
● EC Circle Defect

Defects in circles, such as depressions and scorching in molded items, can be easily measured at high precision. The defect in the circle can be extracted even with a patterned background.

Reduced Work with Simple Operations

● Zoom Function for 1-million-pixel Images

Zoom in to see detail clearly for easier setting and adjustment (display enlargement supported).

Entire Screen Display   Enlarged Display   Entire Screen Display   Enlarged Display

Setting Screen   ZOOM   Measurement Screen   ZOOM

● High-speed Serial USB Interface

A USB interface simplifies high-speed communications between the Vision Sensor and a computer. Communications can be used to handle measurement data, setting data, system data, image data, and more.
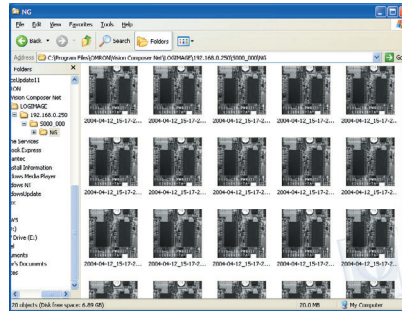
Storage & Network

Networking to Access, Save, View, and Edit Data

Batched Access and List Viewing of Logged Images

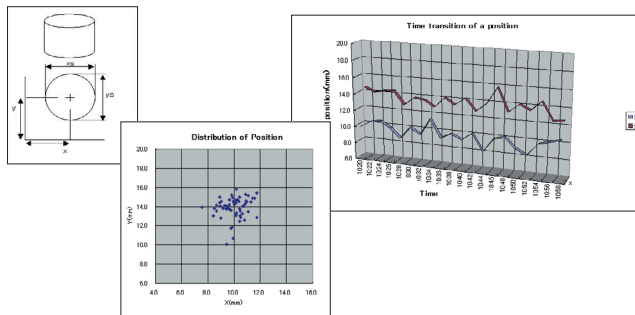### Batched Access and List Viewing of Logged Images

The data stored in the Controller can be displayed in lists.

Access **View**

Batched Access and List Viewing of Measurement Data

Batched Access and List Viewing of Measurement Data

Links can be created to spreadsheet software to statistically process measurement results or display graphs. All measurement data can be saved for feedback to trend management or to monitor variations in measurement data.

Access **View**

Log Production and Quality Control Information

Log Production and Quality Control Information

Macros can be used to total production quantities, production information such as fault rates, or NG products according to the type of inspection.

*Windows are exemplary only.

Access **View**

Managing and Transferring Setting Data

Managing and Transferring Setting Data

Files containing Vision Sensor setting data (such as scenes and system data) can be sent and received.

The software version of the Vision Sensor can also be easily upgraded.

Access **Save** **View**

Batch File Uploading

The data saved in the Controller can be transferred to a computer as a batch upload. This function is useful when determining judgement values for initial settings or to back up data.

And because measurements and communications are executed independently, files can be uploaded without affecting the Vision Sensor's measurement operation.

Production   15400 pcs.
Good products 14890 pcs.
NG products   610 pcs.

Batch Transfer

Daily Report
Date:
Production quantity

Rate of operation
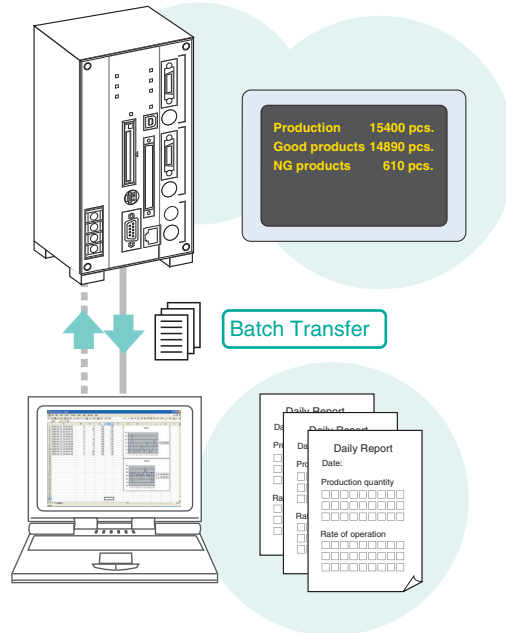
Live Monitoring Function

Industry First

Vision Sensor images can be displayed in realtime on the computer via Ethernet. (See note 1.)

Live inspection images can also be monitored remotely. (See note 2.) And what's more, the images from several Controllers connected via the network can be monitored simultaneously on the computer screen.

Live transfer via Ethernet

LIVE

Note 1: The transfer speed of live images depends on the network environment.
2: Remote monitoring is not possible through a firewall.
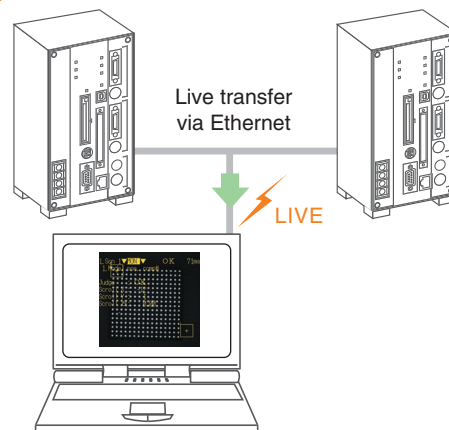
Remote Operations

Vision Sensor measurements can be started and stopped and scene data settings can be specified from a remote computer.

All operations that were previously possible from the Console can be performed remotely from a computer.

Factory

Office

Remote controller
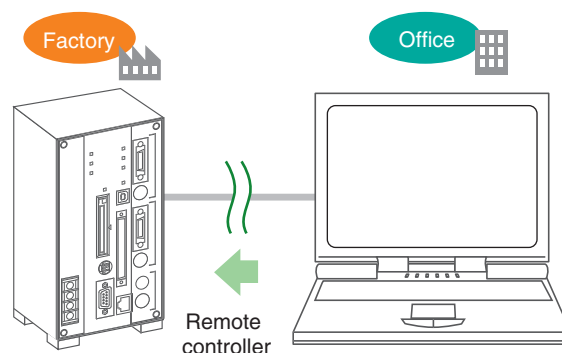
Vision Composer

The Vision Composer NET and Vision Composer Watcher PC Software Tools Maximize the Functionality of the Network-compatible Vision Sensor.

Vision Composer Net

Vision Composer Net
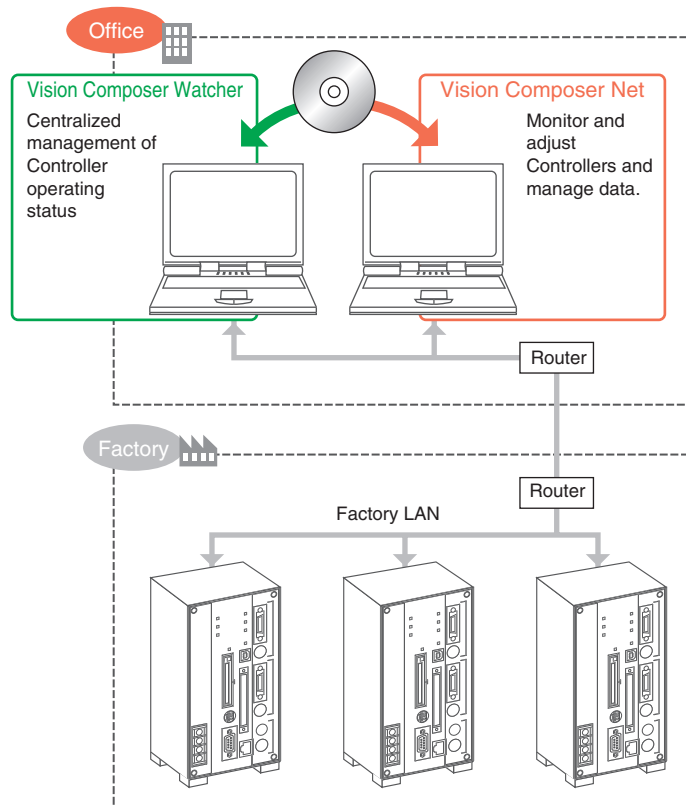
The Vision Composer Net software connects to OMRON Controllers to monitor and control operation, change settings, and perform other tasks.

Controllers can be connected across networks to monitor and adjust Controllers in the factory from an office.

The Vision Composer Watcher software tool enables centralized management of the operating status of multiple Controllers running on production lines.

Vision Composer Net NEW

Windows-based GUI

Vision Sensor setup, settings, and data management are performed using Windows-type operations. Operation is simple, with no need for concern with the original menu screen.

Strengthened Security Function

NEW

List Displays
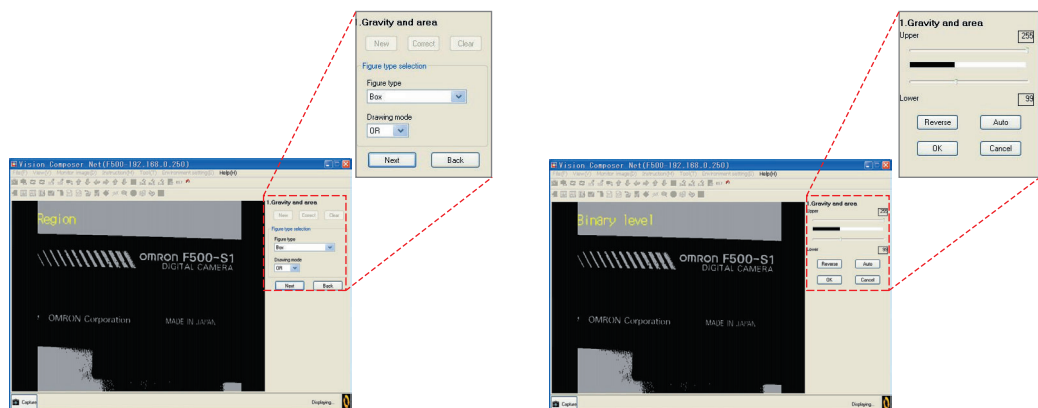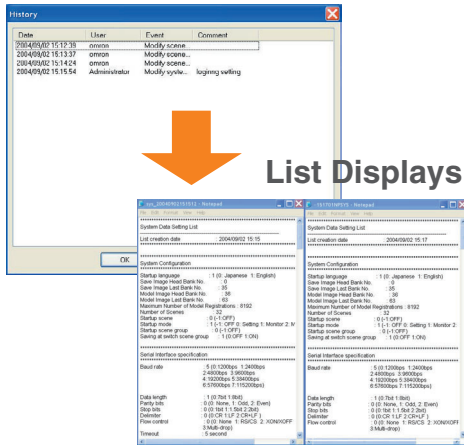
By enabling the Security Function, you can divide the operations registered users are allowed to perform into three permissions levels: Administrator, Supervisor, and Operator.

Utilizing the Security Function enables you to store a revision history recording the specifics of what data was changed, when it was changed, and by whom.

Addition of Image Capture and Image Recording Functions

NEW

Image Capture
Measurement images and setting images can be easily saved at the computer.

Image Recording Function
Video signals transmitted back to the computer from a Controller can be recorded in AVI format.
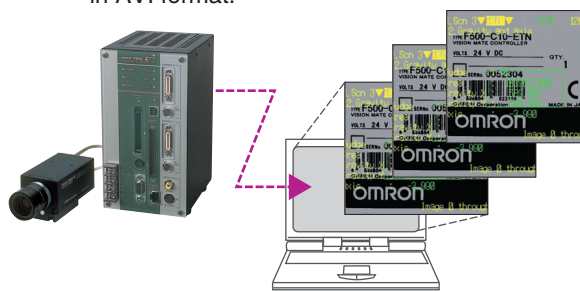
Applications Using Improved Functions: Storage and Networking

Connector and IC Lead Inspections

Pitch

Length

No. of leads

Sensing

High-resolution inspection over a wide field of view is enabled by using a 1-million-pixel high-resolution camera.

And with macro functions, the statistics on lead pitch data and linear approximations of the lead ends are easily performed.

Storage & Network

Combining networking enables changing inspection devices, managing master data, and uploading statistical data files with macros.

BGA Inspections

Number of balls

Deformed ball   Offset ball
Incorrect
position   Ball size

Sensing

High-resolution inspection over a wide field of view is also enabled by using a 1-million-pixel high-resolution camera with BGA inspection software. Variant BGA processing is also possible.

Storage & Network

Quality control data can be used effectively by storing inspection images in relation to lot numbers. Managing all of the product data on the host computer makes frequent changes to settings much smoother.

Positioning Liquid Crystal Boards
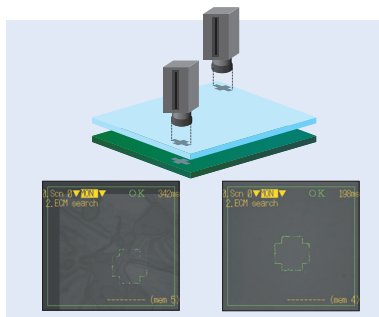
Sensing

EC processing, based on an original algorithm from OMRON, enables position inspections of low-contrast alignment marks. And using a Digital Interface Camera enables stable processing.

Macros can also be used to easily achieve original calibration methods, inspection data calculations, and much more.

Storage & Network

Managing productivity is also possible by saving and reviewing inspection images, detection data, and position compensation data.

Printing Defects

Sensing

Using a 1-million-pixel high-resolution camera provides high-precision inspections over a wide field of view.

Using macros enables saving images and inspection data classified by the type of fault.

Storage & Network

For initial system startup, data to determine judgement values and to troubleshoot problems can be accessed from a remote computer, reducing costs to a minimum.

Molded Product Defect Inspections

Sensing

Misshapen products, as well as contamination and scorching around molded products, can be detected. Setting is as easy as specifying the circle size to detect (i.e., the size of the defects) on limit samples displayed on the monitor.

With macros, statistics on good products, NG products, and fault rates for the inspections performed each day can be calculated and logged in a Memory Card.
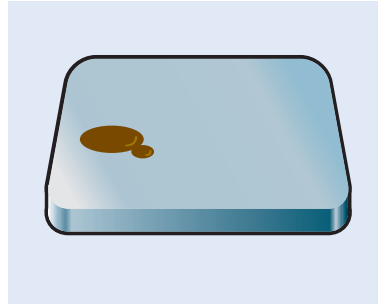
Ceramic Board Defect Inspection

Sensing

Inspect for cracks on the surface of ceramic boards. Even if uneven lighting or rough surfaces show in the images, linear aspects can be consistently detected.

Using the flow menus enables conversion to more stable inspection by repeatedly filtering images.

Image Taken → Filtering Again → Filtering Again → EC Defect Inspection
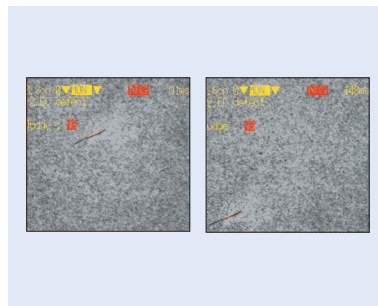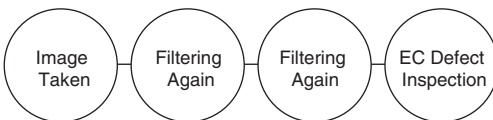
Inspecting Electrolytic Capacitor Dimensions

Sensing

The diameter of round workpieces can be measured at multiple points to determine if they are round or not.

With macros, deviations in inspection values can be stored in memory and statistics, such as minimum values, maximum values, and standard deviations, can be calculated.
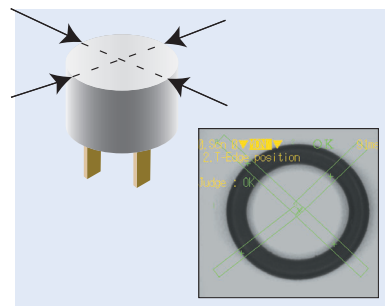
Chip Capacitor Electrode Defect Inspection

Sensing

Even if the size of the inspection object changes, the size of the inspection area adjusts to the external size to enable measurement. Misshapen products and contamination and scorching around products can be detected.

With macros, production statistics (e.g., number of good products, number of NG products, and fault rates) can be calculated and monitored onscreen.

Higher precision
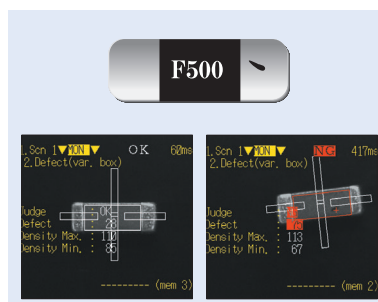
Processing Items	Binary Processing	Gray-scale Processing	EC Processing

● **Positioning**

	Gravity and Axis	Gray Search (x-y: Pixel Level) Precise Search (x-y: Subpixel Level) Rotation Search (x-y-⊖: Subpixel Level) Circular Angle	ECM Search EC Positioning

● **Presence and Direction Inspections**

	Gravity and Area Binary Defect Labeling Label Data (counting possible)	Density Data (Average and Deviation) Gray Search (x-y: Pixel Level)	EC Circle Count

● **Appearance (Defect) Inspections**

	Area (Var. Box)	Density Defect # Defect Defect (Var. Box) Fine Matching Flexible Search	EC Circle Defect EC Defect

● **Dimensions**

		Edge Position_1 Edge Position_8 (Number of areas drawn differs.) Edge Width (Width between edges measured.) T-Edge Position	

● **Applications Packages**

		BGA	

The same F500-UM Applications Software is used for the F210, F250, and F270.
Many other measurement functions are also supported by this software. For details, go to http://www.fa.omron.co.jp/
(Japanese only)

Flow Menus

Complete Image Processing Items

Image Input

Camera Image
The camera image is read synced on an external signal.

Switch Camera
The camera can be selected when two cameras are connected.

Changing Filtering
Filtering can be performed that is different from that performed when the image was read.

Filtering Again
Filtering can be performed many times for the same image.

Position Compensation

Binary Position Compensation
Positioning is compensated based on the center of gravity and axis angle found using binary processing.

EC Position Compensation
EC position compensation is effective for low-contrast marks that vary in size.

Edge Position Compensation
Positioning is compensated based on the outline of the workpiece found through edge processing.

Model Position Compensation
Positioning is compensated based on search points found by matching with registered models.

Scroll
Images read using X,Y coordinates and angle data found with measurement functions can be scrolled.

Reset Scroll
Images that have been scrolled can be reset to their original positions.

Measurement

Positioning

Presence and Direction Inspection

Appearance (Defect) Inspection

Dimension Inspection

Applications Package

Measurement Support

Calculation
Calculations, such as basic arithmetic, tangent, cosine, and distance calculations, can be performed on the measurement data found using measurement functions.

Macros

Elapsed Time
The processing time to a specified point in the process flow can be measured. This can be used for the required processing, such as canceling measurements for time delays.

Wait
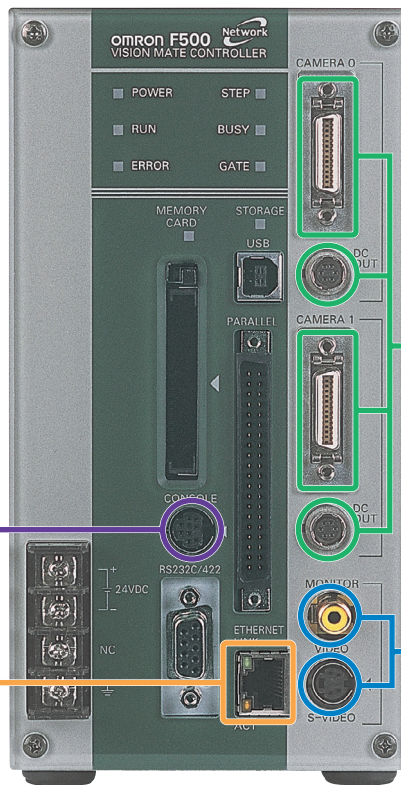The processing flow can be temporarily paused to place processing on standby for a set period of time.

Set Unit Data
Setting data can be overwritten.

Trend Monitor
Measurement time can be displayed on a graph along a time axis.

Branching Control

Conditional Branching
Measurement conditions can be changed based on measurement values and results.

DI Branching
Processing can be branched based on the input status of the parallel interface.

End
End indicates the end of the process flow. (No settings are required.)

Results Output

Memory Card Data
Measurement values can be output to a Memory Card inserted in the Controller.

DO Data
Measurement values can be output as binary or BCD data on the parallel interface.

DO Judgement
The OK/NG judgement results can be output on the parallel interface.

Host Link Data
OMRON's PLC Host Link communications can be used for measurement commands, judgement results, measurement values, and other data without special programming.

Normal Data
RS-232C communications can be used for measurement commands, judgement results, measurement values, and other data.

Data Logging
Measurement data and images can be stored inside the Controller.

Results Display

Display String   **Display Item**   **Display Line**   **Display Cursor**

Display Measure   **Display Time**   **Display Box**

Display Judge   **Display Figure**   **Display Circle**

System Configuration

Network-compatible Vision Sensor
F500-C10-ETN/F500-C15-ETN

1 Camera cable connector
(Up to two Cameras can be connected.)

3 Console connector

4 To computer via LAN (Ethernet)

Monitor connectors

1

Camera Cable
F500-VS 2M

1-million-pixel Camera with Digital Interface
F500-S1

2

10.4-inch LCD Monitor
F500-M10L

Optical Chart

High-resolution Lens

F500-LE16
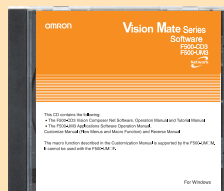
F500-LE25

F500-LE50

Extension Rings

3

Consoles
F150-KP   F160-KP

4

PC Support Software
F500-CD3E   Vision Composer Net*

Memory Cards
F160-N128S (128 MB)
F160-N256S (256 MB)

128M

256M

Applications Software
Use the following model numbers when ordering Application Software:
F500-UM3FE/-UM3ME

F500-UM 3E

F500-U 3M

*The F500-CD3E Vision Controller NET software includes the Vision Composer Watcher.

Specifications

F500-C10-ETN/F500-C15-ETN

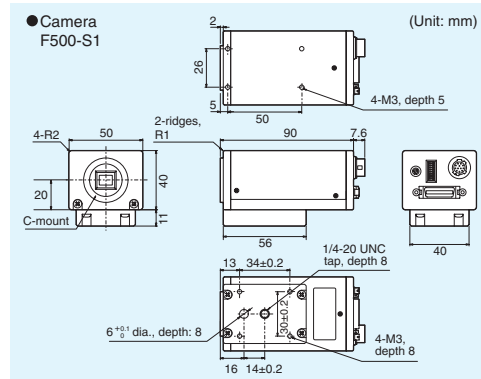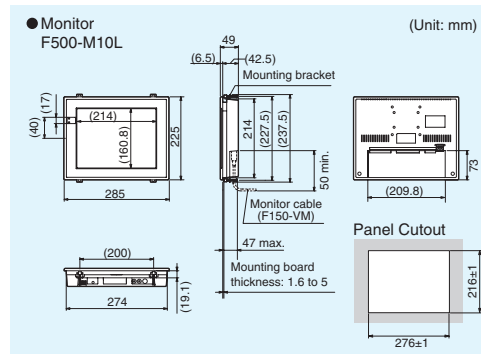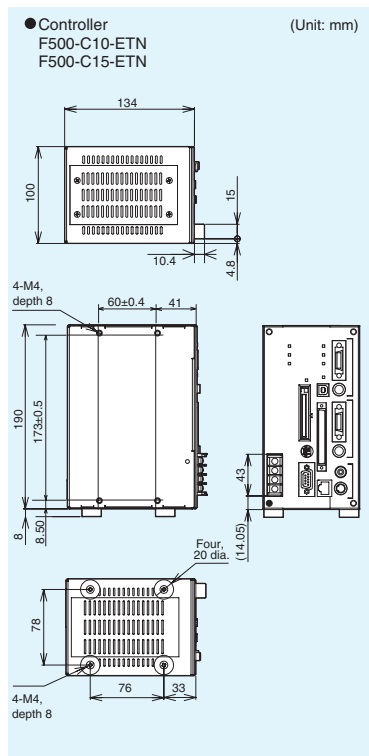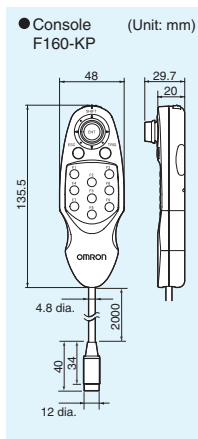|			
Connected Camera	F500-S1	Parallel I/O	11 inputs, 22 outputs
No. of connectable Cameras	2	Monitor interface	Composite video output: 1 channel, S-VIDEO output: 1 channel
Processing resolution	1024 (H) x 1024 (V)	Memory Card interface	Compact Flash card slot, 1 channel
No. of scenes	32 (Can be increased using Memory Cards.)	Power supply voltage	20.4 to 26.4 VDC
Image memory function	35 images max.	Current consumption	2.1 A max. (with two F500-S1 Cameras connected)
Storage	256 MB non-volatile memory	Ambient temperature	Operating: 0 to 50ºC Storage: –25 to 65ºC with no icing or condensation
Operation and settings	Measurement items installed using Applications Software.Menu operations used to combine measurement items. Vision Composer Net can be used for operation and settings.	Ambient humidity	Operating/storage: 35% to 85% with no condensation
Menu language	Japanese or English (switchable)	Dimensions	100 x 198 x 134 mm (WxHxD) (without connectors and other protrusions)
Serial communications	USB series B: 1 channel RS-232C/422: 1 channel	Weight	Approx. 1.6 kg (Controller only)
Network communications	Ethernet 100Base-TX/10Base-T	Accessories	Ferrite core for Console (1), Setup Manual

F500-S1

Picture elements	2/3-inch CCD
Pixel size	6.45 µm (H) x 6.45 µm (W)
Shutter	Electronic shutter, 10 shutter speeds (1/24 to 1/10,000 s), changed via menu
Partial function	Four settings
Communications interface	Conforms to Camera Link
Ambient temperature	Operating: 0 to 50ºC Storage: –25 to 60ºC with no icing or condensation
Ambient humidity	Operating/storage: 30% to 85% with no condensation
Dimensions	50 x 40 x 90 mm (WxHxD) (without connectors and other protrusions)
Weight	Approx. 270 g
Accessories	Instruction Manual

System Requirements for F500-CD2E Vision Composer Net

CPU		Pentium III 600 MHz min. (Pentium III 1 GHz min. recommended)
OS		Windows 2000 Professional, Service Pack 3 or higher Windows XP Home Edition, Service Pack 1 or higher Windows XP Professional, Service Pack 1 or higher
Memory		192 MB min. (256 MB min. recommended)
Hard disk		200 MB min. available space
Monitor		Resolution: 1,024 x 768 min. Display colors: High Color (16-bit) min. (True Color (32-bit) min. recommended)
Network		10BaseT-compliant network (100Base-TX recommended)
Vision Sensor	Controller	F500-C10-ETN/F500-C15-ETN
	Applications software	F500-UM Version 2.00 or higher

Dimensions

● Console F160-KP (Unit: mm)

● Controller F500-C10-ETN F500-C15-ETN (Unit: mm)

● Monitor F500-M10L (Unit: mm)

● Camera F500-S1 (Unit: mm)

F210 Vision Sensor

Helps save work with a flow menu method and macro function.

F270 Vision Sensor

Integrates OMRON's accumulated know-how and achieves super-high-speed processing to improve manufacturing processes.

This document provides information mainly for selecting suitable models. Please read the Setup Manual (SCHB-747) carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

Note: Do not use this document to operate the Unit.

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Note: Specifications subject to change without notice.

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