MITSUBISHI ELECTRIC

FA Sensor

MELSENSOR

Vision Sensor VS Series Setting Guide

-VS20M-11F310
-VS20M-12F410
-VS20M-13F410
-VS20C-12F410
-VS20C-13F410
-VS70M-600-E
-VS70M-600-ER
-VS70M-600
-VS70M-600-R
-VS70M-800-E
-VS70M-800-ER
-VS70M-800
-VS70M-800-R
-VS70M-802-E
-VS70M-802-ER
-VS70M-802
-VS70M-802-R
-VS70C-600-R
-VS70C-800-R
-VS70C-802-R

-VS80M-100-E
-VS80M-100
-VS80M-200-E
-VS80M-200-ER
-VS80M-200
-VS80M-200-R
-VS80M-400-E
-VS80M-400-ER
-VS80M-400
-VS80M-400-R
-VS80M-202-E
-VS80M-202-ER
-VS80M-202
-VS80M-202-R
-VS80M-402-E
-VS80M-402-ER
-VS80M-402
-VS80M-402-R
-VS80C-100
-VS80C-200-R
-VS80C-400-R
-VS80C-202-R
-VS80C-402-R

Powered by COGNEX

This product is designed and manufactured by Cognex Corporation.
*Note that the warranty and general specifications of this product differ from that of programmable controller products.

COGNEX

SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. For the safety precautions for other modules, refer to their respective user's manuals.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".

⚠ **WARNING**	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ **CAUTION**	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

CONDITIONS OF USE FOR THE PRODUCT

(1)This vision sensor shall be used in conditions;
i) where any problem, fault or failure occurring in the vision sensor, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the vision sensor for the case of any problem, fault or failure occurring in the vision sensor.

(2)This vision sensor has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI ELECTRIC SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY THIS VISION SENSOR THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI ELECTRIC USER'S, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the VISION SENSOR.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the vision sensor in;
Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the vision sensor.
Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.
Notwithstanding the above restrictions, Mitsubishi Electric may in its sole discretion, authorize use of the vision sensor in one or more of the Prohibited Applications, provided that the usage of the vision sensor is limited only for the specific applications agreed to by Mitsubishi Electric and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the vision sensors are required. For details, please contact the Mitsubishi Electric representative in your region.

(3)Mitsubishi Electric shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

CONTENTS

RELEVANT MANUALS

Manual name [manual number]	Description	Available form
Vision Sensor VS Series Setting Guide [BCN-P5999-1065] (this manual)	Functions of In-Sight Explorer and procedures for creating and executing a job, etc.	e-Manual PDF
Vision Sensor Setting Guide (Spreadsheet) [BCN-P5999-1072]	Operating and job creation methods, etc. for using a spreadsheet in In-Sight Explorer	e-Manual PDF
Vision Sensor Connection Guide [BCN-P5999-0861]	Procedures for connecting a vision sensor to a MELSEC programmable controller to control a vision system through a CC-Link IE Field Network Basic connection, an SLMP connection, an I/O connection, or an EtherNet/IP connection	e-Manual PDF
Vision Sensor VS20 User's Manual [SH-081769ENG]	Functions, installation methods, system configuration, and required hardware components, etc. of the vision sensor VS20	Print book e-Manual PDF
Vision Sensor VS70 User's Manual [SH-081889ENG]	Functions, installation methods, system configuration, and required hardware components, etc. of the vision sensor VS70	Print book e-Manual PDF
Vision Sensor VS80 User's Manual [SH-081891ENG]	Functions, installation methods, system configuration, and required hardware components, etc. of the vision sensor VS80	Print book e-Manual PDF

Point

e-Manual refers to the Mitsubishi Electric FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- Hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.
- Sample programs can be copied to an engineering tool.

1 MELSENSOR VISION SENSOR OVERVIEW

1.1 Features of the MELSENSOR Vision Sensor

Tool-integrated sensor

This standalone vision sensor integrates a CPU with personal computer level performance and image processing tools in a compact camera.

Replaceable options

The lighting and lens structure can be arranged freely to match the requirements of the application.

Interaction with iQSS

Total costs can be reduced in design, startup, operation, and maintenance through the automatic detection of connected devices and tool interaction functions.

Linkage with a programmable controller

Vision sensors support SLMP and CC-Link IE Field Network Basic. A vision sensor can start and the state of the vision sensor can be monitored by assigning devices that control and monitor the vision sensor and turning the devices ON or OFF. In addition, parameters can be changed by assigning the devices.

FTP support

Vision sensor inspection images can be transferred to GOTs and host-computer systems to enable traceability combining recognition results and recognition images.

Simple setup on a personal computer

In-Sight Explorer (vision sensor setup tool) is an interface in which images play a central role and enables easy configuration of the vision sensor.
Furthermore, inspection configuration is program-free, and target characteristics in images can be selected by pointing and clicking, so configuration can be completed quickly.

MEMO

2 OVERVIEW OF In-Sight Explorer

2.1 Procedure for Using In-Sight Explorer

Preparation of In-Sight Explorer

1. Installation

Check the installation requirements, and then install In-Sight Explorer.

☞ Page 10 Installation of In-Sight Explorer

2. Acquisition of offline programming key

Acquire the offline programming key, and then enable the emulator function using In-Sight Explorer.

☞ Page 13 About Emulator Use

2.2 Installation of In-Sight Explorer

When running In-Sight Explorer in EasyBuilder view, a VS series vision sensor can be configured and monitored using a Windows personal computer on the same network as the VS series vision sensor.

Precautions

For the latest operating system requirements, refer to In-Sight Explorer release notes.

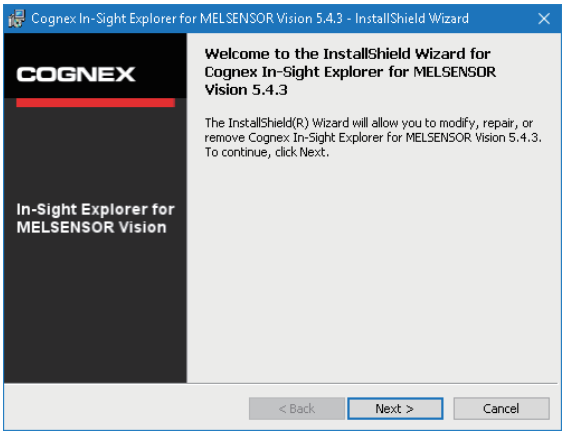
Installation requirements

Item	Description
Operating system (English version)	Microsoft® Windows® 10 Professional (64-bit) Microsoft® Windows® 7 Professional, Service Pack 1 (64-bit) Microsoft Windows Server 2008 R2, Service Pack 1 (64-bit)
CPU	Intel® Pentium® 4 processor 2.0 GHz or higher (Intel Core™ i7 processor; 2.7 GHz or better recommended)
Free memory	1 GB or more (4 GB or more recommended)
Monitor	1024×768 (1980×1080 recommended)
Free hard disk space	2 GB or more (2.5 GB or more recommended)
Display colors	24-bit color (32-bit color recommended)
Ethernet	100 Mbps (1 Gbps recommended)

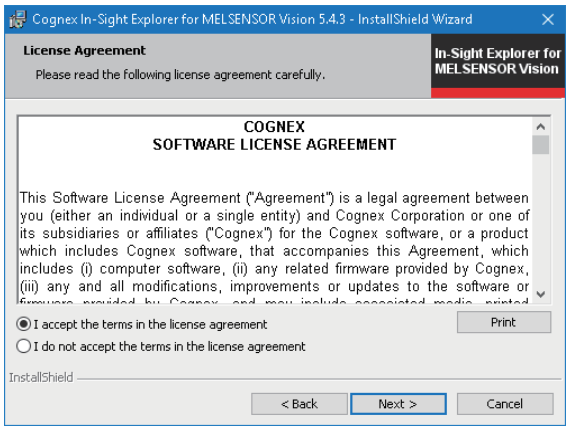
Installation procedure

Operating procedure

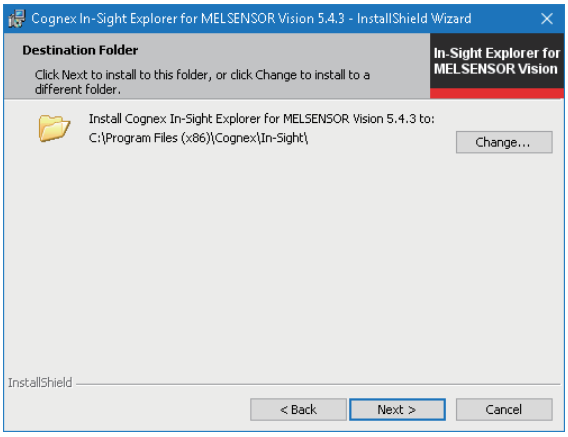
1. Download the installer of In-Sight Explorer from the Mitsubishi Electric FA website.
   www.mitsubishielectric.co.jp/fa
2. Close all running applications.
3. Run the obtained installer.



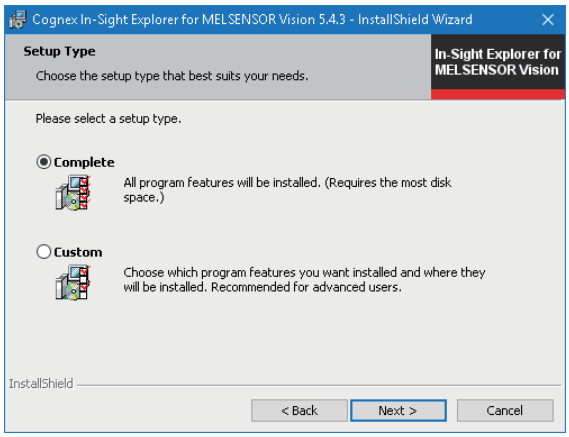
4. In the "License Agreement" screen, select "I accept the terms in the license agreement", and click the [Next] button.



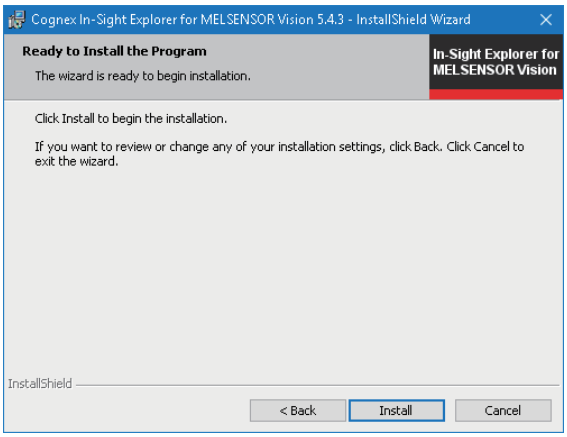
5. Configure the installation destination folder.
To change the default installation destination, click the [Change] button.



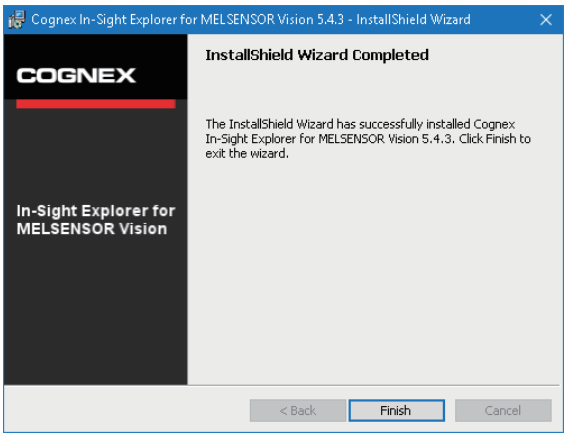
6. In the "Setup Type" screen, select the method that suits the conditions from "Complete" or "Custom".
Click the [Next] button.



7. In the "Ready to Install the Program" screen, click the [Install] button to start installation.



8. In the "InstallShield Wizard Completed" screen, click the [Finish] button to close the setup utility and quit the installation.



2.3 About Emulator Use

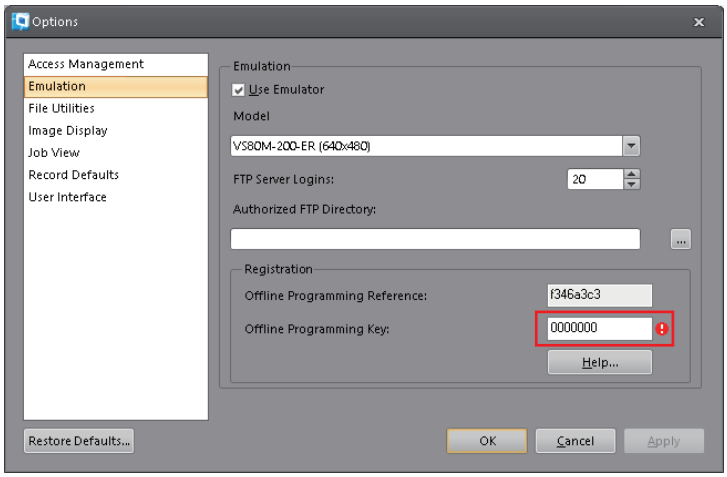
Overview of emulator function

In-Sight Explorer has an emulator function.
The emulator allows the addition of tools to jobs and the editing of parameters even when the VS series vision sensor is not on hand.
Images of inspection items captured with the VS series vision sensor or other cameras and saved to a personal computer can be imported, and the parameters of the location tools and inspection tools can be adjusted, added, and deleted.
Job files created using the emulator can be run on an actual vision sensor by loading the files on a VS Series vision sensor.

Registration of an offline programming key

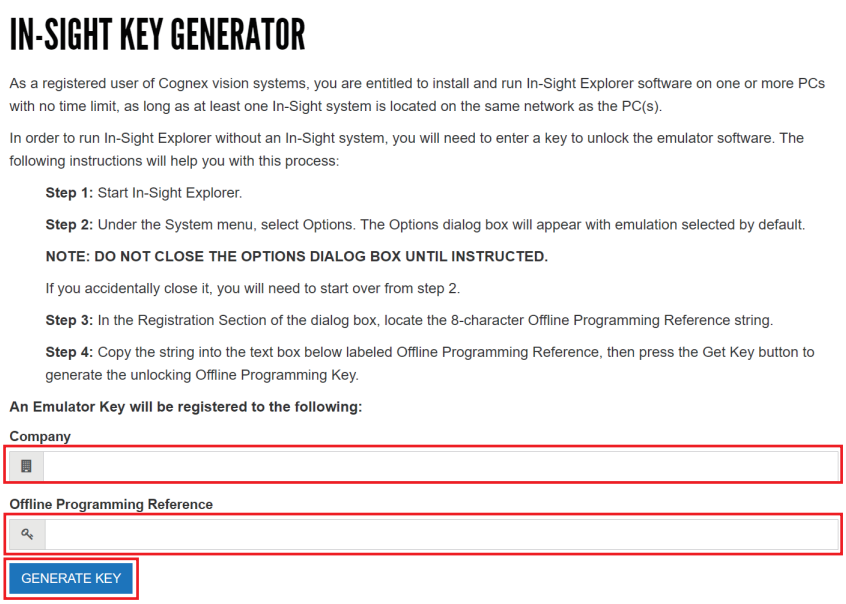
Operating procedure

1. Select [Options] from the [system] menu of In-Sight Explorer.
2. In the "Options" screen, select [Emulation].
3. Copy the alphanumeric characters listed for "Offline Programming Reference" to the clipboard.



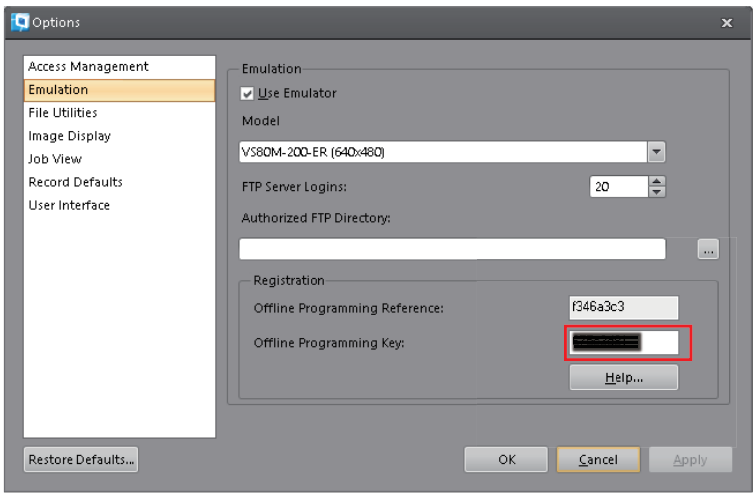
4. Access the following web site with a web browser.
   support.cognex.com/en/InsightEmulatorKey

5. The [IN-SIGHT KEY GENERATOR] page opens. Enter your company's name in "Company" under "An Emulator Key will be registered to the following:".
Paste the number copied in Step 3 onto "Offline Programming Reference", and click the [GENERATE KEY] button.



6. The offline programming key is displayed. Copy it to the clipboard.

7. In the "Offline Programming Key" field of the "Options" screen, paste the offline programming key copied in Step 6.



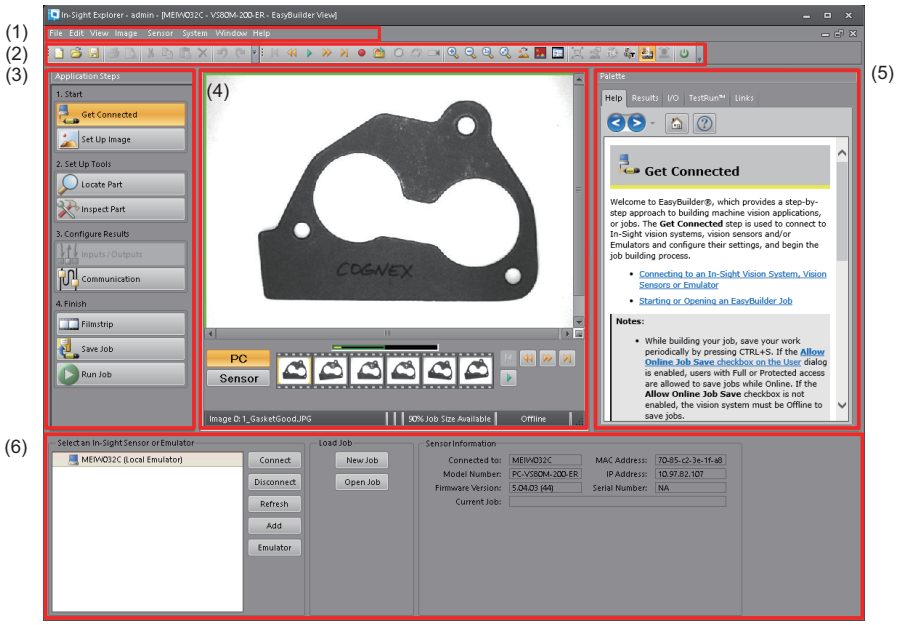
8. In the "Options" screen, click either the [OK] button or the [Apply] button to apply the settings.

Precautions

If In-Sight Explorer is started without the offline programming key already entered, Error 6001 or Error 6047 may appear.
The offline programming key can only be acquired from a personal computer that can connect to the Internet.
When using a personal computer that cannot connect to the Internet, acquire an offline programming key with another personal computer that can connect to the Internet, or please contact your local Mitsubishi Electric sales office or representative.
The job run time displayed by In-Sight Explorer when a job is run by the emulator may differ from the job run time on an actual machine.

2.4 Overview of EasyBuilder

The EasyBuilder graphical user interface (GUI) is centered on images.
It is designed so that vision applications can be constructed simply by configuration following the application steps.
The EasyBuilder GUI is made up of the following six parts.



(1) Menu bar
(2) Toolbar (Standard, EasyBuilder, Explorer)
(3) Application Steps
(4) EasyBuilder View
(5) Palette
(6) Setting Pane

Application Steps

"Application Steps" are displayed in the order they are generally used for job creation.
These steps can be accessed again in an arbitrary order after job creation, so parameters can be changed and fine-tuned until the target results are acquired.
Every step of EasyBuilder can be accessed by one click from the [Application Steps] pane.

2.5 Operation Workflow

The basic operating procedure of In-Sight Explorer is as follows.

Vision sensor configuration procedure

1. Get Connected

Configure the vision sensor network and connect with In-Sight Explorer.

☞ Page 18 GET CONNECTED

2. Set Up Image

Configure the trigger type settings and image import settings, and then run calibration.

☞ Page 27 SET UP IMAGE

3. Locate Part

Add and configure tools to locate the part.

☞ Page 51 Configuring Location Tools

4. Inspect Part

Add and configure tools to inspect the part.

☞ Page 57 Configuration of Inspection Tools

5. Input/output configuration

Configure the I/O module connection settings and the input/output operation settings.

☞ Page 103 INPUTS/OUTPUTS

6. Configuring a communication setting

Configure the EasyView and FTP settings, and configure communication via the industrial protocol.

☞ Page 108 COMMUNICATION

7. Settings during operation

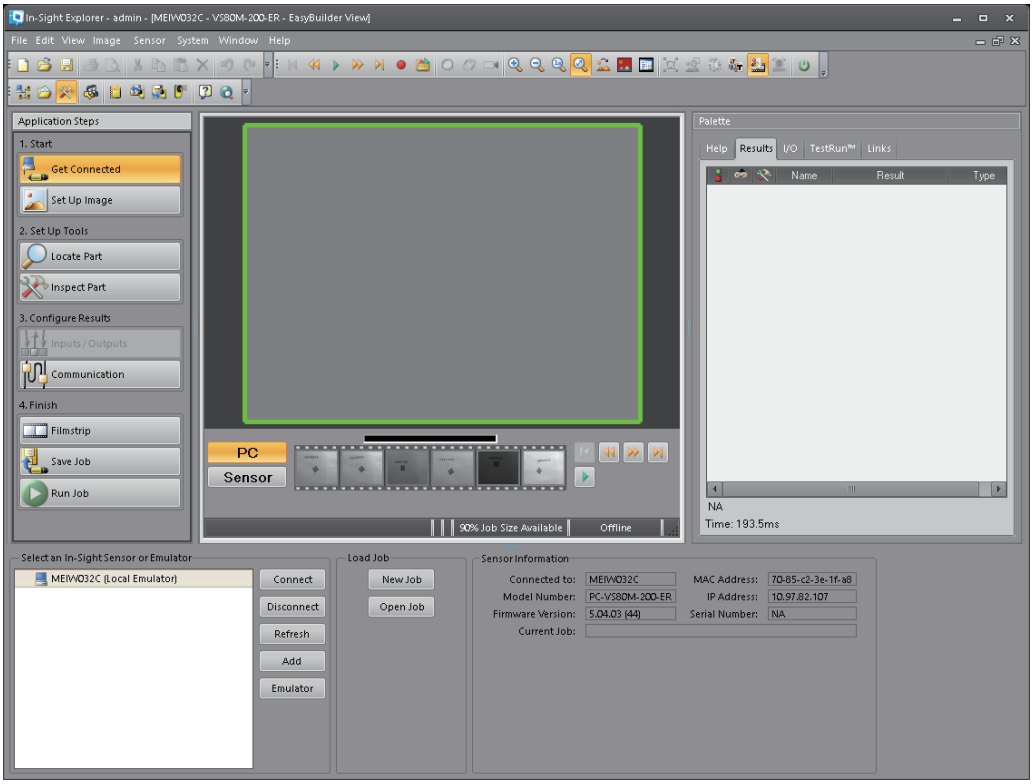
Configure Filmstrips, jobs to be loaded at startup, and online mode.

☞ Page 117 FILMSTRIP, Page 122 SAVING JOB, Page 124 RUN JOB

3 GET CONNECTED

3.1 Connecting to a Vision Sensor or Emulator

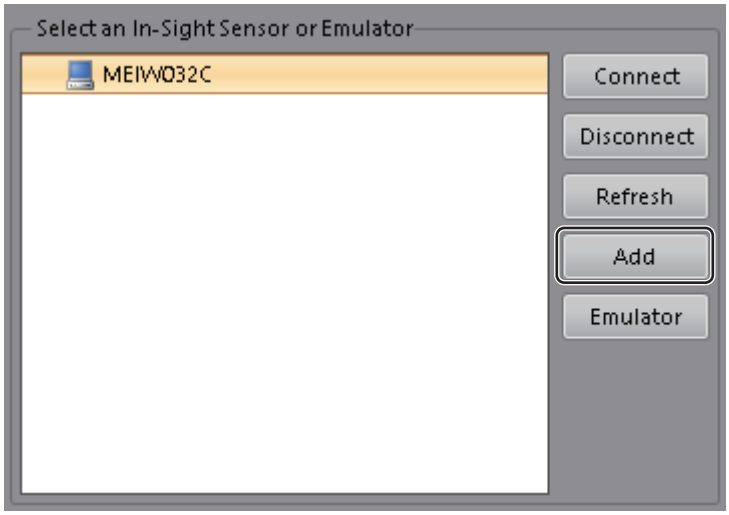
The following screen appears when In-Sight Explorer is started.



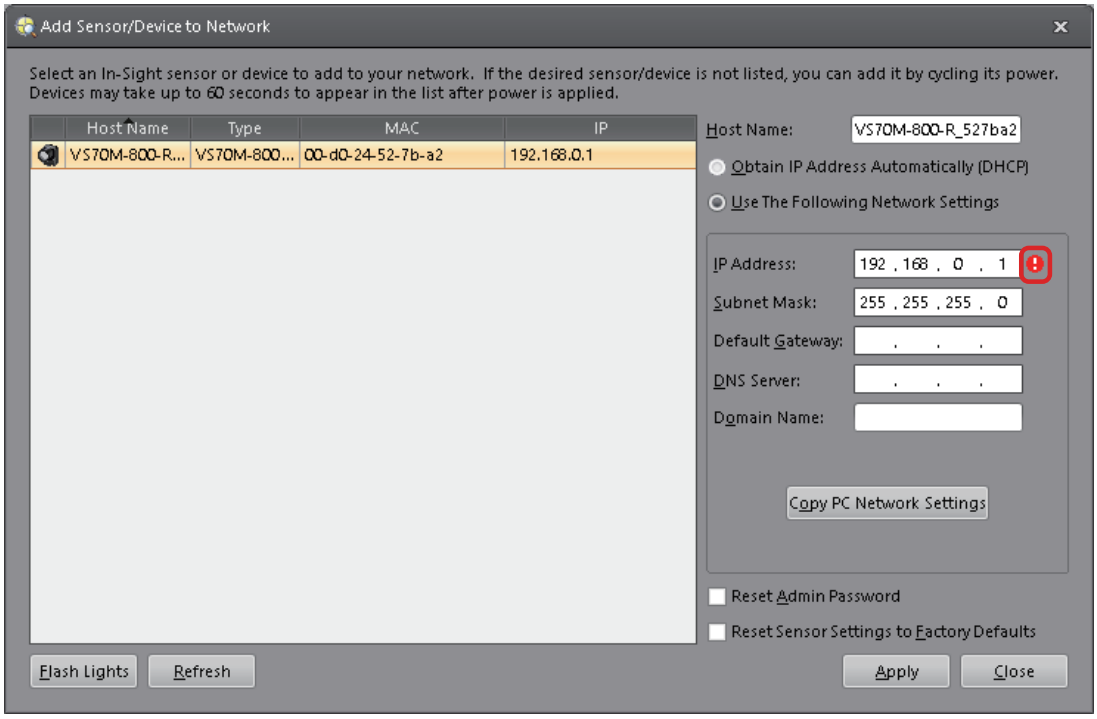
If the vision sensor to be connected does not appear in the "Select an In-Sight Sensor or Emulator" area at the bottom left, run the following procedure.

Operating procedure

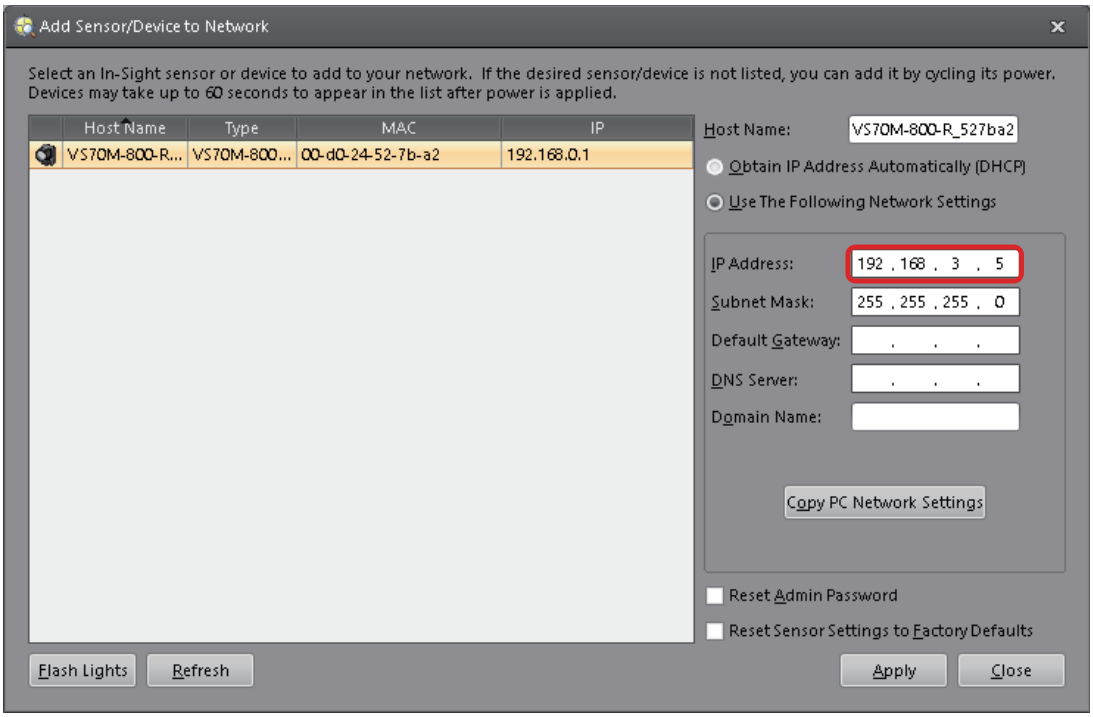
1. Click the [Add] button.



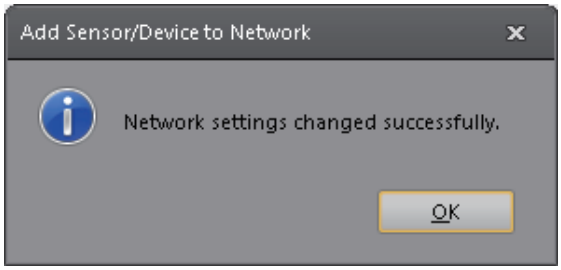
2. In the "Add Sensor/Device to Network" screen, select the vision sensor to be connected.
When a personal computer cannot connect to the vision sensor, such as when the subnet of the displayed IP address is different from the subnet of the local personal computer, a warning mark is displayed on the right side of the IP address as shown in the following figure. In that case, enter an appropriate IP address.



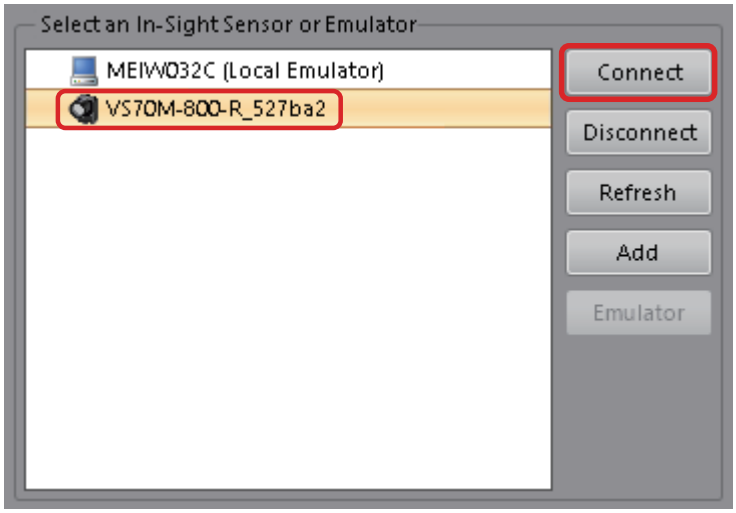
3. The warning mark disappears when an appropriate IP address is entered.



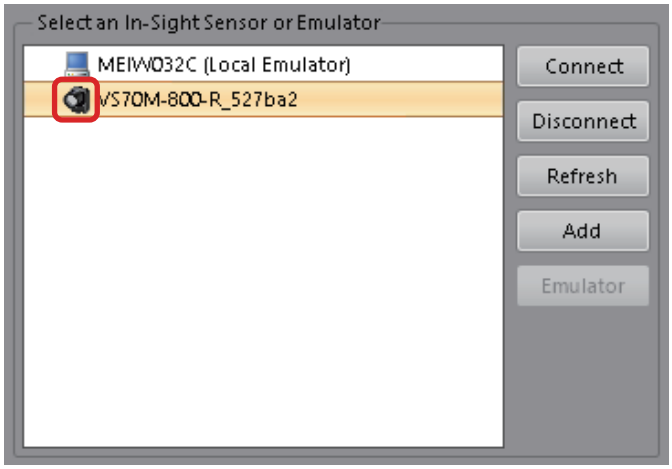
4. After changing the IP address, click the [Apply] button.
If the setting change is completed normally, the following message appears.



5. If it can be detected, the vision sensor appears as shown below.
Select the vision sensor to be connected, and then click the [Connect] button.



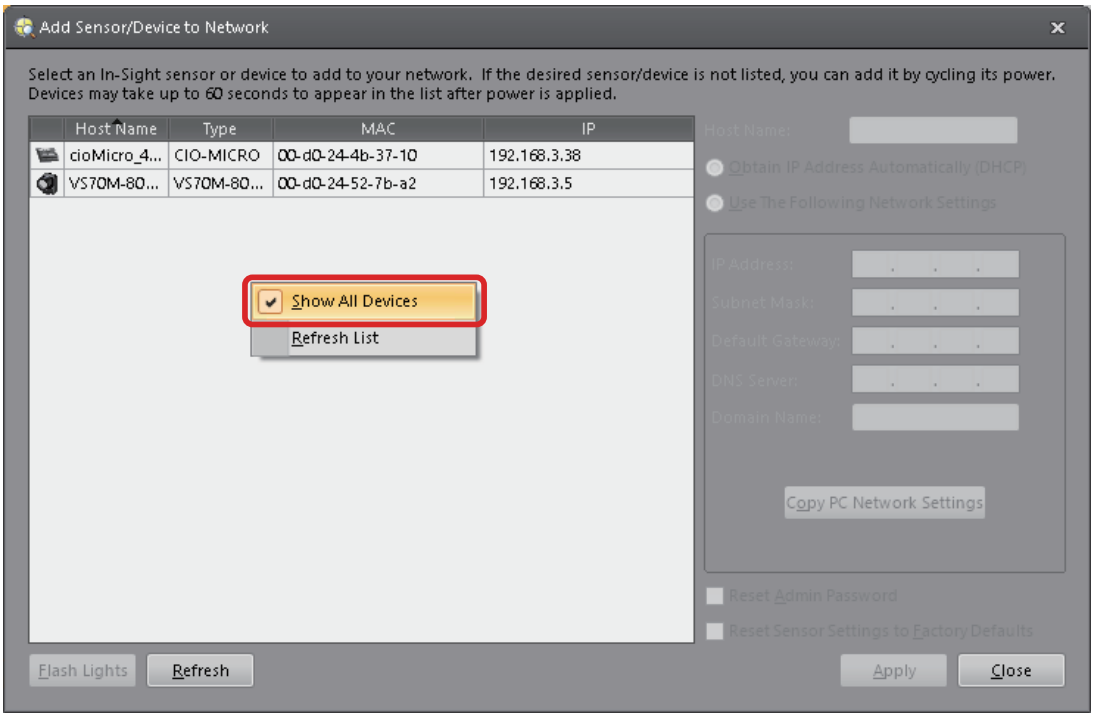
6. An In-Sight Explorer image appears in the background of the icon of the connected vision sensor.
In the case of the emulator, an In-Sight Explorer image appears in the monitor of the personal computer icon.



Icon changes by the status of the connection to the vision sensor or emulator in In-Sight Explorer

Connection target	Not connected	Connected
Vision sensor (shape may differ by model)		
Emulator		

When the target vision sensor is not displayed in the "Add Sensor/Device to Network" screen even though the vision sensor is connected to the network and the power is ON, right-click the sensor/device display area to open a menu and click [Show All Devices] from the menu to enable the display.



Precautions

■ When a vision sensor is not recognized

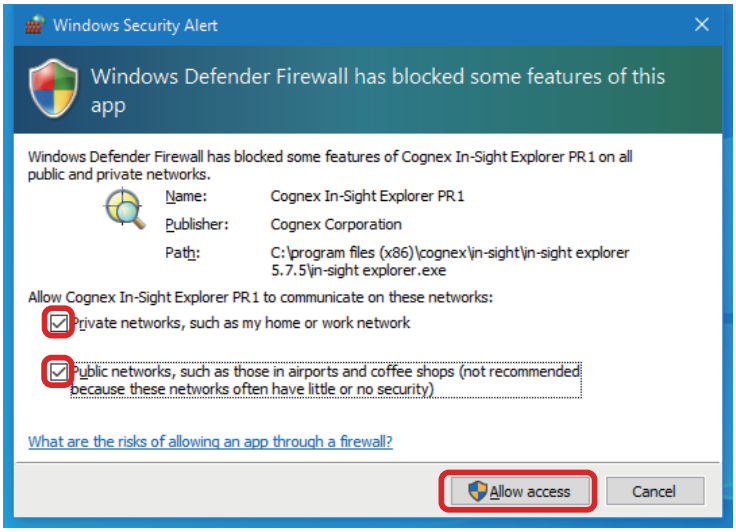
When a vision sensor is not recognized, try the following operations:

- Check that the cables are properly connected.
- Allow the communication in the settings of a firewall or security software.
  For details, refer to the following:
  ☞ Page 23 When communication with In-Sight Explorer (vision sensor setup tool) and In-Sight (emulator) is not allowed by a firewall

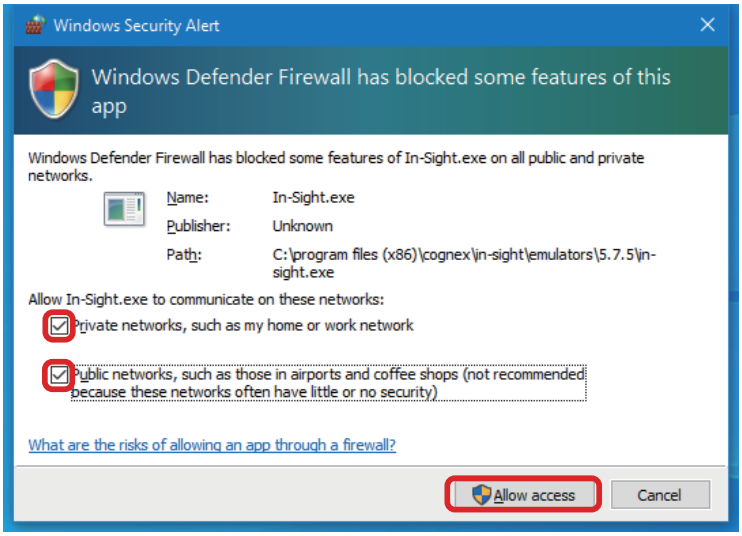
■ When a warning message appears

A warning message may appear, which indicates that a function of In-Sight Explorer (vision sensor setup tool) and In-Sight (emulator) is blocked by the Windows firewall.
Select the checkboxes of "Private networks" and "Public networks," click the [Allow access] button, then continue the operation.

- When the vision sensor setup tool is blocked by a firewall



- When the emulator is blocked by a firewall



■ When communication with In-Sight Explorer (vision sensor setup tool) and In-Sight (emulator) is not allowed by a firewall

When a firewall is enabled and communication with In-Sight Explorer (vision sensor setup tool) and In-Sight (emulator) is not allowed, a vision sensor may not be recognized since communication is not possible.

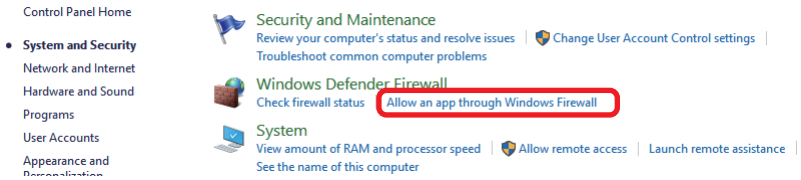
To allow the communication in the Windows firewall, refer to the procedure below.

When using other software with a firewall function, refer to the manual of the software and allow the communication with In-Sight Explorer (vision sensor setup tool) and In-Sight (emulator).

The following shows the procedure for Windows 10.

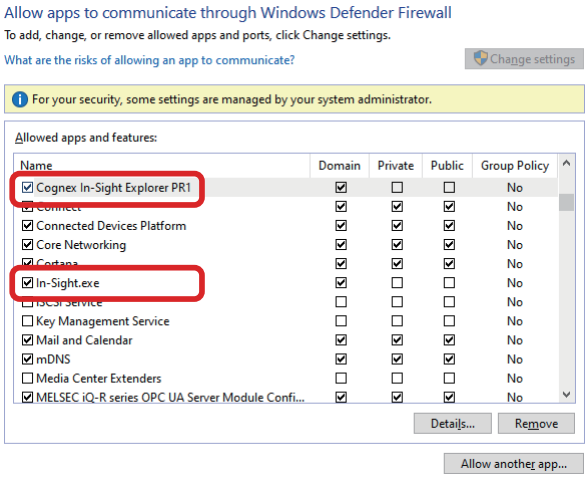
Operating procedure

1. Select [Control Panel] ⇨ [System and Security] ⇨ [Allow an app through Windows Firewall] from Windows Start.



2. Click the [Change settings] button.

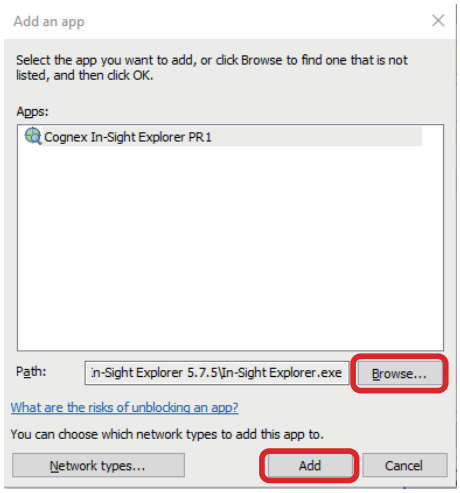
Check if "Cognex In-Sight Explorer PR1" (vision sensor setup tool) and "In-Sight" (emulator) are displayed in the list. If they are displayed, the operations in Step 3 to 5 are not necessary.



3. Click the [Allow another app] button.

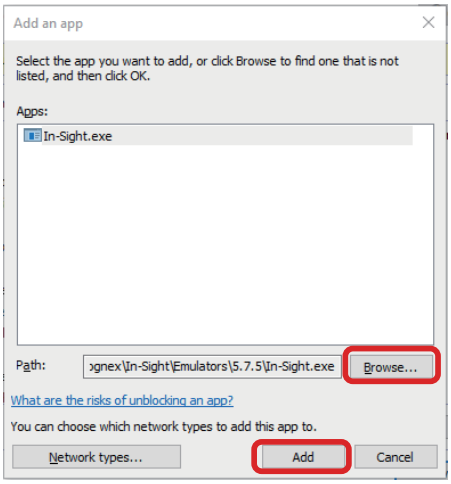
4. Click the [Browse] button in the "Add an app" screen, select "In-Sight Explorer"[*1] in the folder where In-Sight Explorer is installed, then click the [Add] button.

*1 The folder to be browsed is stored in the following if the installation destination folder for the vision sensor setup tool is not changed.
(Example) When the version of the vision sensor setup tool is 5.7.5PR1
C:\Program Files (x86)\Cognex\In-Sight\In-Sight Explorer 5.7.5

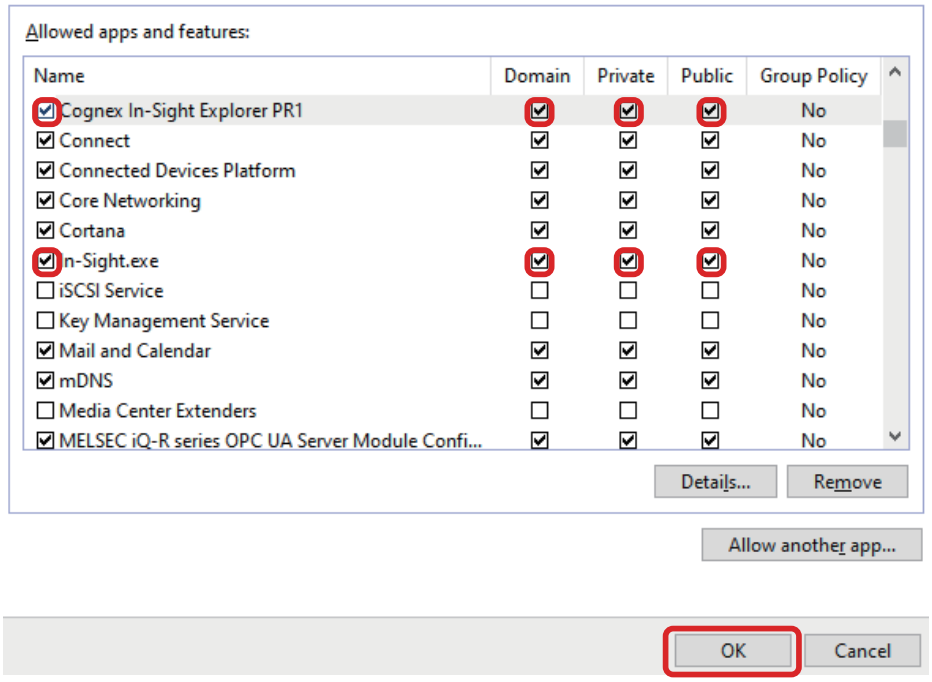


5. Click the [Browse] button in the "Add an app" screen, select "In-Sight"[*1] in the folder where In-Sight Explorer is installed, then click the [Add] button.

*1 The folder to be browsed is stored in the following if the installation destination folder for the vision sensor setup tool is not changed.
(Example) When the version of the vision sensor setup tool is 5.7.5PR1
C:\Program Files (x86)\Cognex\In-Sight\Emulators\5.7.5



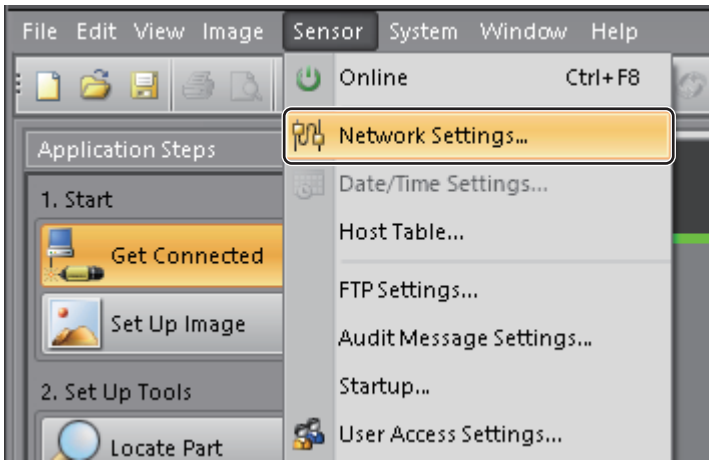
6. Select the checkboxes of "Name," "Domain," "Private," and "Public" for "Cognex In-Sight Explorer PR1" (vision sensor setup tool) and "In-Sight" (emulator) in the list, and click the [OK] button.



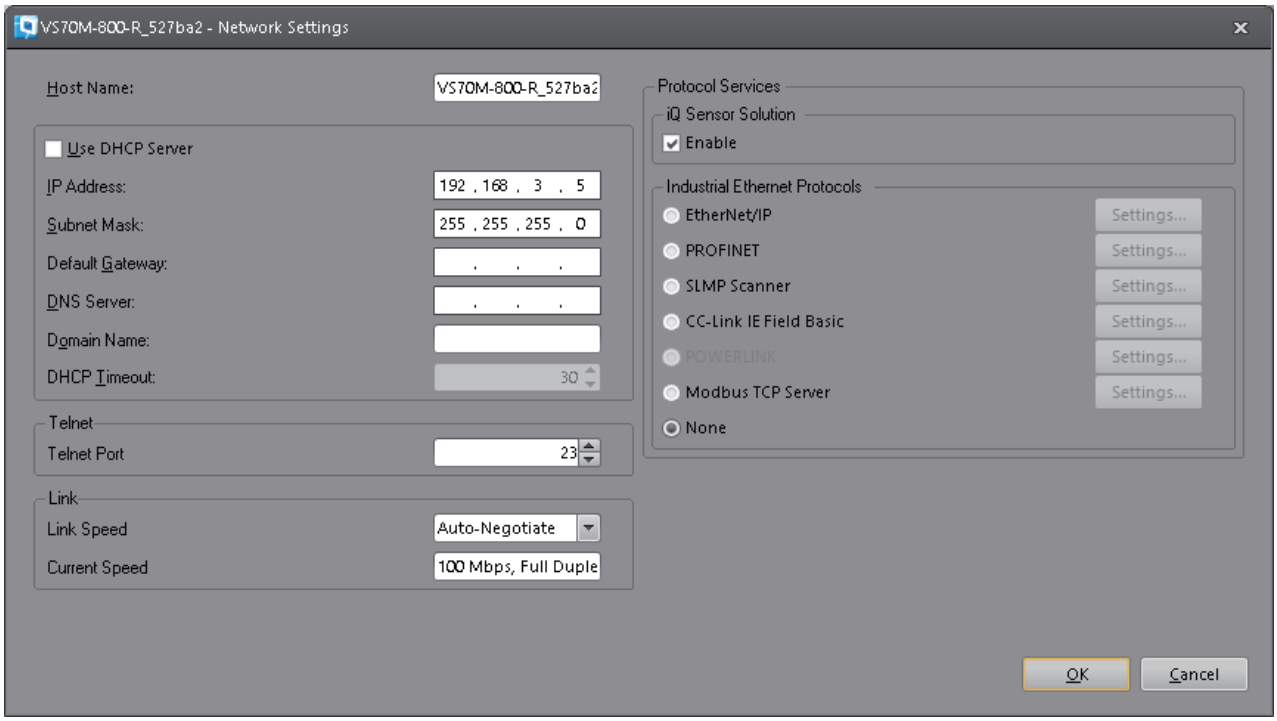
3.2 Vision Sensor Network Settings

To configure a vision sensor before connection (before configuration), refer to Page 18 Connecting to a Vision Sensor or Emulator.

To change the network settings of a connected vision sensor, click [Network Settings] from the [Sensor] menu.

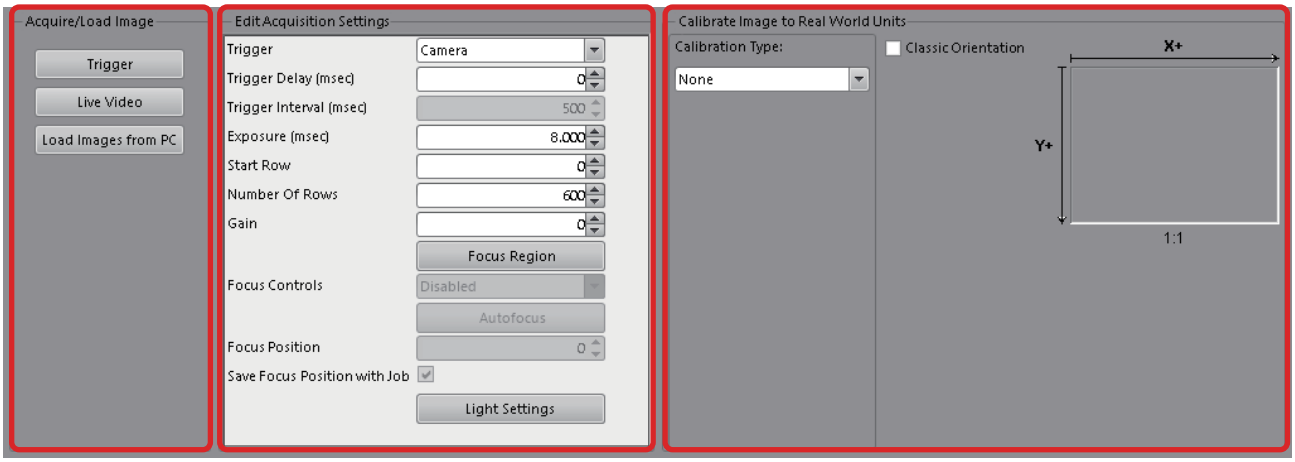


In the "Network Settings" screen, settings including IP address-related settings, validation for iQ Sensor Solution and industrial Ethernet protocol settings are available.

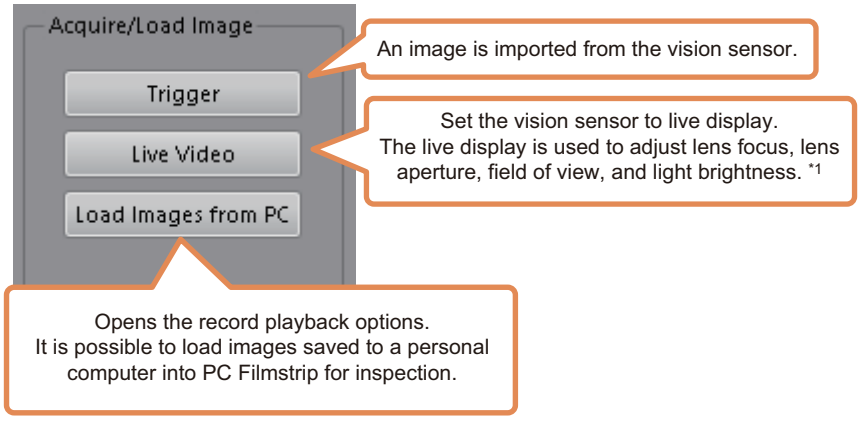


4 SET UP IMAGE

Using Set Up Image, it is possible to configure image import and calibration, and import using triggers, live video, and loading from a personal computer.



4.1 Importing/Loading Images



*1 Image adjustment tips (☞ Page 28 Image adjustment tips)

Image adjustment tips

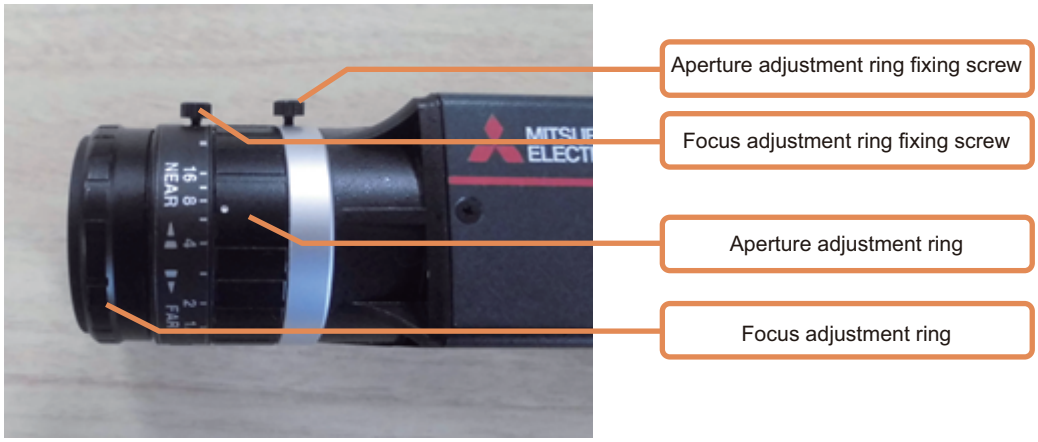
Focus: Set live video and adjust.

To focus, rotate and adjust the focus adjustment ring so that the inspection screen is displayed most clearly.

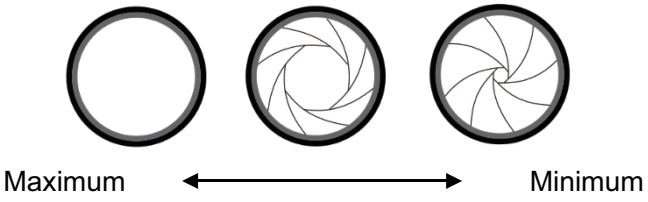
Brightness: To adjust the camera brightness, change the lens aperture (when available), the camera exposure time, and gain. Generally, the exposure time is the initial value, and the aperture should be roughly midway between the maximum and minimum. However, when the inspection target is moving during recording, shorten the exposure time until the image is not blurry.

When the exposure time cannot be adjusted, adjust the brightness of the lighting.

Lens example (configuration may differ by manufacturer, type, etc.)



Lens aperture example (aperture may be fixed depending on the lens)



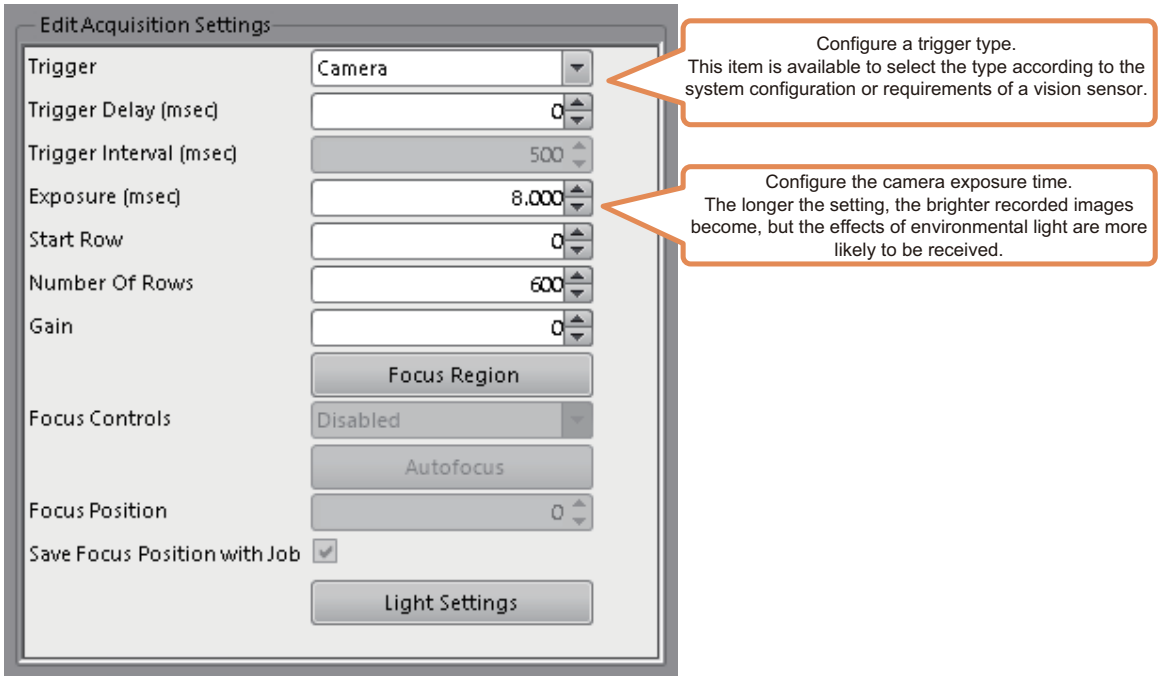
Depth of field* is shallow
Becomes brighter

Depth of field is deep
Becomes darker

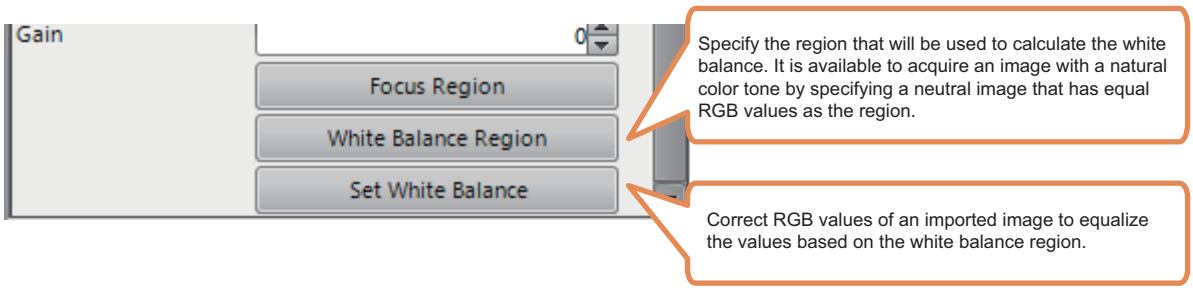
*Depth of field: Depth at which focus is reached.

4.2 Image Import Settings

Using the image import settings, it is possible to configure trigger settings, exposure time, focus control (when an autofocus lens is used), and lighting settings (with built-in lighting or when external lighting is connected to the vision sensor).



Additionally, when using a vision sensor that is compatible with color images, white balance settings are required.
White balance is an important adjustment to obtain an appropriate color tone under different light sources.



Point

It is recommended to initially import an image of a white piece of paper and specify the image for a white balance region.

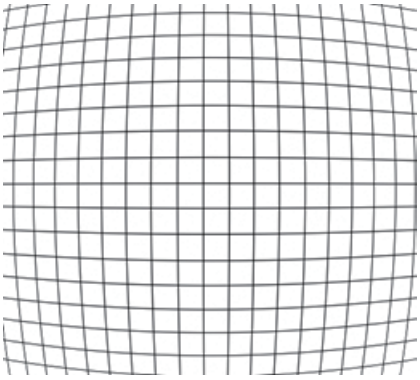
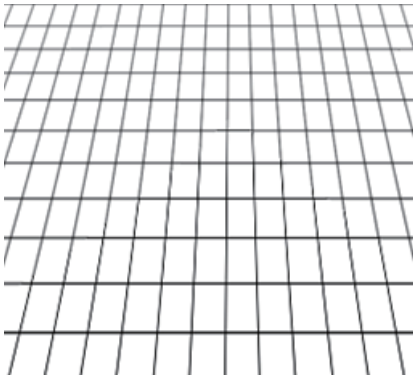
For details on each setting, refer to "Adjusting the Acquisition Settings" under "Set Up Image" on EasyBuilder Help.

4.3 Calibration

Calibration is a function to transform the dimensions that correspond to the measurement surface from pixel units to actual units.

There are two types of calibration: one in which actual workpieces or items with determined dimensions are arranged at the same height as the measurement surface, and one in which patterns defined in advance are arranged on the measurement surface.

Only the latter type can handle lens radial distortion and perspective distortion.

Example of lens radial distortion	Example of perspective distortion
	
Cause As the focal length becomes shorter, the radial distortion becomes stronger. With some high performance lenses, this distortion is small.	Cause Perspective distortion occurs when the camera is set diagonally to the inspection surface.

For details on calibration, refer to "Calibrating the Image to Real World Units" under "Set Up Image" in EasyBuilder Help.

Calibration types

Calibration type: Edge

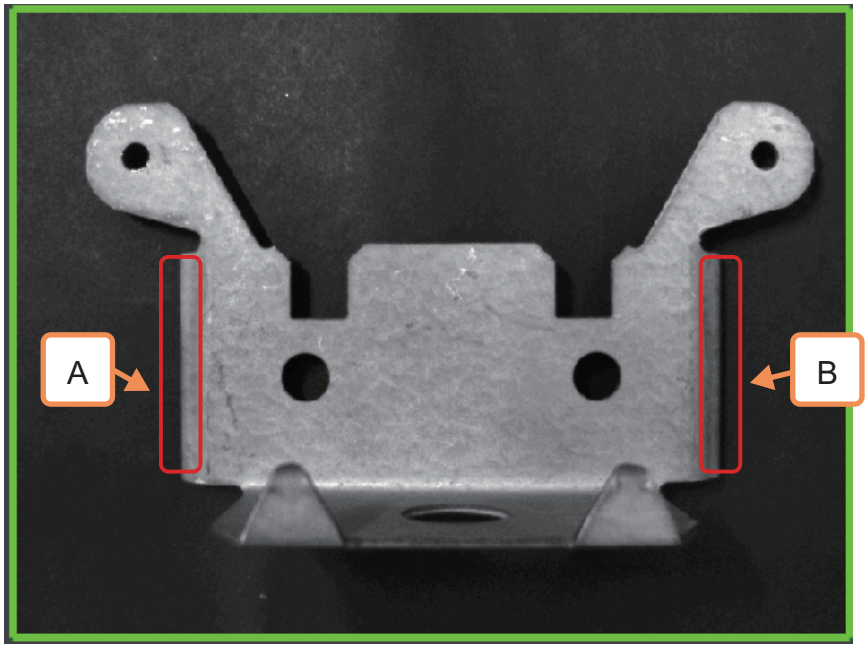
Edge calibration can be used when the distance between edges is known.

Because radial distortion and perspective distortion are not taken into consideration, precision is best when the measurement surface is parallel with the image sensor.

Operating procedure

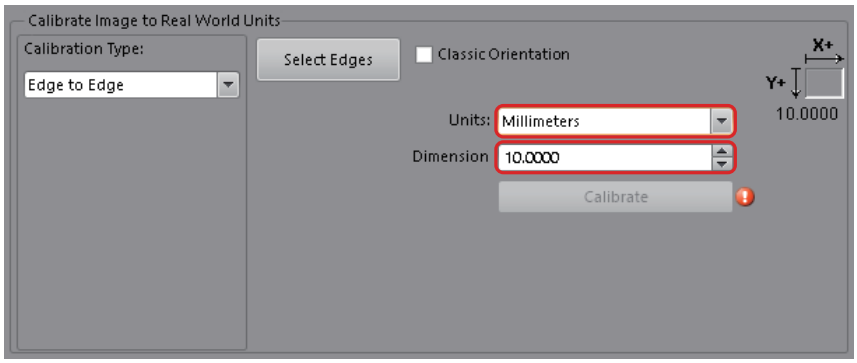
1. The workpiece is captured.

The distance between edges of the captured workpiece indicated by frames A and B is treated as 30 mm.

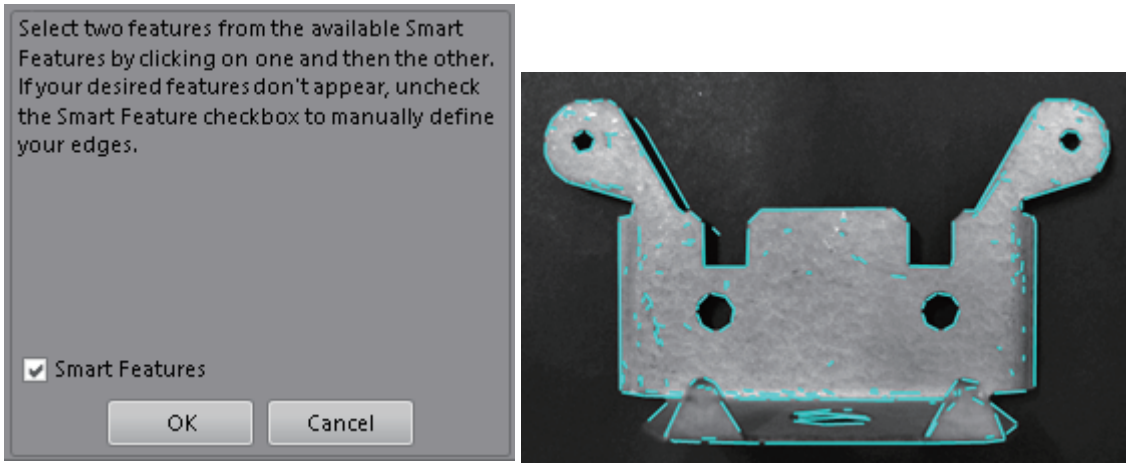


2. Select Edge for the calibration type of Set Up Image.

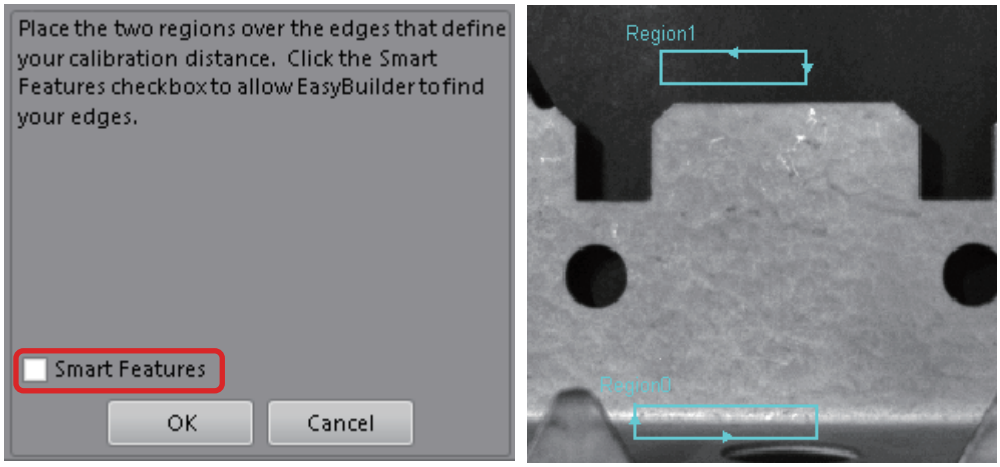
Check the units, and then enter 30 for the dimension.



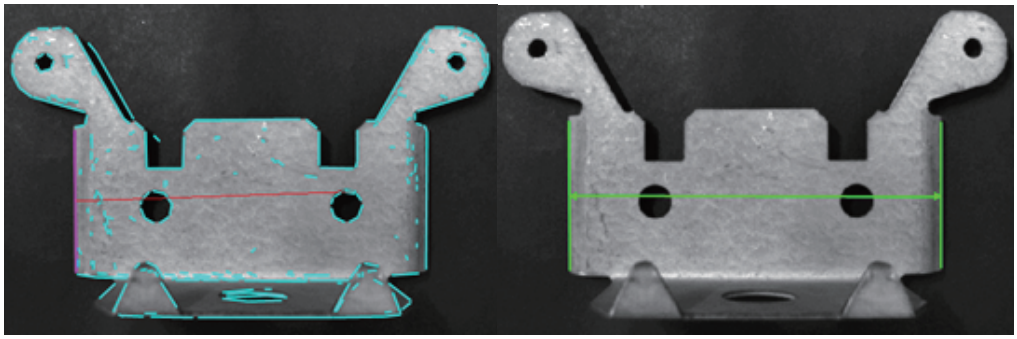
3. Click the edge selections, and then select the edges to be used for calibration.



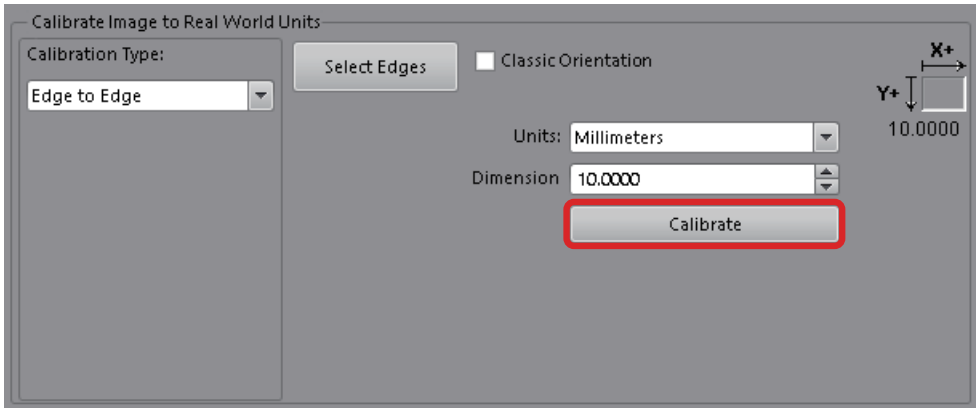
Because the edges used for calibration are detected as smart features in this case, they are used for calibration. When they are not detected, it is possible to arrange the region in which an arbitrary edge is to be detected by clearing the "Smart Features" checkbox.



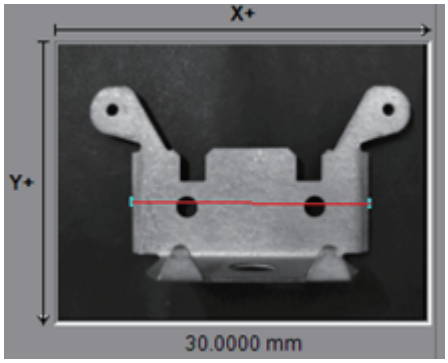
4. If one of the edges detected as a smart feature is selected, and then the other one is selected, they are entered.



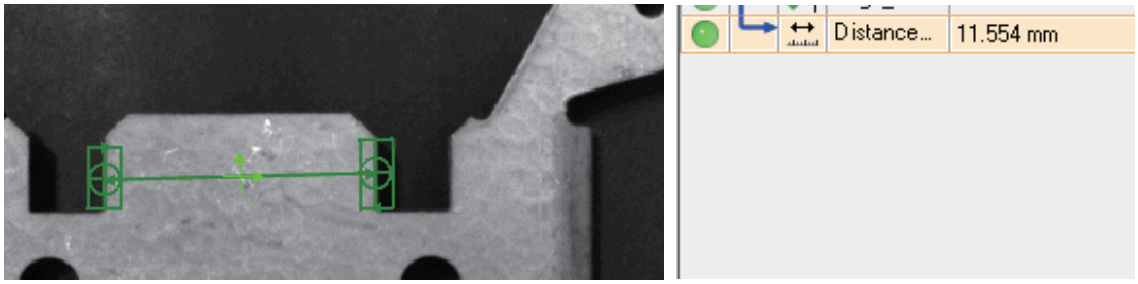
5. Click the [Calibrate] button.



If calibration is completed, an image like the one shown below appears.



If measurement is performed by a measurement tool, the measurement results are displayed using actual units.



Calibration Type: Grid

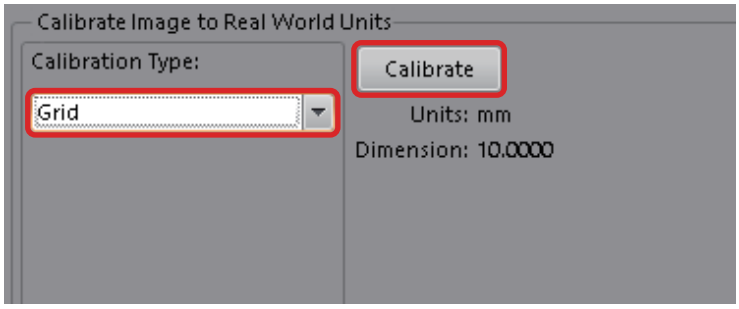
Grid calibration presents a predefined grid graphic to the camera. Performing calibration in this manner allows the radial distortion and perspective distortion to be calibrated nonlinearly.

The grid graphic used in calibration can be printed from In-Sight Explorer as well. However, use a calibration plate for locating that requires high precision.

Operating procedure

1. Select grid calibration.

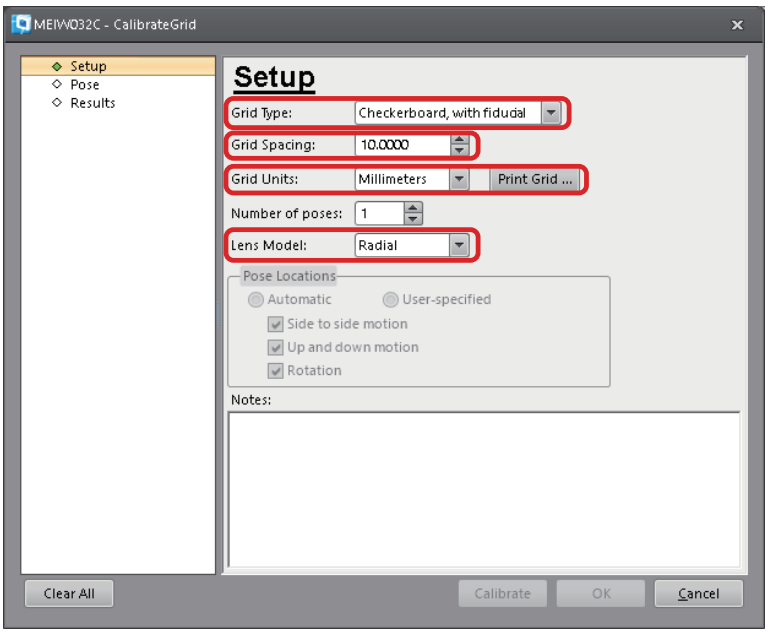
Select "Grid" for Calibration Type and click the [Calibrate] button.

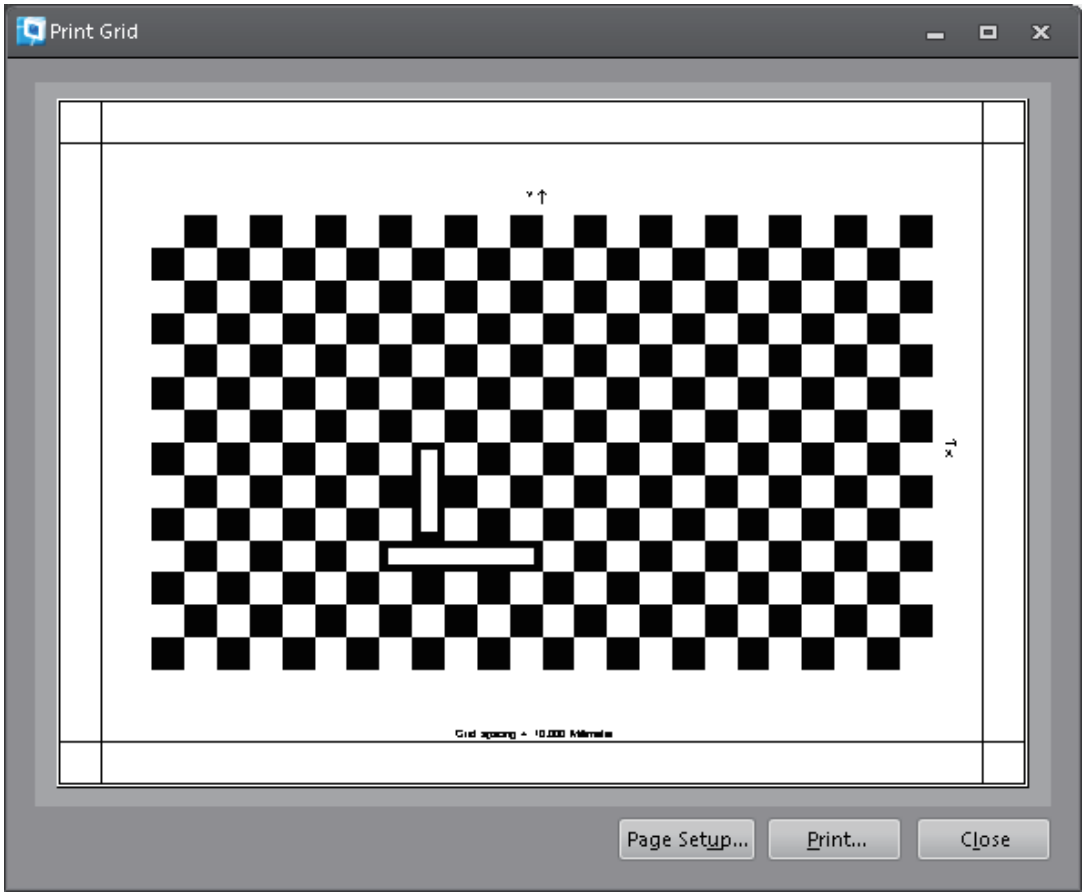


2. Specify the grid settings and lens model.

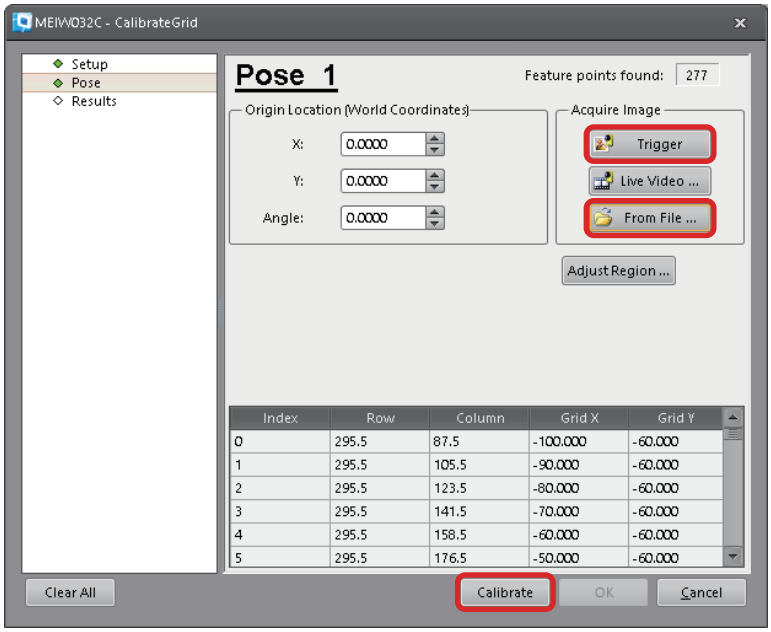
Select the type of grid to be presented, the grid interval and unit, and the lens model (radial distortion and perspective distortion).

If the [Print Grid] button is clicked, checkerboards or dots of the configured grid type and grid interval can be printed. (Paper size is A4 only)





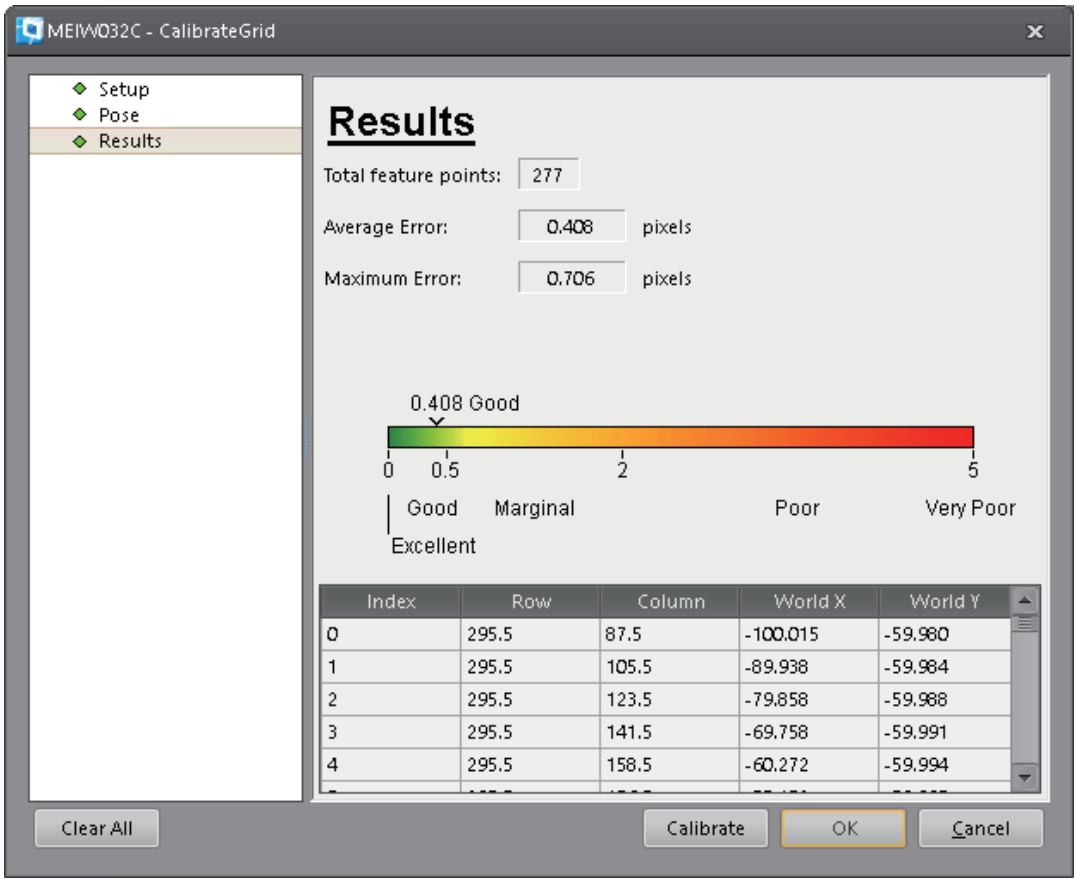
3. Under Pose, import and calibrate an image.
After arranging a calibration plate, click the [Trigger] button to import an image.
When using the image saved in advance, click [From File] and select the image.
After importing the image, click the [Calibrate] button.



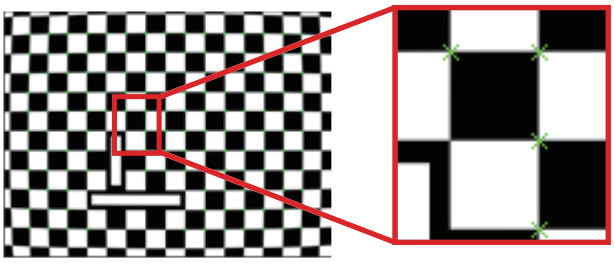
4. Check the results.

The total number of detected feature points, the average error, and the maximum error are displayed, and the calibration state is displayed from Excellent to Very Poor.

The average error is the average value of the pixel distance from the location in which the feature point was expected to be to the coordinates at which the feature point was actually detected.

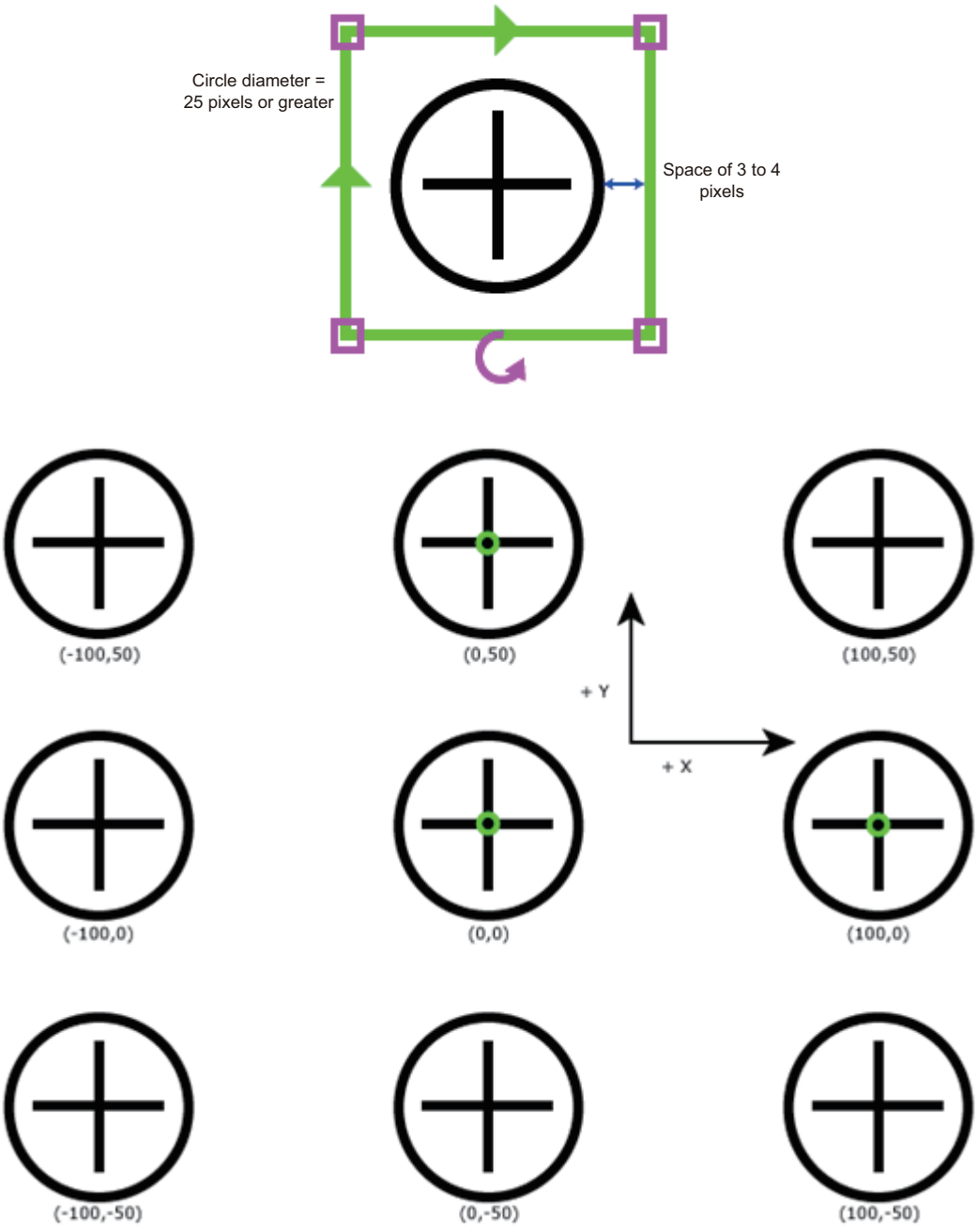


The detected points are displayed on the grid when the calibration results are displayed.



Calibration type: 9 Point

Nine point calibration is useful when creating an accurate coordinate space in a robot application.
This calibration option is based on the circle target shown in the illustration below.
A grid pattern with nine targets arranged evenly spaced makes for an ideal calibration plate.
Before calibration, it is necessary to know the horizontal and vertical distances between the targets.

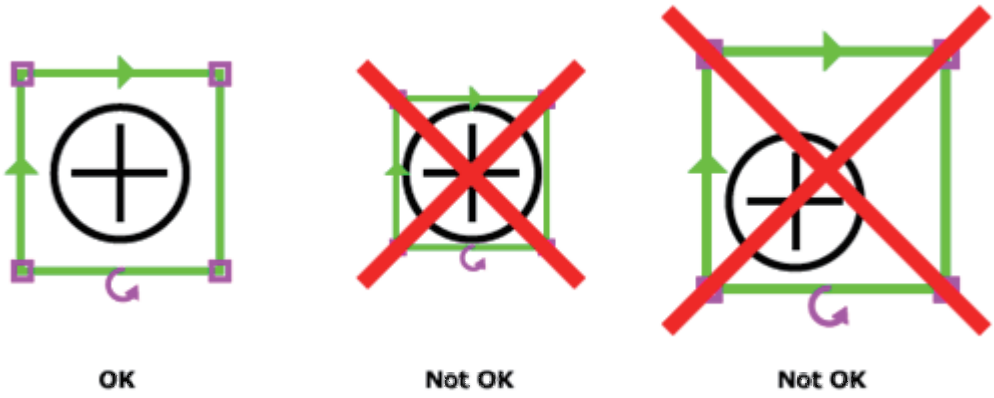


Before calibration, import a calibration plate image that includes nine targets arranged evenly spaced.

Operating procedure

1. From the [Calibration type] drop-down menu, select [9 point].
2. Click the [Edit model] button, configure the region so that the center target is enclosed, and then click the [OK] button.
   When configuring the region to enclose the target, leave a space of 3 to 4 pixels or more between the edge of the outer side of the circle and the region.
   Furthermore, place the center of the region in the center of the target as best as possible.

[Example]



3. After the model is configured, all targets in the image are detected, and green cross marks are displayed on the targets.
   Note: When the target fiducial (cross mark section) is detected, but the circle that encloses the fiducial is not detected, a red cross mark appears.
   In such a case, either register the model again or import a new image and solve the problem.
4. From the [Unit] drop-down menu, select the actual unit (microns, millimeters, centimeters, or inches).
5. In the "X dimension" field, enter the actual horizontal distance (distance from the center of a target to the center of another target) of two targets in the same row.
6. In the "Y dimension" field, enter the actual vertical distance (distance from the center of a target to the center of another target) of two targets in the same column.
7. Click the [Calibrate] button to quit the calibration process.
   The results of the location and inspection tools are displayed in actual units.

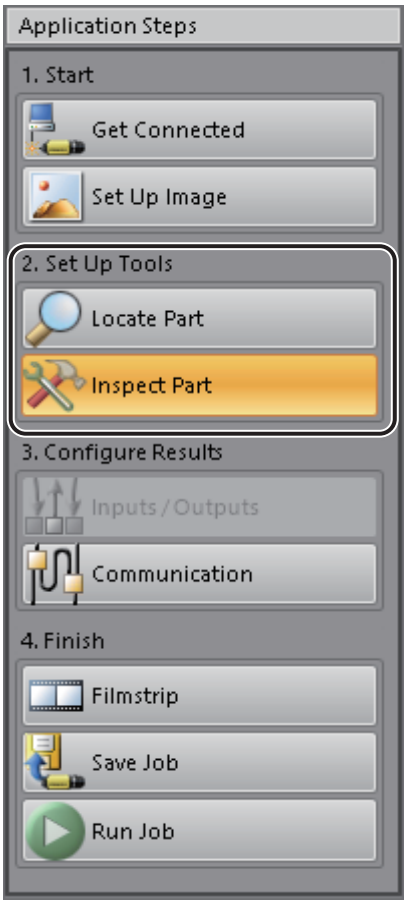
Calibration Type: Import

For the procedure to import calibration data, refer to the following section.

☞ Page 99 Calibration Tools: N Point

5 SET UP TOOLS

"2. Set Up Tools" in Application Steps is a step to add and configure location tools and inspection tools.
This chapter lists methods to add a tool to a job and configure a tool, and overviews of each tool.



The following tools are explained in this chapter.

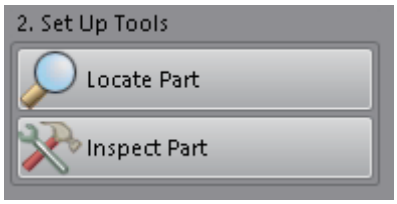
Usage	Classification	Tool name	Reference
Locate Part	Location Tools	PatMax Pattern, PatMax RedLine Pattern, Pattern	Page 51 Configuring Location Tools
Inspect Part	Presence/Absence Tools	Brightness	Page 58 Presence/Absence Tools: Brightness
	Measurement Tools	Distance	Page 61 Measurement Tools: Distance
	Counting Tools	Blob	Page 65 Counting Tools: Blobs
	Identification Tools	Read Text (OCRMax), Color Model*1	Page 67 Identification Tools: Read Text (OCR Max) Page 72 Identification Tools: Color Model
	Geometry Tools	Point-to-Point: Dimension	Page 77 Geometry Tools: Point-to-Point: Dimension
	Math & Logic Tools	Math	Page 80 Math & Logic Tools: Math
	Plot Tools	String	Page 84 Plot Tools: String
	Image Filter Tools	Filter	Page 88 Image Filter Tools: Filter
	Defect Detection Tools	Surface Flaw	Page 96 Defect Detection Tools: Surface Flaw
	Calibration Tools	N Point	Page 99 Calibration Tools: N Point

*1 A tool available in a vision sensor that is compatible with color tools.

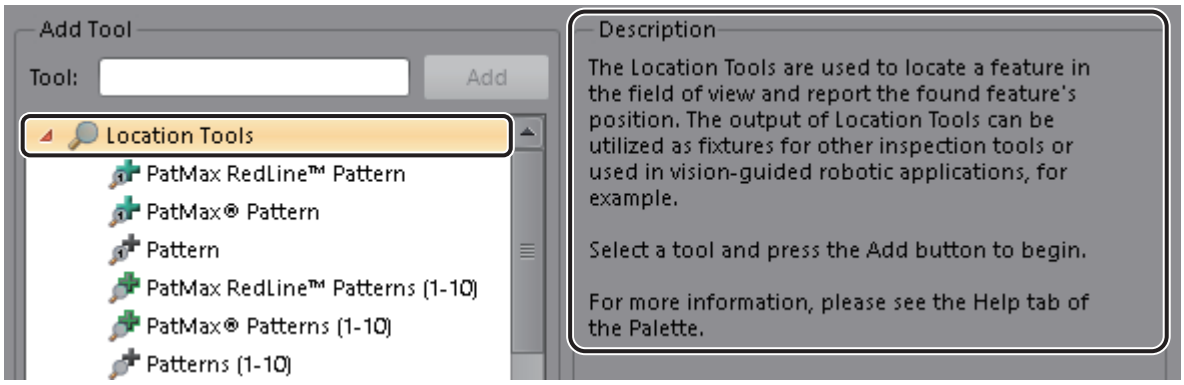
5.1 Adding a Tool to a Job

Operating procedure

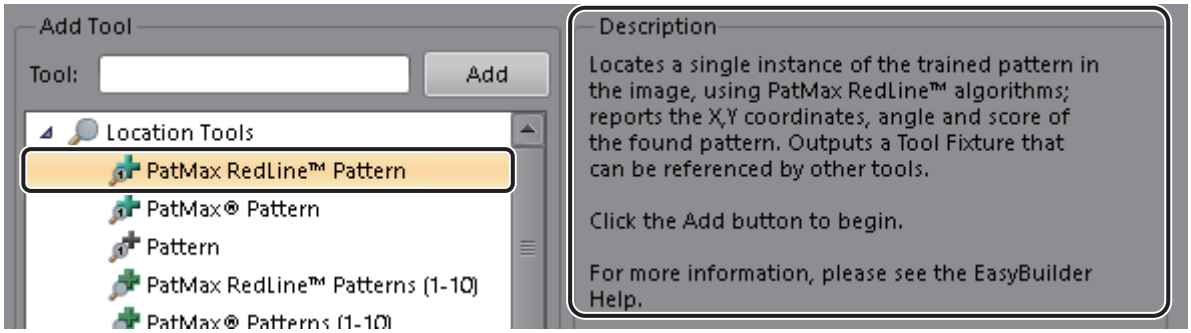
1. From Application Steps, select [Locate Part] or [Inspect Part].



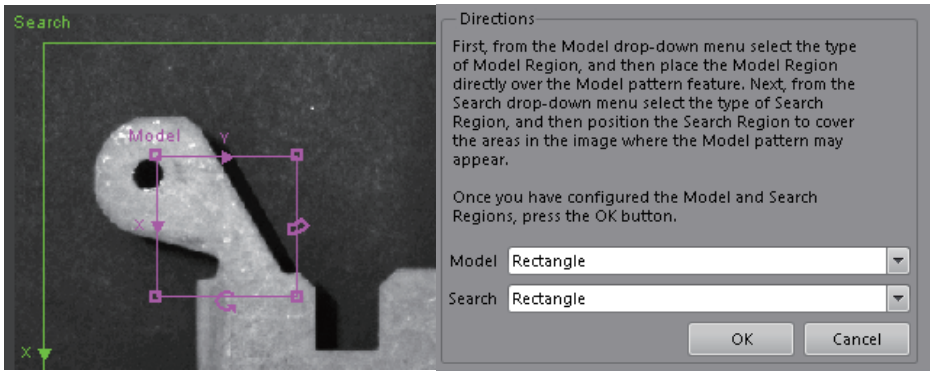
2. If a tool classification is clicked, a summary of the tool classification appears in the Description field.



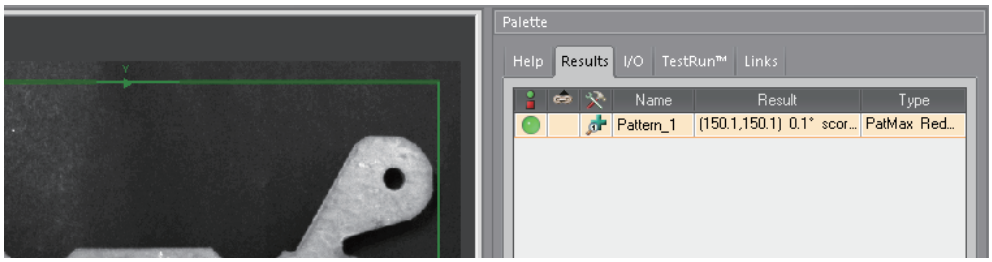
Furthermore, if a tool is clicked, a description of that tool appears.



3. If the [Add] button is clicked, the tool is added to the job, and the display changes so that initial settings that comply with the added tool are configured.



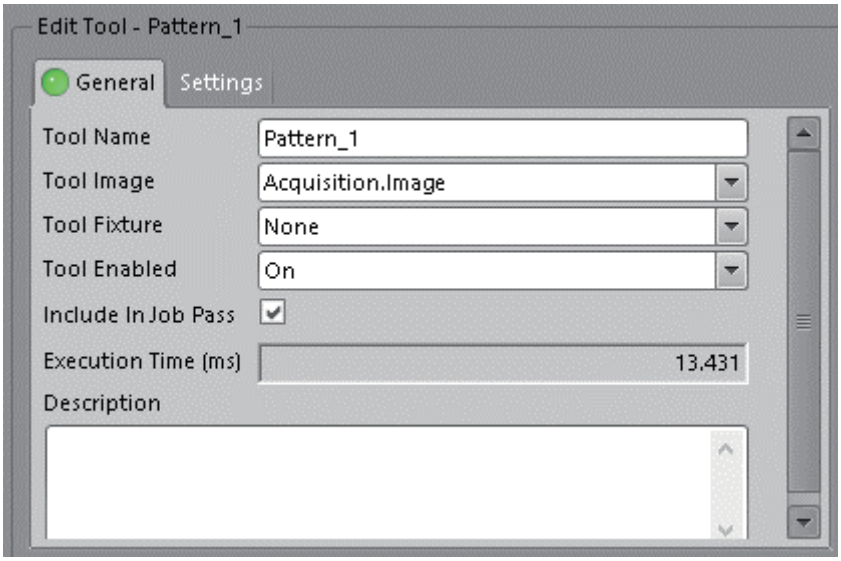
4. If [OK] is clicked, the settings are confirmed, and the tool is added to the Results tab of the Palette.



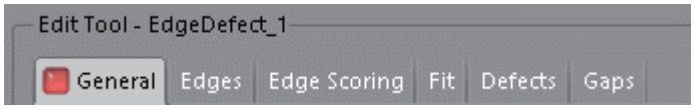
5.2 Configuring a Tool

Overview of the tool setting pane

Set Up Tools basically has [General] and [Settings] tabs. Depending on the tool, there are tabs to configure other advanced parameters.
The [General] tab is present for all tools, and it is possible to configure tool names, whether a tool is active, and whether to include it in the overall judgment.

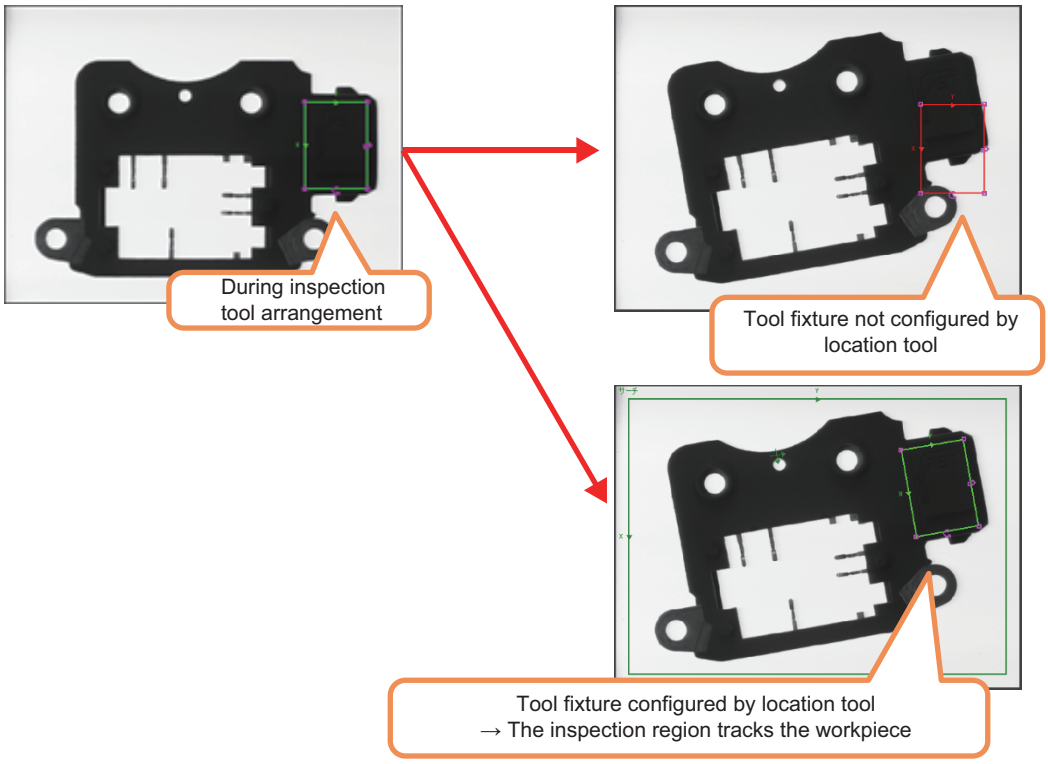


The [Settings] tab differs by tool. In some cases, there is no [Settings] tab. Special tabs may appear for tools for edges and defects.

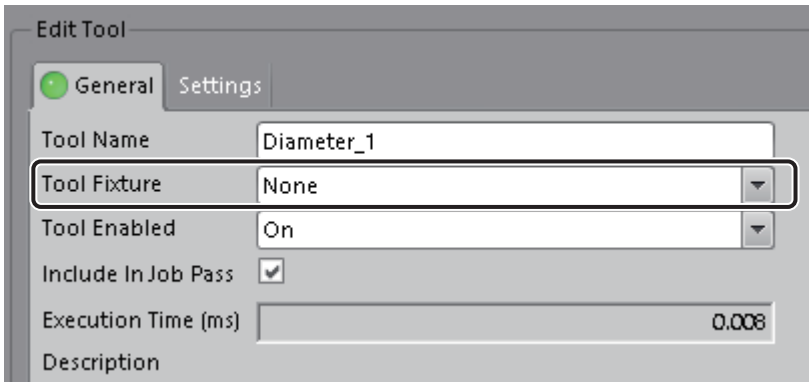


Furthermore, there are also tools to configure detailed settings through displayed dialog boxes.
For parameter details and configuration methods of each tool, refer to "Locate Part" ⇨ "Choosing a Location Tool", or refer to "Inspect Part" ⇨ "Choosing Inspect Part Tools" in EasyBuilder Help.

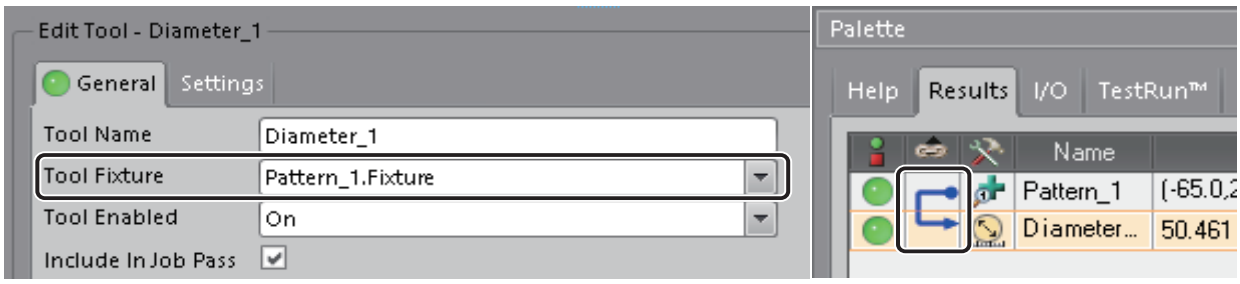
Linking an inspection tool with a location Tool



When an inspection tool is not tracking the assumed location tool, open the inspection tool and browse to the [General] tab. Using "Tool Fixture", select the location tool to be tracked.

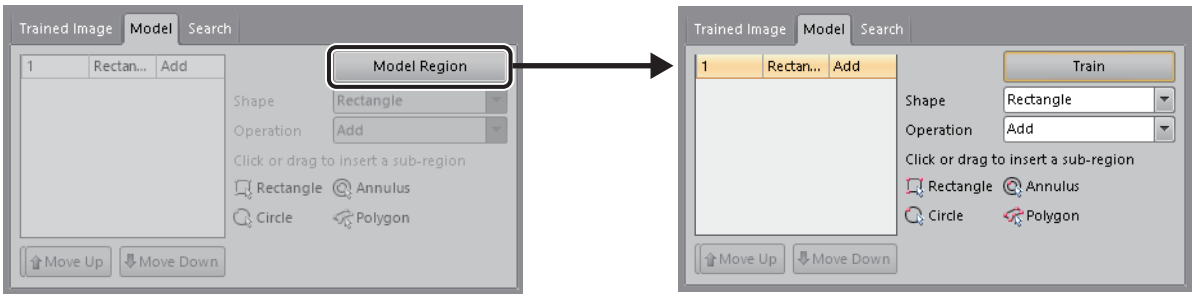


If the setting is configured, it is possible to check which location tool the selected tool is using, even in the [Results] tab of the Palette.

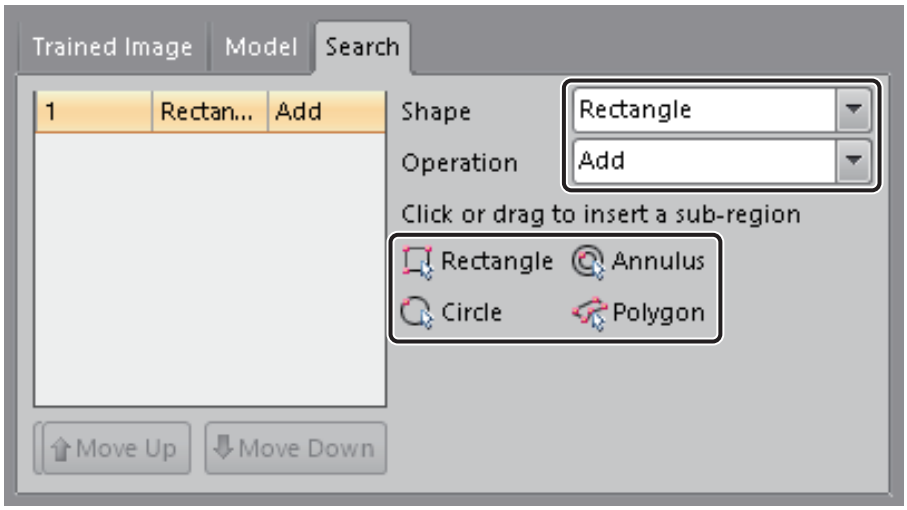


Region configuration

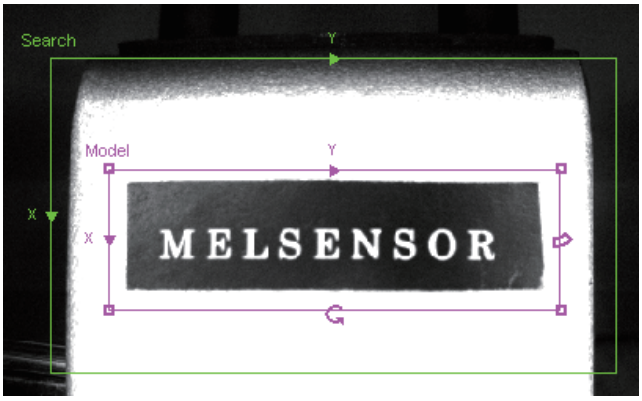
Depending on the tool, the inspection region and model region may be configured.
Various regions can be created, from simple rectangles to complex polygons and partially masked regions.
Regions are configured when a tool is added, but regions can be configured or changed again later.
In the case of tools that require model registration such as PatMax patterns, it is possible to configure each region in the [Model] or [Search] tabs.
If [Model Region] is clicked in the [Model] tab, the model region can be edited.



In the [Search] tab, various items can be edited, including shape and operation. Sub-regions can be inserted by click operations.
Use shapes and operations when adding changes to a selected region.



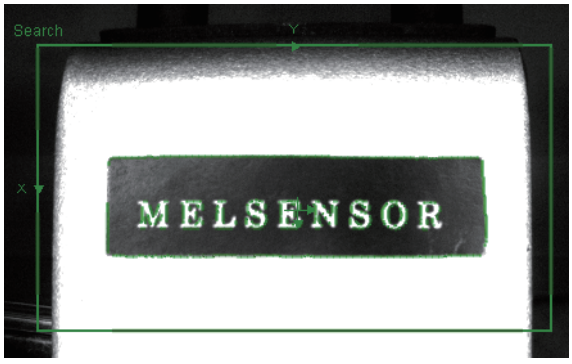
For example, when using only a border in the following model for locating part with PatMax pattern tool, add a subtraction region.
When the PatMax Pattern tool was added, the text inside the border is registered as well as the border.



When the entirety was registered, the score is affected even when the interior is changed.

Operating procedure

1. Image during registration

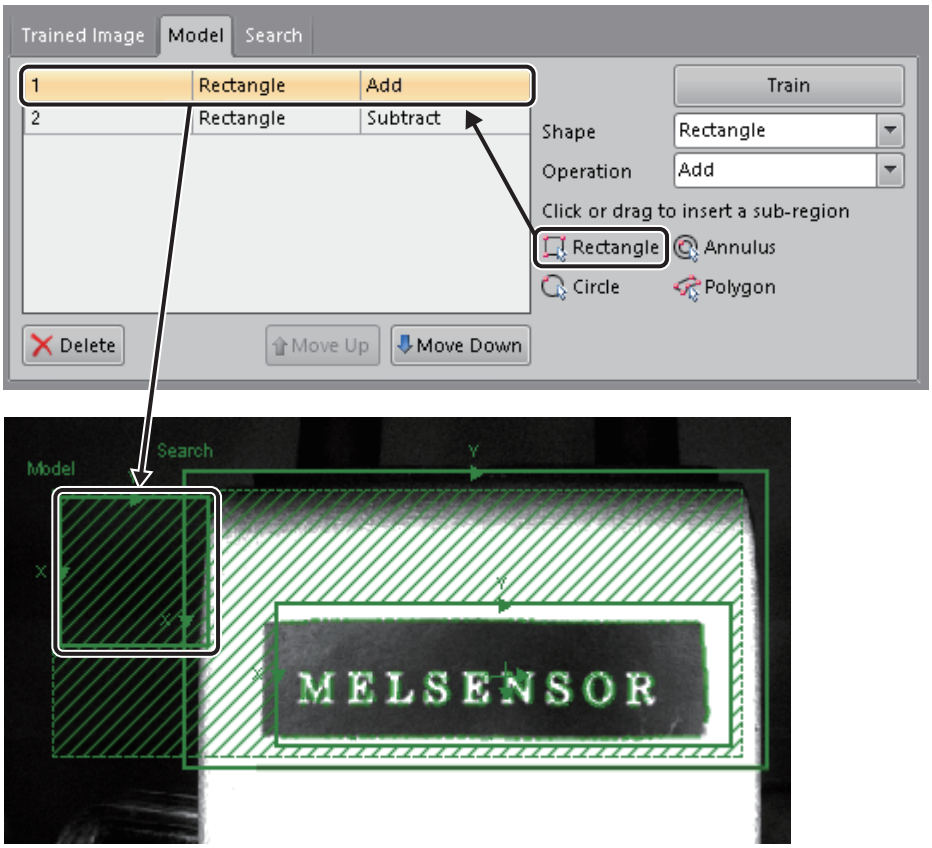


Pattern_1	(385.6,220.4) 0.0° score = 99.8

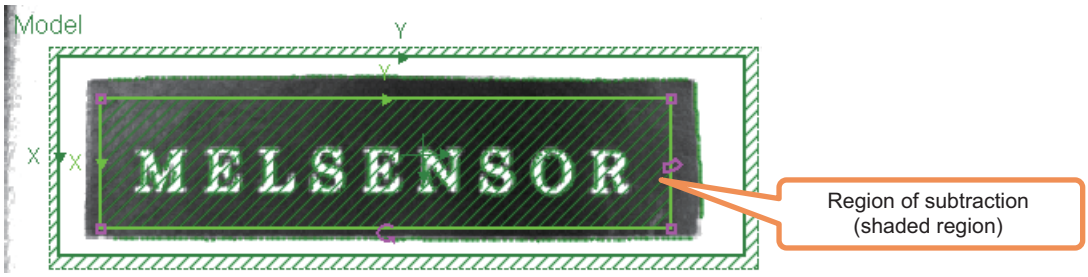
2. Case of an image in which the interior differs with the registration model

Pattern_1	(391.3,195.4) 0.6° score = 92.6

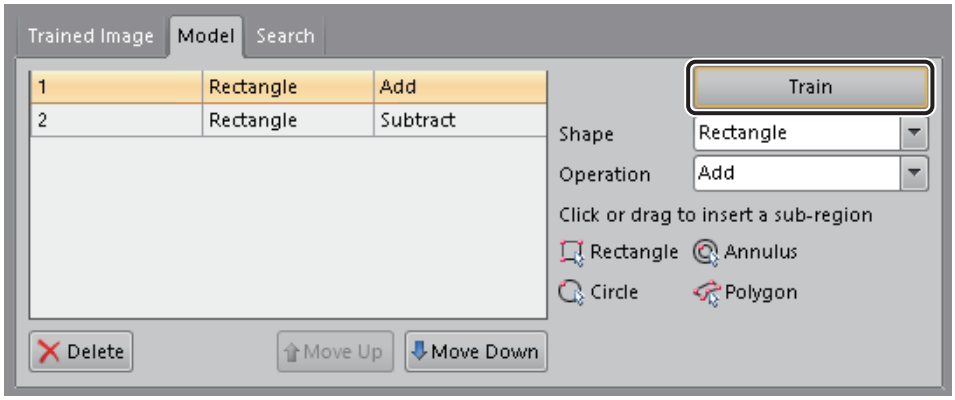
3. Click [Rectangle] of 'sub-region' to add the region.



4. Configure the subtraction region so that the area outside the border does not undergo model registration.



5. If [Train] is clicked at the [Model] tab, the section outside the subtraction region undergoes model registration again.

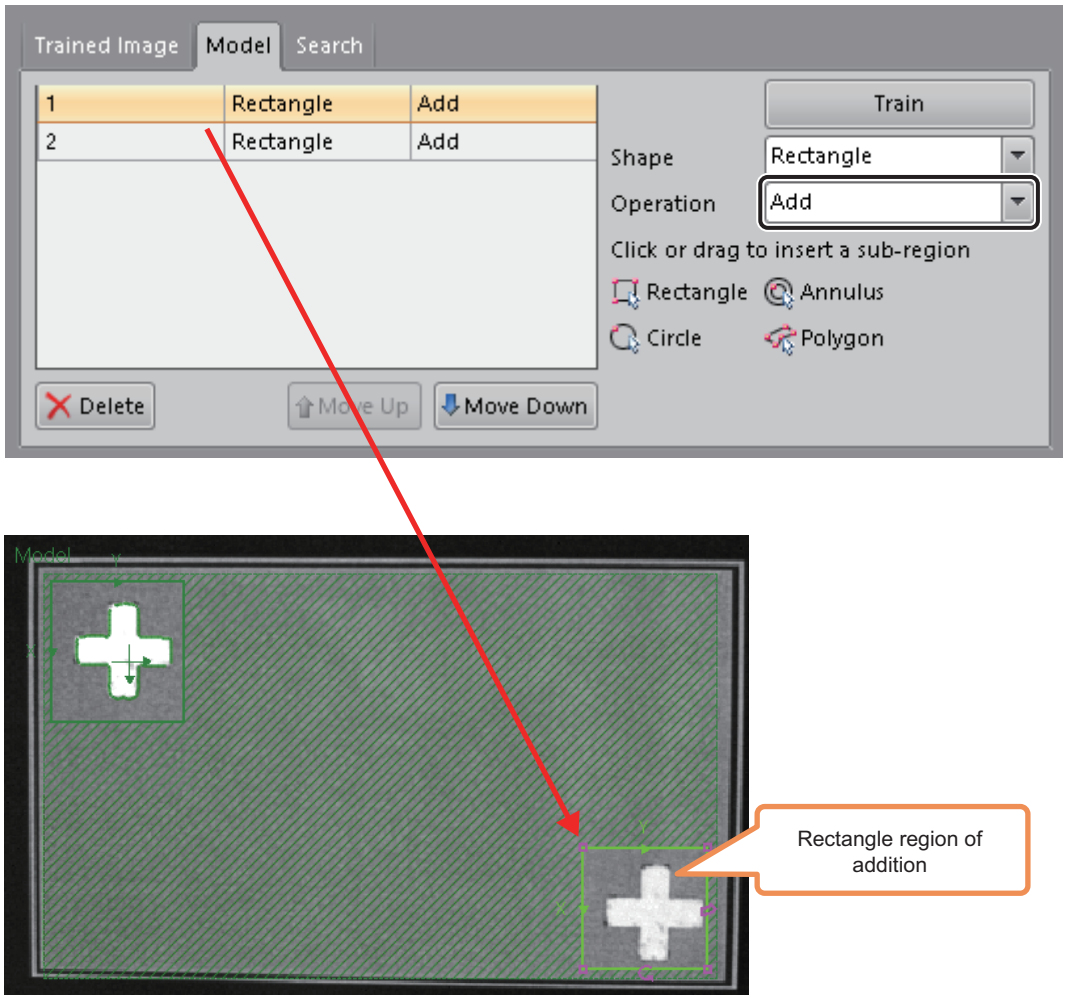


6. Only the border undergoes model registration.

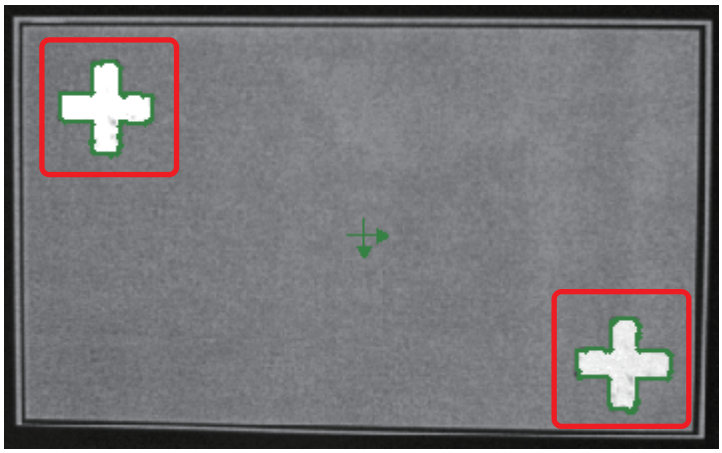
7. The score is not affected even when the area outside the border is changed.

Pattern_1	(385.6,220.4) 0.0° score = 99.8

To put isolated regions under model registration, click the appropriate sub-region shape to add the region, change this region from "Subtract" to "Add" and then allocate it.



If [Register] is clicked, the two regions are registered again as models.

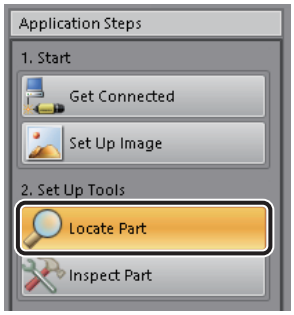


5.3 Configuring Location Tools

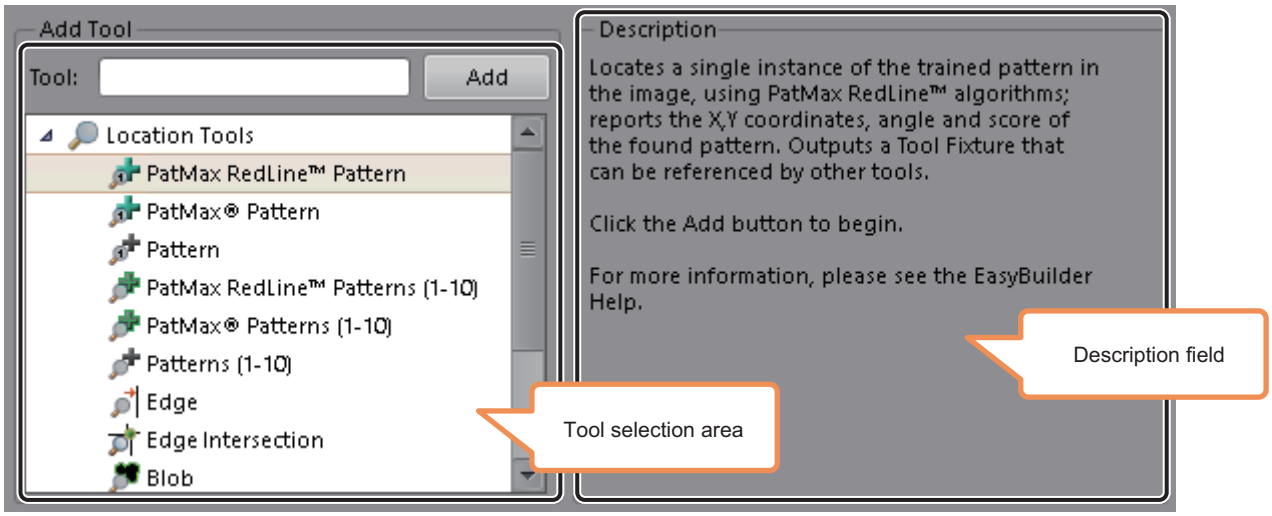
Location tools identify special locations included in an image and output the coordinates.
Furthermore, it is possible for inspection tools to track the movement of targets and send coordinates for use with robot position control.

Operating procedure

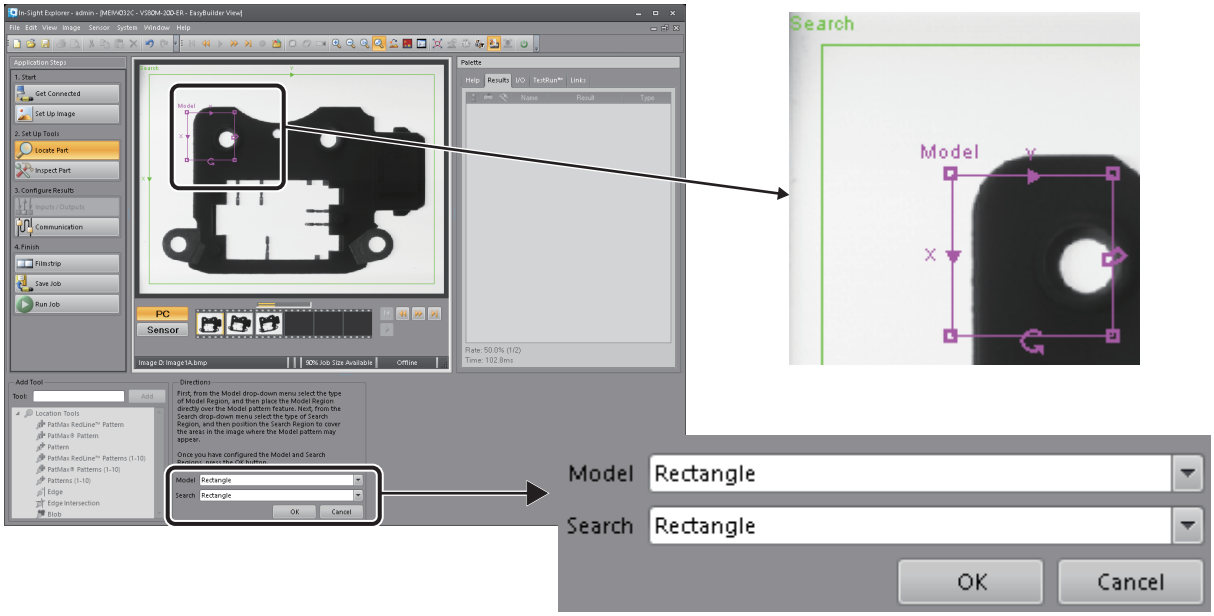
1. From Application Steps, select [Locate Part].



2. From Add Tool, select the appropriate location tool according to the workpiece features, tact time, and other conditions.
If a location tool classification or a tool is clicked, a summary appears in the Description field to the right.



3. If a tool is added, the display changes so that the model region (PatMax® pattern, PatMax Redline™ pattern, and pattern tools only) and search region can be configured.

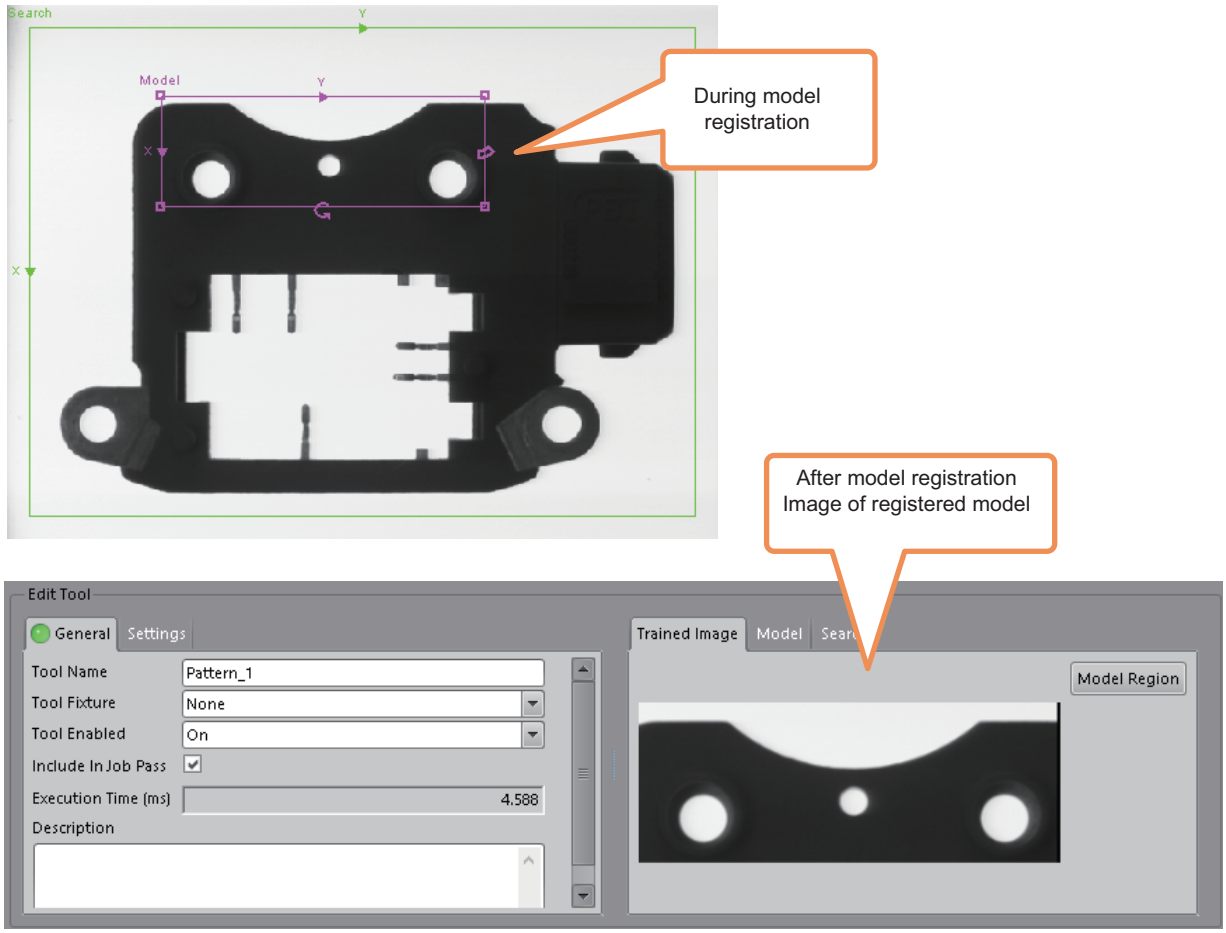


Point

Tips during model region configuration in the PatMax pattern tool, etc.

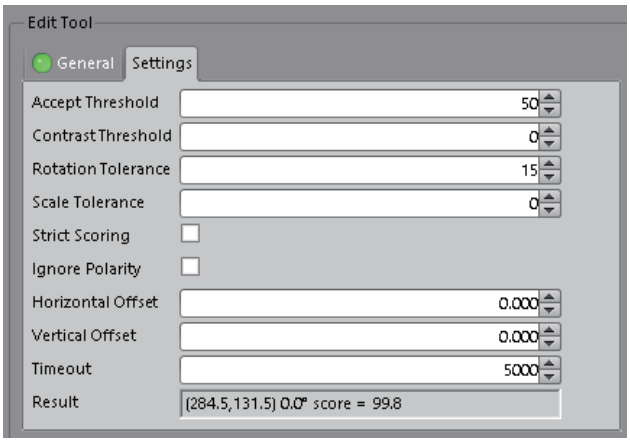
- Select a shape with few common changes in any lot of the inspection target.
- When the pattern of background and work surface areas are erroneously registered as shapes, configure a subtraction region to exclude it.
- In a model subject to detection, for example, the orientation may be determined incorrectly in the case of a cylinder shaped workpiece.
  Configure the model region so that the proportion of the special region becomes larger within the registered model.
  For details of region settings, open the EasyBuilder help, search for "Inspection target region", and then see the "Region" page.

4. After model registration is complete, adjust the parameters to suit the conditions during operation.

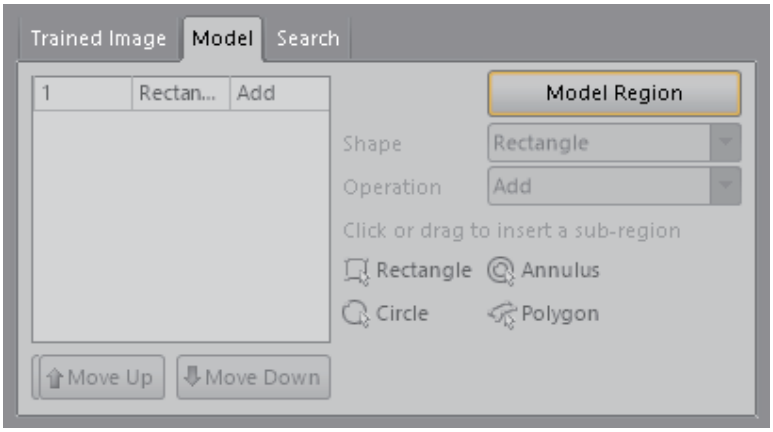


The "Edit Tool" screen has the following tabs: [General], [Settings], [Trained Image], [Model], and [Search]. Details of each item are listed in the Help section of EasyBuilder, which is described later.

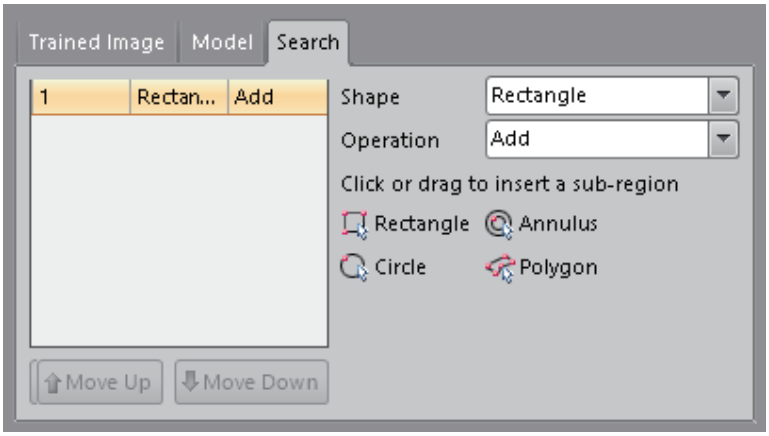
■ Settings tab



■ Model tab



■ Search tab

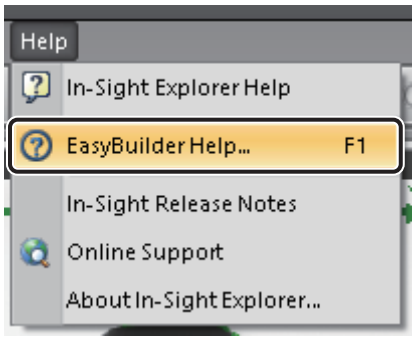


Details of each parameter

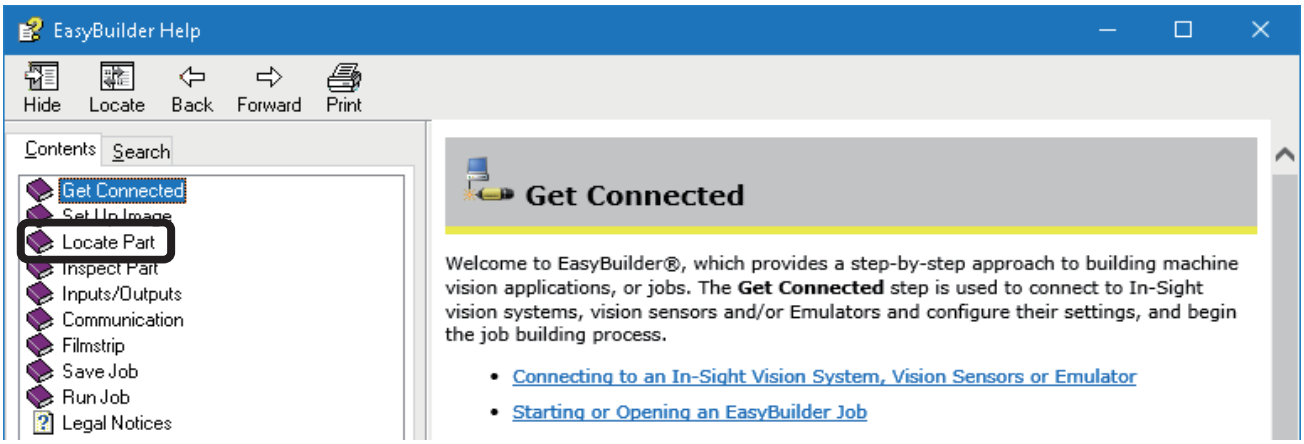
For details of each parameter, refer to the Help section of EasyBuilder as shown below.

Operating procedure

1. From the menu bar, select [Help], and then [EasyBuilder Help].

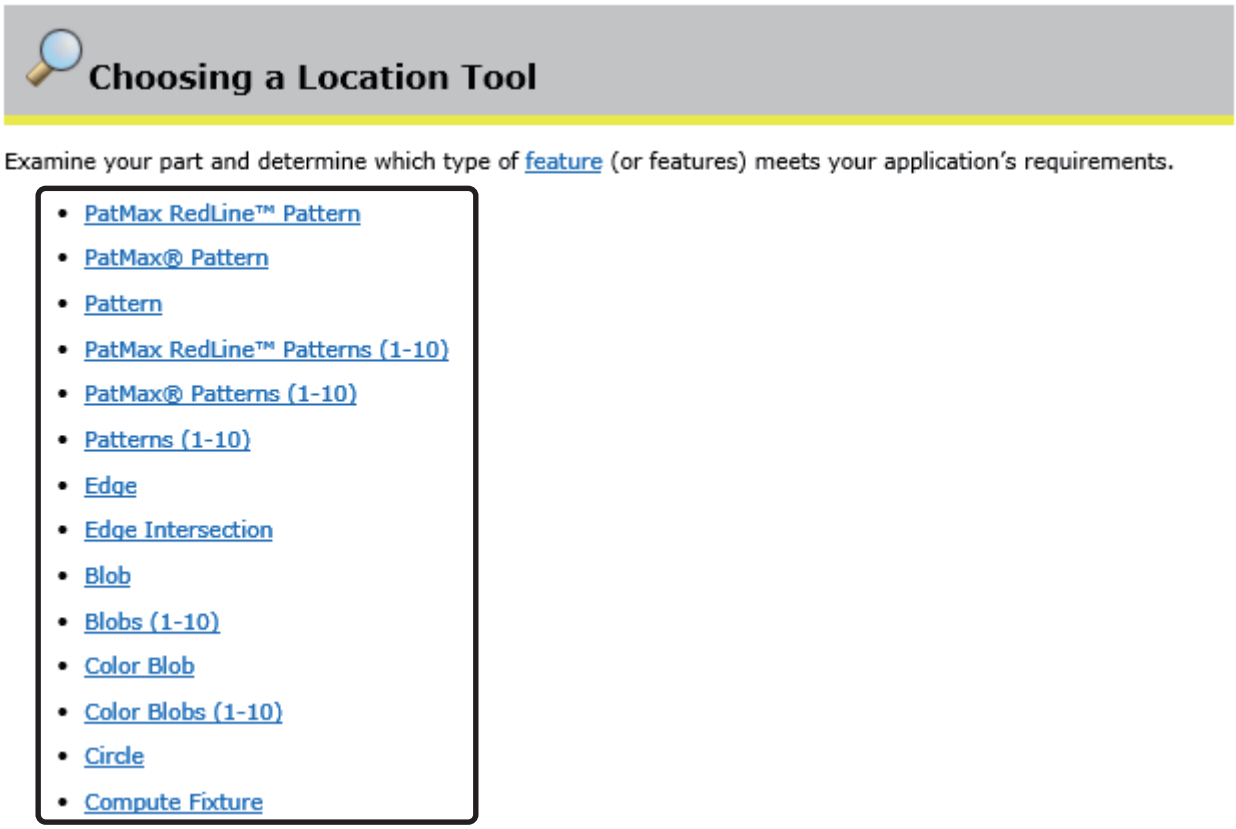


2. Select [Locate Part].



3. Click "Choosing Inspect Part Tools".

4. Click the corresponding tool.

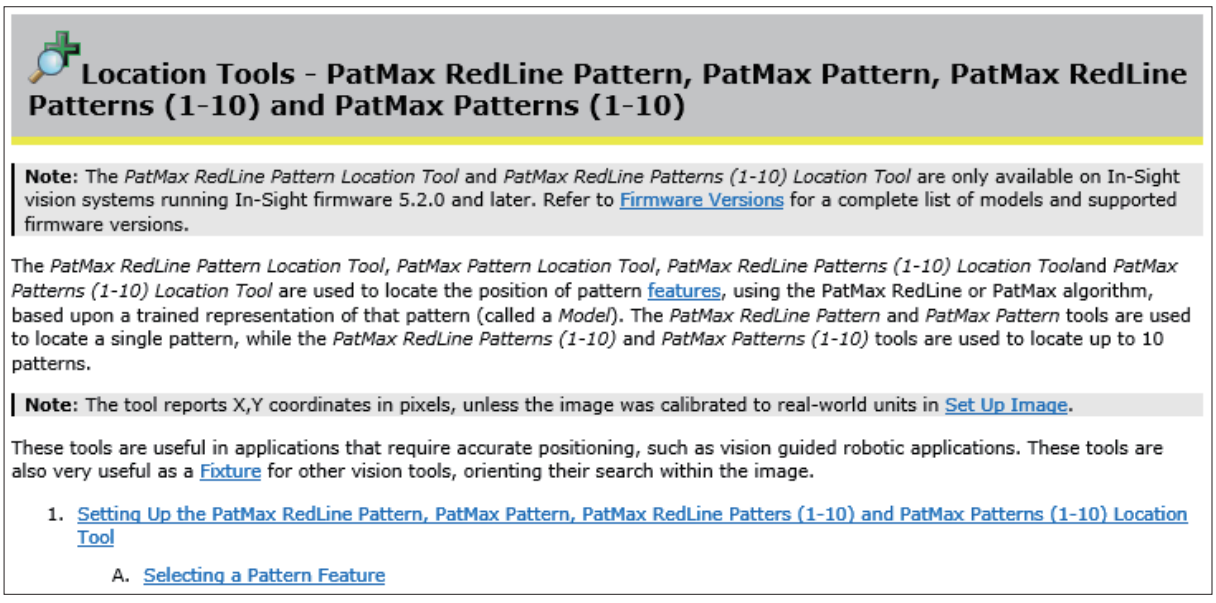


Choosing a Location Tool

Examine your part and determine which type of feature (or features) meets your application's requirements.

- PatMax RedLine™ Pattern
- PatMax® Pattern
- Pattern
- PatMax RedLine™ Patterns (1-10)
- PatMax® Patterns (1-10)
- Patterns (1-10)
- Edge
- Edge Intersection
- Blob
- Blobs (1-10)
- Color Blob
- Color Blobs (1-10)
- Circle
- Compute Fixture

5. A page with details of the tool appears.



Location Tools - PatMax RedLine Pattern, PatMax Pattern, PatMax RedLine Patterns (1-10) and PatMax Patterns (1-10)

Note: The *PatMax RedLine Pattern Location Tool* and *PatMax RedLine Patterns (1-10) Location Tool* are only available on In-Sight vision systems running In-Sight firmware 5.2.0 and later. Refer to Firmware Versions for a complete list of models and supported firmware versions.

The *PatMax RedLine Pattern Location Tool*, *PatMax Pattern Location Tool*, *PatMax RedLine Patterns (1-10) Location Tool*and *PatMax Patterns (1-10) Location Tool* are used to locate the position of pattern features, using the PatMax RedLine or PatMax algorithm, based upon a trained representation of that pattern (called a *Model*). The *PatMax RedLine Pattern* and *PatMax Pattern* tools are used to locate a single pattern, while the *PatMax RedLine Patterns (1-10)* and *PatMax Patterns (1-10)* tools are used to locate up to 10 patterns.

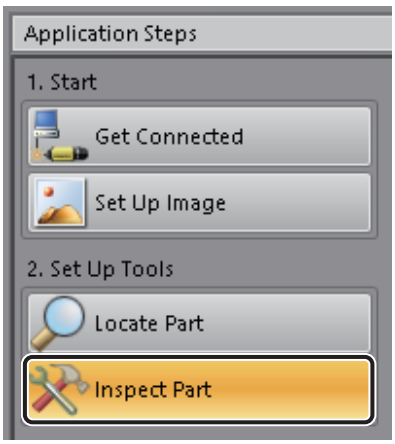
Note: The tool reports X,Y coordinates in pixels, unless the image was calibrated to real-world units in Set Up Image.

These tools are useful in applications that require accurate positioning, such as vision guided robotic applications. These tools are also very useful as a Fixture for other vision tools, orienting their search within the image.

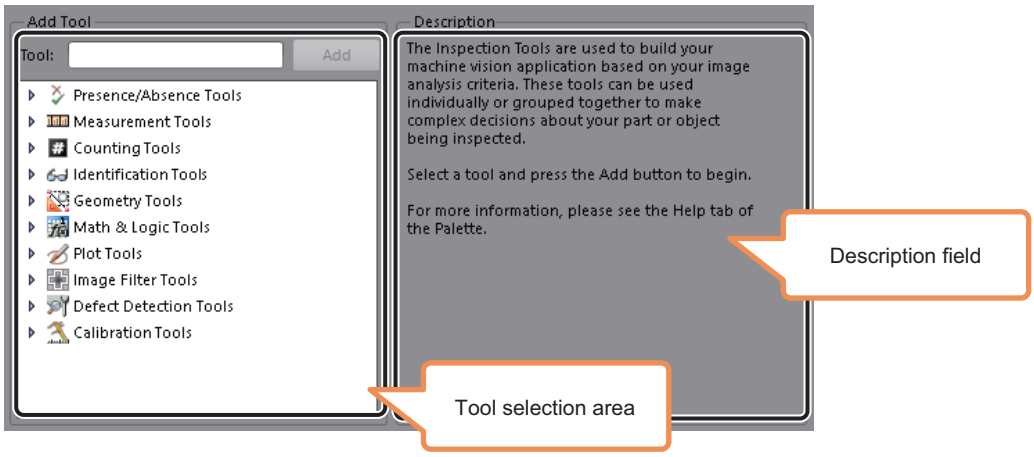
1. Setting Up the PatMax RedLine Pattern, PatMax Pattern, PatMax RedLine Patters (1-10) and PatMax Patterns (1-10) Location Tool
   A. Selecting a Pattern Feature

5.4 Configuration of Inspection Tools

Inspection tools are a group of tools that are important for the vision sensor.
EasyBuilder has an interface that makes it easy to configure complex inspection.



If a tool classification or tool name is clicked, a summary appears in the Description field.

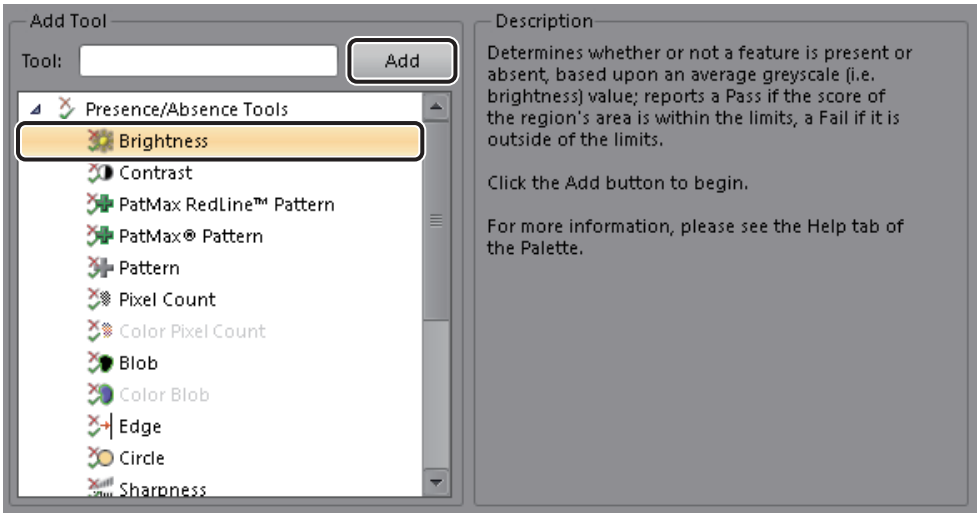


Presence/Absence Tools: Brightness

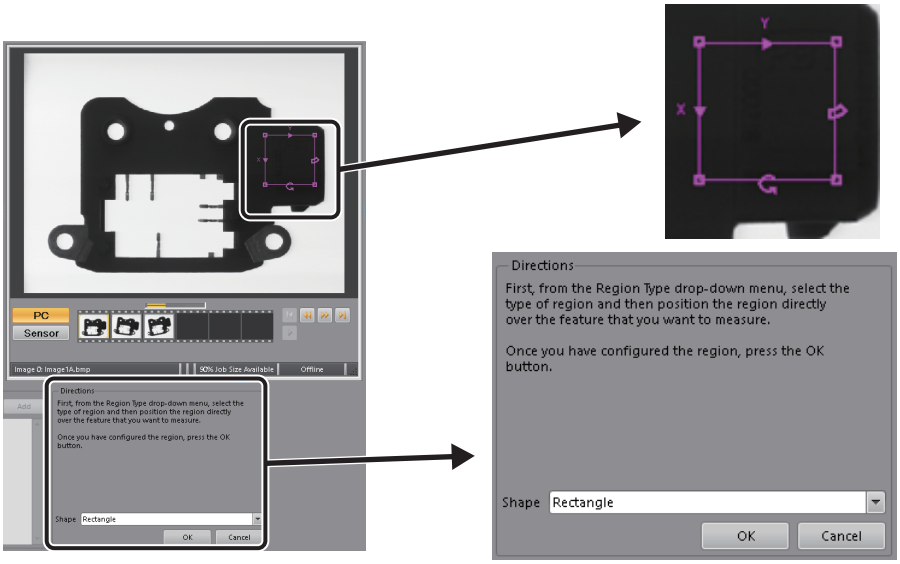
Presence/Absence Tools return presence/absence results about features in an image.
Tools include brightness, contrast, patterns, blobs, and edges, and a pass/fail judgment is made based on the presence of features that satisfy the specified conditions.
The brightness tool used here judges whether the average value of the brightness in the region is within the specified range. This easy-to-use tool processes quickly, and judgment conditions are easy to determine. However, an environment with stable lighting is necessary because the lighting conditions greatly affect the inspection results.

Operating procedure

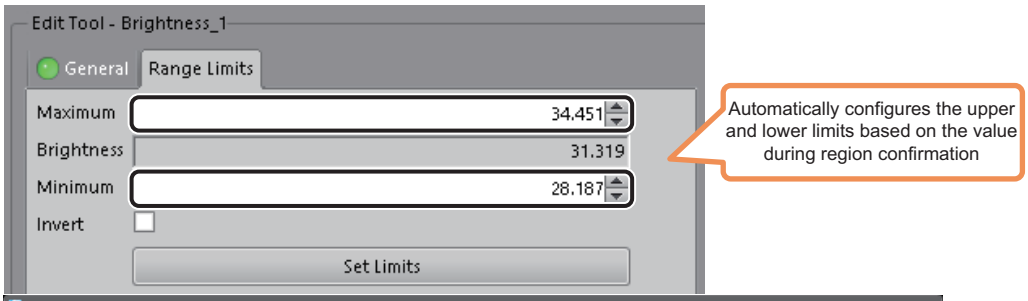
1. Add "Brightness" under "Presence/Absence Tools" to the job.

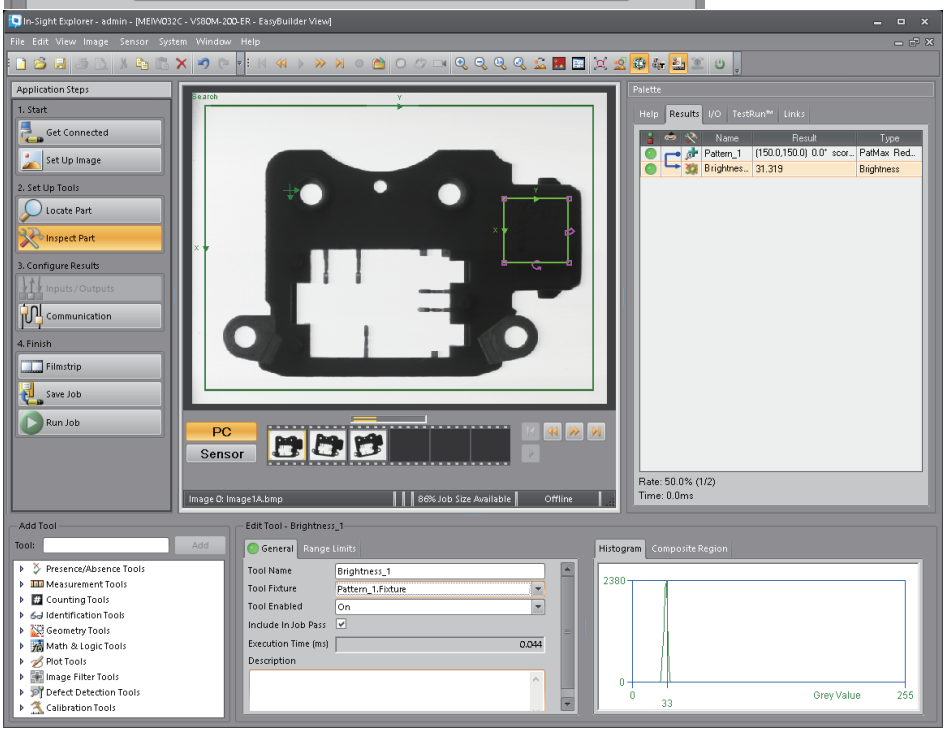


2. Configure the region subject to inspection.
Configure only the necessary measurement range as the region to calculate the average value of brightness of the entire region.



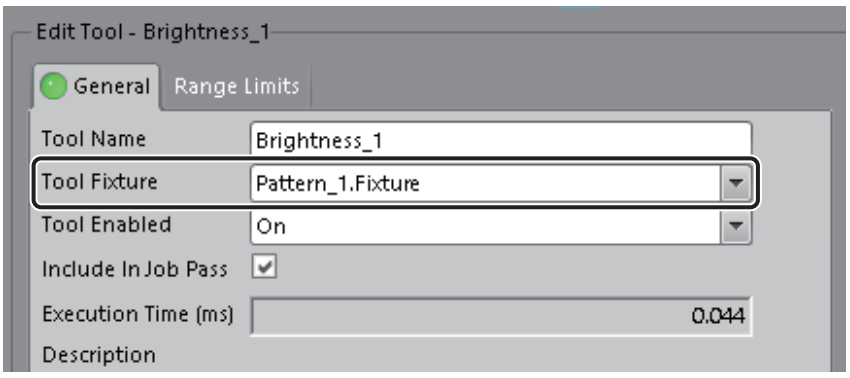
3. If the region is entered, the maximum and minimum of the restricted range are configured automatically based on the average value of the brightness in this region.
As a result, a pass judgment state results when the tool is added.
Adjust the restricted range by the conditions of the inspection section.





Point

When location tools are added ahead of time, they are configured as tool fixtures for location tools and inspection tools added later.
When multiple location tools are being used, configure tool fixtures so that intended fixtures are followed.

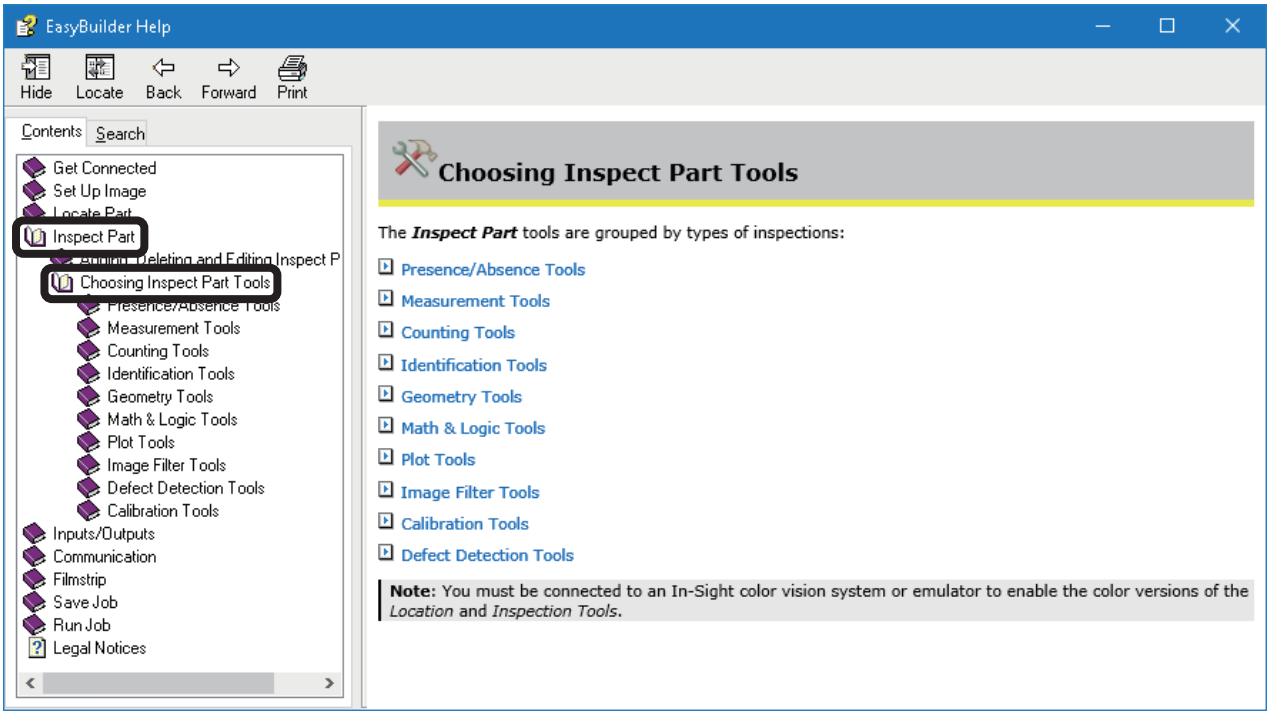


Other Presence/Absence Tools

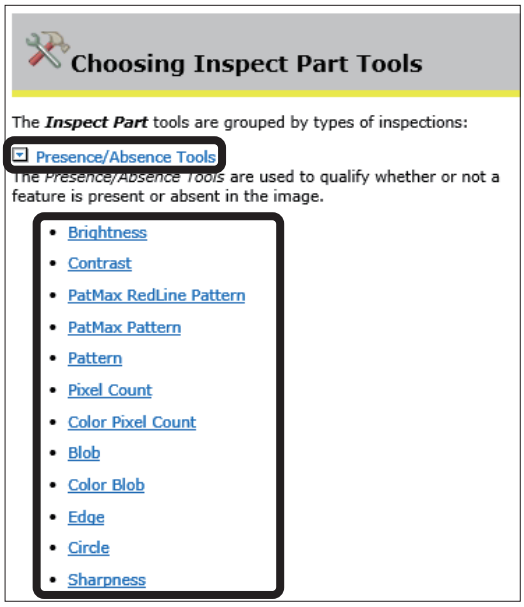
For details of other Presence/Absence Tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].



2. If a section of Presence/Absence Tools is clicked, tools that can be used for presence/absence judgment appear.

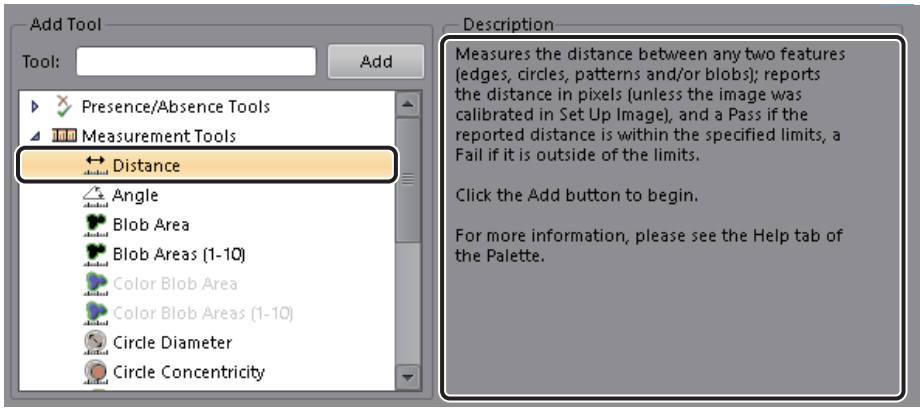


Measurement Tools: Distance

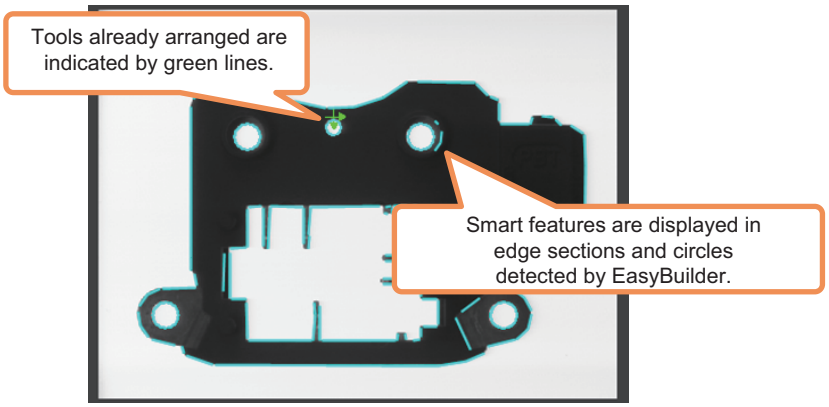
Measurement tools are used to measure the distance, diameter, angle, and surface area of features in images.
For distance and surface area, running calibration makes it possible to output in actual dimensions instead of pixel units.
This section describes Distance, which is used to measure the distance between features such as edges, circles, patterns, and blobs.

Operating procedure

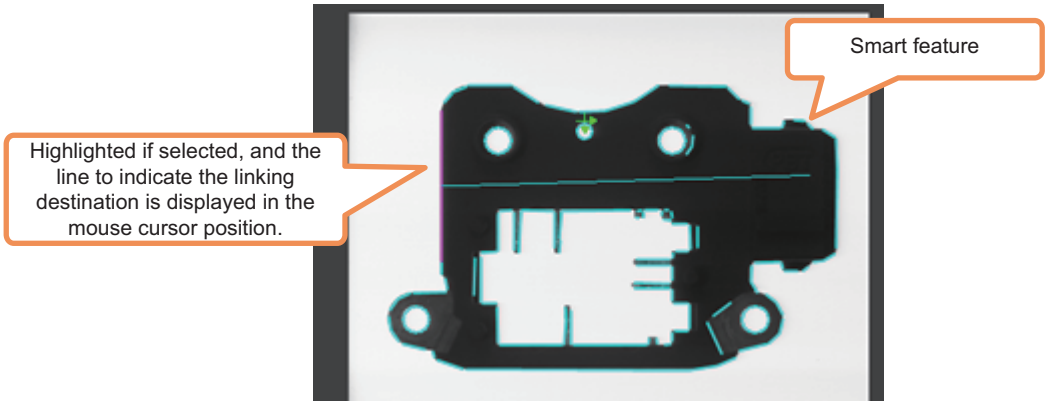
1. Add "Distance" under "Measurement Tools" to the job.



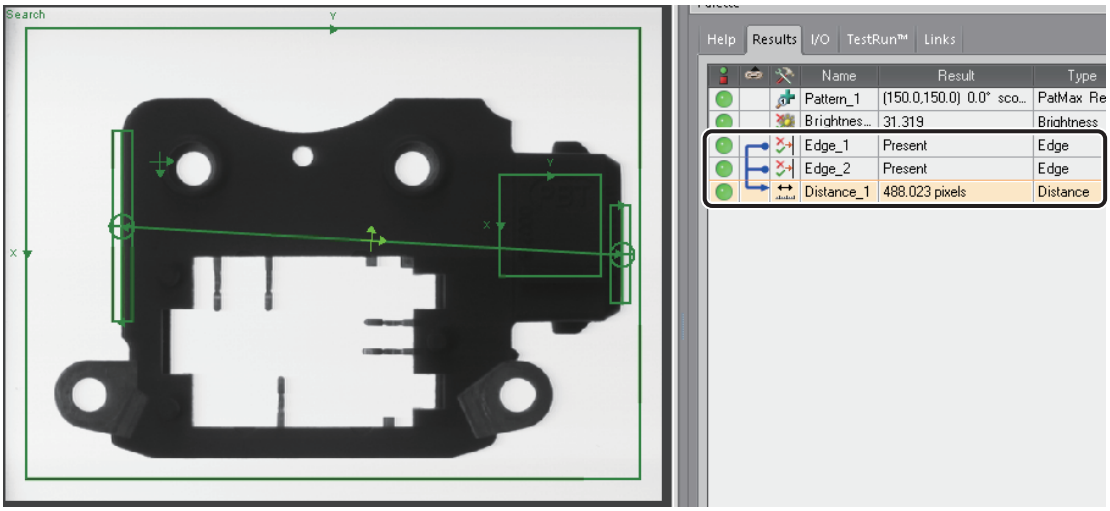
2. A smart feature is displayed in the image. Select the edge to be measured.
It is possible to select the fixture position of edge tools (Presence/Absence Tools), circles (Presence/Absence Tools), and positioning tools that have already been arranged.



3. Click the smart features of the section to be measured in order, and then confirm the measurement locations.

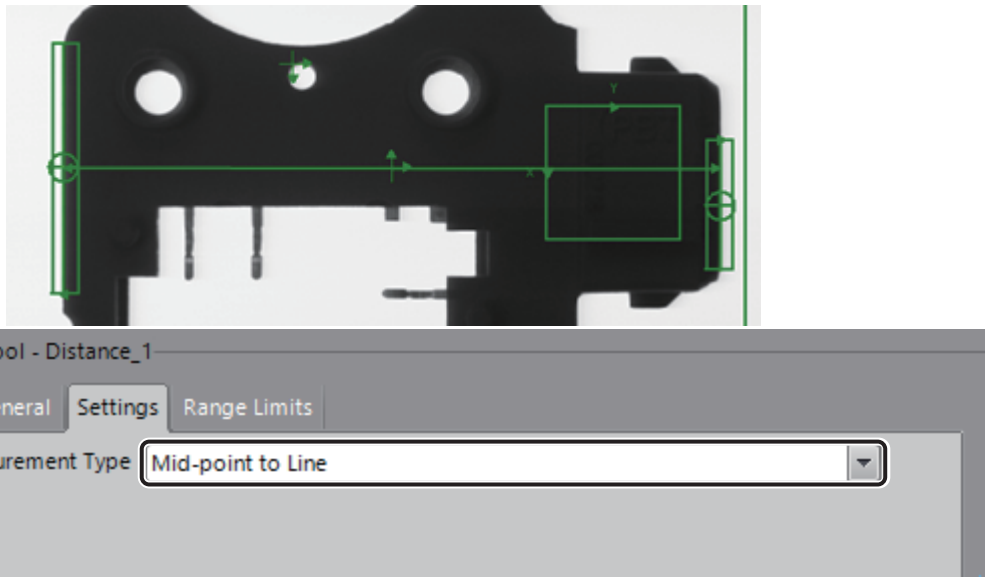


4. If a second edge smart feature is selected, two edge tools (Presence/Absence Tools) are created, and a distance tool to measure the interval of these edge tools is added.



At the default value, distance measurement between edges is from center to center.

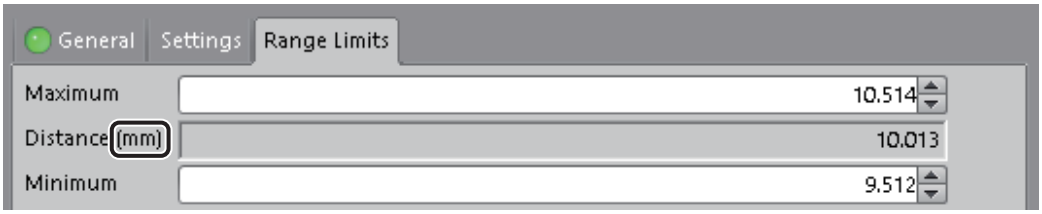
When selecting "Mid-point to Line" for "Measurement Type" in the Settings tab, the perpendicular distance between the mid-point of the first selected edge and the line of the edge selected the next time is measured.



5. In the [Range Limits] tab, configure the range to pass inspection.
When the calibration is performed, the results and range limits are displayed in the physical units determined by calibration.

■ Calibration not performed

■ After calibration

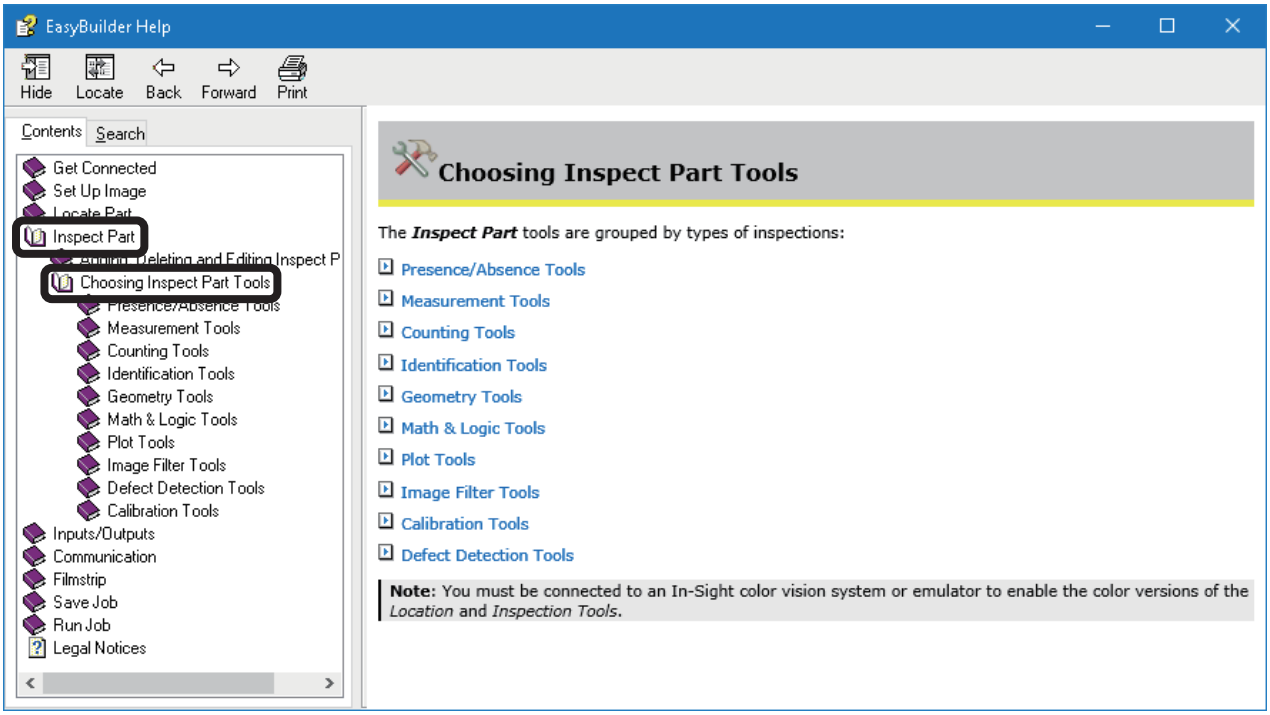


Other Measurement Tools

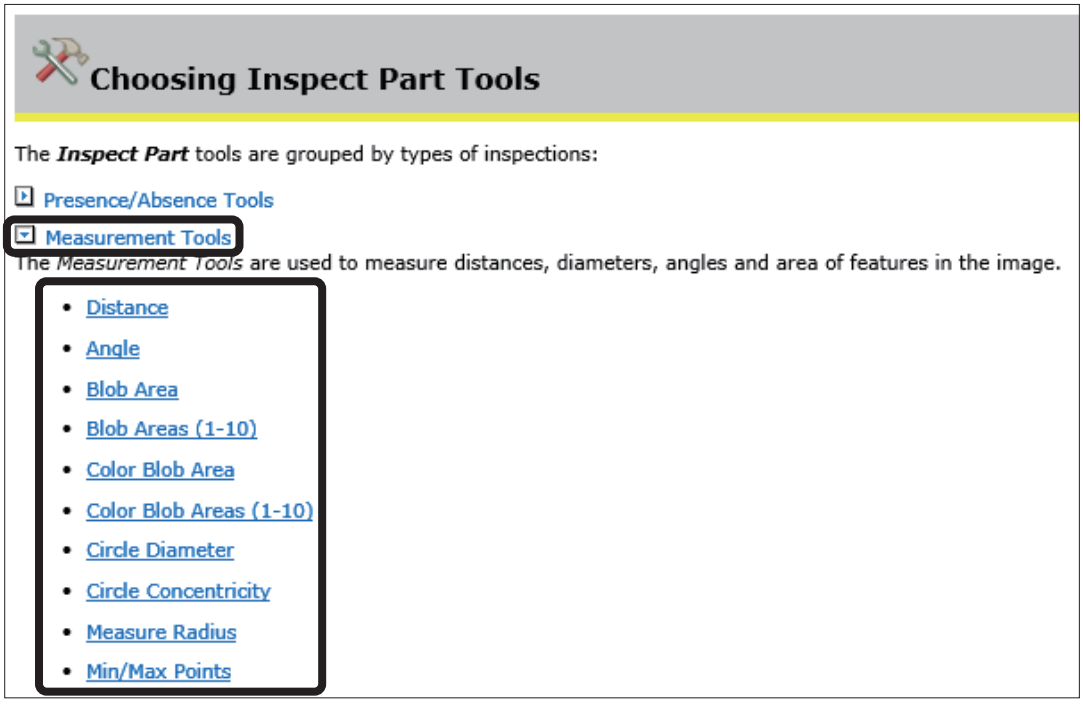
For details of other measurement tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].



2. By clicking "Measurement Tools", available tools for measurement are displayed.



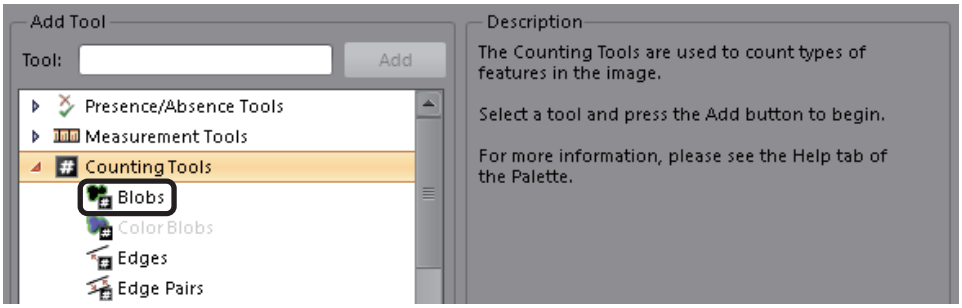
Counting Tools: Blobs

Counting tools count features included in images.

Use this tool when inspecting whether the required quantity has been set.

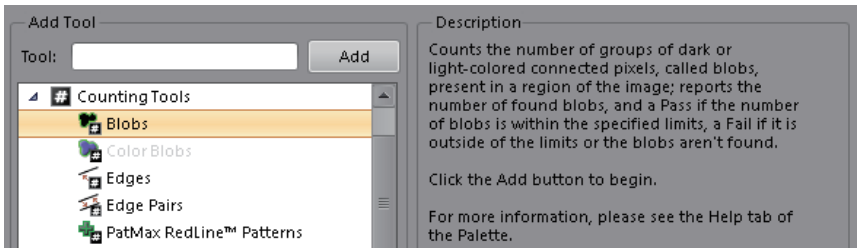
Blobs used here indicate black or white masses.

This tool is suitable for finding black or white features relative to the background with undefined shapes in the configured inspection region.

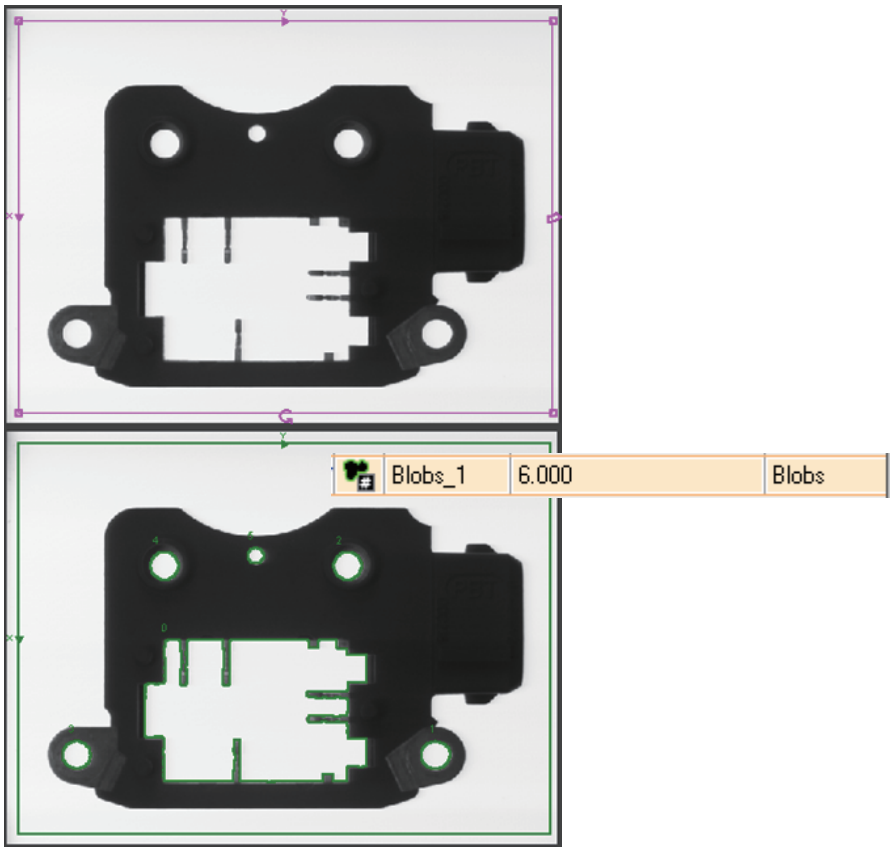


Operating procedure

1. Add "Blobs" under "Counting Tools" to the job.



2. Arrange the inspection region so it encloses the entire region in which blobs are to be detected.

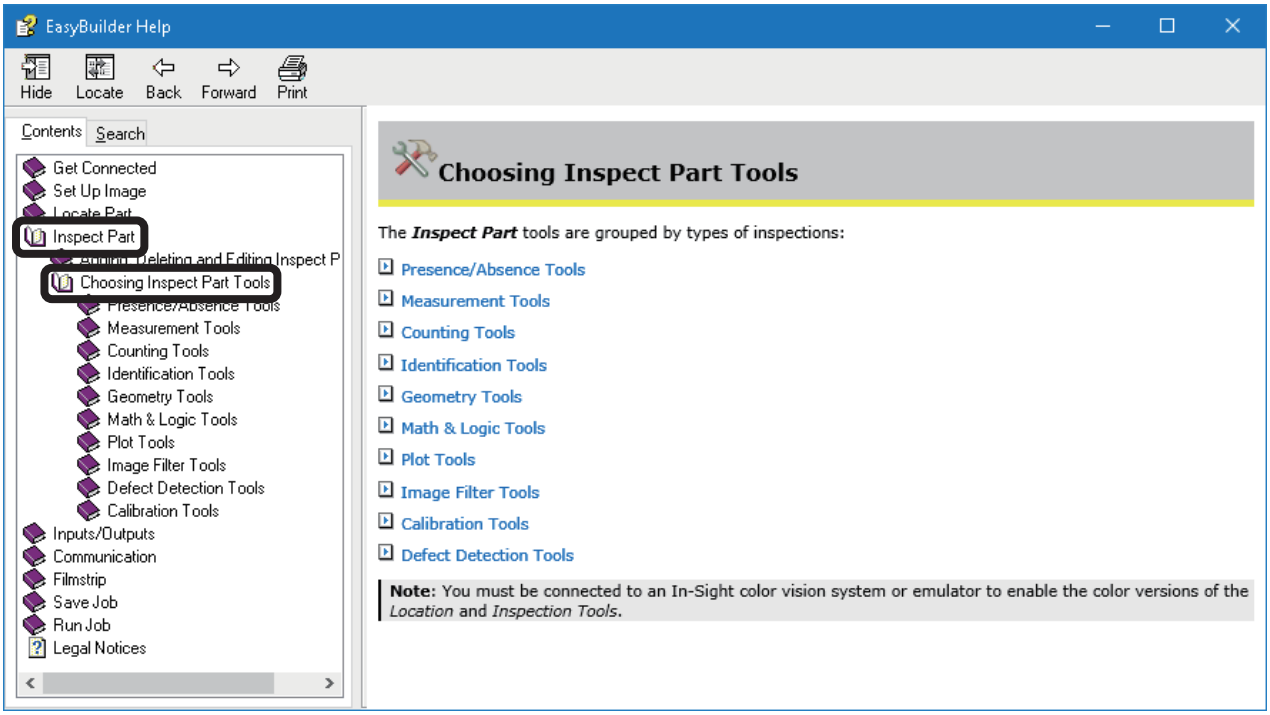


Other Counting Tools

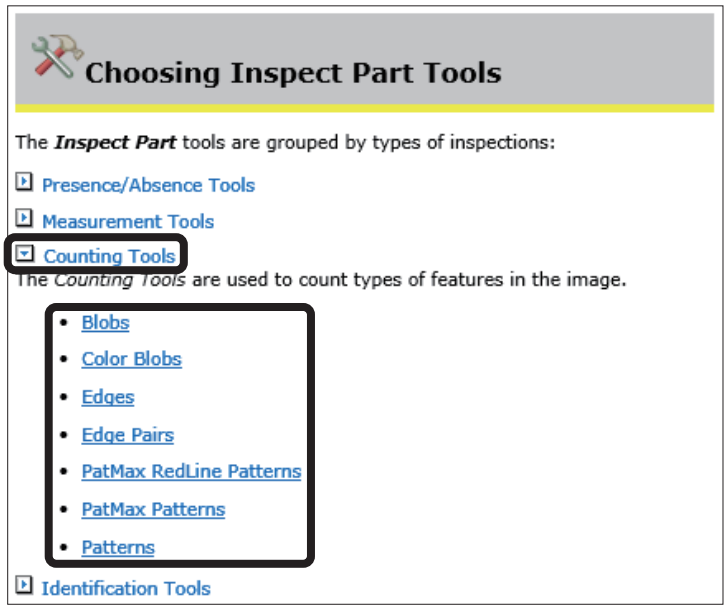
For details of other counting tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].

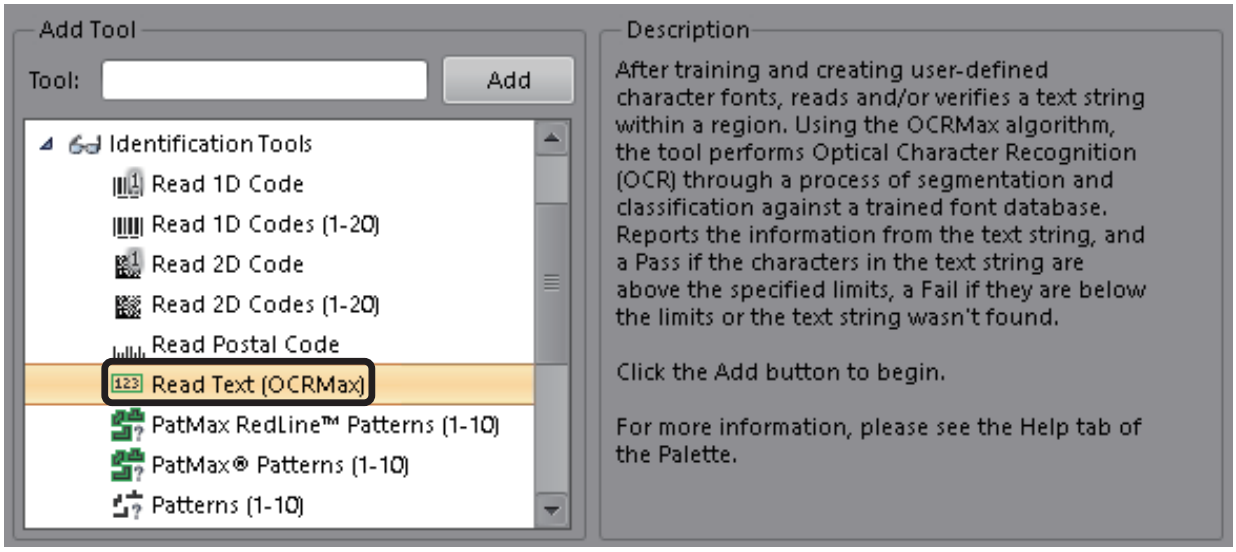


2. By clicking "Counting Tools", available tools for counting are displayed.



Identification Tools: Read Text (OCR Max)

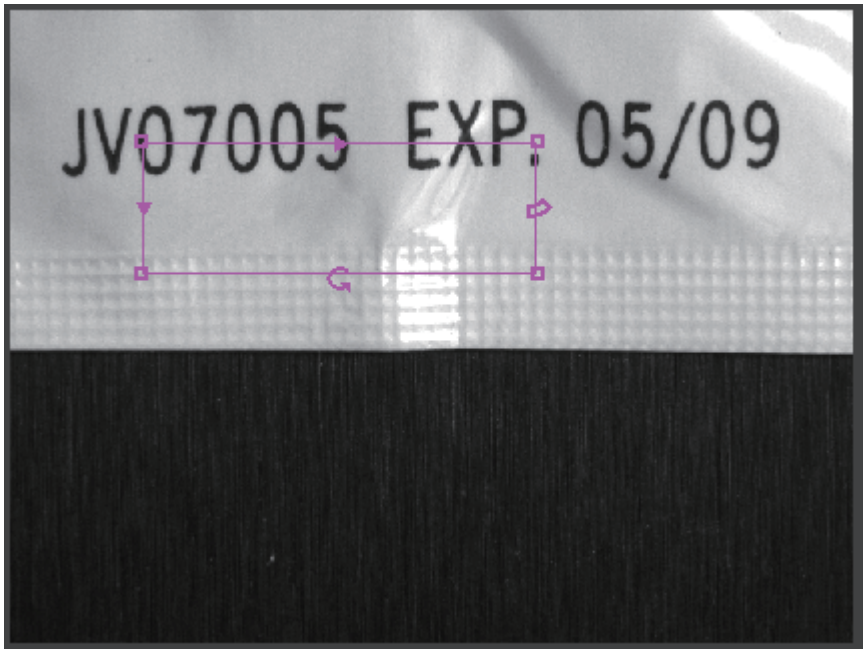
Identification tools identify text, barcodes, 2D codes, colors and other predefined features in the inspection region.
Read Text (OCR Max) identifies text strings in the inspection region, and then outputs the results.
The OCR Max tool separates characters accurately during text recognition to improve the recognition rate. This improves scanning precision and speed compared to traditional OCR tools.



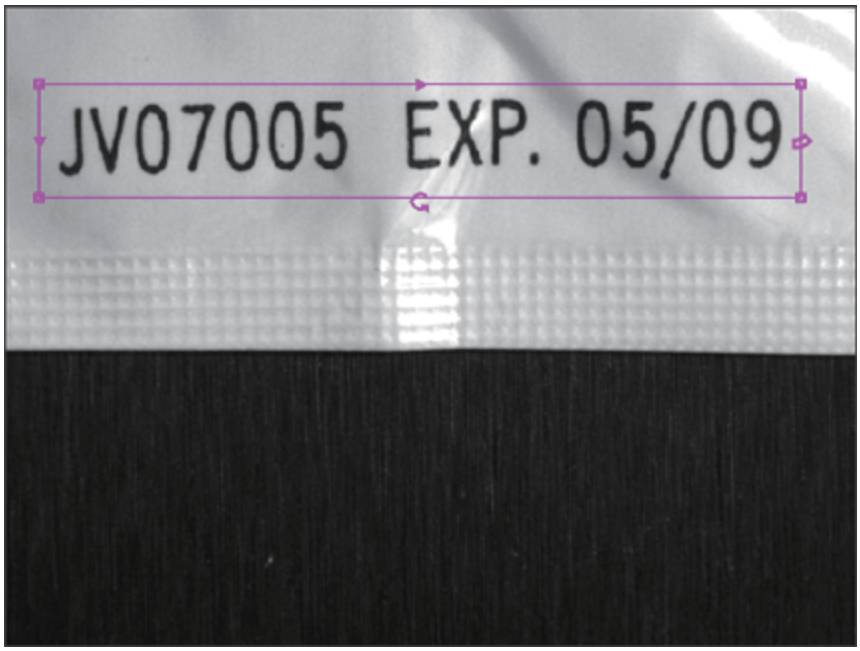
Operating procedure

1. Add Read Text (OCR Max), and then adjust the region to match the section in which the features to be identified are present.

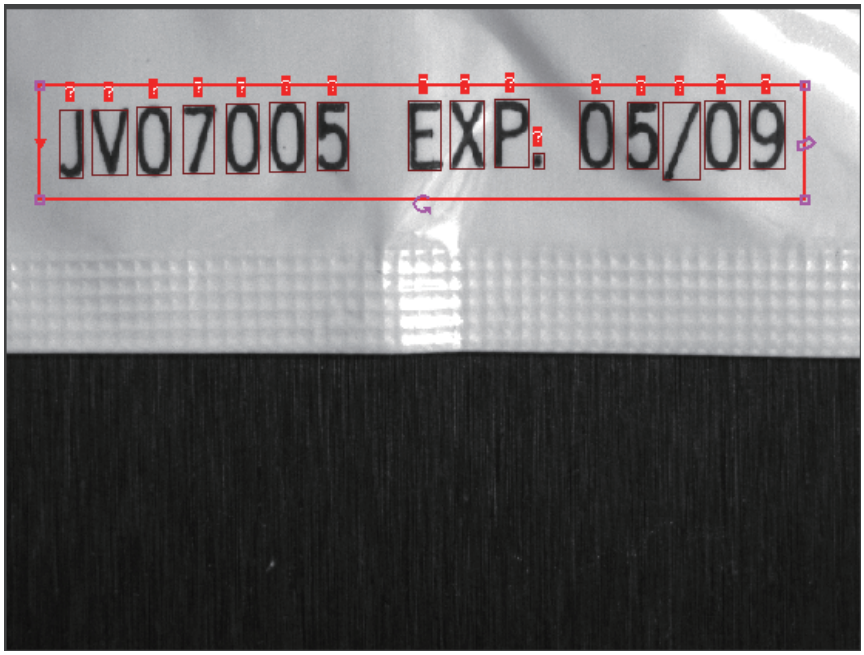
In this example, a location tool has been added in advance so that the inspection region of the Read Text tool can track the location of the text string.



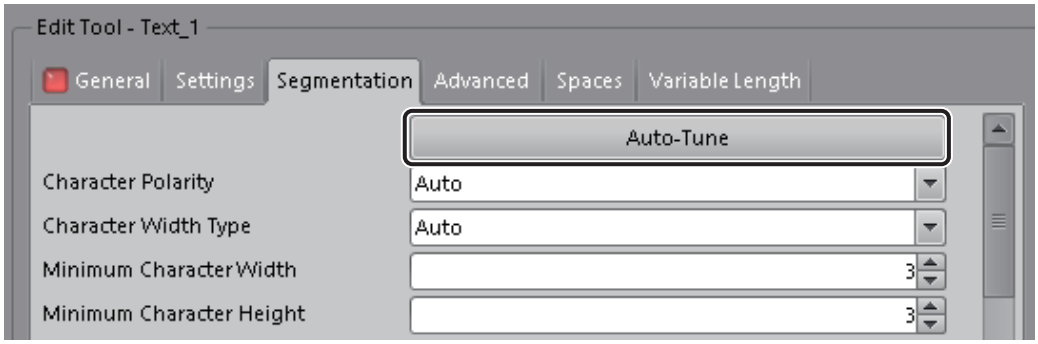
Configure the inspection region so it encloses the target text string to be read.



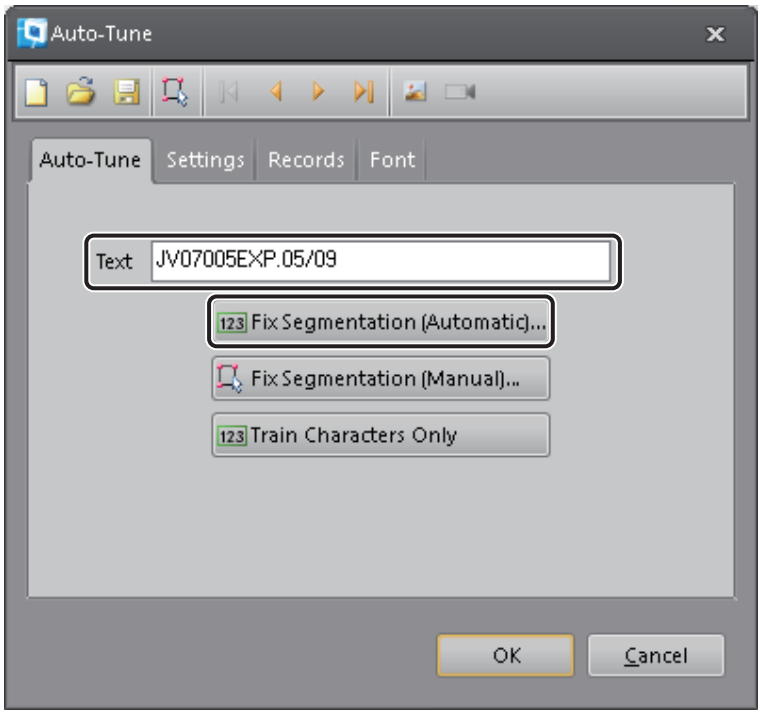
2. If the region is entered, the display changes as shown below.



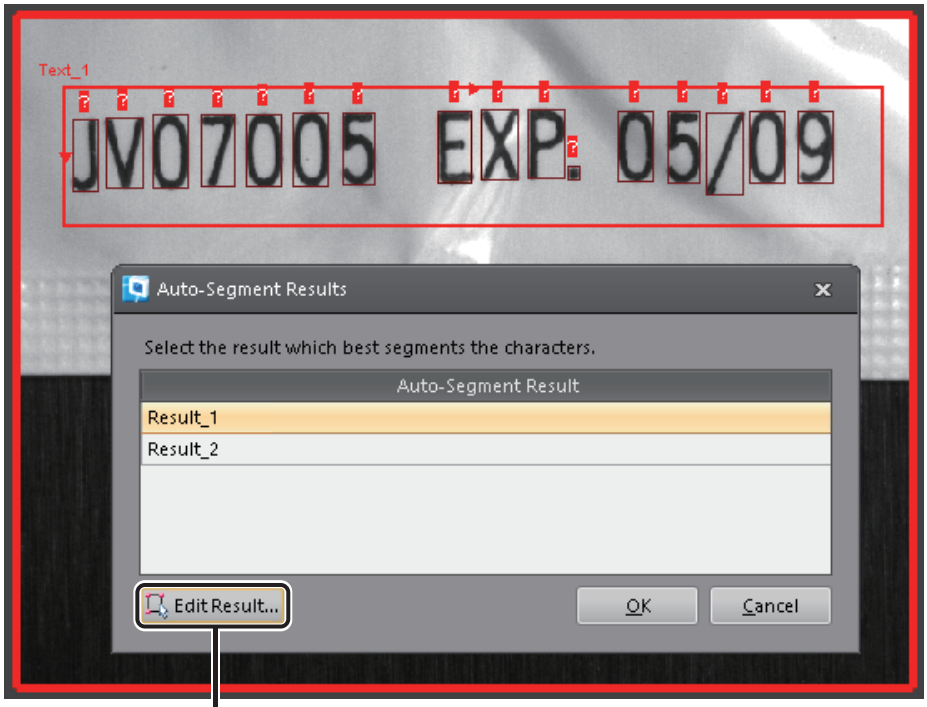
3. After the region is entered, click [Auto-Tune] in the [Segmentation] tab to open the "Auto-Tune" screen.

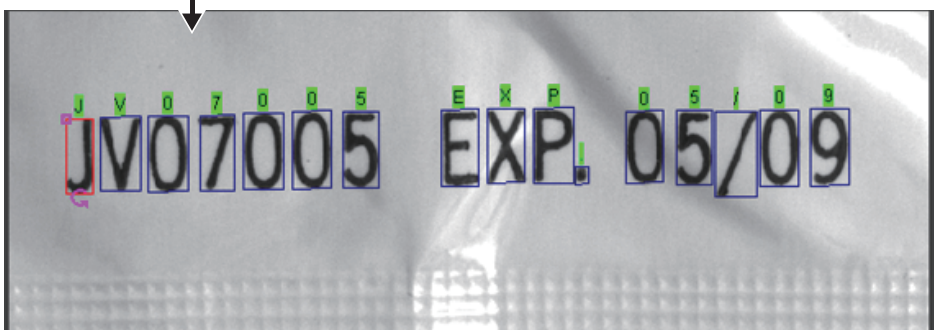


4. In the [Auto-Tune] tab of the "Auto-Tune" screen, enter the text string set for the recognition target in the "Text" text box and click the [Fix Segmentation (Automatic)].

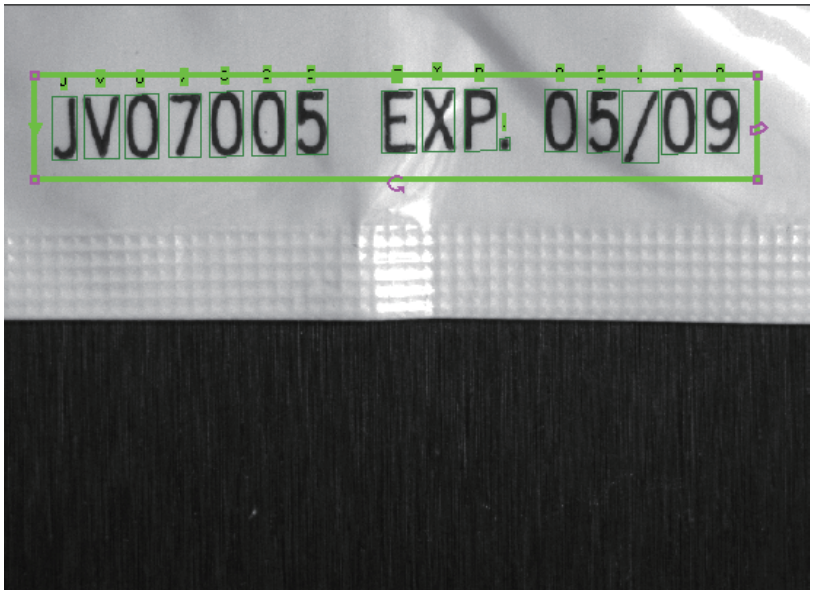


5. The results of the auto-segment are displayed. Select the correct result and click the [OK] button.
If all results are incorrect, click [Edit Result] to adjust each region.





	Name	Result	Type
	Text_1	JV07005EXP.05/09	Read Text



6. If the scanning fails for several times after the registration, adjust the region by the "Auto-Tune" function.

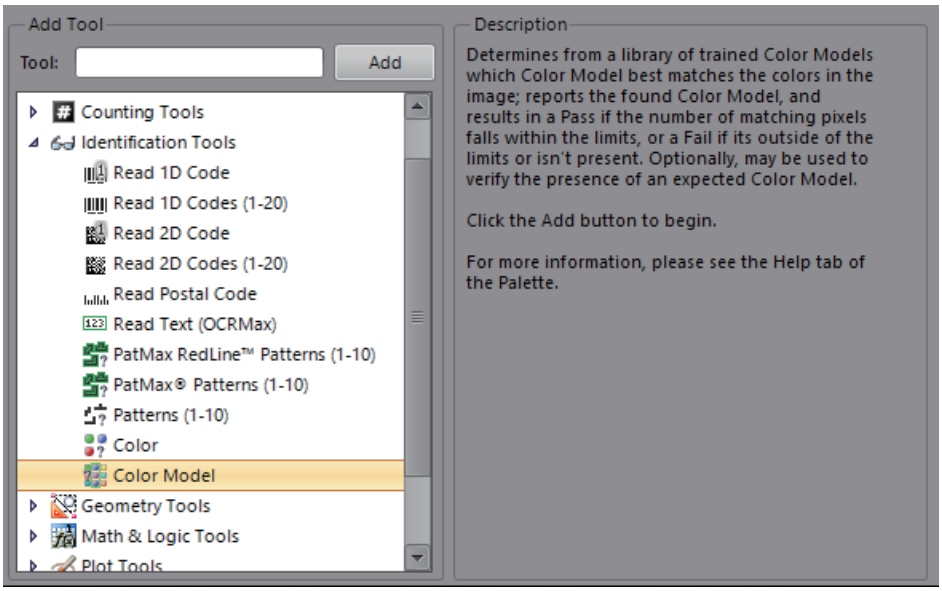
5

Identification Tools: Color Model

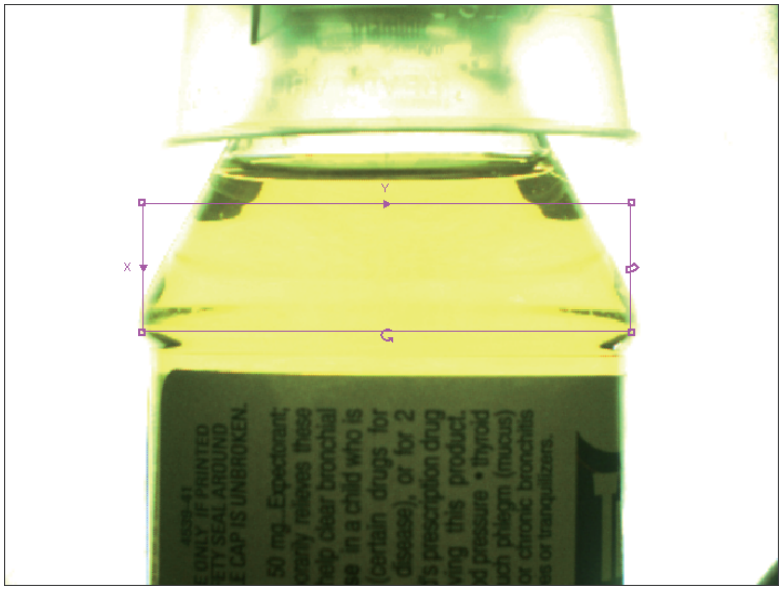
Color Model is a tool available only in a vision sensor that is compatible with color tools. The tool counts the number of pixels present in the inspection region that match a Color Model in the trained Color Library, and judges a Pass or Fail. Additionally, the tool outputs the name of the most found Color Model as a result.

Operating procedure

1. Add "Color Model" under "Identification Tools" to a job.

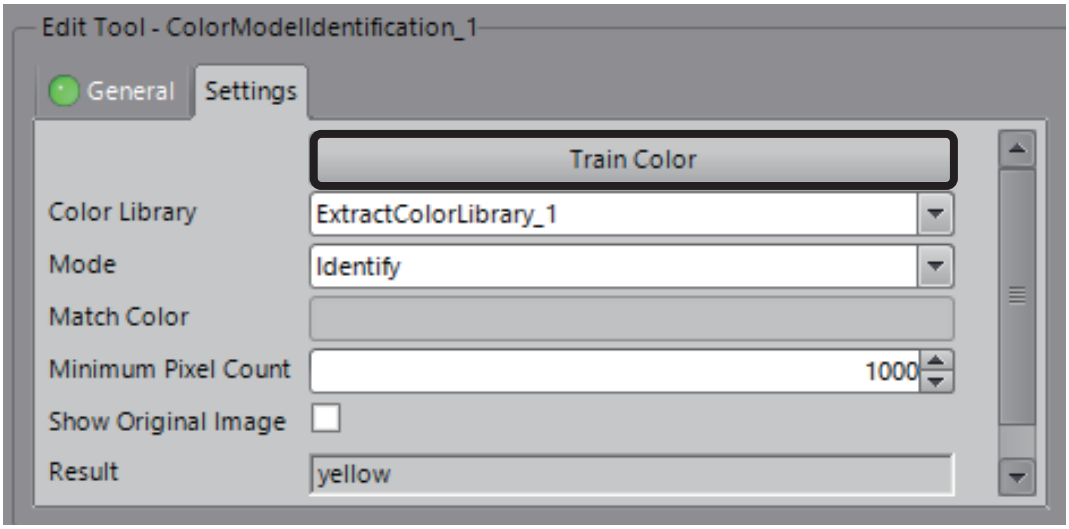


2. Set an inspection region.



3. Train a Color Model.

Click the [Train Color] button to open the "ExtractColor Training" screen.



❶ Click the [New Model] button to create a new Color Model. Rename the Color Model as necessary.

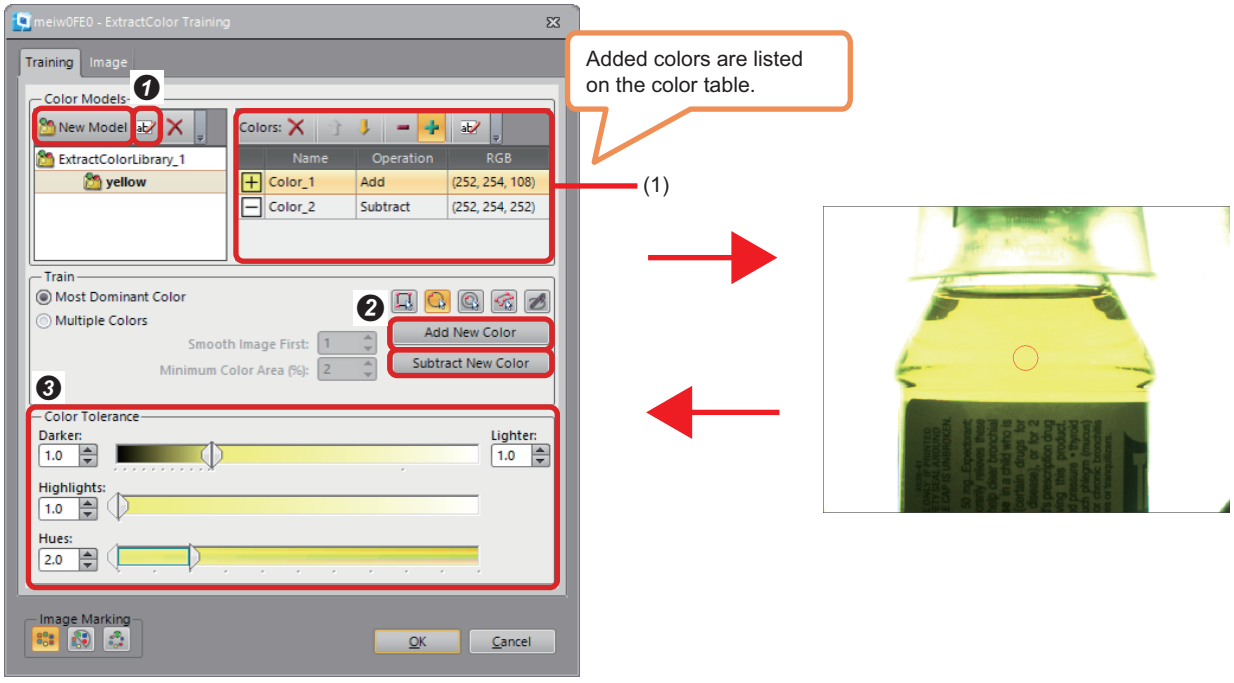
❷ Click the [Add New Color] or [Subtract New Color] button in the [Training] tab to add a color(s) to a Color Model.

Most Dominant Color: To train a single color that occupies the largest area of the target region.

Multiple Colors: To train multiple colors included in the target region.

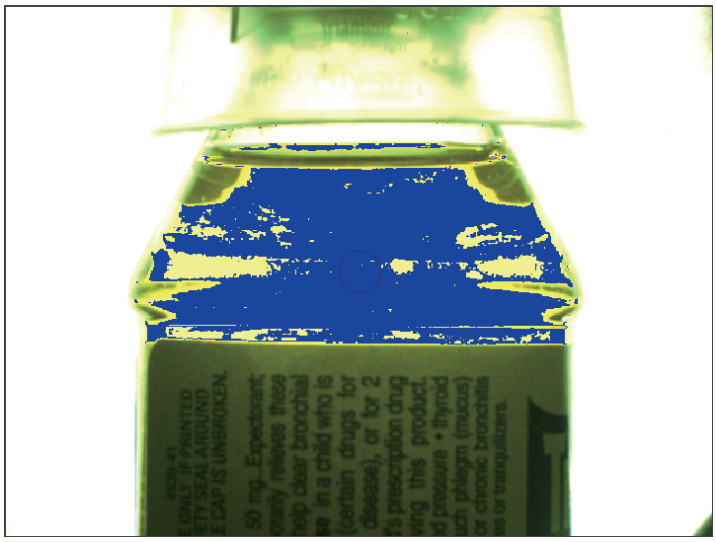
❸ Set a color tolerance of each color selected in the color table.

Adjust brightness and darkness, highlights, and hues appropriately while checking the imported image.



(1) Color table

Pixels that are distinguished by the added color are marked as shown in the following figure.



4. Configure each setting of the tool.

Color Library: Select a library to perform matching.

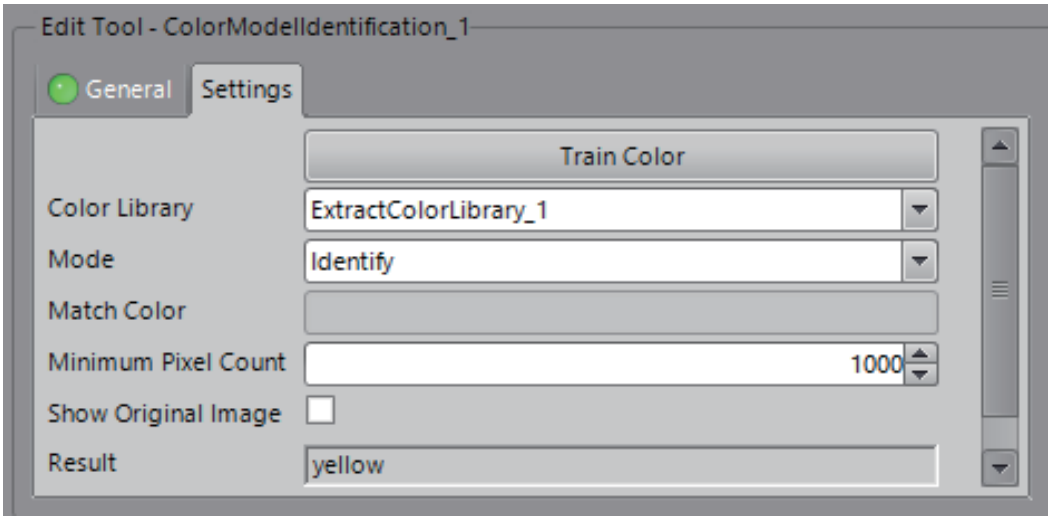
Mode: In the "Identify" mode, the inspection passes when a color in the inspection region matches any of the Color Models in the Color Library.

In the "Match" mode, the inspection passes when a Match Color matches a Color Model that is detected in the inspection region.

Match Color: Set a Color Model to be detected when the Mode is set to "Match."

Minimum Pixel Count: Define the minimum pixel count threshold for determining whether or not a Color Model is considered to be a match.

The following settings are configured as an example:



5. When the inspection passes

When the inspection region color is yellow, the tool outputs a Pass.

Name	Result	Pass	Fail
ColorModelIdentification_1	yellow	1/1	0/1

6. When the inspection fails

When the inspection region color is other than yellow, the tool outputs a Fail.

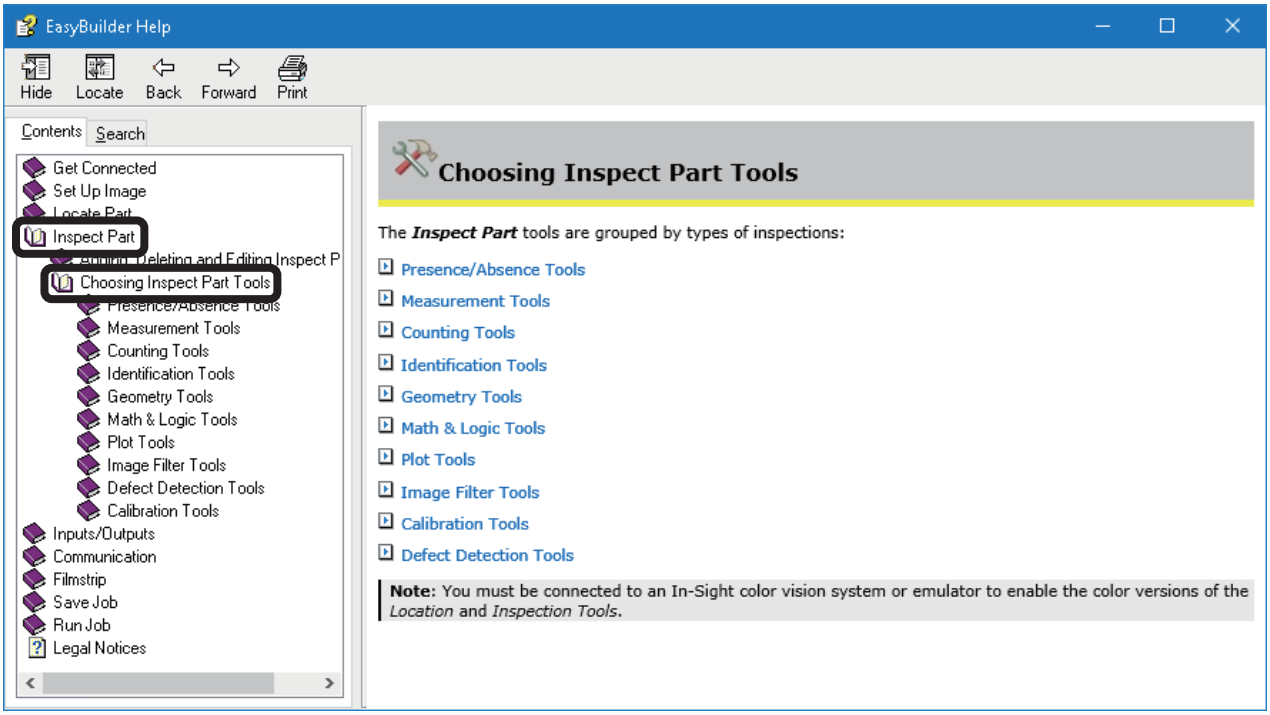
Name	Result	Pass	Fail
ColorModelIdentification_1	No Match: Out of Range	0/1	1/1

Other Identification Tools

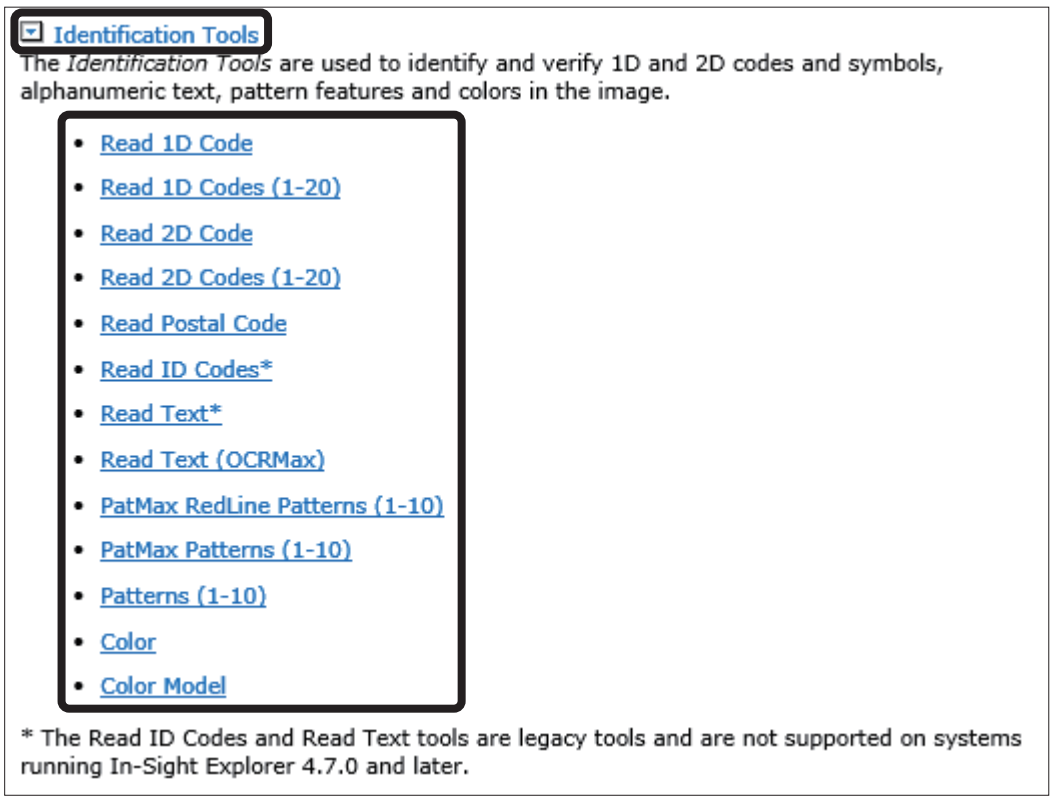
For details of other identification tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].

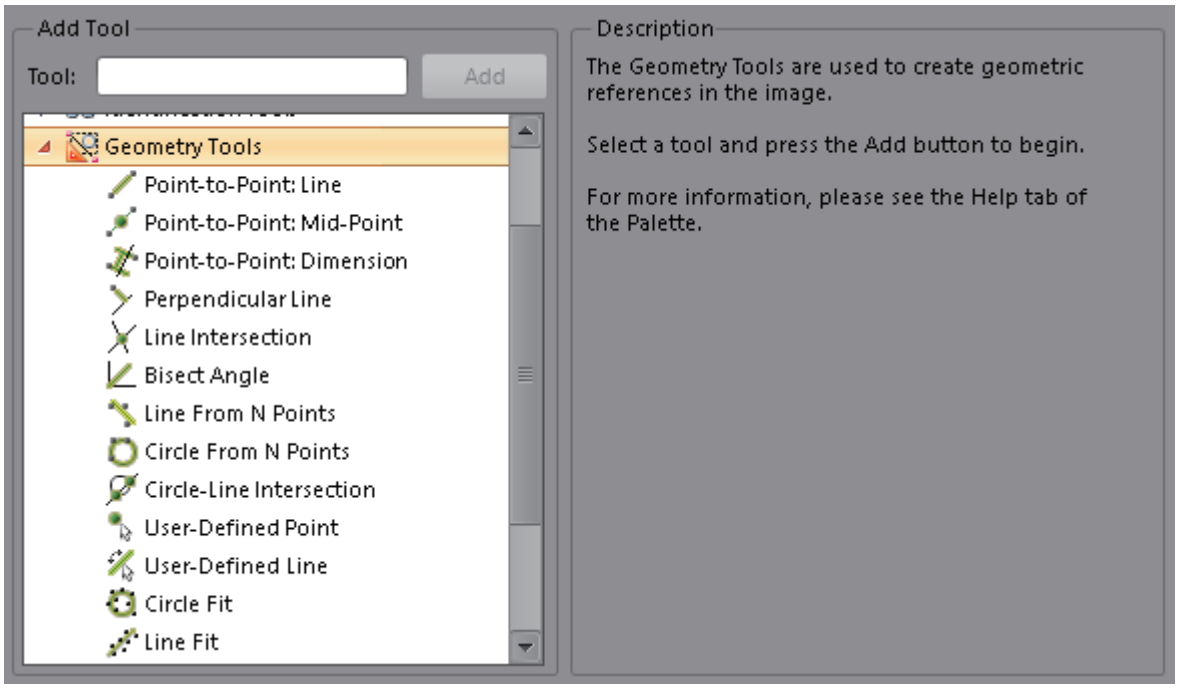


2. Click "Identification Tools" to expand the Help section.



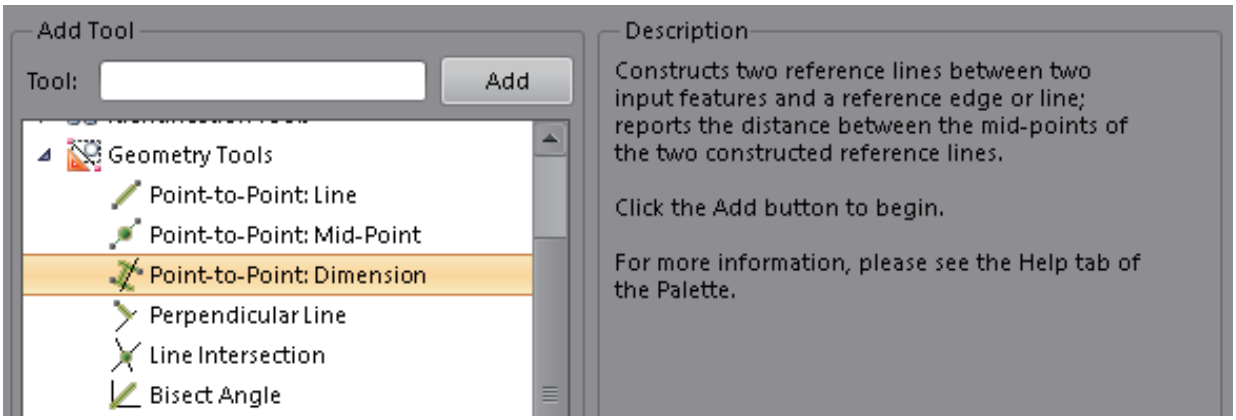
Geometry Tools: Point-to-Point: Dimension

Geometry tools create geometric reference shapes in images.
Furthermore, measurement can be run using the created tool.
The difference between [Point-to-Point: Dimension] and [Distance] of Measurement Tools is it is possible to specify another edge for the reference line to measure distance.

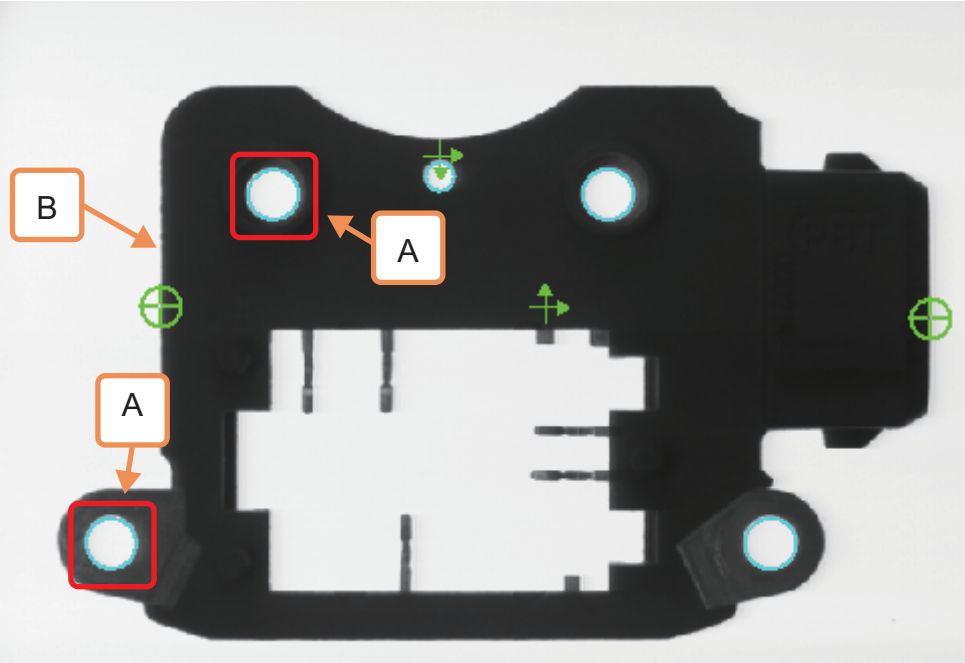


Operating procedure

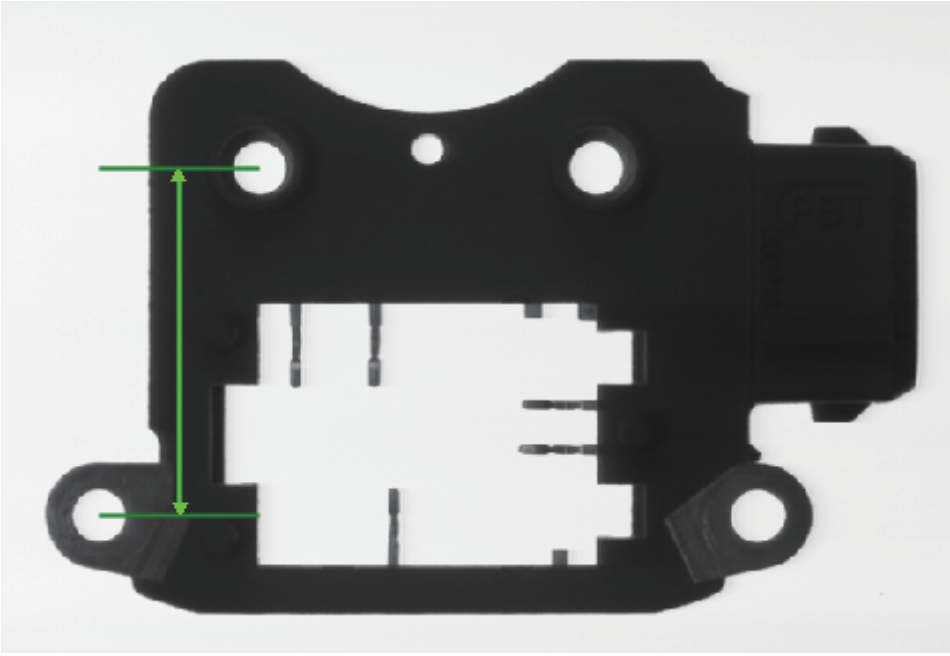
1. Select "Point-to-Point: Dimension" from Add Tool.



2. After the tool is added, specify the point to be measured first.
In this example, settings are configured so that the distance between the centers of the two openings surrounded by red frames is measured in parallel with a line along the edges indicated by the blue lines.
First, click the smart feature of section A.
Next, click the smart feature of section B.



3. If configuration is complete, the display shows the distance between the two points that was measured by a line parallel with the selected edges.

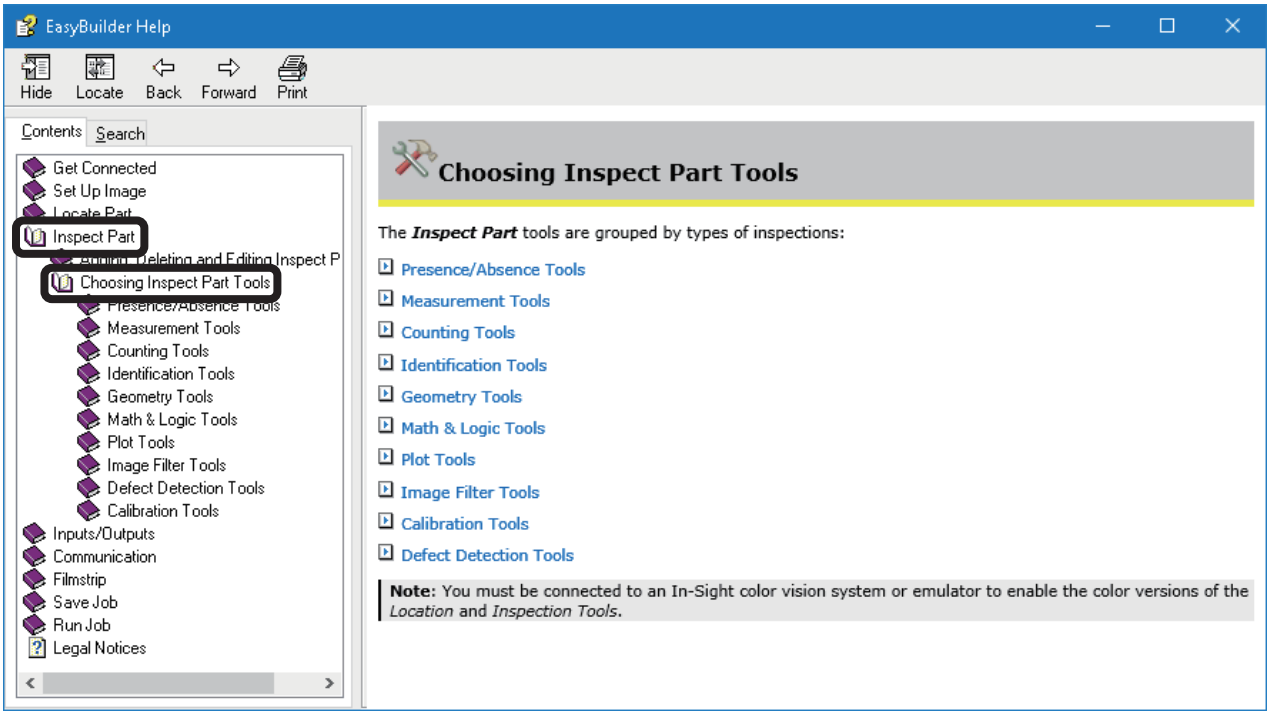


Other Geometry Tools

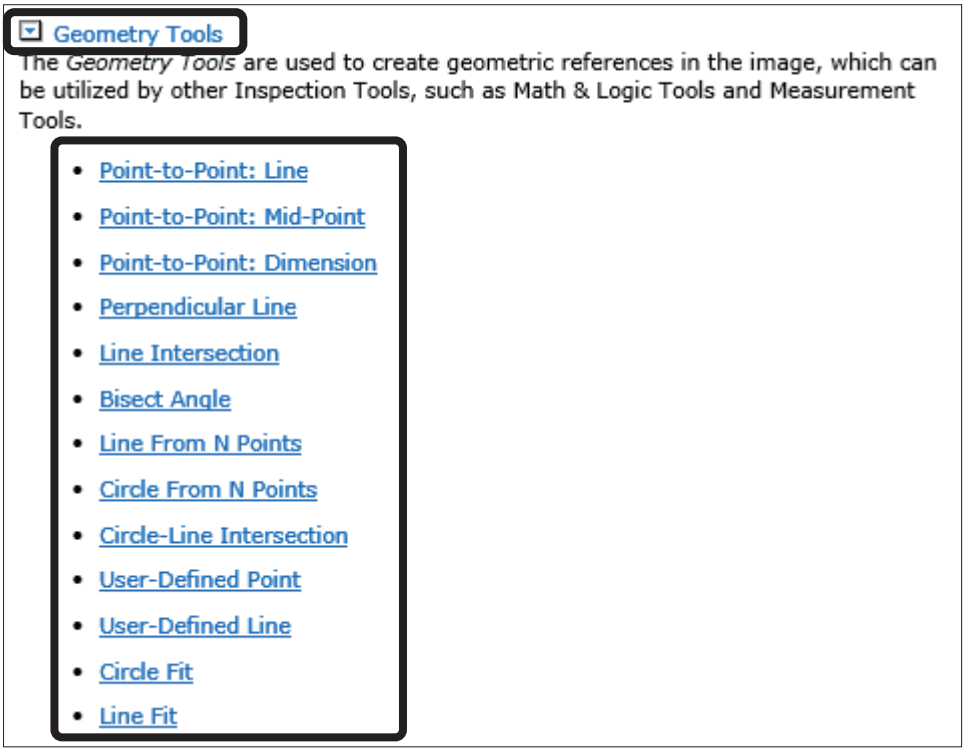
For details of other geometry tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].

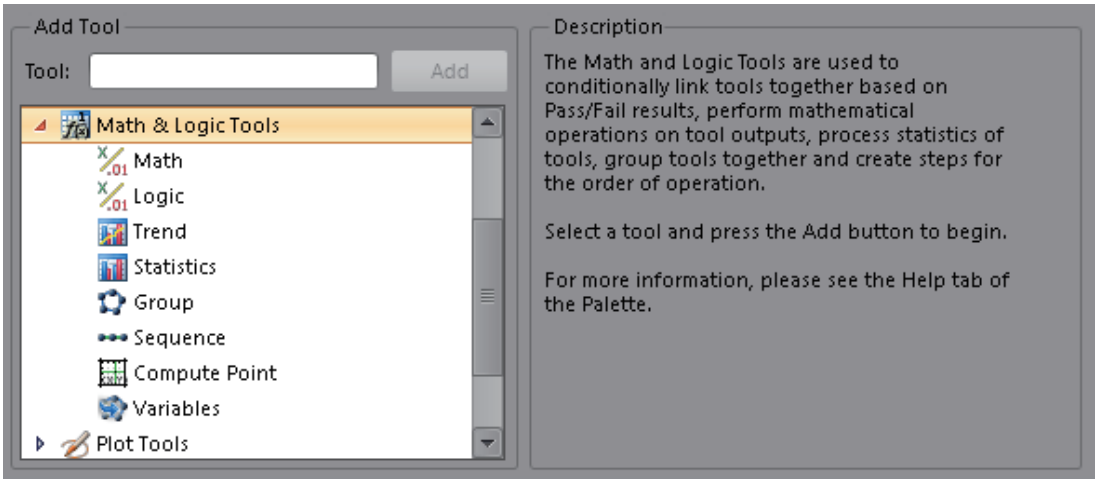


2. Click "Geometry Tools" to expand the Help section.

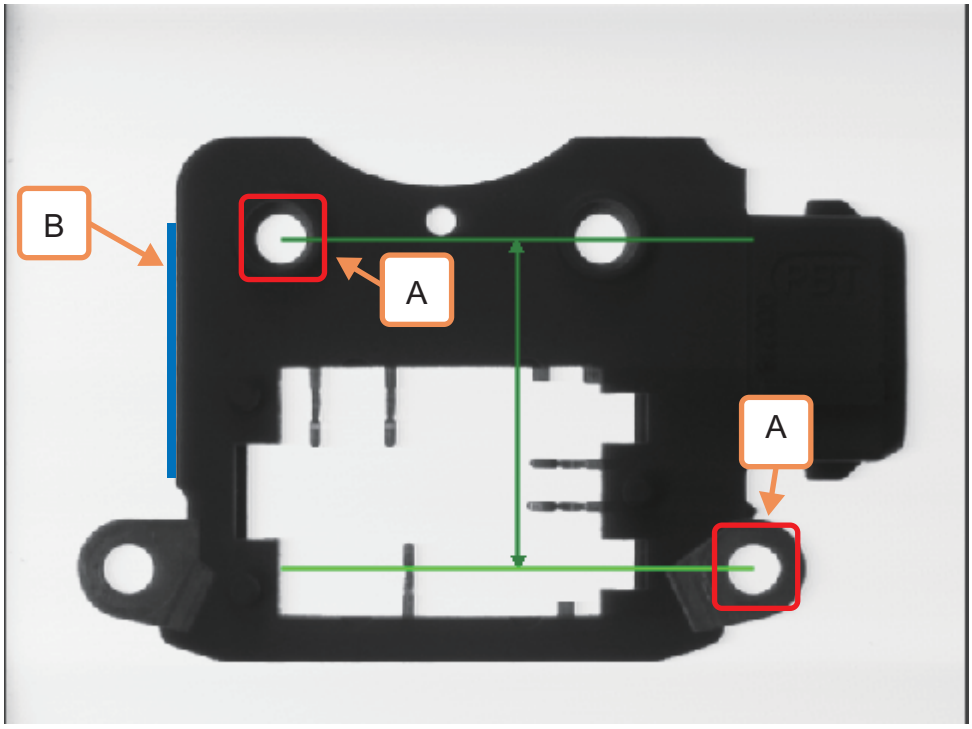


Math & Logic Tools: Math

Math and logic tools perform mathematical and statistical processing using the output values of location tools and other inspection tools (coordinates, brightness, presence/absence judgment values, etc.).
Math tools can carry out numerical calculations using parameters and output values of other tools and extract only identified sections from the results of identification tools using text string operations.

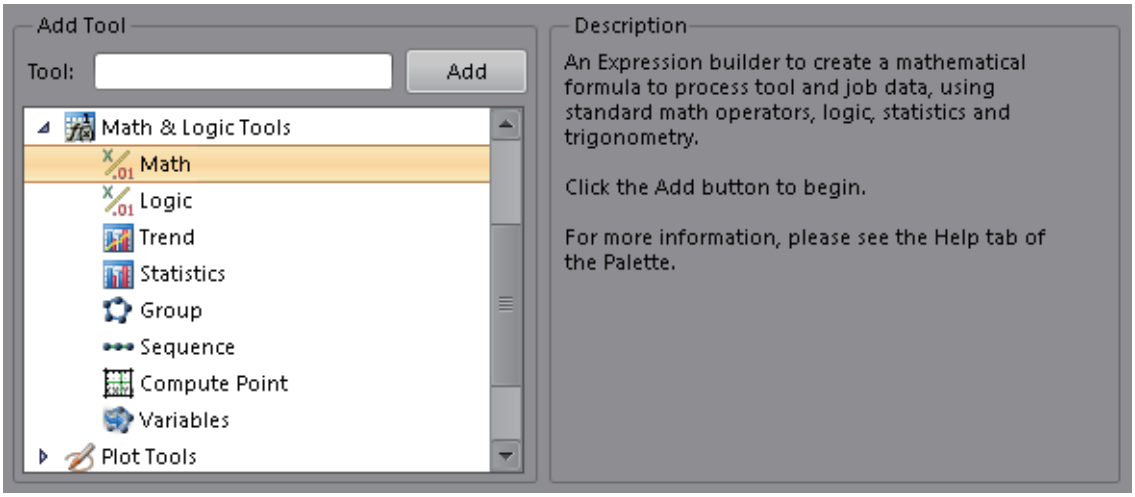


In this example, the Point-to-Point: Dimension tool added on Page 77 Geometry Tools: Point-to-Point: Dimension and another Point-to-Point: Dimension tool (measurement of the distance between the circles in frames A in parallel with a line along the edge of section B in the image below) are added and the difference of the measured distances is calculated.

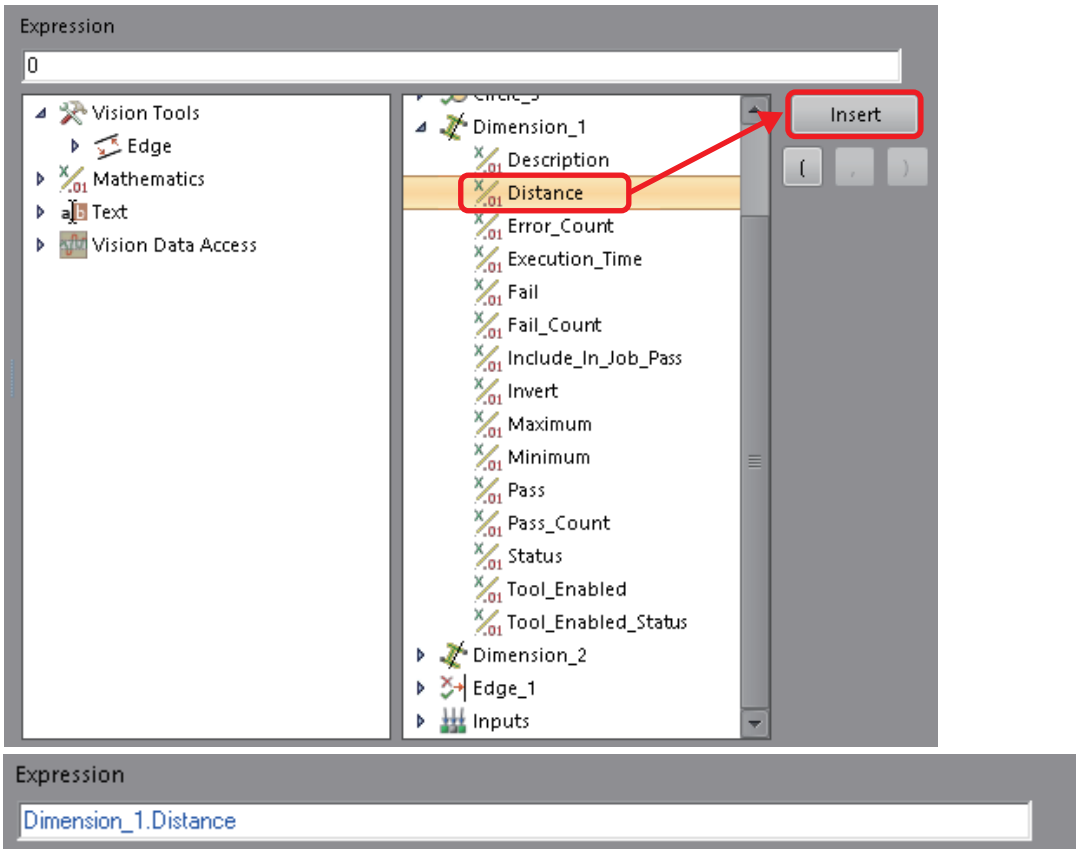


Operating procedure

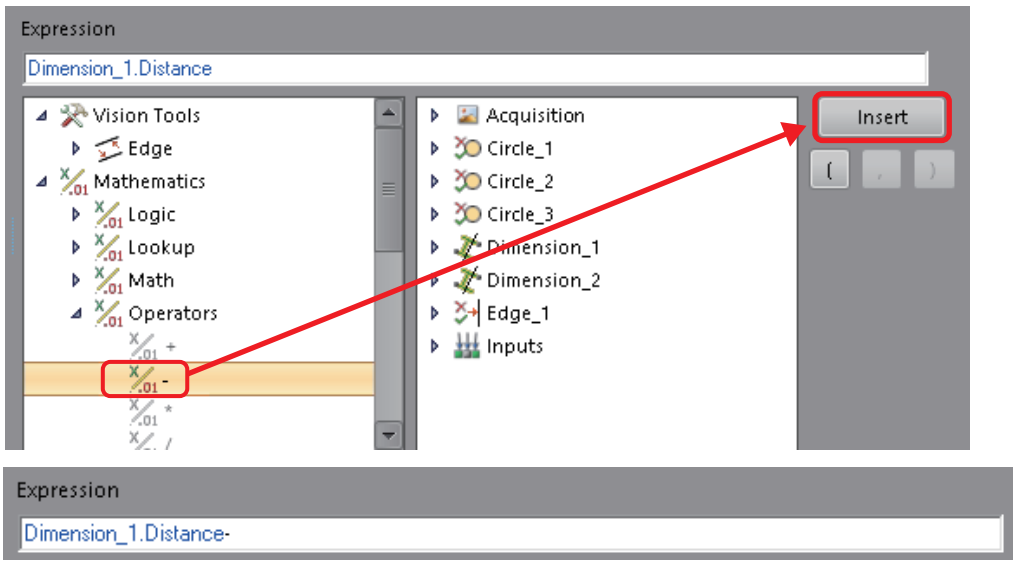
1. Add "Math" to the job.



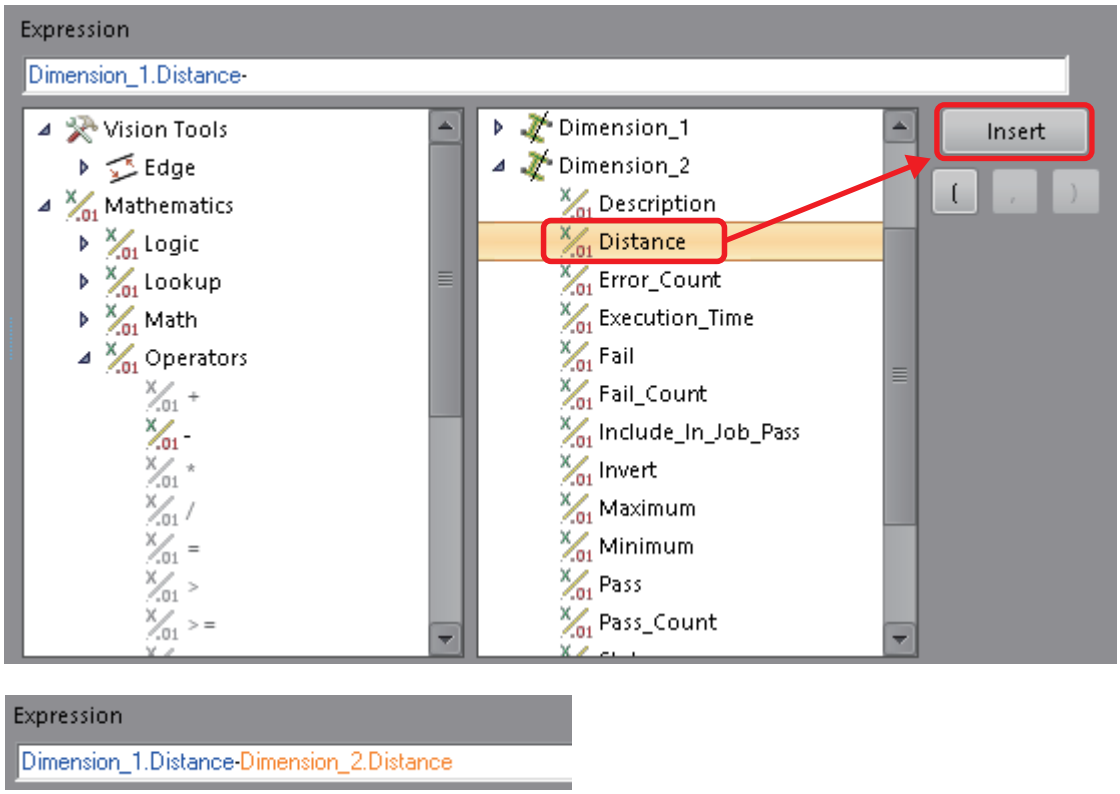
2. Insert the dimension of the Point-to-Point: Dimension tool to "Expression".



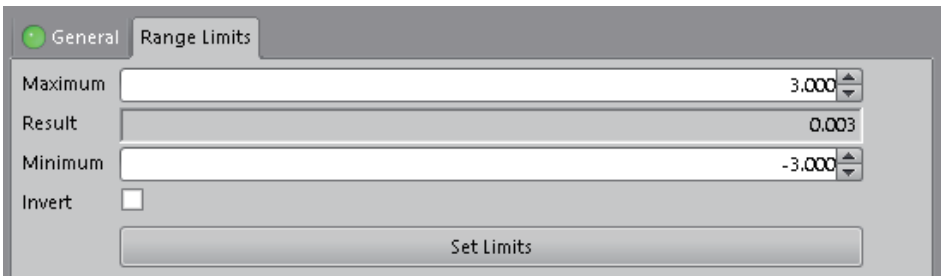
3. Either edit the formula directly or insert "-" from Operators under Mathematics.



4. Insert another dimension of the Point-to-Point: Dimension tool to "Expression".



5. In the [Range Limits] tab, configure the numerical range to pass judgment.
Minimum value and maximum value can be configured by entering the values directly.
In addition, range limits can be configured automatically by clicking the [Set Limits] button.

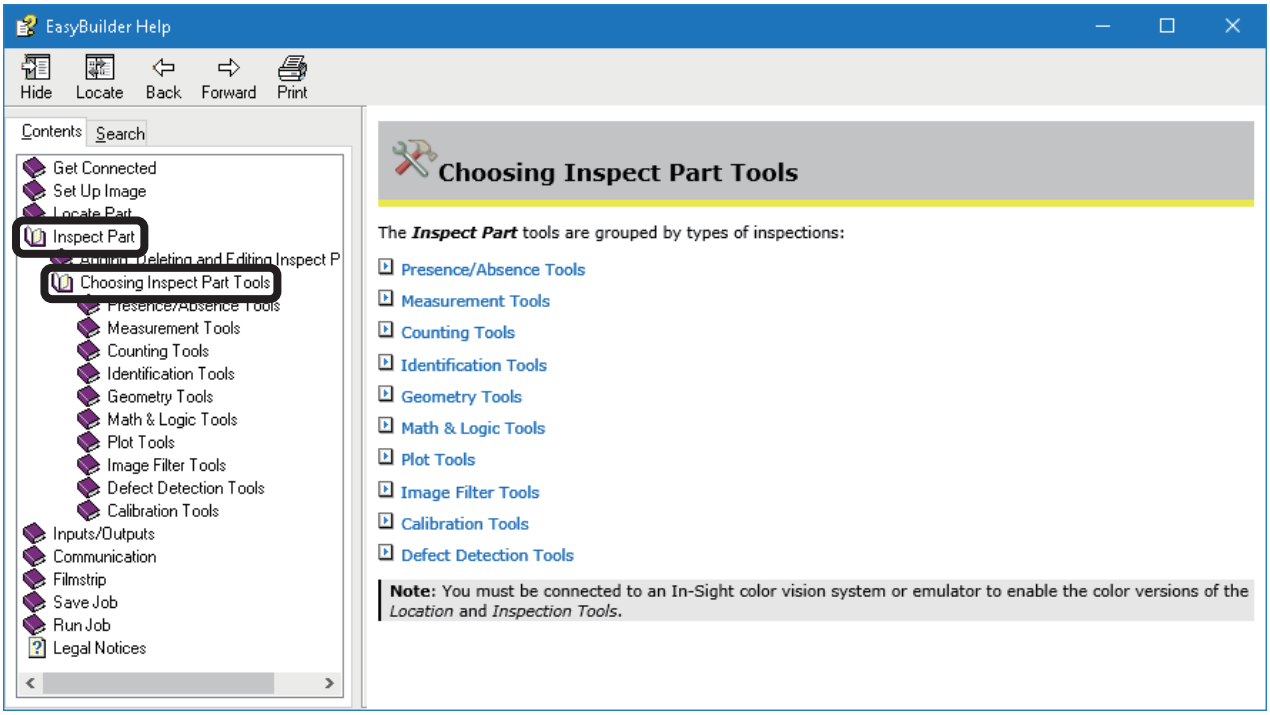


Other Math & Logic Tools

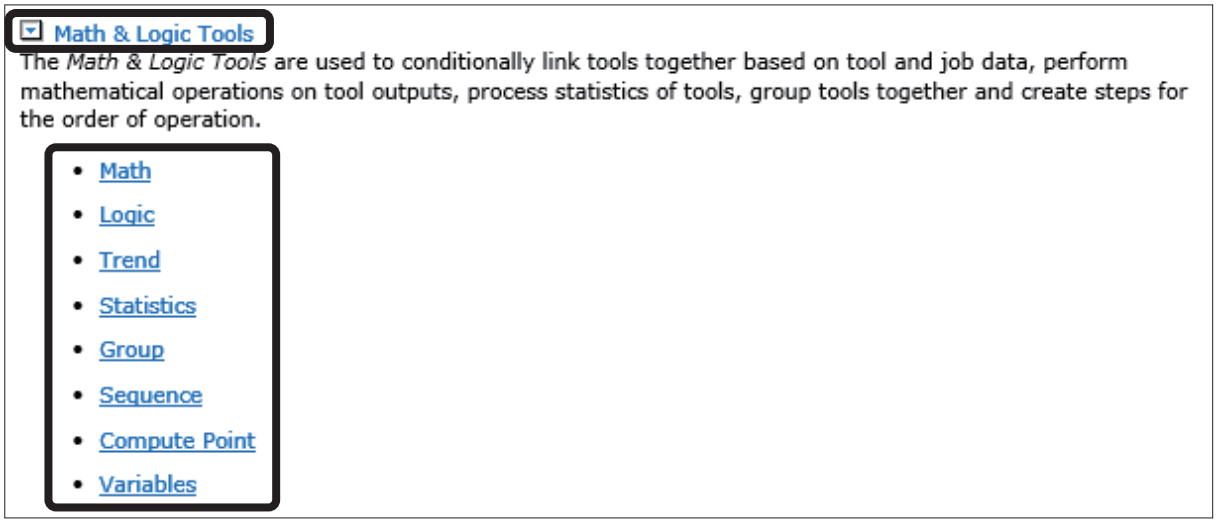
For details of other math and logic tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].

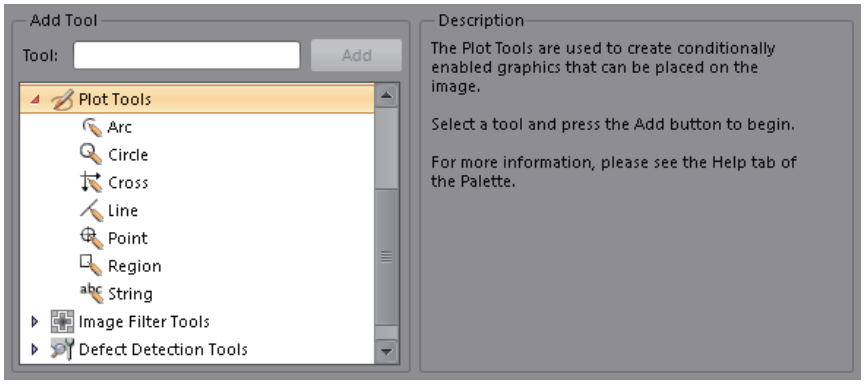


2. Click "Math & Logic Tools" to expand the Help section.



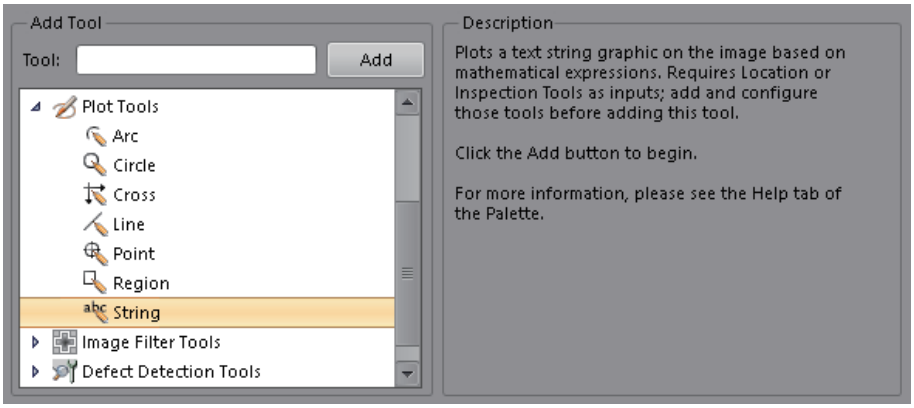
Plot Tools: String

Plot tools can display arbitrary shapes and character strings on the inspection screen in a manner similar to the results of other tools.
This section describes the String tool that displays character strings in arbitrary locations.

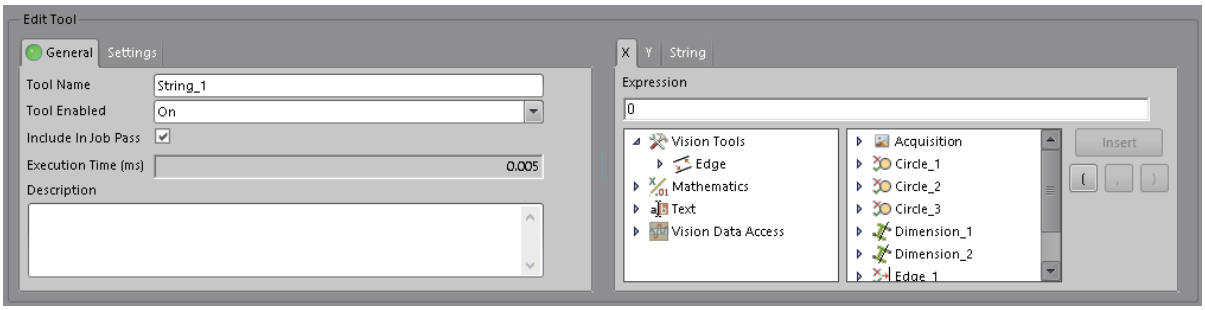


Operating procedure

1. Add "String" under "Plot Tools" to the job.

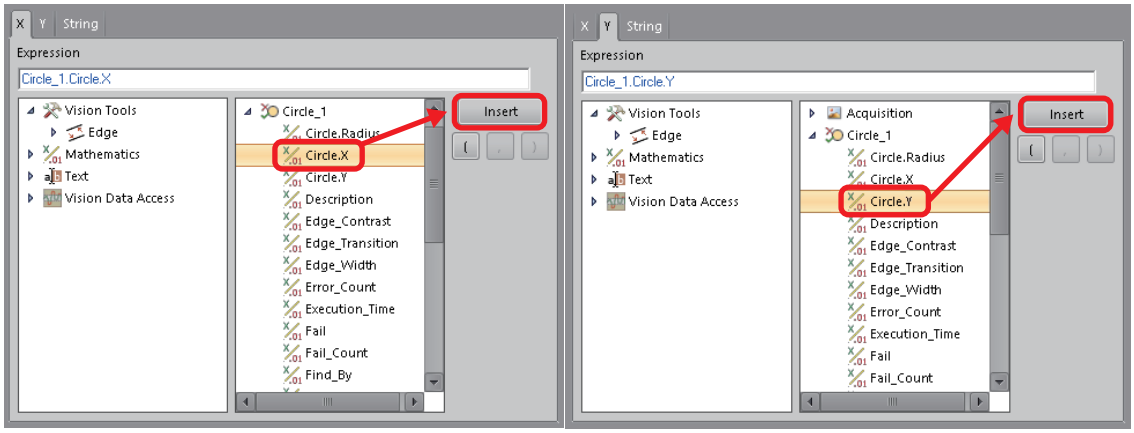


2. Configure the String tool.
The X and Y tabs on the right side are the X and Y coordinates to be displayed, respectively.
The String tab defines the character string to be displayed.
In each tab, it is possible to use the results of Math and other tools in a manner similar to the formula entry section on Page 80 Math & Logic Tools: Math.

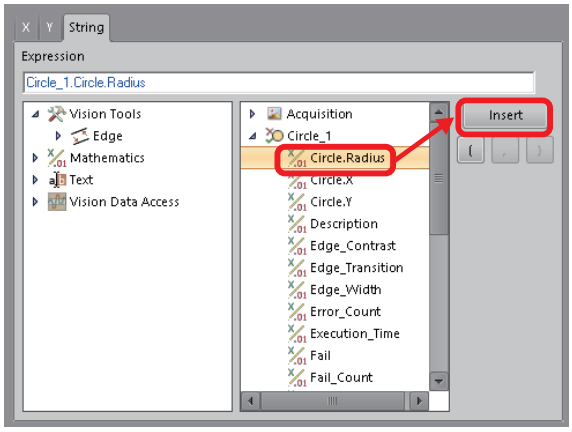


In this example, the screen displays the radius of the detected circle for Circle_1 of the Presence/Absence Tool added automatically to detect circles when the Point-to-Point: Dimension tool was added.
The display location uses the coordinates of the circle.

3. In the X formula section and Y formula section, insert Circle_1.Circle.X and Circle_1.Circle.Y, respectively.

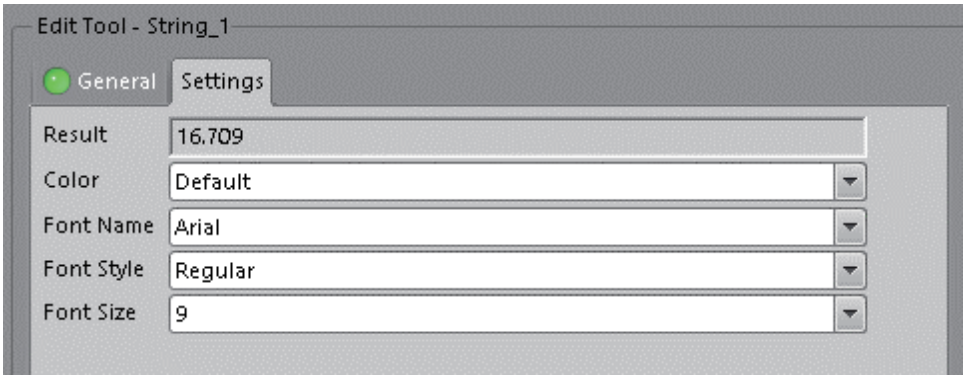


4. In the String formula section, insert Circle_1.Circle.Radius.



5. The radius of the circle is displayed on the center coordinates of the circle detected by Circle_1.

It is possible to change the font, font size, color, and other features of the character string to be displayed at the [Settings] tab.

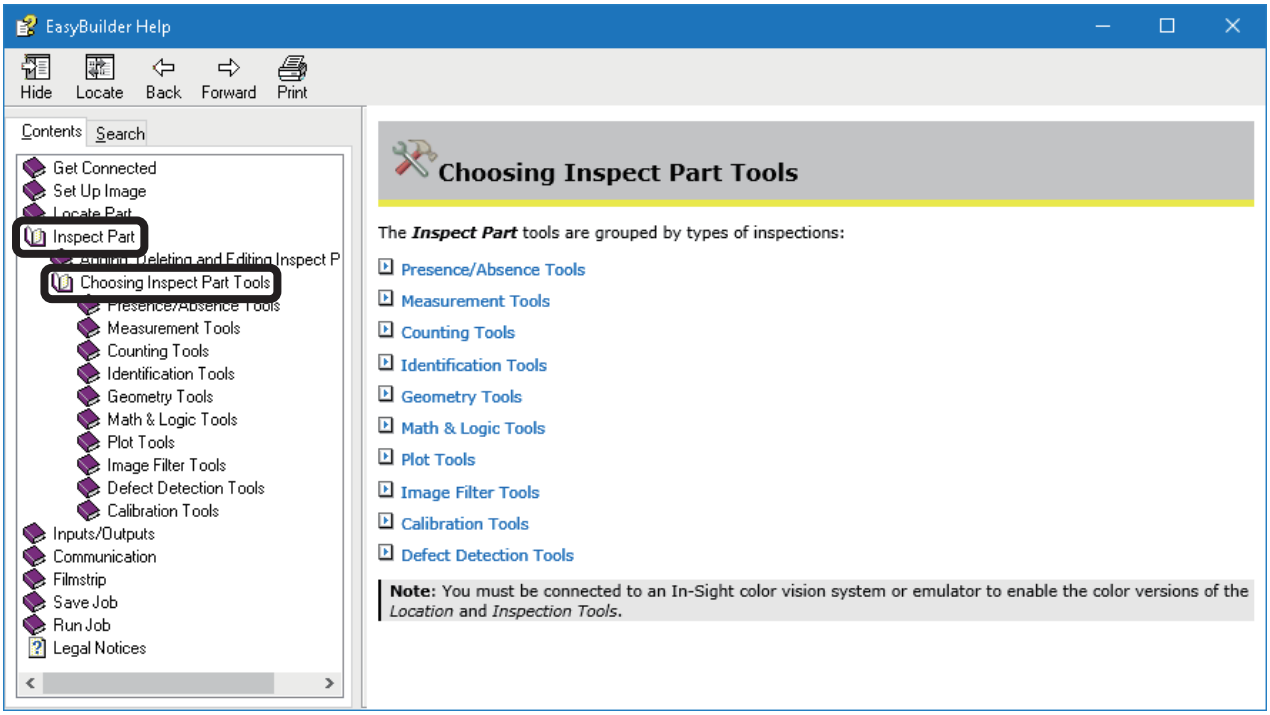


Other Plot Tools

For details of other plot tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].



2. Click "Plot Tools" to expand the Help section.

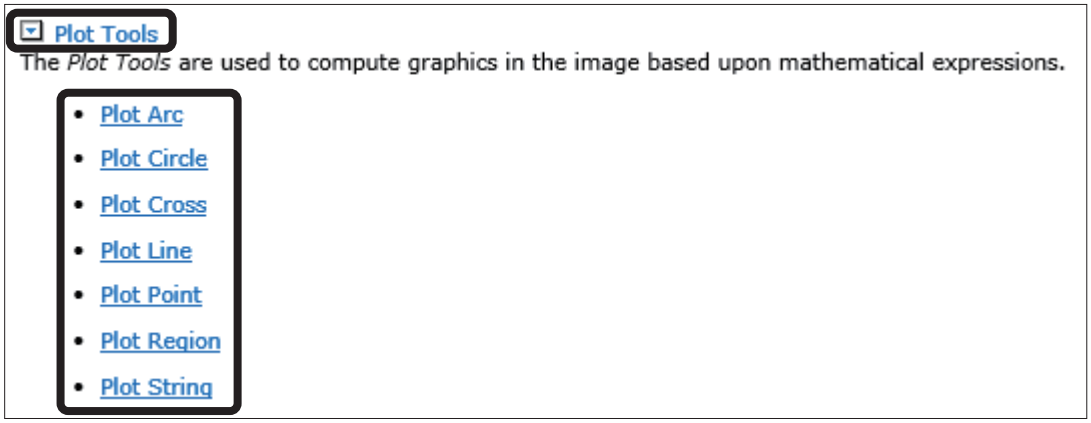
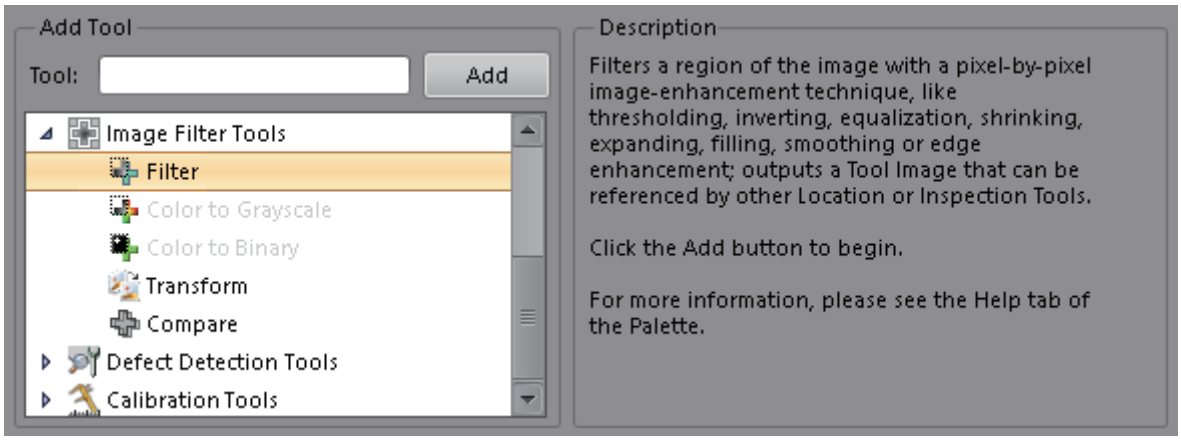


Image Filter Tools: Filter

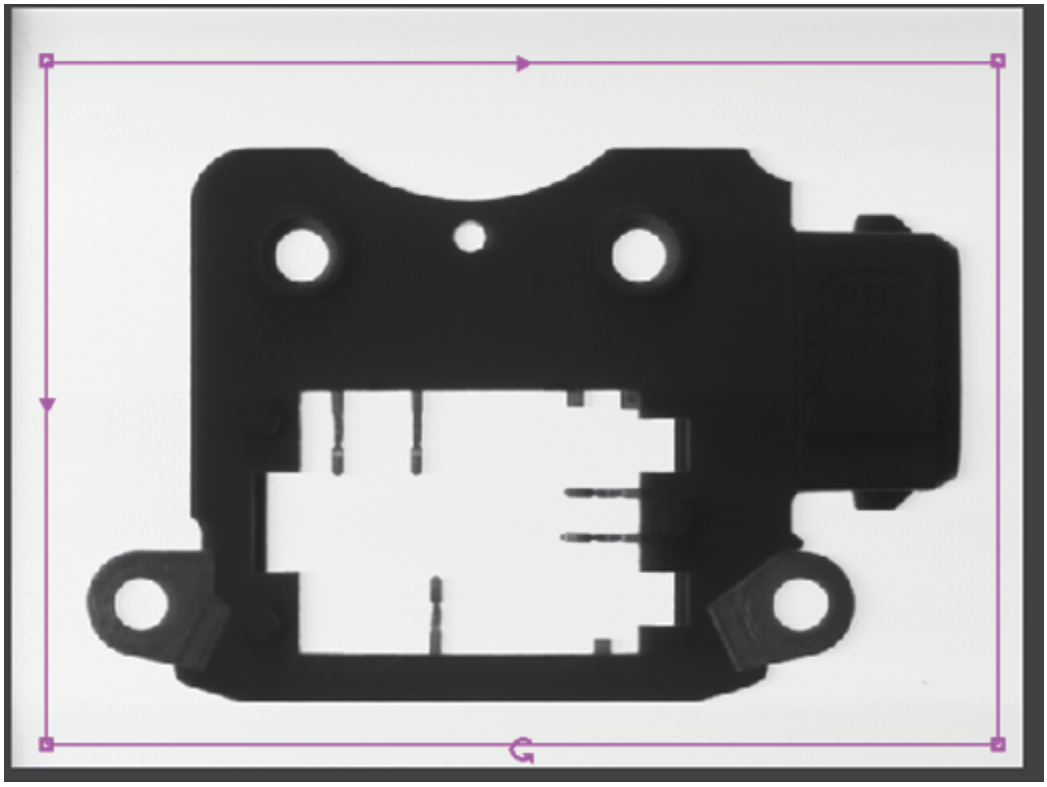
The image filter tools are used to emphasize features as preprocessing for image analysis.
This section describes the settings of [Filter].

Operating procedure

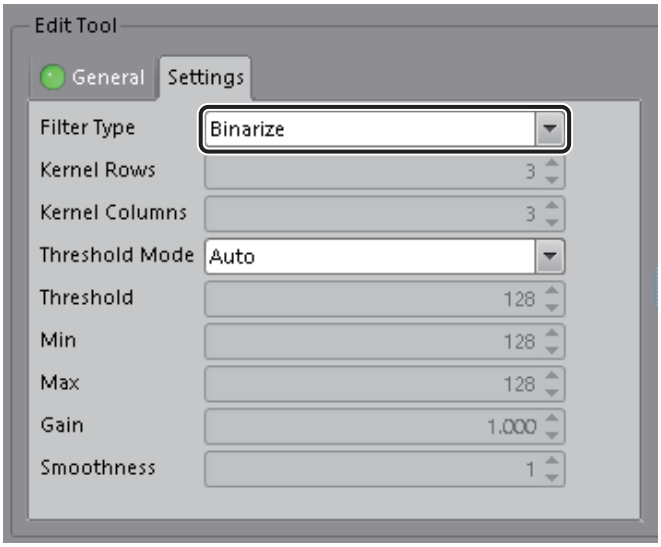
1. Add "Filter" to the job.
The filter tool can run emphasis-processing on various images in the prescribed region.



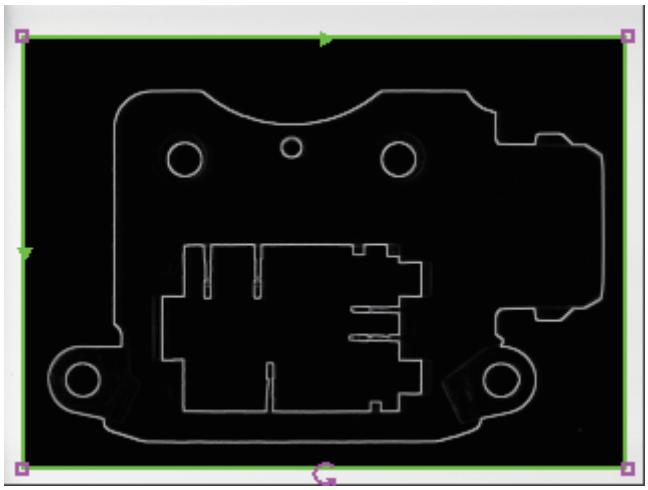
2. Specify the area to be emphasized by the filter.



3. Select the filter type.

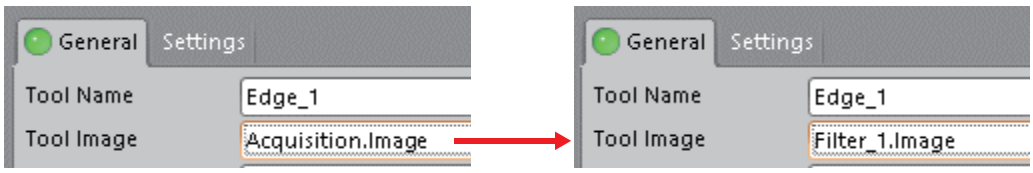


For example, when selecting Edge Magnitude, an image as shown below is displayed.



Point

To use images emphasized by Image Filter Tools with location tools and inspection tools, it is necessary to browse to the [General] tab in each tool setting, and then change "Tool Image" to "Filter_1.Image", etc.

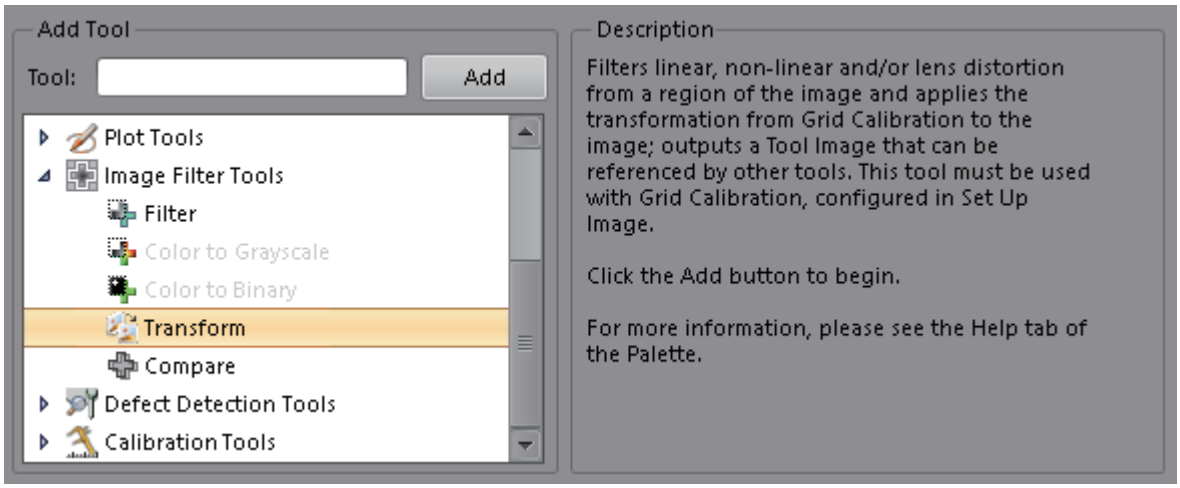


■ About [Transform] of Image Filter Tools

[Transform] in the Image Filter Tools is a filter that can be used only when grid calibration has been run.

It is possible to generate an image in which radial distortion and perspective distortion have been eliminated from a captured image.

It can be utilized for inspection that depends on shapes subject to inspection, such as Identification Tools and Presence/Absence Tools.

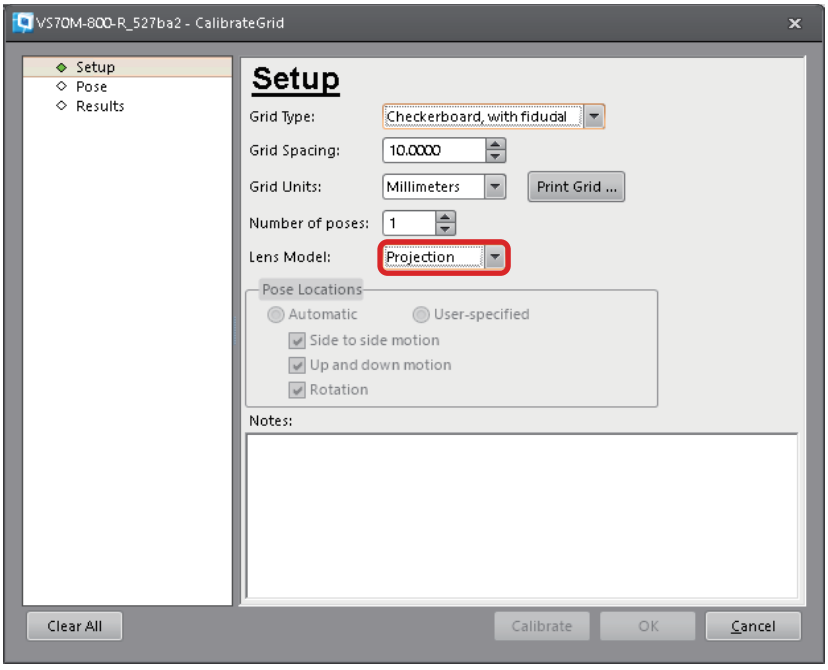


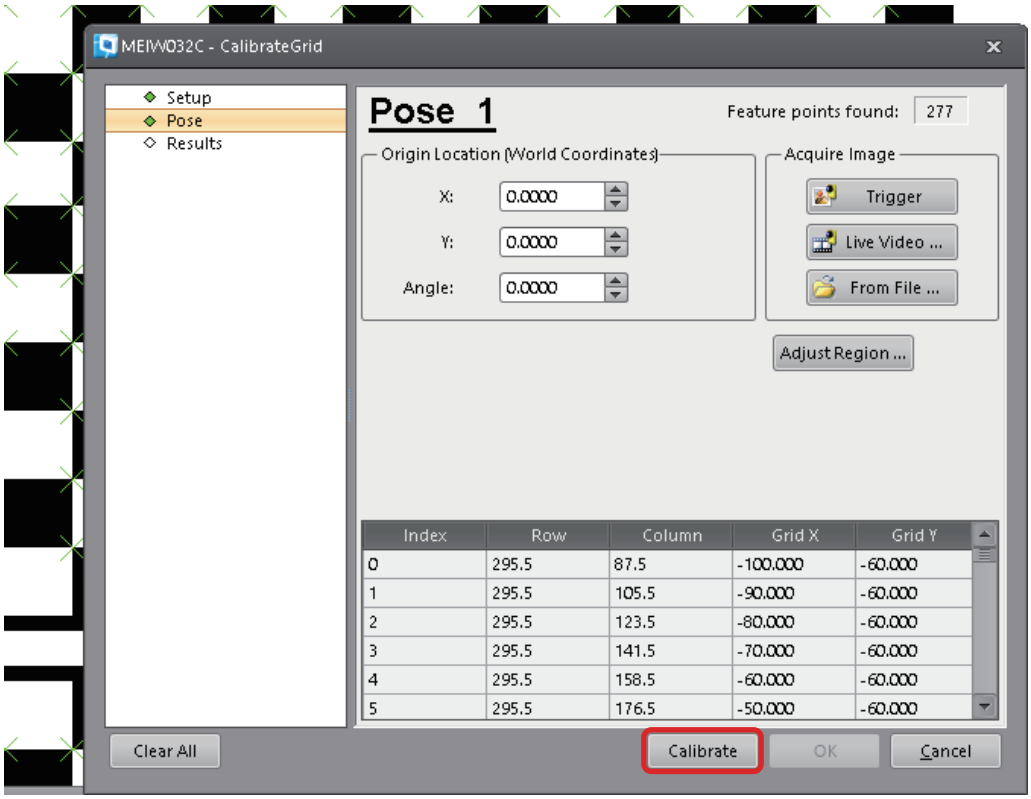
■ Example of use of the Transform filter

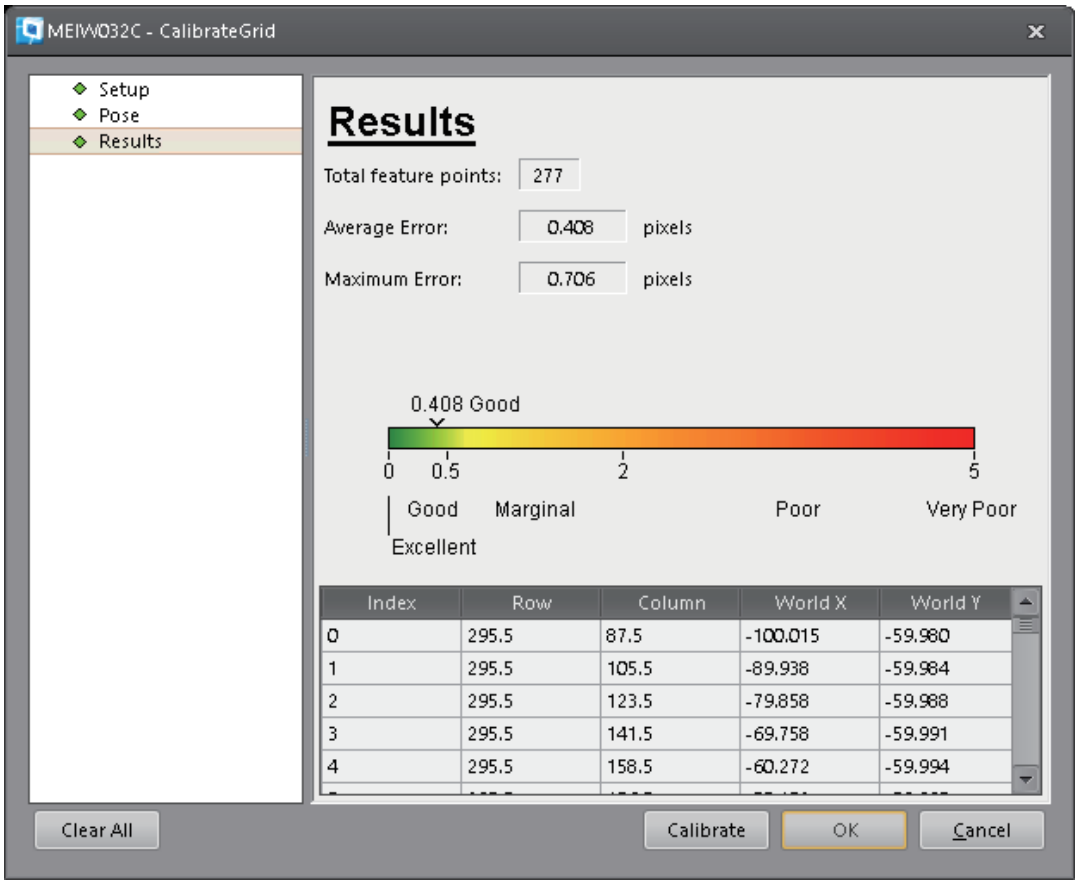
Operating procedure

1. Run calibration.

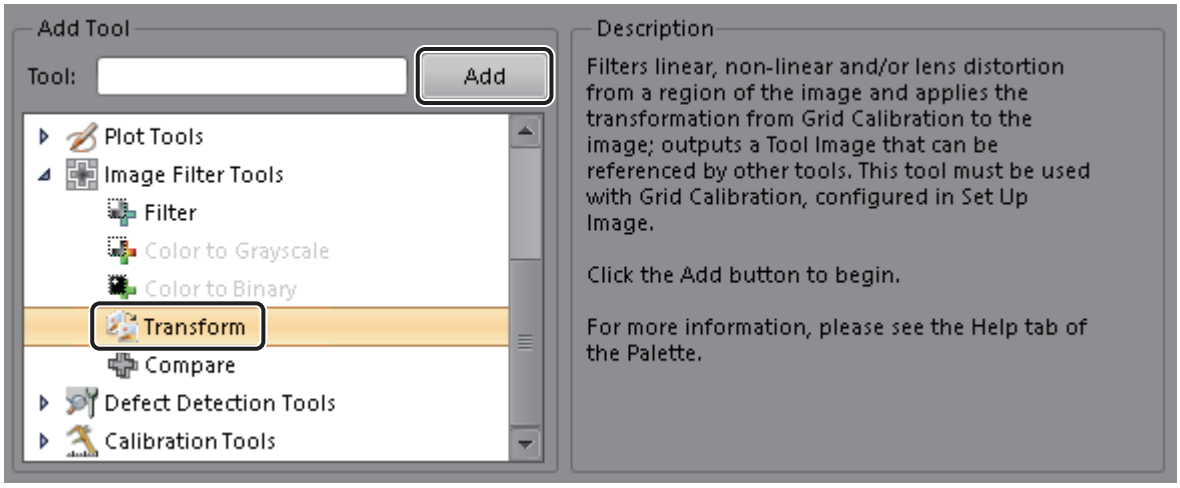
To correct the distortion for the inclination of the camera, set "Radial" for Lens Model. To correct the distortion for the lens, set "Projection" for Lens Model.



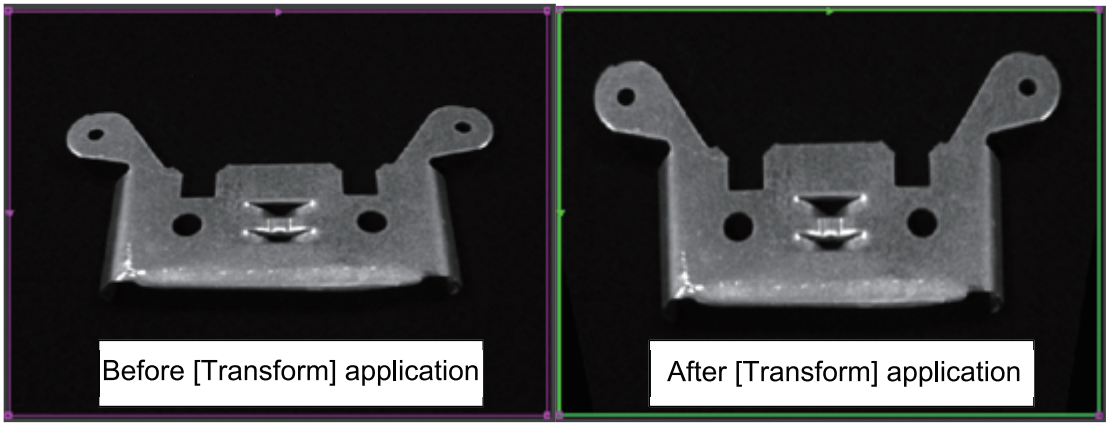

MEIW032C - CalibrateGrid
Setup
Pose
Results
Pose 1
Feature points found: 277
Origin Location (World Coordinates)
X: 0.0000
Y: 0.0000
Angle: 0.0000
Acquire Image
Trigger
Live Video ...
From File ...
Adjust Region ...
Index Row Column Grid X Grid Y
0 295.5 87.5 -100.000 -60.000
1 295.5 105.5 -90.000 -60.000
2 295.5 123.5 -80.000 -60.000
3 295.5 141.5 -70.000 -60.000
4 295.5 158.5 -60.000 -60.000
5 295.5 176.5 -50.000 -60.000
Clear All
Calibrate
OK
Cancel


MEIW032C - CalibrateGrid
Setup
Pose
Results
Results
Total feature points: 277
Average Error: 0.408 pixels
Maximum Error: 0.706 pixels
0.408 Good
0 0.5 2 5
Good Marginal Poor Very Poor
Excellent
Index Row Column World X World Y
0 295.5 87.5 -100.015 -59.980
1 295.5 105.5 -89.938 -59.984
2 295.5 123.5 -79.858 -59.988
3 295.5 141.5 -69.758 -59.991
4 295.5 158.5 -60.272 -59.994
Clear All
Calibrate
OK
Cancel

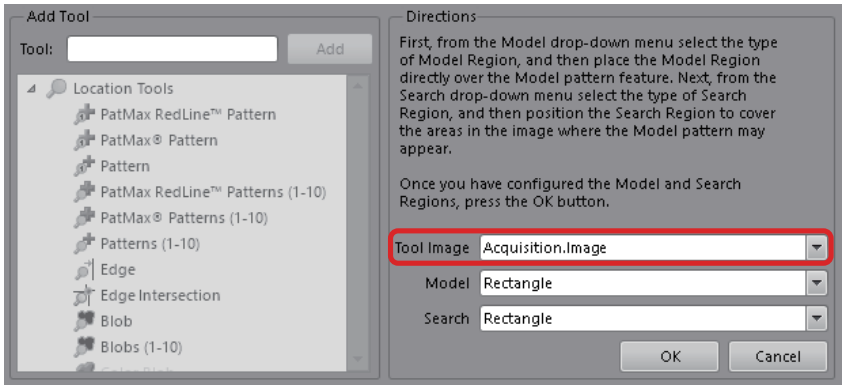
2. Add "Transform" from "Image Filter Tools".



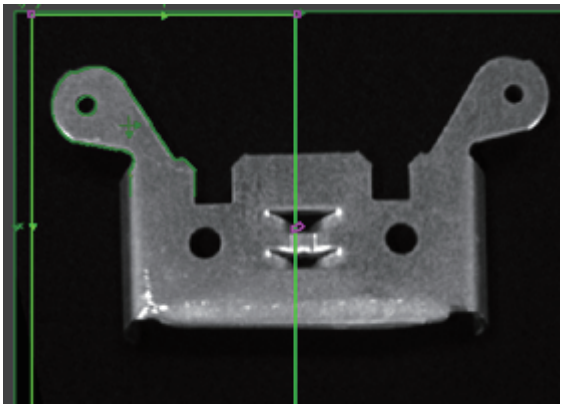
If [Transform] is added, and the region is configured, it is possible to check the image that was transformed according to the grid calibration results.



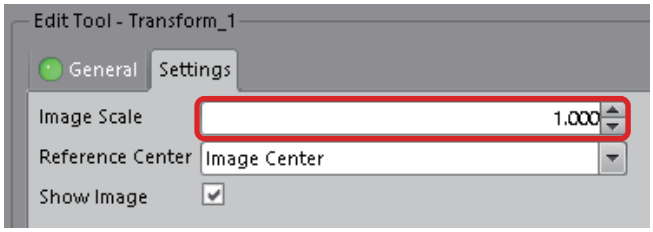
3. Use the image after [Transform] with other tools.
If location tools and inspection tools are added, the region configuration screen appears. It is possible to select the tool image to be used there when the Image Filter Tool has been added.

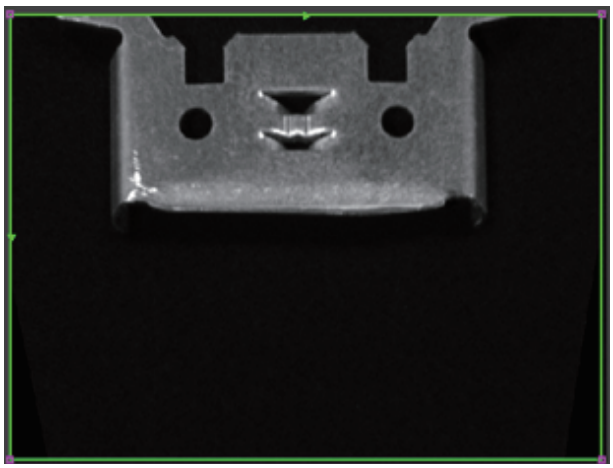


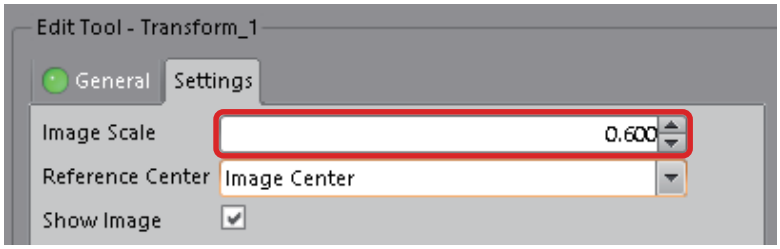
If this setting is changed to "Transform_1.Image", it is possible to use the image that was output by Transform of the Image Filter Tools as an inspection image.

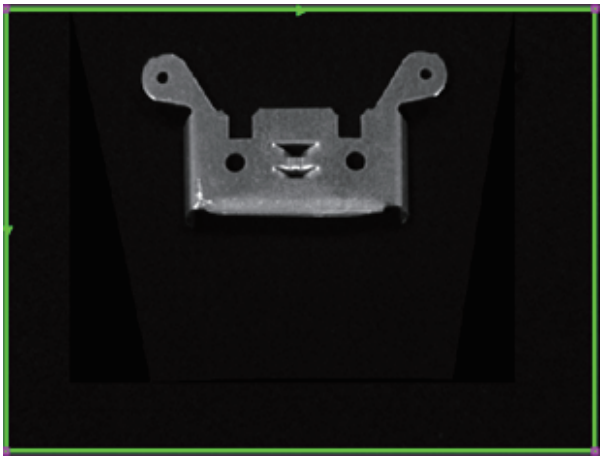


If [Transform] is used, the workpiece may not fit within the display region.
In that case, set the number less than 1 to "Image Scale" in the [Settings] tab of [Transform] so that the workpiece fits in the frame.

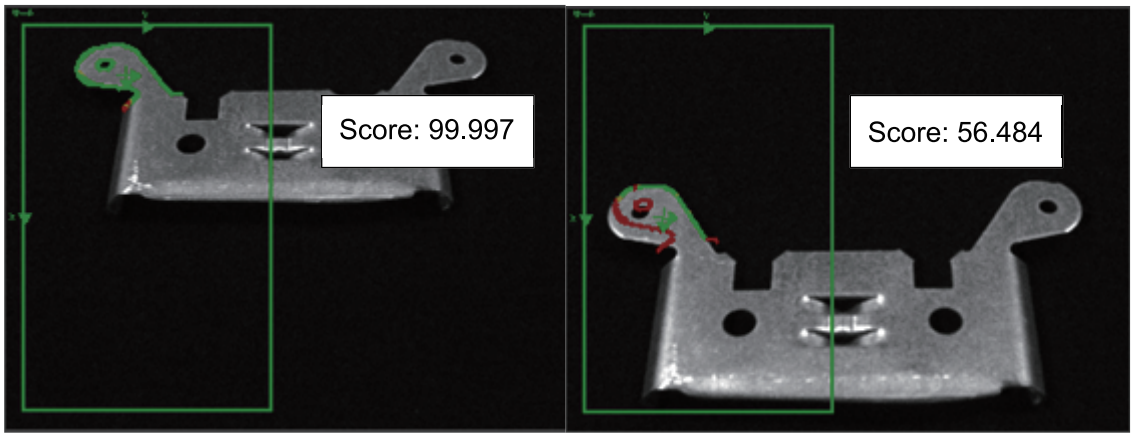




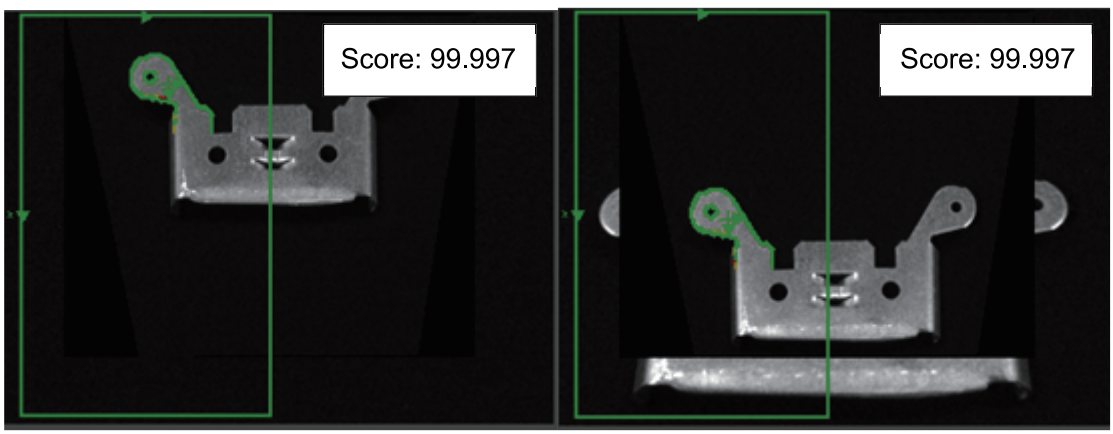




When a PatMax pattern is run without using a transformed image. (Model registration shown on the left)



When a PatMax pattern is run while using a transformed image. (Model registration shown on the left)

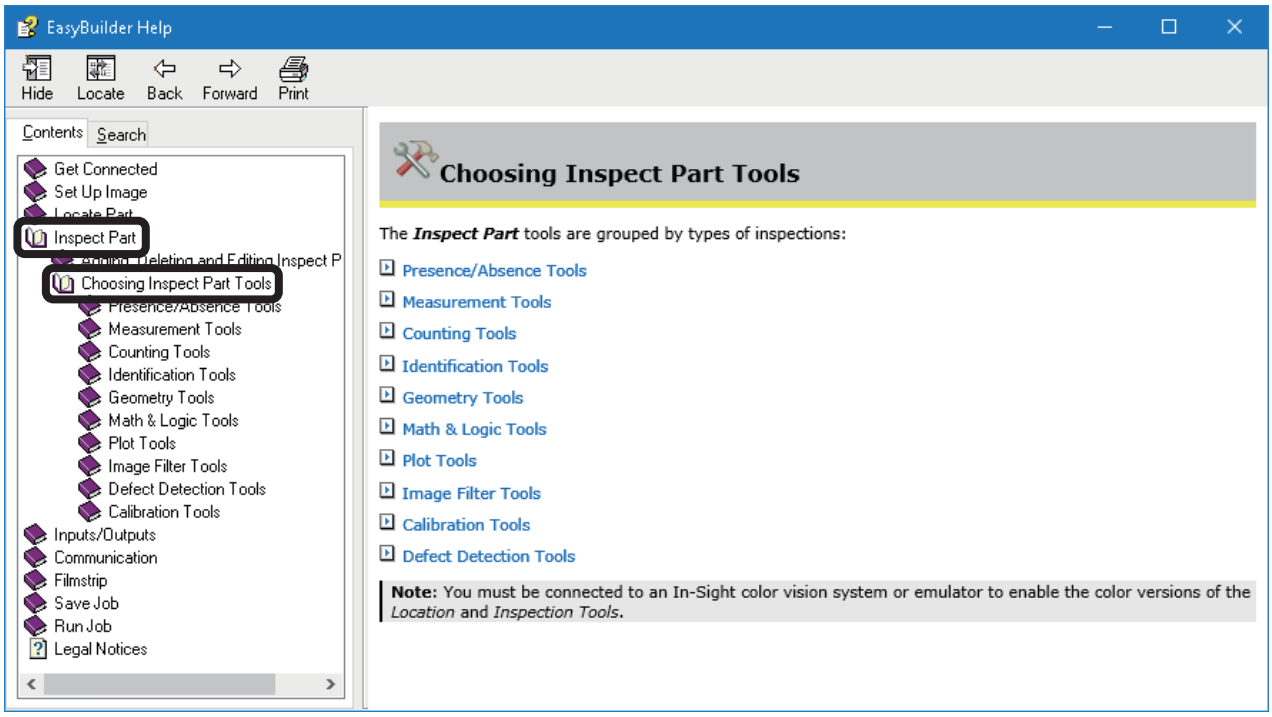


Other Image Filter Tools

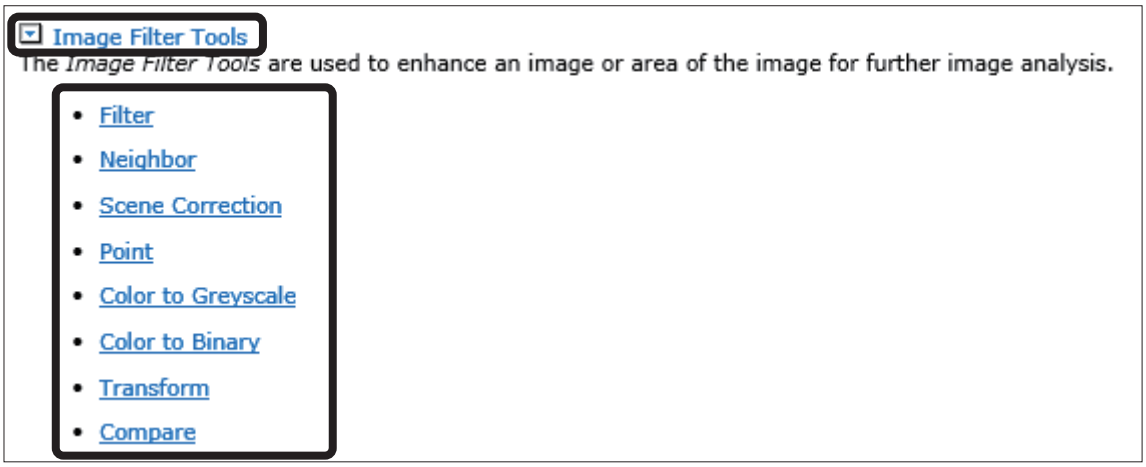
For details of other image filter tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].



2. Click "Image Filter Tools" to expand the Help section.

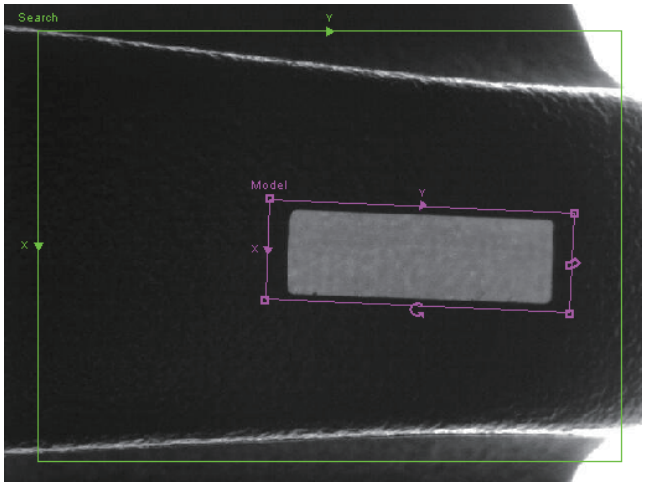


Defect Detection Tools: Surface Flaw

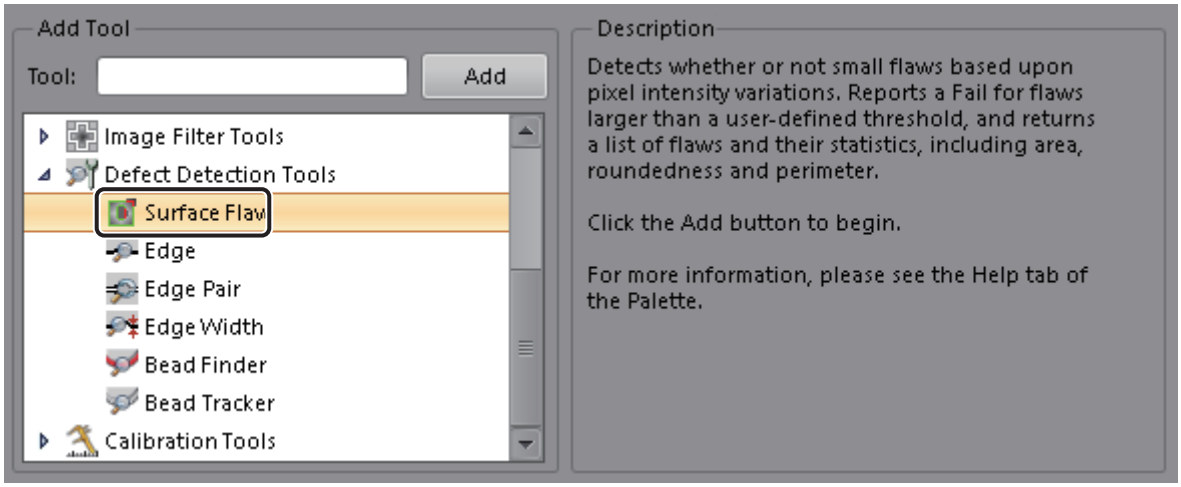
Defect detection tools determine whether there are cracks, wrinkles, depressions, gaps, scratches, and other defects on inspection target items or objects.
This section describes the Surface Flaw tool.

Operating procedure

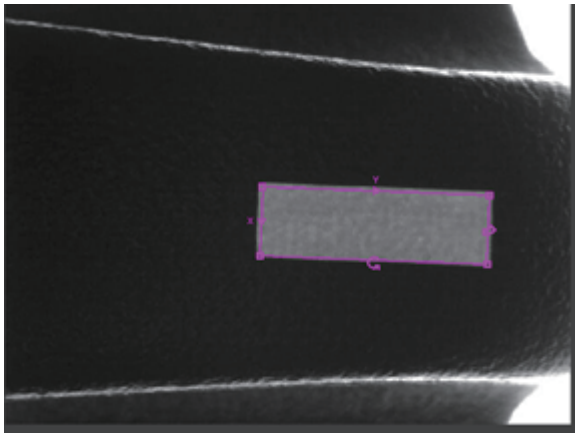
1. Arrange the location tool to identify the inspection area.



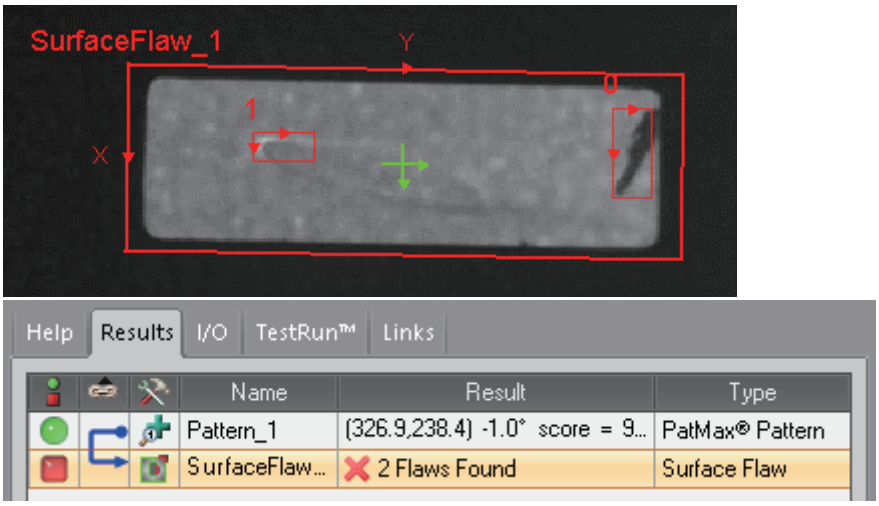
2. Add "Surface Flaw" from the "Defect Detection Tools" of Inspect Part.



3. Surround the range to run defect inspection using the region.



4. If flaws are detected, the number of detected flaws are output to Results.

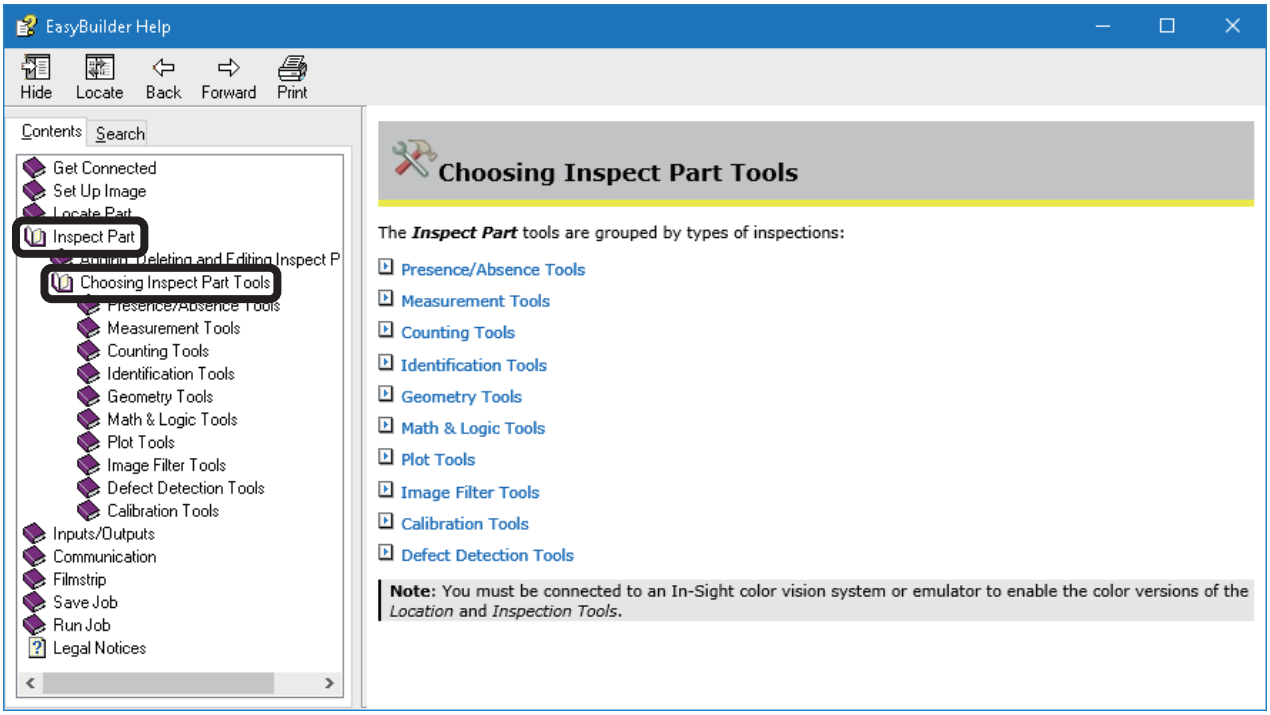


Other Defect Detection Tools

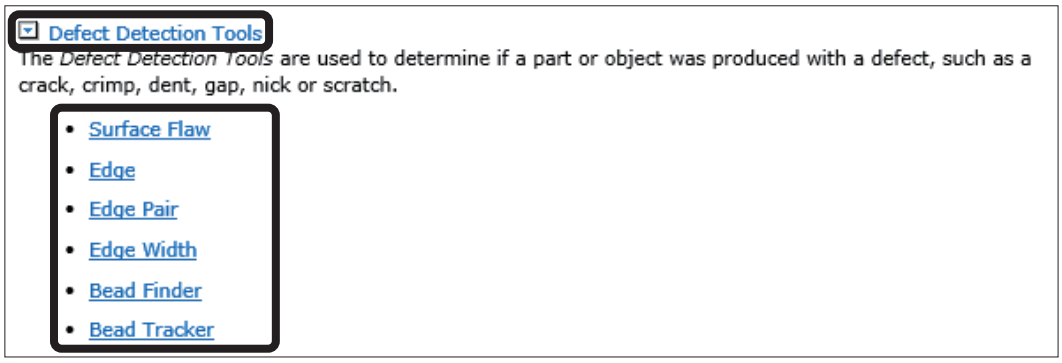
For details of other defect detection tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].



2. Click "Defect Detection Tools" to expand the Help section.

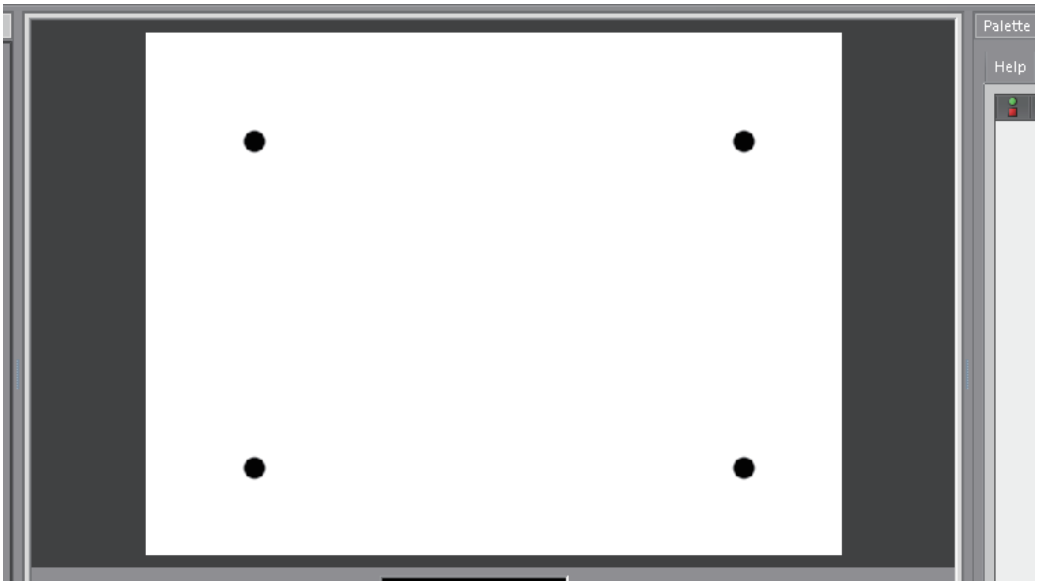


Calibration Tools: N Point

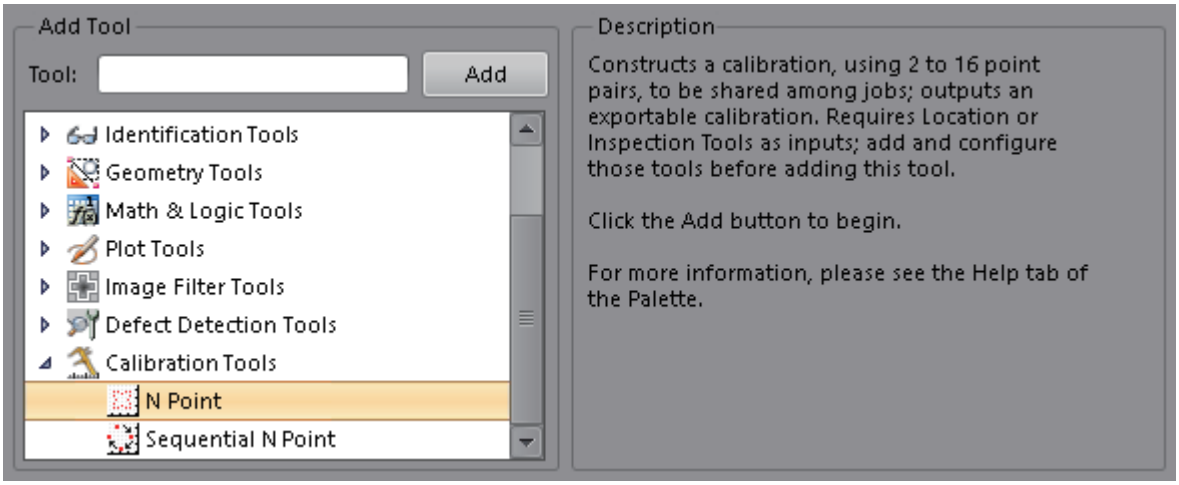
Calibration tools are used to create calibration results that can be shared between jobs.
Generally, the tools are used to create jobs for calibration.
There are two types of calibration tools: N Point and Sequential N Point.
N Point is used when all targets used for calibration appear within the field of vision.
Sequential N Point is used when only one target used for calibration appears within the field of vision, and the indicator moves to known coordinates and capture is repeated.
N Point calibration and Sequential N Point calibration can be used to compensate for nonlinear distortion when five or more points are used.
This section describes the calibration tools of N Point.

Operating procedure

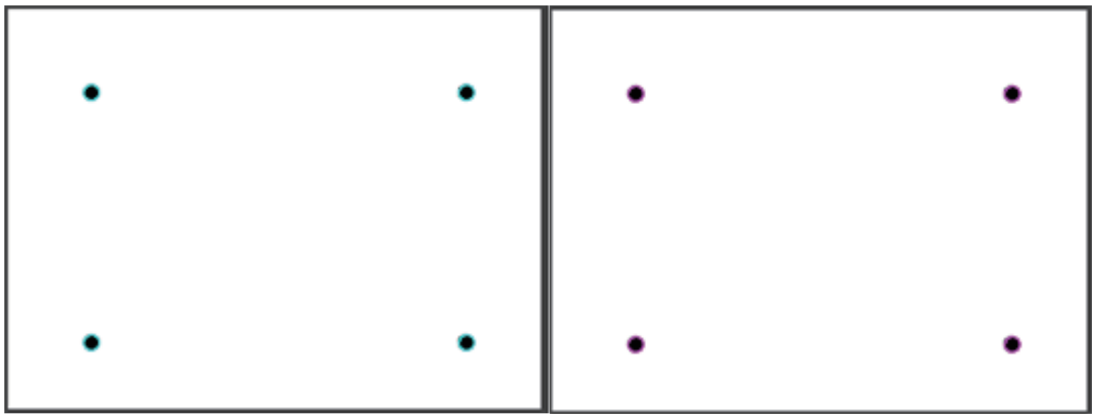
1. Import an image of the calibration targets.



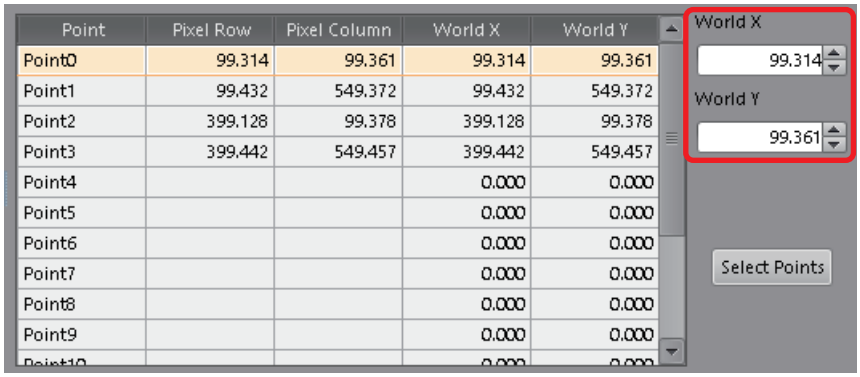
2. Add "N Point" under "Calibration Tools" to the job.

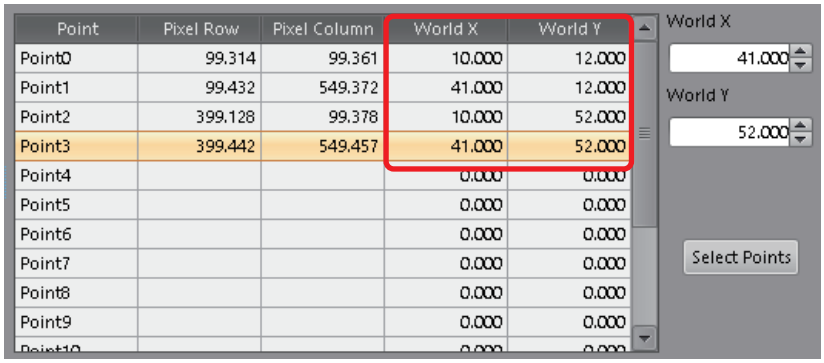


3. Smart features are displayed. Select a section with known coordinates.
Select 2 to 16 points.

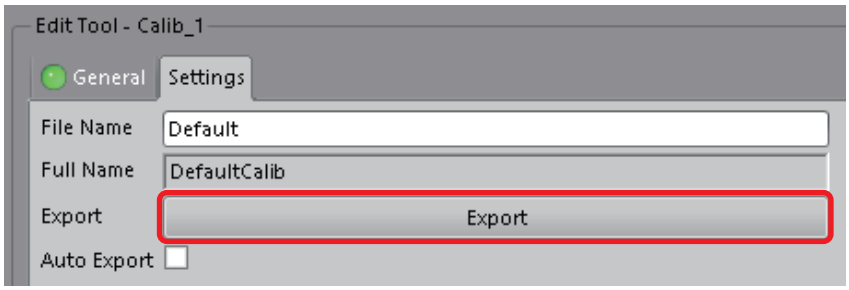


4. Using tool editing, configure the world coordinates for each point.
Pixel row (X) and Pixel column (Y) indicate the coordinates on the image.
World X and World Y indicate the X coordinate (actual units) and Y coordinate (actual units) in the actual coordinate system, respectively.
Specify the dimensional unit entered here during the import of calibration results.

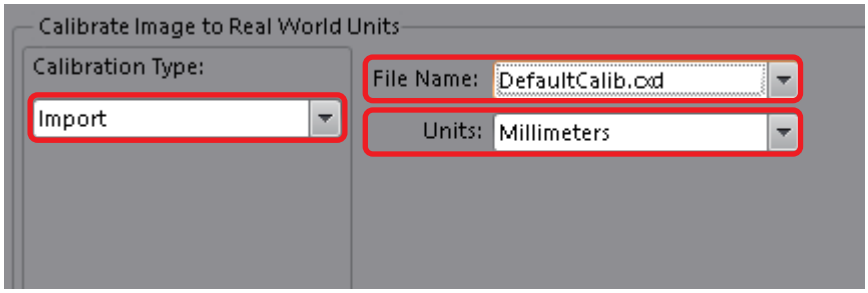




5. In the [Settings] tab, configure the file name, and click [Export].



6. Select "Import" in Calibration Image to Real World Units of Set Up Image to use the exported calibration file.
For the file name, use the name set when the file was exported.

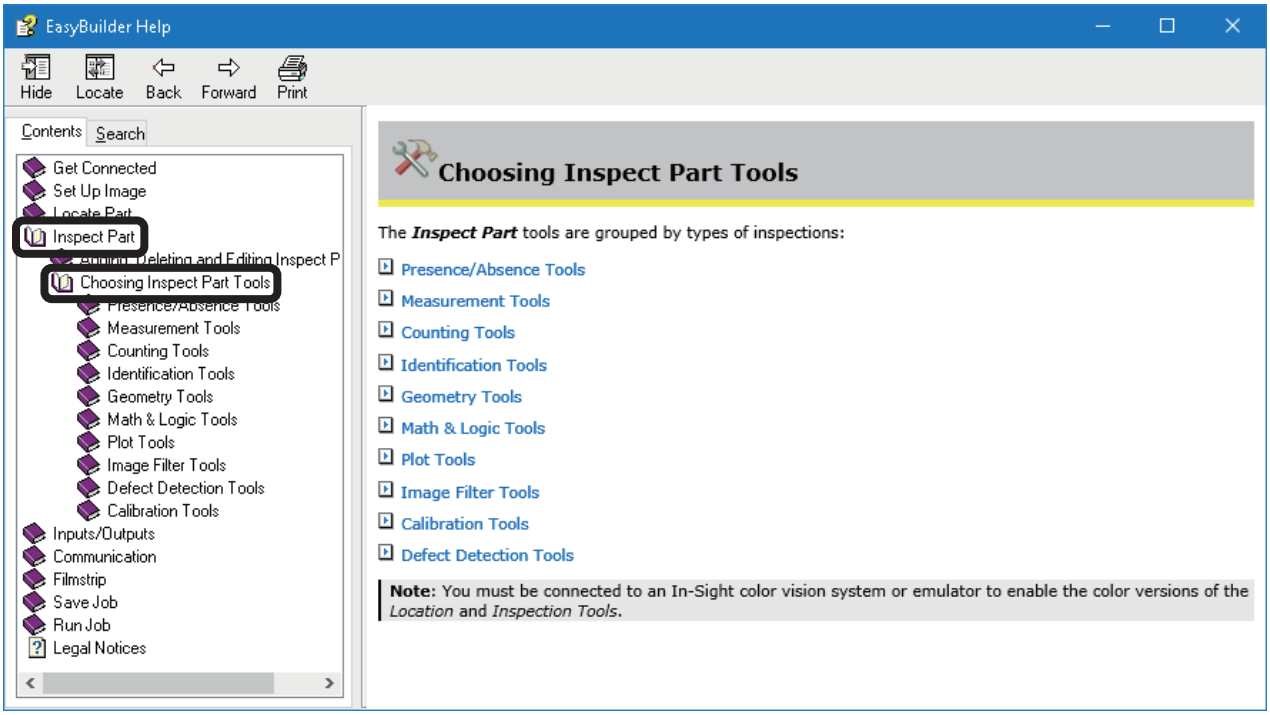


Other Calibration Tools

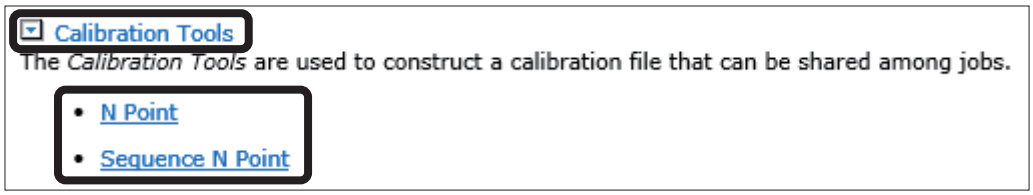
For details of other calibration tools, use the following procedure to refer to the Help section.

Operating procedure

1. In EasyBuilder Help, open [Inspect Part] ⇨ [Choosing Inspect Part Tools].



2. Click "Calibration Tools" to expand the Help section.



6 INPUTS/OUTPUTS

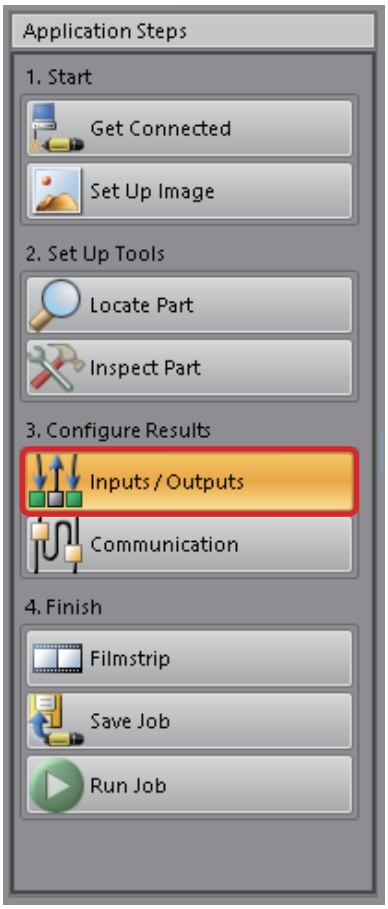
Configure inputs and outputs to input signals to control a camera and to output job pass/fail and run-complete signals. Because hardware configurations differ by model, refer to the following manual and help section before using the input/output function.

- EasyBuilder Help: Inputs/Outputs

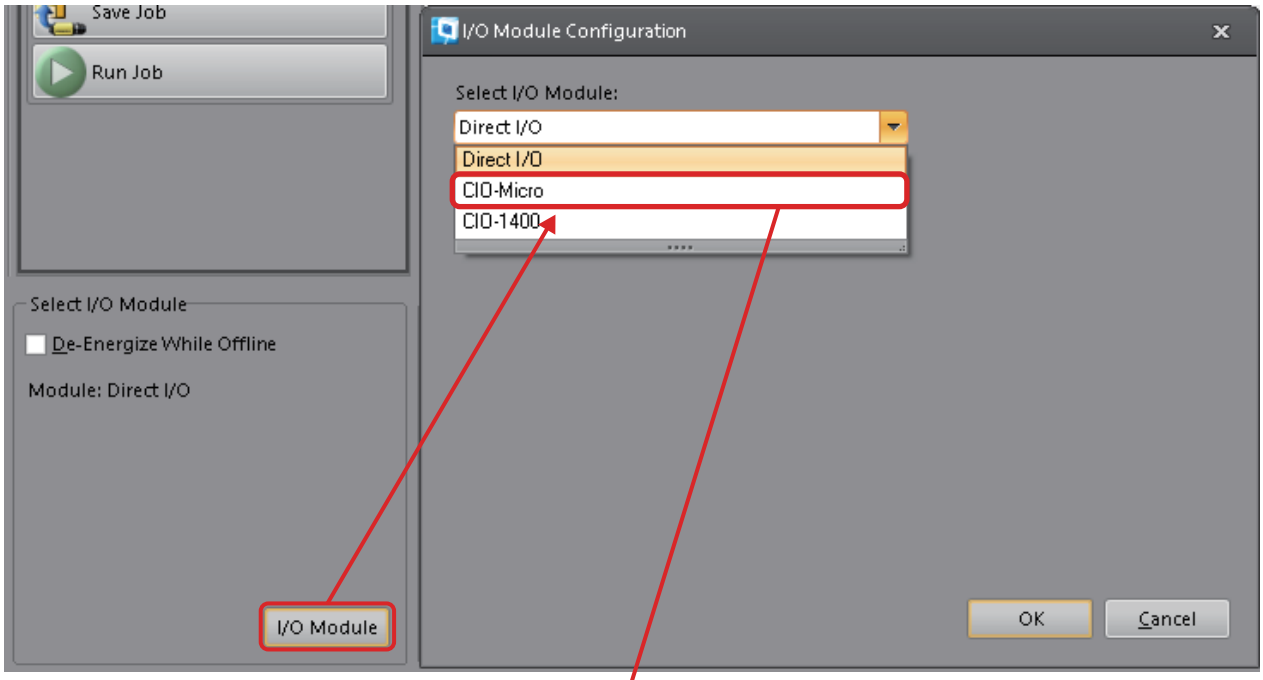
This section describes the configuration method using Vision Sensor VS80.

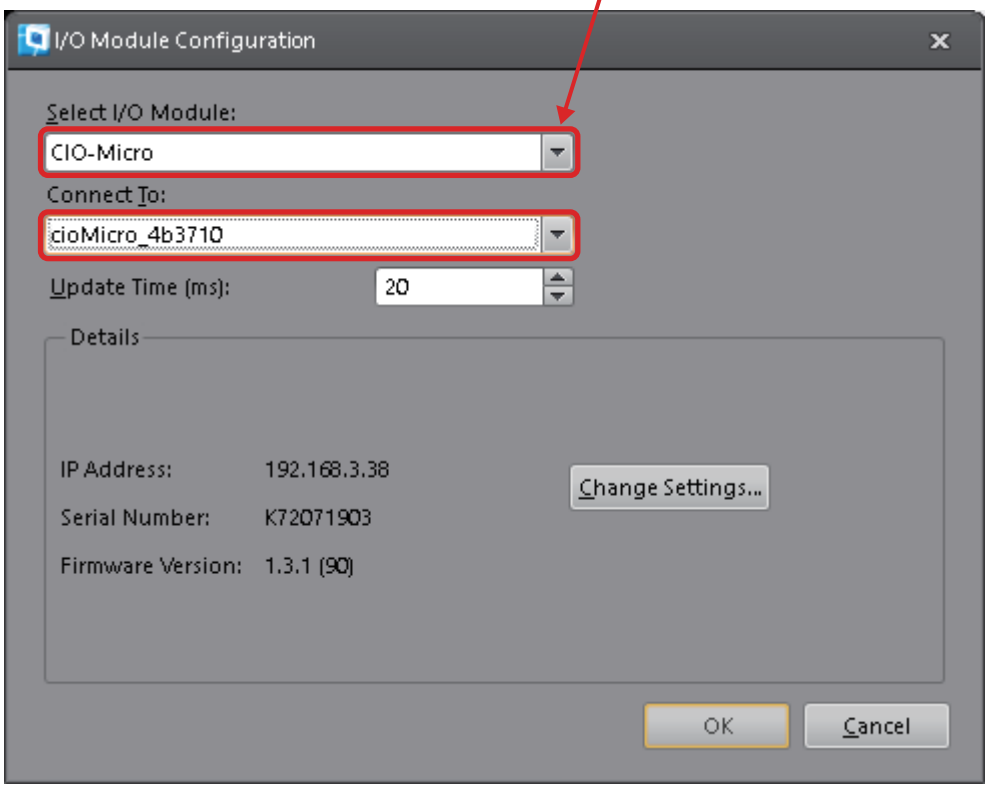
Operating procedure

1. Under Application Steps, select Inputs/Outputs to open the discrete I/O settings screen.

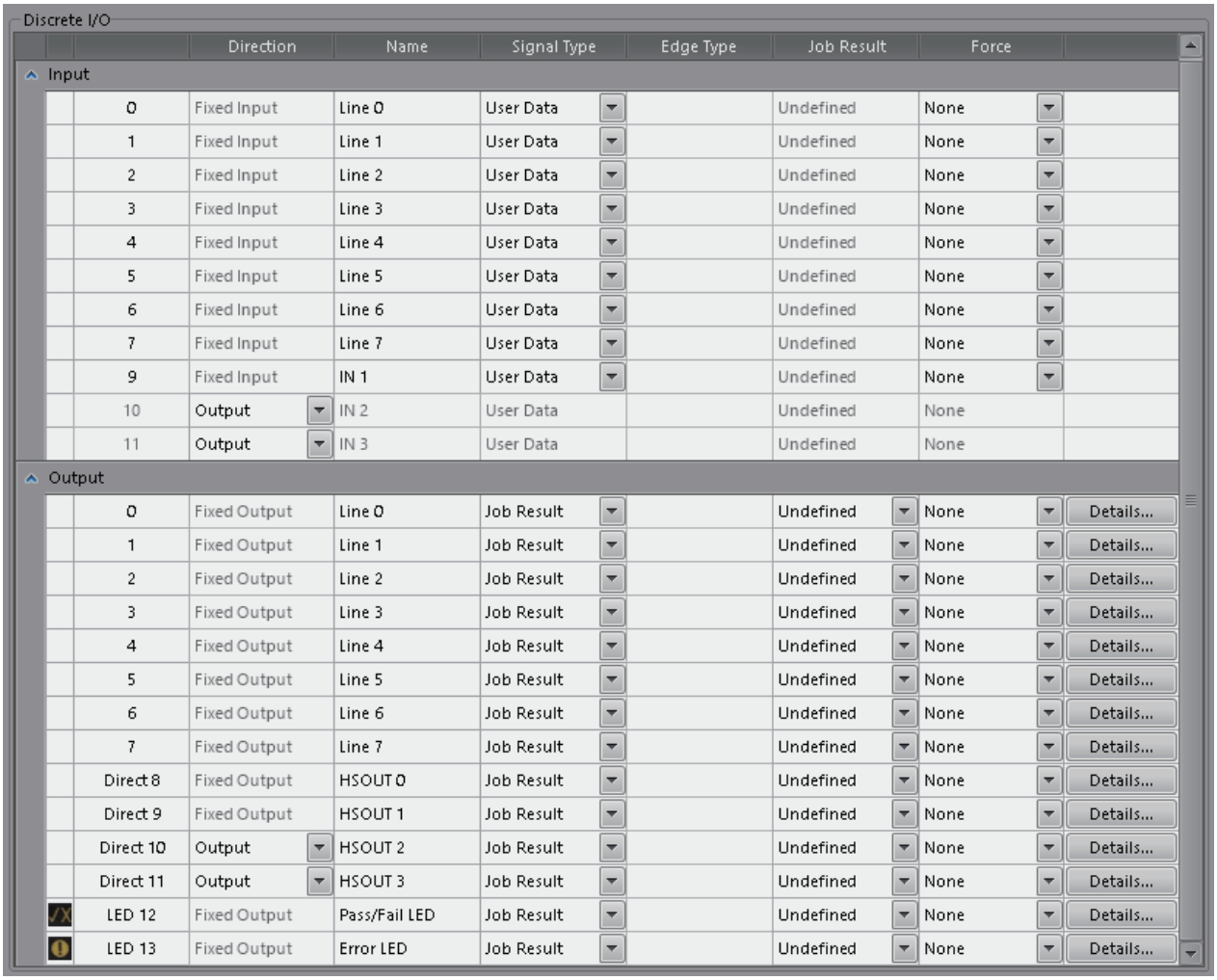


2. To connect an I/O module, connect the module and vision sensor, and then select the I/O module with the power of the I/O module switched on as well.





3. If there is a connection to the module, the discrete I/O settings screen appears.



The items to be configured differ by signal type.

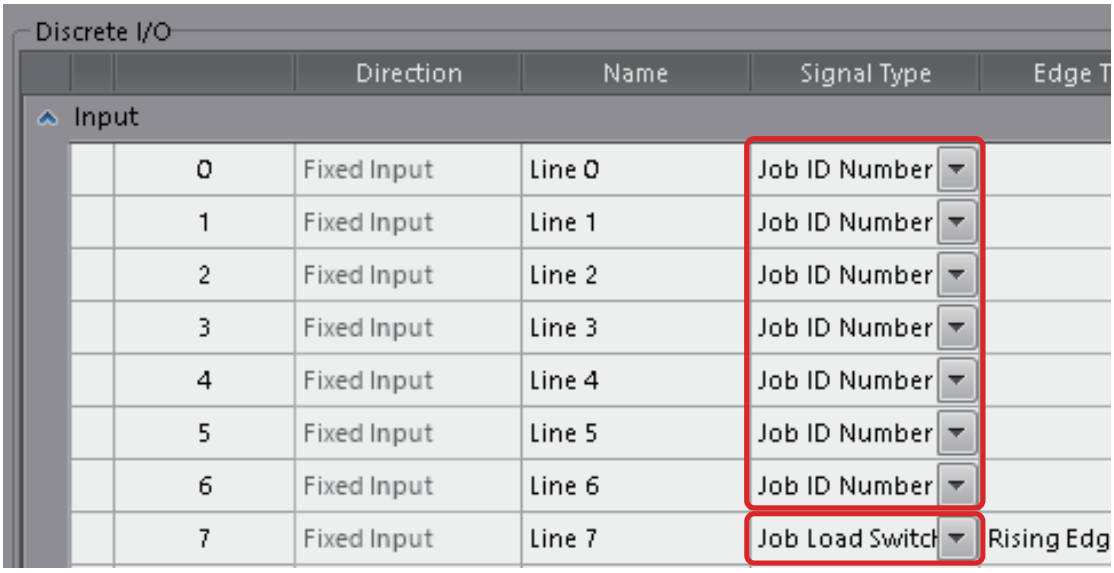
In this section, the method to specify the job ID and load the job file by input (☞ Page 106 Loading a Job File by Specifying Job ID to Input Lines) and configuration to output the results of inspection tools (☞ Page 107 Outputting the Result of Inspection Tools) are run.

6.1 Loading a Job File by Specifying Job ID to Input Lines

A job ID is a number from 0 through 127 added to the front of a job file name.
For the file named "1aaa.job", the job ID is "1".
For job ID specification, one input line is treated as one bit, and when multiple input lines are used, the form is binary.
It is acceptable if input lines are configured so that the job ID range can be specified. In the case of 0 through 127, configure seven lines; in the case of 0 to 15, configure four lines, etc.

Operating procedure

1. Configure the input signal type.
When handling job IDs from 0 through 127, seven input lines must have a signal type of "Job ID Number", and one input line must have a signal type of "Job Load Switch", as shown in the image below.



2. If the job IDs for input line 0 through 6 are specified and set input line 7 to ON, the job file of the specified job ID is opened.

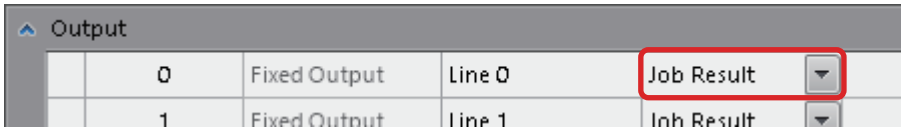
(Example) When "3aaa.job" is loaded
3 (decimal number) = 0000011 (binary number). Therefore, Line 0 and Line 1 are set to ON and Line 2 through Line 6 are set to OFF.
In this condition, Line 7 is set to ON.
(Example) When "65bbb.job" is loaded
65 (decimal number) = 1000001 (binary number). Therefore, Line 0 and Line 6 are set to ON and Line 1 through Line 5 are set to OFF.
In this condition, Line 7 is set to ON.

6.2 Outputting the Result of Inspection Tools

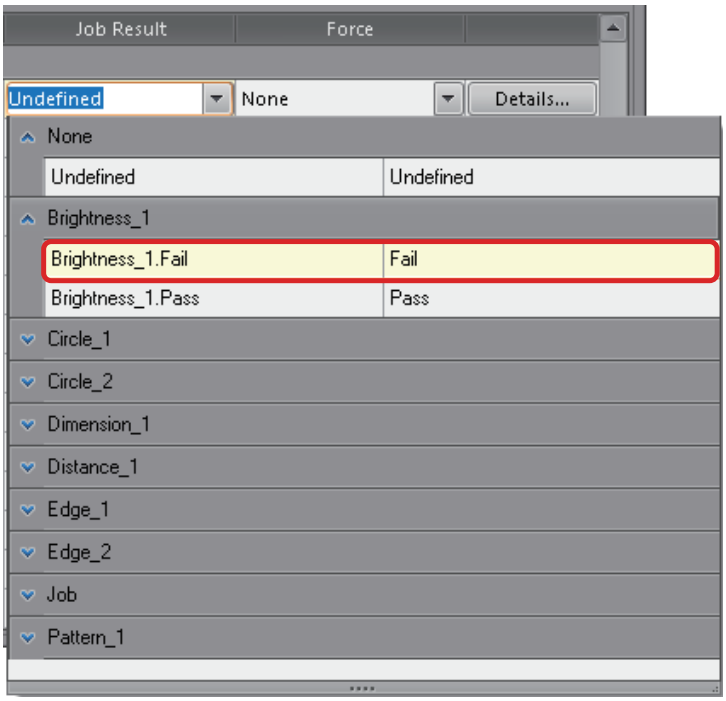
On the output lines, pass/fail is output for each tool, not just for the job as a whole.
In this section, settings are configured so that a signal is output for output line 0 when Brightness of the Presence/absence tools fails.

Operating procedure

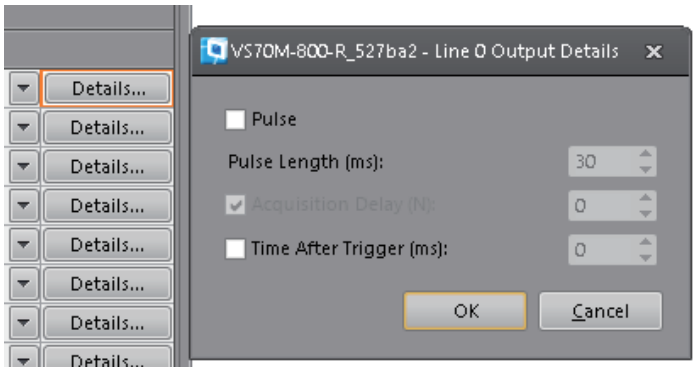
1. Configure the signal type of output line 0 to the job results.



2. Change the job results from "Undefined" to "Brightness_1.Fail".



3. In the output signal details, configure the pulse output time, etc.



7 COMMUNICATION

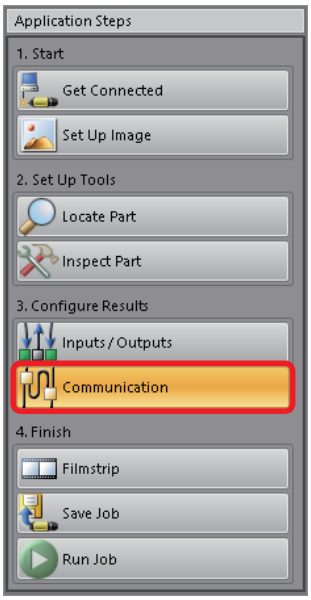
It is possible to connect the vision sensor with programmable controllers, servers, personal computers, and other equipment so that it is possible to change the parameters of the vision sensor, send detailed information of inspection results, and perform other operations.

7.1 CC-Link IE Field Basic Communication

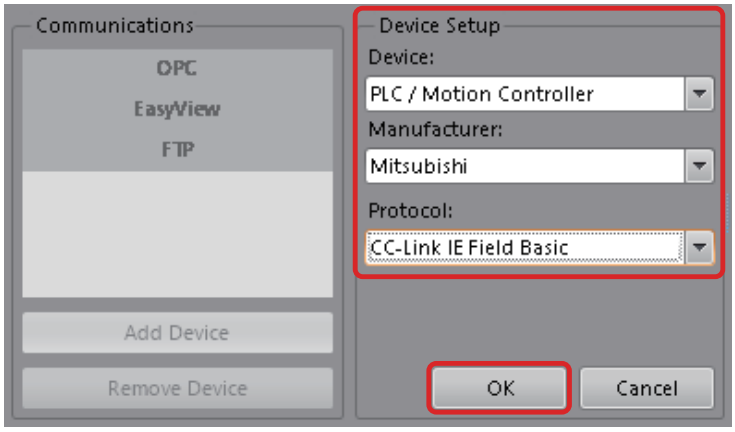
CC-Link IE Field Network Basic is a factory automation network using standard Ethernet.
Data is periodically exchanged between a master station and slave stations using link devices (cyclic transmission).
The entire CC-Link IE Field Network Basic is configured by the master station.
Cyclic transmission is possible if IP addresses and subnet masks are configured for slave stations.
It is not necessary to configure master station information to slave stations.
For details of master station settings, refer to the following manual.
📖CC-Link IE Field Network Basic Reference Manual
For details on the connection procedure, refer to the following manual.
📖Vision Sensor Connection Guide

Operating procedure

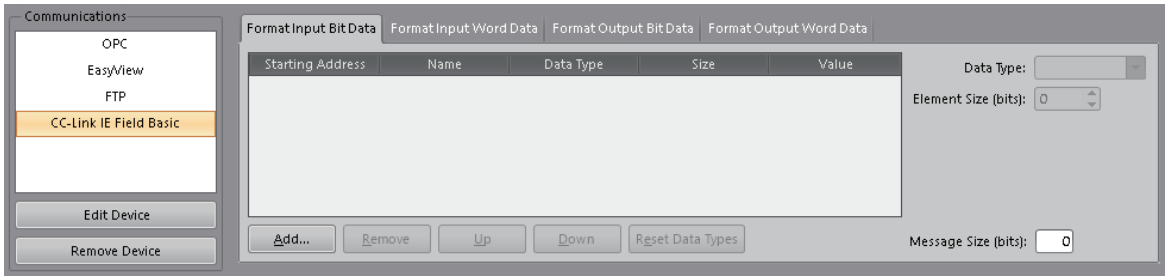
1. From Application Steps, select Communication, and then add a communication device.



2. Configure CC-Link IE Field Network Basic for the vision sensor.
Click Add device, select the following settings (Device: PLC / Motion Controller; Manufacturer: Mitsubishi; Protocol: CC-Link IE Field Basic), and then click the [OK] button.



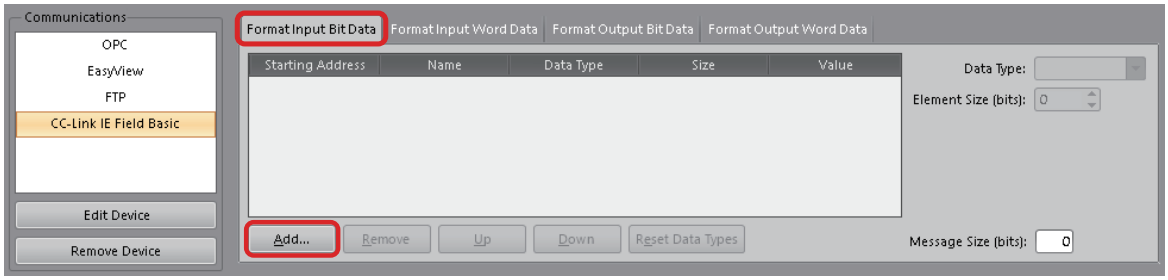
3. Specify the data to be input and output.
Specify the input and output data by words and bits.



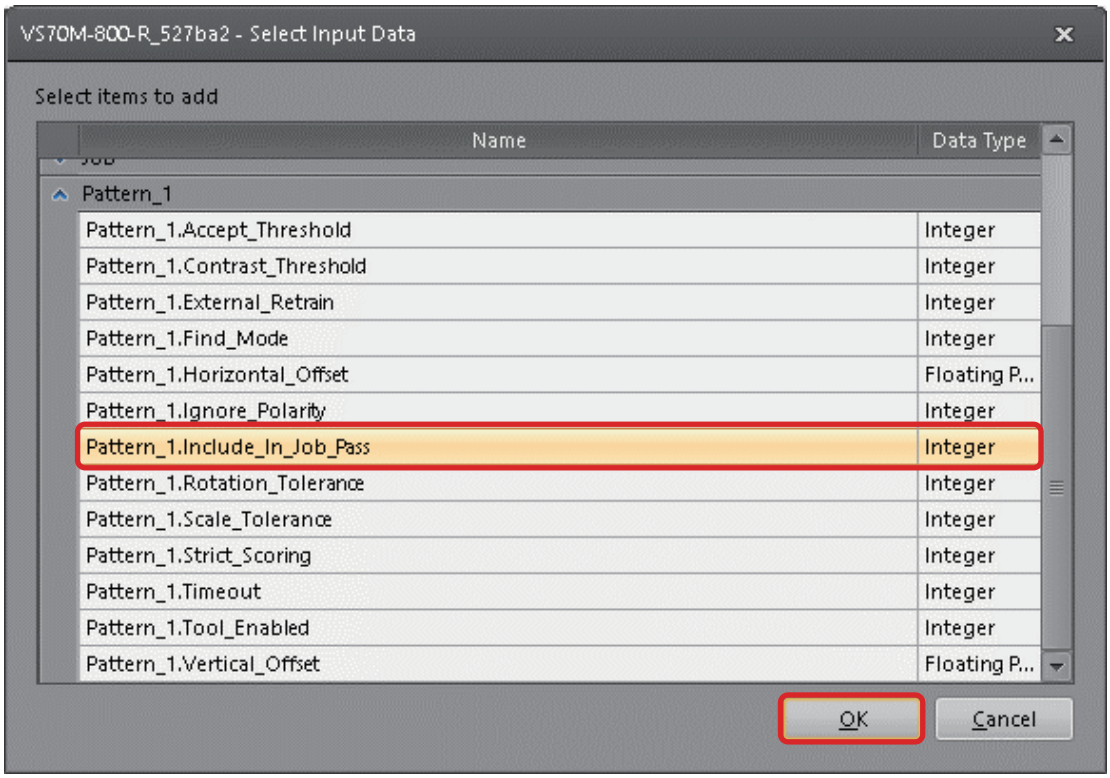
Example of specification of format input bit data

Operating procedure

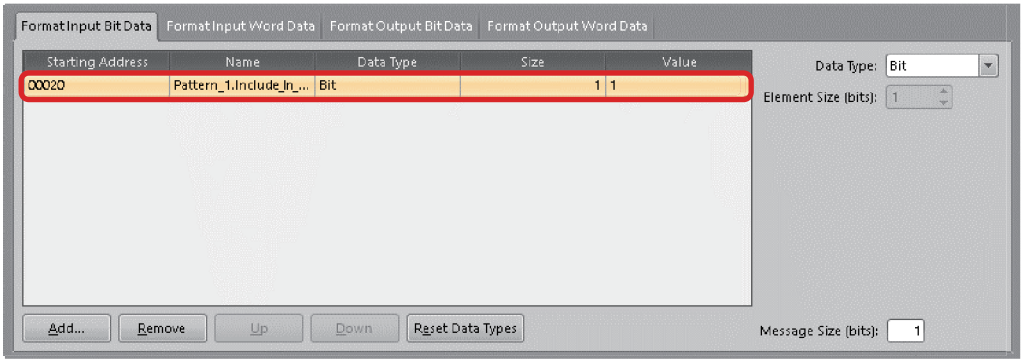
1. Select [Format Input Bit Data] and click the [Add] button.



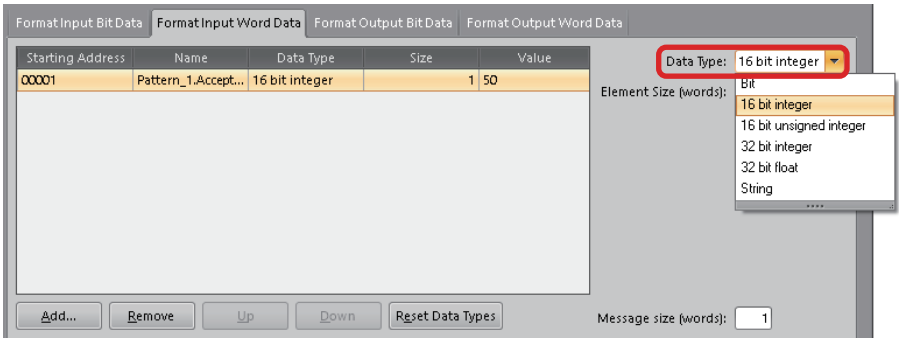
2. Select "Include_In_Job_Pass" under Pattern_1, and click the [OK] button.

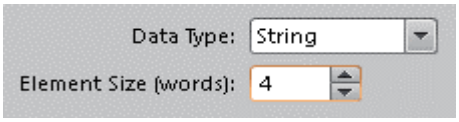


3. The parameter is added to the format input bit data.

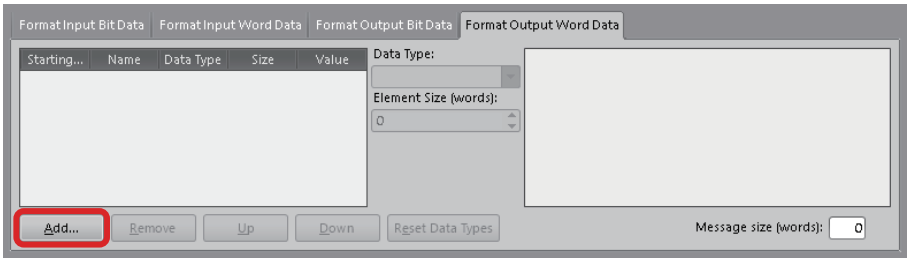


4. In the case of word data, it is possible to specify the data type.
In the case of a character string, specify the length of each element by words.

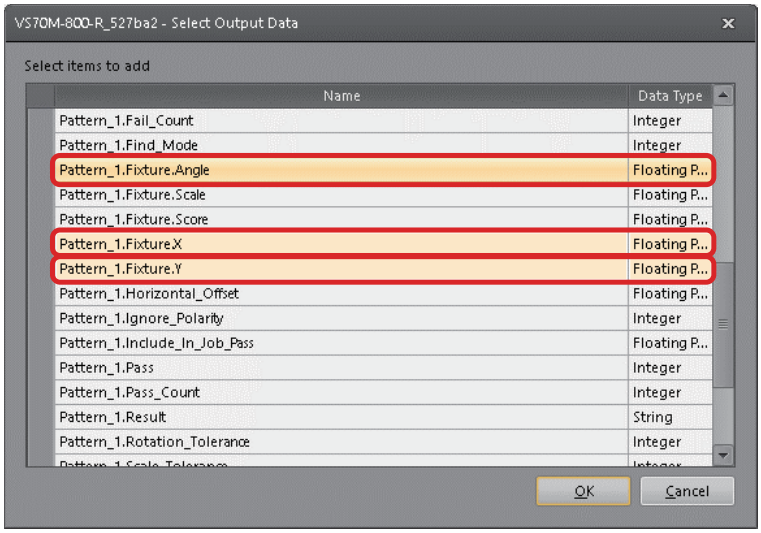




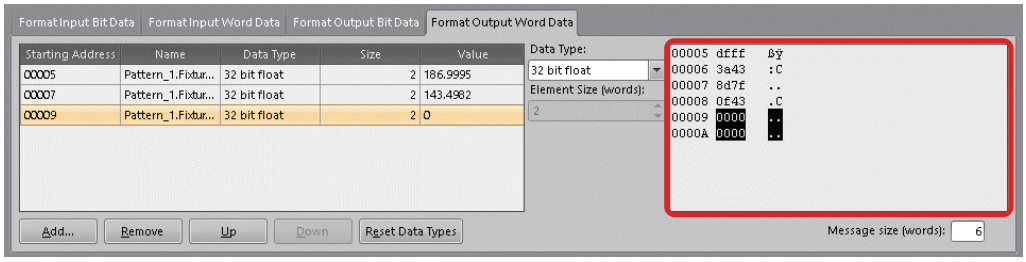
5. Add format output data in the same manner.

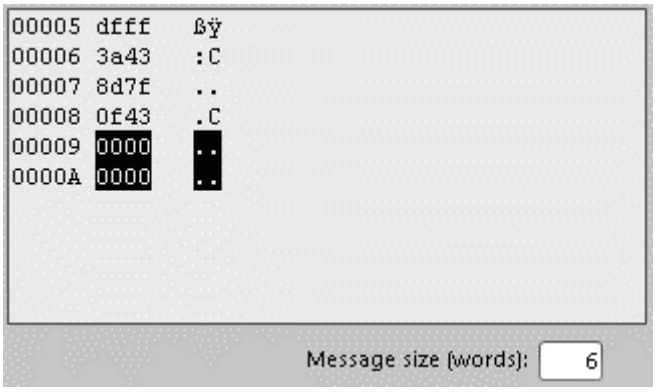


It is possible to specify multiple items at the same time by clicking while holding down the Ctrl key of the keyboard.



6. In the case of format output data, a preview of the data to be output is displayed on the right.



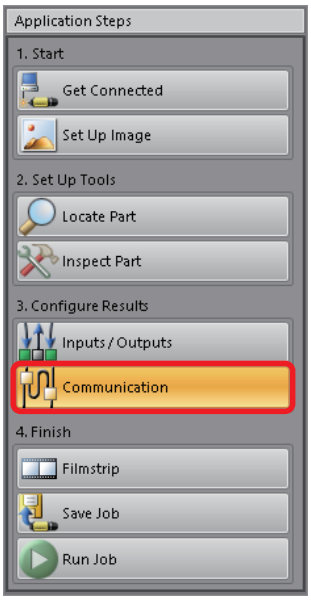


7.2 SLMP Scanner Communication

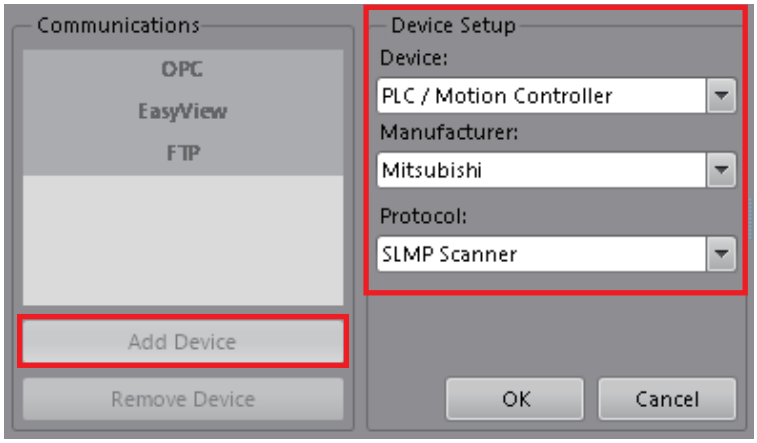
This section lists the method to use the SLMP scanner communication function to connect to the MELSEC iQ-R Series programmable controller.

Operating procedure

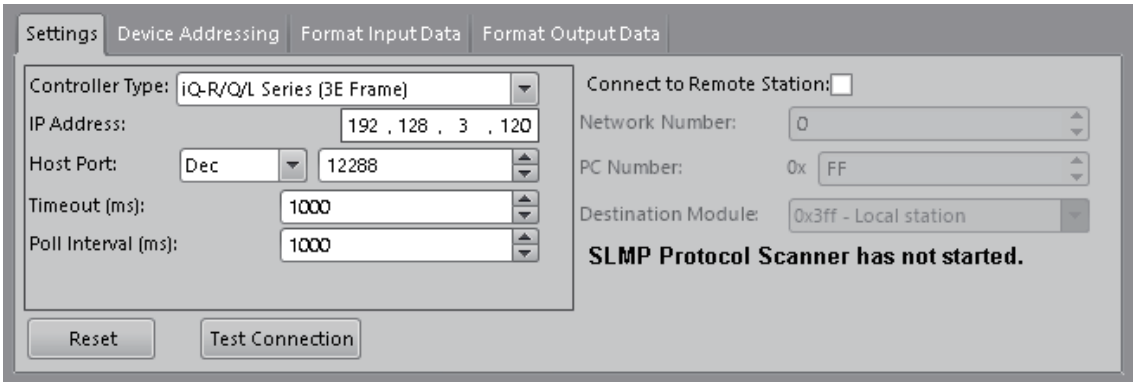
1. From Application Steps, select Communication, and then add a communication device.



Select the protocol that suits the equipment to be connected.



2. Configure the controller type, IP address, host port, and other settings to suit the communication destination.

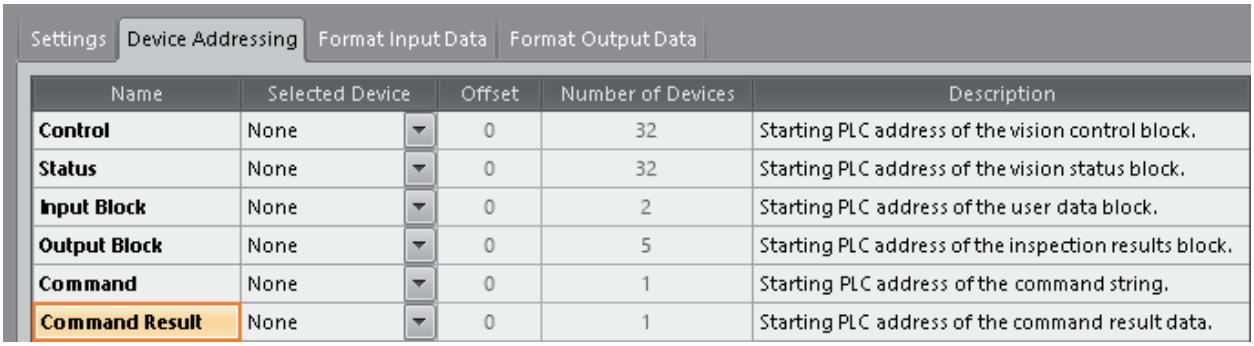


For details of the vision sensor communication settings and the communication settings of the connection-destination programmable controller, refer to the following references.

- EasyBuilder Help: SLMP scanner communication
- Vision Sensor Connection Guide

3. Configure the devices.

For each function, configure the device, offset (start address), and the number of devices.



For details of each function, open the In-Sight Explorer Help section, and then search for "SLMP defined data blocks".

4. Specify the format input data and format output data.

The format input data and format output data use the devices specified by the input blocks and output blocks of Step 3.

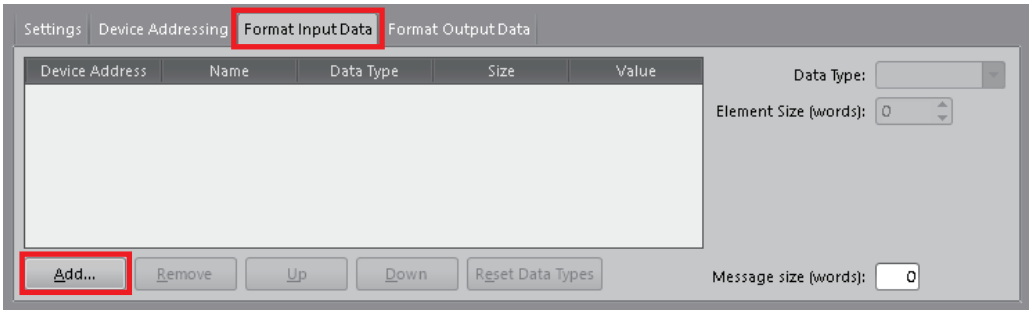
Using format input data, it is possible to specify parameters from the programmable controller by assigning the parameters of each tool.

Using format output data, it is possible to send the values of the measurement results, in addition to the pass/fail of the results of the inspection tool, to the programmable controller.

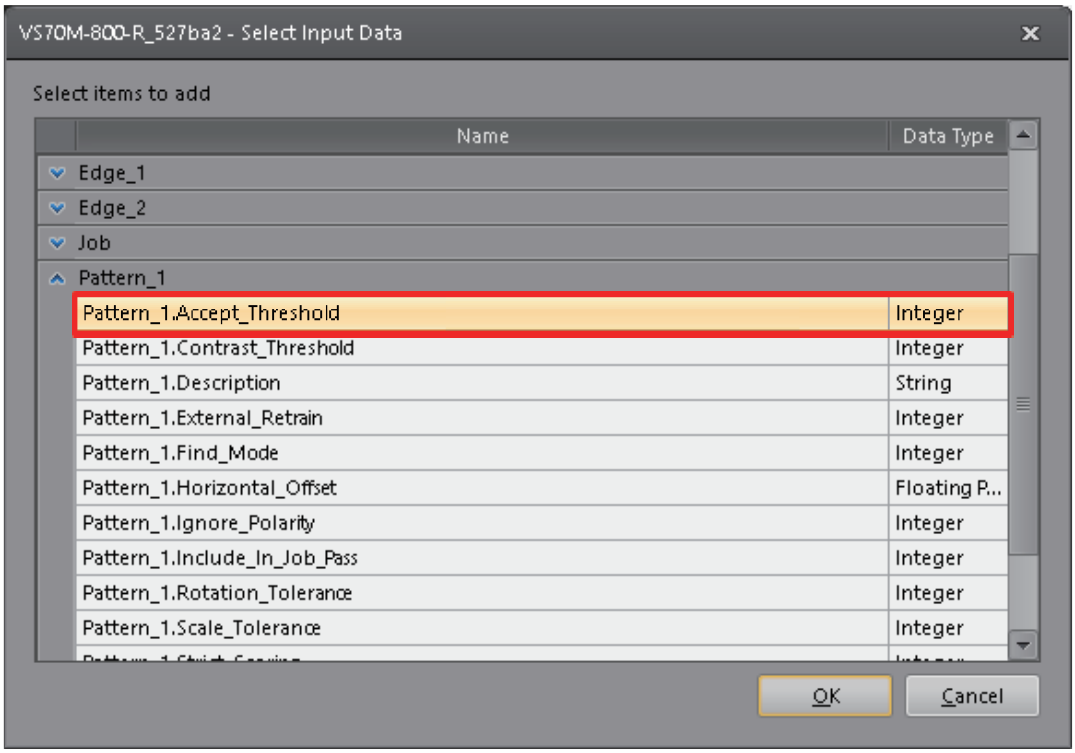
In this example, the acceptable threshold of the PatMax Redline™ pattern tool is changed to the setting to control from the programmable controller.

Furthermore, settings are configured so that the X coordinates, Y coordinates, and angle results detected by the PatMax RedLine Pattern tool are output to the programmable controller.

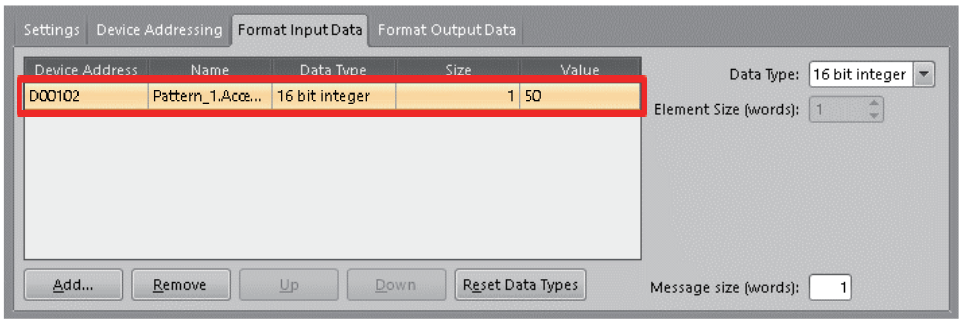
5. Open the [Format Input Data] tab, and then click the [Add] button.



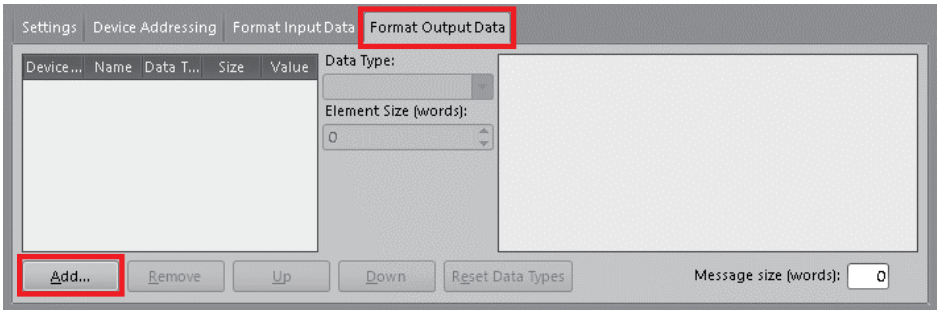
6. Select "Pattern_1.Accept_Threshold", and click the [OK] button.



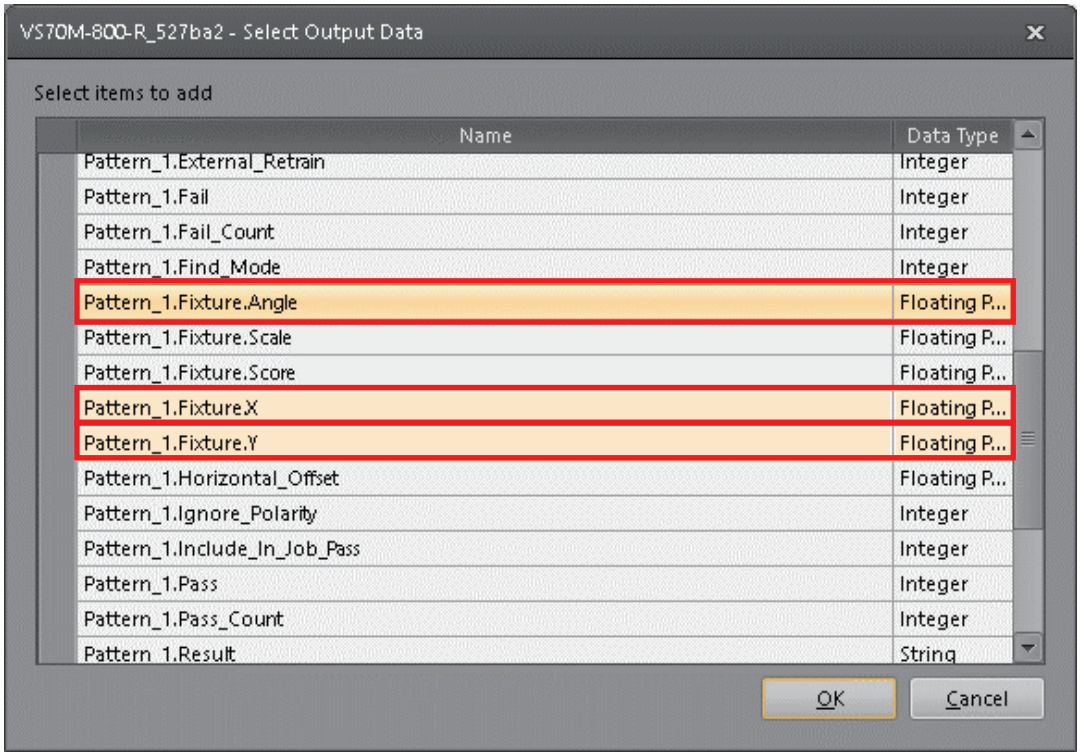
7. One row is added as shown below.



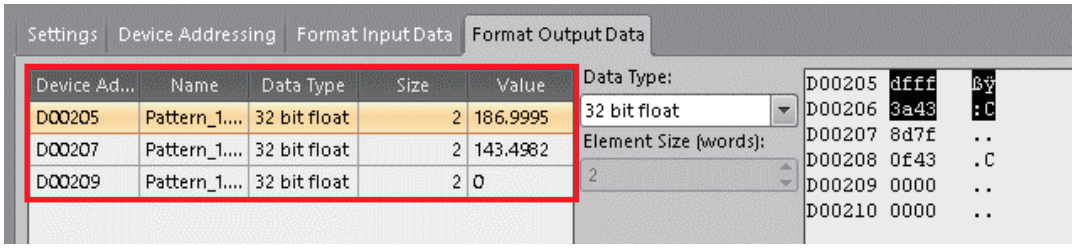
8. Open the [Format Output Data] tab and click the [Add] button.



9. Open Pattern_1, and then select "Pattern_1. Fixture.X", "Pattern_1. Fixture.Y", and "Pattern_1.Fixture.Angle"
It is possible to select multiple items by clicking items while holding down the Ctrl key.



10. Three rows are added as shown below.



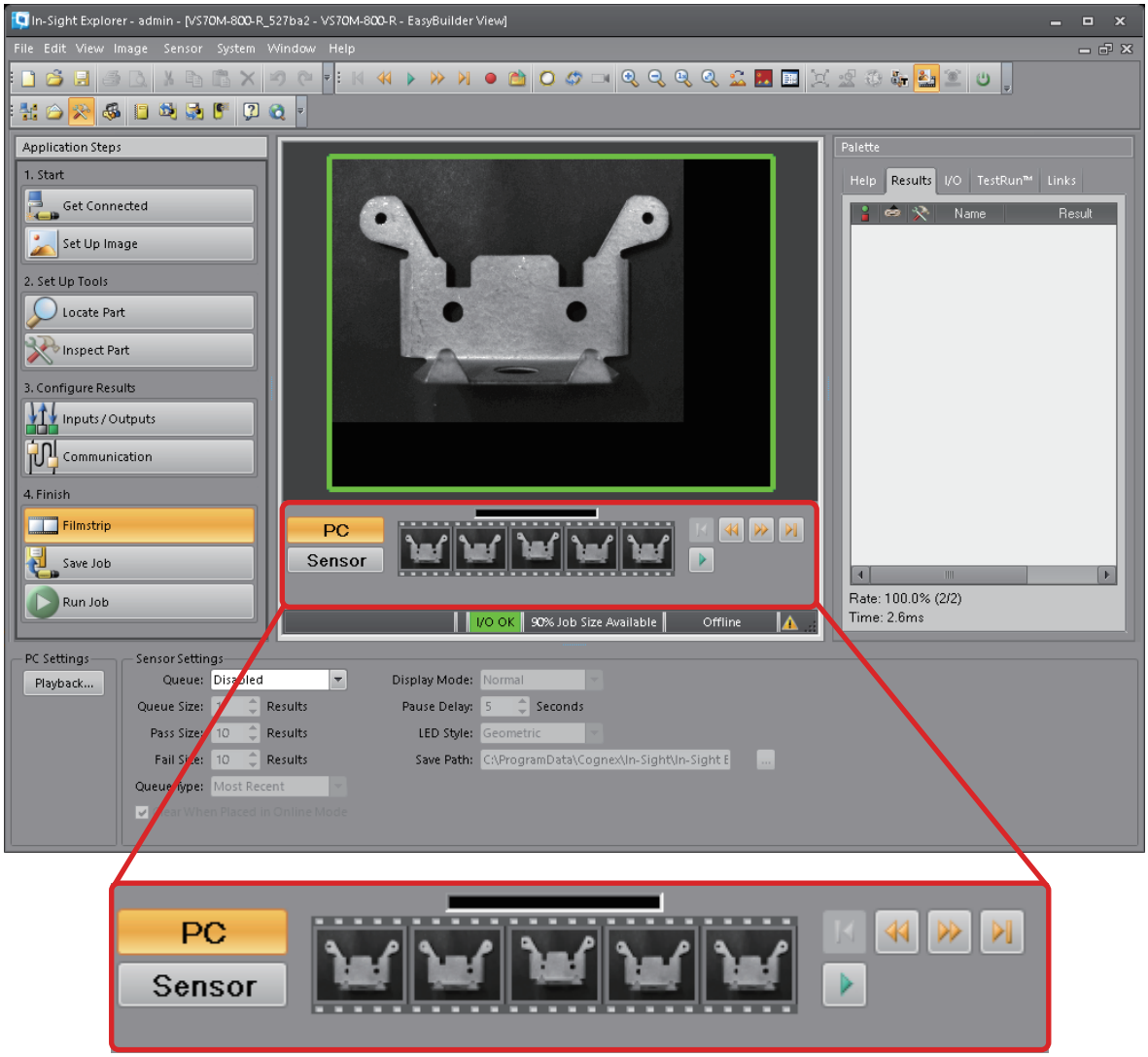
8 FILMSTRIP

8.1 Overview of the Filmstrip GUI

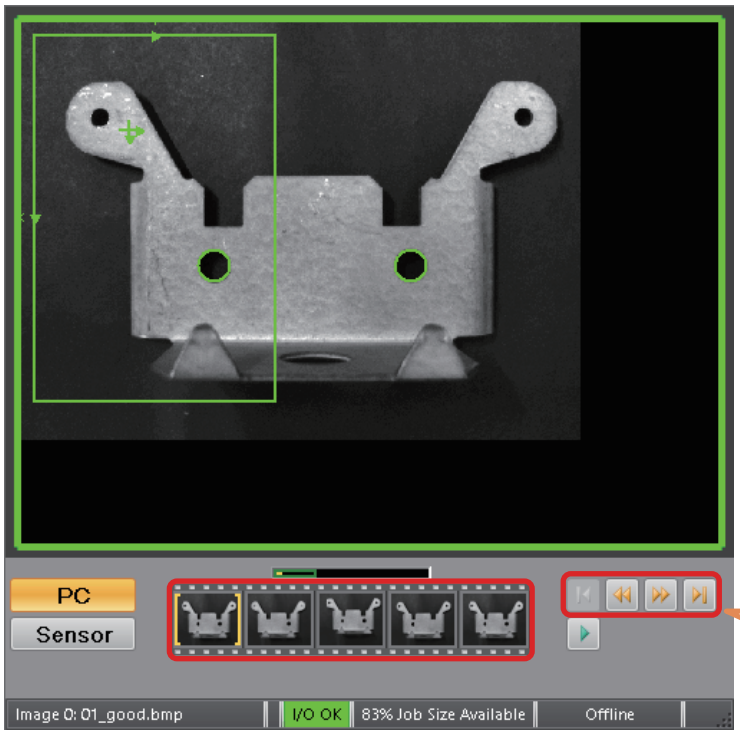
Filmstrip is an interface modeled after photo film that can display scanned images and display a buffer of images of specified conditions in order.

There are two types of filmstrips: PC filmstrip and sensor filmstrip, and each have the following functions.

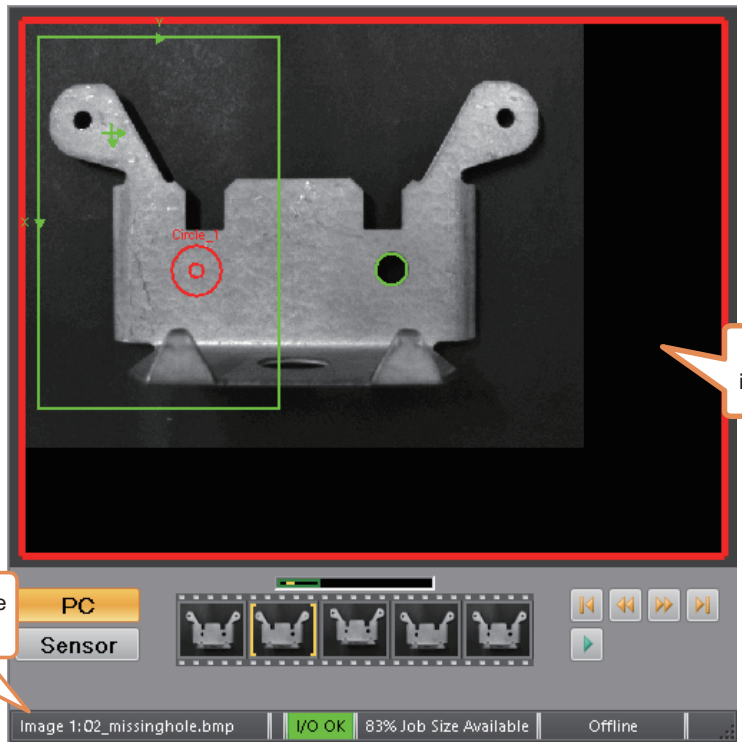
- PC Filmstrip: Displays images in folders specified by the image playback settings as a list so that jobs can be verified while switching images.
- Sensor Filmstrip: Displays images accumulated in the vision sensor queue (image buffer) by specified conditions as a list so that jobs can be verified while switching images.
  Because images are stored in the sensor memory, there is a limit to the queue size. (From 1 to 20; the maximum number of items is limited by the job size.)



If a Filmstrip image is clicked, this image is loaded, and the job is run.



To switch the image currently being displayed, either click an image in Filmstrip or click the image sending button.



If the image is switched, the image is evaluated by the job.

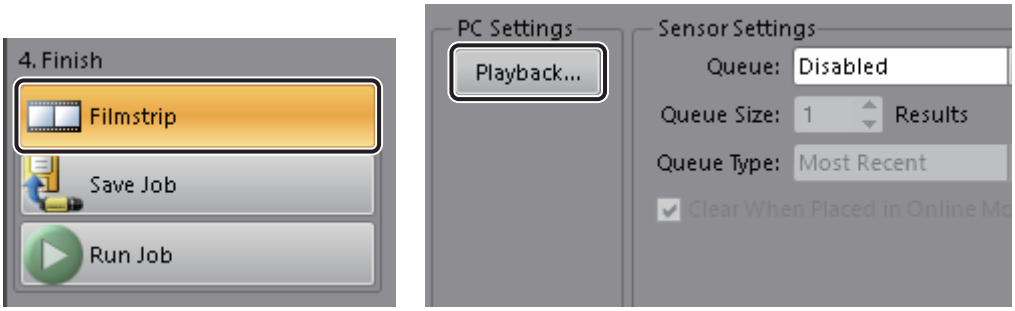
The name of the image file is displayed.

8.2 PC Filmstrip Settings

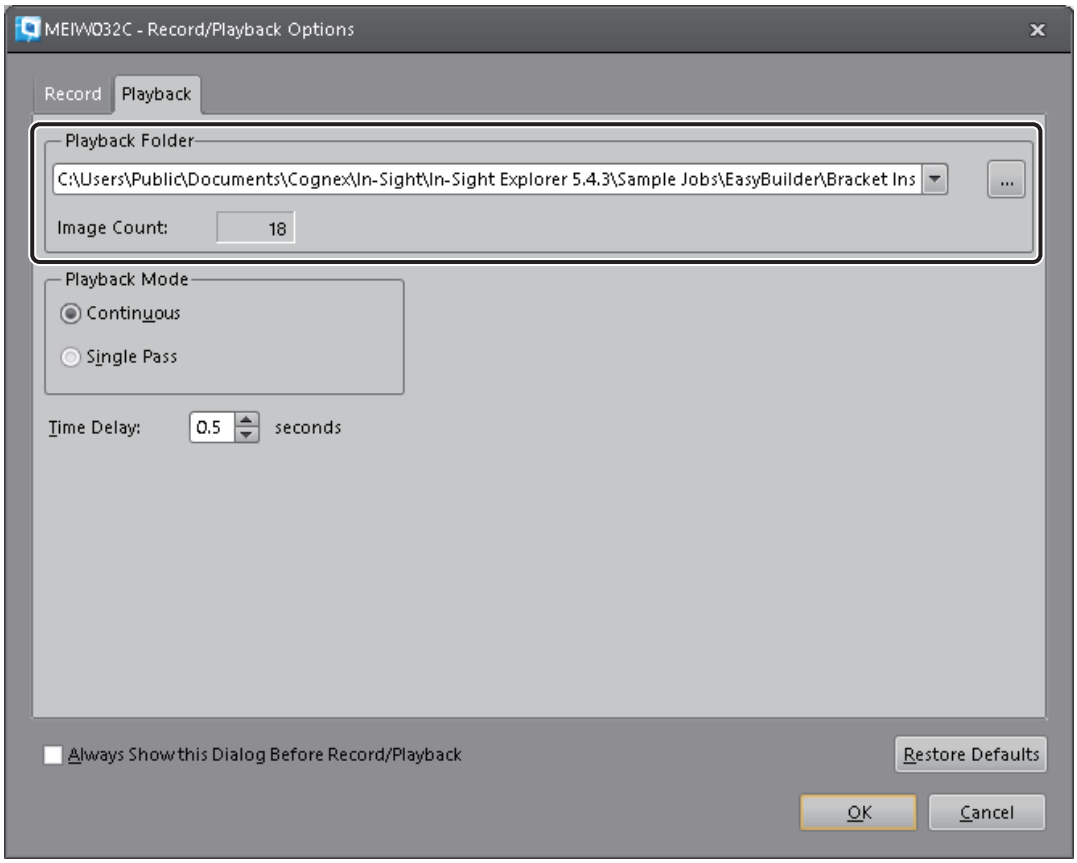
Use the following procedure to configure PC Filmstrip settings.

Operating procedure

1. Under Application Steps, select [Filmstrip], and then click the [Playback] button under PC settings.



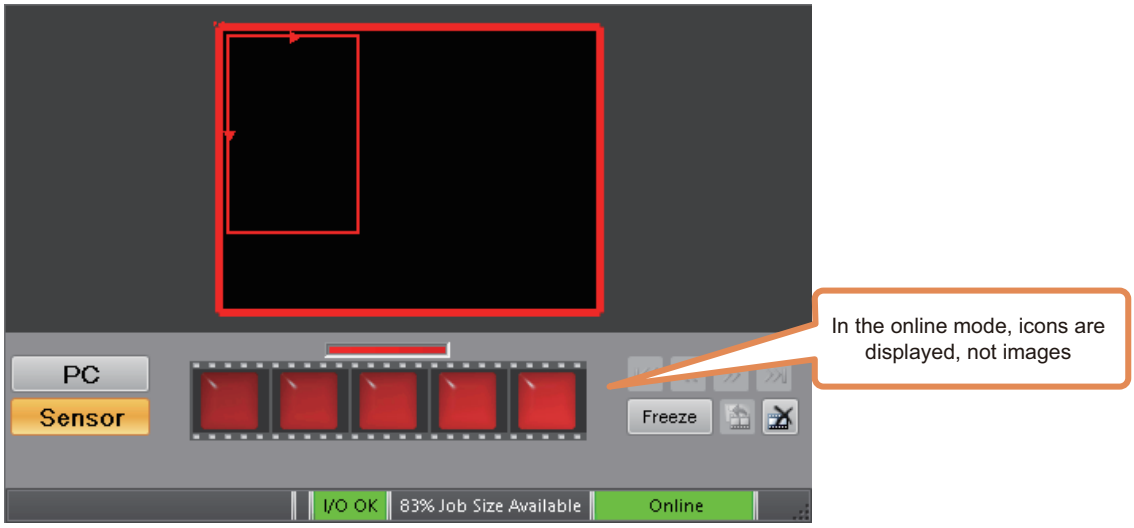
2. In the [Playback] tab of the "Record/Playback Options" screen, specify the folder that contains the images to be displayed in the filmstrip.



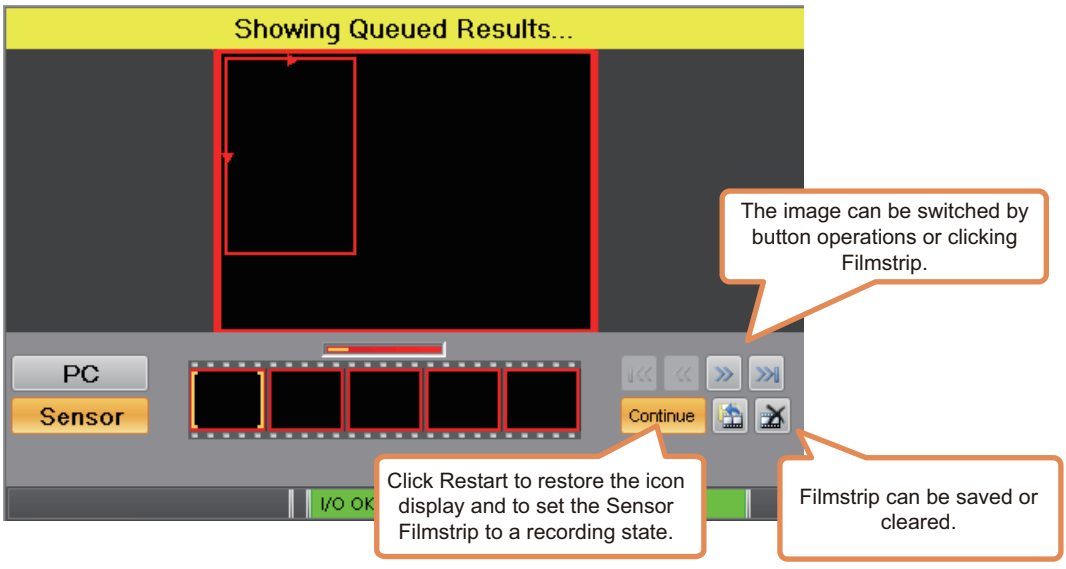
3. The images in the folder are displayed in the filmstrip.

8.3 Sensor Filmstrip Settings

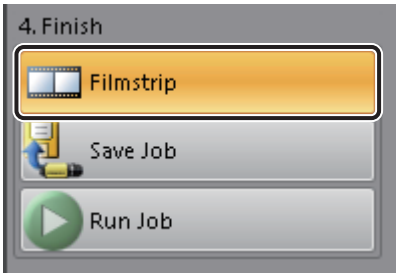
The sensor Filmstrip function temporarily retains images recorded while online and images in the vision sensor memory according to queue conditions.
For the queue conditions, select from the following: [Disabled], [Success results], [Fail results], and [Success/fail results].
While the vision sensor is online, images are not displayed in the filmstrip. Instead, icons specified by the LED style of the settings of the sensor are displayed. Images are displayed when the sensor filmstrip is stopped temporarily.

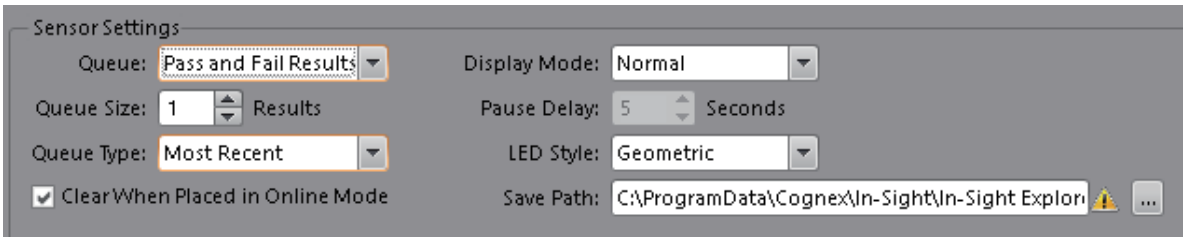


The recording of the filmstrip can be stopped, and recorded images are displayed if the [Freeze] button beside the filmstrip or the filmstrip itself is clicked.
Using the settings, it is possible to stop the filmstrip automatically during a failure or temporarily for a specified time only.



To configure the Sensor Filmstrip, under Application Steps, select [Filmstrip] to display "Sensor Settings".



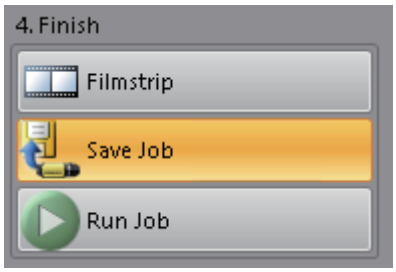


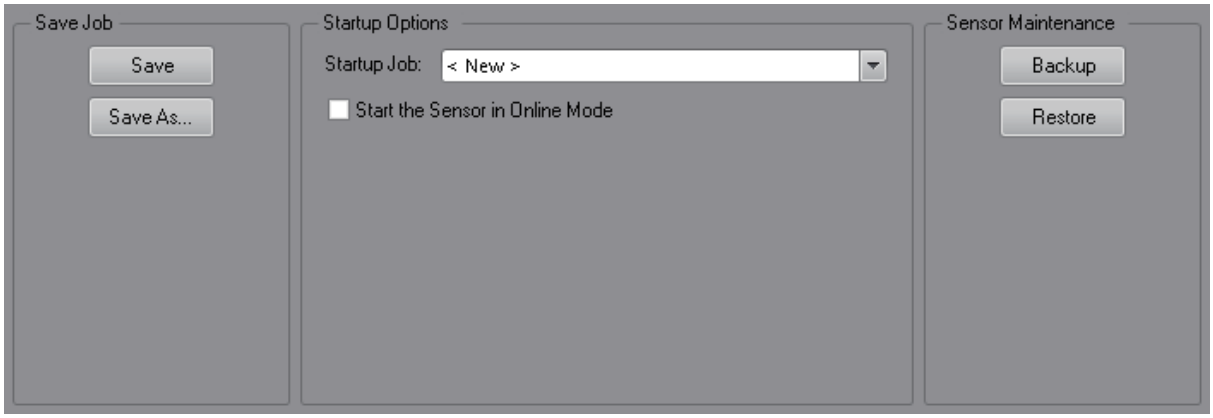
For details of each setting, open the EasyBuilder help, and then browse to [Filmstrip], and then [Sensor Settings].

9 SAVING JOB

9.1 Overview of the [Save Job] GUI

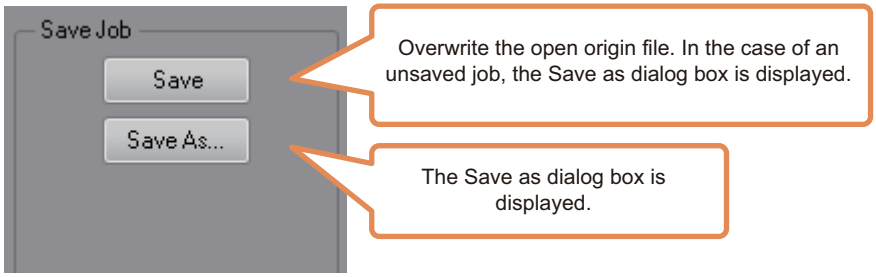
If [Save Job] under Application Steps is clicked, content related to saving jobs is displayed in the setting pane.
Here, it is possible to save jobs, select jobs to be loaded during vision sensor startup, select online mode, and backup and restore data.





Save Job

Save job files to the memory of the vision sensor or a personal computer.
To use startup jobs, save them on the vision sensor or a job server.

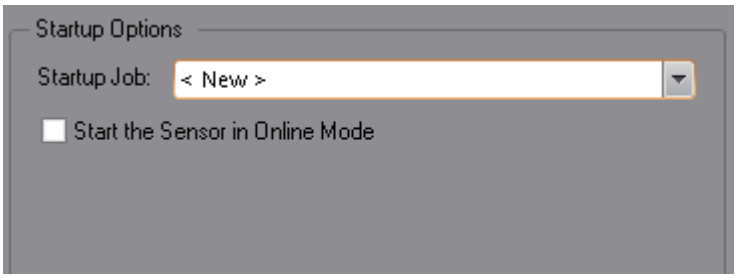


Precautions

Communication and input/output settings are not included in saved job files.
To save or restore communication settings, use the backup and restore functions of sensor maintenance.

Startup Options

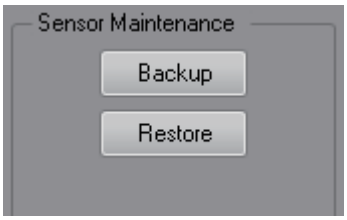
It is possible to configure the job to be loaded when the vision sensor starts.



Startup Job: It is possible to select a job file that is saved in the memory of the vision sensor.
When New was selected, an empty job is loaded.
Start the Sensor in Online Mode: if this checkbox is selected, the system enters online mode after the job file specified by Startup Job is loaded when the power supply of the vision sensor is switched ON.
Select this check box for normal operation.

Sensor Maintenance

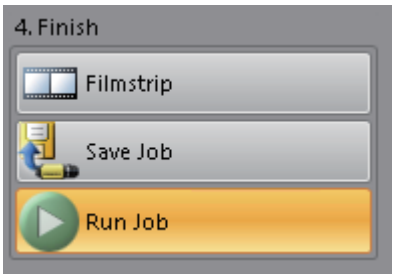
It is possible to backup and restore the vision sensor using sensor maintenance.
Backup: Backup data in the vision sensor to a personal computer.
Only the most recent backup is retained.
Restore: Restore the most recent backup, and then restart the vision sensor automatically.

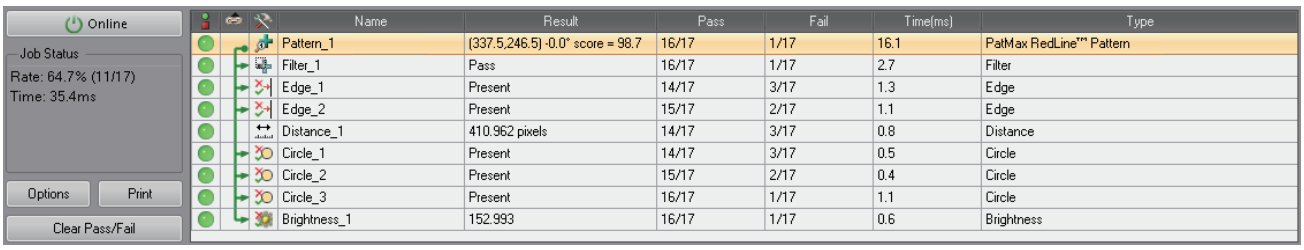


10 RUN JOB

10.1 Overview of the [Run Job] GUI

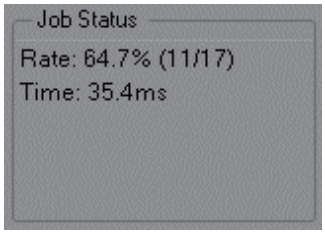
If [Run Job] under Application Steps is clicked, the Online button, the Job Status button, the Options button, the Clear Pass/Fail button, and the Print button for run results of each tool, and the detailed run results of each tool are displayed in the setting pane.



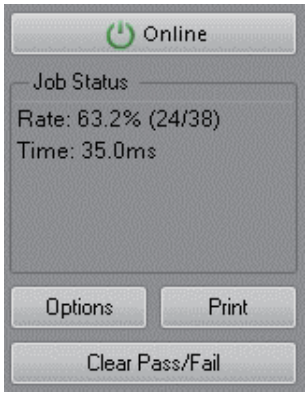


10.2 [Job Status] Group Box

The following items are displayed in the job status group box: Job PASS (no errors) rate, PASS count / inspection count, and job run time of the most recent inspection.
To clear the PASS rate, click the [Clear Pass/Fail] button listed in the next section.



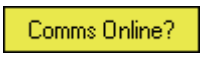
10.3 The [Online], [Options], [Print], and [Clear Pass/Fail] Buttons



It is possible to switch the vision sensor between online and offline mode by clicking the [Online] button.
To run a job on the sensor, the sensor must be switched to online in advance.
Furthermore, the vision sensor must be set to offline to edit a job using EasyBuilder.
Online mode

Offline mode

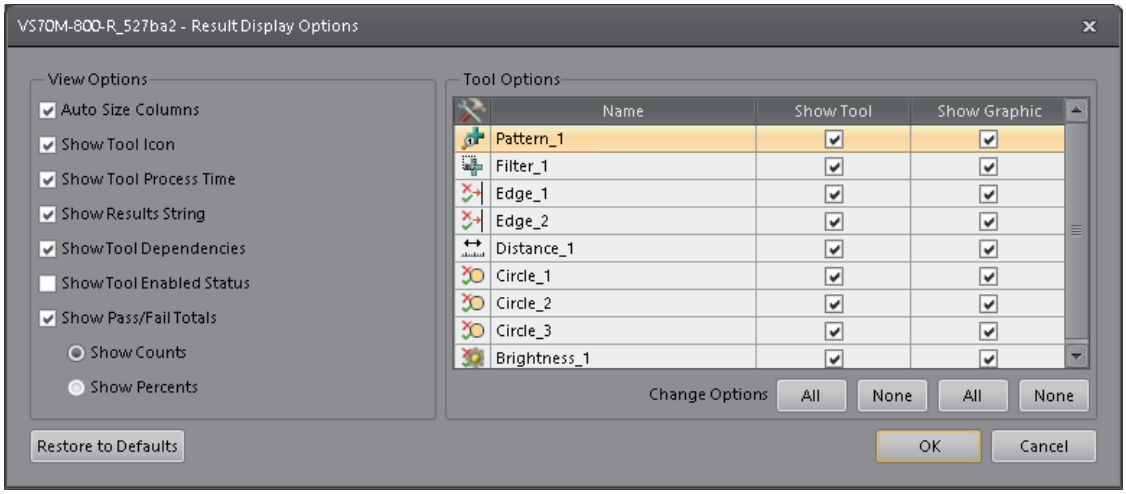
It is possible to determine whether the vision sensor is online or offline by looking at the status bar in the lower right corner of the user interface.



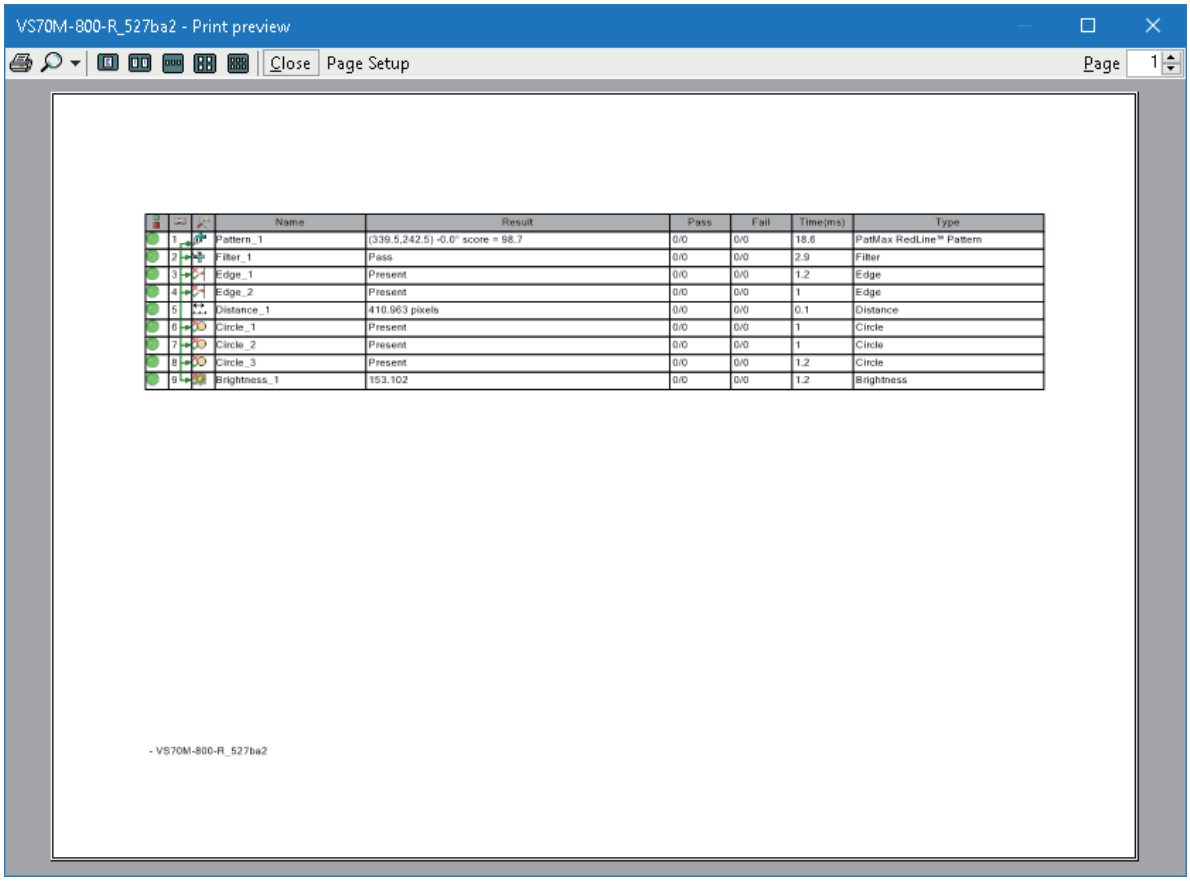
The vision system was configured to online from the GUI, but the vision system remains offline according to the communication protocol (SLMP scanner, CC-Link IE Field Network Basic, native mode, etc.)
For example, the Set Online command SO0 to switch the vision system to offline mode was issued in native mode.
To switch the vision system to online mode, it is necessary to send the Set online command SO1 to the vision system.

The vision system was configured to online mode from the GUI, but the discrete input line configured as the online/offline type is configured to Low (0).
If the status of the discrete input signal becomes High (1), the vision system switches to online mode.

If the [Options] button is clicked, the "Result Display Options" screen is displayed. It is possible to configure the content displayed by the results table and the display content in the EasyBuilder View.

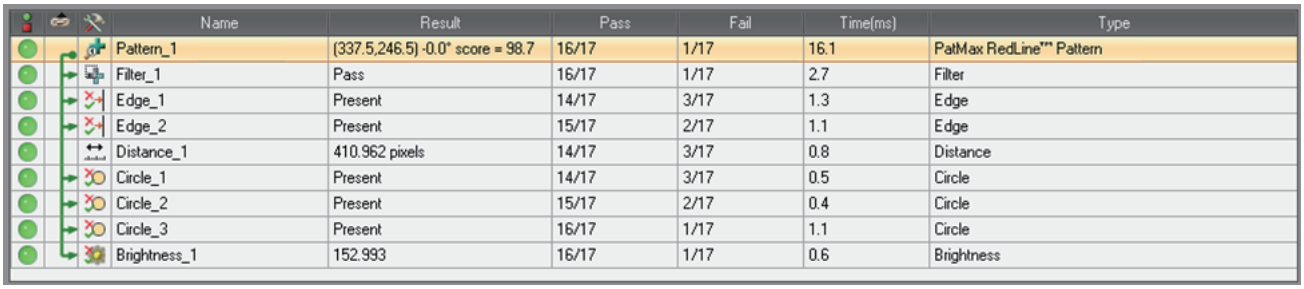


If the [Print] button is clicked, a print preview of the content displayed in the results table appears, and it is possible to print this data.



10.4 [Results] Table

The [Results] table displays detailed run results of each tool as a list.
It is possible to sort the list by clicking an item name.
Furthermore, if the tool is clicked, tools that affect or are affected by the target tool are indicated by the green and blue link lines displayed in the second column from the left.



Name	Result	Pass	Fail	Time(ms)	Type
Pattern_1	(337.5,246.5) -0.0° score = 98.7	16/17	1/17	16.1	PatMax RedLine™ Pattern
Filter_1	Pass	16/17	1/17	2.7	Filter
Edge_1	Present	14/17	3/17	1.3	Edge
Edge_2	Present	15/17	2/17	1.1	Edge
Distance_1	410.962 pixels	14/17	3/17	0.8	Distance
Circle_1	Present	14/17	3/17	0.5	Circle
Circle_2	Present	15/17	2/17	0.4	Circle
Circle_3	Present	16/17	1/17	1.1	Circle
Brightness_1	152.993	16/17	1/17	0.6	Brightness

When there was a problem due to tact time or another issue, it is possible to check which tool is the bottleneck in the screen.

11 THE INSPECTION SCREEN MONITORING

The following methods are available to monitor the inspection screen depending on the display destination equipment.

No.	Display destination	Method	Features
1	GOT touch panel display device by Mitsubishi Electric Corporation	FTP transfer from vision sensor	• Can be monitored without a personal computer • Can also be used as an operation panel to save space • No additional equipment is necessary if there is an Ethernet connection
2		Display output video from COGNEX VisionView VGA on GOT	• Can be monitored without a personal computer • Can also be used as an operation panel to save space • Possible to display and adjust only the information necessary on-site
3	COGNEX VisionView 900	VisionView	• Can be monitored without a personal computer • Possible to display and adjust only the information necessary on-site
4	Personal computer (LCD)	In-Sight Explorer	• Display is updated quickly • Vision sensor can be adjusted
5		COGNEX VisionView PC	• Display is updated quickly • Possible to display and adjust only the information necessary on-site

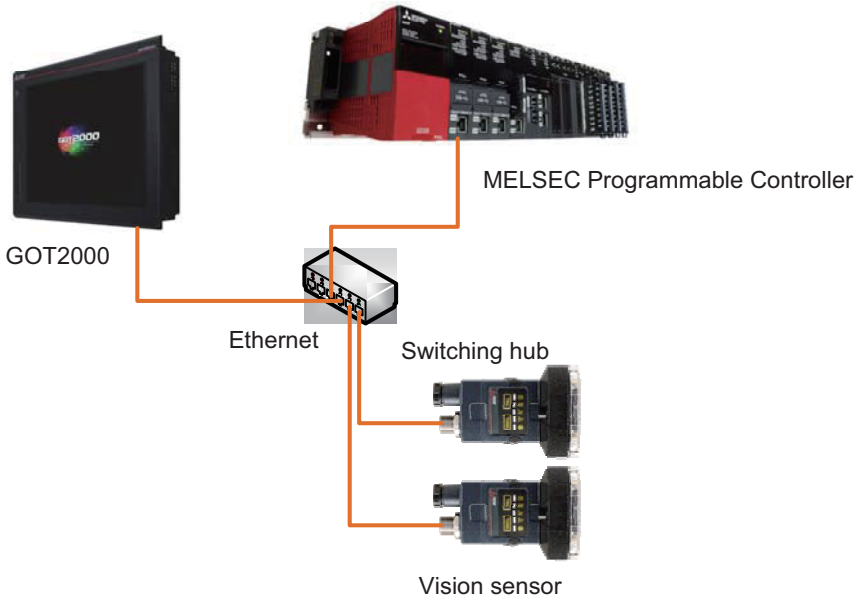
The following section lists the equipment configuration and details of each display method.

Descriptions of the vision sensor I/O and power supply are omitted because they differ by model.

11.1 Displaying an Image by FTP Transferring the Image from a Vision Sensor to a GOT

Components

- GOT 2000 Series touch panel display device by Mitsubishi Electric Corporation (GT25, GT27) (SD card)
- MELSENSOR Vision Sensor

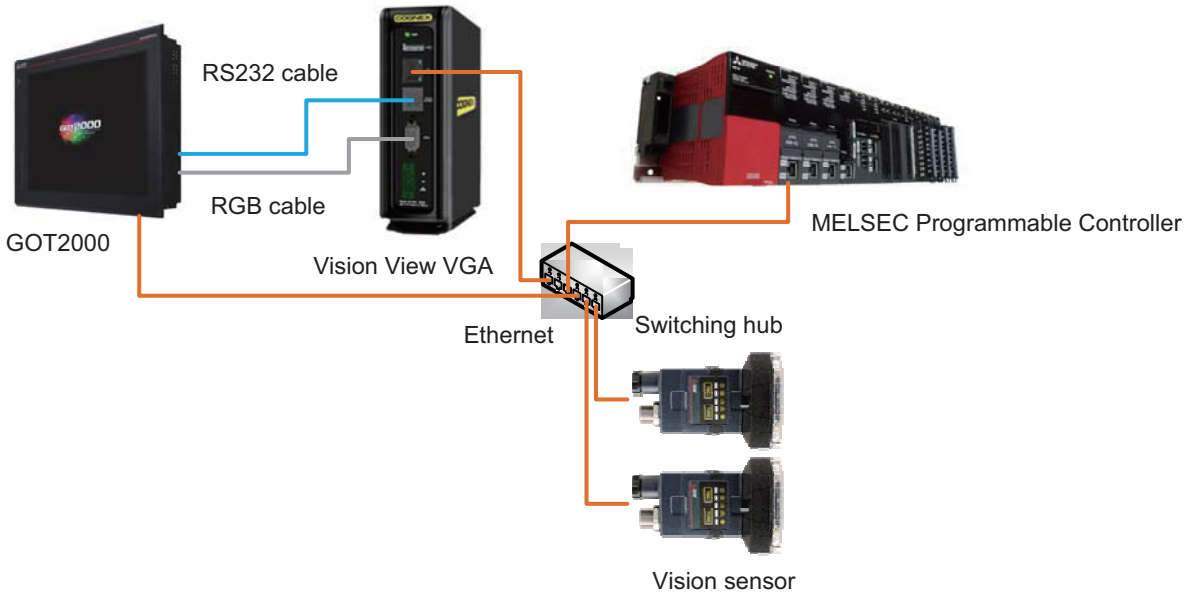


The vision sensor must be configured for FTP transfer advance.
On the GOT2000, the FTP server function is enabled.
For details on settings, refer to the following page.
☞ Page 150 Image Transfer to a GOT

11.2 Displaying a Moving Image of VisionView VGA on GOT

Components

- GOT 2000 Series touch panel display device by Mitsubishi Electric Corporation (GT25, GT27)
- RGB input module for GOT2000
- COGNEX VisionView VGA
- MELSENSOR Vision Sensor
- RGB cable, RS232 cable (CCB-VVVGA-GOT)

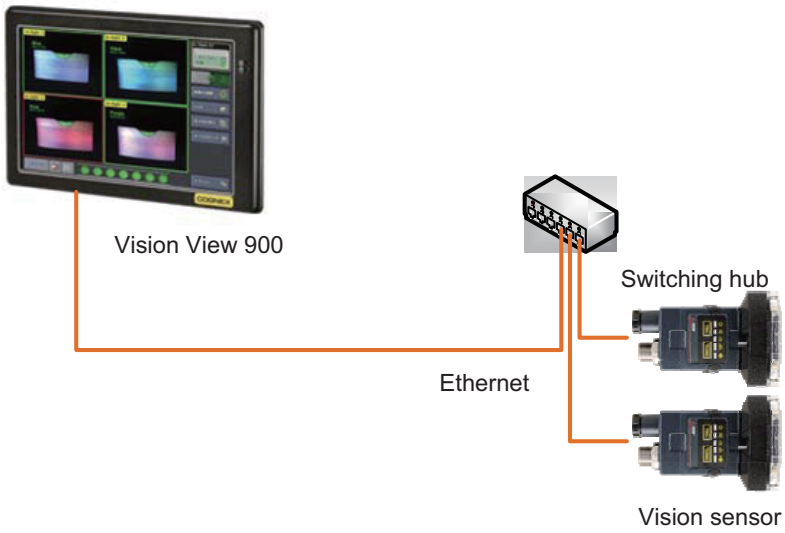


Connect the VisionView VGA and GOT using an RGB cable and RS232 cable to display the VisionView VGA image on the GOT screen.
Furthermore, enable the personal computer remote operation (serial) function of the GOT to manipulate the interface of the VisionView VGA using touch operations of the GOT.
For connection details, visit the COGNEX website, browse to the VisionView support section, and then reference [VisionView VGA Mitsubishi GOT connection procedure and sample].
The interface can be constructed by configuring EasyView by [Communication] of In-Sight Explorer.

11.3 Monitoring a Vision Sensor by Using the VisionView 900

Device organization

- COGNEX VisionView 900
- MELSENSOR Vision Sensor

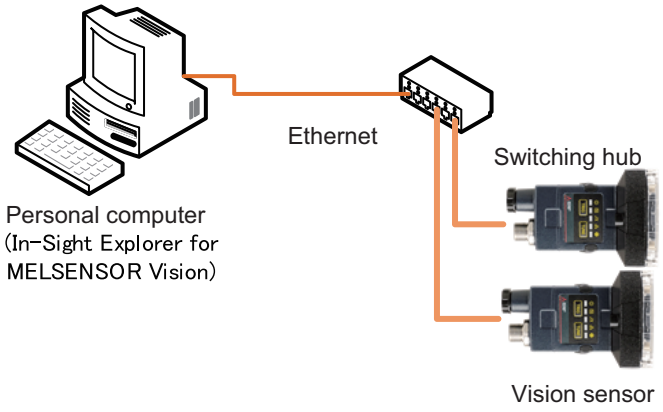


VisionView 900 is a standalone touch panel display device that can monitor the vision sensor.
Monitoring is possible simply by connecting to the vision sensor. It is not necessary to create a monitoring screen.

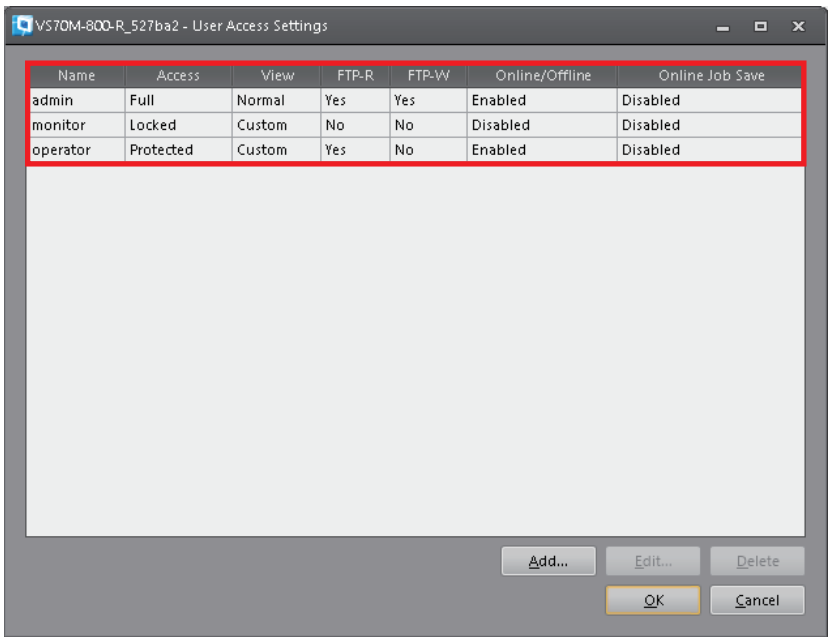
11.4 Monitoring a Vision Sensor by Using In-Sight Explorer on a Personal Computer

Device organization

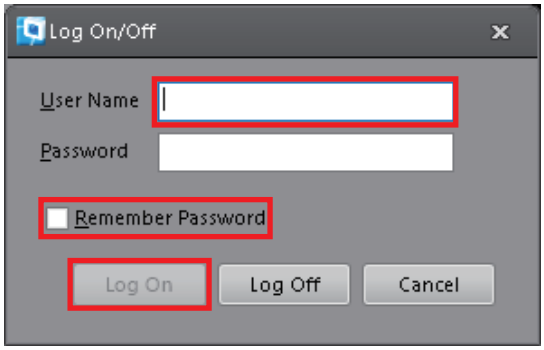
- Personal computer (In-Sight Explorer)
- MELSENSOR Vision Sensor



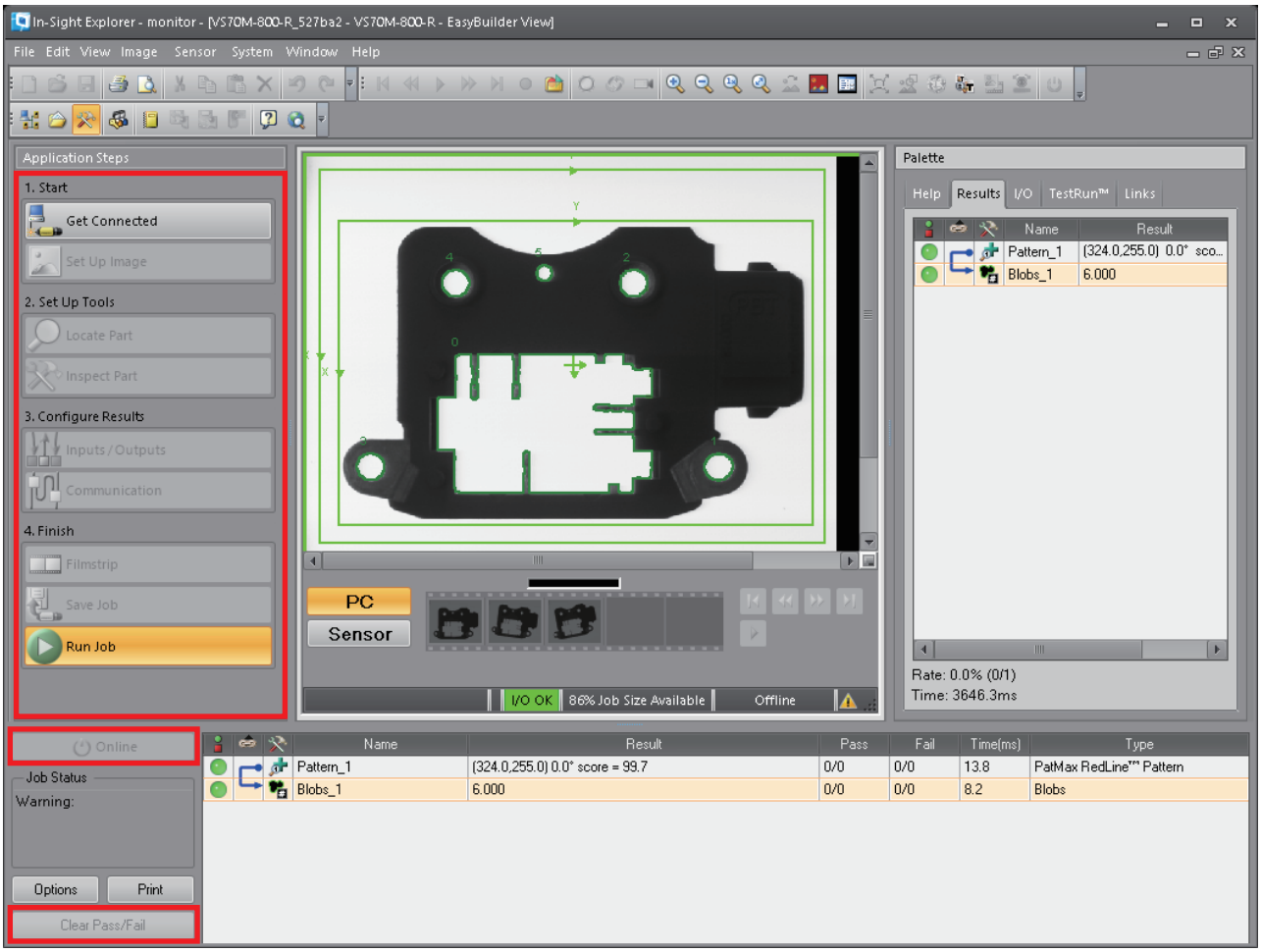
Use In-Sight Explorer for vision sensor configuration for monitoring.
If In-Sight Explorer is started normally and used for monitoring at a production site, there is a risk that settings may be changed accidentally because the software can change job and camera settings.
It is possible to restrict job changes by changing the user that logs into In-Sight Explorer to a monitoring-only user.
It is possible to check users configured to the sensor by opening In-Sight Explorer, clicking the [Sensor] menu, and the clicking [User Access Settings].
Use "monitor" or "operator" that is registered in advance for a user name, or register a new user name to be used.



To switch users, click [Log On/Off] from the [System] menu in In-Sight Explorer to display the screen below.
The logon user can be switched by entering a user name and password, and clicking Log On.



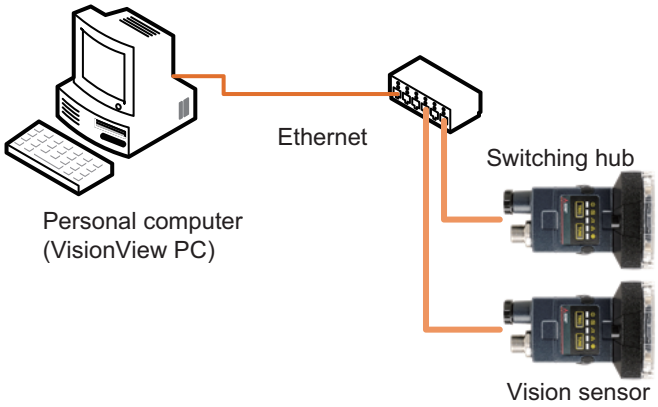
When logging on as "monitor" user, some functions are restricted as shown in the following figure.



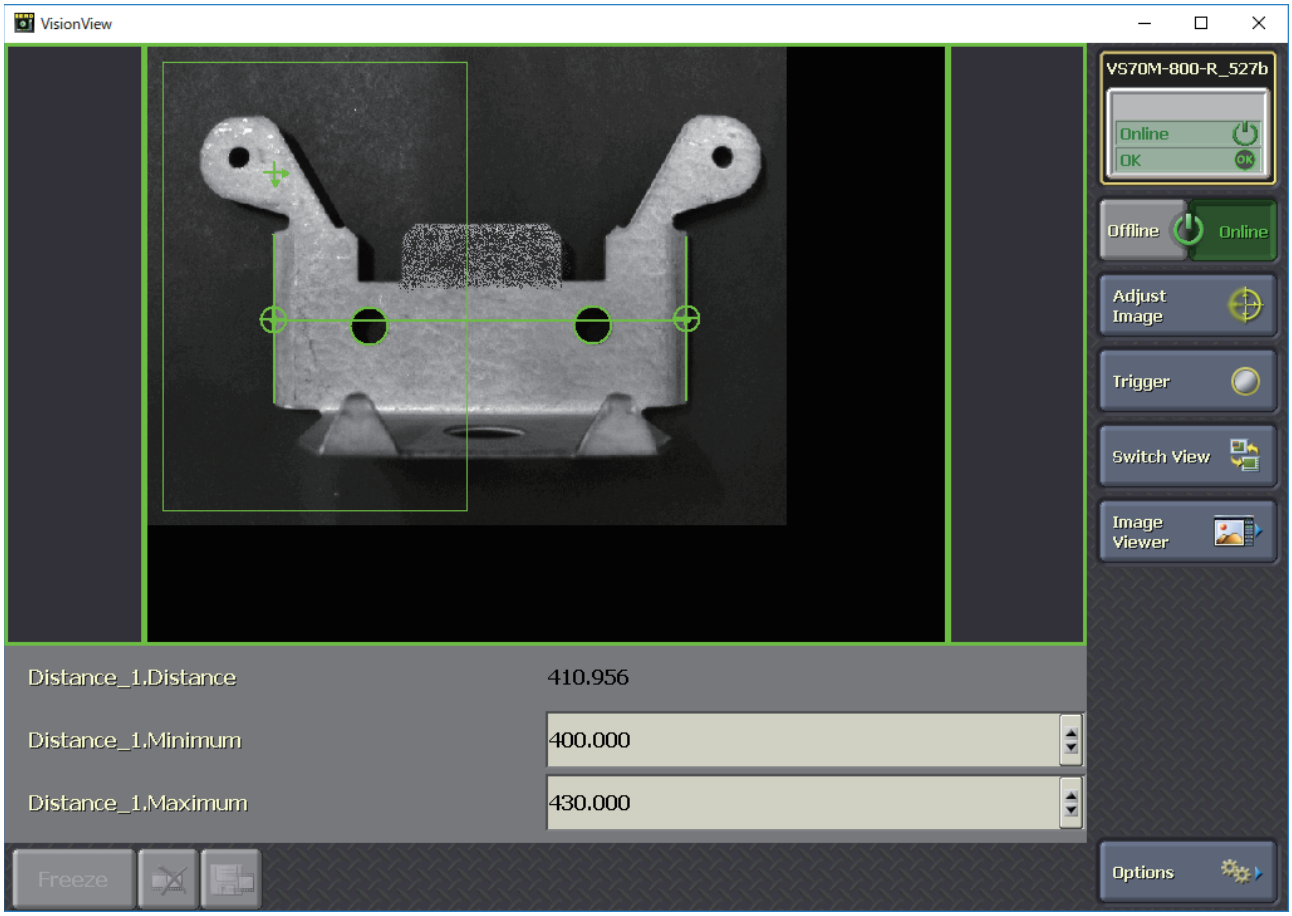
11.5 Monitoring a Vision Sensor by Using a VisionView PC on a Personal Computer

Device organization

- Personal computer (VisionView PC)
- MELSENSOR Vision Sensor



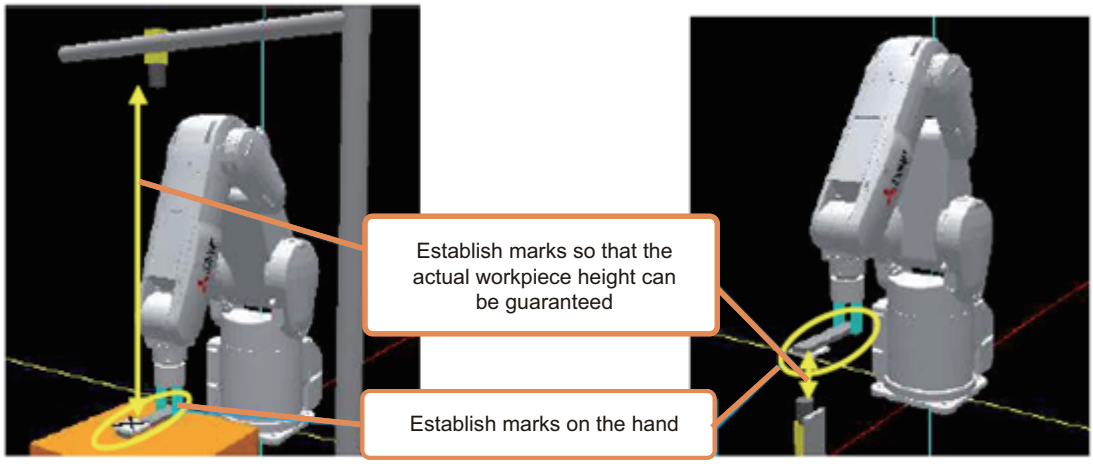
VisionView PC is software to realize the VisionView interface on the screen of a Windows personal computer.
It is possible to monitor and adjust the vision sensor using the same interface as the VisionView 900 and VisionView VGA.
A license is required for use.



APPENDIX

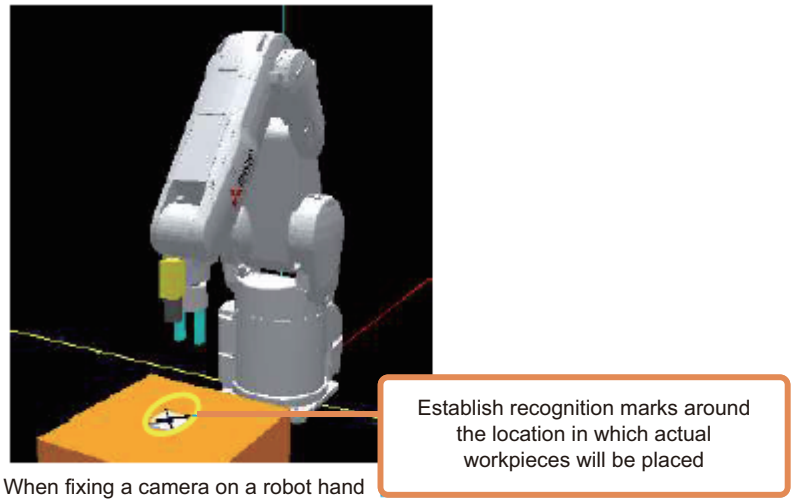
Appendix 1 Example of Robot Calibration

To use a vision sensor as robot guidance, calibration to gather the coordinate system is necessary.
There are cases in which coordinate transformation after calibration is carried out by a robot and cases in which it is carried out by a vision sensor. This chapter describes the latter.
For detailed procedures, robot settings and programming, and other information, visit the Mitsubishi FA website and see [MELFA Vision System Automatic Calibration Sample Program].
In this section, the Sequential N Point Calibration Tool is used to create a calibration file, the file is imported by the job to be used during operation, and then calibration is carried out.
When the camera is fixed, attach visual marks to the robot hand.
When the camera is attached near the robot hand, set the visual marks on the stand upon which the workpiece is arranged.



When fixing a camera above a robot hand

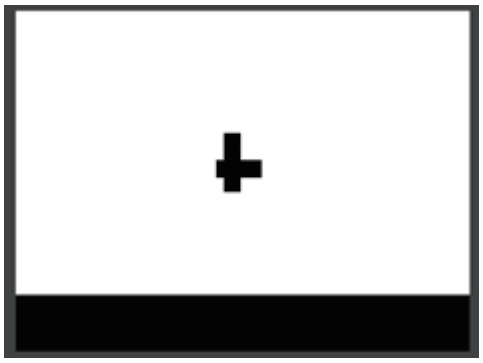
When fixing a camera below a robot hand



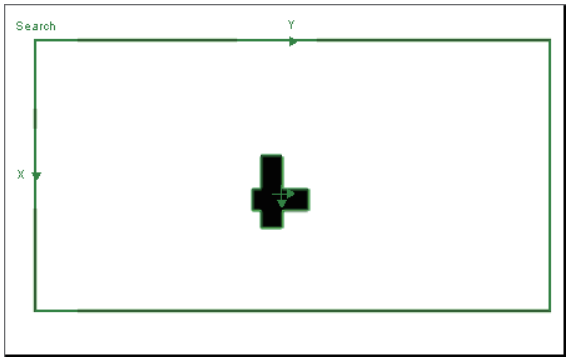
When fixing a camera on a robot hand

Operating procedure

1. Arrange the visual marks so they are within the field of view of the camera.
The marks do not need to be in the center of the field of view. However, because they are also used as reference points of the robot, for example, arrange the marks in locations in which workpieces are assumed to be arranged.



2. Add a location tool to locate the visual marks by the vision sensor.



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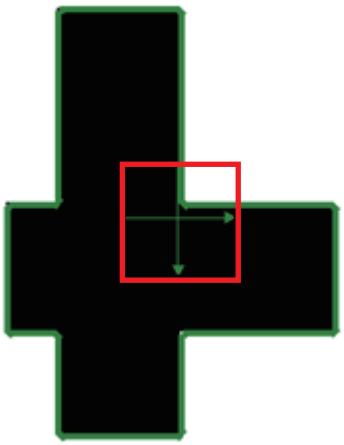
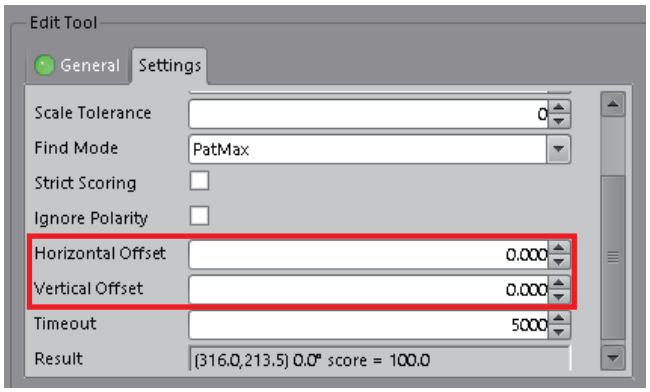
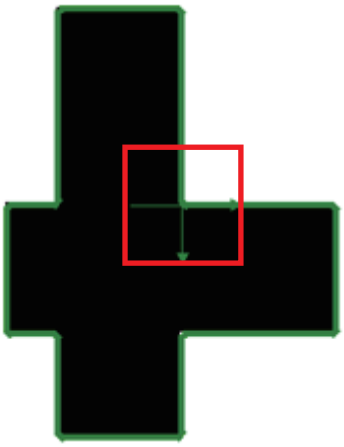
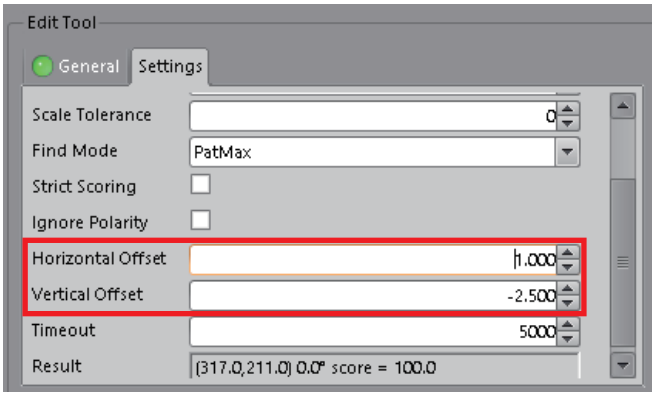
If necessary, adjust [Horizontal Offset] and [Vertical Offset] to adjust the location coordinates.

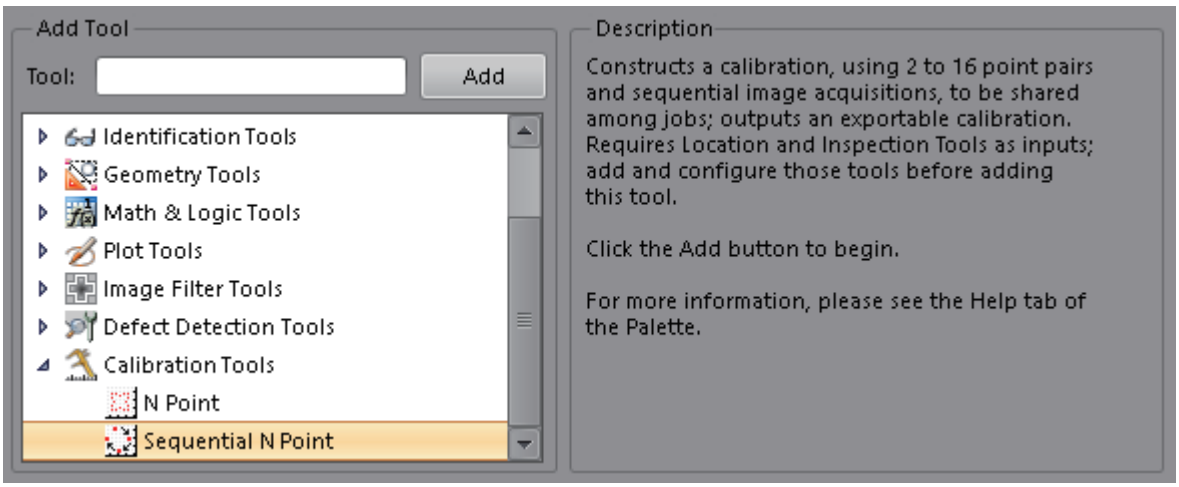






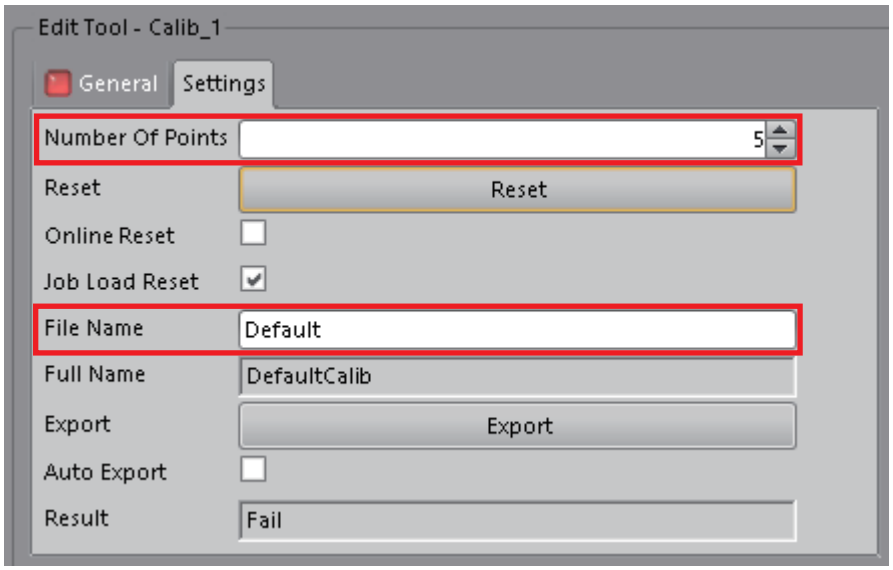


3. Add [Sequential N Point] of Calibration Tools to the job.

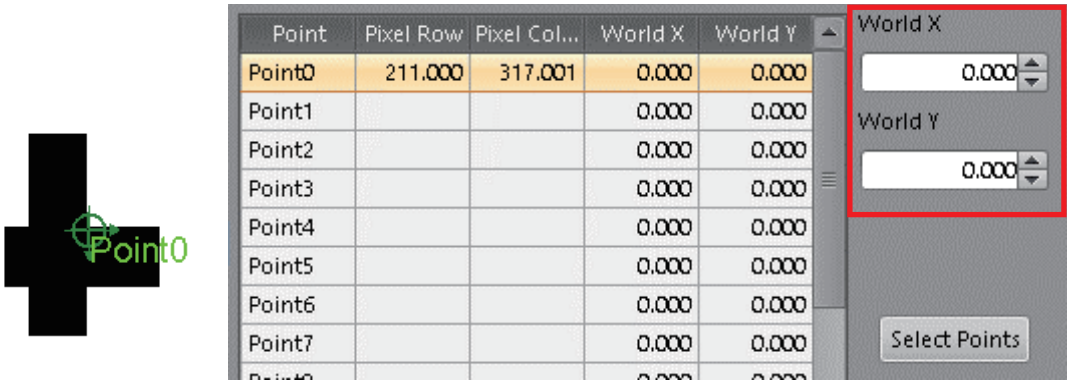


4. Using a smart feature selection, select and enter the shape to indicate the coordinate point of the location tool.

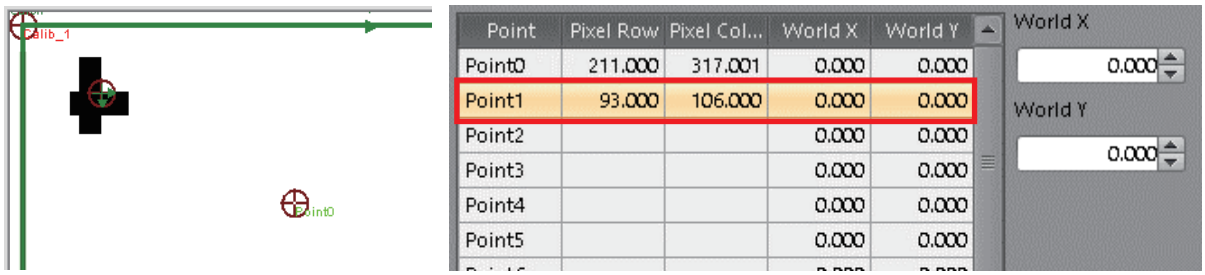
5. Configure the Sequential N Point Calibration Tool.
In this case, the number of points is 5, but up to 16 points can be acquired.
The file name is the file name to be added when the calibration file is exported.
Change to an easy-to-understand name.



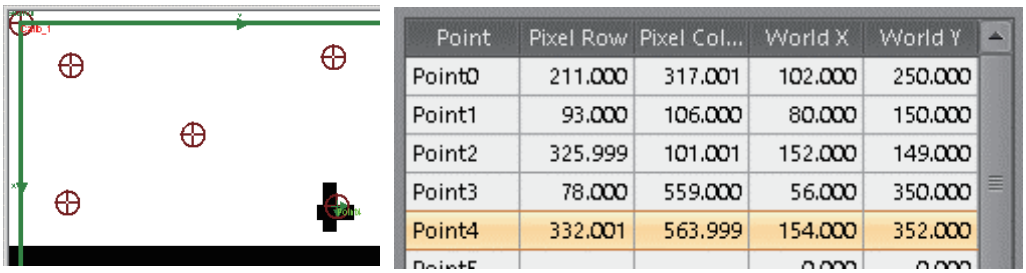
6. Set the camera to online mode, input the trigger, and then acquire the coordinates of the initial point.
If the image is scanned, and a pattern is located, coordinates are entered in the pixel row and pixel column of Point 0 of the Sequential N Point Calibration Tool table.
Enter the robot coordinates at this time in World X and World Y.



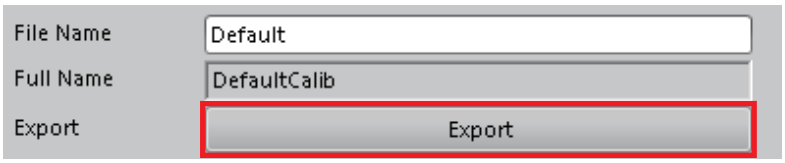
7. Move the robot arm to the next point, and then switch ON the camera trigger.



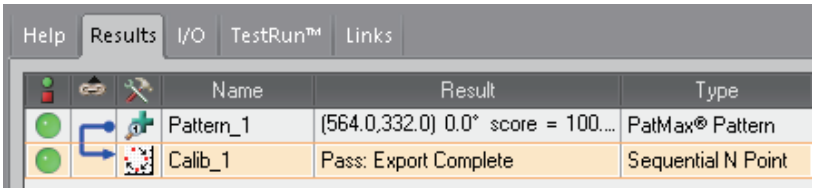
Acquire the pixel coordinates of the next point.
As with Step 6, enter the X and Y coordinates of the robot in World X and World Y.
Move, image scan, and enter World X and World Y for the remaining number of scan points.



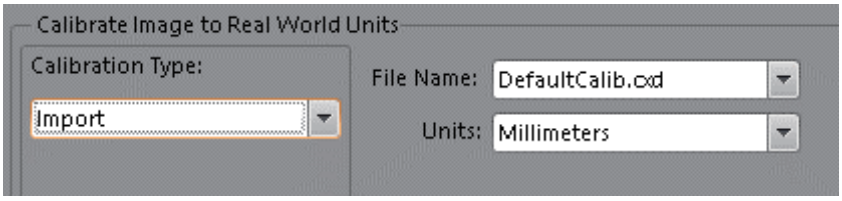
8. After the necessary number of scans and coordinate configurations are complete, click the [Export] button.



If export is completed normally, "Pass: Export Complete" appears in the Palette results.
Calibration files are saved in the non-volatile memory of the vision sensor.



9. Use the exported calibration file for the calibration of the job to be used in operation.
In a job separate from the calibration, select "Import" for the Calibration type of the image settings.



If "Import" is selected, a file name can be selected. Select the file exported in Step 8.
Furthermore, specify the units of the entered World X and World Y.

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Appendix 2 Saving Images

It is possible to configure the VS series to transfer images to an FTP server on the network.
If this setting is configured, images scanned for archives (based on the PASS/FAIL of the tool or job) are transferred and can be saved on other devices.
Furthermore, checking saved images can be useful for researching the cause of problems that occur during the manufacturing process.

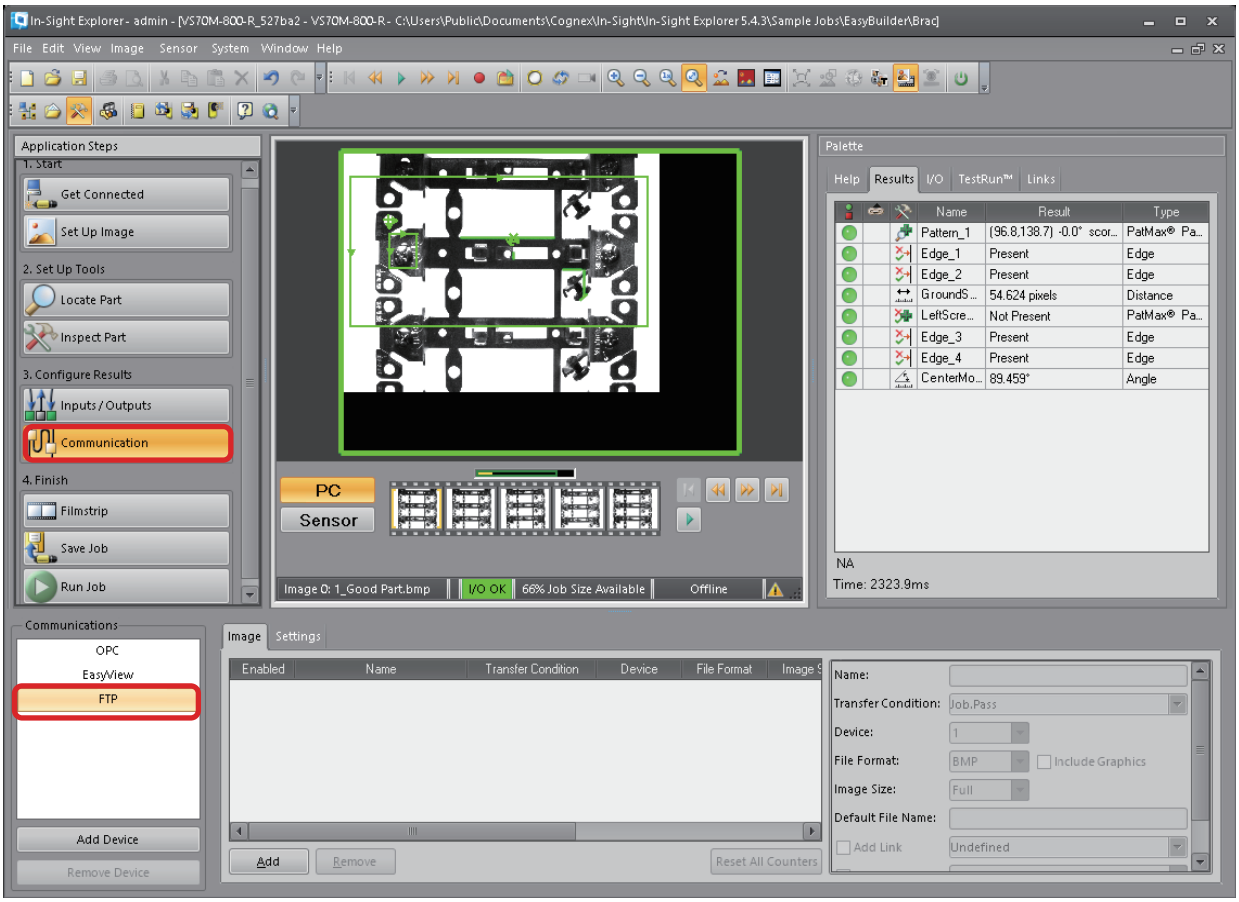
Transferring images via FTP

Image Transfer to In-Sight Explorer

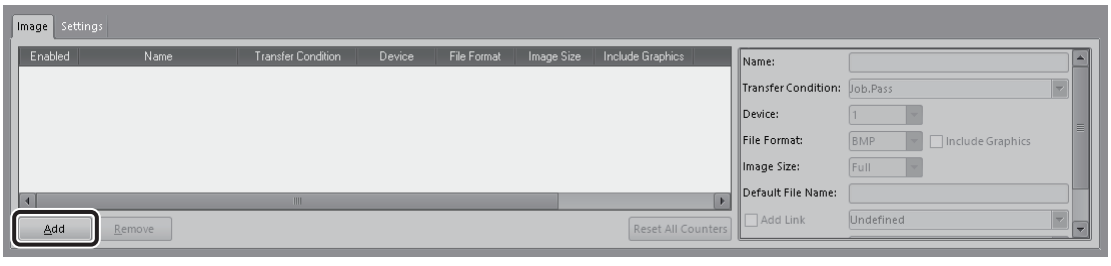
Because In-Sight Explorer runs as an FTP server simply by starting it (connection with the VS series is not necessary), it is possible to construct an FTP server environment easily by configuring settings so that it starts automatically when the personal computer used as the server is started (Step 6 below).
This section explains the procedure to use the emulator run by In-Sight Explorer as an FTP server.

Operating procedure

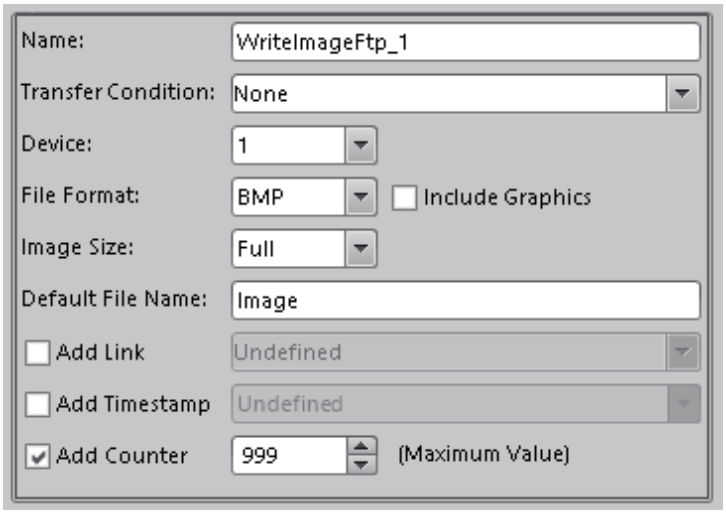
1. From Application Steps, click [Communication], and then select [FTP].



2. Open the [Image] tab, and then click the [Add] button to add the FTP transfer settings.



3. Configure the added FTP settings.



- Name: WriteImageFtp_1
- Transfer Condition: None

Select "None" to transfer all images.

To transfer according to the pass or fail condition of the inspection tool or job run results, select "Tool PASS" or "FAIL".

To transfer when a job has failed, select "Job.FAIL".

- Device: 1
- File Format: BMP

Select the transfer file format from "BMP" (bitmap image) and "JPG" (JPEG image).

To verify again by the emulator regardless of format, select "BMP".

- Image Size: Full

Select the size of the transferred image from "Full", "Half", or "Quarter".

Select full access image transfer.

- Default File Name: Image

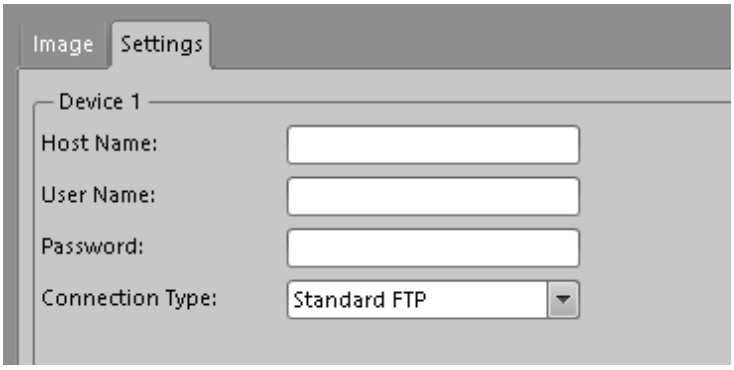
Configure the folder to store image files and the starting character string of the image file name.

(For details, see Page 148 Procedure to Specify the Folder by the Default File Name of the FTP Image Tab.)

- Add Counter: 999

Configure the upper limit for the sequential number added to the end of the file name.

4. In the [Settings] tab, configure the FTP server settings of the transfer destination.



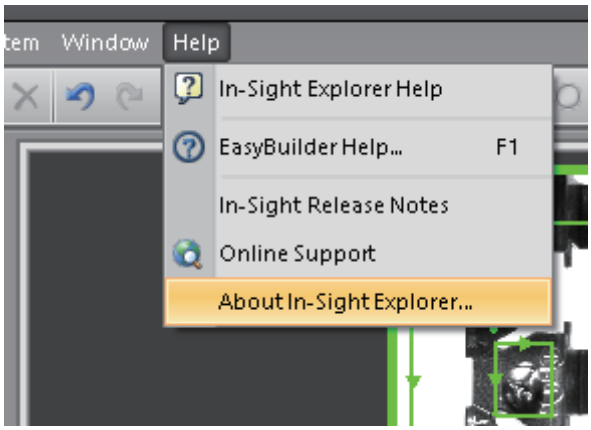
Host Name: IP address of the computer running In-Sight Explorer*1

User Name: admin

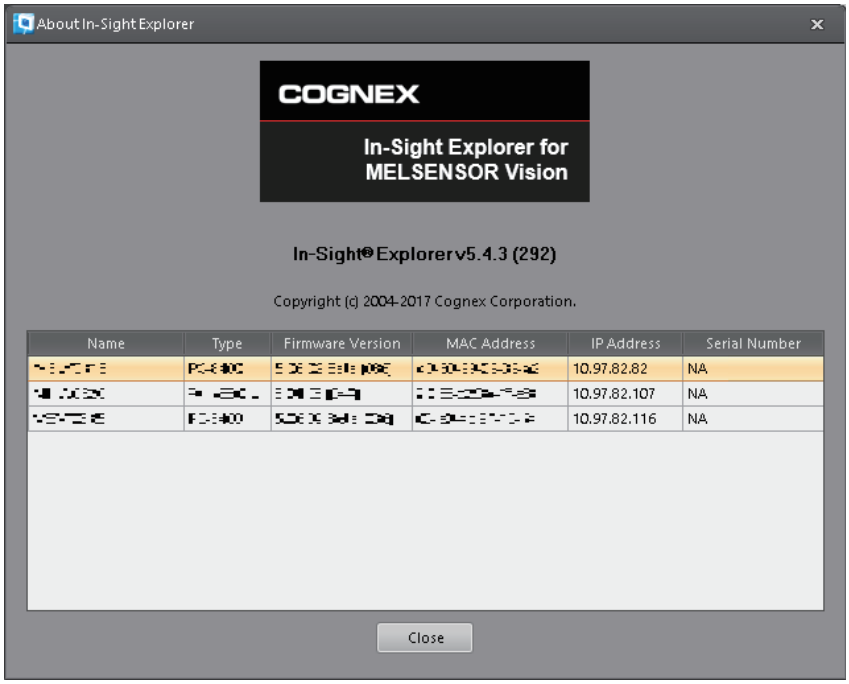
Password: (blank)

Connection Type: Standard FTP

*1 To check the IP address of the computer running In-Sight Explorer, from the menu, click [Help], and then [About In-Sight Explorer].



The IP addresses of computers running In-Sight Explorer are displayed in the bottom section of the displayed version information window.



5. Specify the FTP root directory and the default file name of image files.

☞ Page 146 Procedure to Specify the Root Directory in the Option Settings

☞ Page 148 Procedure to Specify the Folder by the Default File Name of the FTP Image Tab

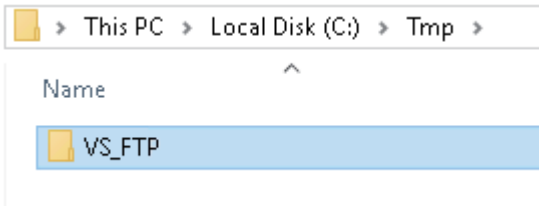
6. To start In-Sight Explorer automatically when the personal computer is started, configure the following settings.

☞ Page 149 Starting In-Sight Explorer Automatically when the Personal Computer Starts

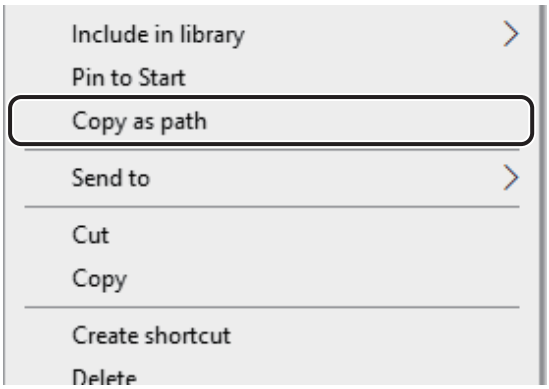
■ Procedure to Specify the Root Directory in the Option Settings

Ex.
When image files are stored in a folder created in C:\Tmp

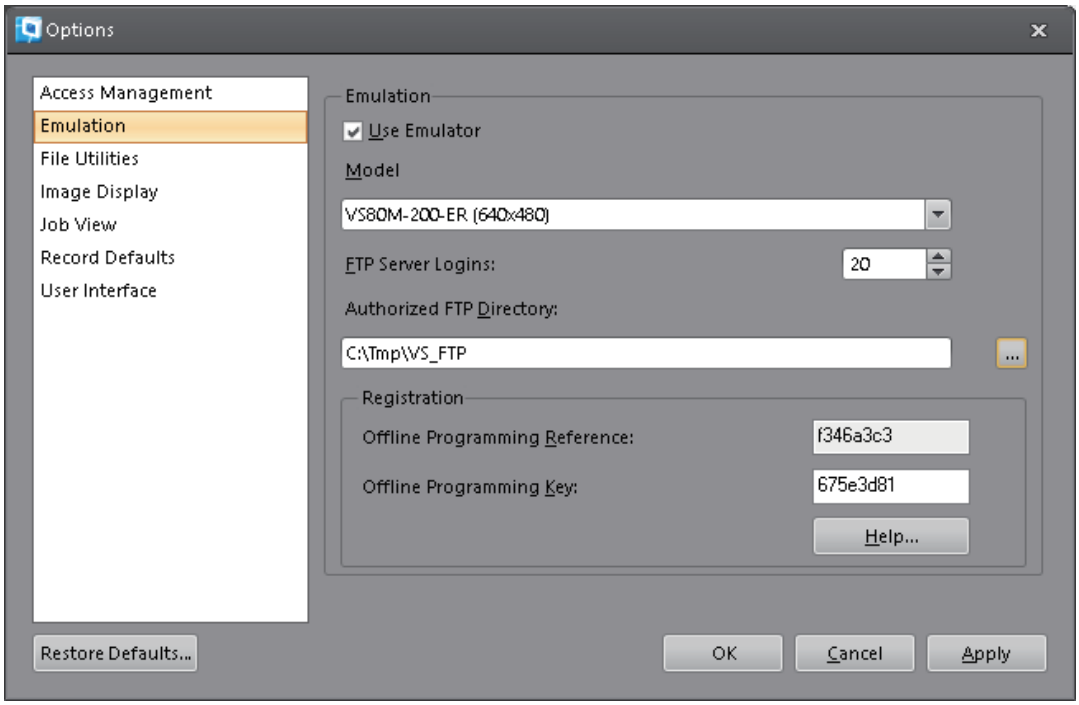
1. Create a folder in C:\Tmp. (For images, VS_FTP)



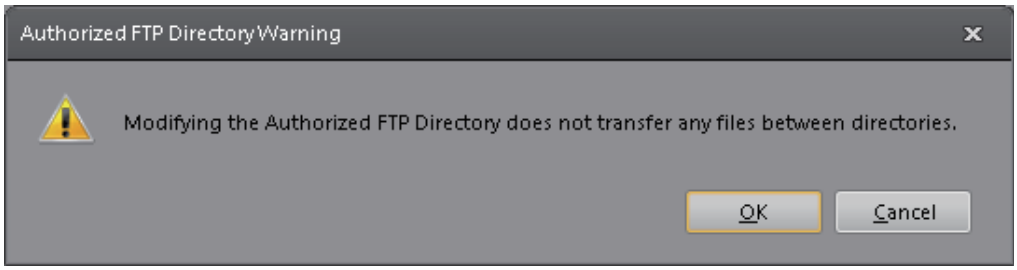
2. Move the mouse cursor over the folder, hold down the Shift key, and then right-click. Select [Copy as path].



3. Click [System] ⇨ [Options] from the In-Sight Explorer menu to open the "Options" screen, and select "Emulation". Paste the folder path copied in step 2 onto the "Authorized FTP Directory" field. (At this time, remove double quotation marks.)



4. If the [OK] button or the [Apply] button is clicked, the following message appears.
If the [OK] button is clicked, the emulator restarts. Configuration is complete.



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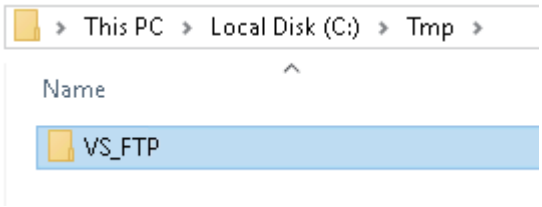
■ Procedure to Specify the Folder by the Default File Name of the FTP Image Tab

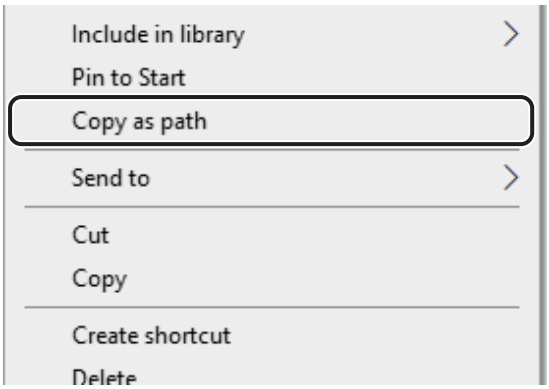
Ex.

When image files are stored in a folder created in C:\Tmp

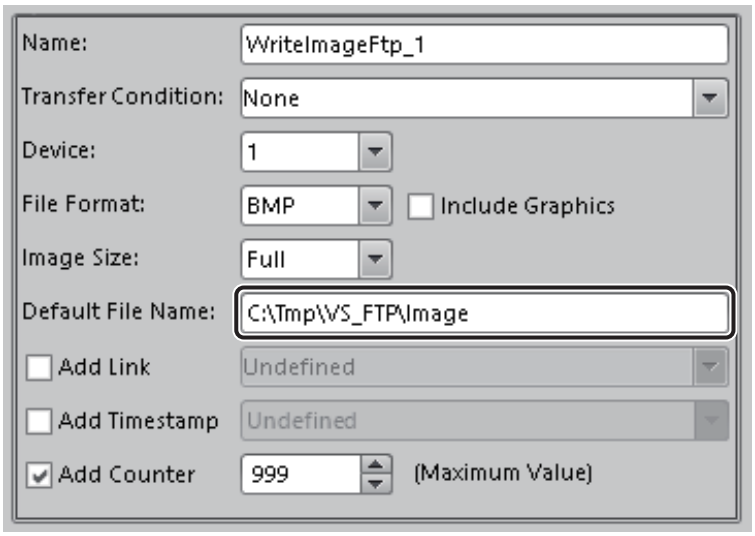
1. Create a folder in C:\Tmp. (For images, VS_FTP)



2. Move the mouse cursor over the folder, hold down the Shift key, and then right-click. Select [Copy as path].



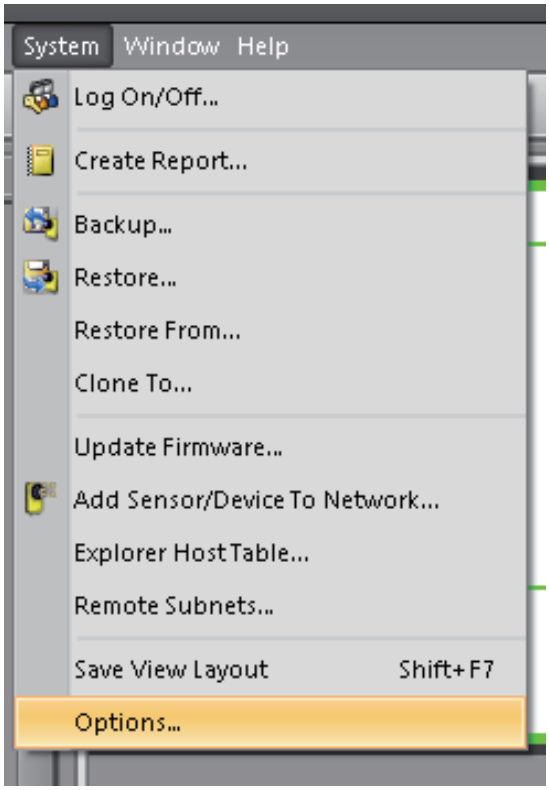
3. Paste the folder path copied in Step 2 onto the Default File Name field, remove double quotation marks, and add "\Image" to the end of the path. [\] is converted to a backslash.



■ Starting In-Sight Explorer Automatically when the Personal Computer Starts

Operating procedure

1. From the menu, select [System], and then open [Options].



2. Select "Start at Windows Log On" and click either the [Apply] button or the [OK] button.

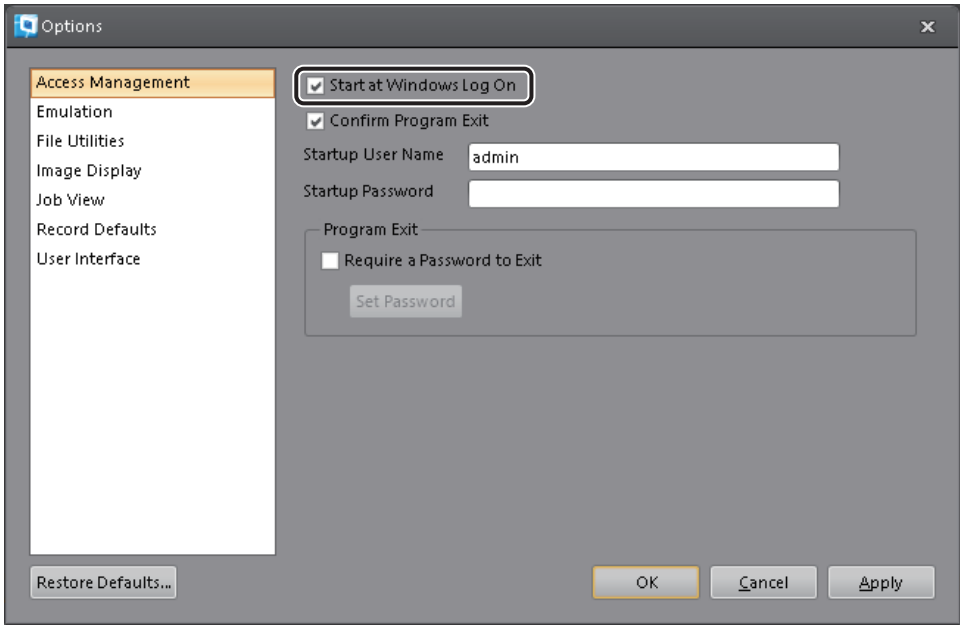


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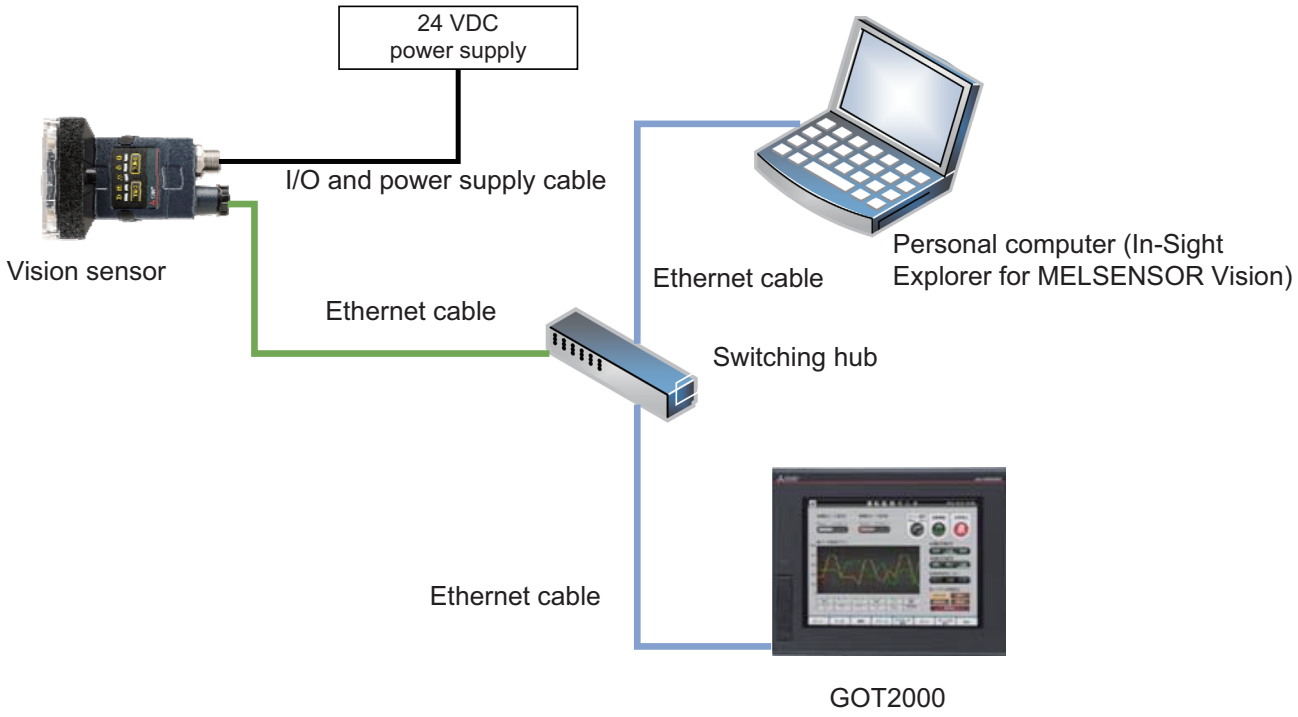
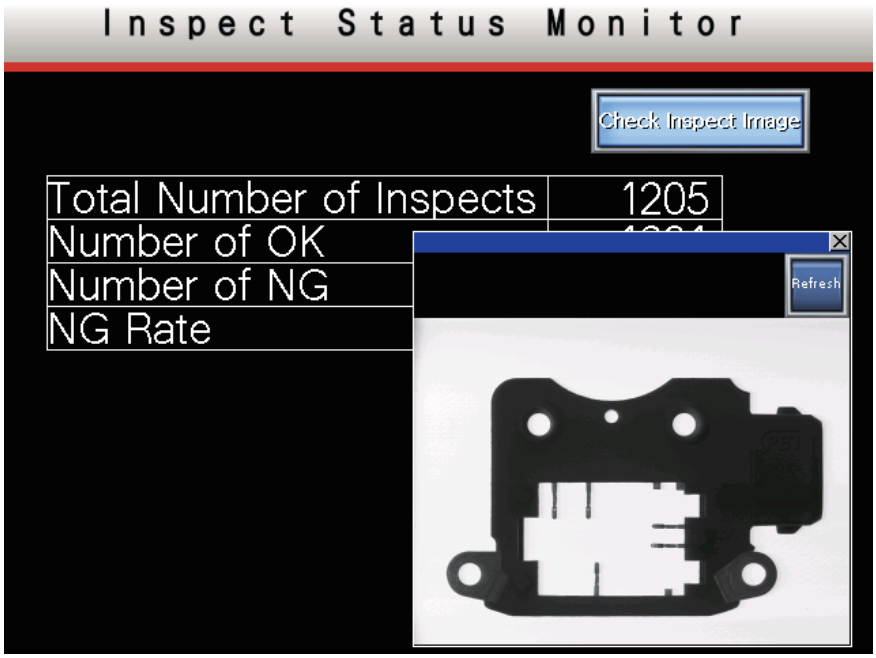
Image Transfer to a GOT

This chapter shows the method to connect the vision sensor and a GOT using Ethernet, and then transferring images captured by the vision sensor via FTP.

■ Network Structure Diagram for Vision Sensor and GOT





GOT Screen Display Image

■ Necessary equipment

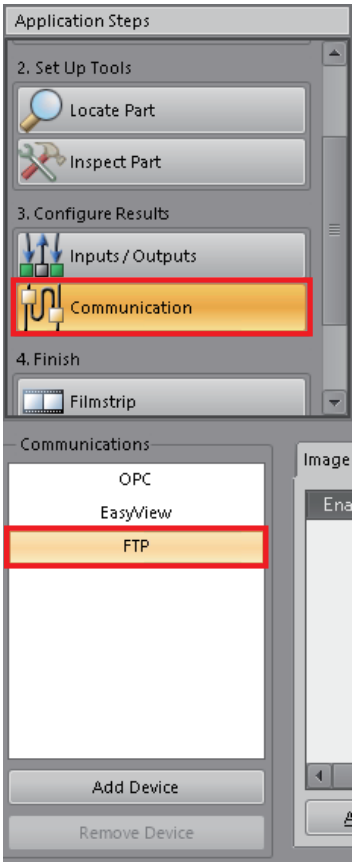
Equipment	Description
Vision sensor VS Series	—
GOT2000 or GOT1000 Series display device	For compliant GOT models, refer to the following items of the manuals. 📖GT Designer3 (GOT2000) Screen Design Manual 📖GOT1000 Series Gateway Functions Manual for GT Works3 Note: VS20 Series cannot transfer images via FTP to the GOT1000 Series.
SD card	NZ1MEM-2GBSD, NZ1MEM-4GBSD, NZ1MEM-8GBSD, NZ1MEM-16GBSD, L1MEM-2GBSD, L1MEM-4GBSD For SD cards manufactured by other companies, refer to the following technical news. Operation Check Results of Non-Mitsubishi SD Cards on GOT2000 Series Units(GOT-A-0065)
In-Sight Explorer (vision sensor configuration software)	—
GT Designer3 Version1	—

■ Vision Sensor Settings

Connect the vision sensor and computer, and then configure the FTP transfer settings on the vision sensor.

Operating procedure

1. Connect the vision sensor and computer around a switching hub.
   Alternatively, connect to the vision sensor using In-Sight Explorer running on the personal computer.
2. In In-Sight Explorer, select [Communication] under Application Steps, and then click [FTP].



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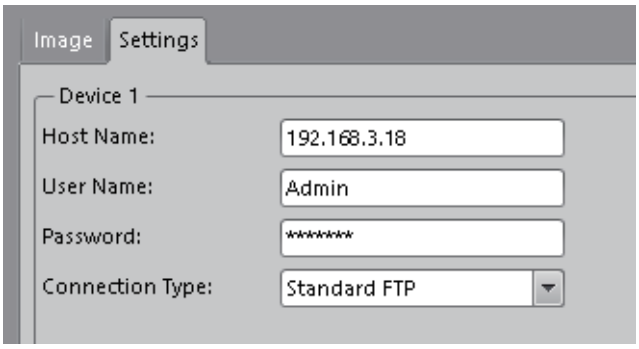
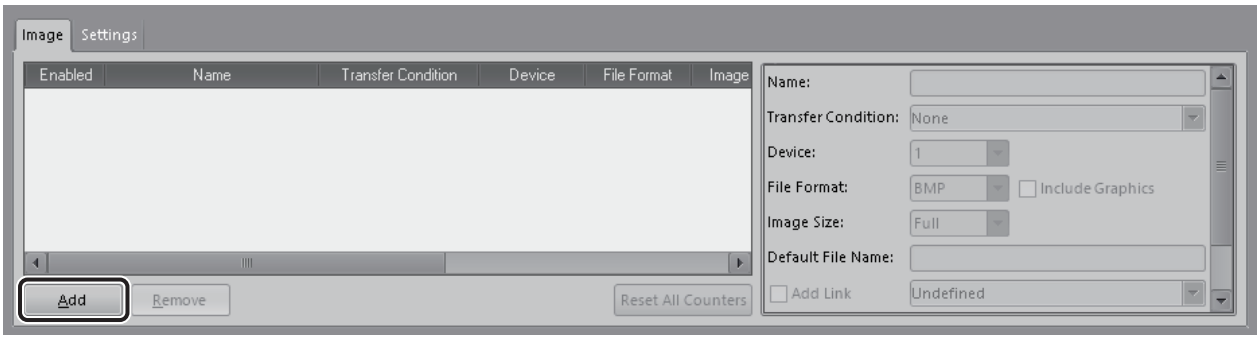
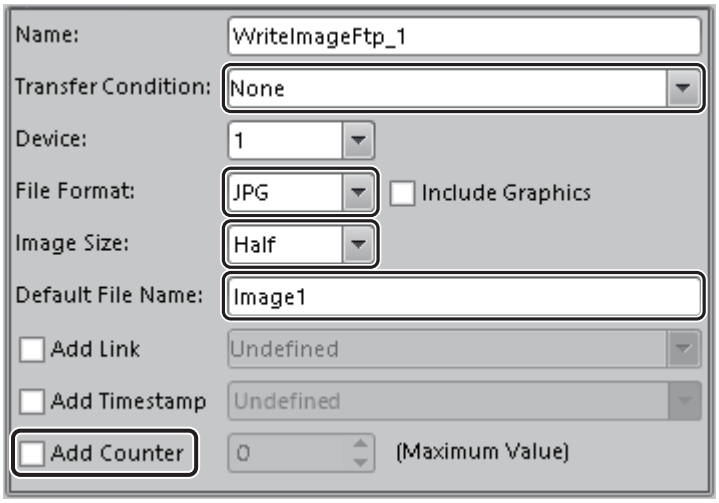
3. In the FTP [Settings] tab, configure the settings to match the connection-destination GOT.
Host Name: IP address of connection-destination GOT
User Name: Admin
Password: (password configured by the FTP server settings of GT Designer 3)
Connection Type: Standard FTP (when connecting to the GOT1000 Series, select [Mitsubishi GOT])



4. In the FTP [Image] tab, click the [Add] button.



5. Configure the added image transfer settings as shown below.

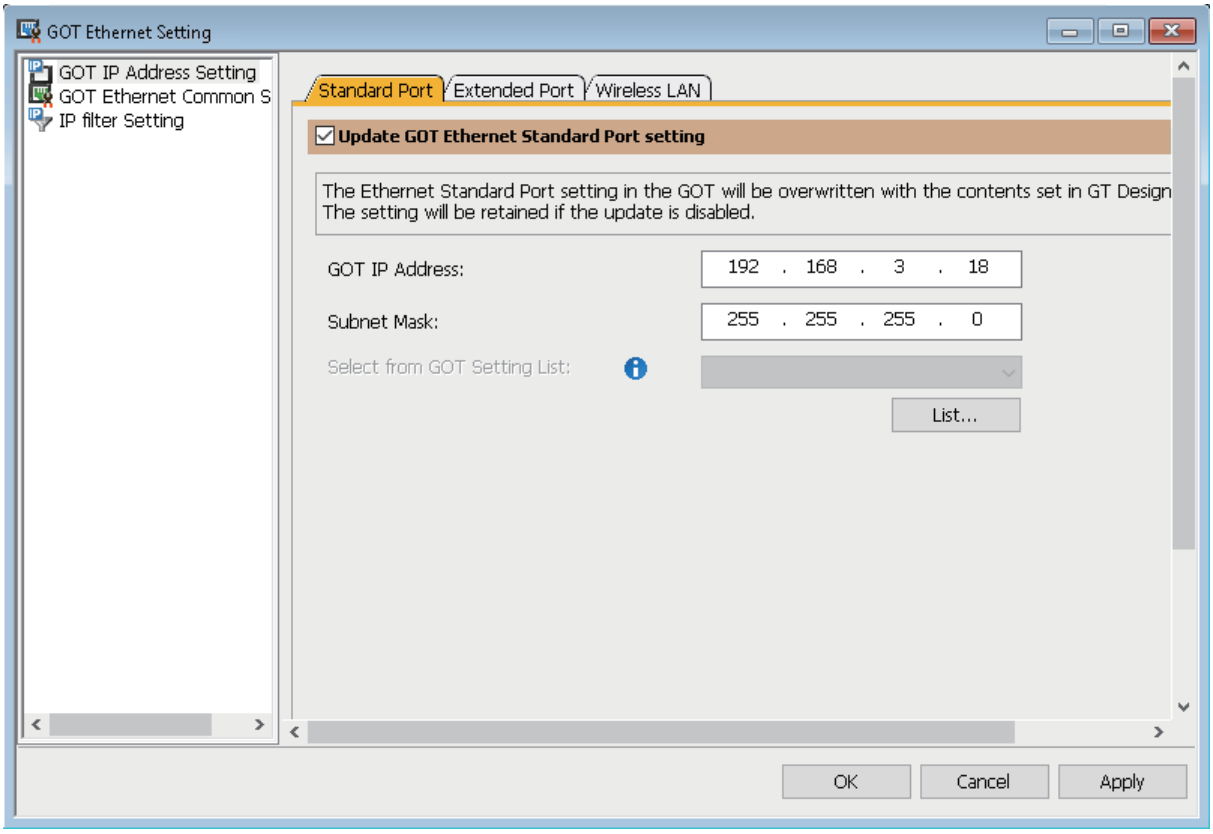


Transfer Condition: "None" transfers all inspection images.
If necessary, configure for when the job is incorrect, etc.
File Format: File format to be transferred.
When using the image for the job re-verification, select BMP.
Image Size: Configure at what size to transfer via FTP for the imaging size.
The image size can be selected from "Full", "Half", or "Quarter".
When using the image for the job re-verification, select Full as well as File Format.
Default File Name: Configure the name of the file to be transferred via FTP.
Add Counter: Define the maximum value of the counter to be added to the name of the file to be transferred.
In this section, because files with the same name transferred to a GOT are overwritten each time, disable the addition of a counter.

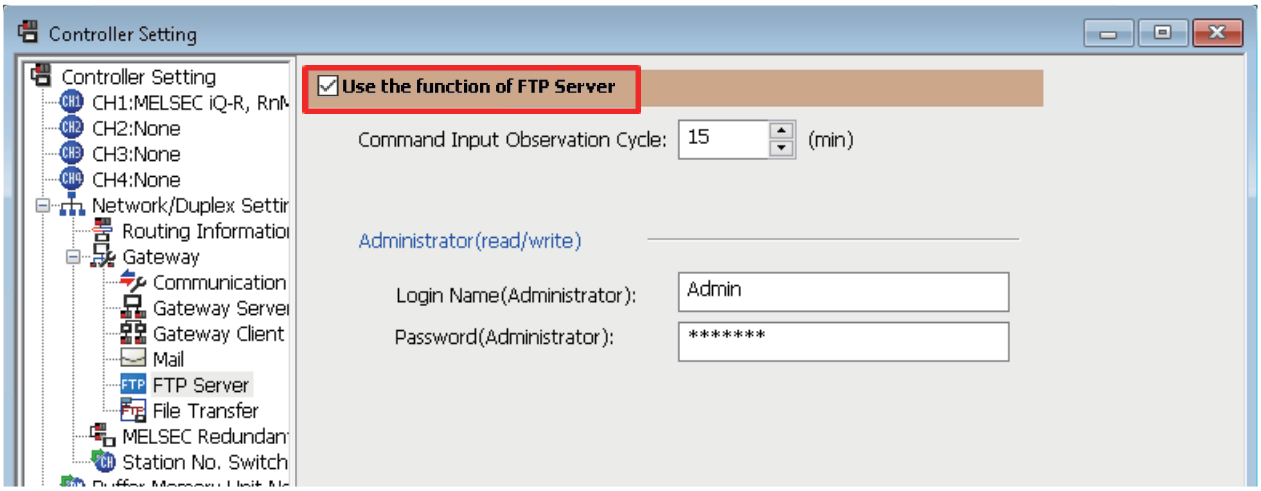
■ Configuring the FTP Server Using GT Designer 3

Operating procedure

1. Configure the IP address in the GOT Ethernet settings.
Make sure that the content configured here and the FTP settings configured in In-Sight Explorer (☞ Step 3 of Page 151 Vision Sensor Settings) match.



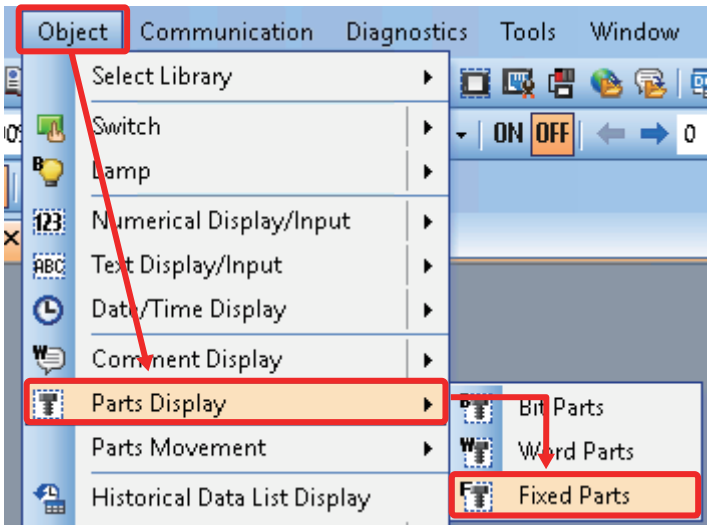
2. Configure the FTP server settings of the GOT.
By default, a password is not configured.
Configure a password as necessary and match it to the settings of In-Sight Explorer.

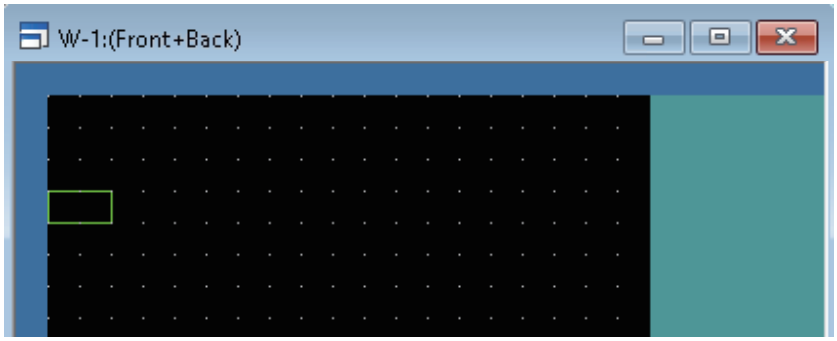


■ Configuring the Screen of the GOT to Display Images

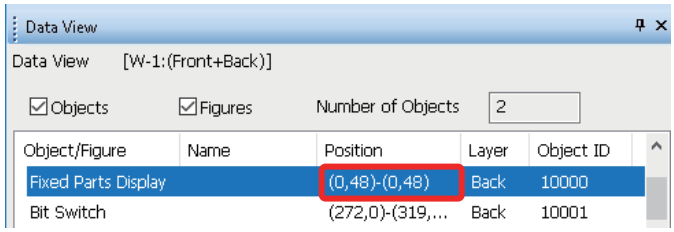
Operating procedure

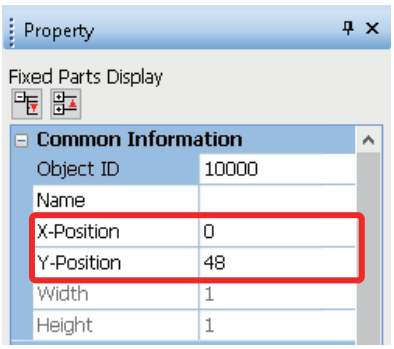
1. Add a new window screen, and then arrange the part display (fixed) in the top left.





From the upper left edge of the part display, ensure a window size of the size of the image to be displayed.
In the window screen, right click. From the menu that appears, select [Resize Screen]. Use mouse operations to adjust the handles of the window screen. Alternatively, select [Screen Property], click [Screen Size], and then change the size using the "Change Window Screen Size" window.
It is possible to check the object arrangement coordinates of the part display by the docking window list or the Properties sheet.





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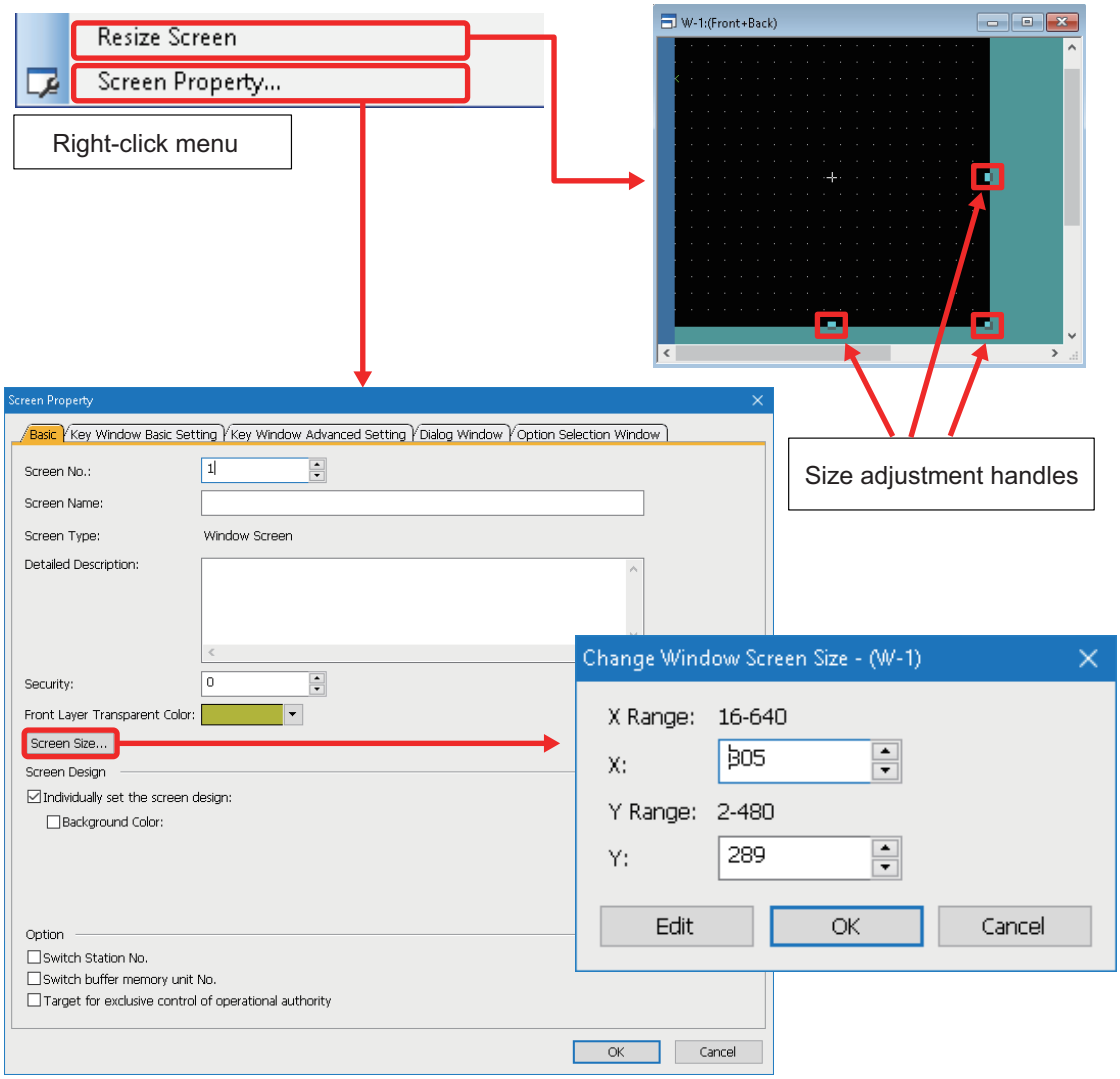
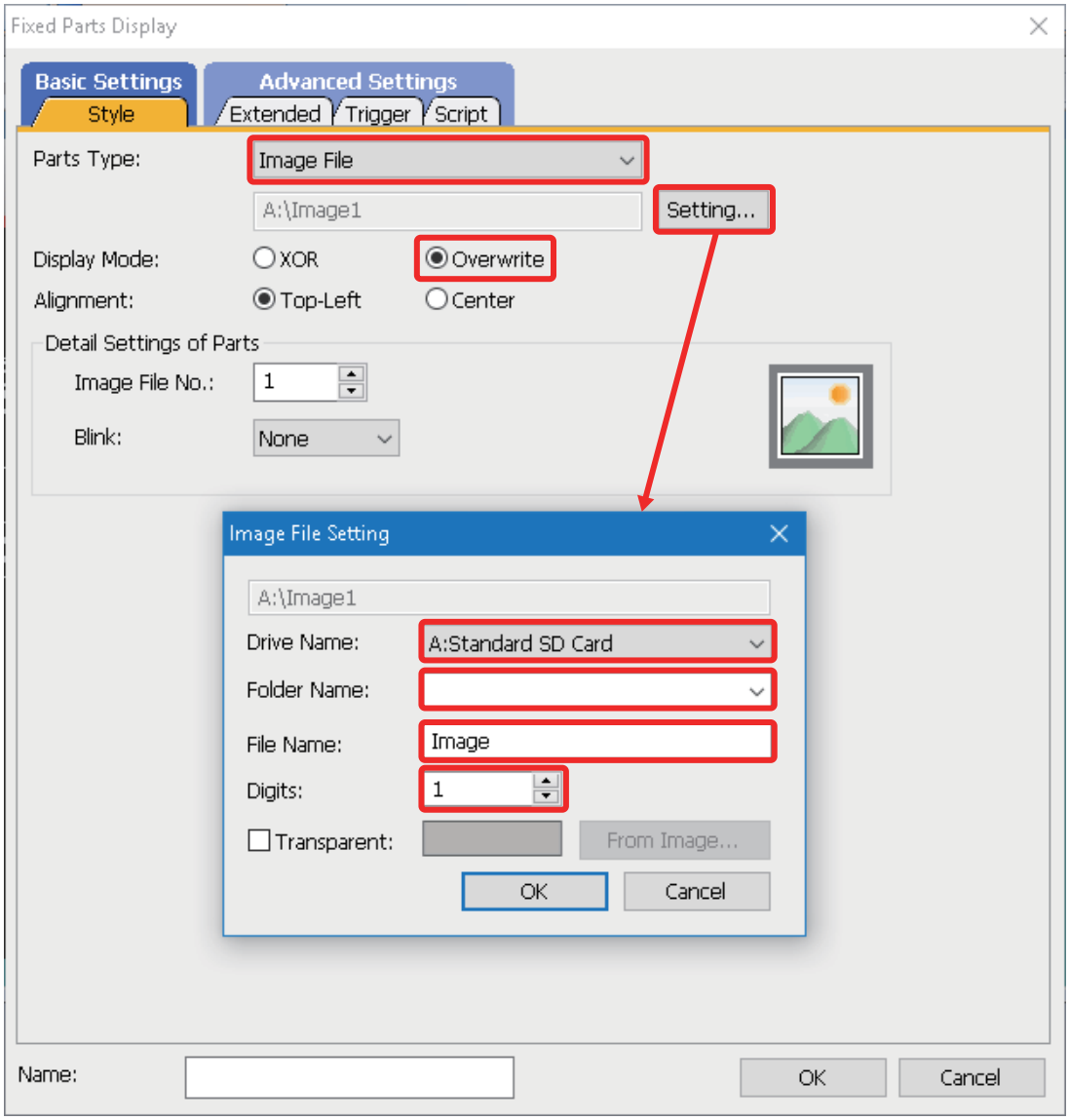

Resize Screen
Screen Property...
Right-click menu
W-1:(Front+Back)
Size adjustment handles
Screen Property
Basic
Key Window Basic Setting
Key Window Advanced Setting
Dialog Window
Option Selection Window
Screen No.:
1
Screen Name:
Screen Type:
Window Screen
Detailed Description:
Security:
0
Front Layer Transparent Color:
Screen Size...
Screen Design
Individually set the screen design:
Background Color:
Option
Switch Station No.
Switch buffer memory unit No.
Target for exclusive control of operational authority
OK
Cancel
Change Window Screen Size - (W-1)
X Range: 16-640
X:
305
Y Range: 2-480
Y:
289
Edit
OK
Cancel

2. Configure the part display so that the images transferred via FTP can be displayed.
Double-click the part display (fixed) to open the Settings screen, and then configure the following settings.



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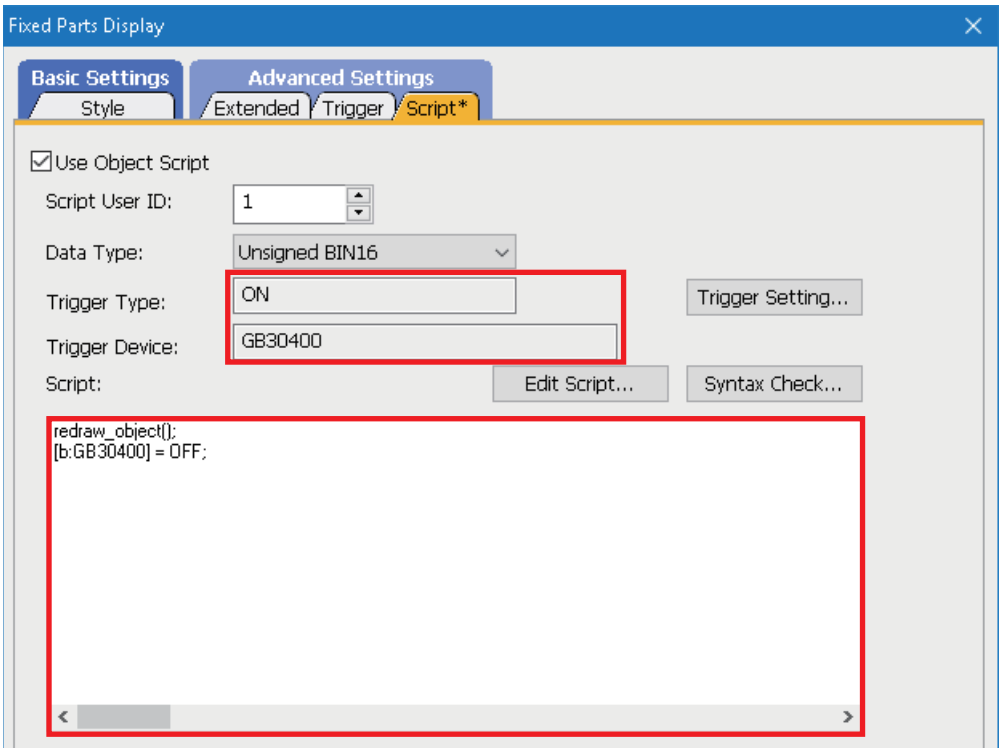
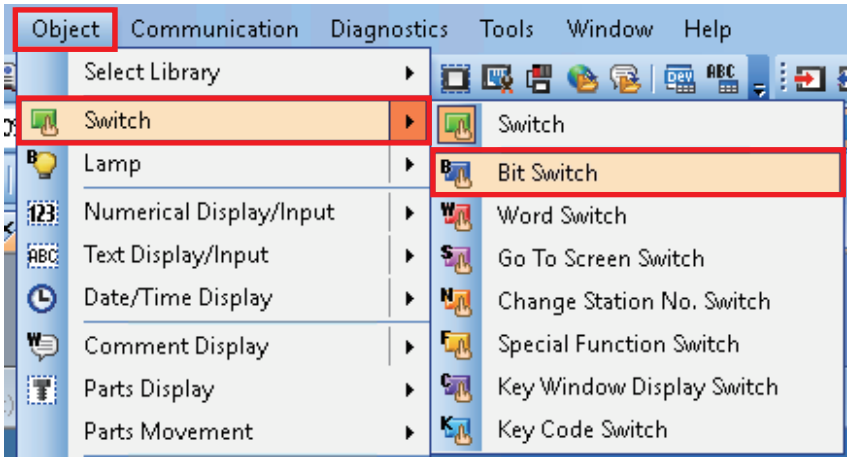
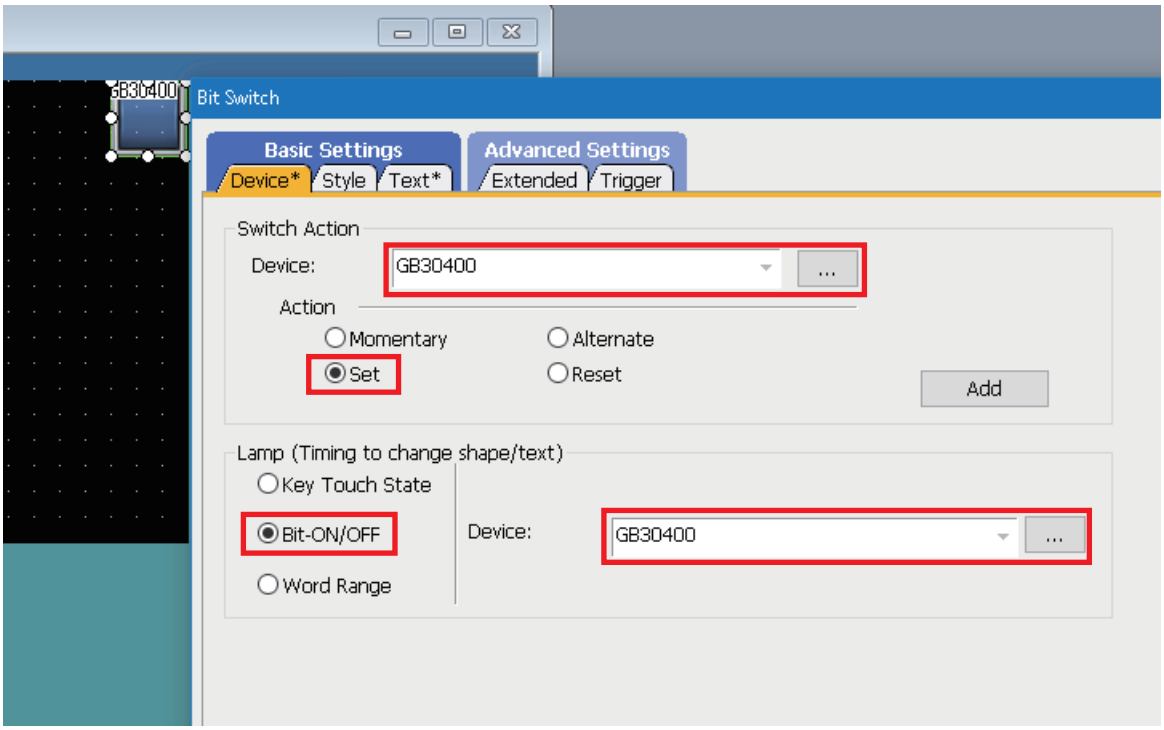
3. Configure an object script for the part display (fixed) object so that images can be updated.
The script is listed below.
redraw_object();
[b:GB30400] = OFF;

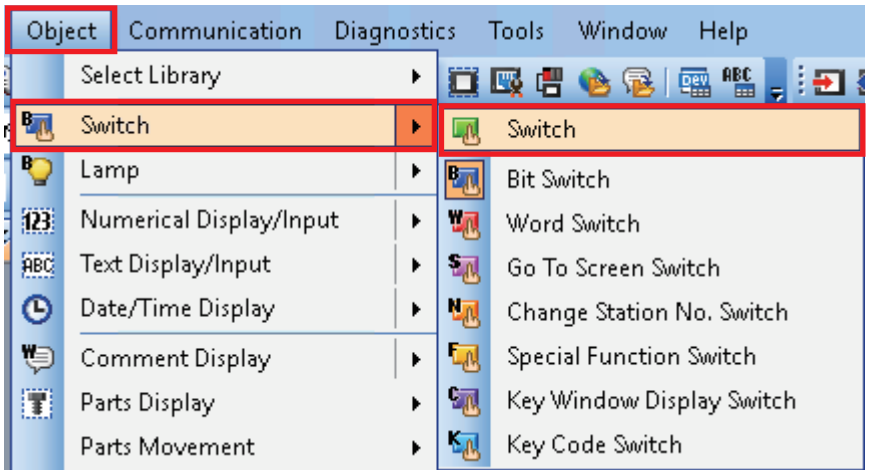


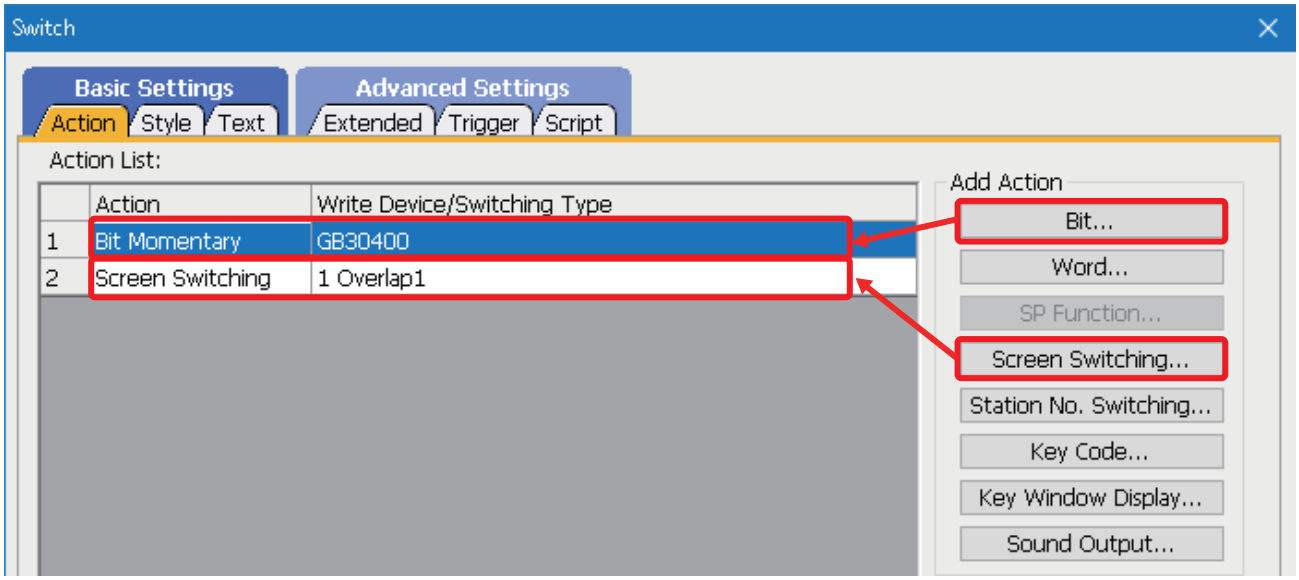
4. Arrange the start switch of the object script on the window screen so the image can be read again at an arbitrary time.
Device: GB30400
Operation setting: Bit set





Configure the switch to open the window screen from the base screen.
At the same time, add an operation to switch ON the bit as well to update drawing.





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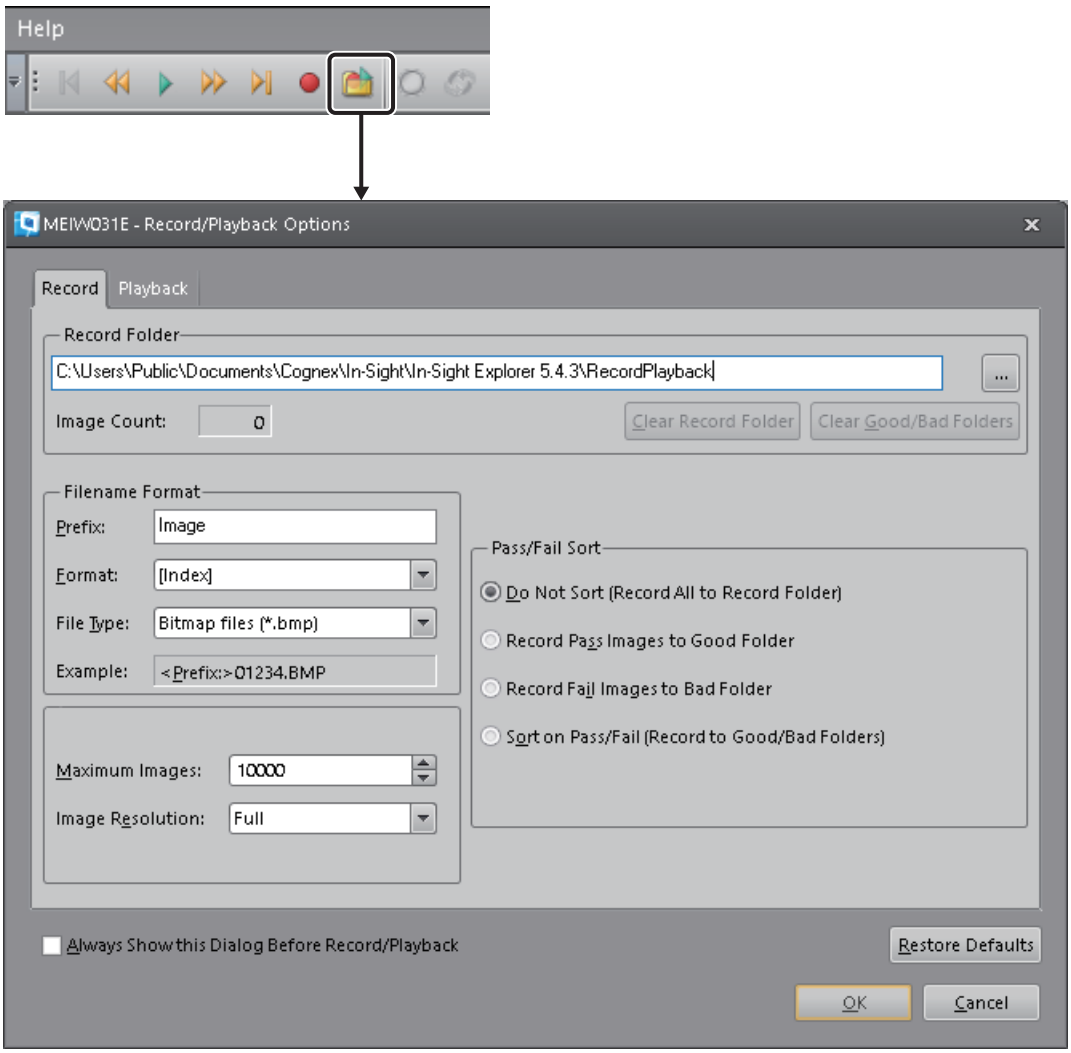
Saving images in a local drive of a personal computer by using In-Sight Explorer

In-Sight Explorer has a function to record images captured automatically to the folder specified at the Record tab of the options of record playback.
This function saves image files when In-Sight Explorer is connected to the camera, and the trigger is switched ON when the [Record] button was pressed.

Operating procedure

1. Open the record playback options and configure the settings.



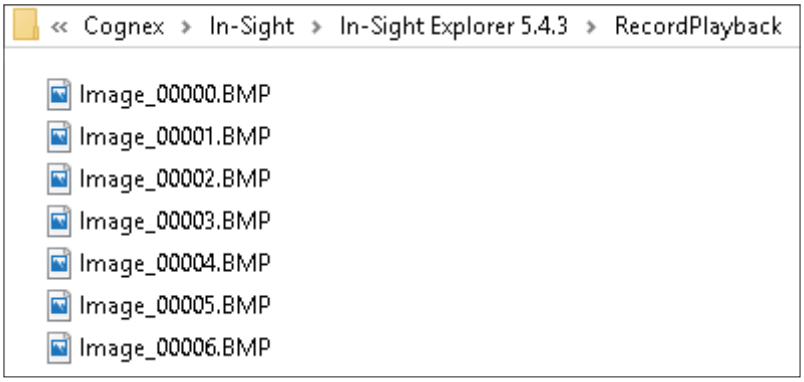
The initial value of the record folder is as follows: C:\ProgramData\Cognex\In-Sight\In-Sight Explorer (Installation version)\RecordPlayback.
It is possible to separate the save destination of passed images and failed images by the PASS/FAIL result.

2. Click the [Record] button to set a recording state.

Before clicking

After clicking (flashing slowly)

If the trigger is switched ON in this state, captured images are stored in the record folder.



If the record folder and playback folder are specified to the same folder, images in the record folder are displayed in order in the PC Filmstrip.

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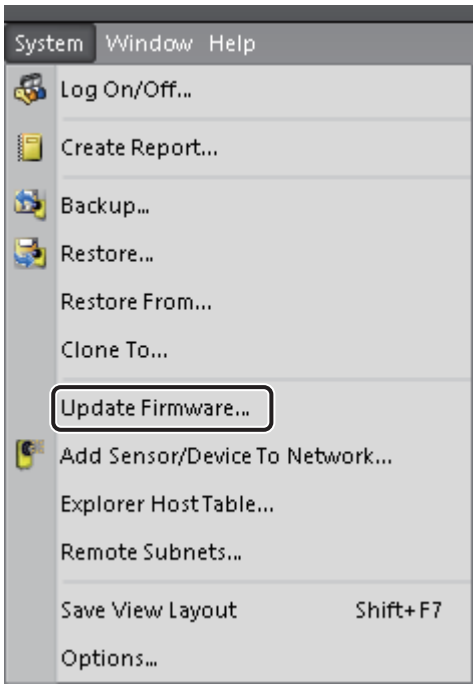
Appendix 3 Updating the MELSENSOR VS Series Firmware

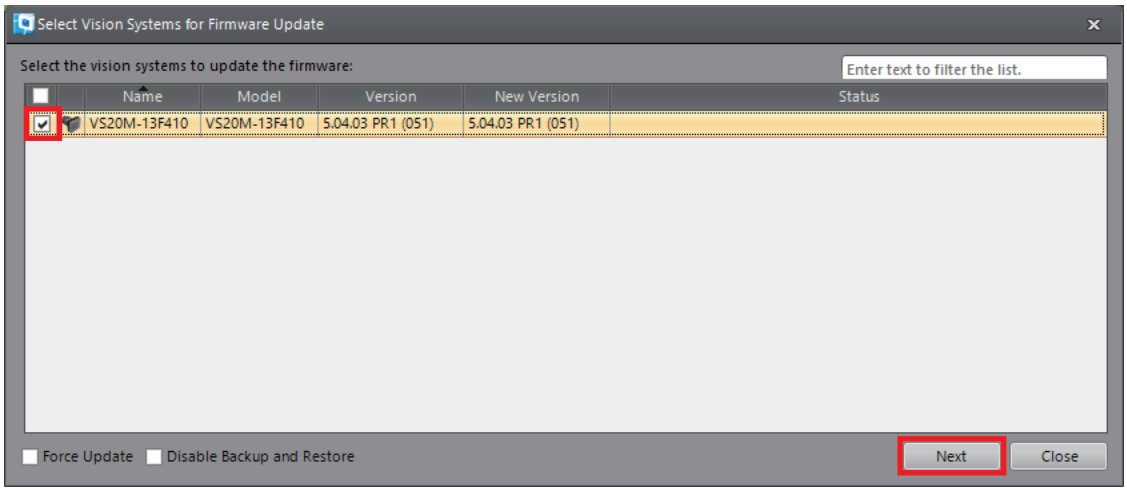
The firmware of the vision sensor is included in In-Sight Explorer.
The firmware update is run by In-Sight Explorer.

Operating procedure

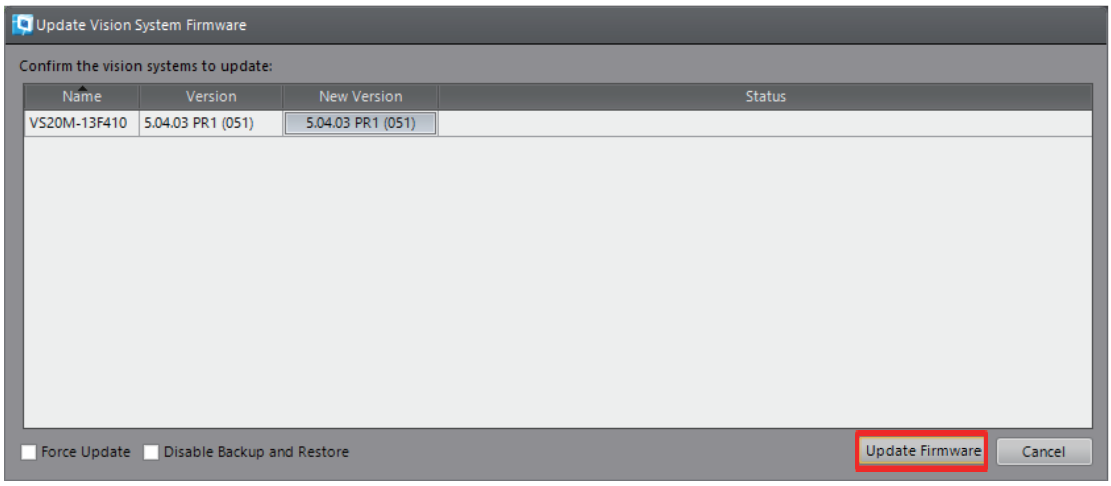
1. From the menu, click [System], and then [Update Firmware].



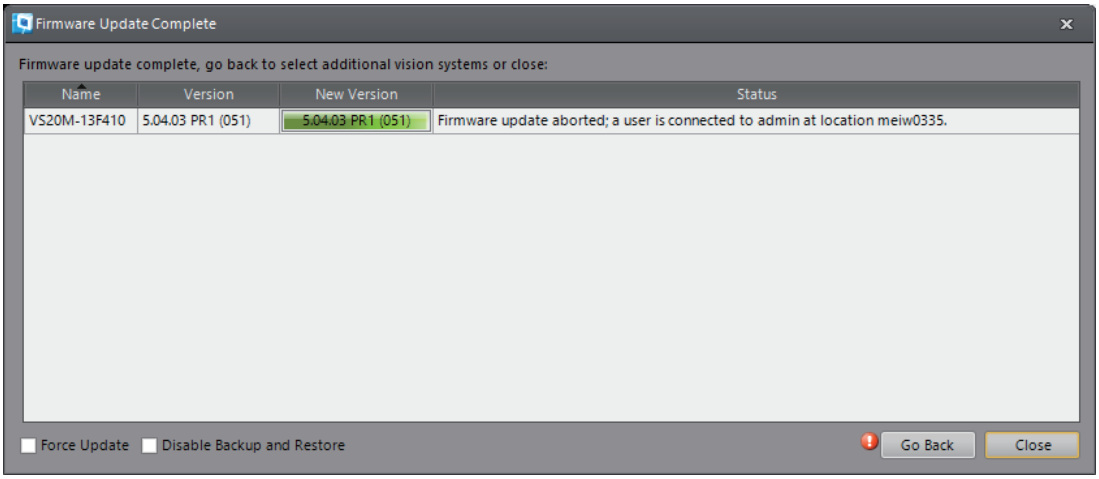
2. Select the vision sensor to be updated, and then click the [Next] button.



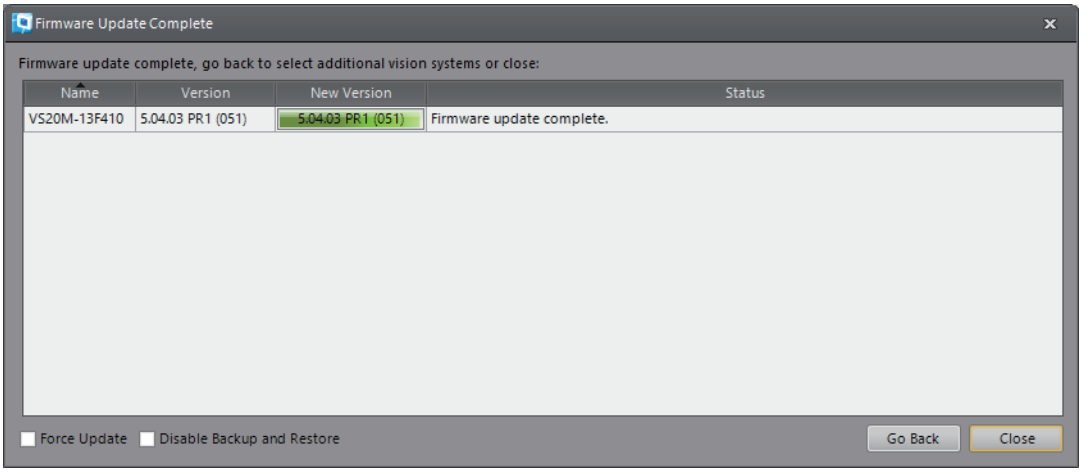
3. Check the vision system to be updated, and then click the [Update Firmware] button.



When In-Sight Explorer is connected to the corresponding vision sensor at this time, the following window appears, and the firmware update is stopped.
Disconnect the vision sensor, and then run the firmware update again.



4. The system is restarted automatically. Wait until the completion screen appears.



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Appendix 4 Manipulating Regions via the Keyboard

Basically all mouse operations are possible during adjustment of vision tool model regions, search regions, and inspection regions. However, it is possible to also use keyboard operations for fine adjustments, such as position adjustment in pixel units and angle adjustments by a single degree.

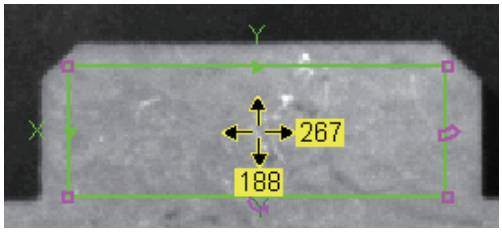
With the region to be edited selected, press F9 on the keyboard.

A state in which movements by key operations are possible appears as shown below.

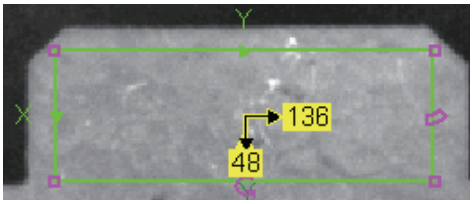
In this state, press the ↓ ← → ↑, Home, PgUp, End, and PgDown keys to make adjustments.

Furthermore, if the F9 key is pressed again, the system switches to scale mode, rotation mode, and bending mode.

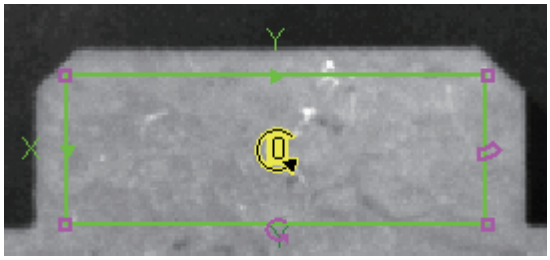
The modes available depend on the shape of the region.



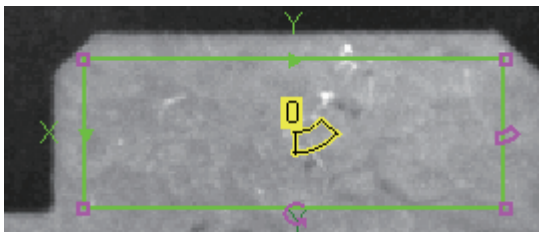
Movement mode



Scale mode



Rotation mode

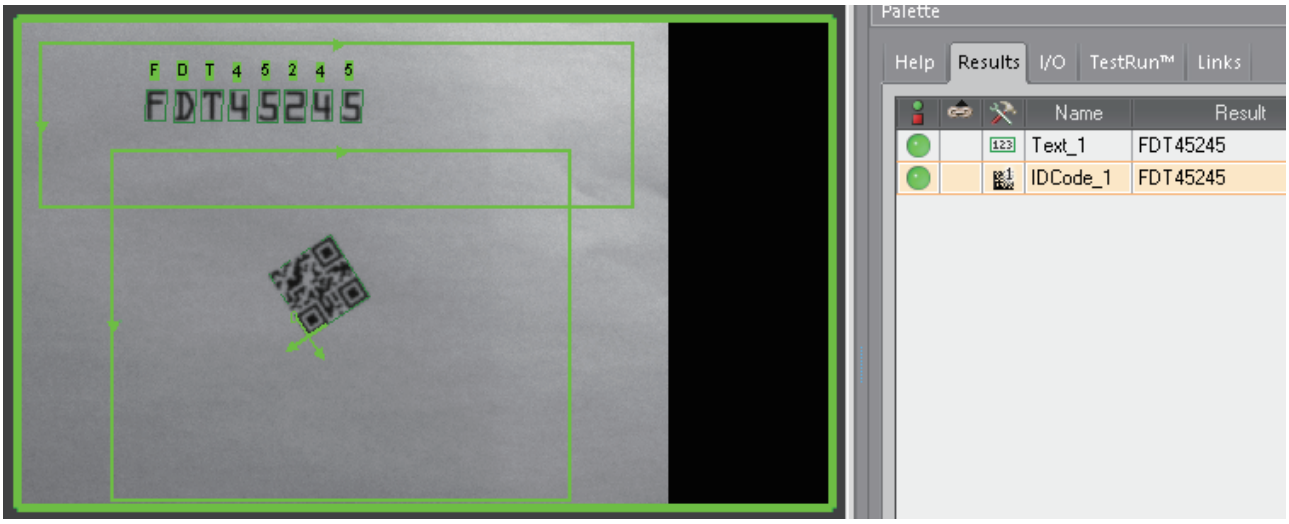


Bending mode

For details of key operations, open the In-Sight Explorer Help section, and then search for "Using interactive graphics mode".

Appendix 5 Using the Output Values of Other Tools for Parameters

If the link function is used, values output by other tools can be used as parameters.
This section describes the link function assuming the following inspections.



- Scanning characters of notation using Read Text (OCRMax)
- Scanning printed 2D codes using 2D code scanning
- Setting the inspection mode to 'Recognize and Compare' in the 2D code scanning settings to verify if the printed character string and 2D code content match

By setting a link, the read result of Read Text (OCRMax) is substituted into the "Match String" of 2D code scanning and the verification stated above is performed.

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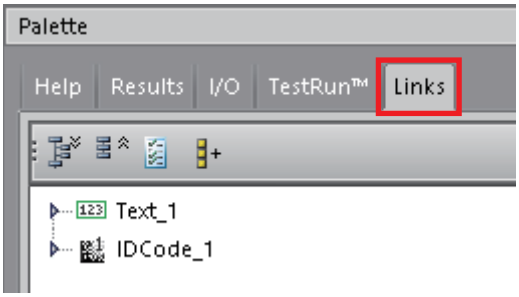
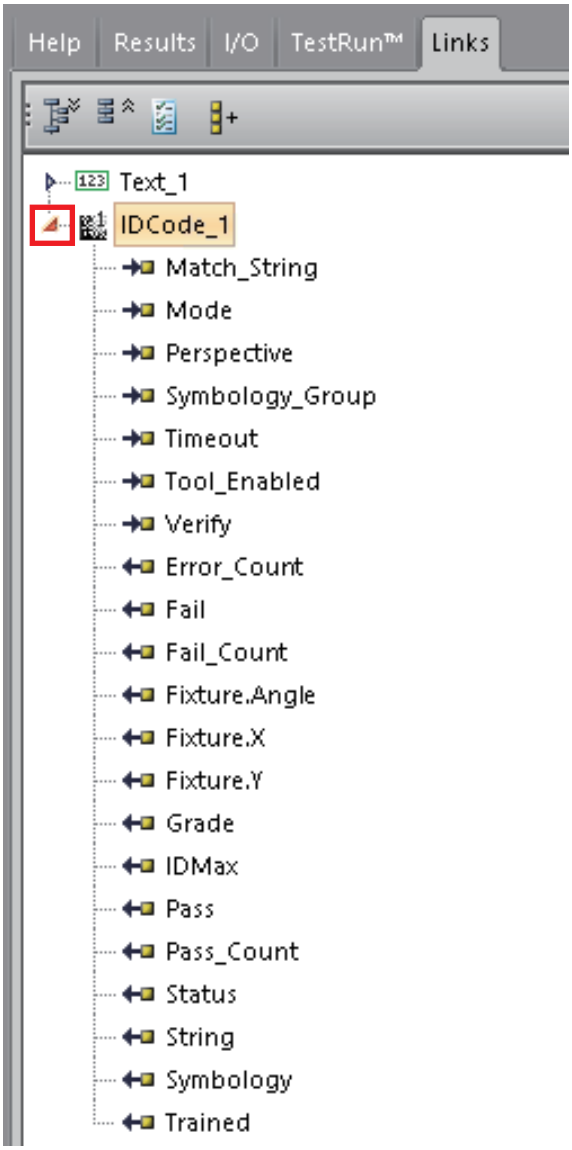
Operating procedure

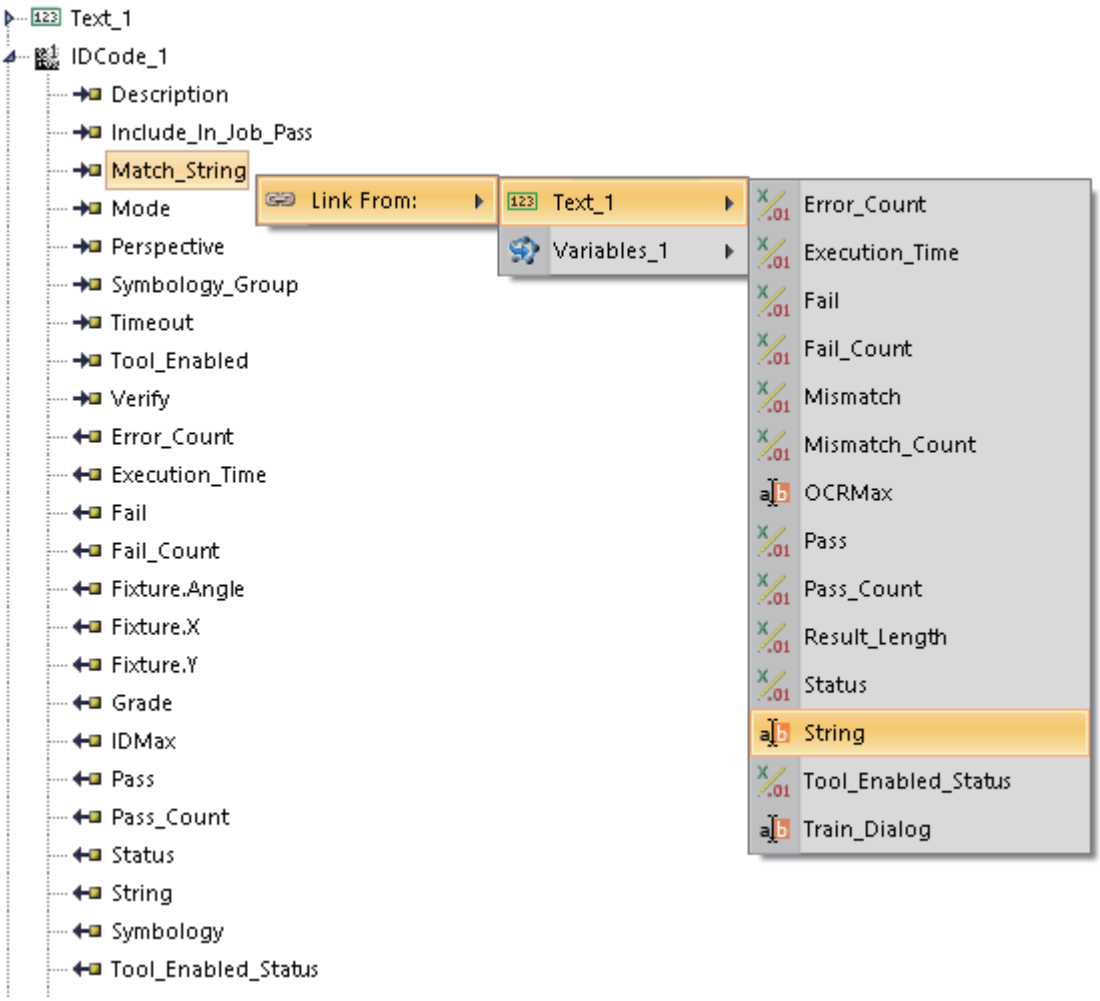
1. Moving to the Link tab
In the Palette, click the [Links] tab.



2. Click the triangle to the left of the tool to be configured to expand it



3. Right click the parameter to be configured, and then click the output value to be linked.



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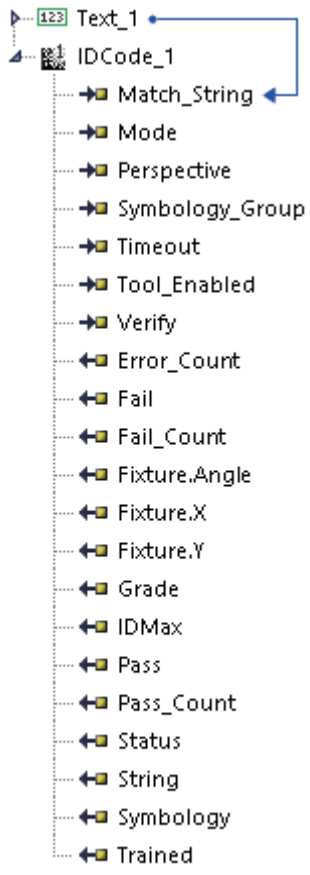
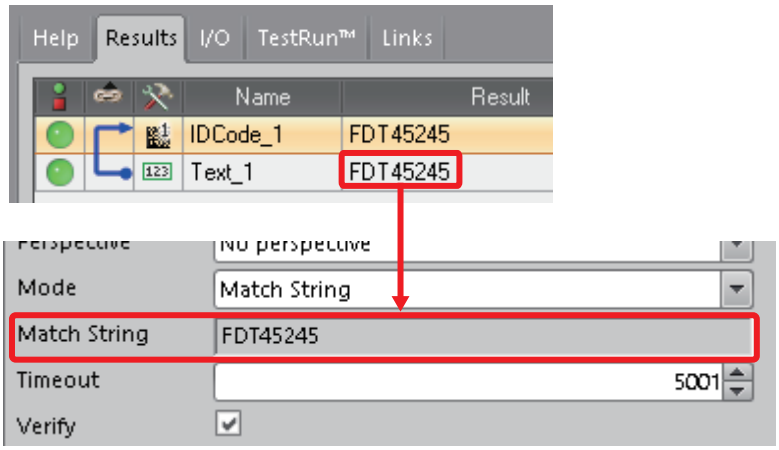
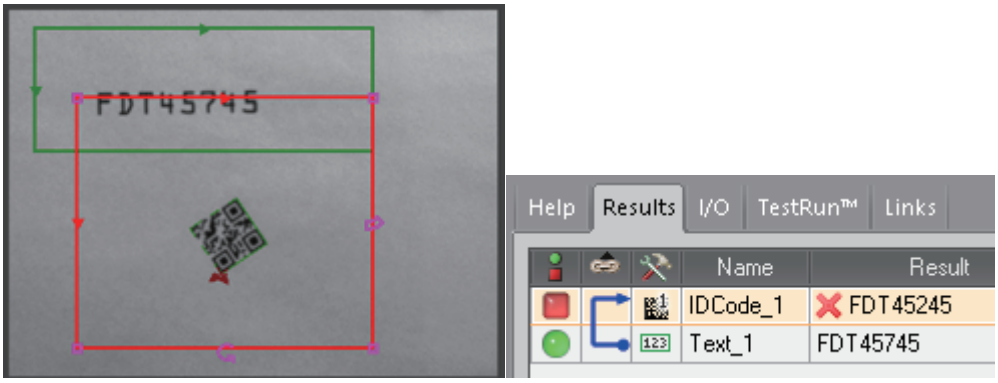
4. A linked status is indicated by a blue line.



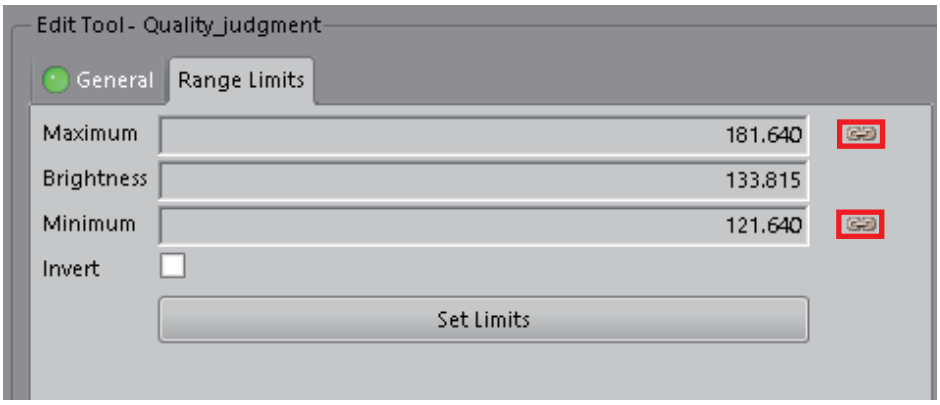
The Read Text (OCRMax) results are reflected in the match character string of 2D code scanning.



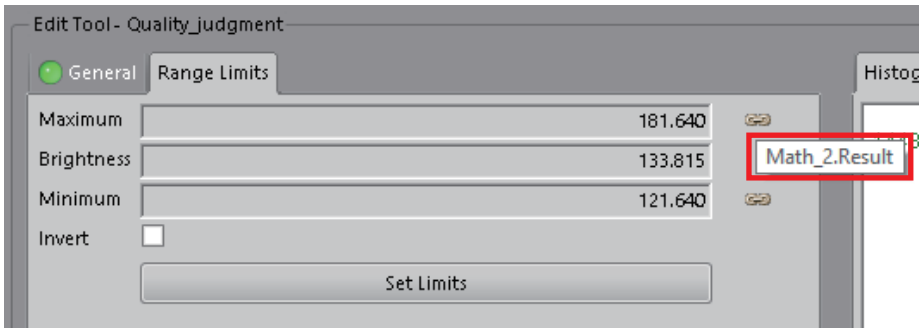
When Read Text (OCRMax) and 2D code scanning results are different, the 2D code scanning tool side configured to the match character string mode is incorrect.



Furthermore, depending on the parameter, link icons are displayed beside linked parameters and the parameters are changed so the manual editing is not possible.



If the cursor is moved over the link icon, it is possible to check the link origin tool and content.



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REVISIONS

*The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
October 2018	BCN-P5999-1065-A	First edition
December 2018	BCN-P5999-1065-B	Partial correction
January 2020	BCN-P5999-1065-C	■Added or modified parts RELEVANT MANUALS, Section 4.2, Chapter 5, Section 5.4
July 2021	BCN-P5999-1065-D	■Added or modified parts SAFETY PRECAUTIONS, CONDITIONS OF USE FOR THE PRODUCT, RELEVANT MANUALS, Section 2.3, Section 3.1

Japanese manual number: BCN-P5999-1016-D

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BCN-P5999-1065-D(2107)

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