Canon

Instruction Manual

CANON INDUSTRIAL IMAGING PLATFORM

Vision Edition

Ver. 1.4

ENGLISH

This Instruction Manual should be read before using the image processing controller.

Important Safety Instructions

Safety Precautions

Robot Operation

⚠ **WARNING**

It shall be the sole responsibility of the installing agent or project managers to carry out a thorough risk assessment of the industrial robot connected to the Canon Industrial Imaging Platform – Vision Edition system and to devise plans to minimize any risks to a level within their tolerance standards.

Introduction

Thank you for purchasing the Canon Industrial Imaging Platform - Vision Edition*. This instruction manual will guide you through installing and setting up the industrial computer where the Vision Edition software is installed, and explain how to use the software. Please read the manual carefully before using the software and retain it for future reference.
For details about how to use devices compatible with this software**, please refer to their respective instruction manuals.

* Might not be available in your country or region.
** Network cameras, industrial cameras, industrial robots, PLC (programmable logic controllers), Power-over-Ethernet (PoE) hubs, etc.

For the latest information on this product, visit the Canon website (📖 214).

Things to Know Before Using the Product

Disclaimer

- This software is not intended for use with medical equipment and systems involving people's lives, food safety management systems or in explosion protection areas. Do not use the software for such purposes.
- In cases such as the following, the software may not be able to capture the target subject or to correctly process the captured image.
  - The target subject surface or its periphery is dark or the camera is installed in a very dark location.
  - The camera is installed on a surface that is not stable.
  - The camera or lens is dirty.
  - The lens surface and target subject surface are not parallel or are misaligned.
  - An object such as a cable is in the line of sight between the camera and target subject.
  - When the following apply to the target subject:
    - There are dirt particles, insects or water droplets on the subject.
    - The setting sun is shining directly on, or is reflected from the subject.
    - Numbers to be recognized are too close, stylized or decorated.
    - The printing is not clear enough.
    - There is too little brightness difference between numbers to be recognized and the background.
    - The subject appears close to the periphery of the image.
  - The shutter speed used is faster than the flickering frequency of artificial light sources.
  - The line of sight between the camera and target subject is often obstructed by crossing people or other objects.
- In cases such as the following, the software may not be able to analyze the processed image, or the resulting analysis may be wrong or inaccurate.
  - When the following apply to the target subject:
    - There is little contrast between subject and background.
    - There is too much stray or reflected light.
    - The subject is reflected on, or is transmitted through mirror surfaces.
    - The subject is too bright due to a saturation of light sources.
    - The subject is flashing on and off.
  - The surroundings are too dark or too bright.
  - When the image is captured using one-shot AF and there is not a subject in the frame with sufficient contrast in brightness or color.
  - When the image is captured while the focus is being adjusted using one-shot AF.
  - When using automatic exposure, if the image is captured while the exposure is being adjusted after the brightness changed suddenly or considerably.
  - When the image is captured using auto white balance and a color light fills the whole frame.

Other factors about the installation conditions or specific usage environment may also affect the results, so be sure to test the system in advance before deploying it for actual use.

- Before using this software, be sure to understand fully its usage conditions and system requirements.
- The customer introducing the system is solely responsible for all network security measures and protecting media devices from viruses.

- Canon shall not be liable, directly or indirectly, for any damage or collateral loss (including loss of business opportunities, loss of profits or business interruptions, loss or corruption of data, etc.) caused by or in connection with the use of this software.

Data Collection

In case of a critical failure, the software will record relevant data. This failure analysis data is collected only for the purpose of providing technical support in such case.

About Third-Party Software

This product includes software developed by third parties.
You can check the license terms of free software used in the product, by clicking [See License Terms] in the [System Settings] menu (📖 195).

Conventions Used in the Manual

- **Important** Important information and restrictions regarding the operation of the software.
- **Note** Additional details and reference information.
- 📖 Reference page within this manual.
- The following terms are used in the manual:
  - "Industrial computer" refers to the computer (hardware) where this software is installed.
  - "Image processing controller" refers to the Vision Edition system as a whole – the industrial computer with the Vision Edition software installed.
  - "Camera" refers to compatible Canon network cameras, Axis Communications (hereafter, "Axis") network cameras and Canon industrial cameras.
  - "Industrial robot" refers to the COBOTTA robot manufactured by DENSO WAVE.
  - "Piece of work" refers to production parts, products or parcels to be captured by the camera and moved by the industrial robot.
  - "PoE hub" refers to commercially available network switching hubs compatible with Power-over-Ethernet technology.
  - "PLC" refers to commercially available programmable logic controllers (robot controllers).
  - "Memory device" refers to commercially available USB flash drives, hard drives and other storage devices.
- Software screenshots in this manual are sample screens for illustration purposes only. The screenshots may differ from the actual screens displayed when using the final product.

Entering Data

To enter characters, use the keyboard or onscreen keyboard.

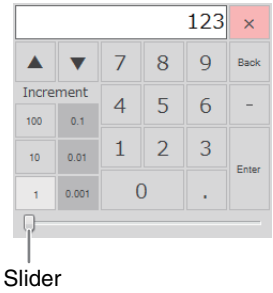
To enter numerical values in most screens, you can use the keyboard, onscreen keyboard, [▲] / [▼] buttons or mouse wheel. Note that a number of functions do not accept all entry methods.

Using the Onscreen Keyboard

Click [⌨] to display the onscreen keyboard. Click ✕ at the top right corner of the onscreen keyboard window to close it.

Using the Value Entry Tool

Double-click within any numerical value field to display the value entry tool. You can use the numeric keypad to enter values or move the slider to adjust values. Click [×] to close the value entry tool.



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Chapter 1

Before Use

This chapter explains what you can do with this software and provides examples of typical network configurations and use cases.

Overview of Vision Edition

You can combine compatible devices with this software to carry out various image inspection and pick-and-place tasks.

Image inspection

You can use Vision Edition with compatible cameras to capture, process and analyze images in order to automate production line tasks that until now required individual visual inspections. For example, count pieces of work, read and check barcodes, read an analog meter, detect a warning light, etc. You can also output result values from the processing of operation units to a connected PLC.

Pick and place

You can use Vision Edition with an industrial robot with a mounted industrial camera in order to move pieces of work or sort them into trays, for example.

Compatible Devices and Databases

The following devices are compatible with this software. In this manual, external databases and database servers will be considered "external devices".

Device	Compatible models
Canon network cameras	VB-S30D / VB-S30D Mk II, VB-H43 / VB-H45, VB-S910F, VB-S30VE, VB-R13 / VB-R13VE
Axis network cameras	P1214, P1224-E, M1065-LW, V5915, M5065, P3905-R Mk II, P3915-R Mk II
Canon industrial camera	N10-W02
Industrial robot	DENSO WAVE's COBOTTA robot (compatible with b-CAP communication over Ethernet)
PLC	Mitsubishi Electric's programmable controllers (compatible with SLMP communication over Ethernet*) Siemens's programmable controllers (SIMATIC S7 series controllers compatible with the Open User Communication standard) OMRON's programmable controllers (compatible with FINS communication over Ethernet)
Databases	Oracle Database systems Microsoft SQL Server systems PostgreSQL systems

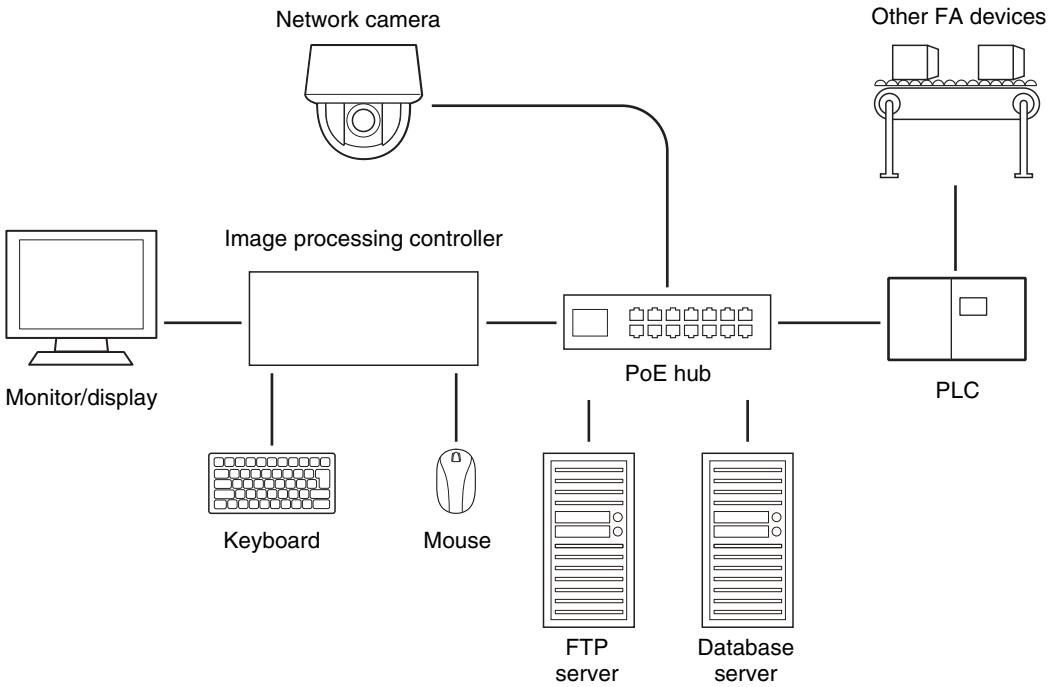
* This software can communicate with devices that support the QnA compatible 3E communication protocol.

Note

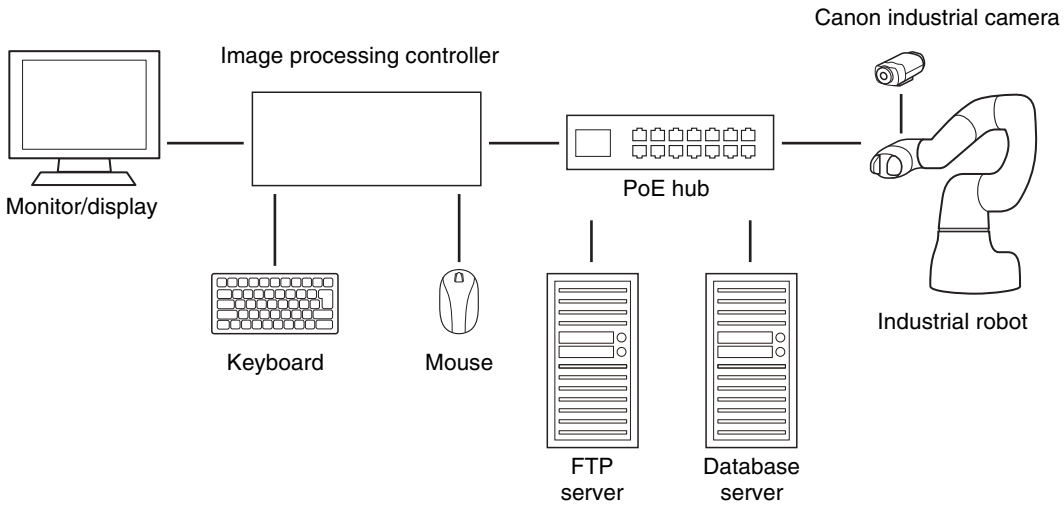
- For details about how to use the compatible devices, refer to their respective instruction manuals.
- For the latest information about industrial computers verified for correct operation, visit the Canon website (214).

Typical Setup Configurations

Image inspection



Pick and place



Installation and Connection

Install the image processing controller and connect it to a power source, PoE hub and monitor. For details about where to install the industrial computer, how to mount it or fix it in place, how to connect the power supply, monitor and other peripheries, and for relevant precautions about connecting the computer, refer to the instruction manual supplied with the industrial computer.

Required Preparations

Before you install and connect the image processing controller, check the devices you plan to use with the Vision Edition system and their connection to the network.

☐ Verify that all the cameras, robot, PLC and PoE hub are correctly installed and configured.

☐ Verify that all the cameras, robot, PLC and PoE hub are correctly connected to the network. Check the IP addresses of each of the devices and note them if necessary.

Note

- The instructions in this manual assume that all the external devices used with this software are already connected to the network and correctly configured.

Installing the Image Processing Controller

Install the image processing controller and connect a display and other peripherals. Be sure to use a display with a resolution of 1024x768 (recommended resolution for using Vision Edition) or better.

Connecting the Image Processing Controller to a PoE Hub

Connect the image processing controller to a PoE hub. For details about setting up the PoE hub and for relevant precautions, refer to the PoE hub's instruction manual.
(Example: Connecting a Siemens's SIMATIC IPC427E)

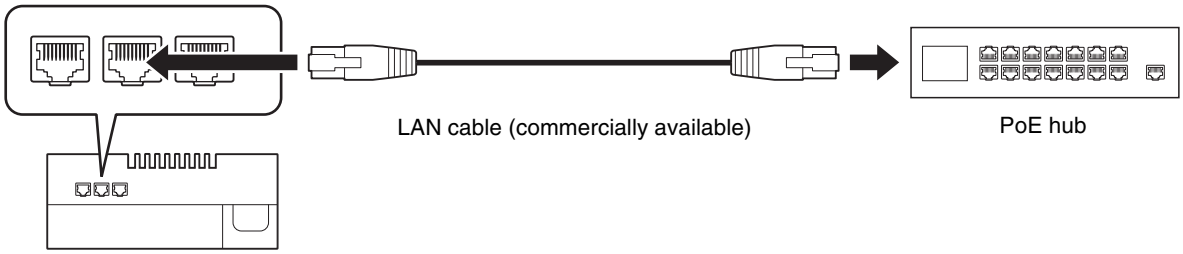


Image processing controller

1 Connect a LAN cable to the image processing controller.

- Connect a commercially available category 6 or better LAN cable to the industrial computer's LAN1 terminal (in the middle).

2 Connect the LAN cable to a PoE hub.

Note

- If the connection between the image processing controller and external devices connected to the PoE hub cannot be established, check that the LAN cable from the PoE hub is connected to the image processing controller's LAN1 (middle) terminal.
- The image processing controller's LAN settings (📖 195) are applied only to the LAN1 (middle) terminal.

Chapter 2

Vision Edition's Main Screen Functions

This chapter introduces the software's main screen and explains the various functions you can operate from it.

Running Vision Edition

Starting up Vision Edition

Vision Edition will start up automatically when you power up the image processing controller. At the end of the booting process, the software's main screen will appear (📖 17).
With the buttons at the right end of the title bar you can maximize/minimize the application's window. You can enlarge the window beyond Vision Edition's resolution (1024x768).

Exiting Vision Edition

- Click the [X] (Close) icon on the top right corner of the window.
- If there is a ⏻ ([Shut Down)] button in the toolbar
  When you click the ⏻ button, you will be prompted to save your settings. Select [Yes] to save your settings, or [No] to not save them. When the confirmation message appears, click [OK].

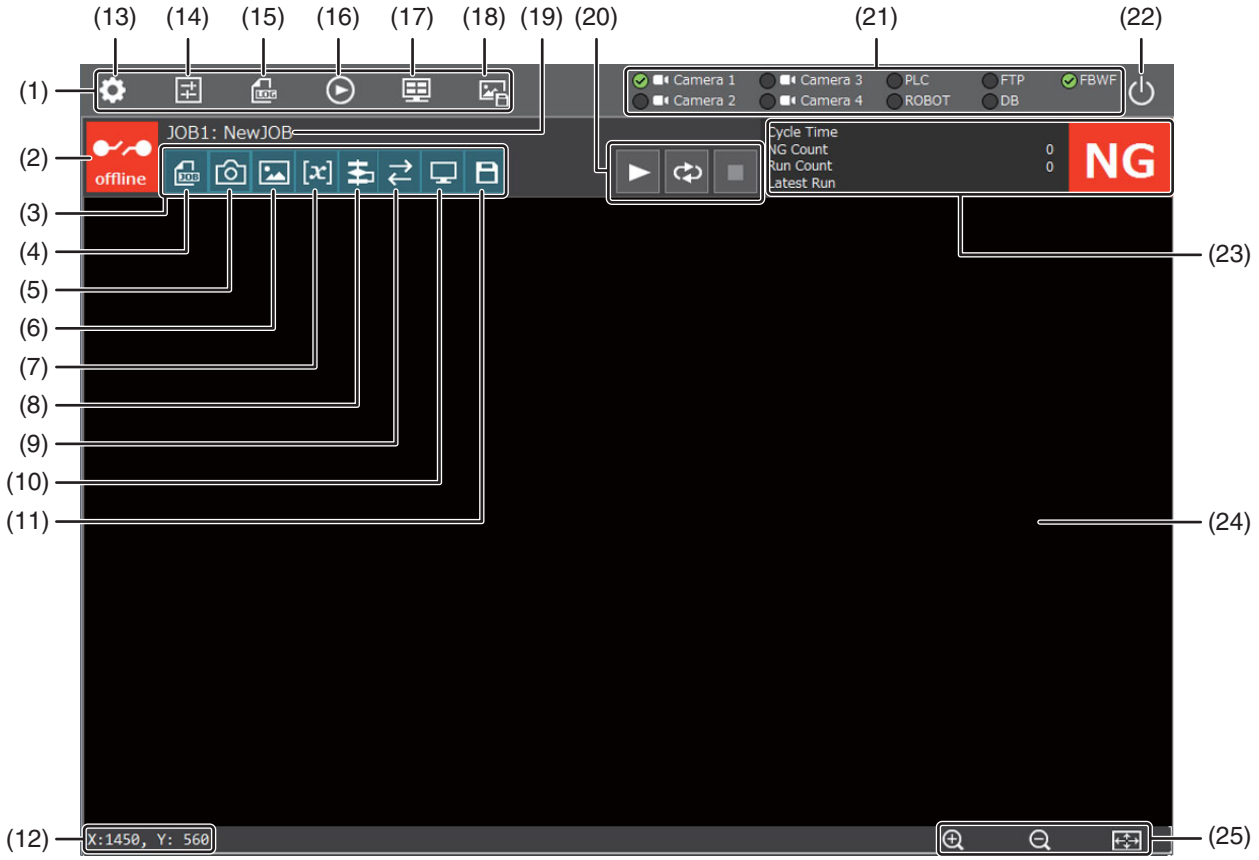
Important

- Do not turn off the image processing controller while data is being processed or saved, or before shutdown has completed. This may result in data corruption or loss.

Note

- The image processing controller is supplied already configured with default network settings (default IP address: 192.168.0.100). You can change the network settings manually if necessary (📖 195).
- All IP addresses use the IPv4 protocol.

Overview of the Main Screen



(1) Main toolbar

(2) System online/offline (📖 85)

(3) Job toolbar

(4) Job settings (📖 21)

(5) Camera settings (📖 26)

(6) Master image settings (📖 32)

(7) Constant settings (📖 35)

(8) Edit flowchart (📖 36)

(9) External data settings (📖 68)

(10) Onscreen information settings (📖 82)

(11) Save the currently selected job's settings

(12) Mouse position coordinates

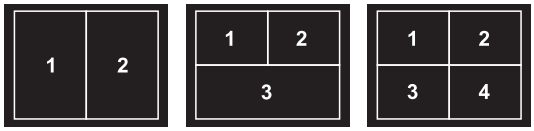
(13) System settings (📖 195)

(14) Main screen display settings (📖 81)

(15) Log record settings (📖 184)

(16) Simulation (📖 200)

(17) Switch screen displays
Depending on the number of cameras connected, the screen will switch automatically to split screen view. Click this button to switch between split screen view and single image view.



2 cameras connected | 3 cameras connected | 4 cameras connected

(18) Save archive images (📖 191)

(19) Currently selected job number and name (📖 25)

(20) Trigger buttons (📖 84)
Single trigger / Continuous trigger / Stop the trigger

(21) Status information icons about external devices and system protection (📖 18)

(22) Shut Down

(23) Flowchart processing status information (📖 85) and judgment result

(24) Image display area

(25) Image size buttons (Enlarge / Reduce / Fit to display area)

Icons displayed in the status information area

Icon/Display		Description
External devices	[Camera]	Camera used for capturing images
	[Camera]	Canon network camera with the event detection function activated (audio detection, moving object detection, etc.)
	[Camera]	Function to use image files from a folder active as a "virtual camera" (26)
	PLC	PLC
	ROBOT	Industrial robot
	FTP	FTP server
	DB	Database
Connection status		Correctly connected
		Connection error
		Not in use

System Protection Indicators

If the image processing controller used is compatible with FBWF or UWF* function (write protection of the C: drive), you will be able protect and unprotect the system (195). The current protection status will be indicated in the status information area as follows.

* FBWF: File Based Write Filter UWF: Unified Write Filter

Icon/Display	Description
FBWF	FBWF / UWF function active. The system is protected and system settings cannot be changed.
UWF	
FBWF	FBWF / UWF function disabled. The system is not protected.
UWF	

Note

- For image processing controllers compatible with the FBWF function, the [Shut Down] button will appear in the toolbar. Make sure to use the [Shut Down] button to exit Vision Edition.

Standard Workflow

The following is the basic workflow for using Vision Edition.

Start up Vision Edition (📖 16)
Power up the image processing controller and wait until Vision Edition launches.

▼

Switch the system offline (📖 85)
If Vision Edition was online when it started, switch the system offline.

▼

Create a new job (📖 21)

▼

Register cameras (📖 26)
Register the cameras that will be used for capturing images.

▼

Configure the cameras (📖 28)

▼

Register master images (📖 32)
Register the images that will be used as reference for comparison when configuring the various operation units.

▼

Set up the necessary external connections (📖 48)
Set up connections with external devices, trigger settings and the output data that will be sent from the image processing controller to the external devices.

▼

Complete other settings as necessary
- Define constants (📖 35) that you can use in the various settings when configuring operation units.
- Configure the main screen's display settings (📖 81).
- Configure other information displayed onscreen (📖 82).

▼

Create a flowchart (📖 36)
Create a flowchart with the steps necessary to complete the desired task.

▼

Configure the operation units (📖 87)
Adjust the operation units' settings as necessary.

▼

Activate the trigger manually to test the flowchart (📖 84)
Activate the trigger and check that the processing of individual operation units and the flowchart as a whole is correctly completed.

▼

Switch the system online (📖 85)
Bring the system online so the image processing controller can start receiving external triggers in real time.

▼

Process the flowchart according to external triggers or manual triggers applied from Vision Edition
Apply external triggers following the external connection settings (📖 49, 56), or apply triggers manually (📖 84), to process the flowchart as necessary.

▼

Check the result values
Check the main screen (📖 85) and log data (📖 186) to check that the flowchart is running as intended and the processing results are correct.

Run simulations (📖 200) and make adjustments as necessary

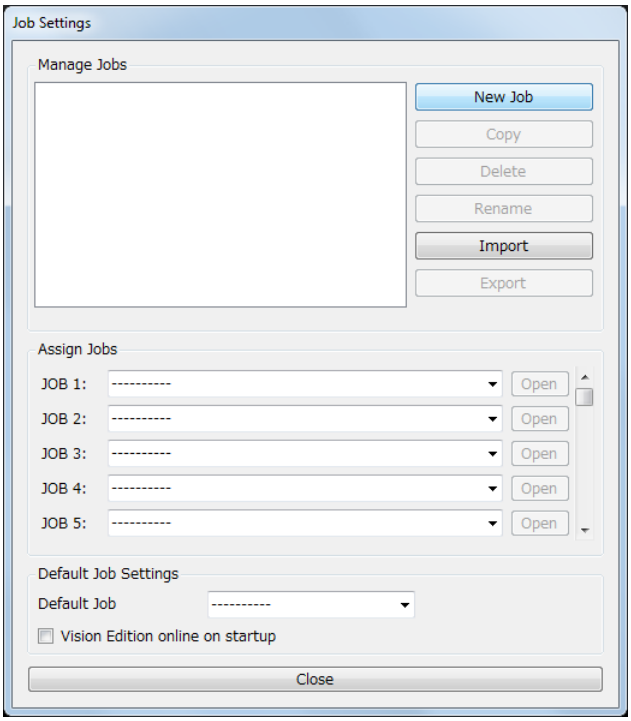
If you are not obtaining the expected results, switch the system offline and try the following.

- Run additional simulations.
- Change the operation units' settings.
- Apply manual triggers to test the processing of the operation units and flowchart after adjusting the settings.

Creating Jobs

A 'job' is the set of all the steps and operations required to complete a pick and place or image inspection task with the Vision Edition system. When creating a new job, you will specify the cameras and master images to be used, create a flowchart and set up external data transfers as necessary in order to define the operations that you want the industrial robot and cameras to perform. You can create different jobs tailored for different inspection tasks or pieces of work and easily switch between them as necessary.

Click ([Job Settings]) in the job toolbar to open the [Job Settings] window.



Creating a Job

When creating a new job, you can select [New Job] and create a flowchart from the beginning, or select one of the preset jobs and use it as a template. Preset jobs offer a suggested typical flowchart using sample master images that you can then adjust to match your actual conditions.

Preset Jobs

[Pick (Random), Place (Fixed)]
The industrial robot will pick pieces of work laid randomly and place them in predetermined locations.

[Pick (Random), Palletize (No Check)]
The industrial robot will pick pieces of work laid randomly and place them in a container, filling the container's compartments in order.

[Pick (Random), Palletize (+Precheck)]
The industrial robot will pick pieces of work laid randomly and place them in a container, using the camera to check the next empty compartment before placing the piece of work.

[Pick (Random), Place (Sorting)]
The industrial robot will pick pieces of work laid randomly and sort them into containers based on the recognized type of piece of work.

[Pick (Fixed), Place (Fixed)]
The industrial robot will pick pieces of work from preset positions and place them in preset positions.

[Pick (+Corr), Place (+Corr)]
The industrial robot will use the camera to find pieces of work laying close to preset positions, pick them and place them in preset positions.

[Pick (Fixed), Palletize (No Check)]
The industrial robot will pick pieces of work from preset positions and place them in a container, filling the container's compartments in order.

[Depalletize, Place (Fixed)]
The industrial robot will pick pieces of work from compartments in a container and place them in preset positions.

[Depalletize, Palletize (No Check)]
The industrial robot will pick pieces of work from compartments in a container and place them in another container, filling the container's compartments in order.

[Depall (+Corr), Palletize (+Check)]
The industrial robot will use the camera to find pieces of work inside compartments in a container and place them in another container, using the camera to check the next empty compartment before placing the piece of work.

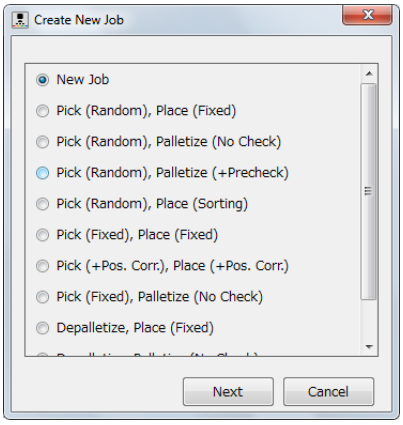
[Auto Read Multiple Codes (Random)]
The network camera* will capture all the pieces of work and detect randomly positioned features. Then, the camera will adjust the pan/tilt/zoom (PTZ) to those features and read detected codes.

[Auto Read Multiple Codes (Grid)]
The network camera* will capture neatly arranged pieces of work and divide a predetermined area in a grid composed of cells. Then, the camera will adjust the pan/tilt/zoom (PTZ) to each cell to read detected codes.

* Requires a Canon network camera capable of pan, tilt and zoom (PTZ) operations.

1 Click [New Job].

- You can also open the context menu in an empty area of the [Manage Jobs] list and select [New Job].
- Right-click with the mouse to open the context menus. The options shown in the context menu will depend on the location of the mouse pointer when you clicked.



2 Select [New Job] or one of the preset jobs.

(1) Click [Next].

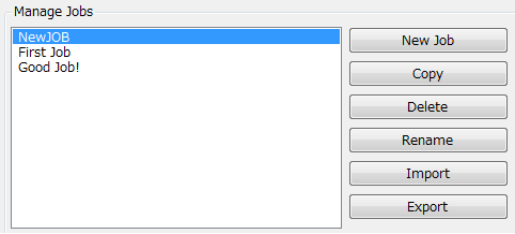
(2) Enter a name for the new job.
The default job name is the same as the option selected in the [Create New Job] dialog box. If a job already exists with the job name entered, the job name will appear in red and you will not be able to click [OK] to confirm.

3 Click [OK].

- The newly created job will appear in the job list under [Manage Jobs].

Managing Jobs

You can copy, delete or rename the jobs you created. You can also import and export job files.



Copying a Job

1 Select the desired job and click [Copy].

- You can also open the context menu on the desired job and select [Copy].

2 Enter a name for the new job.

- By default, "(copy)" is added to the name of the job that was selected as source.
- If a job already exists with the job name you entered, the job name will appear in red.

3 Click [OK].

Deleting a Job

1 Select the desired job and click [Delete].

- A confirmation message will appear.
- You can also open the context menu on the desired job and select [Delete].

2 Click [OK].

Renaming a Job

1 Select the desired job and click [Rename].

- You can also open the context menu on the desired job and select [Rename].

2 Enter the desired name.

- If a job already exists with the job name you entered, the job name will appear in red.

3 Click [OK].

Importing a Job

1 Click [Import].

- You can also open the context menu in an empty area of the [Manage Jobs] list and select [Import].

2 Select the job file.

- Select the job file (.cve file) you wish to import and click [Open].
- If a job already exists with the imported job's name, a confirmation message will appear. Click [OK] to overwrite the existing job.
- When the job is correctly imported, a completion message will be displayed.

3 Click [OK].

Exporting a Job

1 Select the desired job and click [Export].

- You can also open the context menu on the desired job and select [Export].

2 Open the destination folder, enter the desired file name and then click [Save].

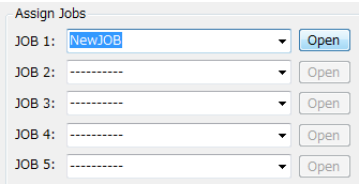
3 Click [OK].

Opening a Job

After creating a job, you can assign it to an available job number and open it to edit or process it.
After opening a job you can edit the flowchart, register cameras, master images and constants, set the communication with external devices and bring the system on- or offline. Only one job can be open at a time.

1 Select the desired job number and assign a job to it.

- Select the desired job from the pulldown menu.



2 Click [Open].

- The selected job will open and the main screen will be displayed again.
- The current job's number and name will be appear above the toolbar.

3 To open a different job, click ([Job Settings]) in the job toolbar.

- A confirmation message will appear. Click [Yes] to save any changes made to the current job or [No] to discard the changes. The [Job Settings] window will then open.
- You can also click [Cancel] to return to the main screen without changing the active job.

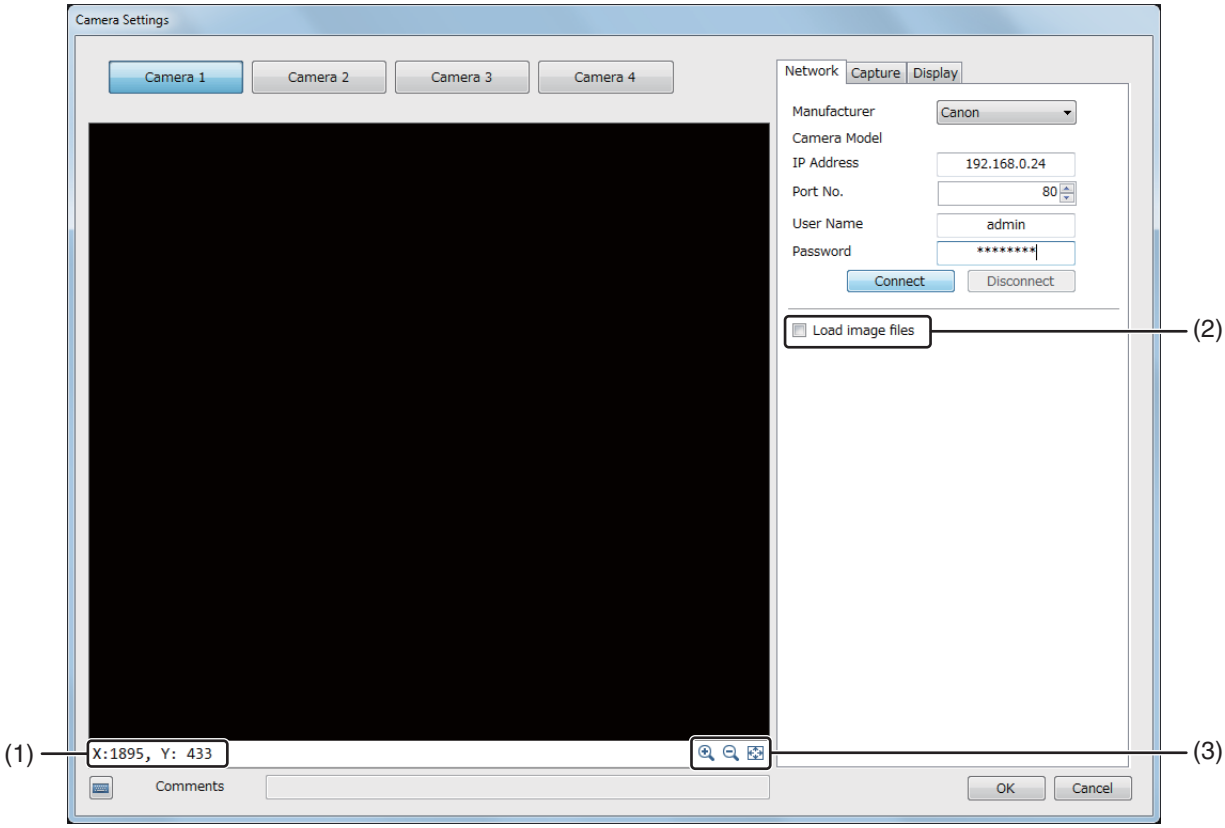
Note

- In the [Job Settings] screen you can also select a job opened by default when the software starts ([Default Job]) and make it so the system will start up automatically in online mode.

Registering Cameras

Register in advance the camera(s) that will be used to capture images. These images will then be processed and analyzed to detect pieces of work and carry out various other inspection tasks. You can register up to 4 cameras individually for each job.

Click ([Camera Settings]) in the job toolbar to open the [Camera Settings] window.



(1) Mouse position coordinates

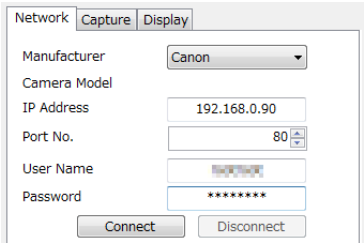
(2) [Load image files] checkbox
Place a checkmark in the box to set this as a "virtual camera", using image files instead of capturing images (33, 103).

(3) Image size buttons (Enlarge / Reduce / Fit to display area)

Registering a Camera

1 Click on one of the buttons [Camera 1] to [Camera 4].

- Make sure to register the Canon industrial camera attached to the industrial robot as [Camera 1].



2 Select the [Network] tab, select the camera's manufacturer and then enter the camera's IP address, port number, user name and password.

- Click [IP Address], [Port No.], [User Name] and [Password] and enter the information used to connect the camera to the network.
- Enter the IP address as four numbers separated by periods.
- The default IP address of the Canon industrial camera is 192.168.0.90.
- If necessary, consult the system administrator who installed the camera.
- The camera's IP address cannot be changed from Vision Edition.

3 Click [Connect].

- When the connection to a compatible camera (📖 12) is established, the camera model will be displayed and the camera's image will appear in the image display area.
- Cameras not compatible with Vision Edition cannot be registered.

4 Click [OK].

Note

- When a P1214 or P1224-E Axis network camera is connected, the displayed model name will be [AXIS P12/M20].
- To delete the settings of a camera previously registered in Vision Edition, select the camera you want to remove and click [Disconnect].

Changing Camera Settings

You can change various settings (focus, exposure, white balance, etc.) that affect the captured image. Available settings, default values and setting ranges will vary depending on the camera used. Refer also to the camera's instruction manual. Functions and options not supported by the selected camera may appear grayed out or may not appear at all.

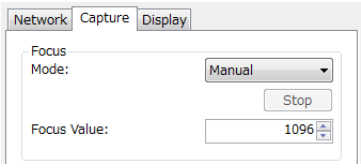
Note

- This manual uses the setting names found in Canon network cameras and Canon industrial cameras. Function names used in the manual such as [Mode] and [Aperture] may differ from those in the connected camera.
- In Axis network cameras, the names of modes are in English only.

Adjusting the Focus

Select the focus mode and adjust the focus as necessary.

1 In the [Camera Settings] window (📖 26), select the [Capture] tab, click [Mode] under [Focus] and select the focus mode.



- [Auto] is available only for Canon network cameras compatible with automatic focus.

[Auto]
The camera will focus automatically (AF).

[Manual]
Enter a focus value to focus manually.

[One-Shot AF]
The camera will focus automatically one time only. The focus mode will then change automatically to [Manual].

[Closer] / [Farther]
The lens will start moving in the selected direction. To stop adjusting the focus, click [Stop]. The focus mode will then change automatically to [Manual].

[Infinity]
Fix the lens at the farthest focusing distance (infinity end).

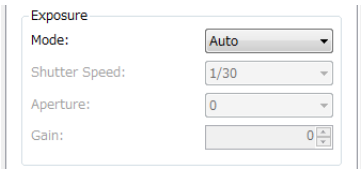
2 When the focus mode is set to [Manual], click [Focus Value] and enter the desired value.

3 Click [OK].

Adjusting the Exposure

To adjust the exposure you can select the exposure compensation mode and/or set a shutter speed, aperture or gain value.

1 In the [Camera Settings] window (📖 26), select the [Capture] tab, click [Mode] under [Exposure] and select the exposure mode.



- [Auto (No Flckr)], [Auto (No Flckr2)], [Auto (S Pri./Tv)] and [Auto (A Pri./Av)]) are available only for Canon network cameras.
- If you selected [Auto], skip to step 5.

[Auto]
The camera will adjust the shutter speed, aperture and gain automatically as necessary.

[Auto (No Flckr)]
This setting reduces the uneven image brightness that can be caused when capturing images under fluorescent lights. The shutter speed is adjusted automatically depending on the surrounding brightness.

[Auto (No Flckr2)]
Use this setting when using the [Auto (No Flckr)] option cannot sufficiently reduce the uneven image brightness. Note that the shutter speed is adjusted automatically to 1/100 second or slower, so the camera may not be able to obtain the correct exposure (captured images may be too bright).

[Auto (S Pri./Tv)]
The camera will automatically adjust the gain and aperture to match the shutter speed you selected.

[Manual]
Control the exposure manually by setting the shutter speed, aperture and gain.

[Auto (A Pri./Av)]
The camera will automatically adjust the gain and shutter speed to match the aperture value you selected.

2 Click [Shutter Speed] and select the desired shutter speed.

3 Click [Aperture] and enter the aperture value.

- If the camera does not support manual aperture adjustment, this setting will be grayed out.

4 Click [Gain] and enter the gain value.

5 Click [OK].

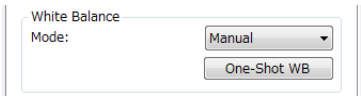
Adjusting the White Balance

Depending on the type of lighting used where the camera is located, the colors in captured images may seem unnatural. In such case, select the appropriate white balance mode or change the lighting used in the actual location so white objects appear truly white.

Selecting a White Balance Mode

Adjust the white balance simply by setting the most appropriate white balance mode. Only [Manual] mode is available for Canon industrial cameras.

1 In the [Camera Settings] window (📖 26), select the [Capture] tab, click [Mode] under [White Balance] and select a white balance mode other than [Manual].



[Auto]
The camera will adjust the white balance automatically.

[Sodium], [Halogen], [Mercury], [Fluor. Warm], [Fluor. Cool], [Fluor. Day]
The white balance is adjusted automatically for environments illuminated by the corresponding type of lamps or fluorescent lights.

2 Click [OK].

Setting the White Balance According to a Captured Image

Capture an image of a standard white object under the actual conditions of use and have the software set the most appropriate white balance. This is available only for Canon cameras compatible with the one-shot WB function.

1 Select the [Capture] tab, click [Mode] under [White Balance] and select [Manual].

[Manual]
You can adjust the white balance manually.

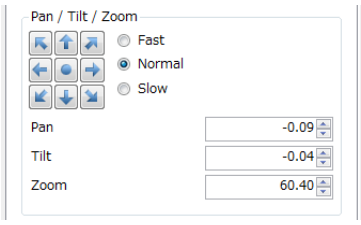
2 Set a standard white object so it covers the whole image display area and then click [One-Shot WB].

- The camera will adjust the white balance automatically one time only.

3 Click [OK].

Moving the Camera and Zooming

When a compatible camera is connected, you can zoom in/out and move the camera left/right (panning) or up/down (tilting).



1 In the [Camera Settings] window (26), select the [Capture] tab and, under [Pan / Tilt / Zoom], select the camera operation speed.

- You can select [Fast], [Normal] or [Slow].

2 Pan or tilt the camera as necessary.

- Click and hold the arrow button of the desired direction. The camera will move until you release the mouse.
- Alternatively, you can enter values for [Pan] and [Tilt].

3 Click [Zoom] and enter the desired value.

- The camera will zoom in/out according to the entered values.
- The amount that the camera zooms depends on the camera manufacturer.

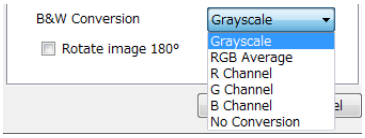
4 Click [OK].

Note

- When the selected camera is compatible with pan/tilt/zoom functions, you can click [●] when the camera is not moving to bring the camera to its default initial position.
- You can adjust the pan/tilt/zoom using also the slider of the value entry tool (5).

Other Image Adjustments

Images captured by the camera are converted to B&W (monochrome) images using a conversion method you can select. You can also turn the image upside down (rotate it 180°).



1 In the [Camera Settings] window (26), select the [Capture] tab, click [B&W Conversion] and select the desired option.

- A preview image illustrating the selected conversion method will be displayed in the image display area.

[Grayscale]
The captured image is converted into a grayscale image with 256 gradation levels (0 to 255).

[RGB Average]
The captured image is converted into a grayscale image with a number of gradation levels that is the average of the gradation levels in the R (red), G (green) and B (blue) channels.

[R Channel]
The captured image is converted into a grayscale image using only the gradation levels of the R (red) channel.

[G Channel]
The captured image is converted into a grayscale image using only the gradation levels of the G (green) channel.

[B Channel]
The captured image is converted into a grayscale image using only the gradation levels of the B (blue) channel.

[No Conversion]
The captured image is not converted into a monochrome image. This option is used only for the camera used in a [Color Detection] operation unit (📖 153).

2 To rotate the image upside down, place a checkmark in the [Rotate image 180°] box.

Note

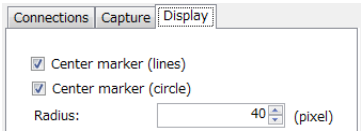
- When the camera is used in image processing units other than [Color Detection], be sure to select one of the options that do convert the image to B&W (any option except [No Conversion]).
- If the image from an Axis network camera does not convert the image to B&W as intended, use Axis's software to set the network camera to constantly capture in color. For example, set the IR cut filter to on.

Displaying Markers

You can select various markers (guide lines) that will appear in the image display area.

1 In the [Camera Settings] window (📖 26), select the [Display] tab and place a checkmark in the [Center marker (lines)] box.

- Horizontal and vertical lines will appear on the image display area indicating the center.

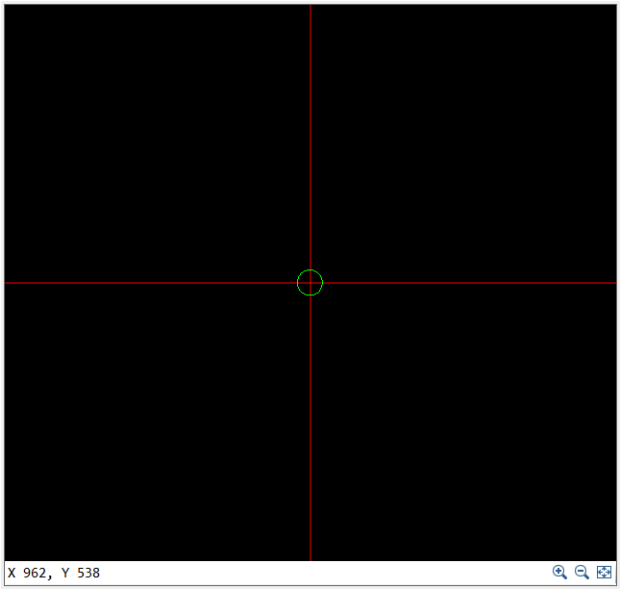


2 To display a center circle, place a checkmark in the [Center marker (circle)] box.

- A circle will appear around the center of the image display area.

3 To change the size of the circle, click [Radius] and enter the desired value.

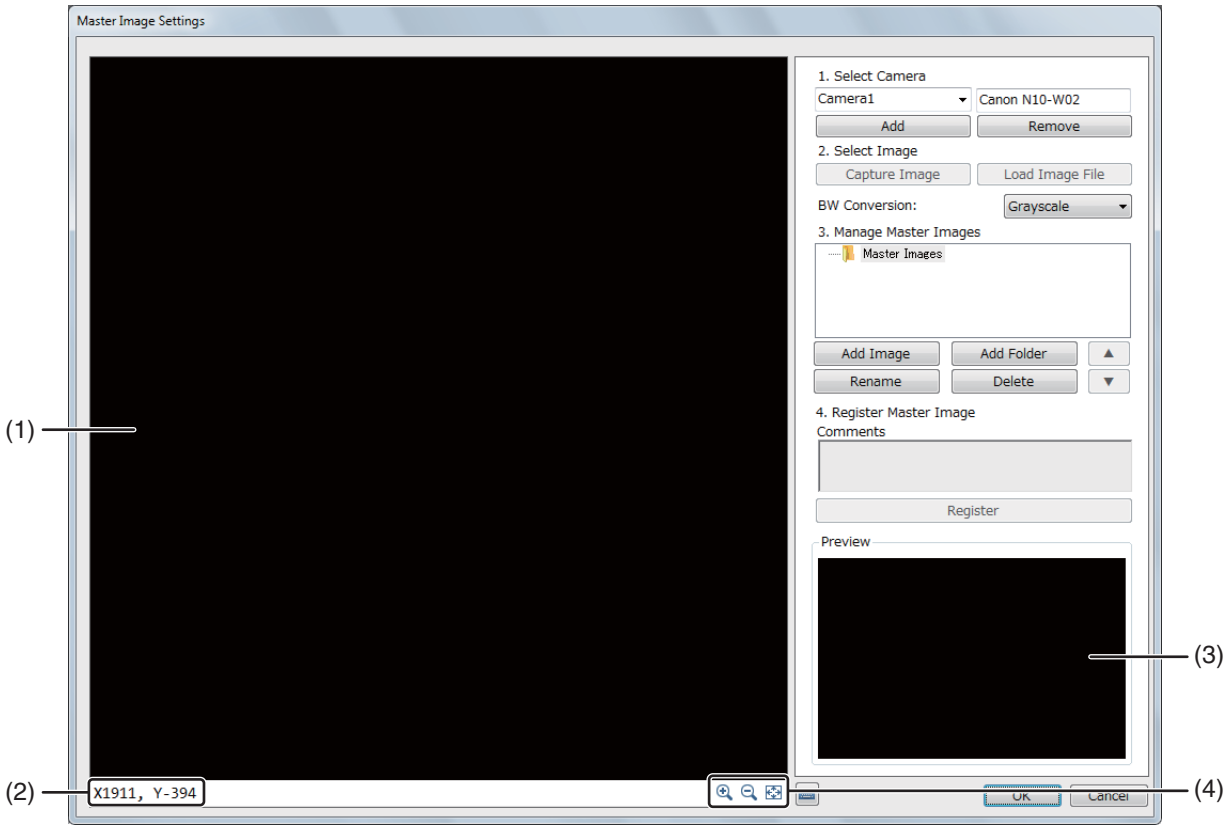
4 Click [OK].



Registering Master Images

You can register master images that can be used as the standard for measurement and comparison in the various jobs you create. You can register as master images, images captured with a registered camera (📖 26) or image files saved in the image processing controller. You can register up to 150 master images under each camera.

Click ([Master Image Settings]) in the job toolbar to open the [Master Image Settings] window.



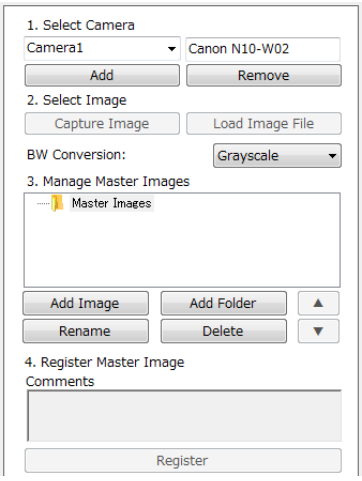
(1) Image display area

(2) Mouse position coordinates

(3) Preview of the image registered as master image

(4) Image size buttons (Enlarge / Reduce / Fit to display area)

Registering a Master Image



1 Under [1. Select Camera], select the camera under which the master image will be registered.

- Click [Add] to open the [Add Camera] dialog box and add a camera. You can click [Remove] to remove a camera.
- When you remove a camera, all the master images registered will be deleted as well so a confirmation message will appear.
- You can add up to 4 cameras.
- To register images saved on the image processing controller, select a [Camera x (Image File)] option ("x" is the camera number 1 to 4) configured for loading image files.

2 Under [3. Manage Master Images], click [Add Image].

- A new master image container, [Master Imagexxx] (where xxx is an automatically added number), will be added to the folder tree.
- You can also open the context menu on the desired folder and select [Add Image].

3 Click on the new [Master Imagexxx] and, under [2. Select Image], select the image to be registered as master image.

- You can capture an image using the camera selected in step 1, or select an existing image file on the image processing controller.

To register a captured image

(1) Click [Capture Image].
The captured image will appear in the image display area.

To register an existing image

(1) Click [Load Image File].

(2) Select the desired image file.

(3) Click [Open].
The selected image will appear in the image display area.

4 Click [B&W Conversion] and select the desired option (📖 30).

- Select [No Conversion] only for master images used in a [Color Detection] operation unit (📖 153).

5 Click [Register].

- The image shown in the image display area will be registered as the selected master image.
- Once the image is registered, the master image will appear in the preview area.
- You can also open the context menu on the desired master image and select [Register].

Note

- When the master image will be used in image processing units other than [Color Detection], be sure to select one of the options that do convert the image to B&W (any option except [No Conversion]).

Managing Master Images

You can add folders, delete or rename folders and master images, and change the order of master images in a folder.

Renaming a Master Image or Folder

1 Select a master image or folder from the list.

2 Click [Rename].

- You can also open the context menu on the desired folder or master image and select [Rename].

3 Enter the desired name.

4 Click [OK].

Deleting a Master Image or Folder

1 Select a master image or folder from the list.

2 Click [Delete].

- A confirmation message will appear.
- You can also open the context menu on the desired folder or master image and select [Delete].

3 Click [OK].

Important

- When you delete a folder, all the master images it contains will be deleted as well.

Adding a Folder

1 Click [Add Folder].

- You can also open the context menu in an empty area of the [Manage Master Images] list and select [New Folder].

2 Enter the folder name.

3 Click [OK].

- The new folder will appear in the master image list.

Reordering the List of Master Images

1 Select a master image whose position in the list you want to change.

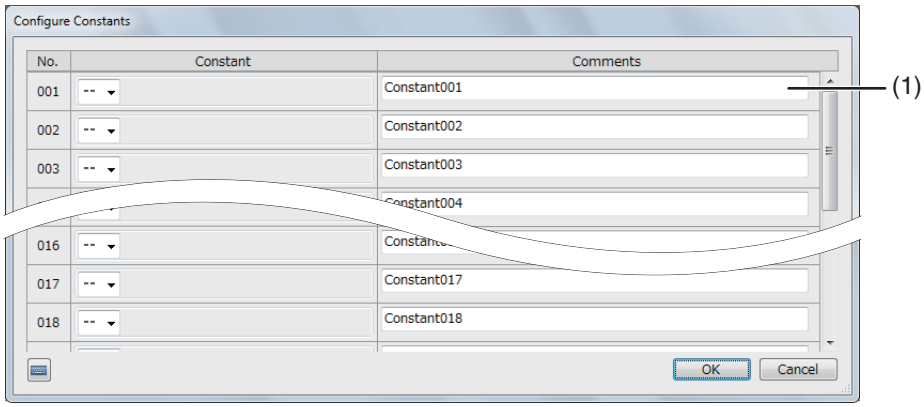
2 Click [▲] or [▼] to bring it to the desired position.

- The position of the selected master image in the list will change.
- You can also open the context menu on the desired master image and select [Up] or [Down].

Defining Constants

You can define in advance up to 100 constants that can be used in settings and formulas. You can select from 3 types of constants: real numbers, angles (in degrees) and functions.

Click [x] ([Configure Constants]) in the job toolbar to open the [Configure Constants] window.



(1) Comments
You can click to enter any comments about the constant.

Defining a Constant

1 Under constant 001, select the type of constant you want to define.

- You can select [Real Number], [Angle (deg)] or [Formula].

2 Enter the value you want to register.

[Real Number] / [Angle (deg)]
Enter the desired value or angle.

[Formula]
Select a trigonometric operator [sin] (sine), [cos] (cosine) or [tan] (tangent) and enter the desired argument.

3 Define additional constants as necessary.

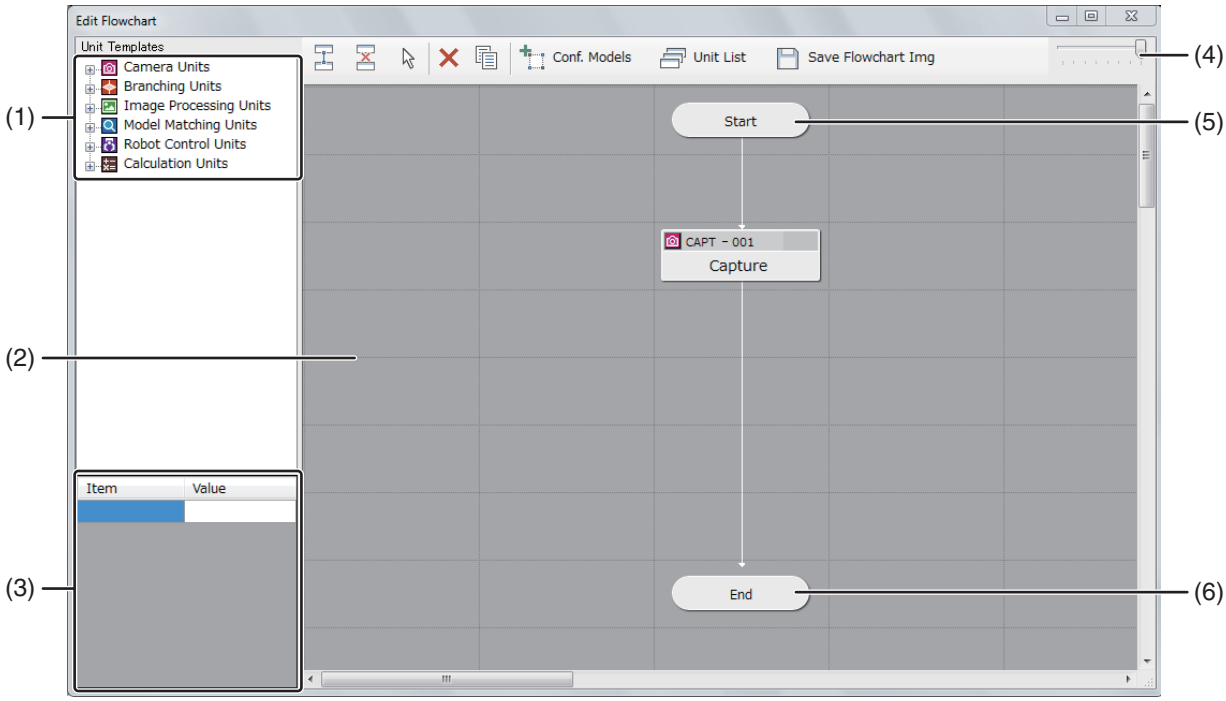
- Repeat steps 1 and 2 to define constants from number 002 onwards.

4 Click [OK].

Creating Flowcharts

In order to carry out image inspection and pick and place tasks, you will need to specify all the required steps in a flowchart. When you create a new job (📖 22), you can select the [New Job] option and combine and connect operation units to create the flowchart from scratch, or you can select one of the preset jobs to have Vision Edition create a template of a typical flowchart that you can then adjust to your actual usage conditions.

Click ([Edit Flowchart]) in the job toolbar to open the [Edit Flowchart] window.



(1) Operation units
The complete list of operation units (📖 37) you can use to create a flowchart.

(2) Flowchart area

(3) Operation unit info area
Result values and other information obtained after processing the selected operation unit. The following fields are common to all operation units. Other fields are result values specific to each operation unit type. For details about these, refer to the relevant step in each operation unit's **Configuring the Operation Unit** procedure in chapter 4, **Units** (📖 37, 87).

[Judgment]
Whether the selected operation unit met the judgment conditions (OK result) or failed to do so (NG result).

[Cycle Time]
Time (in milliseconds) required to process the operation unit.

[Run Count]
Number of times the trigger was activated and the operation unit was processed.

[NG Count]
Number of times that processing the operation unit ended in an NG result.

(4) Transparency bar
Move the slider to adjust the transparency of the flowchart editing screen (left = more transparent, right = less transparent).

(5) Start point

(6) End point

Creating a Flowchart

Flowcharts for complex tasks can consist of many different types of operation units. The following is the basic workflow for creating a flowchart.

1 Select an operation unit from the operation unit list.

- Click on the operation unit you want to place in the flowchart area.

2 Drag and drop the selected operation unit into the flowchart area.

- You can place the operation unit anywhere within the flowchart area.

3 Configure the operation unit (📖 87).

- Double-click the operation unit in the flowchart area to open a window where you can change all the specific settings relevant to the operation unit.

4 Connect the start point to the first operation unit (📖 39).

- Operation units in the flowchart need to be connected in a sequence.
- To insert an operation unit between connected operation units, disconnect the existing units first and then connect them to the newly added operation unit.
- Connect the start point to the first operation unit to connect them with an arrow.

5 Connect additional operation units.

- Following basic steps 1 to 4, keep adding, editing and connecting operation units to complete the flowchart for the desired task.

6 Connect the last operation unit to the end point.

- Connect the last operation unit to the end point to connect them with an arrow.

Types of Units

Operation units can be classified into 6 unit types. The full name of the operation unit will appear in the operation unit panel on the left. However, only a shortened code (up to 5 characters) will be displayed on the operation units in the flowchart area.

Camera units

These are units that communicate with registered cameras to capture images.

- Capture [CAPT] (📖 102)
- Network Camera Position [CPOS] (📖 106)
- NW Camera Mvmt. with Correction [C-COR] (📖 107)
- Grid PTZ [G-PTZ] (📖 109)

Branching units

These are units used to introduce decision points and branching options into the flowchart.

- Branching (📖 112)
- Multi-Condition Branching (📖 113)

Image processing units

These are units used to process images.

- Shading Test [SHDNG] (📖 115)
- Area [AREA] (📖 116)
- Edge Position [EDGEP] (📖 118)

- Edge Width [EDGEW] (📖 120)
- Arc Edge [ARCED] (📖 122)
- Approximate Straight Edge [STRTE] (📖 124)
- Angle Detection [ANGLE] (📖 126)
- Circle Detection [CIRCL] (📖 129)
- Oval Detection [OVAL] (📖 132)
- Blob Detection [BLOB] (📖 134)
- 1D Code Reader [1DCOD] (📖 136)
- 2D Code Reader [2DCOD] (📖 140)
- Number Recognition [NUMBR] (📖 143)
- Text Recognition [TEXTR] (📖 145)
- Circular Text Recognition [CTXTR] (📖 148)
- 7-Segment Number Recognition [7SEGR] (📖 149)
- Analog Meter Readout [AMETR] (📖 151)
- Color Detection [COLOR] (📖 153)

Model matching units

These are units used to compare the shape of objects against a master image (model) registered in advance.

- NCC Matching [NCCM] (📖 155)
- Shape Matching [SHAPE] (📖 157)

Robot control units

These are units used to control an industrial robot connected to the system.

- Robot Movement [R-MOV] (📖 159)
- Robot Mvmt. with Correction [R-COR] (📖 163)
- Robot Palletizing [R-PLT] (📖 167)
- Robot Hand [R-HND] (📖 168)
- Robot I/O [R-I/O] (📖 169)
- Robot-Camera Calibration [RCCAL] (📖 170)
- Camera Coordinates Conversion [CAMCC] (📖 172)

Calculation units

These are units used to calculate values without using images.

- Arithmetic Calculation [ARITH] (📖 173)
- Angle Calculation [ANGCL] (📖 174)
- Multi-Condition Calculations [MCCLC] (📖 175)
- Maximum/Minimum [MX-MN] (📖 177)
- Formula Calculation [FORMC] (📖 178)
- Result Statistics [RSTAT] (📖 179)
- 2-Line Intersection [2-INT] (📖 180)
- 2-Point Geometry [2PGEO] (📖 181)

Managing Operation Units in the Flowchart Area

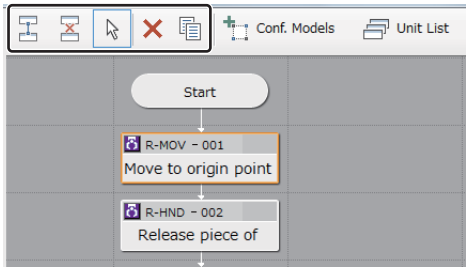
You can select operation units in the flowchart area to group, delete or copy them.

Selecting an Operation Unit

1 Click ([Select]) at the top of the flowchart area.

2 Click on the operation unit you want to select.

- The outline of the selected operation unit will be highlighted in orange.
- You can also click and drag the mouse to draw a rectangle around multiple operation units you want to select.



Connecting and Disconnecting Operation Units

Connect operation units in the flowchart area to include them in the flowchart or disconnect them to exclude them from it.

1 Click ([Connect]) or ([Disconnect]) at the top of the flowchart area.

2 Click on the first unit you want to connect or disconnect, respectively.

- The outline of the selected operation unit will be highlighted in orange.
- When connecting operation units, click on the units in the order you want them to be processed.

3 Click on the second operation unit you want to connect or disconnect.

- When connecting operation units, an arrow from the first operation unit to the second will appear. When disconnecting operation units, the connecting arrow will be removed.

Grouping Operation Units

1 Select multiple operation units (excluding branch units) in the flowchart area.

- Make sure the operation units are connected (📖 39) before making the selection.

2 Open the context menu on the selection and select [Group].

- The selected operation units will be grouped together. The group will be assigned a group name automatically ([Group No.xx], where xx is an automatically added number).
- You can double-click a group to check the individual operation units.

To ungroup operation units
Select the desired group, open the context menu on it and select [Ungroup].

To rename a group
Select the desired group, open the context menu on it and select [Rename Group]. Enter the desired name in the dialog box and click [OK].

Deleting Operation Units

1 Select one or more operation units in the flowchart area.

2 Click ✕ ([Delete]) at the top of the flowchart area.

- A confirmation message will appear.
- You can also open the context menu on the selected operation unit and select [Delete].

3 Click [OK].

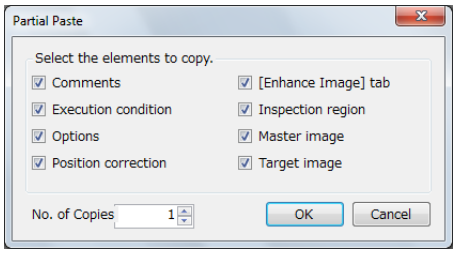
Copying Operation Units

1 Select one or more operation units in the flowchart area.

2 Click ([Copy]) at the top of the flowchart area.

- You can also open the context menu on the selected operation unit and select [Copy].

3 Open the context menu anywhere within the empty space in the flowchart area and select [Paste].

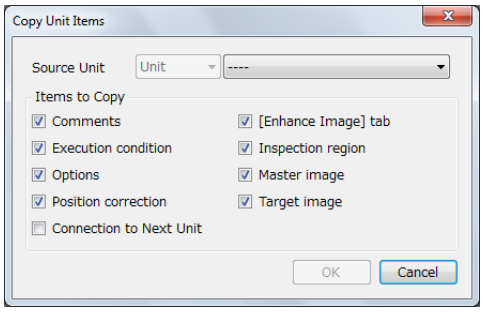


- When copying a single operation unit, the [Partial Paste] dialog box will appear. You have the option to remove the checkmark from items you do not want to copy before clicking [OK].

- To paste multiple copies of the same operation unit, enter the number of copies for [No. of Copies]. You can paste up to 10 copies in this manner.
- When copying multiple operation units, they will be copied as they are.
- Under [Select the elements to copy.], if a checkmark is placed in the [Options] box, the settings under [Options] in the [Others] tab of the operation unit will be copied.

Copying Settings of Similar Operation Units

You can copy the settings (items) from one operation unit in the flowchart area to multiple operation units of the same type in order to have operation units with matching items.



1 Select the operation unit of the same type with the items you want to change.

- You can select multiple operation units (📖 38).

2 Open the context menu on the selection and then select [Copy Unit Items].

- The [Copy Unit Items] dialog box will appear.

3 For source unit, select the operation unit with the settings that are to be copied to the operation unit selected in step 1.

- Select an operation unit in the flowchart area that is of the same type as the one selected in step 1.

4 Select the items that you want copied.

- You have the option to remove the checkmark from items you do not want copied.
- The available items depend on the selected operation unit.

5 Click [OK].

Note

- Under [Select the elements to copy.], if a checkmark is placed in the [Options] box, the settings under [Options] in the [Others] tab of the operation unit will be copied.

Copying the Flowchart Connection of an Operation Unit

You can copy the connection of an operation unit in the flowchart area. For example, operation unit A (the “source unit”) is connected to operation unit B (the “destination unit”). You can then connect operation unit C (the “matched unit”) to operation unit B simply by copying the connection.

1 Select the operation unit to which the connection will be copied (the matched unit).

- You can select multiple operation units (📖 38).

2 Open the context menu on the selection and then select [Copy Connection to Next Unit].

- The [Copy Connection to Next Unit] dialog box will appear.

3 Select the operation unit with the connection to be copied (the source unit).

- Select an operation unit in the flowchart area.

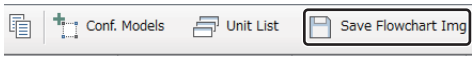
4 Click [OK].

- The connections of the operation unit selected in step 1 are copied.

Saving the Flowchart Area as an Image

You can save an image of the flowchart area in PNG format.

1 Click [Save Flowchart Img] at the top of the flowchart area.



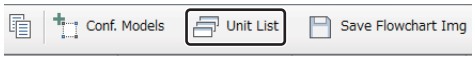
2 Enter the desired file name and click [Save].

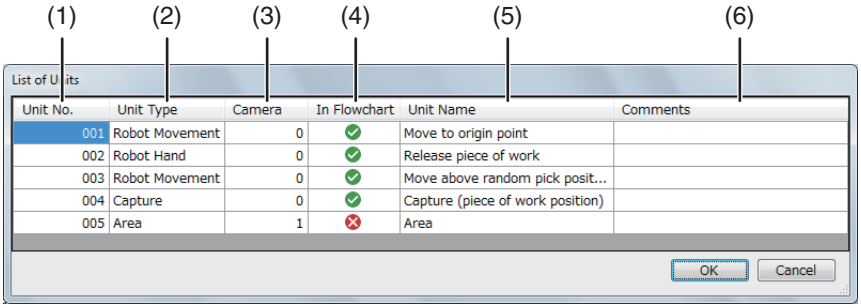
- Select the folder where you want to save the image file, enter the file name and save the file.

Checking the List of Operation Units

You can display a list where you can check all the operation units that are currently placed on the flowchart area.

Click [Unit List] at the top of the flowchart area to open the list of operation units.





(1) Unit number
The number of the operation unit in the flowchart area.

(2) Unit type
Indicates the operation unit's type.

(3) Camera number
"0" is displayed for operation units that do not require a camera.

(4) Connection status
indicates that the operation unit is connected (included in the flowchart); indicates it is not connected (not part of the flowchart).

(5) Unit name
The name of the operation unit in the flowchart area. You can change it from the list.

(6) Comments
Comments you entered when creating the operation unit. You can change them from the list.

Editing the Unit List

1 Change the operation unit's name and comments as necessary.

- Click on the respective field to enter or change the content as necessary.

2 You can sort the list by different fields.

- Click on any column title other than [In Flowchart] to sort the list by the selected field. Click again to switch between ascending/descending order.

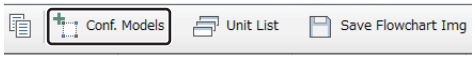
3 Click [OK].

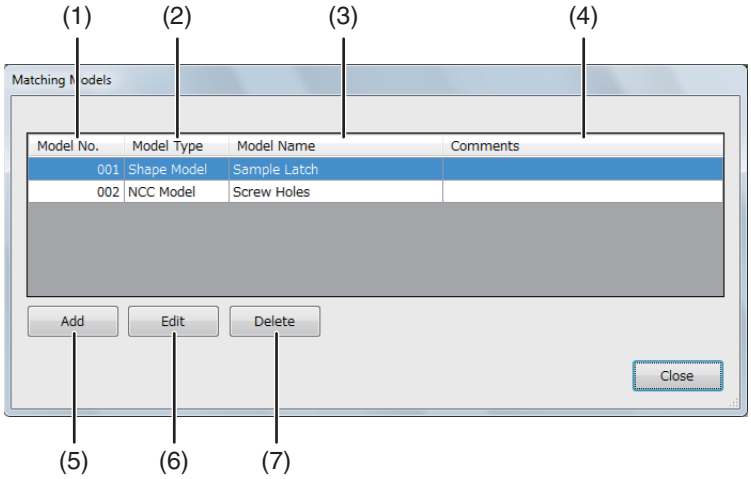
- Any changes made to the fields in the unit list in step 1 will be applied automatically also to the operation units in the flowchart area.

Registering Models

Model matching units (📖 155) compare captured images against an ideal template, or matching model, created in advance. Similarly, the keystone correction function of capture units (📖 104) uses a perspective distortion model as the baseline to correct the image. This section explains how to create and register the models that will be used as the reference for such comparisons.

Click [Conf. Models] at the top of the flowchart area to open the [Matching Models] window.





(1) Model number

(2) Model type

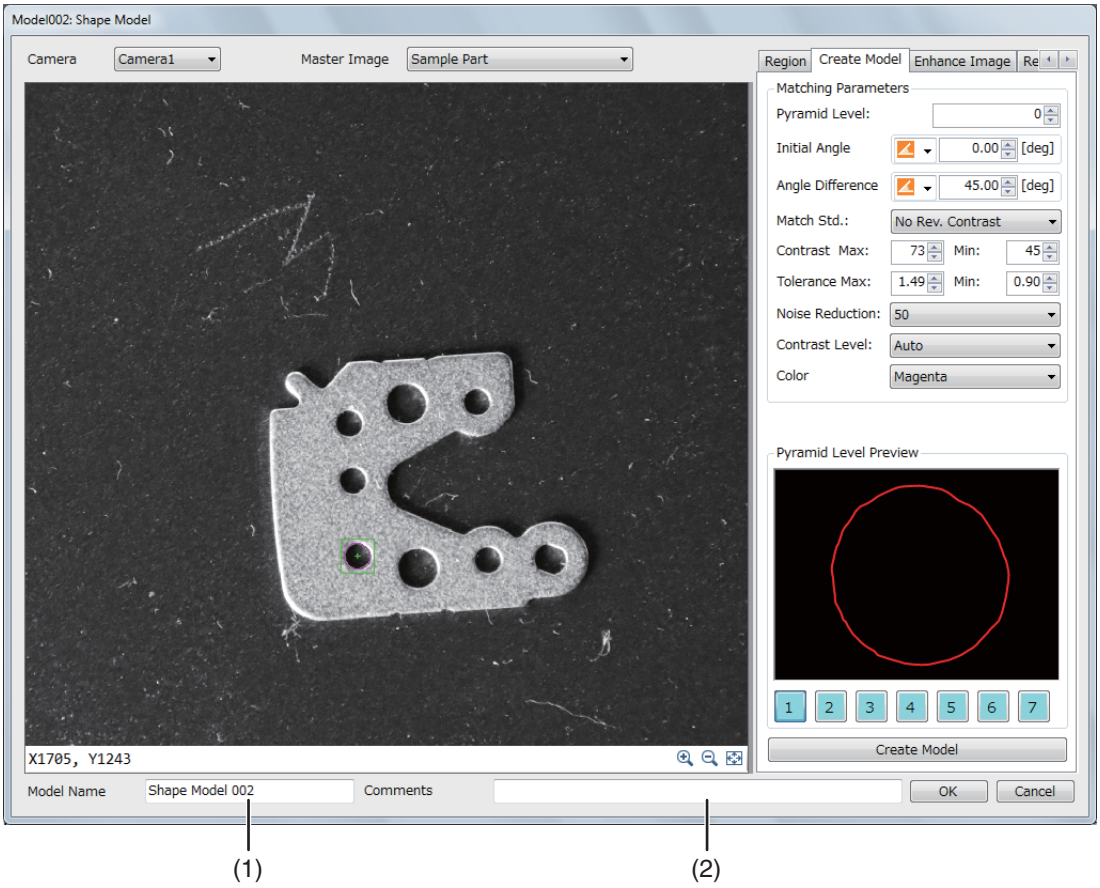
(3) Model name

(4) Comments
You can click to enter any comments about the model.

(5) Add a new model (📖 43)

(6) Edit the selected model

(7) Delete the selected model



Example of the [Shape Model] editing window

(1) Model name
You can click to change the default model name.

(2) Comments
You can click to enter any comments about the model.

Creating an NCC Matching Model

1 In the [Matching Models] window (📖 42), click [Add] and select [NCC Model].

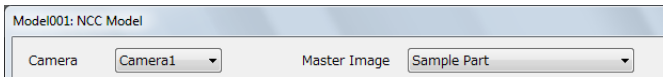
- A new matching model, [NCC Model xxx] (where xxx is an automatically added number), will be added to the list.

2 Select the new matching model just added and click [Edit].

- The [NCC Model] window will open.

3 Select the master image you want to use to create the model.

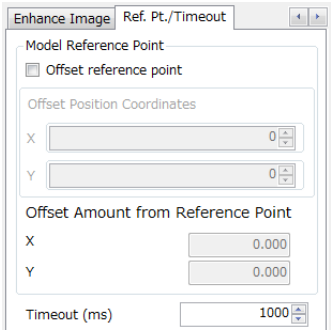
- Click [Camera] and select the camera where the master image is registered and then click [Master Image] and select the desired master image (📖 32).



4 Select the [Region] tab and set the portion of the image (region) that will serve as the matching model's reference for comparison (📖 89).

5 Select the [Enhance Image] tab and set image processing filters (📖 97).

6 Select the [Ref. Pt./Timeout] tab and set the reference point's offset value.



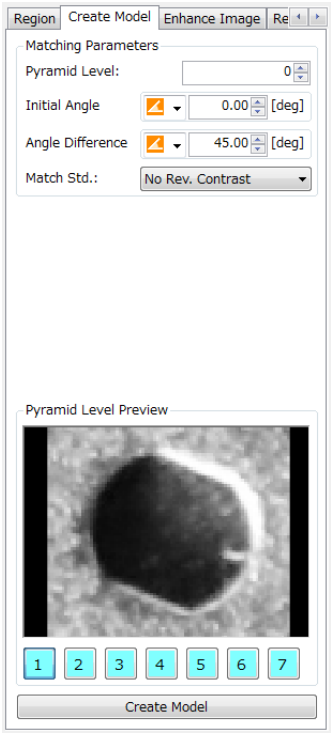
(1) To offset the model's reference point, place a checkmark in the [Offset reference point] box. By default, the reference point is the center of the model's region.

(2) Click [X] and [Y] and enter value for the coordinates of the point that will be used as a reference point. The offset amount relative to the default reference point (the center) will be calculated automatically.

7 Set the model's timeout limit.

(1) Click [Timeout (ms)] and enter a value in milliseconds.
This setting is used during the processing of model matching units and determines the time limit to find a match between the captured image and this NCC model.

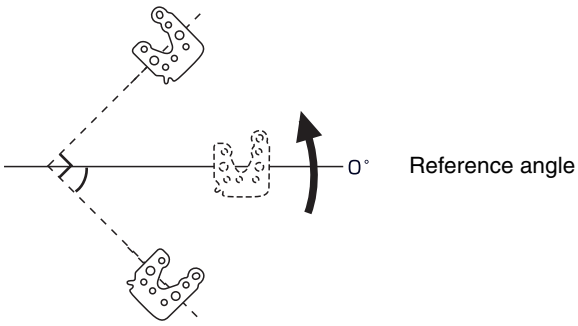
8 Select the [Create Model] tab and create the matching model.



(1) Click [Pyramid Level] and enter a value between 0 (automatic accuracy) and 7.
When the level is set to 0, the matching accuracy is selected automatically. For levels 1 to 7, the higher the level set, the rougher the image used and the lower the matching accuracy.
You can check the image produced for each pyramid level by clicking the [1] to [7] buttons below the preview image.

(2) To rotate the matching model's image, click [Initial Angle] and enter the desired value (in degrees).

(3) Click [Angle Difference] and enter the desired value (in degrees).
The higher the angle difference (the Δ angle), the longer it will take to create the matching model.



Example with [Initial Angle] set to –45° and [Angle Difference] set to 90°

(4) Click [Match Std.] and select whether to allow the matching of a reverse contrast ('negative') image.
When [Reverse Contrast] is selected, a negative image of the model is also recognized as a match.

(5) Click [Create Model].
- When the confirmation message appears, click [OK].
- The model created will be shown in the preview area.

9 Click [OK].

- The matching model and its settings will be saved.
- You can click [Cancel] to close the window without saving the changes.

Creating a Shape Model

1 In the [Matching Models] window (📖 42), click [Add] and select [Shape Model].

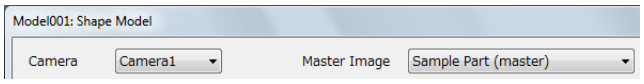
- A new matching model, [Shape Model xxx] (where xxx is an automatically added number) will be added to the list.

2 Select the new matching model just added and click [Edit].

- The [Shape Model] window will open.

3 Select the master image you want to use to create the model.

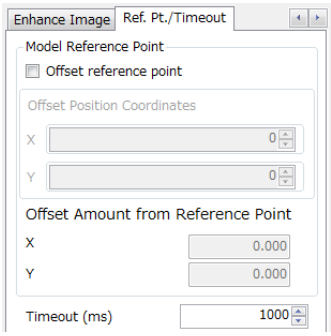
- Click [Camera] and select the camera where the master image is registered and then click [Master Image] and select the desired master image (📖 32).



4 Select the [Region] tab and set the portion of the image (region) that will serve as the matching model's reference for comparison (📖 89).

5 Select the [Enhance Image] tab and set image processing filters (📖 97).

6 Select the [Ref. Pt./Timeout] tab and set the reference point's offset value.



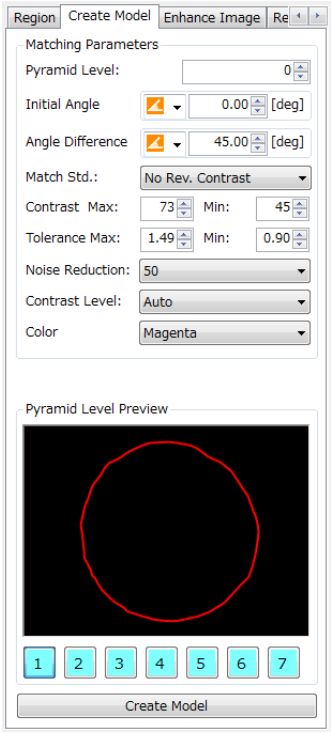
(1) To offset the model's reference point, place a checkmark in the [Offset reference point] box. By default, the reference point is the center of the model's region.

(2) Click [X] and [Y] and enter values for the coordinates of the point that will be used as a reference point. The offset amount relative to the default reference point (the center) will be calculated automatically.

7 Set the model's timeout limit.

(1) Click [Timeout (ms)] and enter a value in milliseconds.
This setting is used during the processing of model matching units and determines the time limit to find a match between the captured image and this shape model.

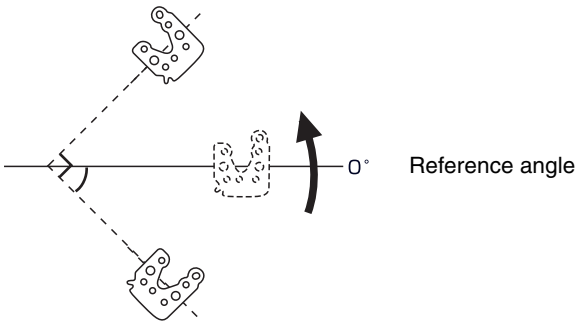
8 Select the [Create Model] tab and set the matching parameters.



(1) Click [Pyramid Level] and enter a value between 0 (automatic accuracy) and 7.
When the level is set to 0, the matching accuracy is selected automatically. For levels 1 to 7, the higher the level set, the rougher the image used and the lower the matching accuracy.
You can check the image produced for each pyramid level by clicking the [1] to [7] buttons below the preview image.

(2) To rotate the matching model's image, [Initial Angle] and enter the desired value (in degrees).

(3) Click [Angle Difference] and enter the desired value (in degrees).
The higher the angle difference (the Δ angle), the longer it will take to create the matching model.



Example with [Initial Angle] set to –45° and [Angle Difference] set to 90°

(4) Click [Match Std.] and select whether to allow the matching of a reverse contrast ('negative') image.
When [Reverse Contrast] is selected, a negative image of the model is also recognized as a match.

9 Set the parameters about color and scale, and create the model.

(1) Set the contrast range that will be detected when creating the matching model.
Click [Contrast Max] and [Min] and enter the desired values. Areas with a contrast outside the range will be ignored.

(2) Set the tolerated scale range to accept a match.
Click [Tolerance Max] and [Min] and enter the desired values. Areas outside the scale range (larger or smaller) will not be considered a match.

(3) Click [Noise Reduction] and select the desired filter level.
When the filter level is set too high, some necessary edge lines in the model may be removed as well. After changing the level, check the pyramid level previews to make sure that necessary lines are not missing from the model.

(4) Click [Contrast Level] and select the minimum contrast level.

(5) Click [Color] and select the desired color.
This is the color of the outline indicating the matching model within the image in the image display area.

(6) Click [Create Model].
- When the confirmation message appears, click [OK].
- The model created will be shown in the preview area.

10 Click [OK].

- The matching model and its settings will be saved.
- You can click [Cancel] to close the window without saving the changes.

Creating a Perspective Distortion Model

Perspective distortion models are used as a reference for the keystone correction function of capture units. Using a shape that does not change and is not vertically or horizontally symmetrical as a model is recommended.

1 In the [Matching Models] window (📖 42), click [Add] and select [Persp. Model].

- A new perspective distortion model, [Persp. Model xxx] (where xxx is an automatically added number) will be added to the list.

2 Select the new perspective distortion model just added and click [Edit].

- The [Perspective Distortion Model] window will open.

3 Select the master image you want to use to create the model.

- Click [Camera] and select the camera where the master image is registered and then click [Master Image] and select the desired master image (📖 32).

4 Complete the settings in the [Region], [Enhance Image], [Ref. Pt./Timeout] tabs and the matching parameters in the [Create Model] tab.

- See steps 4 to 8 in the shape model procedure (📖 45).

5 In the [Create Model] tab, set the parameters about scale and contrast, and create the model.

(1) Under [Vertical] and [Horizontal], set the tolerated scale range to accept a match (0.5 to 2.0).

(2) Click [Contrast Threshold] and select the desired value.

(3) Click [Contrast Level] and select the desired value.

(4) Click [Create Model].
- When the confirmation message appears, click [OK].
- The model created will be shown in the preview area.

6 Click [OK].

- The perspective distortion model and its settings will be saved.
- You can click [Cancel] to close the window without saving the changes.

Setting Up Connections to External Devices

You can set up external data connections to a robot or programmable logic controller (PLC), set up the trigger used when the system is online and select the result values you want the system to output to the selected external device. Note that this software is designed for connecting to up to one industrial robot and one PLC.
For external data connections to other devices, refer to **Setting Up a Connection to a Database** (📖 75), **Setting Up a Connection to a Network Camera** (📖 80).

Trigger types and output destinations

Trigger		External device		Log output (local folder/FTP server/database)
		Robot	PLC	
External trigger	Robot	●	—	●
	PLC	—	●	●
	Database	—	—	●
	Camera	—	—	●
Manual trigger		●	●	●

- For details about saving log data, refer to **Saving and Exporting Log Data to a CSV File** (📖 186), **Saving Log Data to a Database** (📖 188).
- About the manual trigger.
  - [Manual Trigger] cannot be used together with [External Trigger (Robot)] and [External Trigger (PLC)].
  - An Open User Communication-compatible PLC cannot be used.

Preparing an Industrial Robot

Before the image processing controller can communicate with an industrial robot, some preparations are required on the external devices. When you select an external trigger (robot) for the online trigger (📖 68), you will need to create a program for the industrial robot (📖 49) in advance.

Setting Up an Industrial Robot

Set up the following industrial robot settings in advance.

Industrial robot settings

Setting	Value
IP address	Any, as long as it is on the same network as the image processing controller and it does not create an IP address conflict.
Subnet mask pattern	Any, as long as it conforms to the settings of the network to which the image processing controller is connected.
Default router IP address	Any, as long as it conforms to the settings of the network to which the image processing controller is connected.
Startup right	TP or Ethernet TP: Select this setting to use the [External Trigger (Robot)] option in the trigger settings. However, this software's robot control units (📖 159) and [Robot Control] window (📖 161) will not function. Ethernet: Select this setting to use this software's robot control units and [Robot Control] window. However, only the [External Trigger (PLC)] or [Manual Trigger] option can be used in the trigger settings. • When you select the Ethernet setting, designate the image processing controller's IP address and set the operation mode to Normal mode.
Operation mode	Normal mode
Communication protocol	b-CAP

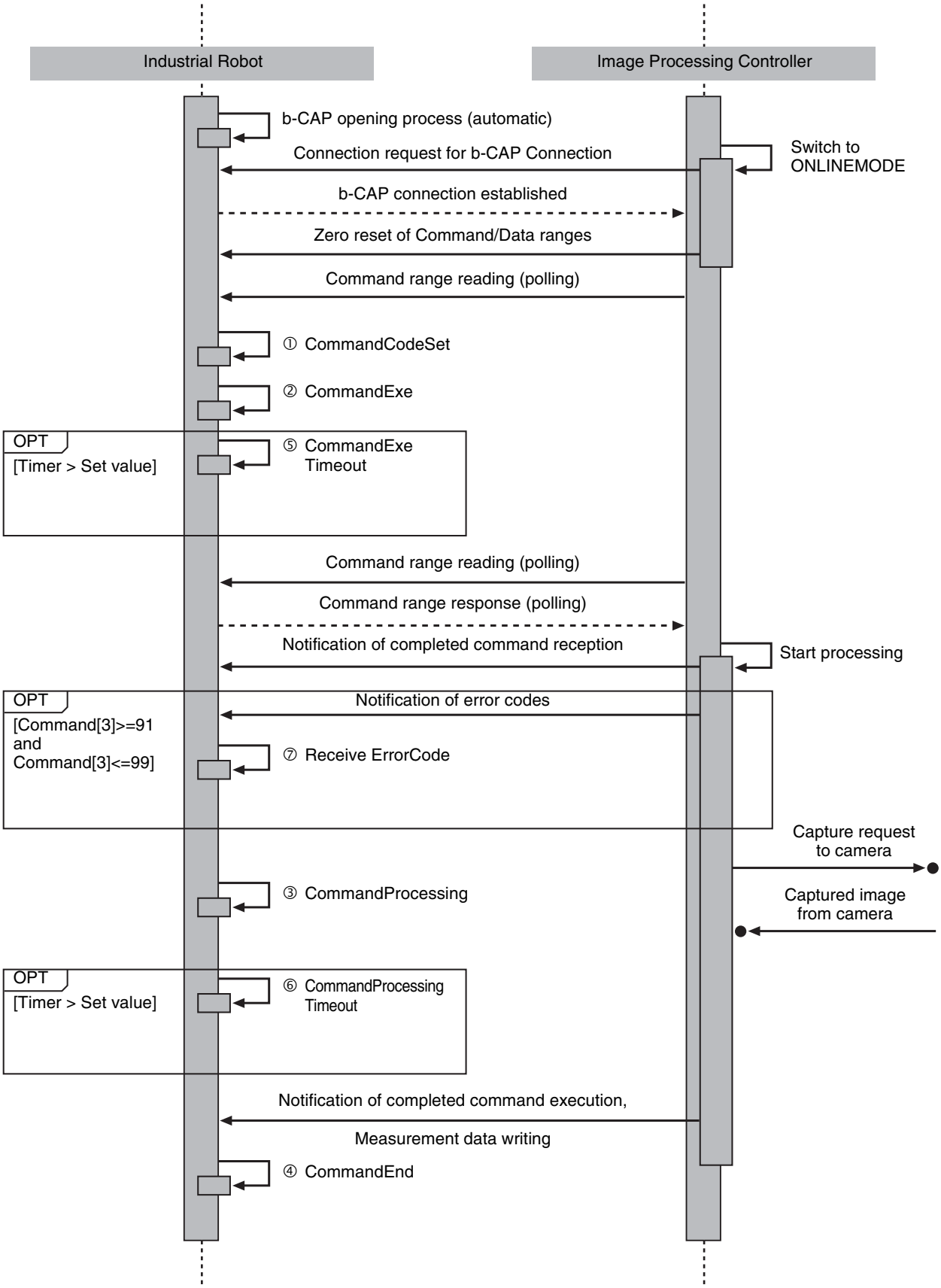
Important

- For precautions about operating an industrial robot, refer to **Robot Operation** (📖 2).

Creating a Program for the Industrial Robot

You will need to create a program for the industrial robot so it can send information and control the image processing controller. The industrial robot and image processing controller communicate through a cyclic read/write pattern using the b-CAP protocol, where the industrial robot is the server and the image processing controller is the client. During the polling interval (scan cycle), the image processing controller reads the I-type variables in the command range whereas the industrial robot's program writes I-type variables onto the same command range.

Sequence diagram of communication between the industrial robot and image processing controller



About the command range

These are the contents of the command range used when the industrial robot controls the image processing controller. The command range uses 5 of the robot program's I-type variables, assigned automatically and consecutively from the start of the range. The command range can use only I-type variables.

Command number	Command name	Function	Robot assignment*
Command[1]	Command execution	Executes the relevant process according to the command code set. The command is set to 0 when completed.	I[0]
Command[2]	Command code	Set a number according to the process you want to execute. The command is set to 0 when completed. 101 = Trigger 1 102 = Trigger 2 103 = Trigger 3 104 = Trigger 4 1 to 40 = Switch to the respective job (JOB01 to JOB40)	I[1]
Command[3]	Command response	When the image processing controller receives a command code, the same data as the command code is written to this command as response. If the image processing controller cannot process the command due to an error, the following error codes are written instead. 91 = Camera connection error 92 = Job switch error 93 = Connection configuration error The command is set to 0 when completed.	I[2]
Command[4]	Command status	Indicates that the image processing controller is processing a command. 1 = Command being processed The command is set to 0 when completed.	I[3]
Command[5]	Command completed	Indicates that the image processing controller finished processing a command. 1 = Command completed The command is set to 0 after the time set for command response elapses.	I[4]

* Example assuming [Command Range Start (I Var.)] is set to 0 (📖 70).

About the data range

These are the contents of the data range sent from the image processing controller to the industrial robot. The data range uses 19 of the robot program's D-type variables, assigned automatically and consecutively from the start of the range. The data range can use only D-type variables.

Data number	Data name	Function	Robot assignment*
Data[1]	Selected job number	(Fixed data) The number of the job processed is stored.	D[0]
Data[2]	Trigger count	(Fixed data) The number of triggers processed is stored. If the number exceeds 32767 times, the count restarts from 1.	D[1]
Data[3]	Output value 01	(User selected) Value 01 in the [Data] tab of the external connection settings is stored.	D[2]
Data[4]	Output value 02	(User selected) Value 02 in the [Data] tab of the external connection settings is stored.	D[3]
Data[5]	Output value 03	(User selected) Value 03 in the [Data] tab of the external connection settings is stored.	D[4]
Data[6]	Output value 04	(User selected) Value 04 in the [Data] tab of the external connection settings is stored.	D[5]
Data[7]	Output value 05	(User selected) Value 05 in the [Data] tab of the external connection settings is stored.	D[6]
Data[8]	Output value 06	(User selected) Value 06 in the [Data] tab of the external connection settings is stored.	D[7]
Data[9]	Output value 07	(User selected) Value 07 in the [Data] tab of the external connection settings is stored.	D[8]
Data[10]	Output value 08	(User selected) Value 08 in the [Data] tab of the external connection settings is stored.	D[9]
Data[11]	Output value 09	(User selected) Value 09 in the [Data] tab of the external connection settings is stored.	D[10]
Data[12]	Output value 10	(User selected) Value 10 in the [Data] tab of the external connection settings is stored.	D[11]
Data[13]	Output value 11	(User selected) Value 11 in the [Data] tab of the external connection settings is stored.	D[12]
Data[14]	Output value 12	(User selected) Value 12 in the [Data] tab of the external connection settings is stored.	D[13]
Data[15]	Output value 13	(User selected) Value 13 in the [Data] tab of the external connection settings is stored.	D[14]
Data[16]	Output value 14	(User selected) Value 14 in the [Data] tab of the external connection settings is stored.	D[15]
Data[17]	Output value 15	(User selected) Value 15 in the [Data] tab of the external connection settings is stored.	D[16]

Data number	Data name	Function	Robot assignment*
Data[18]	Output value 16	(User selected) Value 16 in the [Data] tab of the external connection settings is stored.	D[17]
Data[19]	Output value 17	(User selected) Value 17 in the [Data] tab of the external connection settings is stored.	D[18]

* Example assuming [Data Range Start (D Var.)] is set to 0 (📖 70).

Robot program sample

The following is a simplified version of an image processing controller's operation sequence. You can adjust it to create an actual program for the industrial robot, paying attention to safety precautions and particular usage conditions. This sample program is designed to be used as a subprogram that you call from the main program you create for the industrial robot.

Main program for industrial robot (created by user)

```
#Include "sub_visionedition.pcs"
Sub Main
.....
Call vision_command(101).....
.....
.....
End Sub
```

'[sub_visionedition.pcs] needs to be called within #Include
'declare the command you want to execute in the argument

Call the subprogram

Sample robot program

```
'!TITLE "VisionEdition SampleProgram "
.....
Sub vision_command(ByVal Command_num As Integer)
.....
.....
.....
.....
End Sub
```

Example of image processing controller settings

Setting	Value
[Command Range Start (I Var.)]	0
[Data Range Start (D Var.)]	0

Example of industrial robot program

```
'!TITLE "VisionEdition SampleProgram "

#Pragma Optimize( "wait-idling-time", 100 )

Sub vision_command(ByVal Command_num As Integer)

        '//// Variable declaration
        Dim index_num as integer            'Data index number

        '//// To specify a starting location for data index number
        index_num = 0

        '//// ① CommandCodeSet
        I[index_num + 1] = Command_num

        '//// ② CommandExe
        I[index_num + 0] =1

        Wait I[index_num + 2] <> 0 , 60000

        '////⑦ Receive ErrorCode
        If (I[index_num + 2]  >= 91 and I[index_num + 2]  <= 99 )Then
                Err.Raise &h8160801C 'Error Occur_VisionEdition Receive ErrorCode
                GOTO *PrgEND
        End IF

        '////⑤ CommandExe Timeout
        If I[index_num + 2]  <> I[index_num + 1] Then
                Err.Raise &h81608015 'Error Occur_VisionEdition CommandExe Timeout
                GOTO *PrgEND
        End IF

        '//// ③ CommandProcessing
        Wait I[index_num + 3] = 1 , 60000

        '////  ④ CommandEnd
        Wait I[index_num + 4] = 1 , 60000


        '////⑥ CommandProcessing Timeout
        If I[index_num + 4]  <> 1 Then
                Err.Raise &h81608015 'Error Occur_VisionEdition CommandProcessing Timeout
                GOTO *PrgEND
        End IF


        '//// Finalization
        *PrgEND:

End Sub
```

Preparing a PLC (SLMP-compatible)*

* Refers to a PLC compatible with SLMP communication.

Before the image processing controller can communicate with the PLC (SLMP-compatible), some preparations are required on the external devices. When you select an external trigger (PLC) for the online trigger (📖 68), you will need to create a program for the PLC (📖 56) in advance.

Setting Up a PLC (SLMP-compatible)

Set up the following PLC settings in advance.

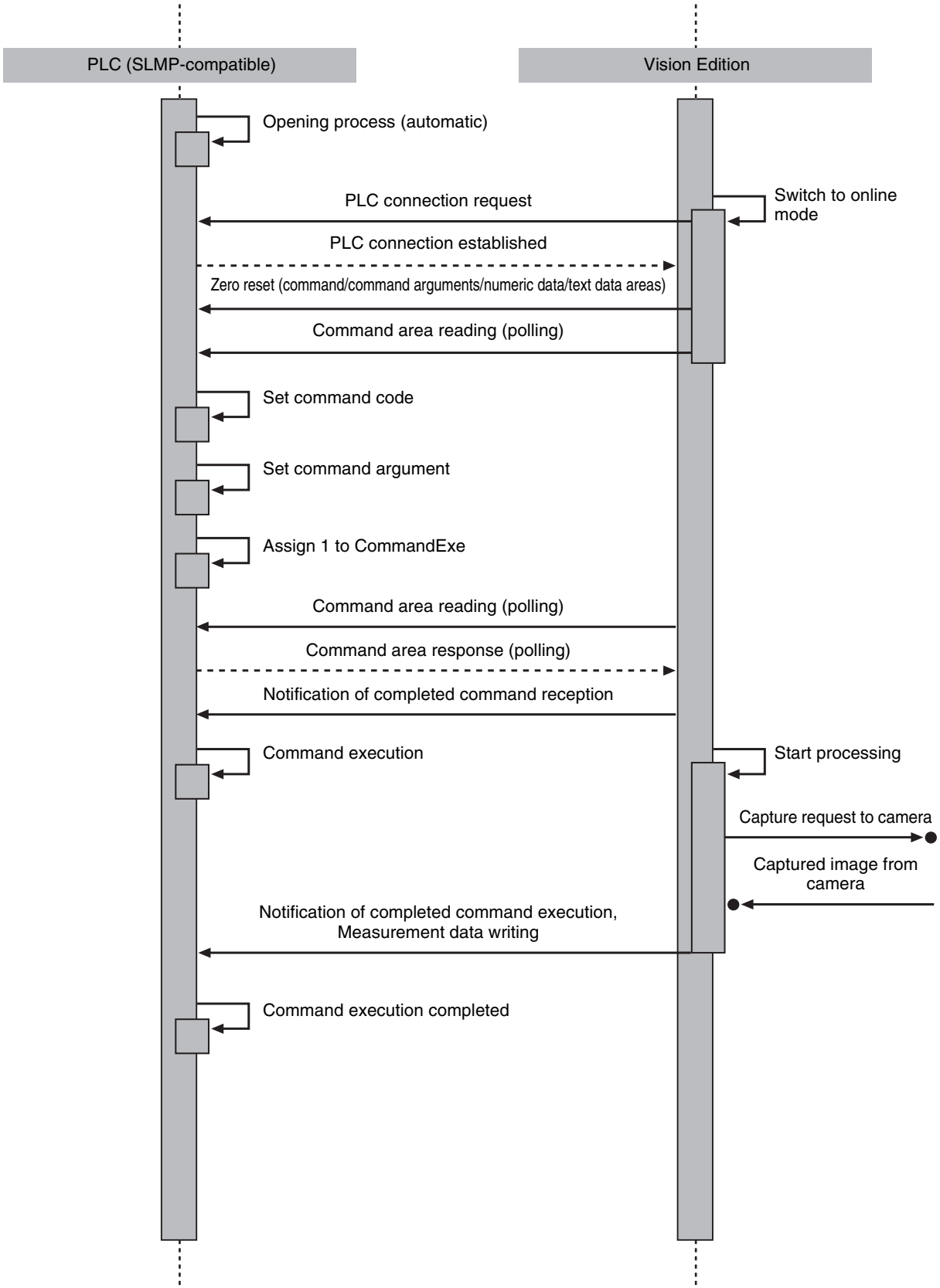
PLC (SLMP-compatible) settings

Setting	Value
IP address	Any, as long as it is on the same network as the image processing controller and it does not create an IP address conflict.
Subnet mask pattern	Any, as long as it conforms to the settings of the network to which the image processing controller is connected.
Default router IP address	Any, as long as it conforms to the settings of the network to which the image processing controller is connected.
Code of communication data	Binary code
Allow writing during RUN	ON
Protocol	TCP
Open format	MC protocol (SLMP)
Host station port number	Any, as long as it does not conflict with the image processing controller's settings.
Compatible frame	QnA-compatible 3E frame only

Creating a PLC Program for the PLC (SLMP-compatible)

You will need to create a program for the PLC (SLMP-compatible) so it can send information and control the image processing controller. The PLC and image processing controller communicate through a cyclic read/write pattern using the QnA-compatible 3E frame, where the PLC is the server and the image processing controller is the client. During the polling interval (scan cycle), the image processing controller checks the command area of the PLC and gets the commands specified in the PLC program.
A sample ladder program is available for download from the Canon website (📖 214).

Sequence diagram of communication between the PLC (SLMP-compatible) and this software



About the command area

These are the contents of the command area used when the PLC (SLMP-compatible) controls the image processing controller. The command area is assigned automatically 5 consecutive registers from the start of the range. The command area can be used only with devices with data registers (D registers).

Example assuming [Command Area Start Address (D)] is set to 0.

Command number	Command name	Function	PLC assignment
Command[1]	Command execution	Executes the relevant process according to the command code set. The command is set to 0 when completed.	D000
Command[2]	Command code	Set a number according to the process you want to execute. The command is set to 0 when completed. 101 = Trigger 1 102 = Trigger 2 103 = Trigger 3 104 = Trigger 4 1 to 40 = Switch to the respective job (JOB01 to JOB40)	D001
Command[3]	Command response	When the image processing controller receives a command code, the same data as the command code is written as response. If the image processing controller cannot process the command due to an error, the following error codes are written instead. 91 = Camera connection error 92 = Job switch error 93 = Connection configuration error The command is set to 0 when completed.	D002
Command[4]	Command status	Indicates that the image processing controller is processing a command. 1 = Command being processed The command is set to 0 when completed.	D003
Command[5]	Command completed	Indicates that the image processing controller finished processing a command. 1 = Command completed The command is set to 0 after the time set for command response elapses.	D004

About the command argument area

These are the contents of the command argument area used when the PLC controls Vision Edition.

Example assuming [Command Argument Area Start Address (D)] is set to 5, and [Number of Arguments to Receive] is set to 2.

Name	Function	PLC assignment
Command argument 1	Value used as argument 01 when executing the command. Designate a 32-bit signed integer number.	D5 D6
Command argument 2	Value used as argument 02 when executing the command. Designate a 32-bit signed integer number.	D7 D8

About the numeric data area

These are the contents of the numeric data area used by Vision Edition to return numeric result values to the PLC. The selected job's number and the trigger count are always stored, regardless of the number of numeric values selected for output.

Example assuming [Numeric Data Area Start Address (D)] is set to 10, and [Number of Values to Output] is set to 2.

Name	Function	PLC assignment
Selected job number	(Fixed data) The job number of the job processed is stored.	D10
Trigger count	(Fixed data) The number of triggers processed is stored. If the number exceeds 32767 times, the count restarts from 1.	D11
Measurement value 01*	(User selected) Value 01 in the [Data (Values)] tab of the external connection settings is stored.	D12 D13
Measurement Value 02*	(User selected) Value 02 in the [Data (Values)] tab of the external connection settings is stored.	D14 D15

* The actual value stored is the product of the output value set in the [Data (Values)] tab of the [External Connection Settings] window (📖 73) multiplied by 10,000, stored as a double word. For example, if output value 01 was 1234.567, 12345670 is stored to registers D12 and D13.
When you need to use the original value, be sure to divide the content of the registers by 10,000 using 32-bit binary division.

About the text data area

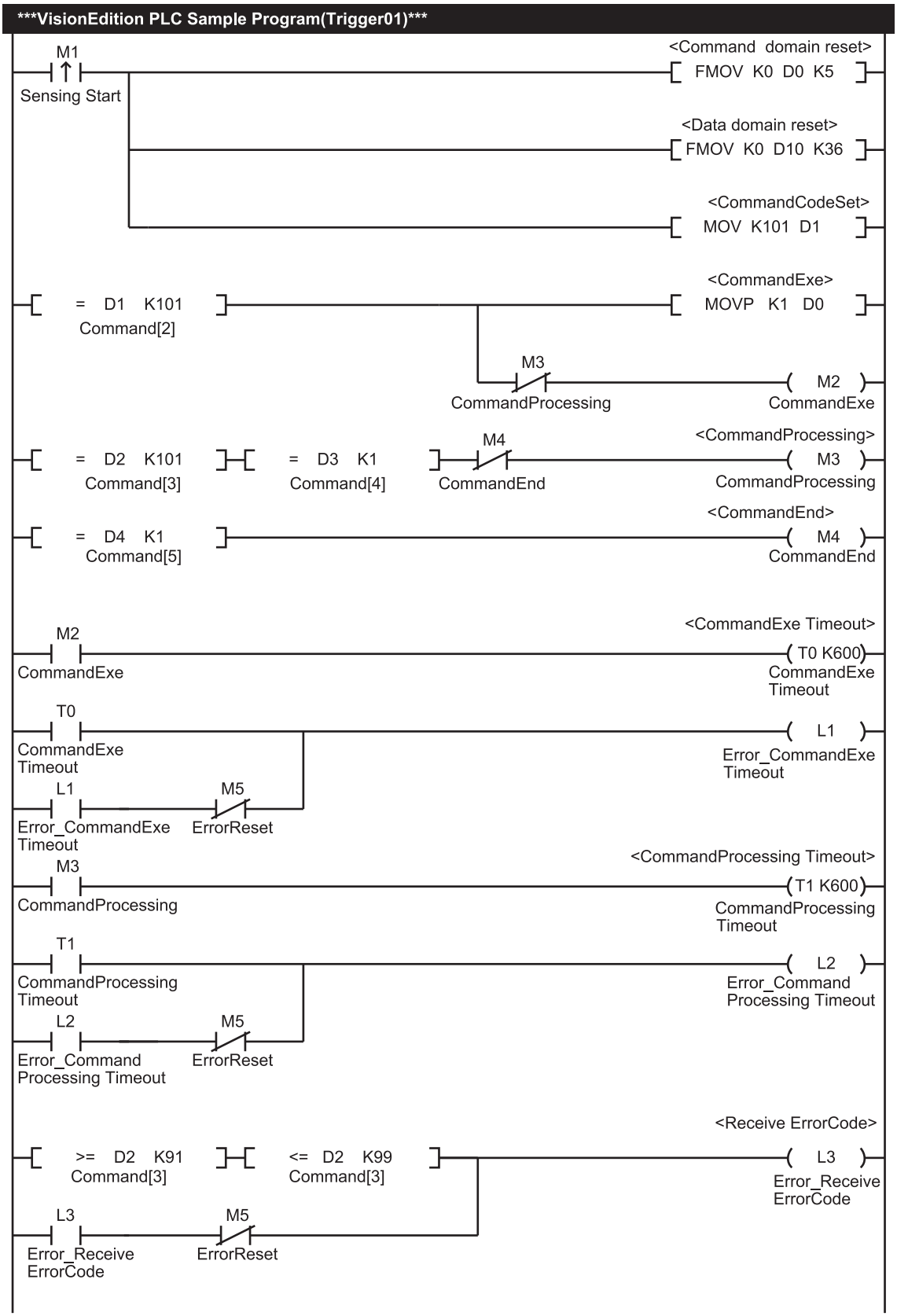
These are the contents of the text data area used by Vision Edition to return result values that are text strings to the PLC.

Example assuming [Text Data Area Start Address (D)] is set to 20, [Number of Values to Output] is set to 2 and [Max. Character Length] is set to 10.

Name	Function	PLC assignment
Measurement value 01	(User selected) Value 01 in the [Data (Text Strings)] tab of the external connection settings is stored.	D20 to D24
Measurement Value 02	(User selected) Value 02 in the [Data (Text Strings)] tab of the external connection settings is stored.	D25 to D29

Program sample for a PLC (SLMP-compatible)

The following is a simplified version of an image processing controller's operation sequence. You can adjust it to create an actual PLC program, paying attention to safety precautions and particular usage conditions.



Example of image processing controller settings

Setting	Value
[Command Area Start Address (D)]	0
[Numeric Data Area Start Address (D)]	10

Example of device settings used in the PLC program

Setting	Device	Value
Start measurement (SensingStart)	M1	—
Execute command (CommandExe)	M2	—
Processing command (CommandProcessing)	M3	—
Command completed (CommandEnd)	M4	—
Reset errors (ErrorReset)	M5	—
Command execution timeout (CommandExeTimeout)	T0	60 seconds
Timeout during command processing (CommandProcessingTimeout)	T1	60 seconds
Command execution timeout error (Error_CommandExeTimeout)	L1	—
Timeout error during command processing (Error_CommandProcessingTimeout)	L2	—
Error receiving error code (Error_ReceiveErrorCode)	L3	—
Command code	D1	101

Preparing a PLC (Open User Communication-compatible)*

* Refers to a PLC compatible with the Open User Communication protocol.

Before the image processing controller can communicate with the PLC (Open User Communication-compatible), some preparations are required on the external devices. When you select an external trigger (PLC) for the online trigger (📖 68), you will need to create a program for the PLC (📖 56) in advance.

Setting Up a PLC (Open User Communication-compatible)

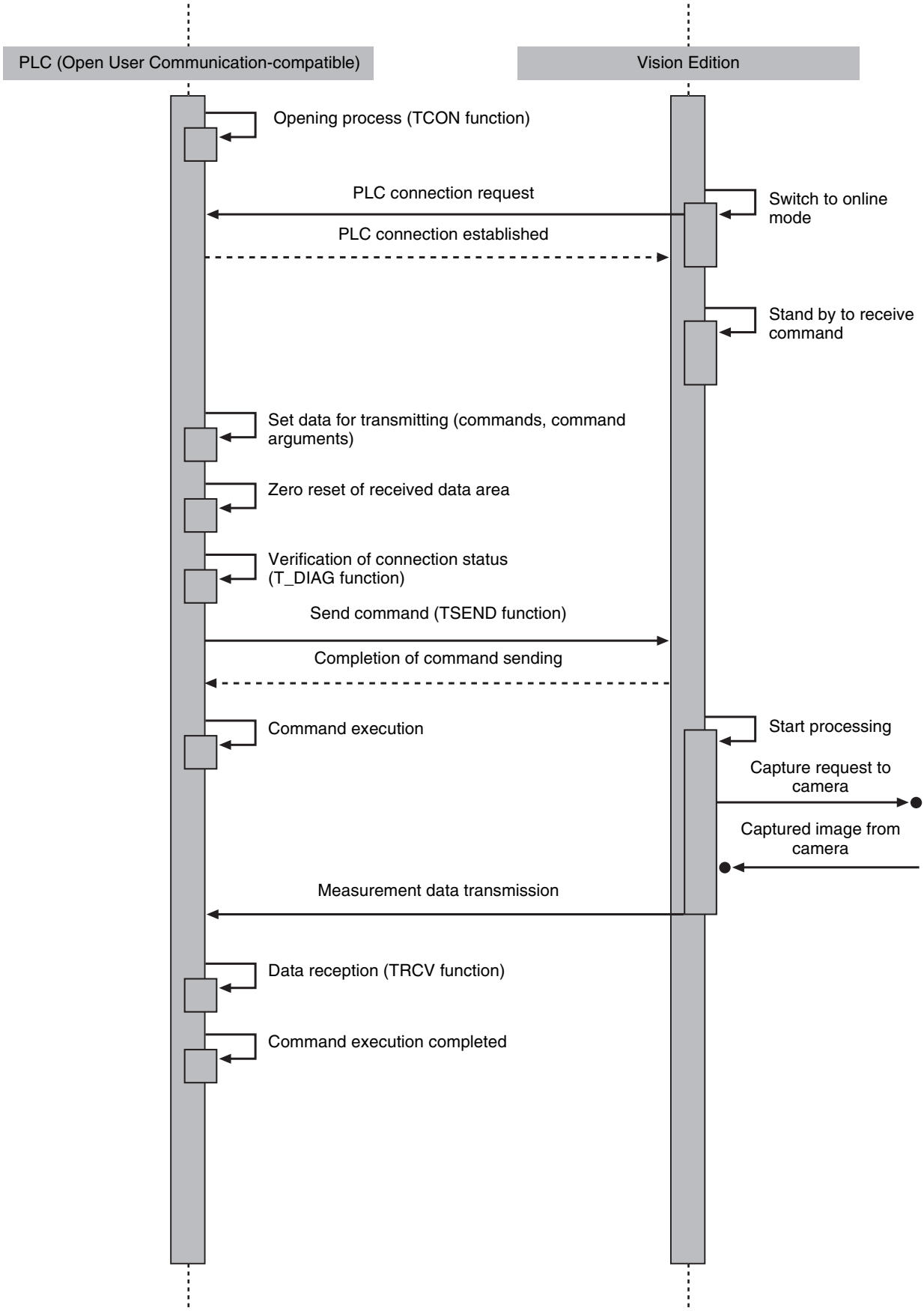
PLC (Open User Communication-compatible) settings

Setting	Value
IP address	Any, as long as it is on the same network as the image processing controller and it does not create an IP address conflict.
Subnet mask pattern	Any, as long as it conforms to the settings of the network to which the image processing controller is connected.
Default router IP address	Any, as long as it conforms to the settings of the network to which the image processing controller is connected.

Creating a PLC Program for the PLC (Open User Communication-compatible)

You will need to create a program for the PLC (Open User Communication-compatible) so it can send information and control the image processing controller. The PLC and image processing controller communicate through the Open User Communication protocol, where the PLC is the server and the image processing controller is the client. A sample ladder program is available for download from the Canon website (📖 214).

Sequence diagram of communication between the PLC (Open User Communication-compatible) and this software



About the transmitted data area

These are the contents of the transmitted data area used when the PLC (Open User Communication-compatible) controls the image processing controller.

Example assuming [Number of Arguments to Receive] is set to 2.

Name	Data type*	Function
Command code	BYTE	Set a number according to the process you want to execute. 101 = Trigger 1 102 = Trigger 2 103 = Trigger 3 104 = Trigger 4 1 to 40 = Switch to the respective job (JOB01 to JOB40)
Command argument 1	REAL	Value used as argument 01 when executing the command.
Command argument 2		Value used as argument 02 when executing the command.

* BYTE data type requires 1 byte of range. REAL data type requires 4 bytes of continuous range.

About the received data area

When data is sent from the PLC (Open User Communication-compatible) to the image processing controller, the image processing controller will take measurements or switch jobs. The results will be sent from the image processing controller to the PLC (Open User Communication-compatible) where they will be stored in the received data area.

Example assuming [Number of Values to Output] is set to 2 and [Max. Character Length] is set to 10.

Name	Data type*	Function
Command code	BYTE	The processed command code is stored.
Error code		If an error occurred on the image processing controller, the error code is stored. 0 = Normal termination 91 = Camera connection error 92 = Job switching error 93 = Connection setting error 94 = Command error 99 = Unexpected error
Trigger count	DINT	The number of triggers processed is stored.
Numeric data 1	REAL	(User selected) Value 01 in the [Data (Values)] tab of the external connection settings is stored.
Numeric data 2		(User selected) Value 02 in the [Data (Values)] tab of the external connection settings is stored.
Text data 1	STRING[10]	(User selected) Value 01 in the [Data (Text Strings)] tab of the external connection settings is stored.
Text data 2		(User selected) Value 02 in the [Data (Text Strings)] tab of the external connection settings is stored.

* BYTE data type requires 1 byte of range. DINT and REAL data types requires 4 bytes of continuous range. STRING[10] data type represents a text string of 10 ASCII characters and requires 10 bytes of continuous range.

Preparing a PLC (FINS-compatible)*

* Refers to a PLC compatible with the FINS communication protocol.

Before the image processing controller can communicate with the PLC (FINS-compatible), some preparations are required on the external devices. When you select an external trigger (PLC) for the online trigger (📖 68), you will need to create a program for the PLC (📖 64) in advance.

Setting up a PLC (FINS-compatible)

PLC (FINS-compatible) settings

Setting	Value
IP address	Any, as long as it is on the same network as the image processing controller and it does not create an IP address conflict.
Subnet mask	Any, as long as it conforms to the settings of the network to which the image processing controller is connected.
Default gateway	Any, as long as it conforms to the settings of the network to which the image processing controller is connected.
Communication format	FINS/UDP only
FINS/UDP port number	Any (set the same port no. in the Vision Edition settings)

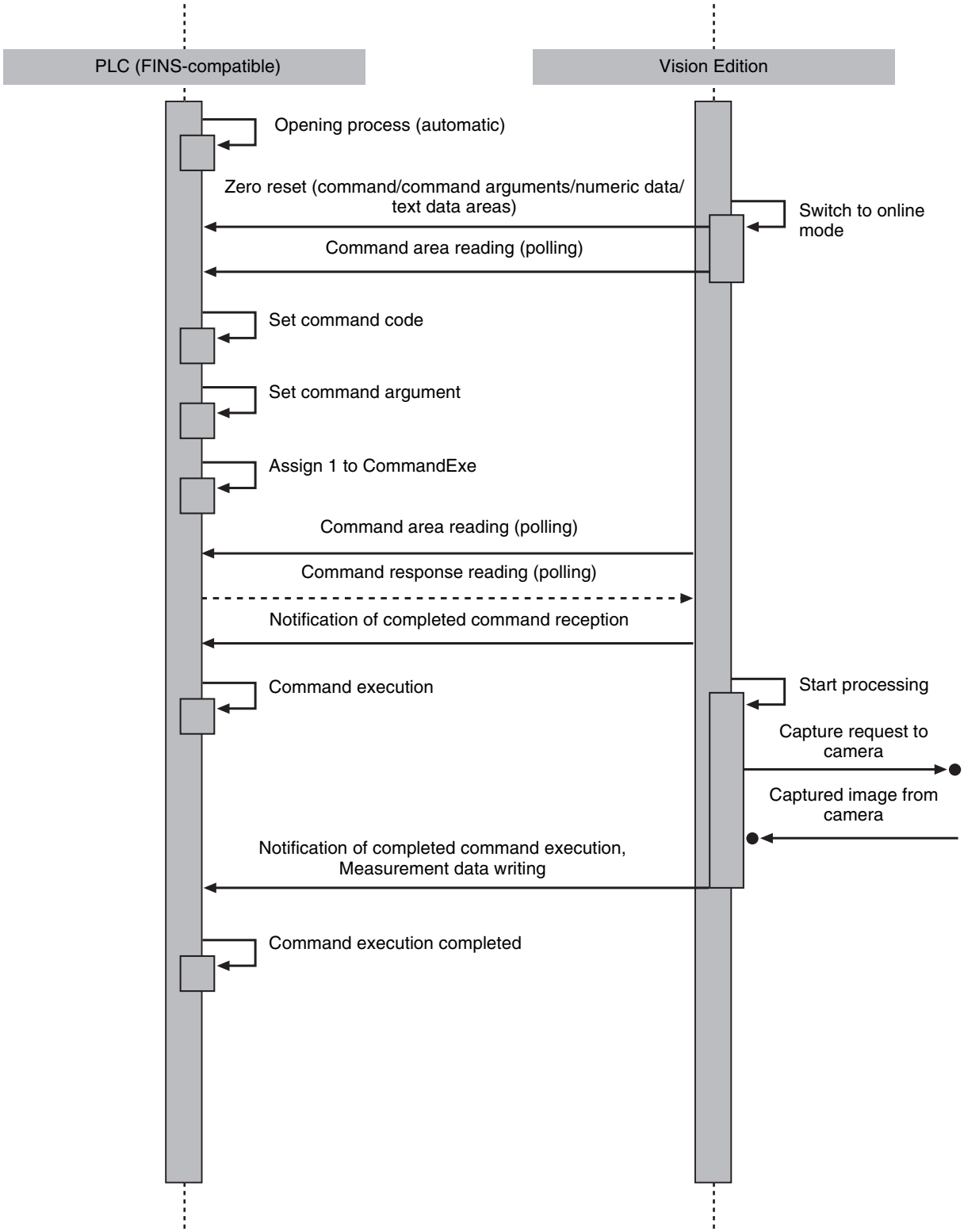
Note

- When changing the IP address settings, make sure there is no address conflict with the node address.

Creating a PLC Program for the PLC (FINS-compatible)

You will need to create a program for the PLC (FINS-compatible) so it can send information and control the image processing controller. The PLC and image processing controller communicate through a cyclic read/write pattern using the FINS/UDP protocol, where the PLC is the server and the image processing controller is the client. During the polling interval (scan cycle), the image processing controller checks the command area of the PLC and gets the commands specified in the PLC program.
A sample ladder program is available for download from the Canon website (📖 214).

Sequence diagram of communication between the PLC (FINS-compatible) and this software



About the command area

These are the contents of the command area used when the PLC (FINS-compatible) controls the image processing controller.

Example assuming [Command Area Start Channel No. (DM)] is set to 0.

Command name	Function	PLC assignment
Command execution	Executes the relevant process according to the command code set. The command is set to 0 when completed.	D0
Command code	Set a number according to the process you want to execute. The command is set to 0 when completed. 101 = Trigger 1 102 = Trigger 2 103 = Trigger 3 104 = Trigger 4 1 to 40 = Switch to the respective job (JOB01 to JOB40)	D1
Command response	When Vision Edition receives a command code, the same data as the command code is written as response. If Vision Edition cannot process the command due to an error, the following error codes are written instead. 91 = Camera connection error 92 = Job switching error 93 = Connection setting error 94 = Command error 99 = Unexpected error The command is set to 0 when completed.	D2
Command status	Indicates that Vision Edition is processing a command. 1 = Command being processed The command is set to 0 when completed.	D3
Command completed	Indicates that Vision Edition finished processing a command. 1 = Command completed The command is set to 0 after the time set for command response elapses.	D4

About the command argument area

These are the contents of the command argument area used when the PLC controls Vision Edition.

Example assuming [Command Argument Area Start Channel No. (DM)] is set to 5, and [Number of Arguments to Receive] is set to 2.

Name	Function	PLC assignment
Command argument 1	Value used as argument 01 when executing the command. Designate a 32-bit signed integer number.	D5 D6
Command argument 2	Value used as argument 02 when executing the command. Designate a 32-bit signed integer number.	D7 D8

About the numeric data area

These are the contents of the numeric data area used by Vision Edition to return numeric result values to the PLC. The selected job's number and the trigger count are always stored, regardless of the number of numeric values selected for output.

Example assuming [Numeric Data Area Start Channel No. (DM)] is set to 10, and [Number of Values to Output] is set to 2.

Name	Function	PLC assignment
Selected job number	(Fixed data) The job number of the job processed is stored.	D10
Trigger count	(Fixed data) The number of triggers processed is stored. If the number exceeds 32767 times, the count restarts from 1.	D11
Measurement value 01*	(User selected) Value 01 in the [Data (Values)] tab of the external connection settings is stored.	D12 D13
Measurement Value 02*	(User selected) Value 02 in the [Data (Values)] tab of the external connection settings is stored.	D14 D15

* The actual value stored is the product of the output value set in the [Data (Values)] tab of the [External Connection Settings] window (📖 73) multiplied by 10,000, stored as a double word. For example, if output value 01 was 1234.567, 12345670 is stored to registers D12 and D13.
When you need to use the original value, be sure to divide the content of the registers by 10,000 using 32-bit binary division.

About the text data area

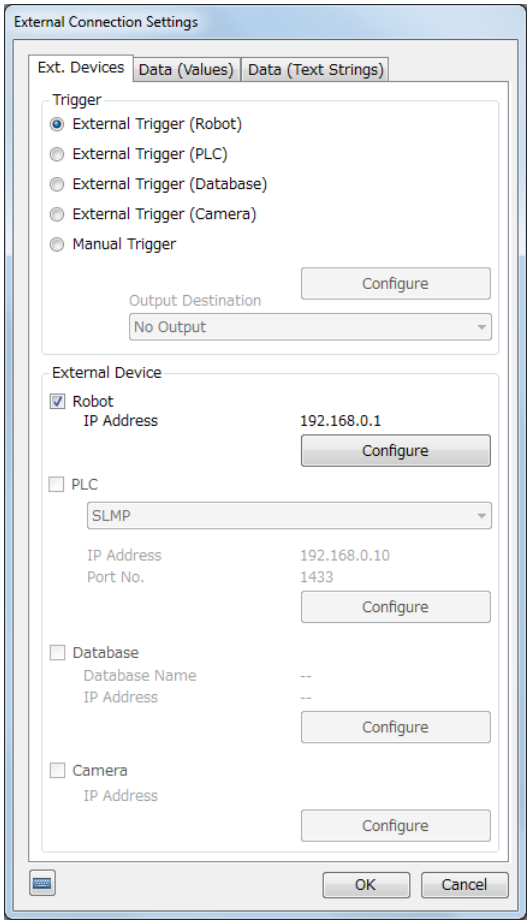
These are the contents of the text data area used by Vision Edition to return result values that are text strings to the PLC.

Example assuming [Text Data Area Start Channel No. (DM)] is set to 20, [Number of Values to Output] is set to 2 and [Max. Character Length] is set to 10.

Name	Function	PLC assignment
Measurement value 01	(User selected) Value 01 in the [Data (Text Strings)] tab of the external connection settings is stored.	D20 to D24
Measurement Value 02	(User selected) Value 02 in the [Data (Text Strings)] tab of the external connection settings is stored.	D25 to D29

Configuring the Trigger and External Devices

Click ⇄ ([External Connection Settings]) in the job toolbar to open the [External Connection Settings] window.



Configuring the Trigger

1 In the [External Connection Settings] window (📖 68), select the [Ext. Devices] tab and, in the [Trigger] area, select the desired trigger.

[External Trigger] options
Vision Edition will check for a trigger signal received from the external device.

[Manual Trigger]
The trigger will be activated from within Vision Edition.

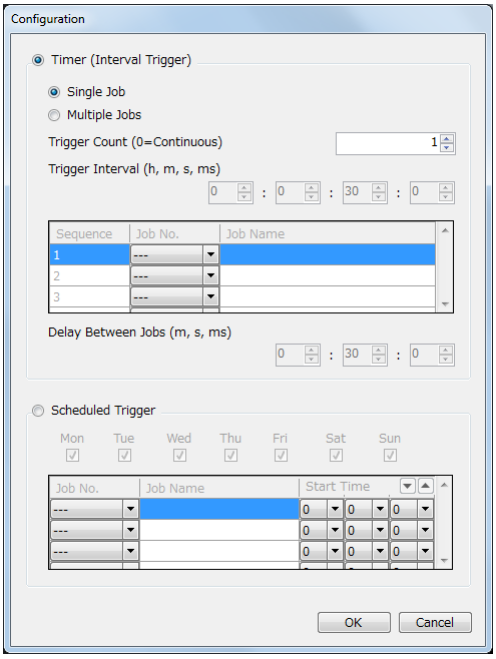
2 [External Trigger] options Configure the external device as necessary.

- Industrial robot (📖 70), PLC (SLMP-compatible) (📖 71), PLC (Open User Communication-compatible (📖 72), PLC (FINS-compatible) (📖 72), Database (📖 79), network camera (📖 80).

[Manual Trigger] Configure how the trigger will be applied.

(1) Click [Configure].
The [Configuration] dialog box will open.

(2) To apply a trigger based on a timer, select [Timer (Interval Trigger)], select the number of jobs to trigger, and configure the following settings.



[Single Job]
Enter the number of triggers applied to the single job under [Trigger Count] and enter the desired interval under [Trigger Interval]. Set [Trigger Count] to 0 to activate a continuous trigger.

[Multiple Jobs]
Select the sequence of jobs you want to trigger and, in addition to the number of triggers and desired interval, enter the delay from the time a job ends until the next job is triggered under [Delay Between Jobs]. In the job sequence list, after selecting a job number from the pulldown menu, the job name will be displayed.

(3) To apply a trigger based on a scheduler, select [Scheduled Trigger].
Place a checkmark in the boxes of the desired days of the week and, in the list of jobs, select the jobs you want to trigger and enter the start time for each job. After selecting a job number from the pulldown menu, the job name will be displayed.

(4) Click [OK] to close the dialog box.

3 Click [OK].

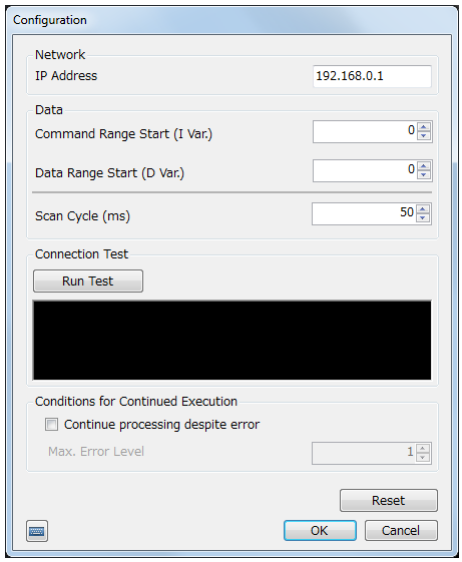
Note

- If [Trigger Count] is set to 0, when you click ▶ ([Trigger]) after bringing the system online (📖 85), the trigger will be applied and the entire flowchart will be processed. The trigger will then be applied continuously at the selected interval. To stop applying the trigger, click ▶ ([Trigger]) again or click ([Switch Online/Offline]) in the main screen to bring the system back offline.
- If another job is being processed at the time set as the start time of a scheduled job, the scheduled job will not start at the designated time. Carefully check in advance the start date and time of each scheduled job before making the settings.

Configuring the Connection to an Industrial Robot

1 In the [External Connection Settings] window (📖 68), select the [Ext. Devices] tab and, in the [Trigger] area, select [External Trigger (Robot)].

2 In the [External Device] area, place a checkmark in the [Robot] box and then click [Configure].



(1) Click [IP Address] and enter the robot's IP address as four numbers separated by periods.

(2) Click [Command Range Start (I Var.)] and enter the desired value.
This is the first number in the industrial robot's command range that the image processing controller will check.

(3) Click [Data Range Start (D Var.)] and enter the desired value.
This is the first number in the industrial robot's data range to which the image processing controller will send output values.

(4) Click [Scan Cycle (ms)] and enter the desired value in milliseconds.
This is the polling interval or scan cycle, that is, the length of time that the image processing controller will check the industrial robot's command range.

3 Test the external connection.

- After completing the settings, you can click [Run Test] to test the connection to the robot. If the test was successful, a message indicating so will appear. If an error message appears, refer to **Troubleshooting** (📖 204).

4 Set the conditions for continuing to process the flowchart.

- Depending on the error level returned by the industrial robot, you can choose to continue the flowchart's processing.
- When there is no checkmark in the [Continue processing despite error] box, the flowchart's processing will end if any robot error occurs.
- To continue processing the flowchart despite a robot error, place a checkmark in the [Continue processing despite error] box and enter the maximum tolerated robot error level.

5 Click [OK] to close the configuration window.

- Click [Reset] to reset all the external device's settings to their default values.

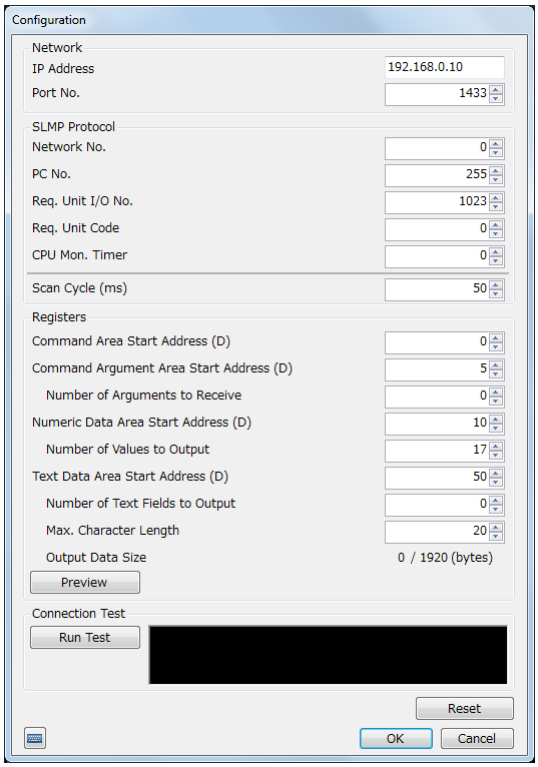
6 Configure the data to output and the output destination (📖 73).

7 Back in the [External Connection Settings] window, click [OK].

Configuring the Connection to a PLC (SLMP-Compatible)

1 In the [External Connection Settings] window (📖 68), select the [Ext. Devices] tab and, in the [Trigger] area, select [External Trigger (PLC)].

2 In the [External Device] area, place a checkmark in the [PLC] box, select [SLMP] and then click [Configure].



(1) Click [IP Address] and enter the IP address of the PLC (SLMP-compatible) as four numbers separated by periods. Then, click [Port No.] and enter the desired port number.

(2) Under [SLMP Protocol], configure the communication protocol settings as necessary.

(3) Click [Scan Cycle (ms)] and enter the desired value in milliseconds. This value determines how often the image processing controller checks the command area of the PLC (SLMP-compatible).

(4) Under [Registers], configure the registers and memory areas used to send/receive commands and data between the PLC and Vision Edition.
Click [Preview] to check a list of the current register assignments.

3 Test the external connection.

- After completing the settings, you can click [Run Test] to test the connection to the PLC (SLMP-compatible). If the test was successful, a message indicating so will appear. If an error message appears, refer to **Troubleshooting** (📖 204).

4 Click [OK] to close the configuration window.

- Click [Reset] to reset all the external device's settings to their default values.

5 Configure the data to output and the output destination (📖 73).

6 Back in the [External Connection Settings] window, click [OK].

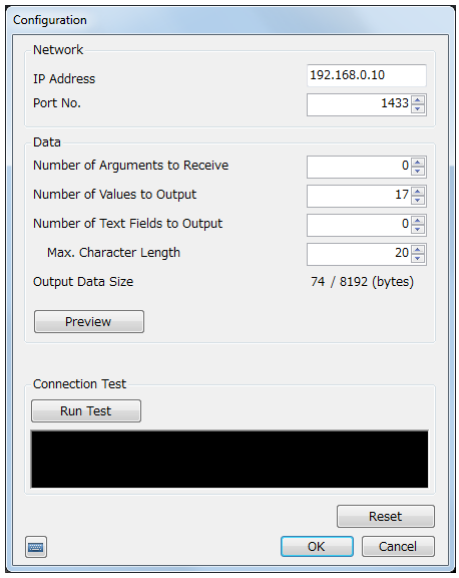
Configuring the Connection to a PLC (Open User Communication-compatible)

1 In the [External Connection Settings] window (📖 68), select the [Ext. Devices] tab and, in the [Trigger] area, select [External Trigger (PLC)].

2 In the [External Device] area, place a checkmark in the [PLC] box, select [Open User Comm. (Siemens)] and then click [Configure].

(1) Click [IP Address] and enter the IP address of the PLC (Open User Communication-compatible) as four numbers separated by periods. Then, click [Port No.] and enter the desired port number.

(2) Under [Data], configure the settings used to send/receive command arguments and data between the PLC and Vision Edition.
Click [Preview] to check a list of the data variables used.



3 Test the external connection.

- After completing the settings, you can click [Run Test] to test the connection to the PLC (Open User Communication-compatible). If the test was successful, a message indicating so will appear. If an error message appears, refer to **Troubleshooting** (📖 204).

4 Click [OK] to close the configuration window.

- Click [Reset] to reset all the external device's settings to their default values.

5 Configure the data to output and the output destination (📖 73).

6 Back in the [External Connection Settings] window, click [OK].

Configuring the Connection to a PLC (FINS-Compatible)

1 In the [External Connection Settings] window (📖 68), select the [Ext. Devices] tab and, in the [Trigger] area, select [External Trigger (PLC)].

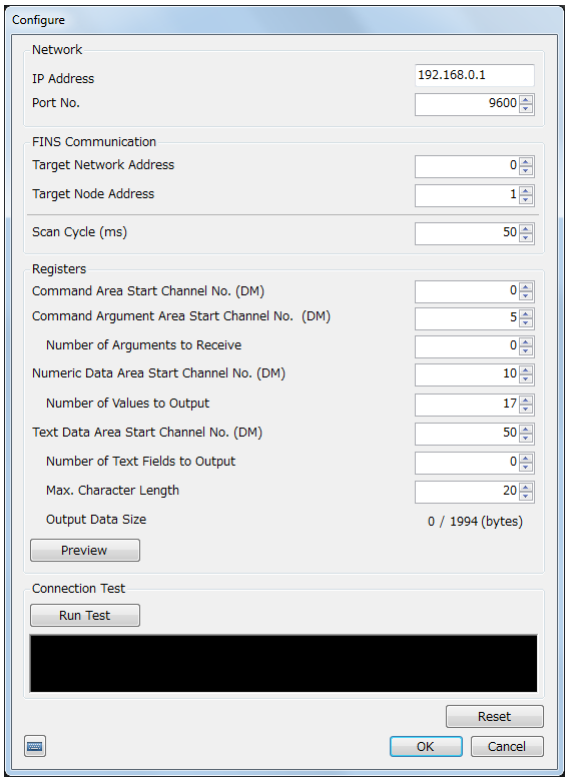
2 In the [External Device] area, place a checkmark in the [PLC] box, select [FINS] and then click [Configure].

(1) Click [IP Address] and enter the IP address of the PLC (FINS-compatible) as four numbers separated by periods. Then, click [Port No.] and enter the desired port number.

(2) Under [FINS Communication], configure the communication protocol settings as necessary.

(3) Click [Scan Cycle (ms)] and enter the desired value in milliseconds. This value determines how often the image processing controller checks the command range of the PLC (FINS-compatible).

(4) Under [Registers], configure the registers and memory areas used to send/receive commands and data between the PLC and Vision Edition.
Click [Preview] to check a list of the current register assignments.



3 Test the external connection.

- After completing the settings, you can click [Run Test] to test the connection to the PLC (FINS-compatible). If the test was successful, a message indicating so will appear. If an error message appears, refer to **Troubleshooting** (📖 204).

4 Click [OK] to close the configuration window.

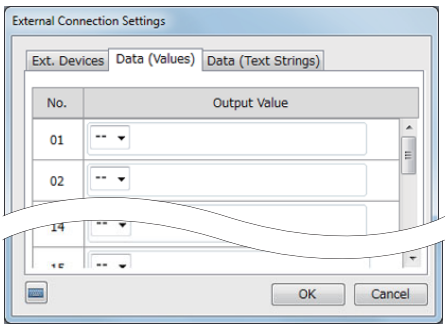
- Click [Reset] to reset all the external device's settings to their default values.

5 Configure the data to output and the output destination (📖 73).

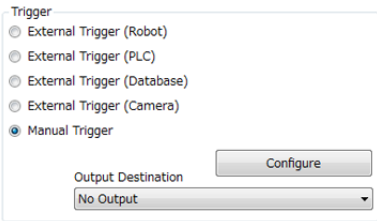
6 Back in the [External Connection Settings] window, click [OK].

Selecting the Output Destination and the Data to Output

You can select the data (result values) to output from Vision Edition to an industrial robot or PLC. For details about saving log data to a database, refer to **Saving Log Data to a Database** (📖 188).



1 In the [External Connection Settings] window (📖 68), select the [Ext. Devices] tab and set up the trigger (📖 68).



2 [Manual Trigger] Under [Trigger], click [Output Destination] and select the desired option.

- You can select [No Output], [Robot] or [PLC].

  [No Output]
  Data is not output.

  [Robot]
  Data is output to the robot.

  [PLC]
  Data is output to the PLC.

[External Trigger] options Select the [Data (Values)] and/or [Data (Text Strings)] tab and select the data to output.

- For each of the data items, you can select [Real Number], [Unit] (result value returned from an operation unit) or [Constant].

  [Real Number]
  Enter the desired value.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to output. Available options will vary depending on the operation unit selected.

[Constant]

Select one of the registered constants (📖 35).

3 Click [OK].

Note

- For a PLC (SLMP-compatible or FINS-compatible), the value written to the PLC is the product of the output value multiplied by 10,000 (📖 59, 67).

Setting Up a Connection to a Database

You can set up a database to use as the external trigger for the image processing controller. The database types that can be used are Microsoft SQL Server, Oracle Database and PostgreSQL.
For details about saving log data, refer to **Saving Log Data to a Database** (📖 188).

Note

- Oracle Database runtime libraries are required to use a database of this type. For details on how to obtain them, visit the Canon website (📖 214).
  Save the runtime libraries to the image processing controller with the following procedure.
  (1) Copy the compressed file you downloaded to the image processing controller.
  If the C: drive is protected, unprotect in advance (📖 195).
  (2) Decompress the file and save the following two files in the C:\Program Files (x86)\Canon\CIIP_VisionEdition folder.
  Oracle.ManagedDataAccess.dll
  Oracle.ManagedDataAccess.EntityFramework.dll

Setting Up a Database

To use a database as the external trigger, complete all the necessary settings on the database server and create a database in advance. If necessary, consult your system administrator for details.

Database settings

Setting	Value
IP address	Any, as long as it is on the same network as the image processing controller and it does not create an IP address conflict.
Port number	Any, as long as it is on the same network as the image processing controller and it does not create a port no. conflict.
Database name	Any, as long as it conforms to the naming rules of the database type used.
User name	Any, as long as it conforms to the rules of the database type used.
Password	Any, as long as it conforms to the rules of the database type used.

Creating a Control Table and Control Records

The database and image processing controller communicate through a control table. During the polling interval (scan cycle), the image processing controller checks the designated records (control records) and executes the specified commands. You can also create the control table and control records using Vision Edition.

Creating the control table and control records using Vision Edition

The following is the structure of the control table created using Vision Edition and an explanation of each column. The record whose primary key (the [Number] column) is 1 is used as the control record.

Control table structure

Item	Column name	Column type	Function
Primary key	Number	Integer	Primary key of the control table. The record with a value of 1 for this column is used as the control record.
Command execution	CommandExecute	Integer	Executes the relevant process according to the command code set. The command is set to 0 when completed.
Command code	CommandCode	Integer	Set a number according to the process you want to execute. 101 = Trigger 1 102 = Trigger 2 103 = Trigger 3 104 = Trigger 4 1 to 40 = Switch to the respective job (JOB01 to JOB40)
Command response	CommandResponse	Integer	When the image processing controller receives a command code, the same data as the command code is written to this column as response. If the image processing controller cannot process the command due to an error, the following error codes are written instead. 91 = Camera connection error 92 = Job switching error 93 = Connection configuration error 94 = Command error 99 = Unexpected error The command is set to 0 when completed.
Command status	CommandStatus	Integer	Indicates that Vision Edition is processing a command. 1 = Command being processed The command is set to 0 when completed.
Command completed	CommandComplete	Integer	Indicates that Vision Edition finished processing a command. 1 = Command completed The command is set to 0 after the time set for command response elapses.
Command argument 1	CommandArgument1	Float	Values used as arguments when executing the command.
Command argument 2	CommandArgument2		
Command argument 3	CommandArgument3		
Command argument 4	CommandArgument4		
Command argument 5	CommandArgument5		

Values that can be used per column type

Database type	Integer type	Float type
Microsoft SQL Server	int	float
Oracle database	NUMBER (15,0)	NUMBER (18,3)
PostgreSQL	integer	numeric (18,3)

Creating the control table and control records without using Vision Edition

The following is the structure of the control table needed to communicate with Vision Edition. The record whose primary key is 1 is used as the control record.

Control table structure

Item	Column name	Column Type
Primary key	Number	Integer
Command execution Command code Command response Command status Command completed	Any, as long as it conforms to the naming rules of the database type used.	Integer
Command argument 1 Command argument 2 Command argument 3 Command argument 4 Command argument 5		Float

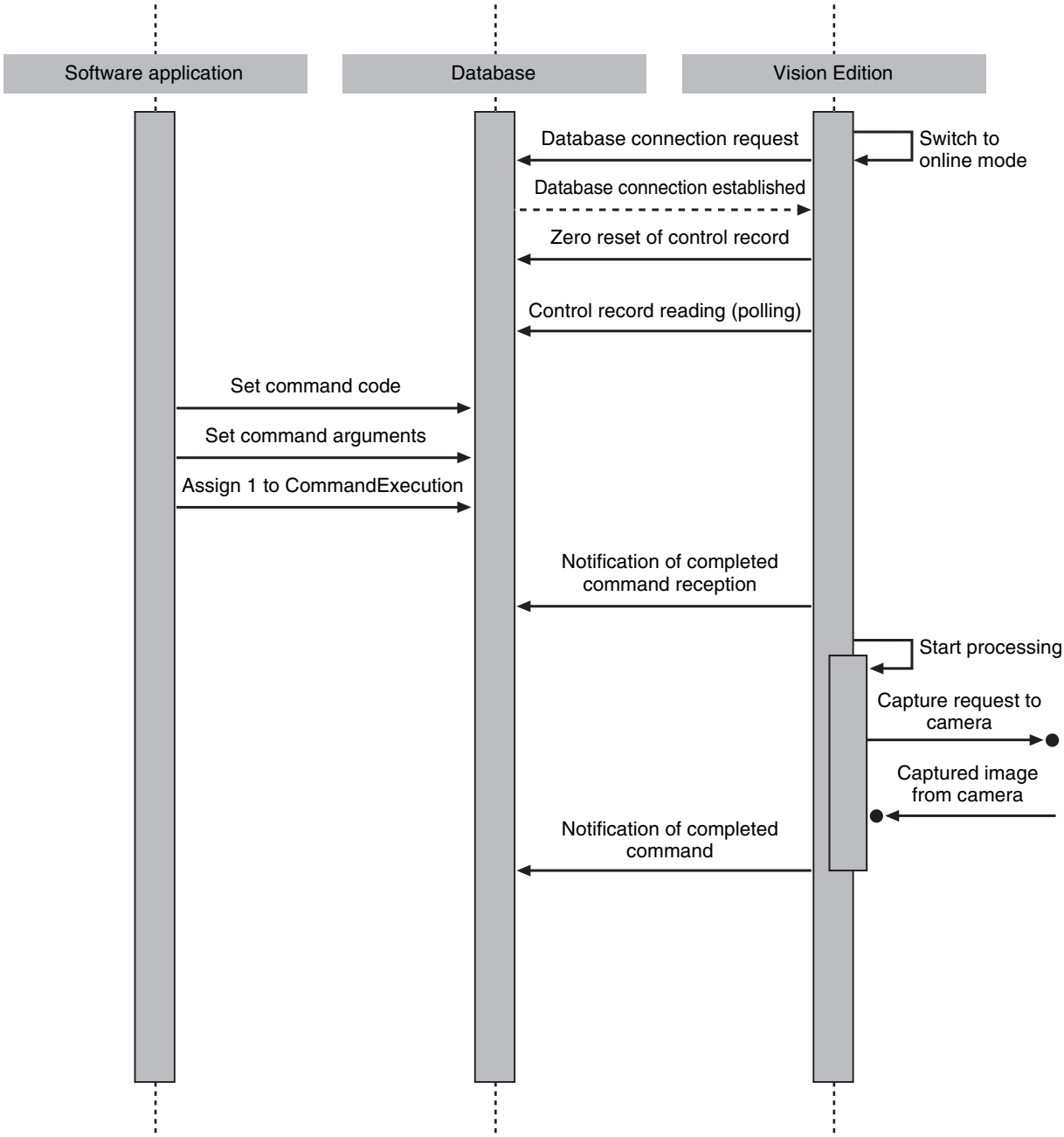
Values that can be used per column type

In the following table "(p, s)" stands for (precision, scale).

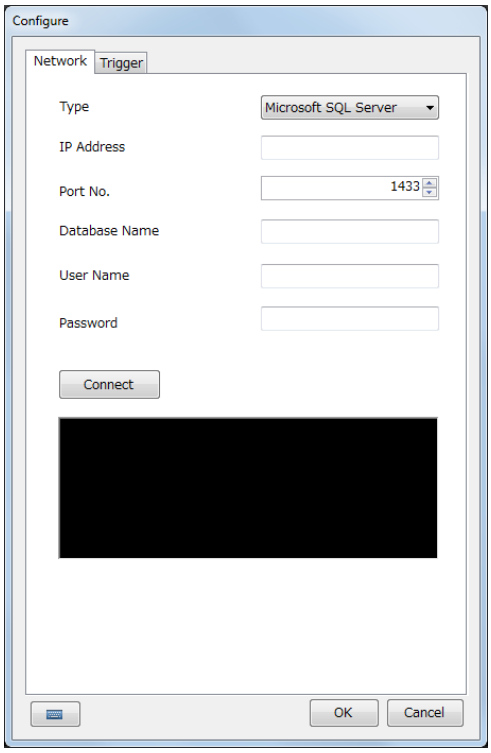
Database type	Integer type	Float type
Microsoft SQL Server	int / bigint / smallint, tinyint	float / real
Oracle database	NUMBER (p,0)	NUMBER (p, s) / BINARY_FLOAT / BINARY_DOUBLE
PostgreSQL	integer / smallint / bigint	numeric (p, s) / decimal (p, s) / real / double / precision

Sequence Diagram of Communication Between a Database and This Software

This is a communication diagram using a database. Prepare the necessary software application in advance.
To output result values, use the log data saving function.



Configuring the Connection to a Database



1 Click ([External Connection Settings]) in the job toolbar to open the [External Connection Settings] window.

2 Select the [Ext. Devices] tab and, in the [Trigger] area, select [External Trigger (Database)].

3 In the [External Device] area, place a checkmark in the [Database] box and click [Configure].

- The [Configuration] dialog box will appear.

4 Select the [Network] tab, select the database type from the pulldown menu and then configure the rest of the database settings.

- Set the IP address, port number, database name, user name and password.

5 Test the external connection.

- After completing the settings, you can click [Run Test] to test the connection to the database. If the test was successful, a message indicating so will appear. If an error message appears, refer to **Troubleshooting** (204).

6 Select the [Trigger] tab and configure the trigger settings.

(1) Click [Select Table] and select the desired table.
- The table's content will be displayed.
- To create a control table, click [Create New Table]. The [Create New Table] dialog box will appear. Enter the desired table name and click [OK]. The control table will be created automatically.

(2) Select the column to use for each item.

(3) Click [Scan Cycle (ms)] and enter the desired value in milliseconds.

7 Click [OK] to close the configuration window.

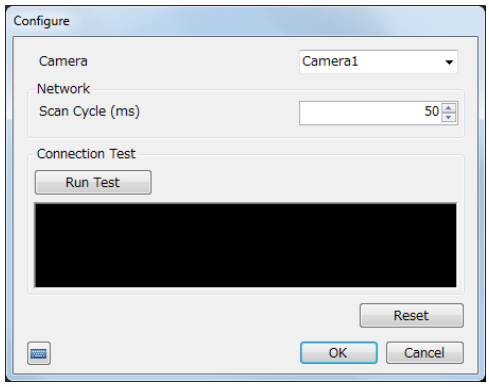
8 Back in the [External Connection Settings] window, click [OK].

- The database connection status icon will change to [DB].

Setting Up a Connection to a Network Camera

You can set up a Canon network camera compatible with the event detection function to use its event detection (audio detection, moving object detection, etc.) notification as the external trigger for the image processing controller.

Configuring the Connection to a Network Camera



1 Click ([External Connection Settings]) in the job toolbar to open the [External Connection Settings] window.

2 Select the [Ext. Devices] tab and, in the [Trigger] area, select [External Trigger (Camera)].

3 In the [External Device] area, place a checkmark in the [Camera] box and click [Configure].

- The [Configuration] dialog box will appear.

4 Click [Camera] and select a registered camera (26).

5 Click [Scan Cycle (ms)] and enter the desired value in milliseconds.

6 Test the external connection.

- After completing the settings, you can click [Run Test] to test the connection to the camera. If the test was successful, a message indicating so will appear. If an error message appears, refer to **Troubleshooting** (204).

7 Click [OK] to close the configuration window.

- Click [Reset] to reset all the camera's settings to their default values.

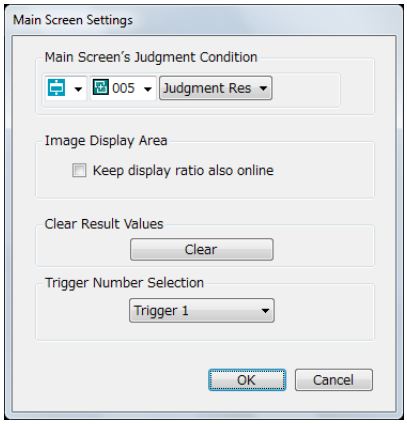
8 Back in the [External Connection Settings] window, click [OK].

- The selected camera's status icon will change to [Camera].

Changing the Status Information Display Area

With the following procedures, you can change some of the information displayed in the status information display area.

Click ([Main Screen Settings]) in the main toolbar to open the [Main Screen Settings] window.



To change the main screen's judgment condition

You can set the condition that determines the judgment result ([OK] or [NG]) displayed prominently at the top right of the main screen. If no judgment condition is set, the main screen will permanently show an [NG] result.

Under [Main Screen's Judgment Condition], select one of the operation units in the flowchart area that will serve as judgment condition. Available options will vary depending on the operation unit selected.

To keep the screen enlargement ratio even when you bring the system online

To keep the enlargement ratio, place a checkmark in the [Keep display ratio also online] box.

To clear the processing results displayed in the status information area

Click [Clear] and, when the confirmation message appears, click [OK]. This will clear also the processing information of all the individual operation units.

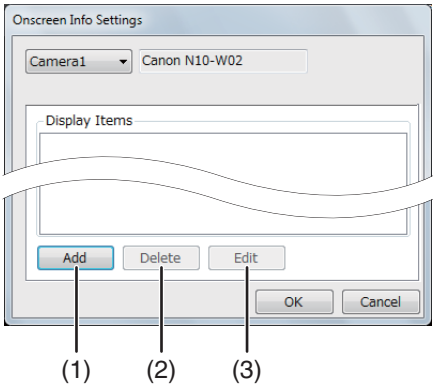
To select the trigger number

You can select the number of the trigger that the image processing controller applies when the manual trigger option is selected. You can also use the trigger number as a condition in [Multi-Condition Branching] operation units (113).

Under [Trigger Number Selection], select the trigger you want to use ([Trigger 1] to [Trigger 4])

Customizing Onscreen Information

Click ([Onscreen Info Settings]) in the job toolbar to open the [Onscreen Info Settings] window.



(1) Add a new display item

(2) Delete the selected display item

(3) Edit the selected display item

Adding Display Items

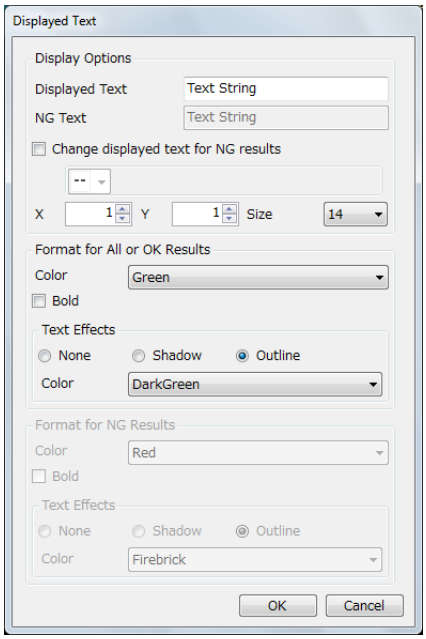
You can set up the text strings and values displayed in the image display area independently for each registered camera (26).

1 Select the camera whose onscreen displays you want to customize.

2 Click [Add] and then select [Text String] or [Value].

- The window that opens will be different depending on your selection.

3 Set up the text string or value to be displayed.



[Text String]

(1) Click [Displayed Text] and enter the desired text string.

(2) To change the displayed text according to a condition, place a checkmark in the [Change displayed text for NG results] box.

(3) Select [Unit] in the menu below the checkbox, select one of the operation units in the flowchart that will serve as the condition and then select [Judgment Result].

(4) Click [NG Text] and enter the text string to display in case of an NG result.

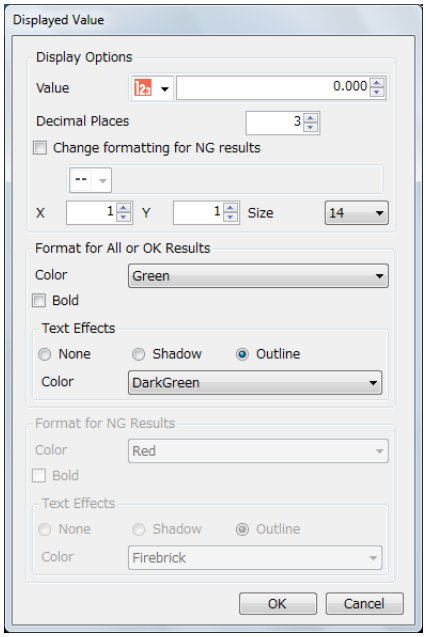
[Value]

(1) Click [Value] and select the value to be displayed.
You can select [Real Number], [Unit] (result value returned from an operation unit) or [Constant].

[Real Number]
Enter the desired value.

[Unit]
Select one of the operation units in the flowchart area and then select the result value you want to display. Available options will vary depending on the operation unit selected.

[Constant]
Select one of the registered constants (📖 35).



(2) To select the number of digits displayed after the decimal point, click [Decimal Places] and enter the desired number.

(3) To change the formatting of the displayed value according to a condition, place a checkmark in the [Change formatting for NG results] box.

(4) Select [Unit] in the menu below the checkbox, select one of the operation units in the flowchart that will serve as the condition and then select [Judgment Result].

4 Set the position and text size of the display item.

(1) To set the display position, click [X] and [Y] and enter the desired coordinates. Note that, depending on the values entered, the coordinates may lie outside the image display area and the text string or value may not appear on the screen.

(2) To set the font size, click [Size] and select the desired value.

5 Set the formatting for the display item.

- If in step 3 you selected to change the text or the value's formatting depending on a judgment result, change the same settings also under [Format for NG Results].

(1) Click [Color] and select the desired color.

(2) To make the text bold, place a checkmark in the [Bold] box.

(3) To add a text effect, select [Shadow] or [Outline].

(4) Click [Color] (under [Text Effects]) and select the desired color.

6 Click [OK].

- The onscreen display settings will be saved.
- You can click [Cancel] to close the window without saving the changes.

Activating the Trigger and Bringing the System Online

You can activate the trigger to run the flowchart you created for the job and verify that the operation units are correctly processed before bringing the system online.

Activating the Trigger

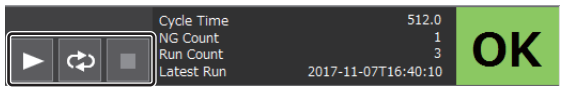
Checking the Processing of the Entire Flowchart

With this procedure you can test that the entire flowchart is processed correctly.

1 Create a flowchart for the job (📖 36).

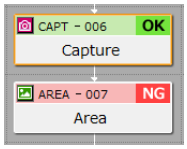
- Make sure all the operation units are correctly connected from start to end.

2 In the main screen, click ▶ ([Trigger]) or ([Continuous trigger]).



- [Continuous trigger] keeps processing the flowchart continuously until you click the button again to stop it.
- Click ■ ([Stop]) to stop processing the flowchart once the processing of the current operation unit ends.

3 Check the flowchart processing results.



- The judgment result of each operation unit in the flowchart (green [OK] icon or red [NG] icon) will appear the top right corner of the operation unit. If you are not obtaining the expected results, try adjusting the settings of individual operation units as necessary.

Checking Individual Image Processing Units

Only for image processing units, you can check that the individual operation unit is correctly processed right from the operation unit editing window. The scope of this test depends on the trigger mode selected. To check a single operation unit, it has to be part of a flowchart correctly connected from start to end.

1 Select an image processing operation unit in the flowchart area (📖 37, 38).

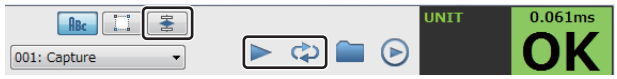
- Double-click the operation unit you want to check to open the editing window.

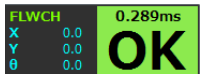
2 Set the operation unit's target image.

- Select one of the [Capture] operation units in the flowchart that will capture the image to be processed.

3 Select the trigger mode.

- Click ([Flowchart mode ↔ Unit mode]) to change the trigger mode.





[UNIT] (unit mode)
The trigger is applied only to the image processing unit being edited and to the [Capture] operation unit selected in step 2 to check the individual operation unit.

[FLWCH] (flowchart mode)
The trigger activates the processing of the entire flowchart so you can check the processing of the individual operation unit as well as the result values of other operation units.
If you set up image position adjustment settings (📖 99), the adjustment values will be displayed in light blue when you apply the trigger.

4 Click ▶ ([Trigger]) or ([Continuous trigger]).

- [Continuous trigger] keeps processing the operation unit or flowchart continuously until you click the button again to stop it.

5 Check the results of the individual operation unit.

- The judgment result shown at the top right corner of the editing window will change to a green [OK], when the operation unit was processed correctly, or to a red [NG], when it was not. If you are not obtaining the expected results, try adjusting the operation unit's settings as necessary.

6 Click [OK].

Bringing the System Online/Offline

The things you can do are different depending on whether the system is online or offline. Switch the system offline/online as necessary.

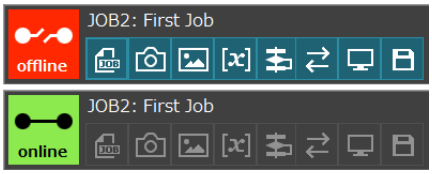
Offline

There is no communication between the image processing controller and external devices. You can change the image processing controller's settings, edit the flowchart and configure operation units and apply manual triggers to test the processing of the job.

Online

The image processing controller can communicate with external devices. The image processing controller will be in standby mode, ready to receive trigger signals form an industrial robot or PLC. When a trigger is received (either an external trigger from a connected device or an internal trigger from Vision Edition), the flowchart will be processed. You can also send judgment results and result values to external devices.

In the main screen, click or ([Switch Online/Offline]) to bring the system online or offline, respectively. A confirmation message will appear. When you click [OK] the icon will change and the system will go online/offline.



Flowchart processing status

Information about the flowchart's processing results appear next to the judgment result icon.

[Cycle Time]
Time (in milliseconds) required to process the entire flowchart.

[NG Count]
Number of times that processing the flowchart ended in an NG result.

[Run Count]
Number of times the trigger was activated and the flowchart was processed.

[Latest Run]
Date and time of the last time the flowchart was processed.

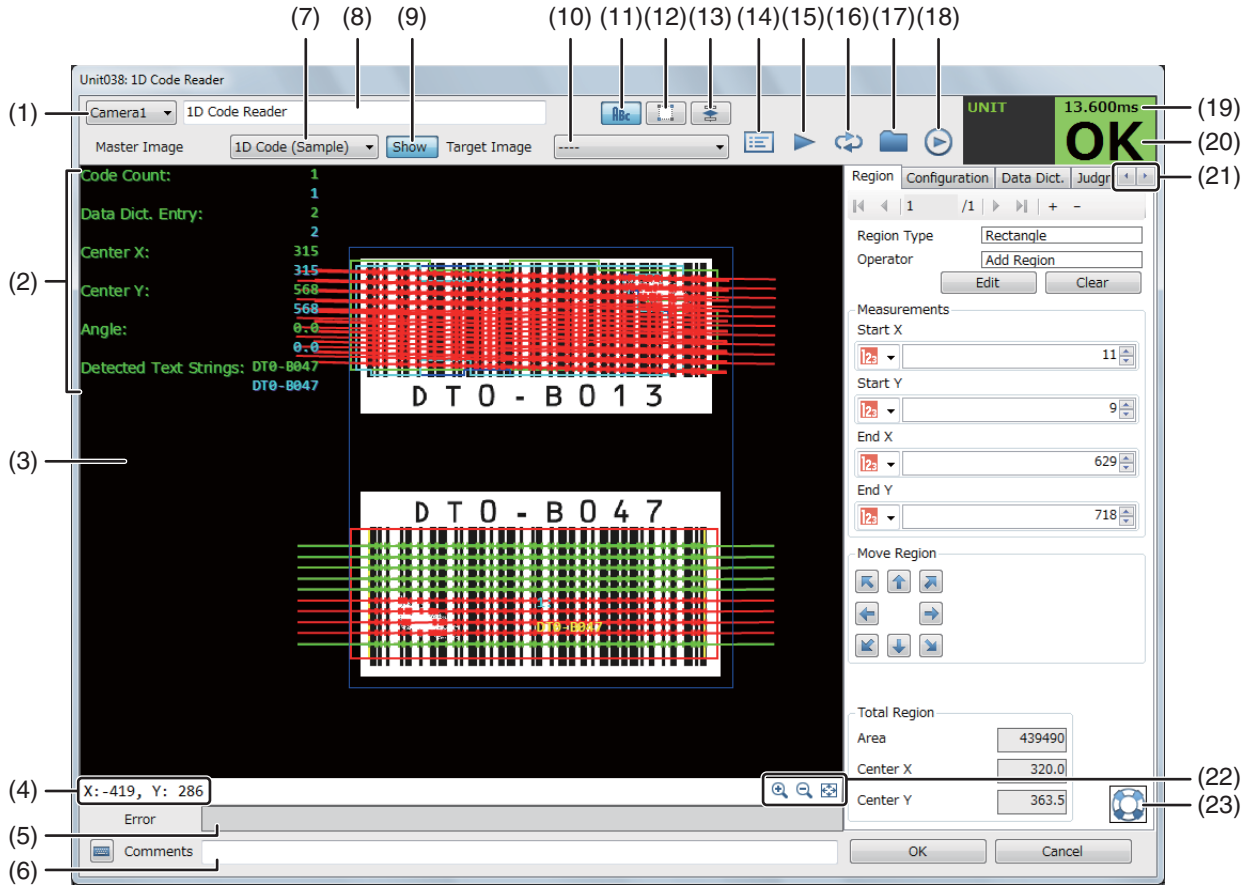
Chapter 3

Units

This chapter explains in detail all the operation units available and their settings.

Common Operation Unit Settings

When you double-click an operation unit in the flowchart area, the operation unit editing window will open. The settings that can be changed will vary depending on the operation unit selected, but some settings and tabs are common to most or all operation units. This section will describe such tabs and settings. For details about settings specific to a certain operation unit, refer to the section describing the individual operation unit (📖 37).



Example: Editing window for a [Shading Test] operation unit (image processing unit)

(1) Camera where the master image used is registered (📖 32)

(2) Result values

(3) Image display area

(4) Mouse position coordinates

(5) Error message display area (📖 206)

(6) Comments
You can click to enter any comments about the operation unit.

(7) Master image used

(8) Operation unit name

(9) Show/Hide the master image

(10) [Capture] operation unit used to capture the target image

(11) Show/Hide the result values

(12) Show/Hide the image processing result values (only image processing units)

(13) Change the trigger mode (📖 84)

(14) List of result values (📖 100)
Can be displayed for some operation units.

(15) Apply a single trigger (📖 84)

(16) Apply a continuous trigger (📖 84)

(17) Load an image file
Select an image file and display the image in the image display area.

(18) Run a simulation (📖 200)

(19) Operation unit's processing time

(20) Operation unit's judgment result

(21) Display additional tabs to the left/right

(22) Image size buttons (Enlarge / Reduce / Fit to display area)

(23) Display tips about the operation unit

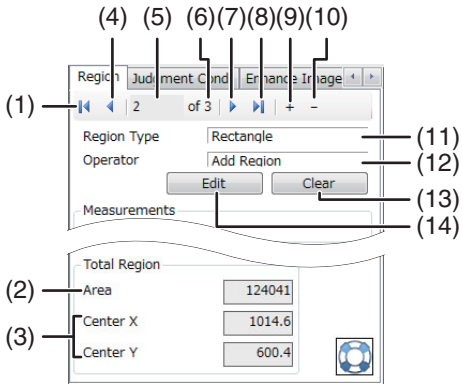
About Input Value Types

The following types of input value are used in Vision Edition's various settings (operation units, result value selection, etc.) Available items may change depending on the function and operation unit and the version of Vision Edition used.

Input type	Valid input values
[Integer]	Enter an integer value.
[Real Number]	Enter a real number value.
[Angle (deg)]	Enter a real number angle value (in degrees).
[Unit]	Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.
[Constant]	Select a previously registered constant (📖 35).
[Command Argument]	Select a 32-bit signed integer number received from the PLC.

Defining a Region

Image processing units and model matching units perform measurements and inspections within a predefined region. You will also need to specify a region when registering models. Detailed settings available in the [Region] tab will vary depending on the type of region selected.



(1) Show the details of the first region

(2) Total surface area of the combined inspection region

(3) Coordinates of the center of the combined inspection region

(4) Show the details of the previous region

(5) Currently selected region

(6) Total number of regions

(7) Show the details of the next region

(8) Show the details of the last region

(9) Add a region

(10) Remove the selected region

(11) Region type of the selected region

(12) Operator of the selected region (region added or subtracted)

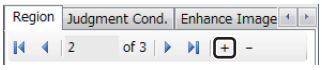
(13) Clear the region being configured and start over

(14) Start configuring the selected region

Adding a Region

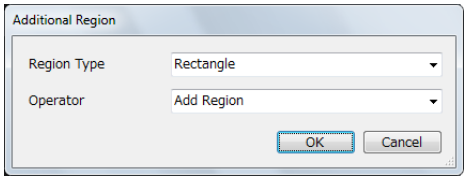
Depending on the operation unit, you may not be able to add regions or the region types that can be added may be limited.

1 Add an inspection region.



- Click [+] ([Add region]) to open the [Additional Region] dialog box.

2 Select the desired [Region Type].

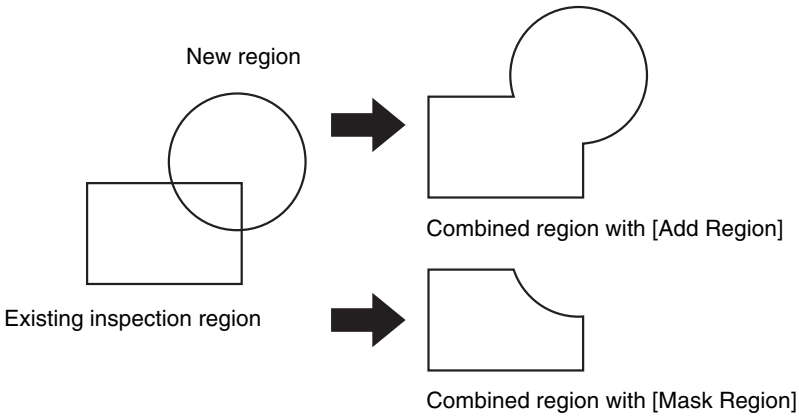


- Depending on the operation unit, you can select [Rectangle], [Rotated Rectangle], [Circle], [Oval], [Arc] or [Ring].

3 Click [Operator] and select the desired operation.

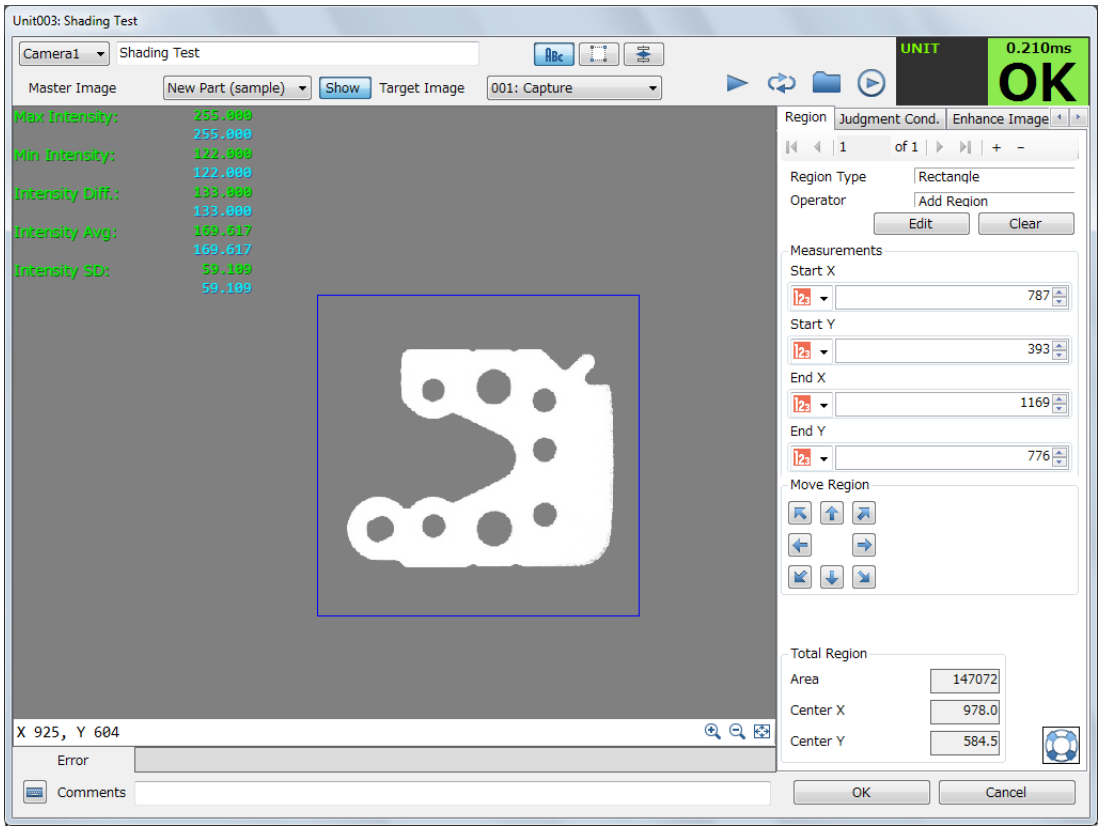
[Add Region]
The new region is added to any previously set inspection region to create a larger combined inspection region.

[Mask Region]
The new region is subtracted from any previously set inspection region to exclude or mask parts of it from inspection.



4 Click [OK].

Drawing a Rectangle



1 Check that the selected region's type is [Rectangle] and draw the desired region.

- Click [Edit] and then click and drag the mouse over the image display area to draw a red rectangle.
- To change the size of the rectangle, click and drag one of the corners or sides of rectangle.
- To move the rectangle without resizing it, click and drag the [+] mark at its center.

2 Right-click on the rectangle to confirm the region.

- If the region is correctly set, the rectangle will change to blue and the enclosed area will be confirmed as the inspection region.

3 Adjust the extent of the region as necessary.

- Click [Start X], [Start Y], [End X], and/or [End Y] and set the desired value.
  All settings: Select [Integer], [Unit] (result value returned from an operation unit) or [Constant].

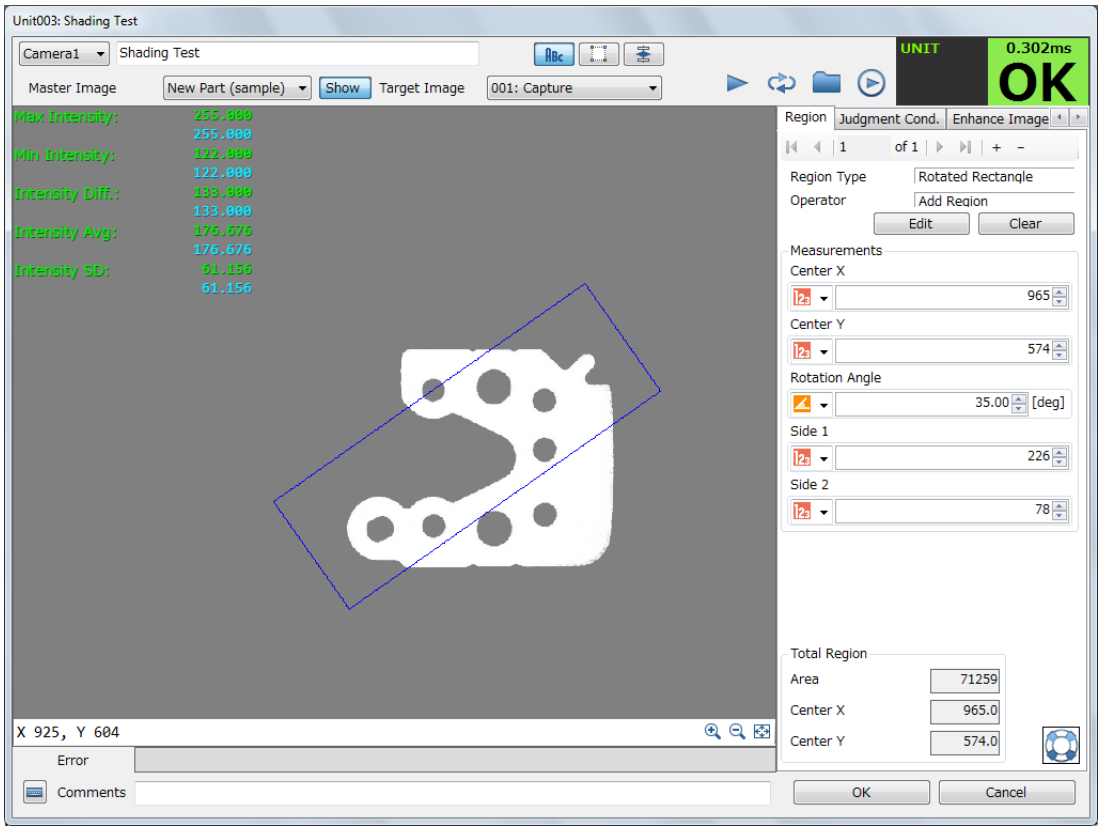
  [Integer]
  Enter the desired value.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use.
  Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

4 If necessary, you can click on the [Move Region] arrows to move the region.

Drawing a Rotated Rectangle



1 Check that the selected region's type is [Rotated Rectangle] and draw the desired region.

- Click [Edit] and then click and drag the mouse over the image display area to draw a red rectangle.
- To change the size of the rectangle, click and drag one of the corners or sides of rectangle. Clicking and dragging the green arrow you can resize the rectangle and change its angle.
- To move the rectangle without resizing it, click and drag the [+] mark at its center.

2 Right-click on the rectangle to confirm the region.

- If the region is correctly set, the rectangle will change to blue and the enclosed area will be confirmed as the inspection region.

3 Adjust the extent of the region as necessary.

- Click [Center X], [Center Y], [Rotation Angle], [Side 1] and/or [Side 2] and set the desired value.
  [Center X], [Center Y], [Side 1], [Side 2]: Select [Integer], [Unit] (result value returned from an operation unit) or [Constant].
  [Rotation Angle]: Select [Angle (deg)], [Unit] or [Constant].

  [Integer] / [Angle (deg)]
  Enter the desired value or angle.

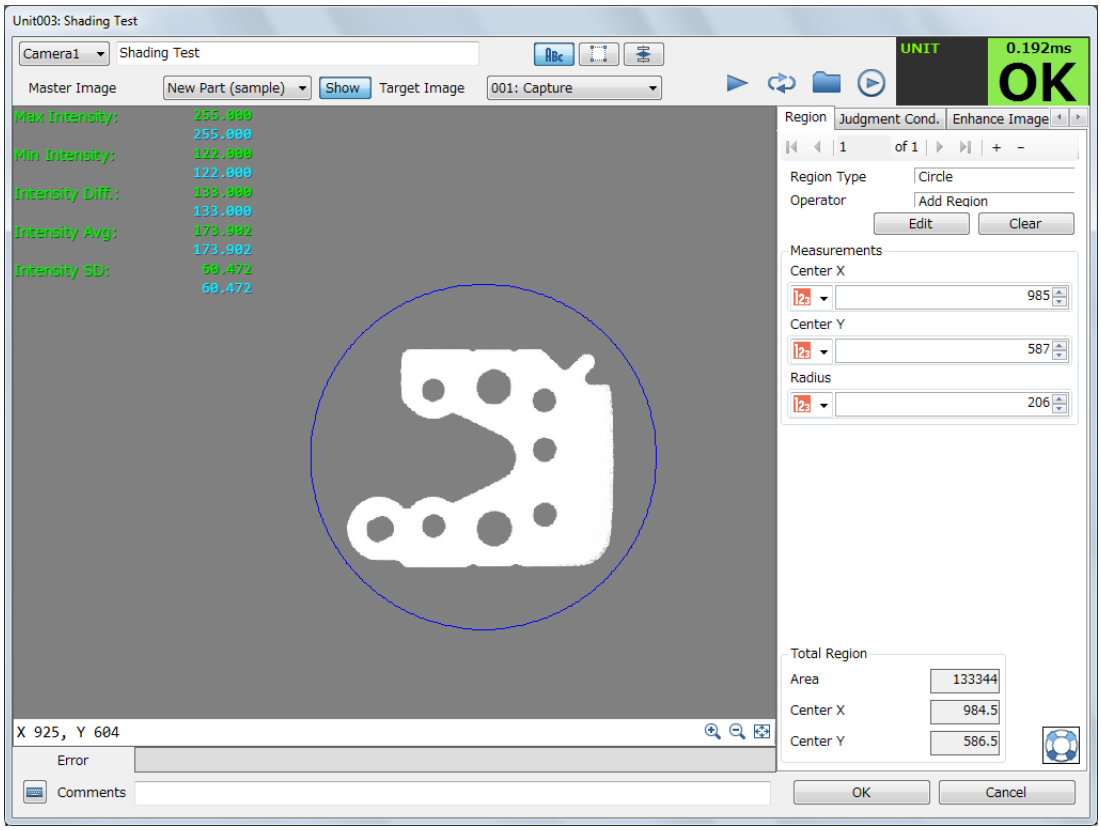
  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

4 For [Approximate Straight Edge] operation units only, set the number of segments (subdivisions) of the inspection region.

- Click [No. of Segments] and enter the desired number.

Drawing a Circle



1 Check that the selected region's type is [Circle] and draw the desired region.

- Click [Edit] and then click and drag the mouse over the image display area to draw a red circle.
- To change the size of the circle, click near its perimeter and drag the mouse.
- To move the circle without resizing it, click and drag the [+] mark at its center.

2 Right-click on the circle to confirm the region.

- If the region is correctly set, the circle will change to blue and the enclosed area will be confirmed as the inspection region.

3 Adjust the extent of the region as necessary.

- Click [Center X], [Center Y] and/or [Radius] and set the desired value.
  [Center X], [Center Y]: Select [Integer], [Unit] (result value returned from an operation unit) or [Constant].
  [Radius]: Select [Integer], [Formula], [Unit] or [Constant].

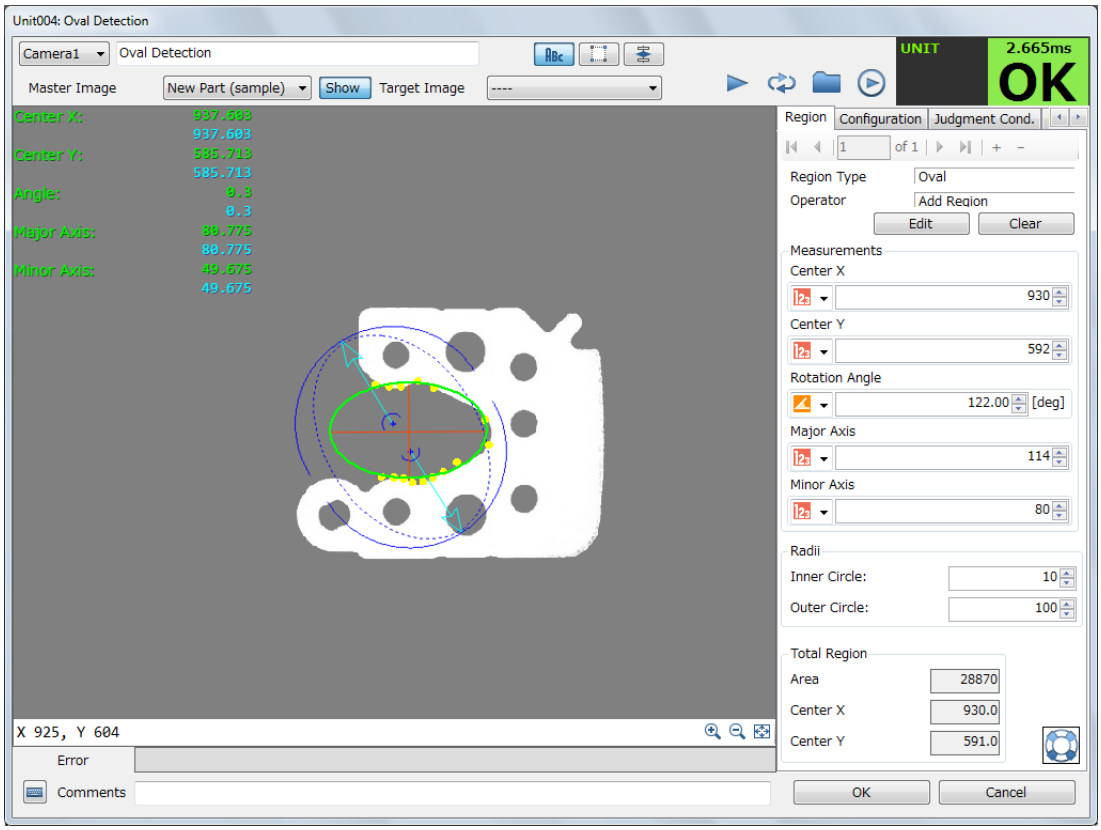
  [Integer]
  Enter the desired value.

  [Formula]
  Select a trigonometric operator [sin] (sine), [cos] (cosine) or [tan] (tangent) and enter the desired argument.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use.
  Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

Drawing an Oval



1 Check that the selected region's type is [Oval] and draw the desired region.

- Click [Edit] and then click and drag the mouse over the image display area to draw a red oval.
- To change the size of the oval, click near its perimeter and drag the mouse. Clicking and dragging the green arrow you can resize the oval and change its angle.
- To move the oval without resizing it, click and drag the [+] mark at its center.

2 Right-click on the oval to confirm the region.

- If the region is correctly set, the oval will change to a blue dotted line and the area enclosed between the half circles will be confirmed as the inspection region.

3 Adjust the extent of the region as necessary.

- Click [Center X], [Center Y], [Rotation Angle], [Major Axis], and/or [Minor Axis] and set the desired value.
  [Center X], [Center Y], [Major Axis], [Minor Axis]: Select [Integer], [Unit] (result value returned from an operation unit) or [Constant].
  [Rotation Angle]: Select [Angle (deg)], [Unit] or [Constant].

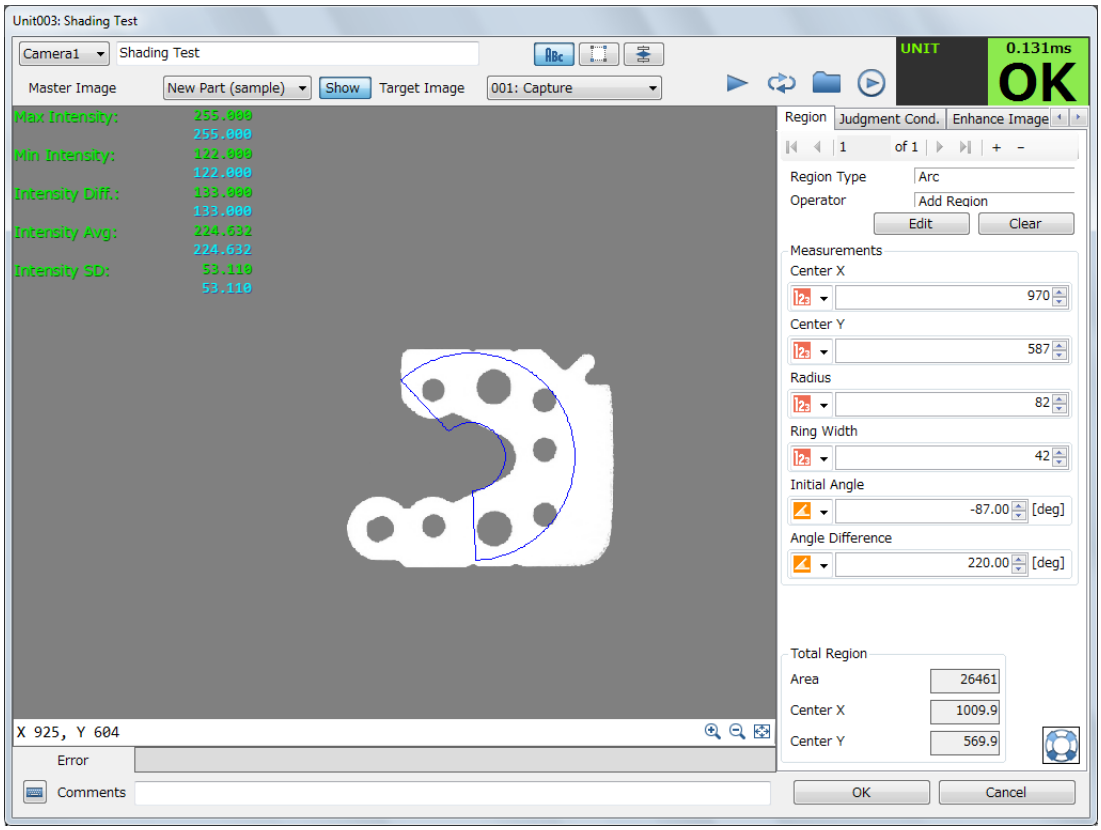
  [Integer] / [Angle (deg)]
  Enter the desired value or angle.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

4 Click [Inner Circle] and [Outer Circle] and for each, enter the desired radius value.

Drawing an Arc



1 Check that the selected region's type is [Arc] and draw the desired region.

- Click [Edit] and then click and drag the mouse over the image display area to draw a red circle.
- To change the size of the circle, click near its perimeter and drag the mouse.
- To move the circle without resizing it, click and drag the [+] mark at its center.

2 Right-click on the circle to confirm the region.

- If the region is correctly set, the circle will change to a blue arc (ring sector) with the circle you drew in step 1 at its center. The area enclosed by the ring sector will be confirmed as the inspection region.

3 Adjust the extent of the region as necessary.

- Click [Center X], [Center Y], [Radius], [Ring Width], [Initial Angle] and/or [Angle Difference] and set the desired value.
  [Center X], [Center Y]: Select [Integer], [Unit] (result value returned from an operation unit) or [Constant].
  [Radius], [Ring Width]: Select [Integer], [Formula], [Unit] or [Constant].
  [Initial Angle], [Angle Difference]: Select [Angle (deg)], [Unit] or [Constant].

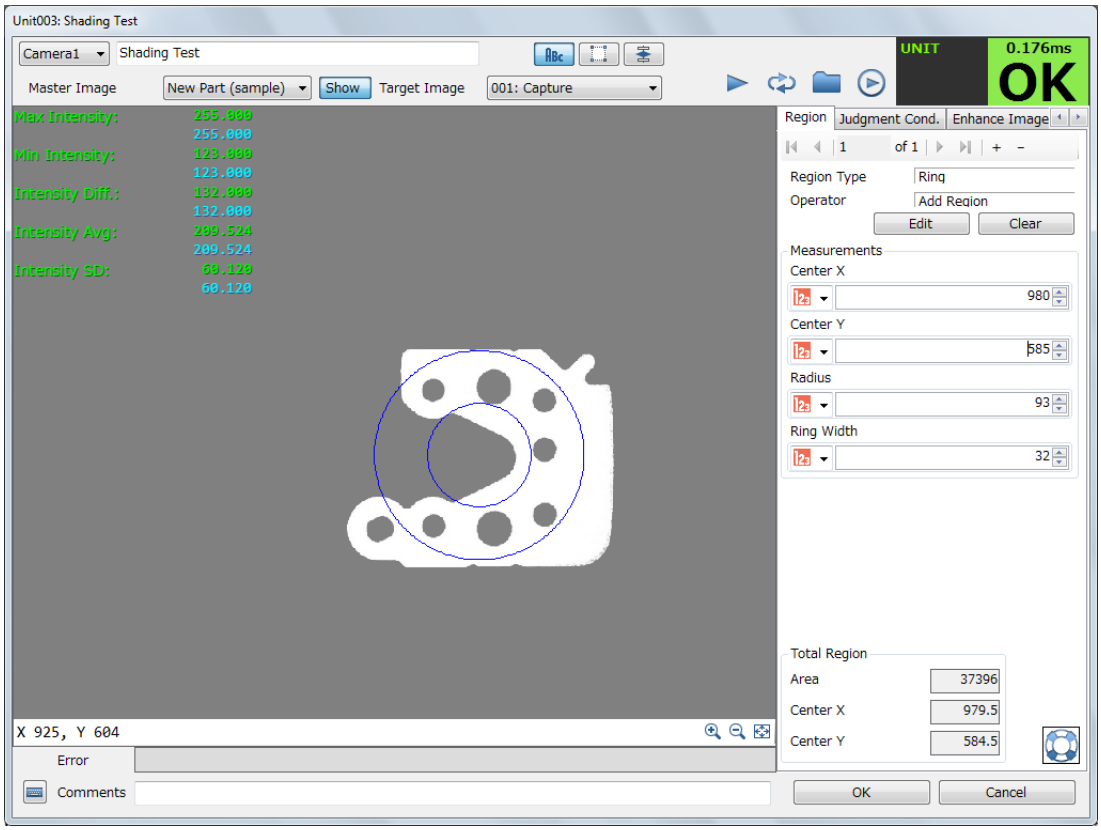
  [Integer] / [Angle (deg)]
  Enter the desired value or angle.

  [Formula]
  Select a trigonometric operator [sin] (sine), [cos] (cosine) or [tan] (tangent) and enter the desired argument.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use.
  Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

Drawing a Ring



1 Check that the selected region's type is [Ring] and draw the desired region.

- Click [Edit] and then click and drag the mouse over the image display area to draw a red circle.
- To change the size of the circle, click near its perimeter and drag the mouse.
- To move the circle without resizing it, click and drag the [+] mark at its center.

2 Right-click on the circle to confirm the region.

- If the region is correctly set, the circle will change to a blue ring with the circle you drew in step 1 at its center. The area enclosed between the inner and outer circles of the ring will be confirmed as the inspection region.

3 Adjust the extent of the region as necessary.

- Click [Center X], [Center Y], [Radius] and/or [Ring Width] and set the desired value.
  [Center X], [Center Y]: Select [Integer], [Unit] (result value returned from an operation unit) or [Constant].
  [Radius], [Ring Width]: Select [Integer], [Formula], [Unit] or [Constant].

  [Integer]
  Enter the desired value.

  [Formula]
  Select a trigonometric operator [sin] (sine), [cos] (cosine) or [tan] (tangent) and enter the desired argument.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use.
  Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

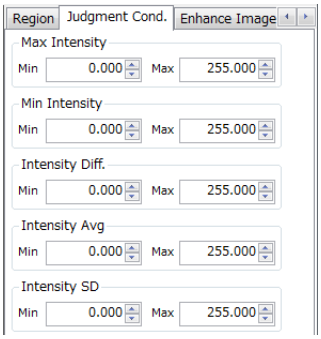
Setting Judgment Conditions

For image processing units, model matching units and calculation units you need to define the conditions necessary for the unit to return an OK judgment. Conditions are set in the [Judgment Cond.] tab by specifying a valid range for each of the result values returned by the operation unit. The result values appear in the image display area and you can refer to them to adjust the conditions.

After the operation unit is processed, only if all the conditions are met (if all the result values are within the range set by each of the [Min] and [Max] settings), the operation unit will return an OK judgment.

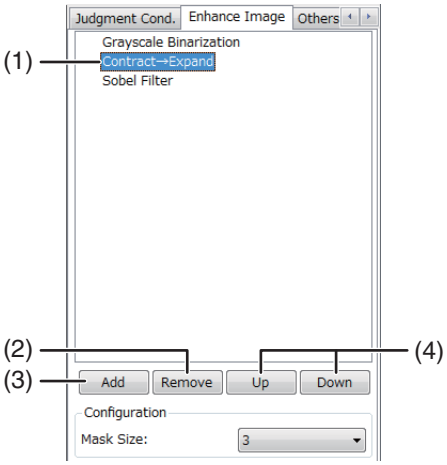
1 Under each of the result values you want to use as judgment conditions, click [Min] and [Max] and enter the desired valid range.

- Available options will vary depending on the operation unit selected (📖 37).



Pre-Processing and Enhancing the Image

For image processing units and when registering models, you can pre-process the image to enhance it. Specify the filters in the [Enhance Image] tab.



(1) Processing filters list

(2) Remove a processing filter

(3) Add a processing filter

(4) Change the order in which processing filters are applied

1 Add a processing filter.

- Click [Add] and select the desired filter from the menu.

  [Grayscale Binarization]
  Creates a binary image where all the pixels with an intensity within a range you can set are changed to white pixels, and all other pixels are changed to black pixels.

  [Contract → Expand]
  Contracts white pixels, removes white pixel noise and then expands them again.

[Expand → Contract]
Expands white pixels, removes black pixel noise and then contracts them again.

[Sobel Filter]
Detects edges along the X and Y axes and combines the results to emphasize edge lines.

[Image Subtraction]
Produces the difference in brightness between the target image and a comparison image using the following formula:
(<target image> – <comparison image you can select>) × [Multiplier] value + [Increase] value.

2 Adjust the filter's parameters.

- Settings available under [Configuration] will vary depending on the selected filter.

Filter	Settings
[Grayscale Binarization]	[Max Intensity], [Min Intensity]: Intensity level range that will be replaced by white pixels.
[Contract → Expand], [Expand → Contract]	[Mask Size]: Size of the pixel expansion/contraction extent.
[Sobel Filter]	[Filter Type]
	[Mask Size]: Size of the pixel processing extent.
[Image Subtraction]	[Multiplier], [Increase]: Parameters used in the calculation of the subtracted image.

3 For the [Image Subtraction] filter only, select the comparison image to subtract.

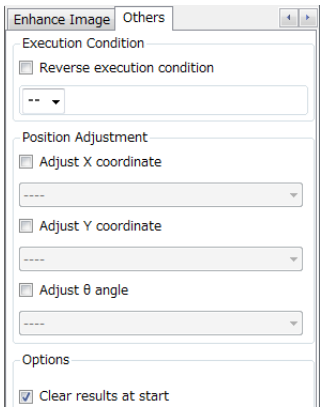
- Under [Comparison Image], select [Master Img] and select one of the registered master images (📖 32), or select [Ref. Image] and select one of the [Capture] operation units in the flowchart that will capture the image to be subtracted.

Note

- Processing filters are applied sequentially from the top of the list.

Adjusting Settings in the [Others] Tab

In the [Others] tab, you can set an execution condition, position adjustment settings (only image processing units and model matching units) and other options for processing the operation unit.



1 Set an execution condition to make the processing of the selected operation unit conditional on another operation unit's judgment results.

- Select [Unit], select one of the operation units in the flowchart area, and then select [Judgment Result]. This operation unit will be processed only when the operation unit set in [Unit] returns an OK result.
- To reverse the condition (process this operation unit when the operation unit set in [Unit] returns an NG result), place a checkmark in the [Reverse execution condition] box.

2 For image processing units and model matching units only, set the image position adjustment settings as necessary.

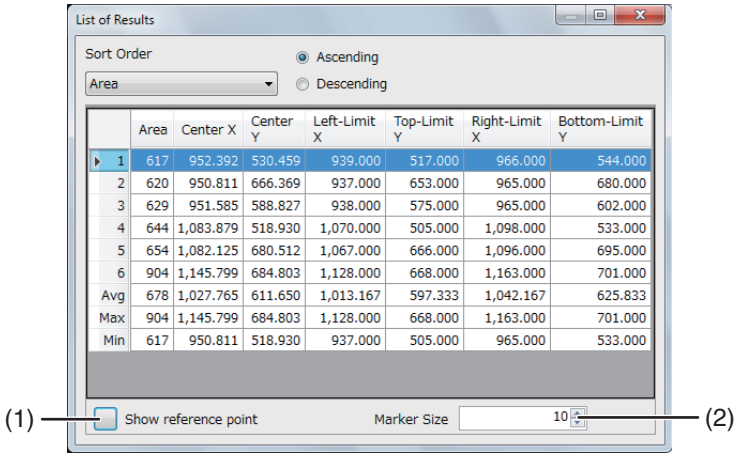
- When the position of the piece of work you want to inspect in the captured image is different from its position in the master image, you can adjust the position of the inspection region (X, Y coordinates and θ angle) to correct for the discrepancy.
- The amount of correction is calculated as the difference between the result values of a captured image (actual position) and the master image (reference position).
- Place a checkmark in the relevant checkbox and select one of the operation units in the flowchart whose result values will be used as the amount of correction. For [Adjust X coordinate] and [Adjust Y coordinate], select an operation unit that has coordinates as result values. For [Adjust θ angle], select an operation unit that has an angle as a result value.
- To apply the position correction when testing an operation unit, make sure to set the trigger mode to [FLWCH] (flowchart mode) (📖 84).
- If you had set a combined inspection region, the position correction will be applied to combined region as a whole.

3 Set additional options.

- By default, the [Clear results at start] box is checked, so previous result values are cleared every time a trigger is activated and the flowchart is processed.
- Remove the checkmark if you want to keep previous result values.

Displaying the List of Result Values

[Blob Detection] operation units, [1D Code Reader] units, [2D Code Reader] units and model matching units can return more than one result depending on the number of parts in the image that match the conditions. Click ([List of Results]) to open the list of result values. In addition to individual result values you can also check aggregate values like average, maximum and minimum values. Click to close the window.



	Area	Center X	Center Y	Left-Limit X	Top-Limit Y	Right-Limit X	Bottom-Limit Y
1	617	952.392	530.459	939.000	517.000	966.000	544.000
2	620	950.811	666.369	937.000	653.000	965.000	680.000
3	629	951.585	588.827	938.000	575.000	965.000	602.000
4	644	1,083.879	518.930	1,070.000	505.000	1,098.000	533.000
5	654	1,082.125	680.512	1,067.000	666.000	1,096.000	695.000
6	904	1,145.799	684.803	1,128.000	668.000	1,163.000	701.000
Avg	678	1,027.765	611.650	1,013.167	597.333	1,042.167	625.833
Max	904	1,145.799	684.803	1,128.000	668.000	1,163.000	701.000
Min	617	950.811	518.930	937.000	505.000	965.000	533.000

(1) [Show reference point]
When the sort order is set to [Distance from Pt.], [Clockwise] or [Counter-Clockwise], you can display a marker indicating the position of the indicated reference point.

(2) [Marker Size]
Click and enter the desired value.

To sort the list of result values

1 Click [Sort Order] and select the desired result value.

- You can select one of the result values returned by the operation unit (refer to the relevant step in each operation unit's **Configuring the Operation Unit** procedure) or one of the following options common to all operation units.

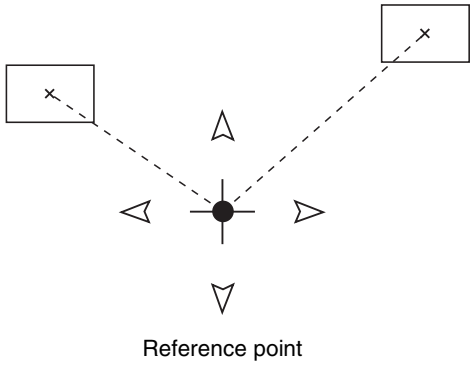
  [Distance from Pt.]
  Results are sorted according to their distance from a certain point. To specify the reference point, click [X] and [Y] under [Reference Point] and enter the desired coordinates. For each of the coordinates, you can select [Integer], [Formula], [Unit] (result value returned from an operation unit) or [Constant].

  [Integer]
  Enter the desired value.

  [Formula]
  Select a trigonometric operator [sin] (sine), [cos] (cosine) or [tan] (tangent) and enter the desired argument.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use. When used for [Reference Angle], select an operation unit that has an angle as a result value. Available options will vary depending on the operation unit selected.

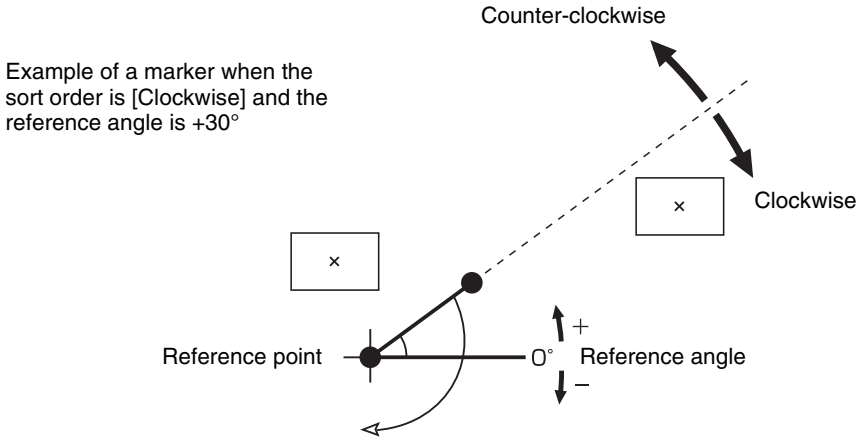
[Constant]
Select one of the registered constants (📖 35).



[Clockwise] / [Counter-Clockwise]
Results are sorted in clockwise or counter-clockwise order starting from a certain point and angle you can set. To specify the reference point, click [X] and [Y] under [Reference Point] and enter the desired coordinates. For each of the coordinates, you can select [Integer], [Formula], [Unit] (result value returned from an operation unit) or [Constant].
To specify the reference angle, click [Reference Angle] and enter the desired value. You can select [Angle (deg)], [Unit] or [Constant].

[Angle (deg)]
Enter the desired angle.

Other setting options
Same as above.



Note

- The marker displayed when the sort order is [Clockwise] or [Counter-Clockwise] will be displayed at the angle set in [Reference Angle].

2 Select whether to sort the results in ascending or descending order.

- Click [Ascending] or [Descending] to set the sort order.
- This setting is not available when you selected to sort by [Clockwise] or [Counter-Clockwise] in the previous step.

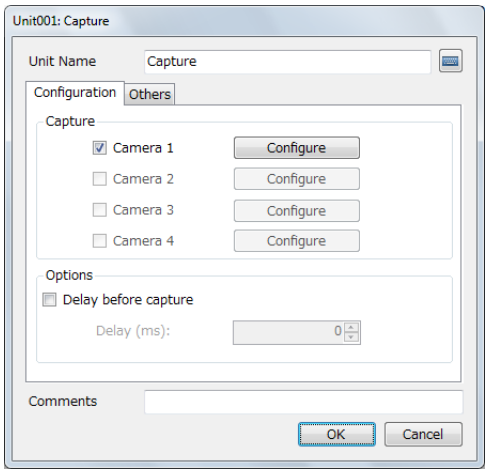
Camera Units

[Capture] (CAPT) Operation Units

These operation units are used to capture images with registered cameras (26). You can even capture images using multiple cameras with a single [Capture] operation unit. You can also set capture units to use previously saved image files instead of capturing images (33).

Note

- You can connect up to four cameras to the Vision Edition system.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (88).

Configuring the Operation Unit

1 Select the [Configuration] tab and place a checkmark next to the camera(s) that will be used.

- To be able to select a camera, it must be added in the [Master Image Settings] screen (32).

2 Click [Configure] next to the camera you want to configure.

- The camera setup window will open.

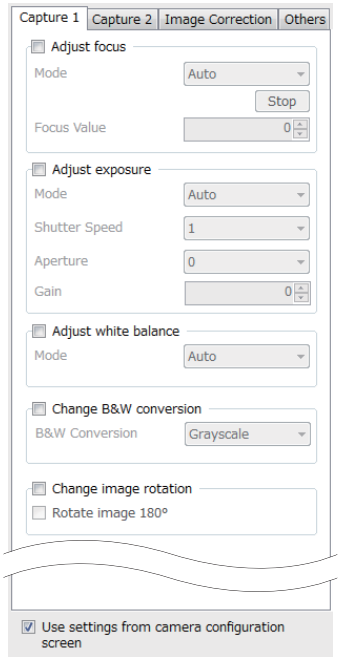
3 Adjust the necessary settings in the various tabs.

- For details, refer to the relevant sections under **Changing Camera Settings** (28).

(1) In the [Capture 1] tab, place a checkmark in the [Adjust focus], [Adjust exposure] and/or [Adjust white balance] box to adjust the focus, exposure and white balance, respectively.

(2) Place a checkmark in the [Change B&W conversion] box to change the method used for B&W conversion.

(3) Place a checkmark in the [Change image rotation] and [Rotate image 180°] boxes to change the image rotation settings.

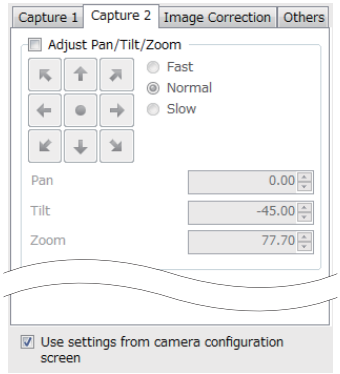


(4) Select the [Capture 2] tab and place a checkmark in the [Adjust Pan/Tilt/Zoom] box to move the camera and adjust the zoom.

(5) To apply the settings from the [Capture] tab in the [Camera Settings] window (📖 26) to the [Capture 1] or [Capture 2] tabs in this window, place a checkmark in the [Use settings from camera configuration screen] box.
- If the settings in steps (1) to (4) are changed, those changes will take priority.

(6) To capture an image with the current settings and register it as a master image, select the [Others] tab and click [Add Master Image].
The [Master Image Settings] window will open. For details refer to **Registering Master Images** (📖 32).

(7) Click [OK].



4 Back in the operation unit's editing window, set the delay options.

- To insert a delay before the image is captured, place a checkmark in the [Delay before capture] box. Click [Delay (ms)] and enter the desired value in milliseconds.

5 Set an execution condition and other options in the [Others] tab (📖 99).

6 Click [OK].

Configuring the Operation Unit to Use Existing Image Files

1 Select the [Configuration] tab and place a checkmark next to the virtual camera that will be used to read image files.

- Select a virtual camera set up in advance to load image files (📖 26, 33).

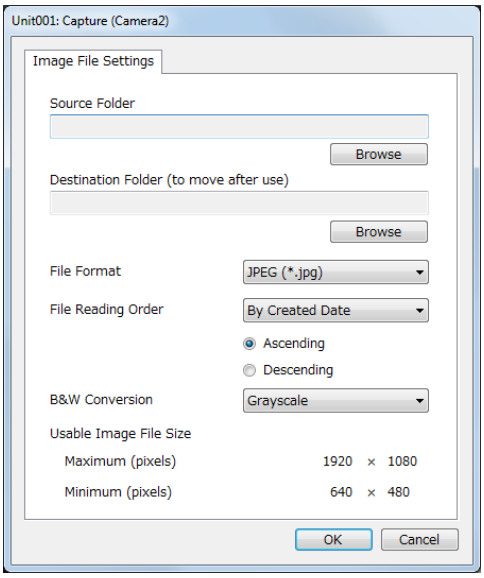
2 Click [Configure] next to the camera selected in step 1.

- The camera setup window will open.

3 In the [Image File Settings] tab configure the settings as necessary.

(1) Click [Browse] next to [Source Folder] and [Destination Folder] and select the folders where the image files are saved and will be moved after use, respectively. Select different folders to be able to distinguish image files that have been processed form those who have not yet.

(2) Click [File Format] and select the desired format.



(3) Under [File Reading Order], select the desired parameter and ascending or descending order. If you select [By Created Date] and [Ascending], the oldest image file in the folder will be read.

(4) Click [B&W Conversion] and select the method used for B&W conversion.

- At the bottom of the dialog box, you can check the resolution (image size) of the image files that can be used.

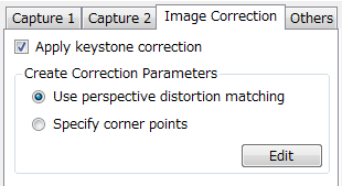
4 Click [OK].

[Capture] (CAPT) Operation Units with Keystone Correction

You can correct the perspective distortion that occurs when capturing an image at an angle instead of directly in front of the subject. Keystone correction can be useful to correct a distorted image before it is used with other operation units (when reading an analog meter or 1D/2D code for example) and increase the accuracy of the results.

Configuring a [Capture] Operation Unit with Keystone Correction

1 Select the [Configuration] tab, place a checkmark next to the camera that will be used and click [Configure].



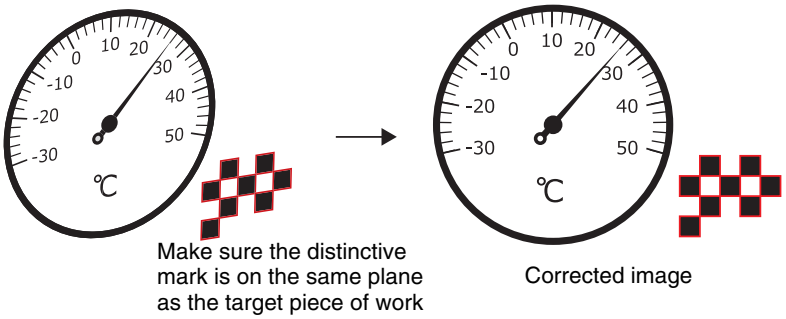
2 In the [Image Correction] tab, place a checkmark in the [Apply keystone correction] box.

3 Select the method to use to correct the image.

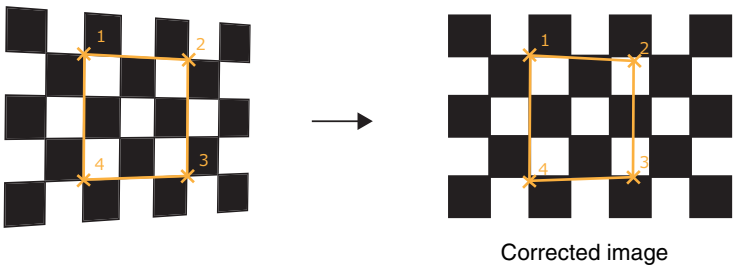
[Use perspective distortion matching]
Vision Edition uses a previously registered perspective distortion model (📖 47) as a reference image and corrects the distorted captured image so it matches the angle of the model. Refer to **Using Perspective Distortion Matching** (📖 105).

[Specify Corner Points]
After you specify 4 points on a captured image, Vision Edition will correct the distorted image so the selected points form the corners of a square. This method is more convenient when you do not have a reference image to use as a model. Refer to **Specifying Corner Points** (📖 106).

Example of perspective distortion matching



Example of corner points



Using Perspective Distortion Matching

With the perspective distortion matching method, you will register in advance an image with no distortion of a distinctive shape or mark as a perspective distortion model (📖 47). When you capture a distorted image, it will be corrected so the distinctive shape or mark matches the previously registered model.
Adjust the correction parameters in such a way that even if you capture the image of the piece of work at an angle, it will be corrected so it appears as if it were captured from the front.

1 In the [Image Correction] tab, select [Use perspective distortion matching] and click [Edit].

- The [Perspective Distortion Matching] dialog box will appear.

2 Select the [Region] tab and set the region that will be inspected (📖 89).

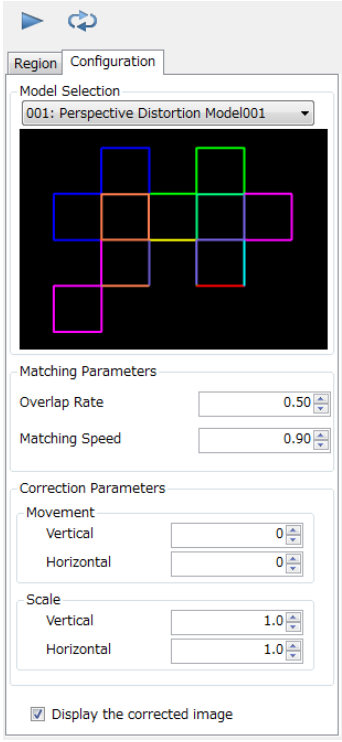
3 Select the [Configuration] tab and configure the matching and correction parameters.

(1) Under [Model Selection], select a perspective distortion model registered in advance (📖 47).

(2) Click [Overlap Rate] and enter the desired value for the overlap tolerance.
A tolerance value closer to 1.00 makes it easier to identify pieces of work even when they overlap or are partly covered by another object.

(3) Click [Matching Speed] and enter the desired value.
Values closer to 1.00 will make the processing faster but the matching accuracy may decrease.

(4) Set the rest of the correction parameters.
Under [Movement] and [Scale] enter such values that will allow to match the model even when captured image is displaced or elongated vertically or horizontally.

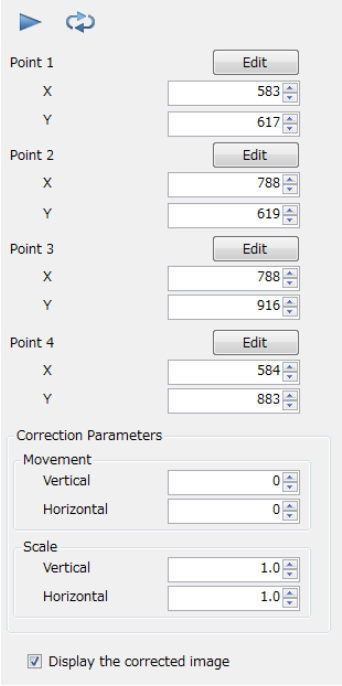


4 To check the corrected image, place a checkmark in the [Display the corrected image] box.

- To capture the image again, click [▶] at the top of the dialog box. You can also click [🔁] to capture images continuously.

Specifying Corner Points

Select 4 points on a captured image and the image will be corrected so the selected points form the corners of a square.



1 In the [Image Correction] tab, select [Specify Corner Points] and click [Edit].

- The [Corner Point Specification] dialog box will appear.

2 Specify the four points on the image.

- Click [X] and [Y] under each point and enter the desired coordinates from the center of the image.
- You can click [Edit] to display a guide. Drag the guide to the desired point on the image and then right-click to confirm.

3 Set the rest of the correction parameters.

- Under [Movement] and [Scale] enter such values that will allow to correct the captured image even when it is displaced or elongated vertically or horizontally.

4 To check the corrected image, place a checkmark in the [Display the corrected image] box.

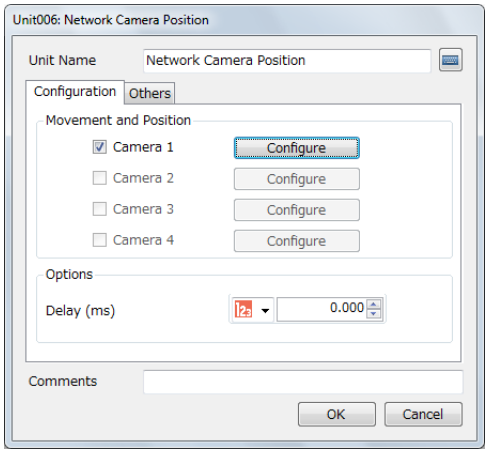
- To capture the image again, click [▶] at the top of the dialog box. You can also click [⟲] to capture images continuously.

Note

- When using a shape or mark other than the subject you want to measure or capture, make sure the mark is on the same plane as the intended subject or piece of work. Once the correction settings are calculated, they will be saved as part of the settings of the selected [Capture] operation unit.
- When specifying corner points, be sure to use a target image that contains rectangular shapes. If you select points on a circle or trapezoid, the results may not be as good as expected. Result may not be optimal also when using a target image that is too small.

[Network Camera Position] (CPOS) Operation Units

You can adjust the position of multiple registered cameras (📖 26) with a single operation unit.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and place a checkmark next to the camera(s) that you want to adjust.

- To be able to select a camera, it must be registered (📖 26) and added in the [Master Image Settings] screen (📖 32).

2 Click [Configure] next to the camera you want to configure.

- The camera setup window will open.

3 Adjust the necessary settings in the various tabs.

- For details, refer to the relevant sections under **Changing Camera Settings** (📖 28).

(1) Adjust the camera's position and zoom, focus, exposure and white balance.

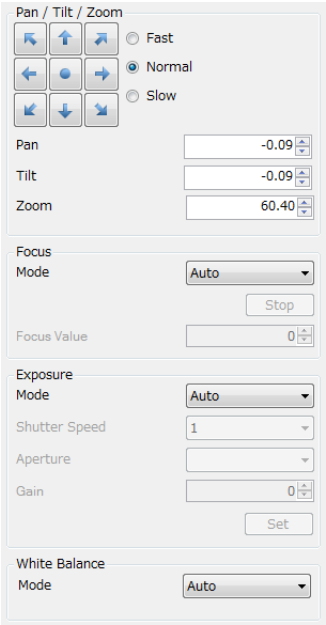
(2) Click [OK].

4 Back in the operation unit's editing window, set the delay options.

- To insert a delay after moving the camera, click [Delay (ms)] and enter the desired value in milliseconds.

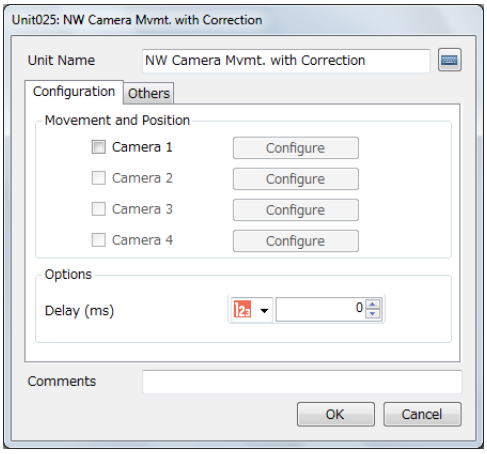
5 Set an execution condition and other options in the [Others] tab (📖 99).

6 Click [OK].



[NW Camera Mvmt. with Correction] (C-COR) Operation Units

You can adjust the camera's position so the desired target point appears in the center of the image display area. This is available only for Canon network cameras capable of pan, tilt and zoom (PTZ) operations.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

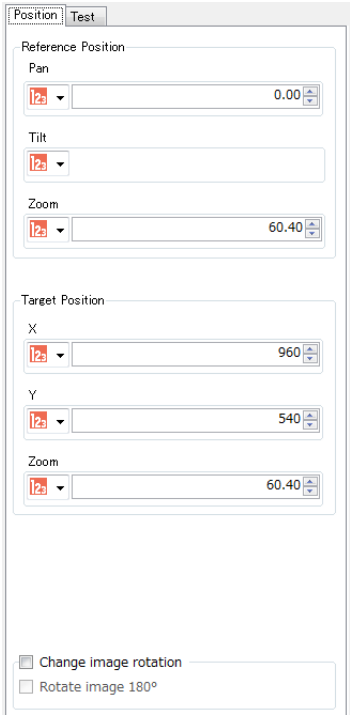
1 Select the [Configuration] tab and place a checkmark next to the camera(s) that you want to adjust.

- To be able to select a camera, it must be registered (📖 26) and added in the [Master Image Settings] screen (📖 32).

2 Click [Configure] next to the camera you want to configure.

- The camera setup window will open.

3 Select the [Position] tab and set the camera's reference position, target position and image rotation.



(1) Set the camera's reference position and target position.

- Set the camera's reference position using the [Pan], [Tilt] and [Zoom] settings and the target position using the [X], [Y] and [Zoom] settings. For [Pan], [Tilt] and [Zoom], you can select [Real Number], [Unit] (result value returned from an operation unit) or [Constant]. For [X] and [Y], you can select [Integer], [Unit] or [Constant].

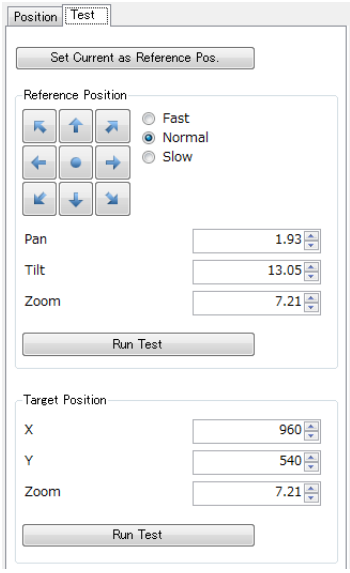
  [Real Number] / [Integer]
  Enter the desired value.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to display. Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

(2) Place a checkmark in the [Change image rotation] and [Rotate image 180°] boxes to change the image's orientation.

4 Select the [Test] tab and set the reference position and target position.



- A green dot will appear in the center of the image display area.
- You can click [Set Current as Reference Pos.] to use the current camera's pan, tilt and zoom values for [Reference Position].

(1) Set the desired reference position (📖 30).

(2) For the camera's target position, click [X], [Y] and/or [Zoom] and set the desired value.
The green dot will move to the corresponding position and a red dot will appear in the center of the image display area. (The dots' positions are approximations.)

5 Test the operation unit.

(1) Under [Reference Position], click [Run Test].

- The [Run Test] button will turn blue and the camera will move to the reference position from step 4. While the button is blue, you can adjust the controls and values under [Reference Position] to move the network camera position.
- After you are finished, click [Run Test] again. The button will turn back gray.

(2) Under [Target Position], click [Run Test].
In the image display area, the red dot will move close to the green dot. Simultaneously, the camera will move to the target position and the red dot will be centered in the image display area.

(3) Click [OK].
The configuration dialog box will close.

6 Back in the operation unit's editing window, set the delay options.

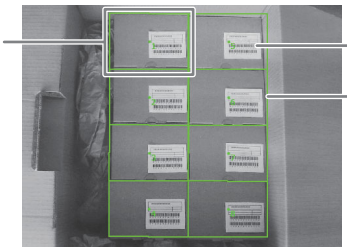
- To insert a delay after moving the camera, click [Delay (ms)] and enter the desired value in milliseconds.

7 Set an execution condition and other options in the [Others] tab (📖 99).

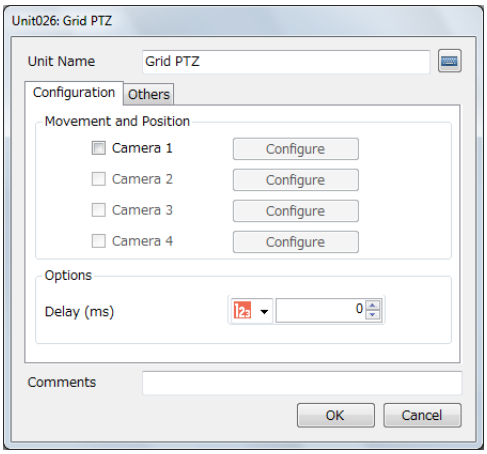
8 Click [OK].

[Grid PTZ] (G-PTZ) Operation Units

The camera will divide a predetermined area into a grid composed of cells. The camera will adjust the pan/tilt/zoom (PTZ) so it can capture each cell. This is available only for Canon network cameras capable of pan, tilt and zoom operations.



[Grid PTZ] dialog box



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and then place a checkmark next to the camera(s) that will be performing the action.

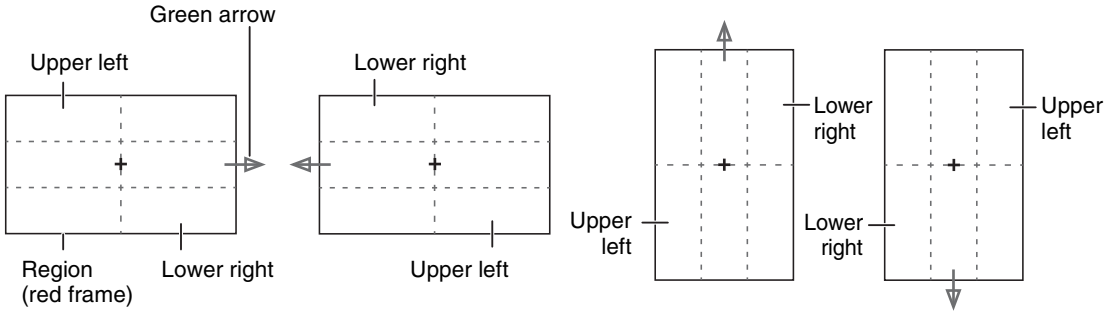
- To be able to select a camera, it must be registered (📖 26) and added in the [Master Image Settings] screen (📖 32).

2 Click [Configure] next to the camera you want to configure.

- The camera setup window will open.

3 Select the [Region] tab and set the region for the pan, tilt and zoom operations (📖 89).

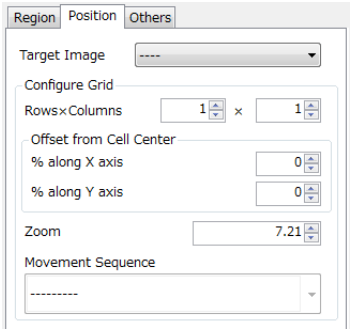
- Only a rotated rectangle region can be used.
- The green arrow that appears when editing a region helps identify the upper left of the grid. The illustrations below show the cell positions based on which way the green arrow is pointing.



- Place a checkmark in the [Change image rotation] and [Rotate image 180°] boxes to change the image's orientation.

4 Select the [Position] tab and set the target image.

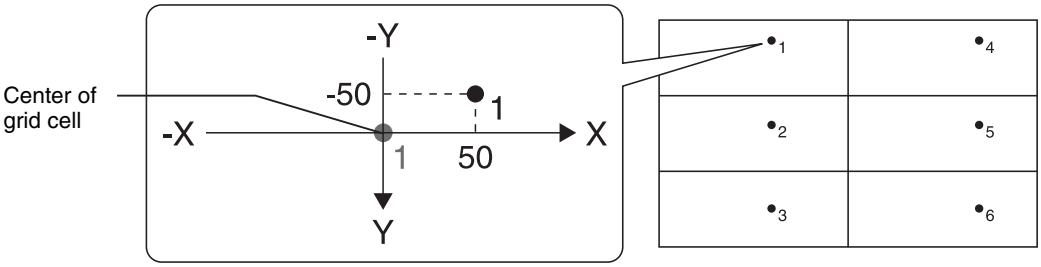
- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.



5 Set the position for pan, tilt and zoom operations.

(1) Enter values for rows and columns to set up the grid.

(2) Set the target position within a grid cell.
Based on the center of the grid cell, set the position as a ratio along the X and Y directions by entering values for [% along X axis] and [% along Y axis].



Settings used in this example
Grid configuration: 3x2
[Movement sequence]: [Top Left, Then Down]
[Offset from Cell Center]: 50% along the X axis, -50% along the Y axis

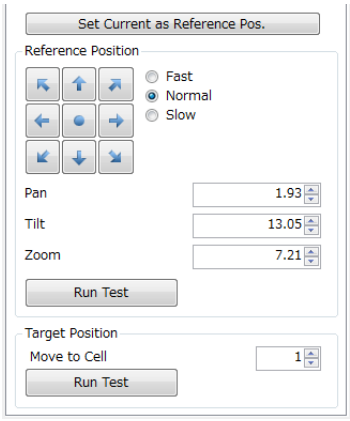
(3) Click [Zoom] and enter the desired value.
The camera will zoom in/out according to the entered values.

(4) Select the sequence in which the camera will move.
The available options will differ based on the grid configuration.
[Left, Then Right], [Right, Then Left], [Up, Then Down], [Down, Then Up], [Top Left, Then Down], [Top Left, Then Right], [Top Right, Then Down], [Top Right, Then Left], [Bottom Left, Then Up], [Bottom Left, Then Right], [Bottom Right, Then Up], [Bottom Right, Then Left]

The sequence will be indicated by numbers close to the target position of each cell.

6 Test the operation unit.

- You can click [Set Current as Reference Pos.] to use the current camera's pan, tilt and zoom values for [Reference Position].



(1) Set the desired reference position (📖 30).

(2) Under [Reference Position], click [Run Test].
The camera will move to the reference position from step (1).

(3) Set the desired target position.
For [Move to Cell], enter the value that corresponds to the number displayed near the target grid cell.

(4) Under [Target Position], click [Run Test].
The network camera will move to the cell set in [Move to Cell] and then to the target position set in step 5 (marked with a [●]), which will appear in the center of the image display area.

(5) Click [OK].
The configuration dialog box will close.

7 Back in the operation unit's editing window, set the delay options.

- To insert a delay after moving the camera, click [Delay (ms)] and enter the desired value in milliseconds.

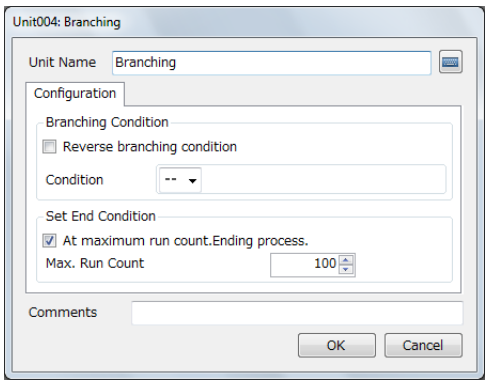
8 Set an execution condition and other options in the [Others] tab (📖 99).

9 Click [OK].

Branching Units

[Branching] Operation Units

These operation units are used to branch the processing of the flowchart into two paths, Yes and No, based on a condition that you can specify. When the condition is met, the processing continues to the “Yes” path. When it is not, the processing continues to the “No” path.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Under [Branching Condition], set the branching condition.

- Select [Unit], select one of the operation units in the flowchart area, and then select [Judgment Result]. This operation unit will be processed only when the operation unit set in [Unit] returns an OK result.
- To reverse the condition (continue with the “Yes” path when the operation unit set in [Unit] returns an NG result), place a checkmark in the [Reverse branching condition] box.

2 Under [Set End Condition], set the ending condition.

- To end flowchart processing after a predetermined run (processing) count, place a checkmark in the [End process at maximum run count] box.
- Click [Max. Run Count] and enter a maximum value for the run count.

3 Click [OK].

4 Back in the flowchart area, connect the two paths to the branching unit.

- The first operation unit you connect to the [Branching] operation unit will be automatically set as the “Yes” path. The operation unit you connect after that will be automatically set as the “No” path.

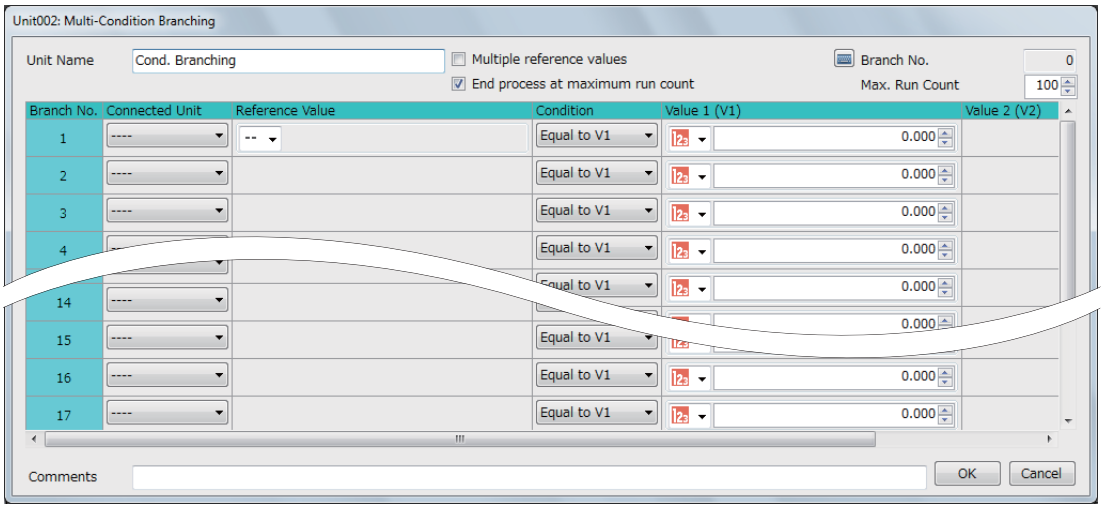
Note

- Make sure the [Branching] operation unit is part of a flowchart correctly connected from start to end.
- To test the operation unit, apply a trigger (📖 84). If a green [OK] icon appears to the right of the [Branching] operation unit, the “Yes” path will be processed. If a red [NG] icon appears instead, the “No” path will be processed.

[Multi-Condition Branching] Operation Units

These operation units are used to branch the processing of the flowchart into multiple paths according to multiple conditions. You can specify up to 20 branches and conditions.

Conditions are evaluated in sequence from the top and the processing of the flowchart will continue with the first branch option whose condition is met.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

To use the same reference value for all conditions

1 Click [Connected Unit] and select one of the operation units in the flowchart area.

- The selected operation unit and this one will be connected automatically.

2 Under [Reference Value], select the reference value you want to use.

- You can select [Unit], [Constant] or [Trigger]. If you selected [Trigger], skip to step 5.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use for the comparison. Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

  [Trigger]
  Select the desired trigger number [Trigger 1] to [Trigger 4]. The number of the manual trigger applied can be selected in the [Main Screen Settings] window (📖 81).

3 Click [Condition] and select the condition from the pulldown menu.

- The condition determines the comparison between the reference value and the comparison value(s). You can select [Equal to V1], [Not Equal to V1], [Greater than V1], [Less than V1], [V1 or Greater], [V1 or Less], [Between V1–V2] or [Not Between V1–V2].

4 Set the first comparison value.

- Under [Value 1 (V1)] you can select [Real Number], [Angle (deg)], [Formula], [Unit] or [Constant].

  [Real Number] / [Angle (deg)]
  Enter the desired value or angle.

[Formula]
Select a trigonometric operator [sin] (sine), [cos] (cosine) or [tan] (tangent) and enter the desired argument.

[Unit]
Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

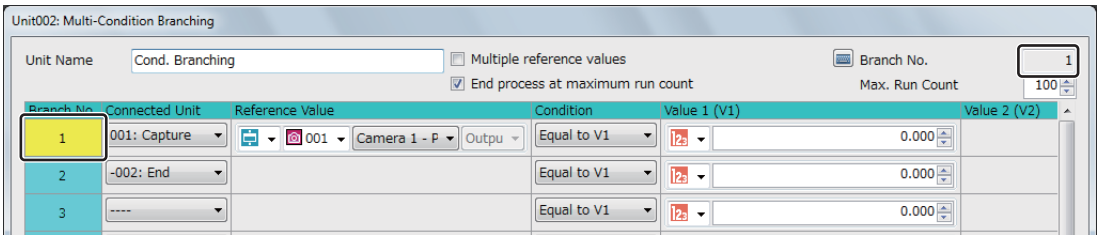
[Constant]
Select one of the registered constants (📖 35).

5 Depending on the condition selected, set a second comparison value.

- If [Condition] is set to [Between V1-V2] or [Not Between V1-V2], set a second comparison value under [Value 2 (V2)] as described in step 3.

6 Specify additional comparisons.

- Repeat steps 2 to 4 to set the conditions for branches from number 2 onwards.
- After setting multiple conditions, the branch number of the first condition met will be highlighted in yellow. The number of the selected branch will also appear in the [Branch No.] field at the top right. If no condition is met, 0 will be displayed in the [Branch No.] field.



7 Set the ending condition.

- To end flowchart processing after a predetermined run (processing) count, place a checkmark in the [End process at maximum run count] box.
- Click [Max. Run Count] and enter a maximum value for the run count.

8 Click [OK].

9 Back in the flowchart area, connect paths to the branching unit.

- Connect multiple operation units to the [Multi-Condition Branching] operation unit to set as many paths as conditions set.
- The operation units (paths) you connect will be automatically assigned consecutive branch numbers from xxx-1 to xxx-20 (where “xxx” is the unit number of the [Multi-Condition Branching] operation unit).

To use multiple reference values in conditions

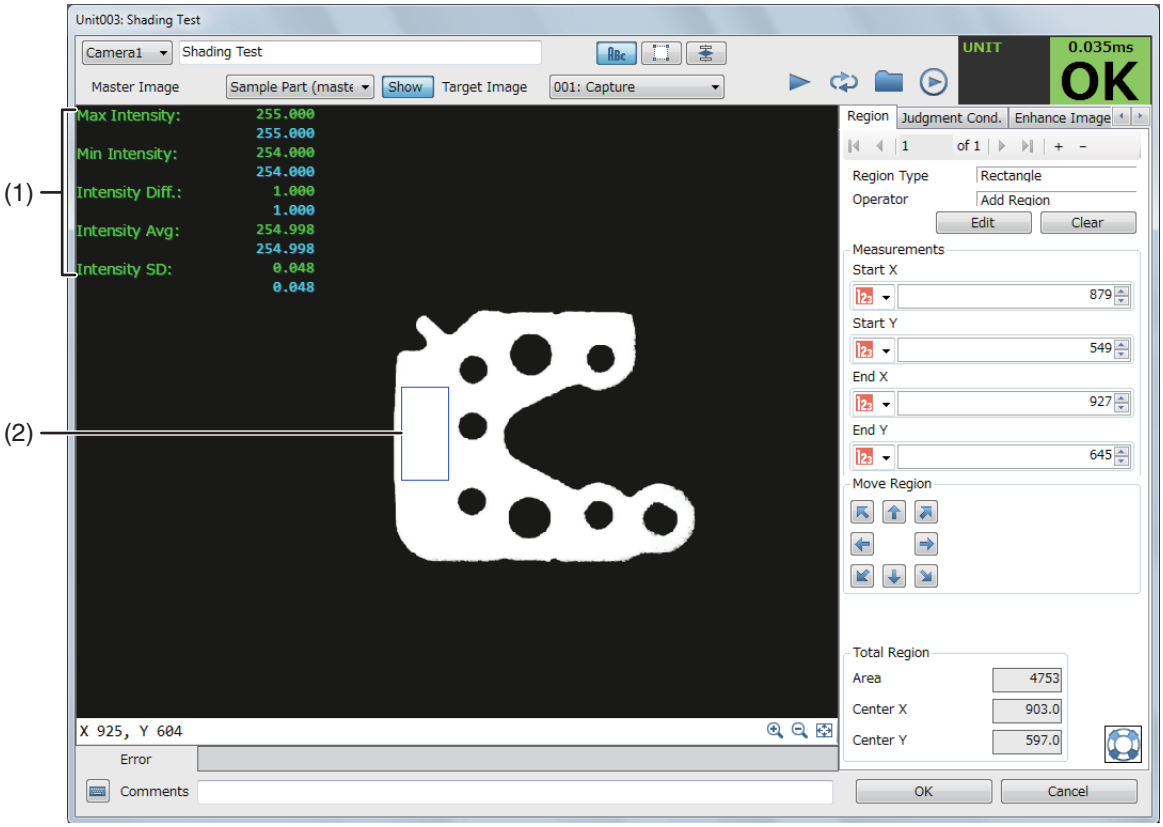
To be able to use different reference values depending on the branching condition, place a checkmark in the [Multiple reference values] box. The procedure for setting up the conditions is essentially the same as when using a single reference value (📖 113) but you will need to specify the reference value (step 1) for each branching condition.

Note

- Make sure the [Multi-Condition Branching] operation unit is part of a flowchart correctly connected from start to end.
- To test the operation unit, apply a trigger (📖 84). If a green [OK] icon appears to the right of the [Multi-Condition Branching] operation unit, one of the paths will be processed. If a red [NG] icon appears instead, none of the conditions were met and the rest of the flowchart will not be processed.

[Shading Test] (SHDNG) Operation Units

These operation units are used to measure the intensity (brightness) inside a selected inspection region and return various result values. Differences in brightness can be used, for example, to distinguish between normal and defective pieces of work or to detect the presence or absence of scratches and flaws.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

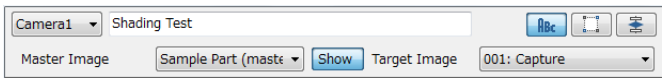
(1) Result values
The operation unit returns the following values about the inspection region: maximum and minimum intensity levels, maximum difference in levels, and the intensity level's average and standard deviation.

(2) Inspection region (blue outline)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 27) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 89).

4 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

  [Max Intensity], [Min Intensity]
  Maximum and minimum intensity level.

  [Intensity Diff.]
  The difference between the maximum and minimum intensity levels.

  [Intensity Avg], [Intensity SD]
  The average intensity level and the standard deviation (σ) of the intensity.

5 If necessary, select the [Enhance Image] tab and select the image processing files to apply (📖 97).

6 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

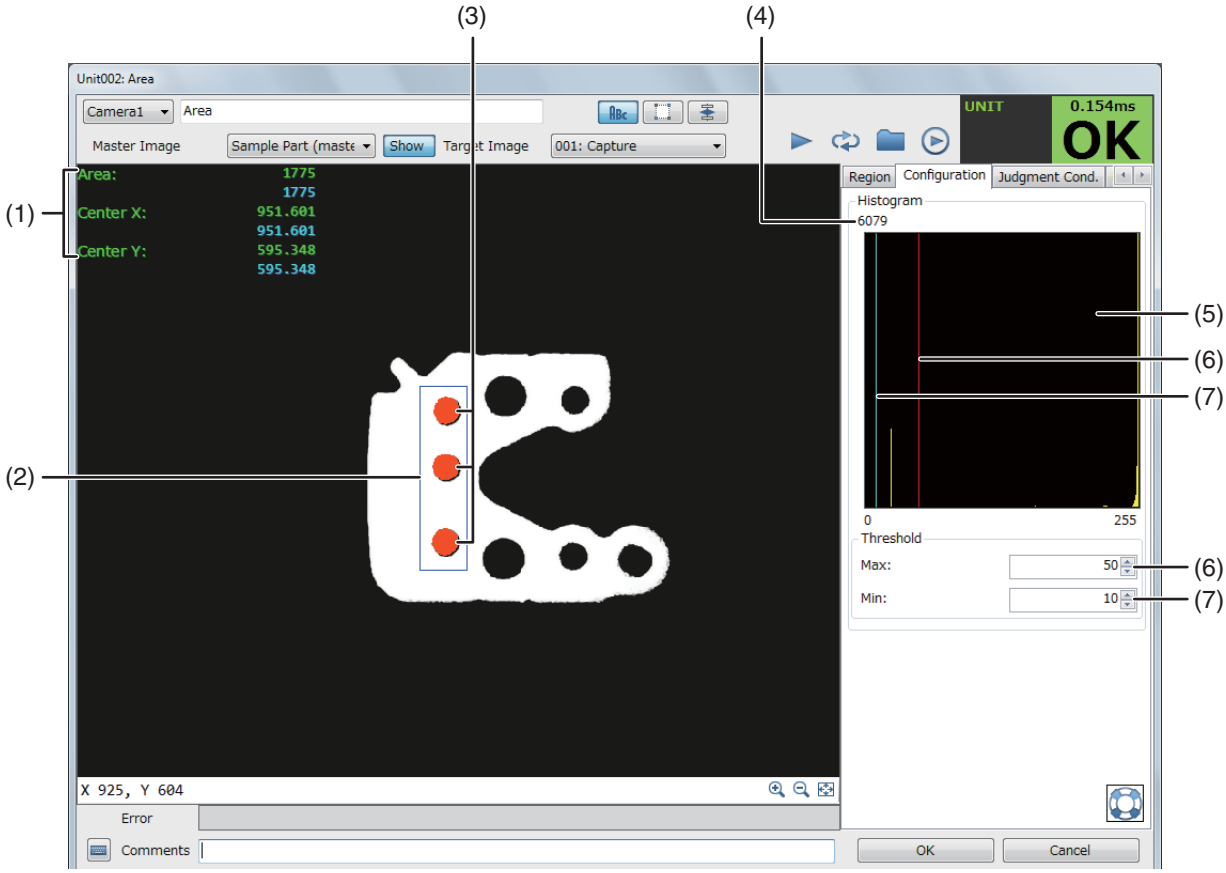
7 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

8 Click [OK].

[Area] (AREA) Operation Units

This operation units measure the total area of the image with an intensity level within a specified range. They can be used, for example, to detect the presence or absence of pieces of work and to check their size.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values about the inspection region: total surface area of the detected area, and X and Y coordinates of the center of the detected area.

(2) Inspection region (blue outline)

(3) Detected area
Pixels within the inspection region with an intensity level within the specified range are shown in orange.

(4) Peak level pixel count
Number of pixels with the most prevalent intensity level.

(5) Intensity (grayscale) histogram of the inspection region

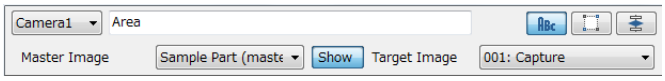
(6) Maximum intensity to detect (red line)

(7) Minimum intensity to detect (light blue line)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



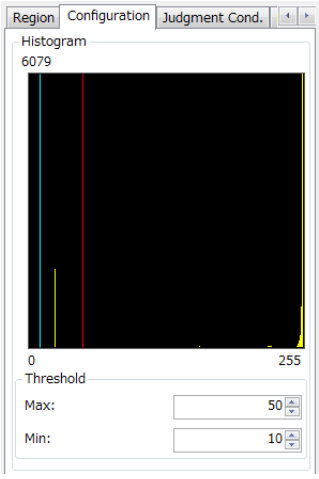
2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 89).

4 Select the [Configuration] tab and set the range of intensity levels you want to detect.

- Click [Max] and [Min] and enter the desired values.



5 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

  [Area]
  Number of pixels within the specified intensity level range.

  [Center X], [Center Y]
  Coordinates of the center of the detected area.

6 If necessary, select the [Enhance Image] tab and select the image processing files to apply (📖 97).

7 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

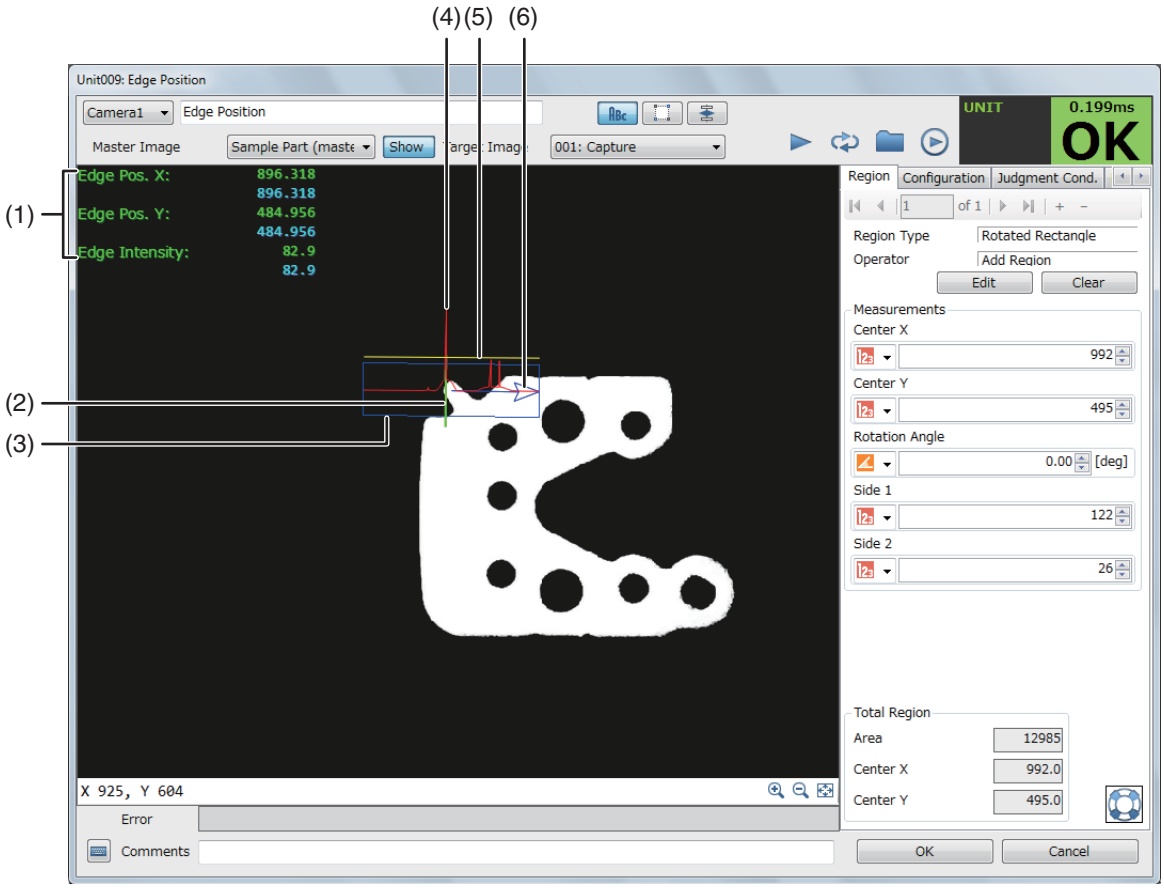
8 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

9 Click [OK].

[Edge Position] (EDGEP) Operation Units

These operation units detect and return the position and intensity level of an edge point. They can be used, for example, to check how much a piece of work has shifted from a certain position and to calculate the required position corrections.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values about the detected edge: X and Y coordinates and intensity level of the edge point.

(2) Detected edge point (green line)
Edge point that matches all the detection parameters.

(3) Inspection region (blue outline)

(4) Edge points found in the selected direction (peaks in the red waveform)

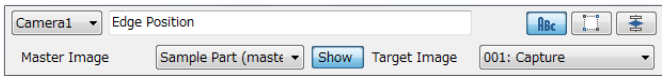
(5) Edge level threshold set by the user (yellow line)

(6) Inspected line (blue arrow)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



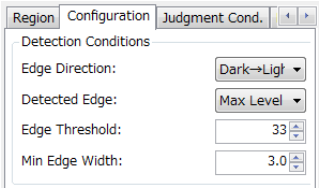
2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 92).

- Only a rotated rectangle region can be used.
- The arrow of the inspection region will determine the orientation (angle) of the scan line along which edges will be searched.

4 Select the [Configuration] tab and set the detection parameters as necessary.



(1) Click [Edge Direction] and select which edges to detect. You can select [All], [Dark → Light] or [Light → Dark].

(2) Click [Detected Edge] and select which edge to regard as the detected edge. You can select [First], [Last] or [Max Level].

(3) Click [Edge Threshold] and enter the desired value.

(4) Click [Min Edge Width] and enter the desired value.
By setting a larger value, you can reduce false detection errors due to image noise.

5 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[Edge Pos. X], [Edge Pos. Y]
Coordinates of the detected edge.

[Edge Intensity]
Intensity level of the detected edge.

6 Select the [Enhance Image] tab and set image processing filters (📖 97).

7 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

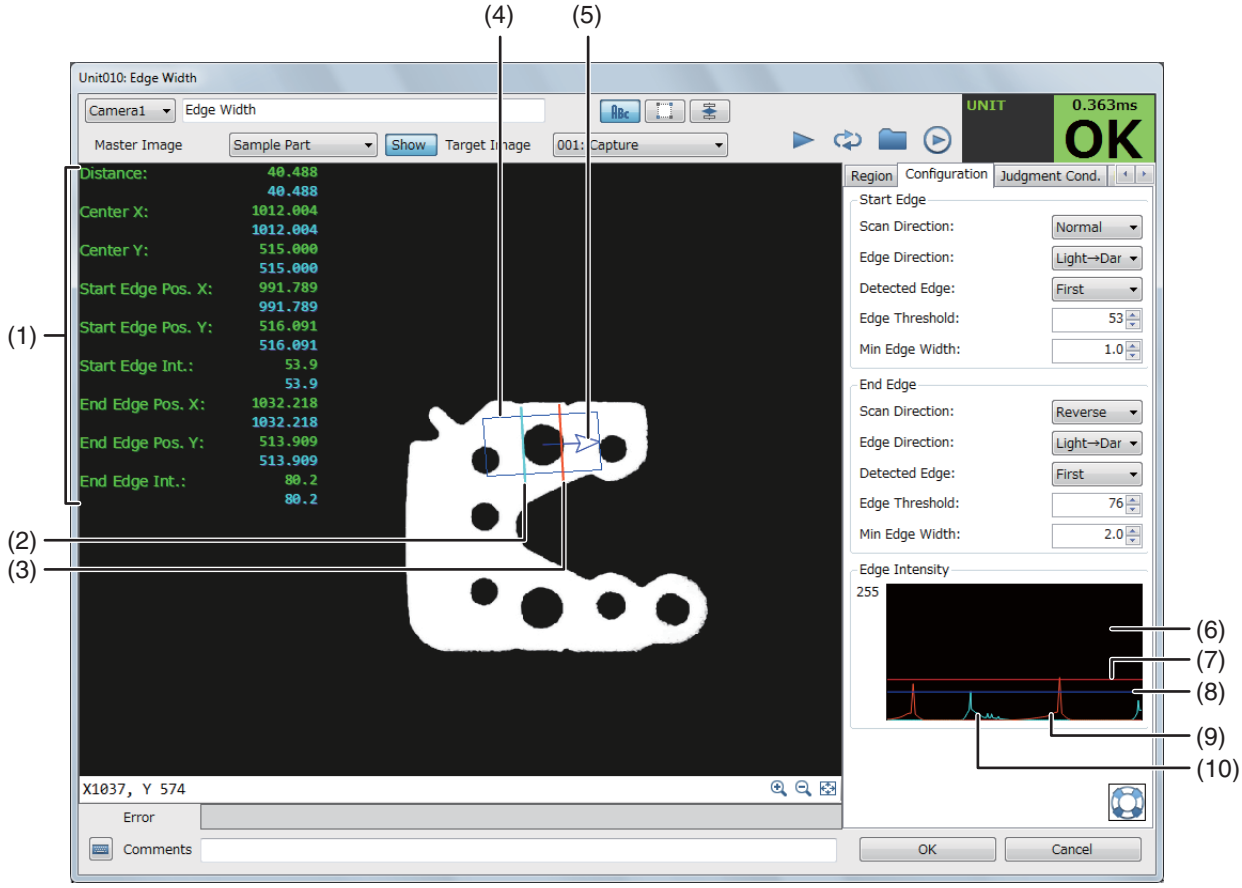
8 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

9 Click [OK].

[Edge Width] (EDGEW) Operation Units

These operation units measure the distance between two edge points in the inspection region. They can be used, for example, to distinguish between normal and defective pieces of work.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values: width between the detected edges, X and Y coordinates of the midpoint between the edges, X and Y coordinates and intensity level of the start edge point, and X and Y coordinates and intensity level of the end edge point.

(2) Detected start edge (light blue line)

(3) Detected end edge (orange line)

(4) Inspection region (blue outline)

(5) Inspected line (blue arrow)

(6) Waveform graph of detected edges

(7) Intensity threshold for end edge (red line)

(8) Intensity threshold for start edge (blue line)

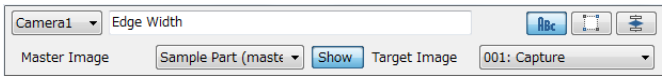
(9) Waveform of edges that match the end edge parameters (orange line)

(10) Waveform of edges that match the start edge parameters (light blue line)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



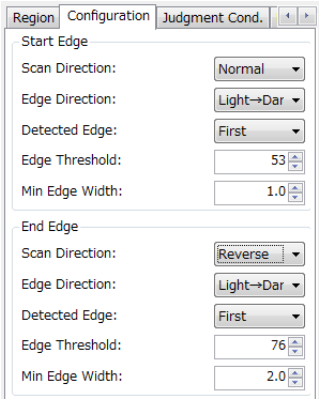
2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 92).

- Only a rotated rectangle region can be used.
- The arrow of the inspection region will determine the normal scan direction and the orientation (angle) of the scan line along which edges will be searched.

4 Select the [Configuration] tab and set the detection parameters as necessary.



- Repeat the following steps to set the parameters independently for the start edge and end edge.

(1) Click [Scan Direction] and select the direction in which the line is scanned. You can select [Normal] (the direction of the blue arrow) or [Reverse] (the opposite direction to the blue arrow).

(2) Click [Edge Direction] and select which edges to detect. You can select [All], [Dark → Light] or [Light → Dark].

(3) Click [Detected Edge] and select which edge to regard as the detected edge. You can select [First], [Last] or [Max Level].

(4) Click [Edge Threshold] and enter the desired value.

(5) Click [Min Edge Width] and enter the desired value.
By setting a larger value, you can reduce false detection errors due to image noise.

5 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[Distance]
Distance between the detected edges.

[Center X], [Center Y]
Coordinates of the midpoint between the detected edges.

[Start Edge Pos. X], [Start Edge Pos. Y]
Coordinates of the detected start edge.

[Start Edge Int.]
Intensity level of the detected start edge.

[End Edge Pos. X], [End Edge Pos. Y]
Coordinates of the detected end edge.

[End Edge Int.]
Intensity level of the detected end edge.

6 Select the [Enhance Image] tab and set image processing filters (📖 97).

7 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

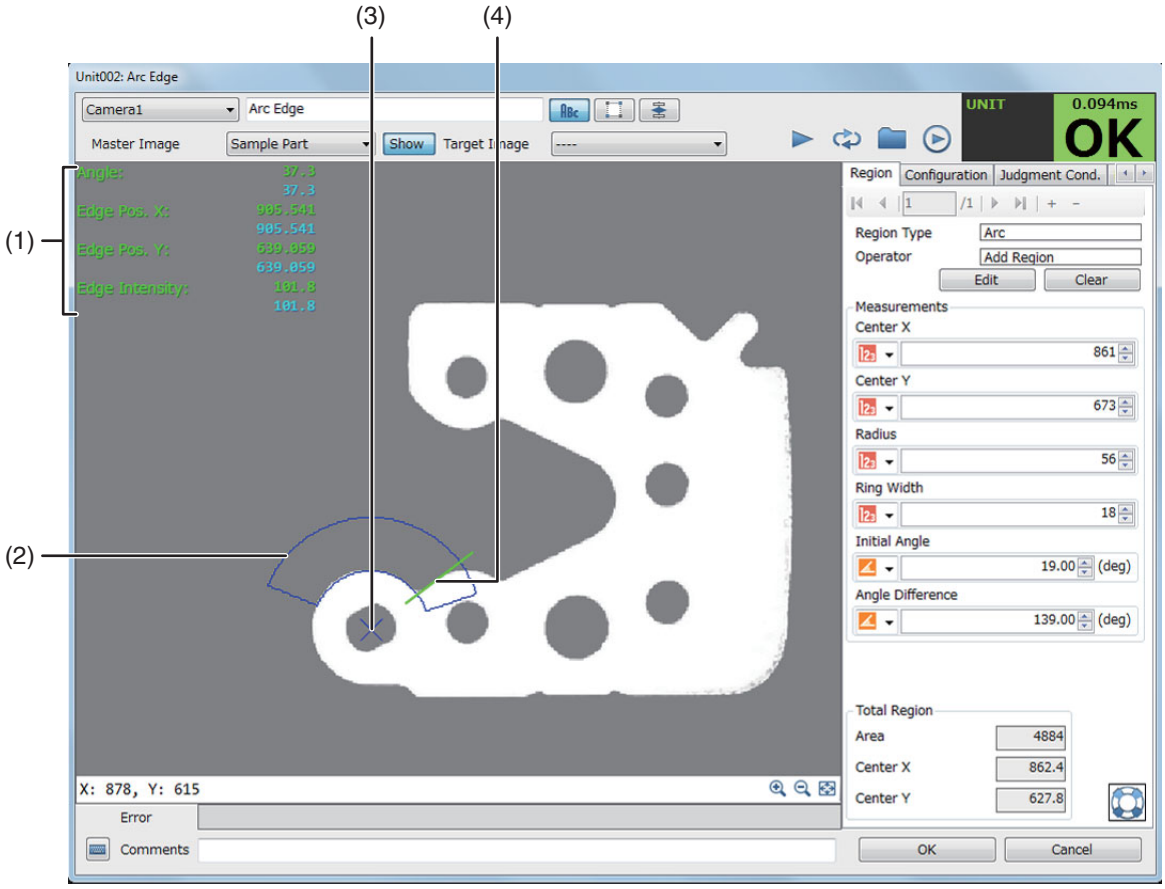
8 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

9 Click [OK].

[Arc Edge] (ARCED) Operation Units

These operation units detect the position and angle of an edge along a circular arc. They can be used, for example, to find fissures or cracks in round pieces of work, to test the cuts and surfaces in gear teeth and to check the angles in ring-shaped pieces of work.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values about the detected edge: angle, X and Y coordinates and intensity level of the edge point.

(2) Inspection region (blue outline)

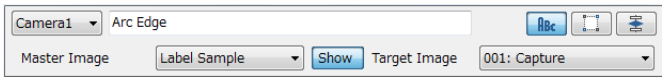
(3) Center of the inspected arc line

(4) Detected edge point (green line)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.

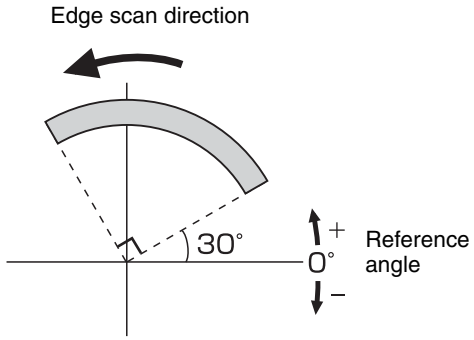


2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

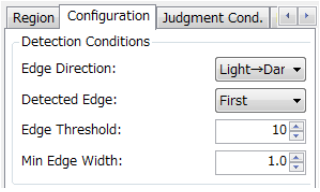
3 Select the [Region] tab and set the region that will be inspected (📖 95).

- Only an arc region can be used.
- The sign of the inspection region's [Angle Difference] setting will determine the scan direction in which edges will be searched.



Example with [Initial Angle] set to 30° and [Angle Difference] set to +90°

4 Select the [Configuration] tab and set the detection parameters as necessary.



(1) Click [Edge Direction] and select which edges to detect. You can select [All], [Dark → Light] or [Light → Dark].

(2) Click [Detected Edge] and select which edge to regard as the detected edge. You can select [First], [Last] or [Max Level].

(3) Click [Edge Threshold] and enter the desired value.

(4) Click [Min Edge Width] and enter the desired value.
By setting a larger value, you can reduce false detection errors due to image noise.

5 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[Angle]
Angle of the detected edge.

[Edge Pos. X], [Edge Pos. Y]
Coordinates of the detected edge.

[Edge Intensity]
Intensity level of the detected edge.

6 Select the [Enhance Image] tab and set image processing filters (📖 97).

7 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

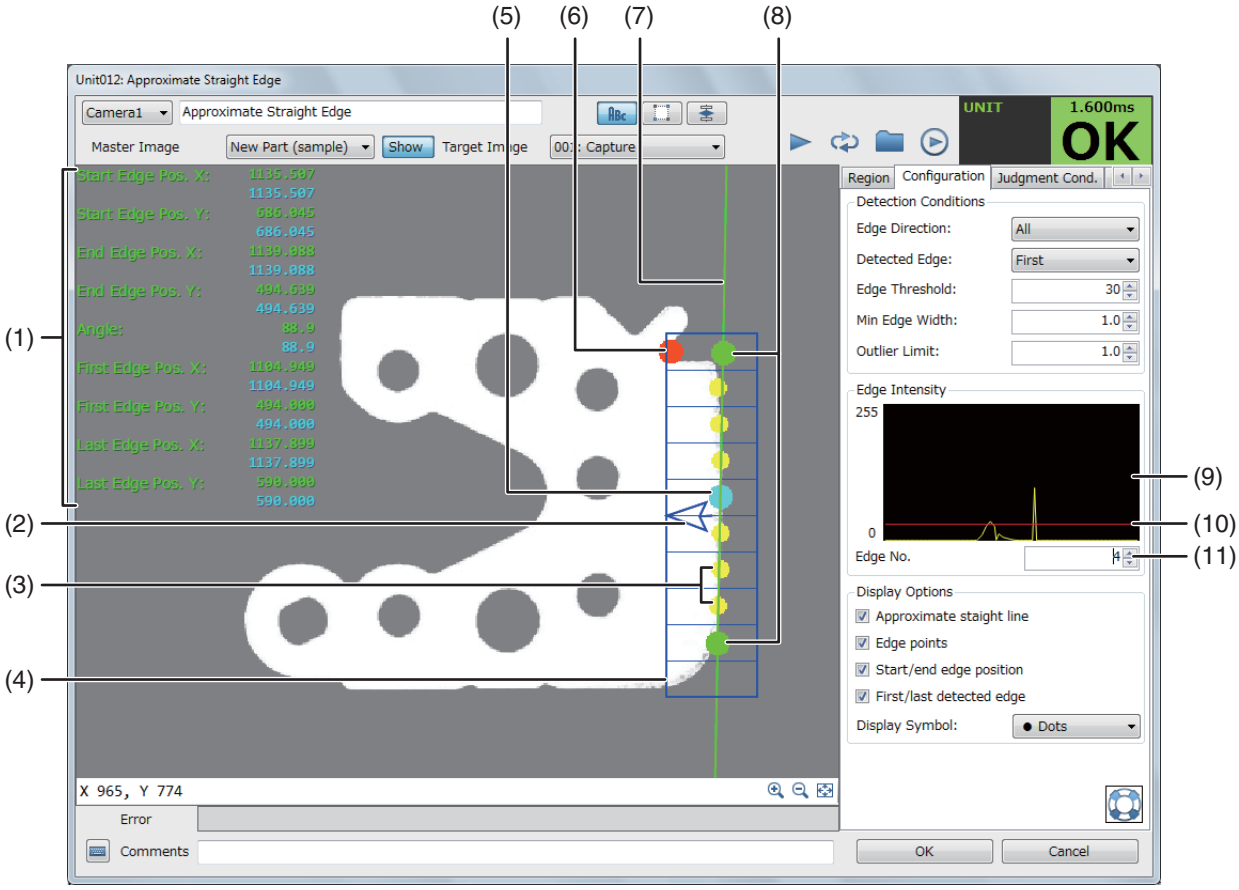
8 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

9 Click [OK].

[Approximate Straight Edge] (STRTE) Operation Units

These operation units are used to detect multiple edge points and derive the approximate straight line that is the best fit for the detected edge points. They can be used, for example, to check the inclination of pieces of work and to test for discrepancies in surface quality.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values: X and Y coordinates of the calculated start and end points, angle of the approximate straight edge line, X and Y coordinates of the first edge detected and X and Y coordinates of the last edge detected.

(2) Scan direction (blue arrow)

(3) Detected edge points (yellow dots/crosses)

(4) Inspection region (blue outline)

(5) Position of the first edge detected (light blue dot/cross)

(6) Position of the last edge detected (orange dot/cross)

(7) Approximated straight edge (green line)
Best fit straight line connecting the calculated start and end points.

(8) Start point and end point of the calculated straight edge line (green dots/crosses)

(9) Edge level graph

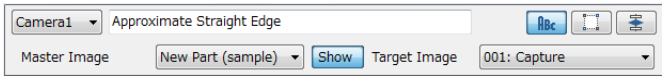
(10) Edge level threshold (red line)

(11) Number of the edge point shown in the graph
Click to enter the number of the edge point you want to check.

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



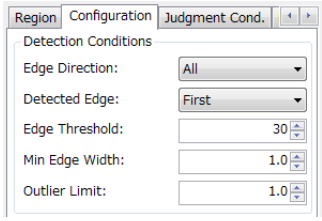
2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 92).

- Only a rotated rectangle region can be used.
- To change the number of inspection region subdivisions, click [No. of Segments] and enter the desired value.

4 Select the [Configuration] tab and set the detection parameters as necessary.



(1) Click [Edge Direction] and select which edges to detect. You can select [All], [Dark → Light] or [Light → Dark].

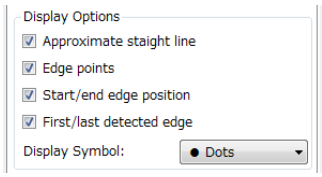
(2) Click [Detected Edge] and select which edge to regard as the detected edge. You can select [First], [Last] or [Max Level].

(3) Click [Edge Threshold] and enter the desired value.

(4) Click [Min Edge Width] and enter the desired value.
By setting a larger value, you can reduce false detection errors due to image noise.

(5) Click [Outlier Limit] and enter the desired value.
When calculating the approximate straight line, edge points farther than the value set are considered outliers and ignored.

5 Set the display options.



(1) Place a checkmark in the box corresponding to the elements you want to display on the image.

[Approximate straight line]
Displays the straight line derived from the detected edge points.

[Edge points]
Displays the detected edge points.

[Start/end edge position]
Displays the positions of the start and end points on the approximated straight line.

[First/last detected edge]
Displays the positions of the first and last edges detected in the selected direction.

(2) Click [Display symbol] and select whether to show the various edge points as [● Dots] or [+ Crosses].

6 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

  [Start Edge Pos. X], [Start Edge Pos. Y]
  Coordinates of the detected start edge.

  [End Edge Pos. X], [End Edge Pos. Y]
  Coordinates of the detected end edge.

  [Angle]
  Angle of the derived approximate straight line.

  [First Edge Pos. X], [First Edge Pos. Y]
  Coordinates of the first edge detected in the selected direction.

  [Last Edge Pos. X], [Last Edge Pos. Y]
  Coordinates of the last edge detected in the selected direction.

7 Select the [Enhance Image] tab and set image processing filters (📖 97).

8 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

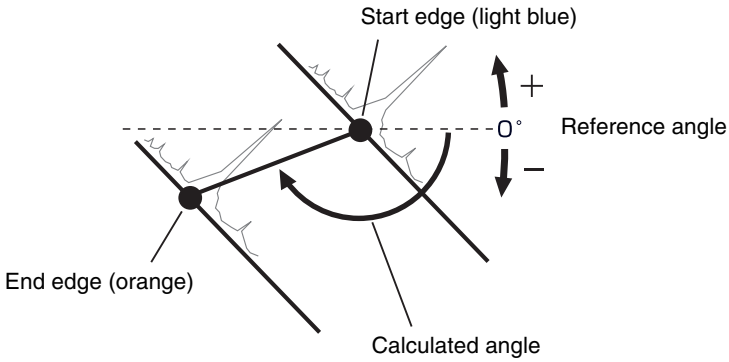
9 Apply a trigger to test the operation unit.

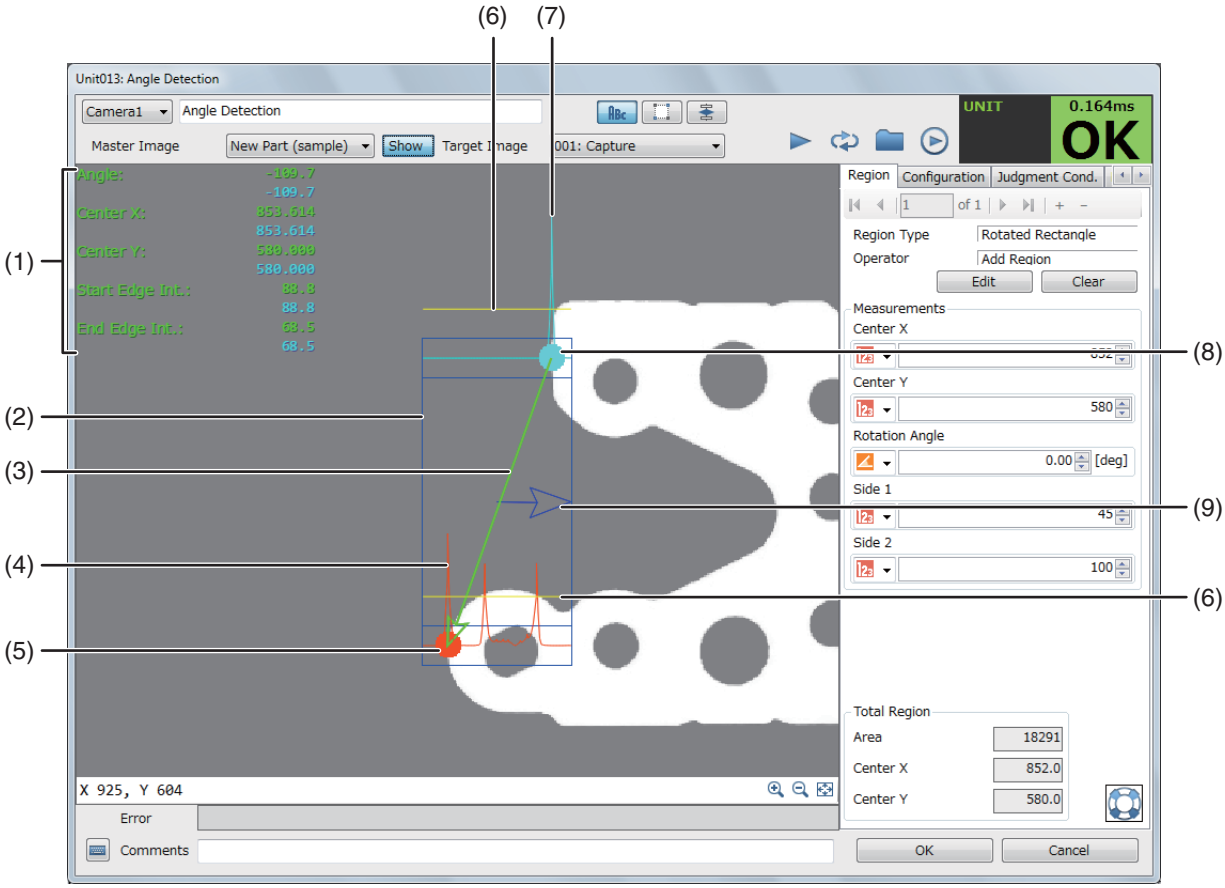
- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

10 Click [OK].

[Angle Detection] (ANGLE) Operation Units

These operation units detect a start edge point and an end edge point and calculate the angle between them, relative to the positive X axis (0°).





For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values: calculated angle, X and Y coordinates of the midpoint between the detected edges, and intensity levels of the start and end edge points.

(2) Inspection region (blue outline)

(3) Calculated angle
Shown as a green arrow from the start edge point to the end edge point.

(4) Waveform of end edges that match the parameters (orange line)

(5) Detected end edge point (orange dot)

(6) Edge level threshold set by the user (yellow line)

(7) Waveform of start edges that match the parameters (light blue line)

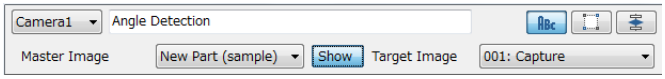
(8) Detected start edge point (light blue dot)

(9) Scan direction (blue arrow)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



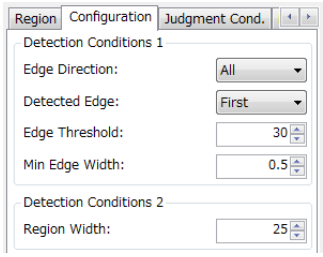
2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 92).

- Only a rotated rectangle region can be used.
- The arrow of the inspection region will determine the normal scan direction in which edges will be searched.

4 Select the [Configuration] tab and set the detection parameters as necessary.



(1) Click [Edge Direction] and select which edges to detect. You can select [All], [Dark → Light] or [Light → Dark].

(2) Click [Detected Edge] and select which edge to regard as the detected edge. You can select [First], [Last] or [Max Level].

(3) Click [Edge Threshold] and enter the desired value.

(4) Click [Min Edge Width] and enter the desired value.

5 Click [Region Width] and enter the desired value.

- This is the width of the area within which the start and end edge points are searched.

6 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[Angle]
Angle of the straight line between the detected edge points.

[Center X], [Center Y]
Coordinates of the midpoint between the detected edges.

[Start Edge Int.], [End Edge Int.]
Intensity levels of the detected edges.

7 Select the [Enhance Image] tab and set image processing filters (📖 97).

8 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

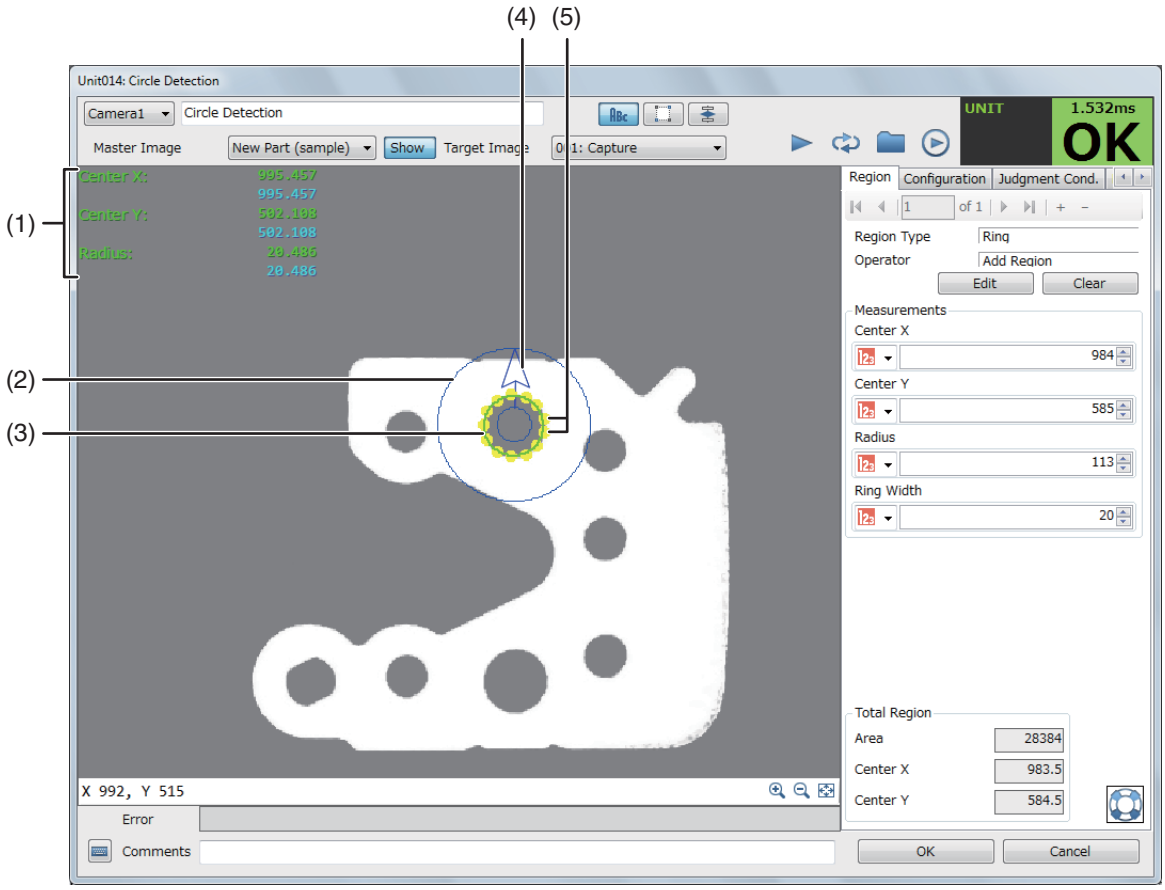
9 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

10 Click [OK].

[Circle Detection] (CIRCL) Operation Units

These operation units are used to detect multiple edge points, derive an approximate circle that best fits them and calculate its size and center point. They can be used to detect the presence or absence of round pieces of work and to check their size.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values: X and Y coordinates of the center of the approximated circle and its radius.

(2) Inspection region
Enclosed within the two blue circles.

(3) Approximated circle (green line)
Approximated circle that best fits the detected edge points.

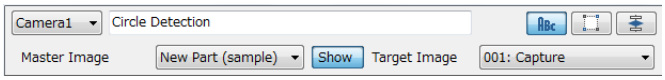
(4) Scan direction (blue arrow)

(5) Detected edge points (yellow dots/crosses)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



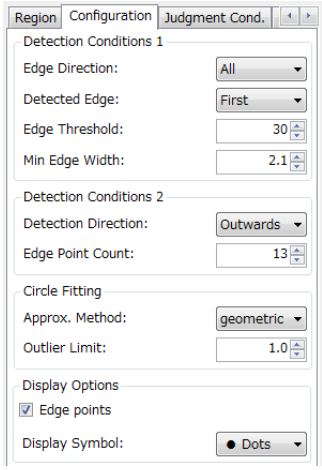
2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 96).

- Only a ring region can be used.

4 Select the [Configuration] tab and set the detection parameters as necessary.



(1) Click [Edge Direction] and select which edges to detect. You can select [All], [Dark → Light] or [Light → Dark].

(2) Click [Detected Edge] and select which edge to regard as the detected edge. You can select [First], [Last] or [Max Level].

(3) Click [Edge Threshold] and enter the desired value.

(4) Click [Min Edge Width] and enter the desired value.

5 Set the detection area parameters.

(1) Click [Detection Direction] and select [Outwards] or [Inwards].

(2) Click [Edge Point Count] and enter the desired number of edge points.

6 Set the circle-fitting parameters.

(1) Click [Approx. Method] and select the desired option. You can select on the following algorithms: [ahuber], [algebraic], [atukey], [geometric], [geohuber] or [geotukey].

(2) Click [Outlier Limit] and enter the desired value.
When calculating the approximate circle, edge points farther than the value set are considered outliers and ignored.

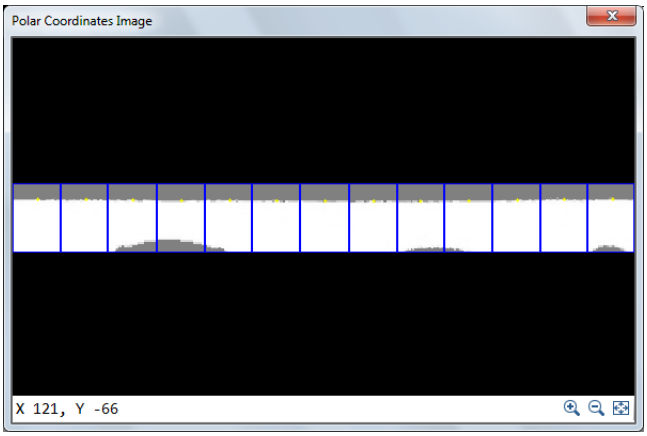
7 Set the display options.

(1) Place a checkmark in the [Edge points] box to display the detected edge points.

(2) Click [Display Symbol] and select whether to show the various edge points as [● Dots] or [+ Crosses].

8 Click [Polar Coordinates Image] to display the inspection region transformed to polar coordinates.

- The [Polar Coordinates Image] dialog box will open with an image showing the detected edge points side by side (as many segments as selected for the [Edge Point Count] setting).
- Click ✕ to close the dialog box.



9 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

  [Center X], [Center Y]
  Coordinates of the center of the derived approximate circle.

  [Radius]
  Radius of the derived approximate circle.

10 Select the [Enhance Image] tab and set image processing filters (📖 97).

11 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

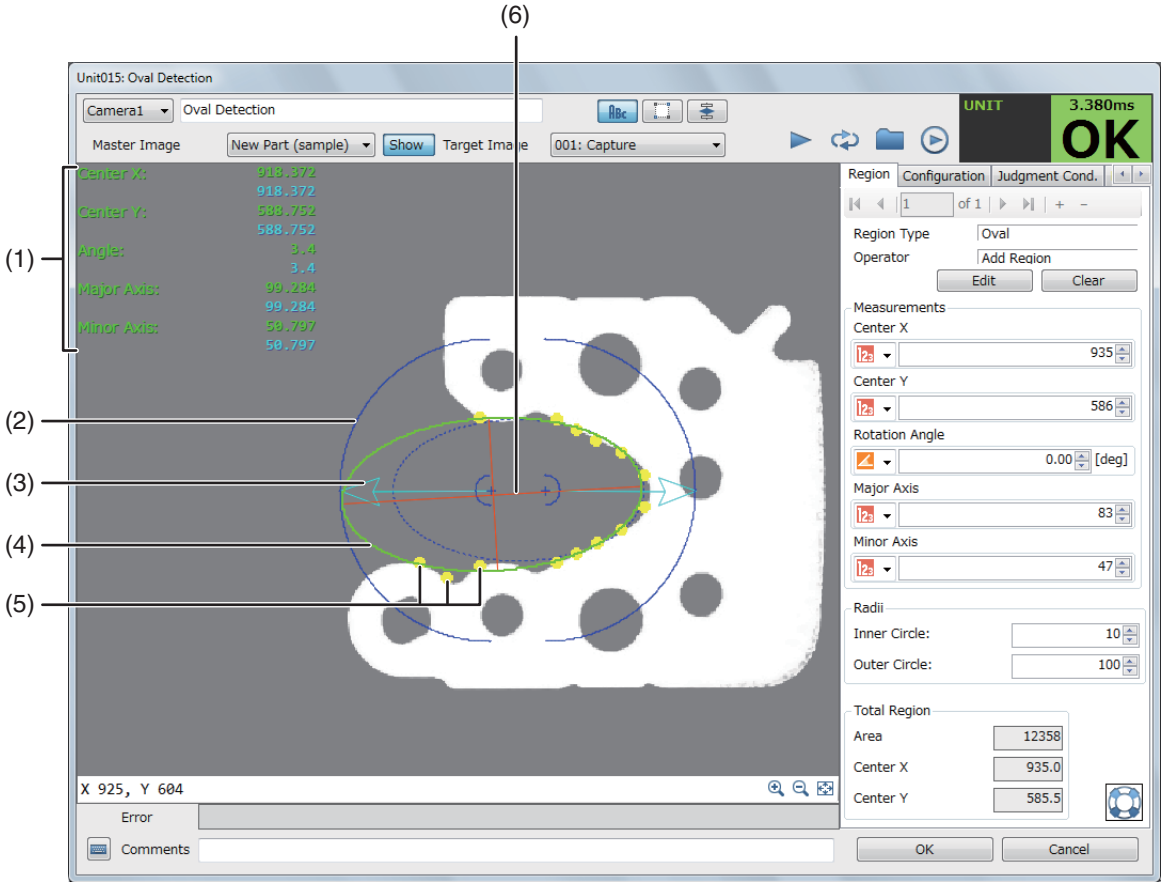
12 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

13 Click [OK].

[Oval Detection] (OVAL) Operation Units

These operation units are used to detect multiple edge points, derive an approximate oval that best fits them and calculate its size and center point.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values: X and Y coordinates of the center of the approximated oval, the angle of the major axis, and the lengths of the major and minor axes.

(2) Inspection region
Enclosed within a blue circle or two half-circles. The oval inspection region you set is indicated with a blue dotted line.

(3) Scan direction (light blue arrows)

(4) Approximated oval (green line)
Approximated oval that best fits the detected edge points.

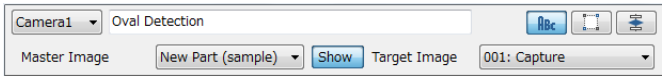
(5) Detected edge points (yellow dots/crosses)

(6) Major and minor axes of the approximated oval (red lines)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



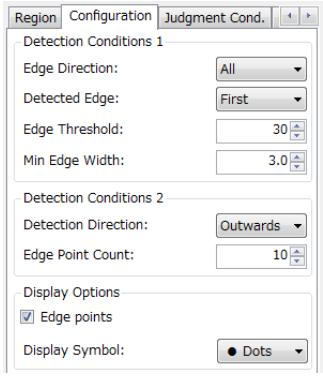
2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 94).

- Only an oval region can be used.

4 Select the [Configuration] tab and set the detection parameters as necessary.



(1) Click [Edge Direction] and select which edges to detect. You can select [All], [Dark → Light] or [Light → Dark].

(2) Click [Detected Edge] and select which edge to regard as the detected edge. You can select [First], [Last] or [Max Level].

(3) Click [Edge Threshold] and enter the desired value.

(4) Click [Min Edge Width] and enter the desired value.

5 Set the detection area parameters.

(1) Click [Detection Direction] and select [Outwards] or [Inwards].

(2) Click [Edge Point Count] and enter the desired number of edge points.

6 Set the display options.

(1) Place a checkmark in the [Edge points] box to display the detected edge points.

(2) Click [Display Symbol] and select whether to show the various edge points as [● Dots] or [+ Crosses].

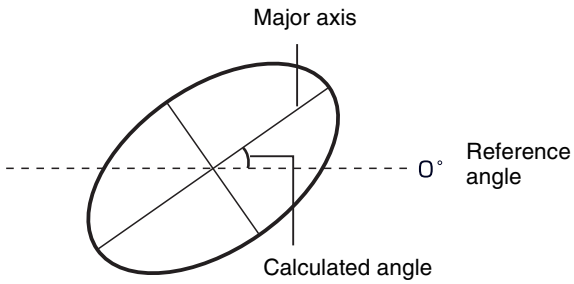
7 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[Center X], [Center Y]
Coordinates of the center of the derived approximate oval.

[Angle]
Angle between the positive X axis (0°) and the major axis of the approximate oval.

[Major Axis], [Minor Axis]
Length of the major and minor axes of the approximate oval.



8 Select the [Enhance Image] tab and set image processing filters (📖 97).

9 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

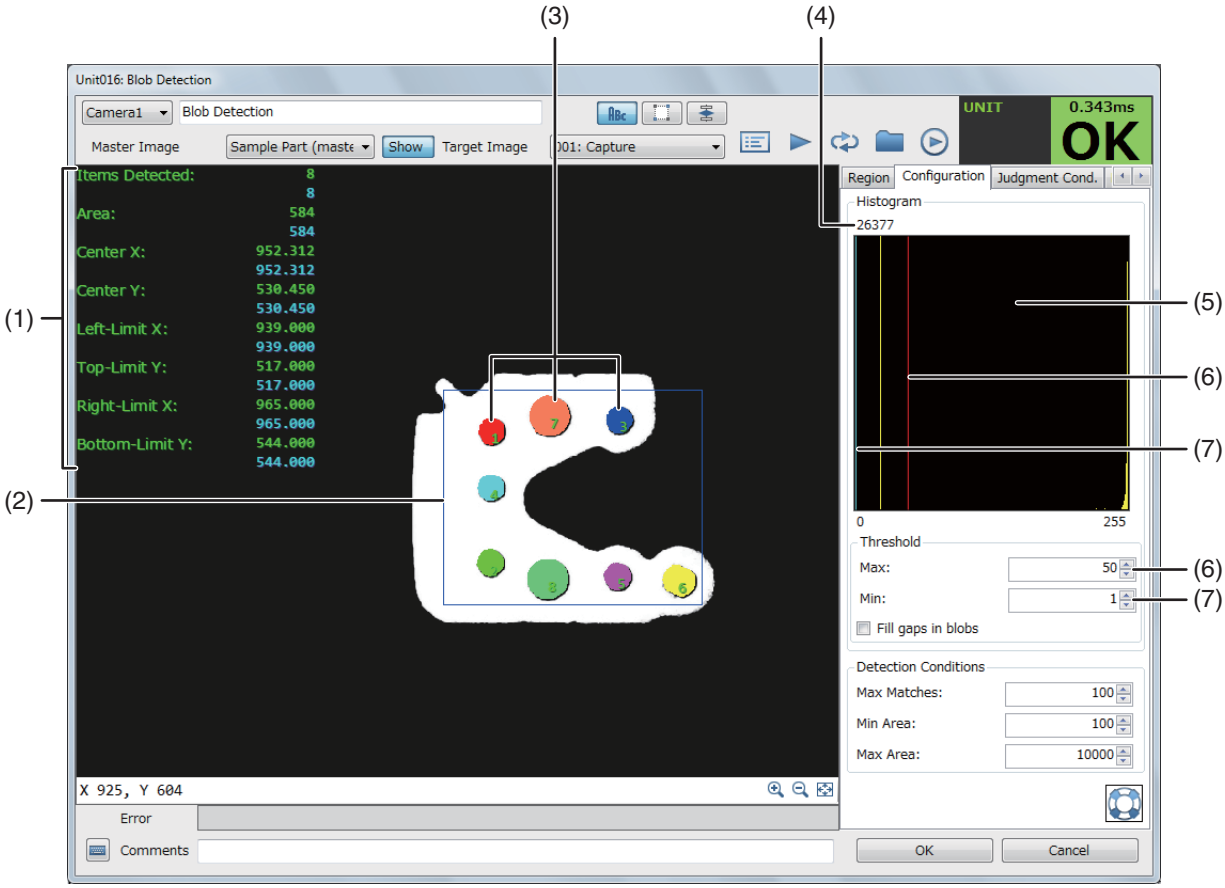
10 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

11 Click [OK].

[Blob Detection] (BLOB) Operation Units

These operation units are used to detect “blobs”, i.e., clusters of pixels in the image with an intensity level within a specified range. You can use these operation units, for example, to identify and count pieces of work.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the number of detected blobs and the following values about the first blob: surface area, X and Y coordinates of the center of the blob, X coordinates of the left and right boundaries of the blob, and Y coordinates of the top and bottom boundaries of the blob.
You can check the results of the other detected blobs in the list of results (📖 100).

(2) Inspection region (blue outline)

(3) Detected blobs
Each number indicates a corresponding index number in the list of results (📖 100).

(4) Peak level pixel count
Number of pixels with the most prevalent intensity level.

(5) Intensity (grayscale) histogram of the inspection region

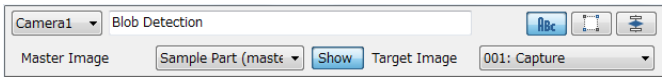
(6) Maximum intensity to detect (red line)

(7) Minimum intensity to detect (blue line)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 89).

4 Select the [Configuration] tab and set the detection parameters as necessary.

(1) Click [Max] and [Min] and enter the desired values to set the range of intensity levels you want to detect.

(2) To fill up areas (gaps or holes) enclosed within the detected blobs, place a checkmark in the [Fill gaps in blobs] box.

(3) Click [Max Matches] and enter the desired number to limit the maximum number of blobs detected.

(4) Click [Min Area] and [Max Area] and enter the desired values to set the range of blob sizes you want to detect.

5 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.
- Conditions set on result values other than [Items Detected], apply only to the first blob detected.

[Items Detected]
Number of detected blobs.

[Area]
Surface area of blob no. 1.

[Center X], [Center Y]
Coordinates of the center of blob no. 1.

[Left-Limit X], [Top-Limit Y], [Right-Limit X], [Bottom-Limit Y]
Coordinates of blob no. 1's boundaries. Thinking of a box circumscribed around blob 1, the results indicate, respectively: X coordinate of the left side, Y coordinate of the top side, X coordinate of the right side and Y coordinate of the bottom side.

6 Select the [Enhance Image] tab and set image processing filters (📖 97).

7 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

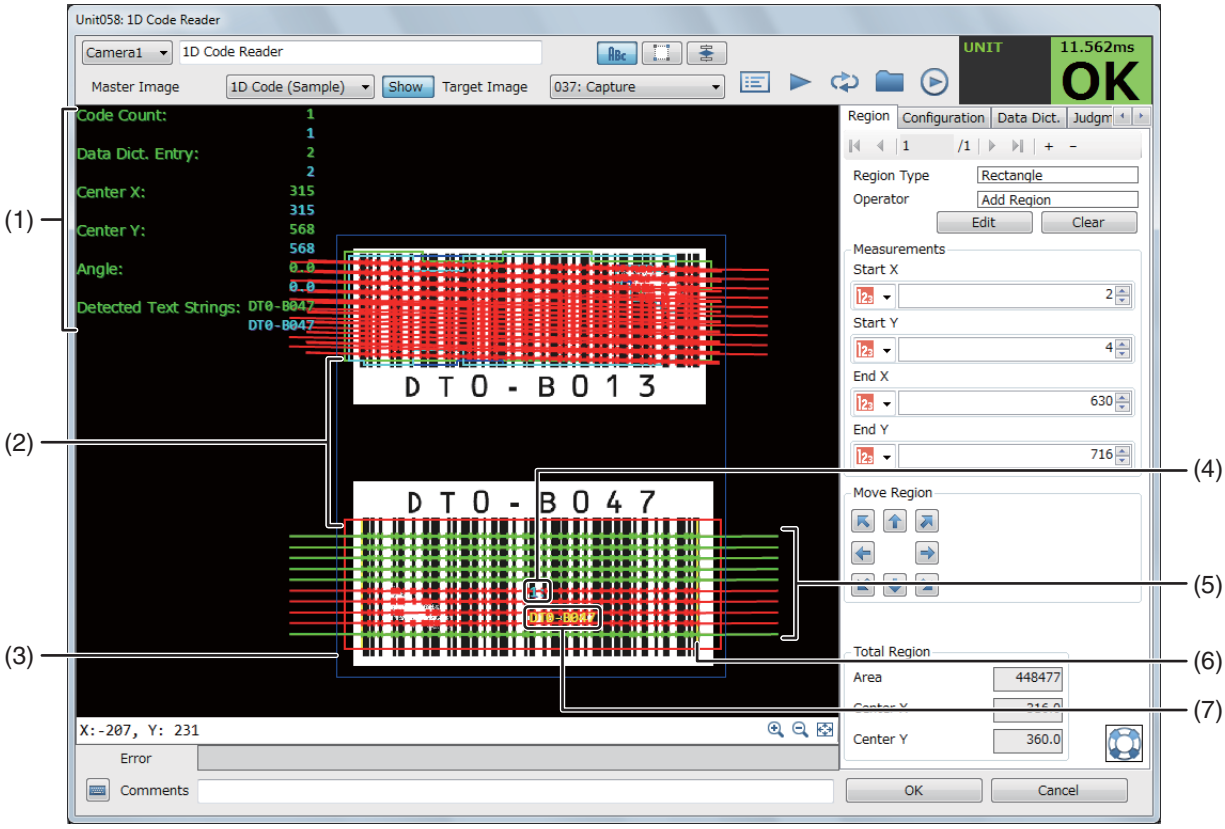
8 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

9 Click [OK].

[1D Code Reader] (1DCOD) Operation Units

These operation units are used to read the text string contained in a 1D code (barcode) and authenticate it against a list of valid values (data dictionary) registered in advance or against a predefined number of detected 1D codes. It is possible to read multiple 1D codes.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values: Number of detected 1D codes, number of the matching entry in the data dictionary ("0" when no match is found), X and Y coordinates of the center of the effective 1D code, angle of the 1D code and the detected text strings. You can check the results of the other detection codes in the list of results (📖 100).

(2) Area identified as a potential 1D code

(3) Inspection region (blue outline)

(4) Index number for list of results
Each number indicates a corresponding index number in the list of results (📖 100).

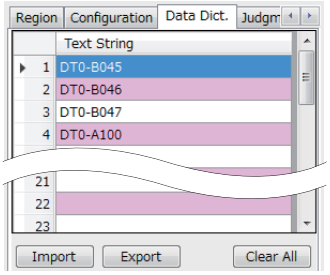
(5) Scan lines
Scan lines used to analyze the image and read the text string in the 1D code. Valid scan lines are shown in green; invalid scan lines in red.

(6) Detected 1D code area (yellow outline)

(7) Detected text string (in yellow)

Configuring the Operation Unit

1 Select the [Data Dict.] tab and register the list of valid text strings.



- The data dictionary is a list of valid text strings used to authenticate the text string read from the 1D code.
- The data dictionary is necessary for [1D Code Reader] and [2D Code Reader] operation units.
- You can export and import dictionary files between operation units.

(1) Click on an empty [Text String] field and enter the desired text string.
If you plan to use [UPC-A], [UPC-A Add-On 2] or [UPC-A Add-On 5]-type codes, see the notes at the end of this procedure (📖 139).

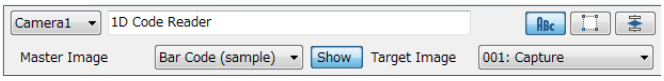
(2) To import a data dictionary: Click [Import], select the dictionary file (.csv file) and open the file.
When the confirmation message appears, click [OK]. The imported data dictionary will replace any existing entries.

(3) To export a data dictionary: Click [Export] and select the destination folder. Enter the desired file name and save the file.
When the confirmation message appears, click [OK].

(4) To delete all entries, click [Clear All].
When the confirmation message appears, click [OK] to clear the data dictionary.

2 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.

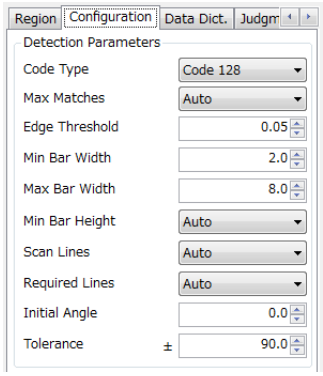


3 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

4 Select the [Region] tab and set the region that will be inspected (📖 89).

5 Select the [Configuration] tab and set the detection parameters as necessary.

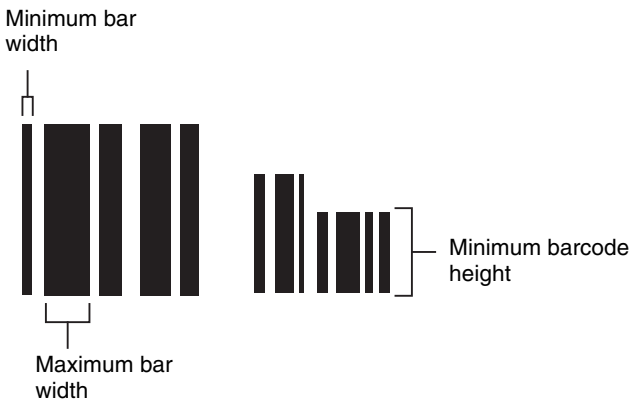


(1) Click [Code Type] and select the desired setting. You can select one of the following barcode types:
[2/5 Industrial], [2/5 Interleaved], [Codabar], [Code 39], [Code 93], [Code 128], [MSI], [PharmaCode], [EAN-8], [EAN-8 Add-On 2], [EAN-8 Add-On 5], [EAN-13], [EAN-13 Add-On 2], [EAN-13 Add-On 5], [UPC-A], [UPC-A Add-On 2], [UPC-A Add-On 5], [UPC-E], [UPC-E Add-On 2], [UPC-E Add-On 5], [GS1-128], [GS1 DataBar Omnidir], [GS1 DataBar Truncated], [GS1 DataBar Stacked], [GS1 DataBar Stacked Omnidir], [GS1 DataBar Limited], [GS1 DataBar Expanded], [GS1 DataBar Expanded Stacked].

(2) Click [Max Matches] and set the maximum number of detected 1D codes.

(3) Click [Edge Threshold] and enter the desired value.

(4) Click [Min Bar Width] and [Max Bar Width] and enter the desired values to set the range of valid bar widths for the 1D code.



6 Set the barcode area parameters.

(1) Click [Min Bar Height] and select the minimum barcode height.

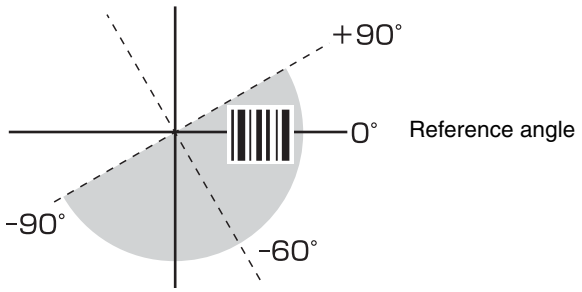
(2) Click [Scan Lines] and select the number of scan lines.

(3) Click [Required Lines] and select the minimum number of valid scan lines needed to confirm a reading.

7 To allow the reading of a 1D code rotated at a certain angle, set the barcode angle parameters.

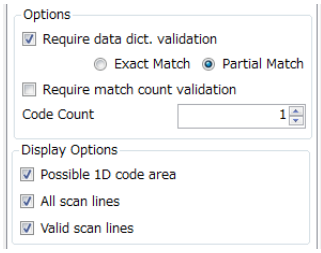
(1) Click [Initial Angle] and enter the desired value to set the 1D code's baseline angle (relative to the positive X axis).

(2) Click [Tolerance] and enter the desired value.
The tolerated rotation will be the initial angle ± the tolerance.



Initial angle –60° ±90° tolerated rotation

8 Set the operation unit's judgment conditions.



- You can set both of the following as conditions.

  [Require data dict. validation]
  Place a checkmark in this box to require that the text strings of the 1D code and data dictionary match. Select [Exact Match] or [Partial Match] to require an exact or partial match for the text strings.

  [Require match count validation]
  Place a checkmark in this box to require that the number of detected 1D codes matches a number of detected 1D codes set in [Code Count]. Click [Code Count] and set the desired number.

9 Set the display options.

- Place a checkmark in the box corresponding to the elements you want to display on the image.

  [Possible 1D code area]
  Displays a red line around areas identified as potential 1D codes.

  [All scan lines]
  Displays all scan lines whether valid or not.

  [Valid scan lines]
  Displays only valid scan lines.

10 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

  [Code Count]
  Number of detected codes.

  [Data Dict. Entry]
  Number of data dictionary entries matching the 1D code. Returns 0 when no matches are found.

  [Center X], [Center Y]
  Coordinates of the center of the detected 1D code.

  [Angle]
  Angle between the positive X axis (0°) and the 1D code's baseline.

  [Detected Text Strings]
  Number of detected characters.

11 Select the [Enhance Image] tab and set image processing filters (📖 97).

12 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

13 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 3.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

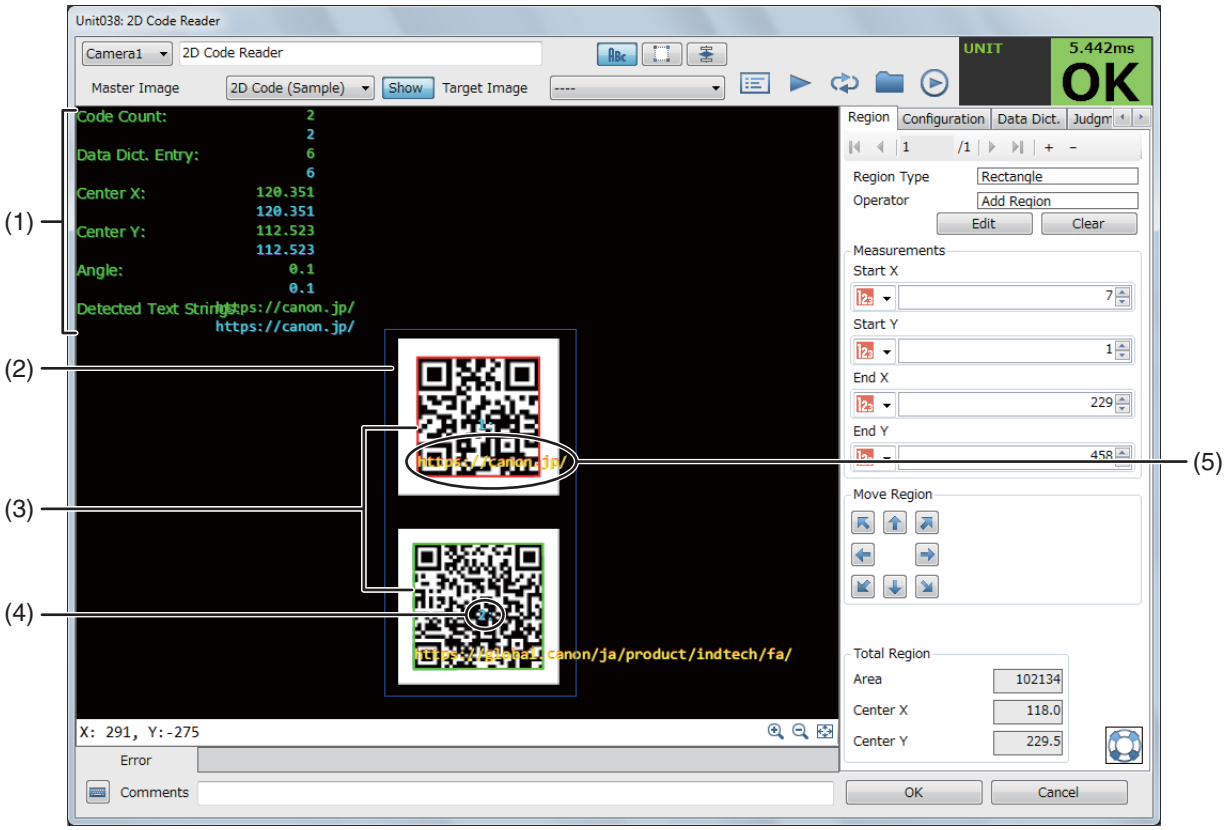
14 Click [OK].

Note

- [PharmaCode]-type codes can be read both from right to left and from left to right. The two text strings detected will be displayed, separated by a comma. The operation unit will return an OK judgment if either of the detected text strings is registered in the data dictionary.
- To register valid text strings for [UPC-A], [UPC-A Add-On 2] and [UPC-A Add-On 5]-type codes, add a leading "0" to the text string when adding it to the data dictionary. For example, if the valid text string is "123456789abc", the data dictionary entry should be registered as "0123456789abc".

[2D Code Reader] (2DCOD) Operation Units

These operation units are used to read the text string contained in a 2D code (QR and other matrix barcodes) and authenticate it against a list of valid values (data dictionary) registered in advance or against a predefined number of detected 2D codes. It is possible to read multiple 2D codes.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values: Number of detected 2D codes, number of the matching entry in the data dictionary ("0" when no match is found), X and Y coordinates of the center of the 2D code, angle of the 2D code and the detected text strings. You can check the results of the other detection codes in the list of results (📖 100).

(2) Inspection region (blue outline)

(3) Detected 2D code

(4) Index number for list of results
Each number indicates a corresponding index number in the list of results (📖 100).

(5) Detected text string (in yellow)

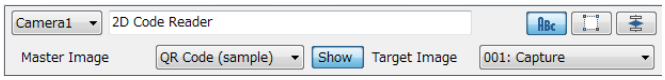
Configuring the Operation Unit

1 Select the [Data Dict.] tab and register the list of valid text strings.

- The procedure is the same as for 1D code data dictionaries (step 1, 📖 137).

2 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



3 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

4 Select the [Region] tab and set the region that will be inspected (📖 89).

5 Select the [Configuration] tab and set the detection parameters as necessary.

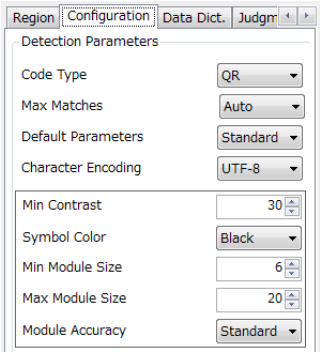
- Available settings will vary depending on the 2D code type selected.

(1) Click [Code Type] and select the desired setting. You can select one of the following types: [Aztec], [ECC 200], [GS1 Aztec], [GS1 DataMatrix], [GS1 QR], [Micro QR], [PDF417], [QR].

(2) Click [Max Matches] and set the maximum number of detected 2D codes.

(3) Click [Default Parameters] and select [Standard], [High Accy.] or [Max Accy.] to set the basic accuracy level.

(4) Click [Character Encoding] and select [UTF-8] or [Locale] for the character encoding used for converting detected data. For details on the [Locale] setting, refer to the following table.



Example of settings for code type [QR]

Display language (📖 196)	Character encoding
Deutsch	Western European (DOS)
English	OEM United States
Français	Western European (DOS)
日本語	Shift-JIS
繁體中文	Big5
한국어	Unified Hangul Code
简体中文	GB2312

(5) Click [Min Contrast] and enter the desired value to set the minimum contrast between symbol and background.

(6) Click [Symbol Color] and select the color of the 2D code's symbol.

(7) Click [Module Accuracy] and select [Standard], [High Accy.] or [Max Accy.] to set the module detection accuracy level.

6 Depending on the 2D code type selected, set the detailed module/symbol parameters.

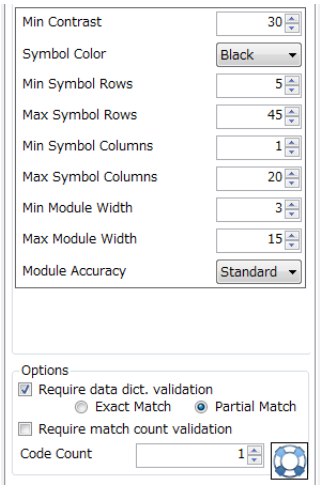
- Initial values depend on the [Module Accuracy] setting selected in the previous step.

[PDF417] codes only:

(1) Click [Min Symbol Rows] and [Max Symbol Rows] and enter the desired values to set the range of number of rows in the symbol.

(2) Click [Min Symbol Columns] and [Max Symbol Columns] and enter the desired values to set the range of number of columns in the symbol.

(3) Click [Min Module Width] and [Max Module Width] and enter the desired values to set the range of valid module width.



Example of settings for code type [PDF417]

[ECC200] and [QR] codes only:

(1) Click [Min Module Size] and [Max Module Size] and enter the desired values to set the range of valid module size.

(2) Click [Max Tilt (deg)] and enter the desired value to set the maximum tolerated rotation angle.

7 Set the operation unit's judgment conditions.

- You can set both of the following as conditions.

  [Require data dict. validation]
  Place a checkmark in this box to require that the text strings of the 2D code and data dictionary match. Select [Exact Match] or [Partial Match] to require an exact or partial match for the text strings.

  [Require match count validation]
  Place a checkmark in this box to require that the number of detected 2D codes matches a number of detected 2D codes set in [Code Count]. Click [Code Count] and set the desired number.

8 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

  [Code Count]
  Number of detected codes.

  [Data Dict. Entry]
  Number of data dictionary entries matching the 2D code. Returns 0 when no matches are found.

  [Center X], [Center Y]
  Coordinates of the center of the detected 2D code.

  [Angle]
  Angle between the positive X axis (0°) and the 2D code's baseline.

  [Detected Text Strings]
  Number of detected characters.

9 Select the [Enhance Image] tab and set image processing filters (📖 97).

10 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

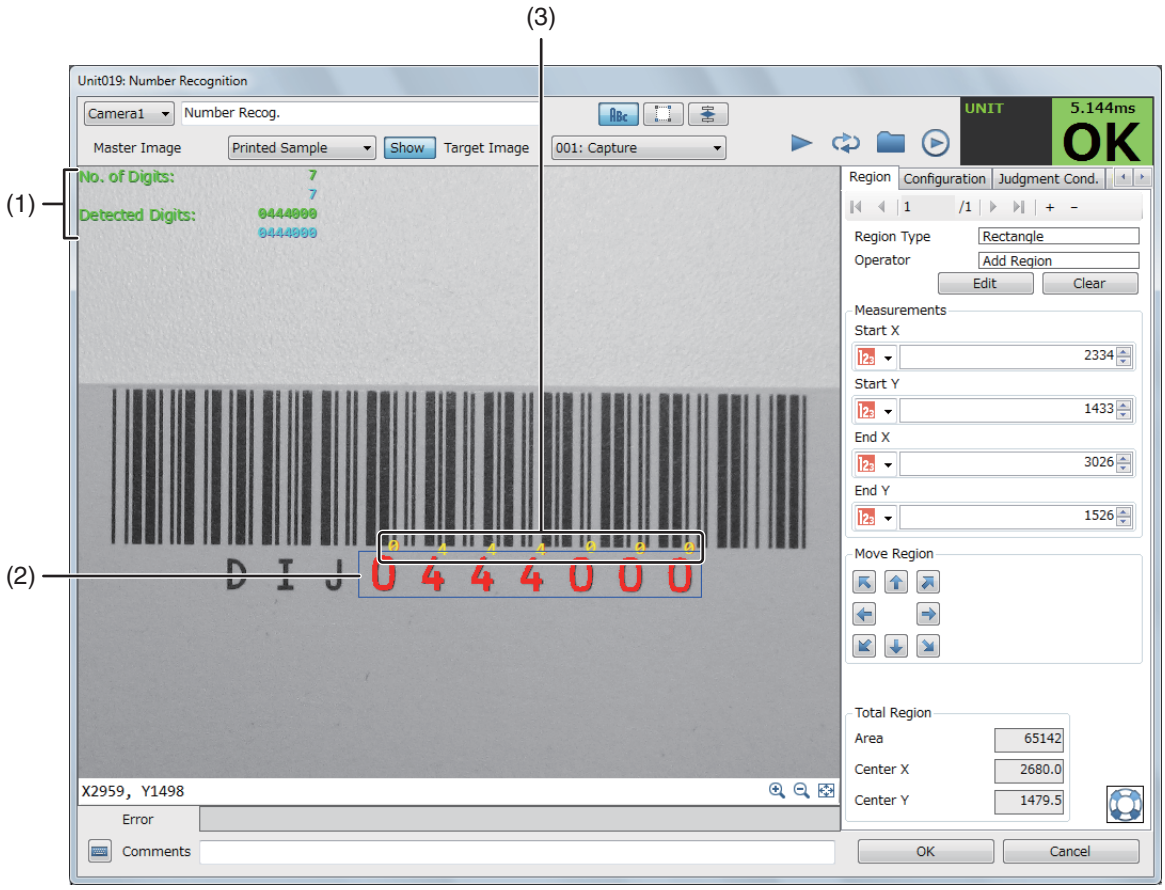
11 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 3.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

12 Click [OK].

[Number Recognition] (NUMBR) Operation Units

These operation units are used to detect and read up to 15 numerals (0 to 9) in the inspected region. They can be used, for example, to read serial numbers from pieces of work. Because the numerals detected by this operation unit are recognized as numbers, they can be used for settings and output values.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values: Number of numerals detected and the detected series of numerals.

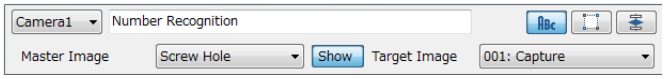
(2) Inspection region (blue outline)

(3) Detected numerals (in yellow)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.

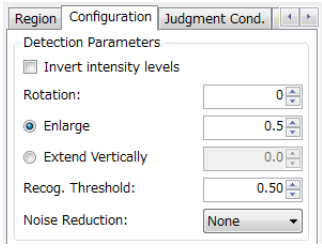


2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 89).

4 Select the [Configuration] tab and set the detection parameters as necessary.



(1) To recognize numbers set in a light color against a dark-colored background, place a checkmark in the [Invert intensity levels] box to use the "negative" complement image.

(2) Click [Rotation] and enter the desired value to rotate the image counter-clockwise.

(3) Click [Enlarge] or [Extend Vertically] and enter the desired value to enlarge the detected numerals.
This can be useful when attempting to read numbers displayed digitally and there are gaps between the numbers or the numbers are faint or blurry.

[Enlarge]
Detected numerals are enlarged in all directions.

[Extend Vertically]
Detected numerals are stretched only vertically.

(4) Click [Recog. Threshold] and enter the desired value.
Smaller threshold values will make it easier to recognize numerals but will also increase the possibility of recognition errors.

(5) Click [Noise Reduction] and select the level of noise reduction filter to apply to the image.
When the level is set too high, some numerals may be removed as well. Check the detected numerals after changing this setting.

5 In the [Configuration] tab, set the minimum and maximum sizes of a single detected character.

- When detecting characters, every single character must fit within the bounds of a height and width set with the following procedure.

(1) Click the fields under [Text Height] and enter the desired range.

(2) Click the fields under [Text Width] and enter the desired range.

(3) Place a checkmark in the [Show reference point] box to display rectangular frames onscreen to show the minimum and maximum sizes of detected text.
The minimum size is shown as a blue frame and the maximum size is shown as a red frame. Note that the frames are an approximation.

6 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[No. of Digits]
Total number of numerals detected.

[Detected Digits]
String of detected numerals.

7 Select the [Enhance Image] tab and set image processing filters (📖 97).

8 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

9 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

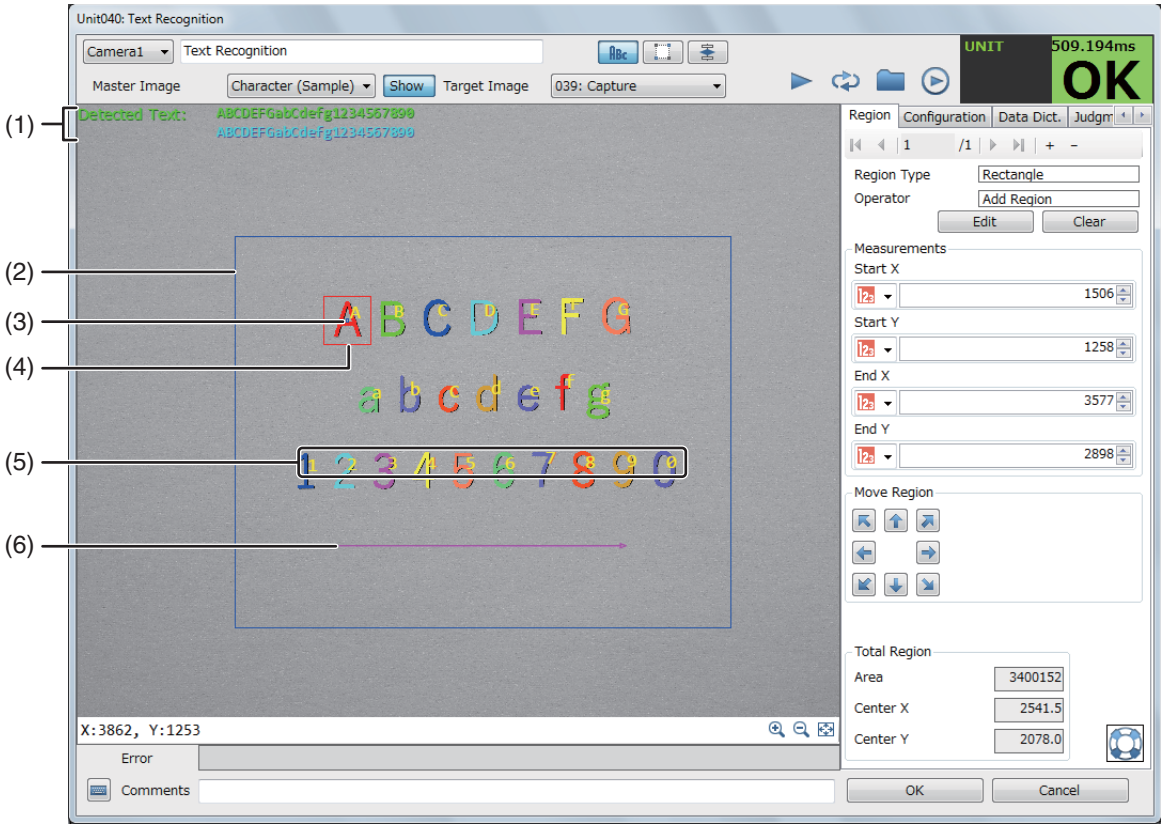
10 Click [OK].

Note

- Because detected numerals are recognized as numbers, you can use them for settings and output values. For example, if the numbers 1, 2 and 3 are detected, they can be used as the number 123. In the desired operation unit, select [Unit] and then select this [Number Recognition] operation unit.

[Text Recognition] (TEXTR) Operation Units

These operation units are used to detect and read letters (upper/lower case alphabet), numerals (0 to 9) and special characters (- / = + : < > . # $ % & ( ) @ *) in the inspected region. This is useful for reading shipping slips on pieces of work, for example.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the detected text.

(2) Inspection region (blue outline)

(3) Minimum size of a single detected character (blue outline)

(4) Maximum size of a single detected character (red outline)

(5) Detected text (yellow)

(6) Scanning direction and angle (pink arrow)

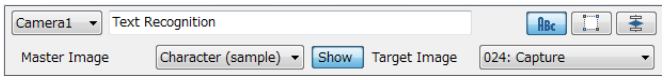
Configuring the Operation Unit

1 Select the [Data Dict.] tab and register the list of valid text strings.

- The procedure is the same as for 1D code data dictionaries (step 1, 📖 137).

2 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.

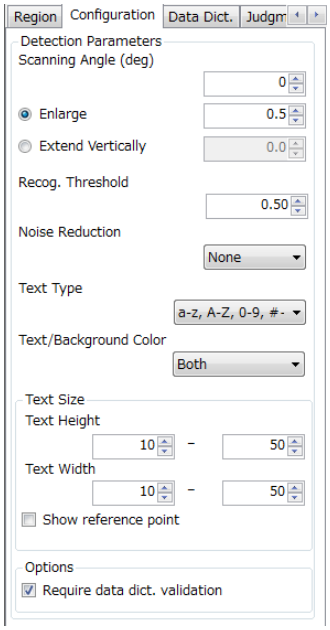


3 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

4 Select the [Region] tab and set the region that will be inspected (📖 89).

5 Select the [Configuration] tab and set the detection parameters as necessary.



(1) Click [Scanning Angle (deg)] and enter the angle of the text to be read.

(2) Click [Enlarge] or [Extend Vertically] and enter the desired value to enlarge the detected text.
This can be useful when attempting to read text displayed digitally and there are gaps between the text or the text is faint or blurry.

[Enlarge]
Detected text is enlarged in all directions.

[Extend Vertically]
Detected text is stretched only vertically.

(3) Click [Recog. Threshold] and enter the desired value.
Smaller threshold values will make it easier to recognize text but will also increase the possibility of recognition errors.

(4) Click [Noise Reduction] and select the level of noise reduction filter to apply to the image.
When the level is set too high, some text may be removed as well. Check the detected text after changing this setting.

6 In the [Configuration] tab, set the detection parameters as necessary.

(1) Click [Text Type] and select the type of text to be detected. You can select a combination of [a-z] (lower case alphabet), [A-Z] (upper case alphabet), [0-9] (numerals) and [#+=] (special characters).

(2) Click [Text/Background Color] to select the text and background color scheme to be detected. Select [Dark on light] for dark-colored text on a light background or [Light on dark] for light-colored text on a dark background. Alternatively, you can select [Both] if both types of color schemes are present.

7 Set the minimum and maximum sizes of a single detected character.

- When detecting text, every single character must fit within the bounds of a height and width set with the following procedure.

(1) Click the fields under [Text Height] and enter the desired range.

(2) Click the fields under [Text Width] and enter the desired range.

(3) Place a checkmark in the [Show reference point] box to display rectangular frames onscreen to show the minimum and maximum sizes of detected text.
The minimum size is shown as a blue frame and the maximum size is shown as a red frame. Note that the frames are an approximation.

8 If necessary, set an additional requirement for operation unit's judgment.

- Place a checkmark in the [Require data dict. Validation] box to require that the detected text and data dictionary match. Select [Exact Match] or [Partial Match] to require an exact or partial match.

9 Select the [Judgment Cond.] tab and set the operation unit's judgment condition.

- You can set the following condition.

[Detected Text]
String of detected characters.

10 Select the [Enhance Image] tab and set image processing filters (📖 97).

11 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

12 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

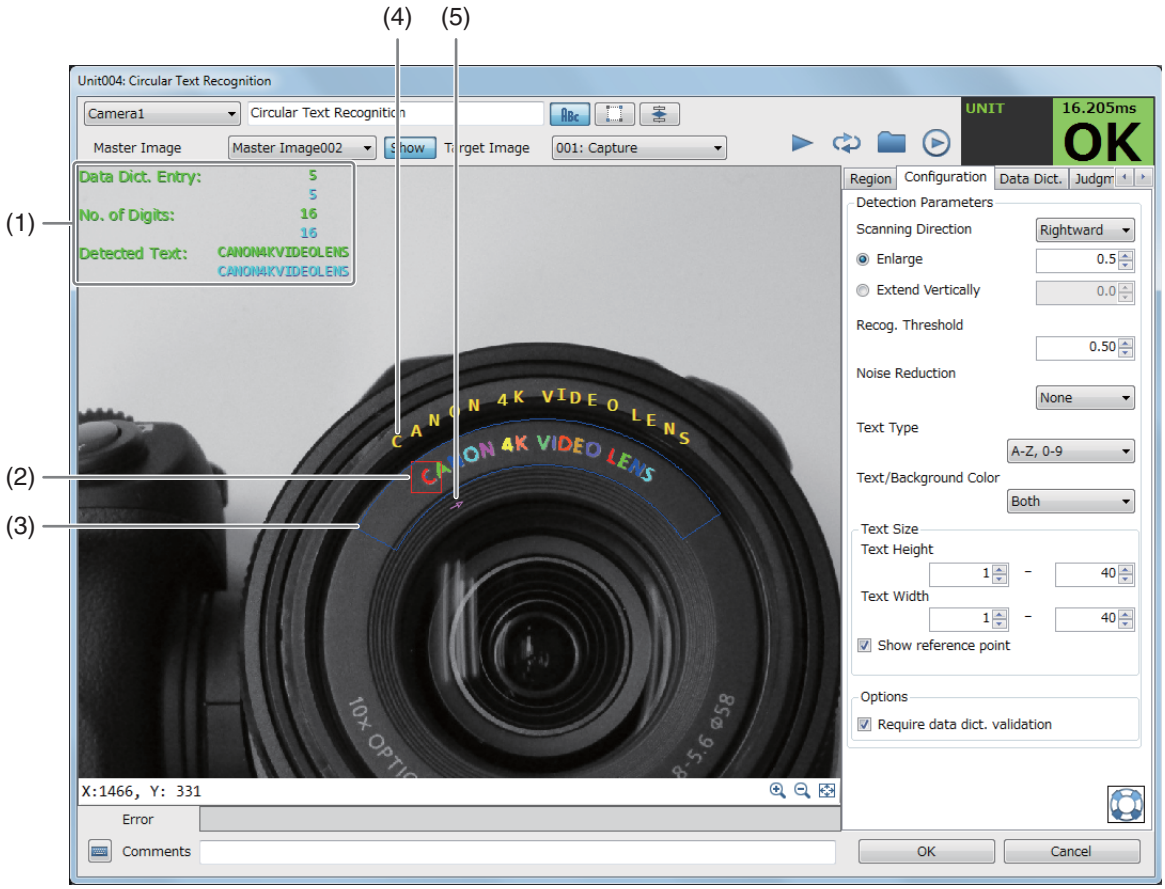
13 Click [OK].

Note

- When numerals cannot be detected as numbers or converted to numeric values, only the number of characters will be output.
- To detect small characters such as periods or dots, enter a minimum text size value that is smaller than the number of pixels in the character you want to detect.

[Circular Text Recognition] (CTXTR) Operation Units

These operation units are used to detect characters set in laid out in a circular or curved pattern.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the detected text.

(2) Maximum size of a single detected character (red outline)

(3) Inspection region (blue outline)

(4) Detected text (yellow)

(5) Scanning direction and angle (pink arrow)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.

2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 89).

(1) Click [Edit] and set an arc region.
Align the red circle's center with the approximate center of the text's circle.

(2) Click [Initial Angle] and [Angle Difference] and enter the desired values.
Set values so the all the target text is included in the inspection region.

4 Select the [Configuration] tab and set the detection parameters as necessary.

(1) Click [Scanning Direction] and select [Rightward] or [Leftward].

(2) Set the rest of the parameters as explained for [Text Recognition] operation units (steps 5 and 6, 📖 146).

5 In the [Configuration] tab, set the minimum and maximum sizes of a single detected character.

- When detecting characters, every single character must fit within the bounds of a height and width set with the following procedure.

(1) Click the fields under [Text Height] and enter the desired range.

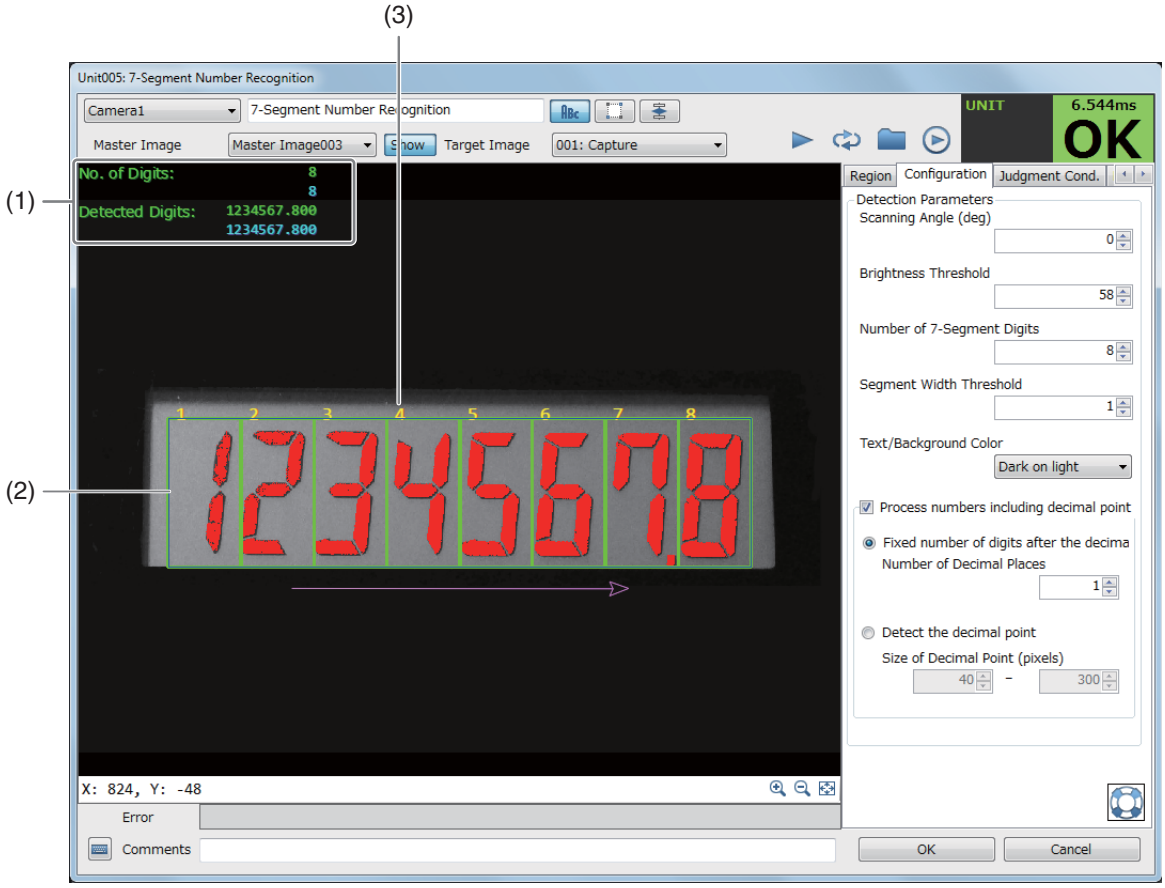
(2) Click the fields under [Text Width] and enter the desired range.

(3) Place a checkmark in the [Show reference point] box to display rectangular frames onscreen to show the minimum and maximum sizes of detected text.
The minimum size is shown as a blue frame and the maximum size is shown as a red frame. Note that the frames are an approximation.

6 Set the judgment conditions, image processing filters and other settings as explained for [Text Recognition] operation units (steps 9 to 11, 📖 146).

[7-Segment Number Recognition] (7SEGR) Operation Units

These operation units are used to read out digital displays using 7-segment displays (SSD).



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the following values: Number of numerals detected and the detected series of numerals.

(2) Inspection region (green frames)

(3) Detected numerals (in yellow)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.

2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 89).

(1) Click [Edit] and set an arc region.
Align the red circle's center with the approximate center of the text's circle.

(2) Click [Initial Angle] and [Angle Difference] and enter the desired values.
Set values so the all the target text is included in the inspection region.

4 Select the [Configuration] tab and set the detection parameters as necessary.

(1) Click [Brightness Threshold] and enter the desired value.

(2) Click [Number of 7-Segment Digits] and [Segment Width threshold] and enter the desired values (enter the width in pixels).

(3) Set the rest of the parameters as explained for [Text Recognition] operation units (steps 5 and 6, 📖 146).

5 To include the processing of values with a decimal point, place a checkmark in the [Process numbers including decimal point] box.

- Select [Fixed number of decimal points] and enter the desired value, or select [Detect the decimal point] and enter the size range for the decimal point in pixels.

6 In the [Configuration] tab, set the minimum and maximum sizes of a single detected character.

- When detecting characters, every single character must fit within the bounds of a height and width set with the following procedure.

(1) Click the fields under [Text Height] and enter the desired range.

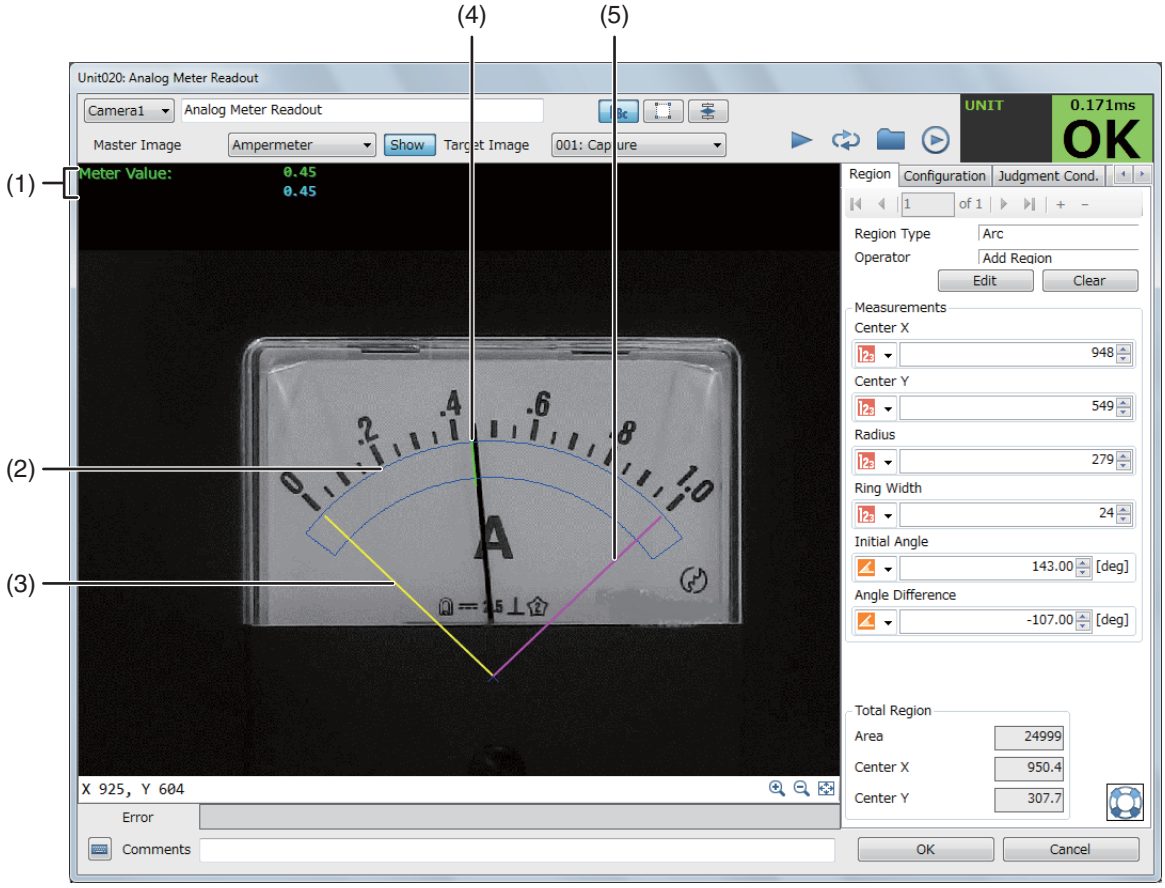
(2) Click the fields under [Text Width] and enter the desired range.

(3) Place a checkmark in the [Show reference point] box to display rectangular frames onscreen to show the minimum and maximum sizes of detected text.
The minimum size is shown as a blue frame and the maximum size is shown as a red frame. Note that the frames are an approximation.

7 Set the judgment conditions, image processing filters and other settings as explained for [Text Recognition] operation units (steps 9 to 11, 📖 146).

[Analog Meter Readout] (AMETR) Operation Units

These operation units can detect the edge position of an analog meter's sweeping needle. After setting the minimum and maximum values of the analog meter, these operation units can be used to read the meter's current value.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Calculated meter value

(2) Inspection region (blue outline)

(3) Minimum needle angle (yellow line)

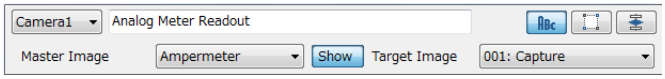
(4) Detected needle position (green line)

(5) Maximum needle angle (pink line)

Configuring the Operation Unit

1 Select a master image.

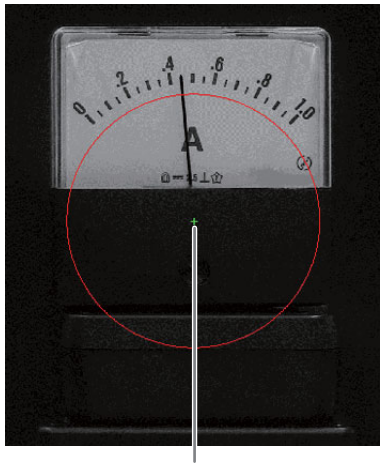
- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 95).



Align the circle's center with the approximate center of the needle

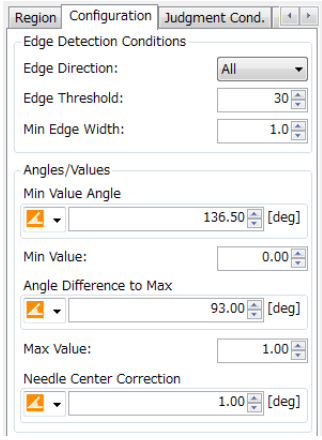
(1) Click [Edit] and set an arc region.
Align the red circle's center with the center of the sweeping needle.
Adjust the size of the red circle as necessary and right-click to confirm.

(2) Click [Angle Difference] and enter [1].
The initial angle will be shown in red.

(3) Click [Initial Angle] and enter the start point of the inspection region.
Set an initial angle value so that the smallest gradation in the analog meter's scale is within the inspection region.

(4) Click [Angle Difference] and enter the end point of the inspection region.
Set an initial angle value so that the largest gradation in the analog meter's scale is within the inspection region. If the values increase clockwise, enter a negative value; if they increase counter-clockwise, enter a positive value.

4 Select the [Configuration] tab and set the detection parameters as necessary.



(1) Click [Edge Direction] and select which edges to detect. You can select [All], [Dark → Light] or [Light → Dark].

(2) Click [Edge Threshold] and enter the desired value.

(3) Click [Min Edge Width] and enter the desired value.

5 Set the angles and values' parameters according to the analog meter.

(1) Click [Min Value Angle] and enter the desired value.
Make sure the yellow line on the image matches the angle of the smallest gradation on the analog meter's scale.

(2) Click [Min Value] and enter the smallest value on the analog meter's scale.

(3) Click [Angle Difference to Max] and enter the desired angle value.
Make sure the pink line on the image matches the angle of the largest gradation on the analog meter's scale.

(4) Click [Max Value] and enter the largest value on the analog meter's scale.

(5) Click [Needle Center Correction] and enter the desired angle value.
Adjust this value as necessary when the value of the analog meter displayed on the screen does not match the actual position of the needle.

6 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set a condition based on the current value of the analog meter ([Meter Value]).

7 Select the [Enhance Image] tab and set image processing filters (📖 97).

8 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

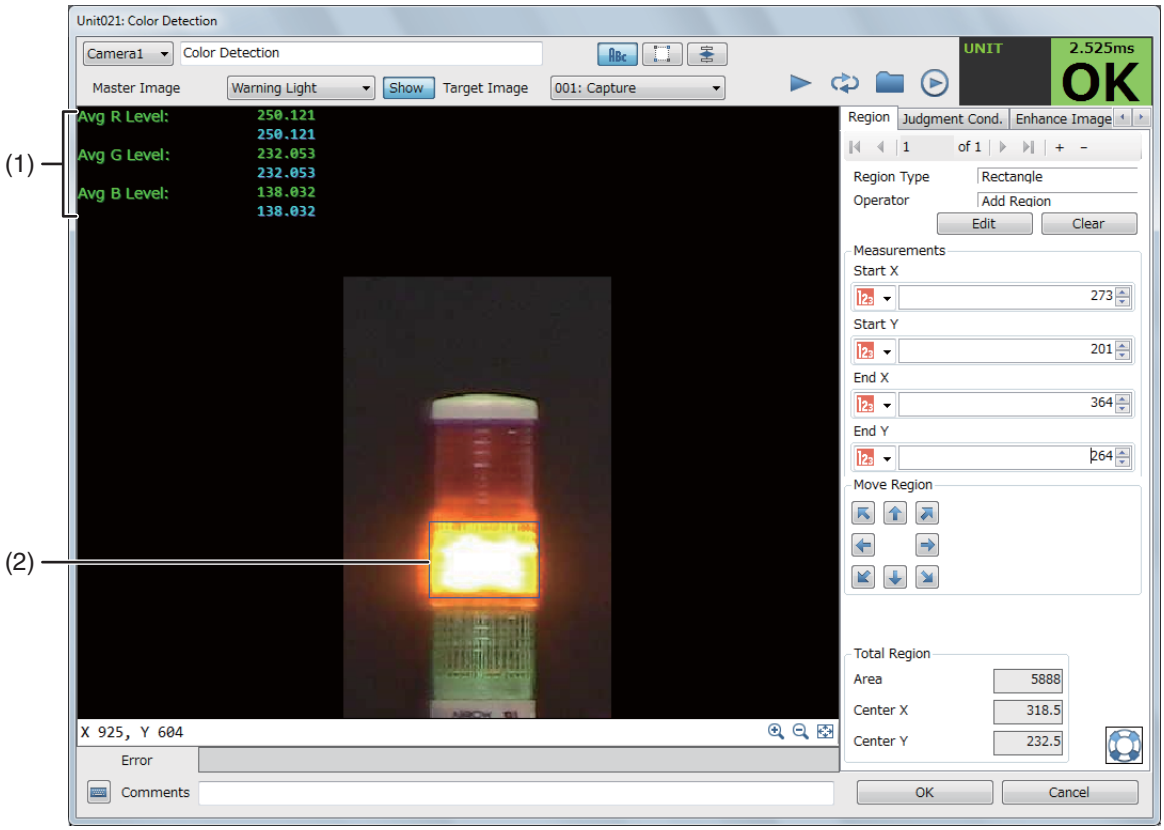
9 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

10 Click [OK].

[Color Detection] (COLOR) Operation Units

These operation units return the average RGB levels within the inspected region of an image. By setting the RGB values of the desired color as judgment conditions, these operation units can be used to test whether the inspection region matches the target color or not. For example, if a signal light is on (lit in a certain color) or not.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

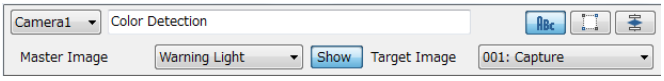
(1) Result values
The operation unit returns the following values: Average R level, average G level, average B level.

(2) Inspection region (blue outline)

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.



2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 89).

4 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.
- You can click (color picker / eyedropper tool) and then click on a desired spot on the image to get the RGB levels of that color for reference.

  [Avg R Level], [Avg G Level], [Avg B Level]
  Average RGB levels of the inspected region.

5 Select the [Enhance Image] tab and set image processing filters (📖 97).

6 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

7 Apply a trigger to test the operation unit.

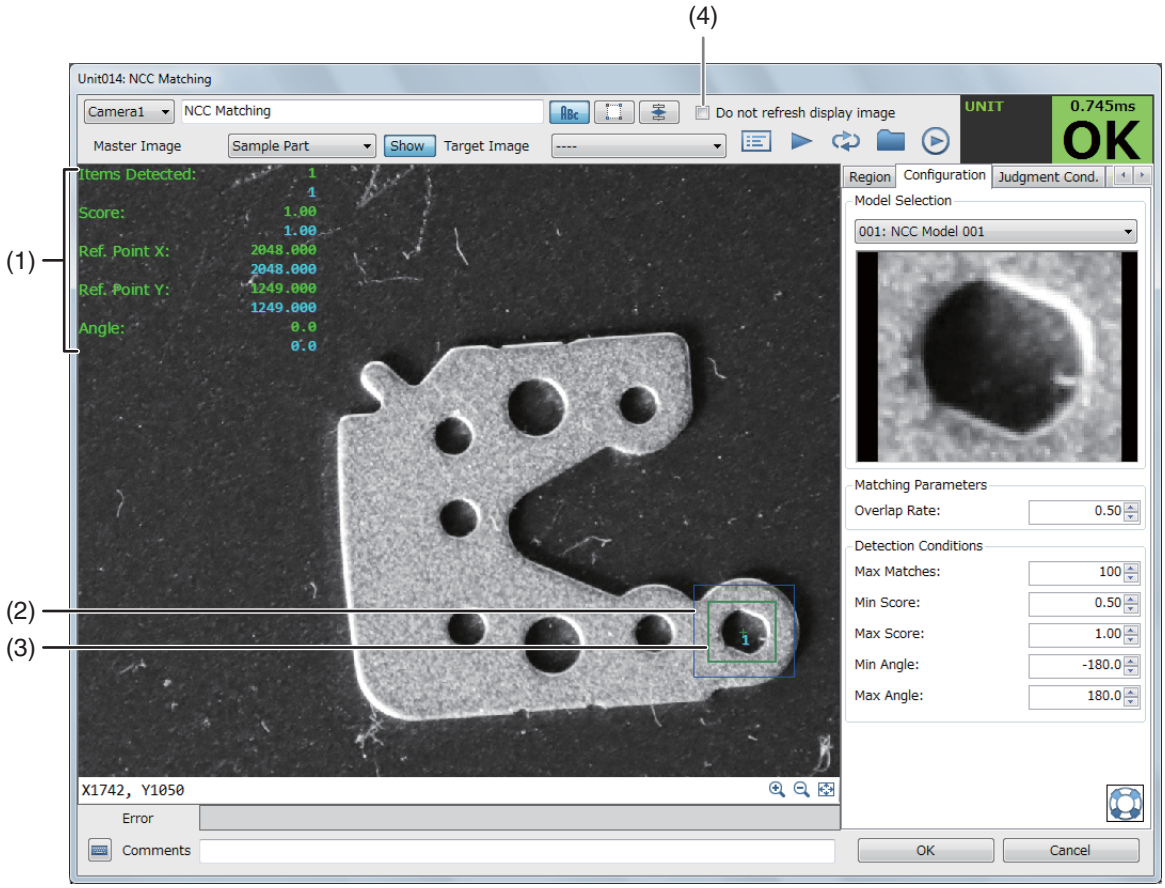
- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

8 Click [OK].

Model Matching Units

[NCC Matching] (NCCM) Operation Units

These operation units use correlation-based matching to find and recognize pieces of work in the work area that are similar to a previously registered NCC model (📖 43).



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values
The operation unit returns the number of detected pieces of work and the following values about the first piece of work detected: matching score, X and Y coordinates and angle of the piece of work.

(2) Inspection region (blue outline)

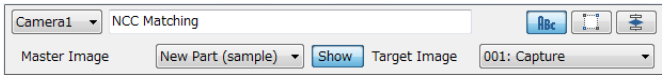
(3) Detected pieces of work (green frames)
Each piece of work detected is given a unique number.

(4) [Do not refresh the display image] check box
Place a checkmark in the box to not process the displayed image every time you change a parameter.

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.

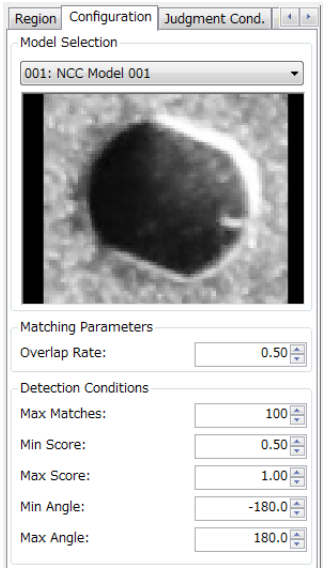


2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 89).

4 Select the [Configuration] tab and set the model parameters.



(1) Under [Model Selection], select an NCC model registered in advance (📖 43).

(2) Click [Overlap Rate] and enter the desired value for the overlap tolerance. A tolerance value closer to 1.00 makes it easier to identify pieces of work even when they overlap or are partly covered by another object.

5 Set the rest of the detection parameters.

(1) Click [Max Matches] and enter the desired value to set the maximum number of pieces of work to detect.

(2) Click [Min Score] and [Max Score] and enter the desired values to set the range of valid matching scores.
Pieces of work with a matching score outside the range will be ignored.

(3) Click [Min Angle] and [Max Angle] and enter the desired values to set the range of tolerated rotation angles.
Pieces of work rotated at an angle outside the range will be ignored.

6 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[Items Detected]
Number of pieces of work detected.

[Score]
Piece of work no. 1's matching score. The more closely the detected piece of work matches the model, the higher the matching score.

[Ref. Point X], [Ref. Point Y]
Coordinates of piece of work no. 1's reference point. By default, the reference point is the center of the detected piece of work but you can offset it in the matching model's settings (step 6, 📖 44).

[Angle]
Difference between piece of work no. 1's angle and the model's baseline.

7 Select the [Enhance Image] tab and set image processing filters (📖 97).

8 Set additional execution conditions, position correction and other options in the [Others] tab (📖 99).

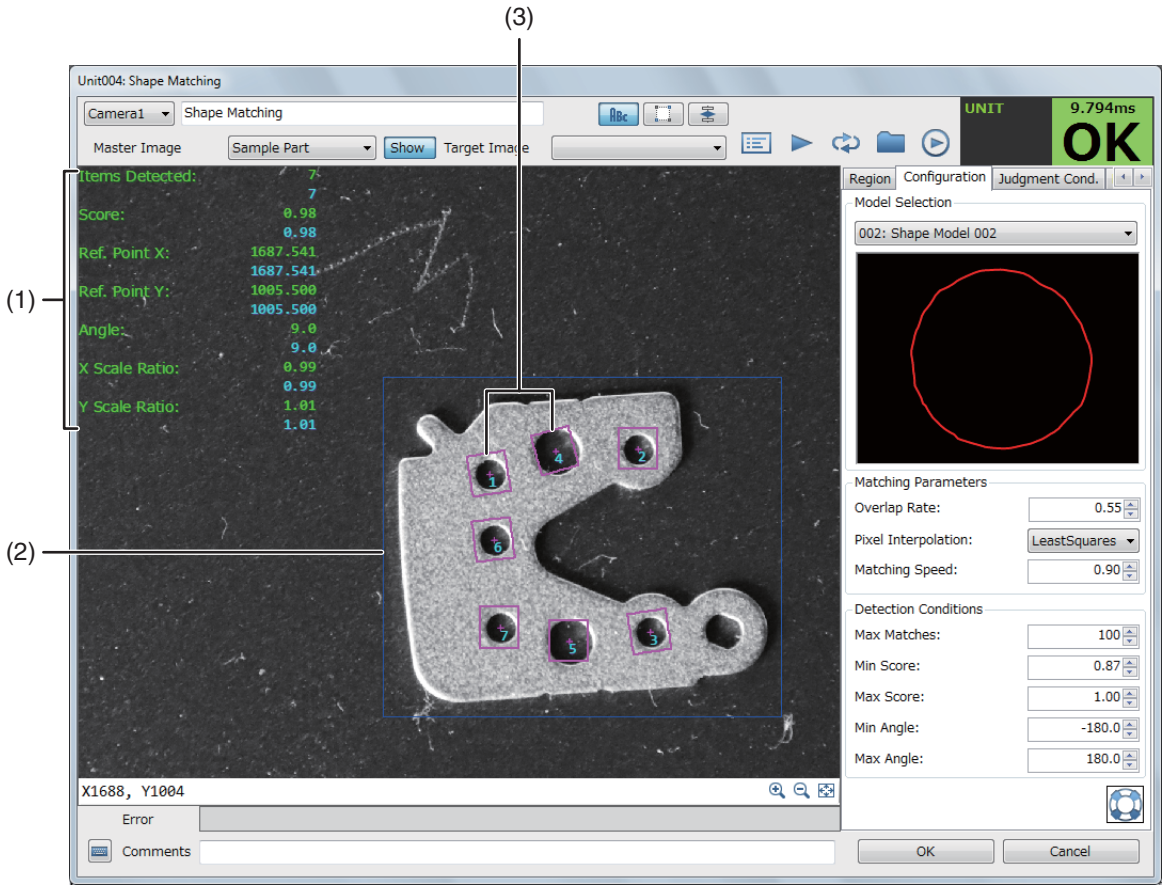
9 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

10 Click [OK].

[Shape Matching] (SHAPE) Operation Units

These operation units use shape-based matching to find and recognize pieces of work in the work area that are similar to a previously registered shape model (📖 45). You can specify scale factors when registering the shape model so pieces of work can be identified even when they are larger/smaller than the model.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result values

The operation unit returns the number of detected pieces of work and the following values about the first piece of work detected: matching score, X and Y coordinates and angle of the piece of work, and its scale ratio along the X and Y axes.

(2) Inspection region (blue outline)

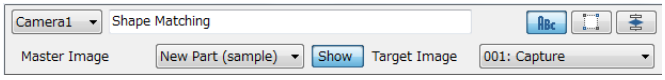
(3) Detected pieces of work

Each piece of work detected is surrounded by a frame and is given a unique number. The color of the frame is determined by the [Color] setting selected when registering the shape model (📖 45).

Configuring the Operation Unit

1 Select a master image.

- Select a registered camera (📖 26) and then click [Master Image] and select a registered master image (📖 32). The master image will appear in the image display area.
- The master image is used to set the inspection region and adjust all the other settings so be sure to use a master image that is as close as possible to the actual image you want to inspect.

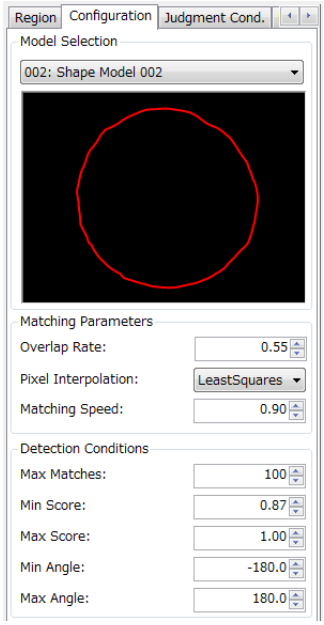


2 Click [Target Image] and set the target image.

- Select one of the [Capture] operation units in the flowchart area that will capture the image to be inspected.

3 Select the [Region] tab and set the region that will be inspected (📖 89).

4 Select the [Configuration] tab and set the model parameters.



(1) Under [Model Selection], select a shape model registered in advance (📖 45).

(2) Click [Overlap Rate] and enter the desired value for the overlap tolerance.
A tolerance value closer to 1.00 makes it easier to identify pieces of work even when they overlap or are partly covered by another object.

(3) Click [Pixel Interpolation] and select the desired algorithm.
You can select [None] (no interpolation), [Interpolation], [LeastSquares], [LeastSquaresHigh] or [LeastSquaresVeryHigh].

(4) Click [Matching Speed] and enter the desired value.
Values closer to 1.00 will make the processing faster but the matching accuracy may decrease.

5 Set the rest of the detection parameters.

(1) Click [Max Matches] and enter the desired value to set the maximum number of pieces of work to detect.

(2) Click [Min Score] and [Max Score] and enter the desired values to set the range of valid matching scores.
Pieces of work with a matching score outside the range will be ignored.

(3) Click [Min Angle] and [Max Angle] and enter the desired values to set the range of tolerated rotation angles.
Pieces of work rotated at an angle outside the range will be ignored.

6 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[Items Detected]
Number of pieces of work detected.

[Score]
Piece of work no. 1's matching score. The more closely the detected piece of work matches the model, the higher the matching score.

[Ref. Point X], [Ref. Point Y]
Coordinates of piece of work no. 1's reference point. By default, the reference point is the center of the detected piece of work but you can offset it in the matching model's settings (step 6, 📖 45).

[Angle]
Difference between piece of work no. 1's angle and the model's baseline.

[X Scale Ratio], [Y Scale Ratio]
Scale factor of piece of work no. 1 relative to the model along the X and Y axes, respectively.

7 Select the [Enhance Image] tab and set image processing filters (📖 97).

8 Set an execution condition, position correction settings and other options in the [Others] tab (📖 99).

9 Apply a trigger to test the operation unit.

- Click ▶ ([Trigger]) to capture an image using the [Capture] operation unit selected in step 2.
- The captured image will appear in the image display area along with the actual result values and the judgment result will appear at the top right corner of the editing window.

10 Click [OK].

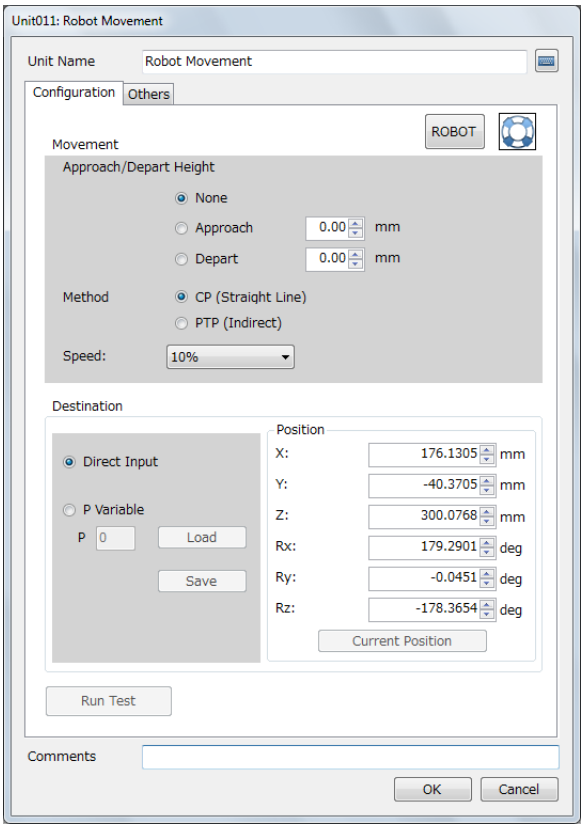
Robot Control Units

Important

- If the image processing controller and the industrial robot are not connected to the same network (📖 70), you will be able to configure any robot control units in the flowchart but you will not be able to test the industrial robot's operation.

[Robot Movement] (R-MOV) Operation Units

These operation units are used to communicate with a connected industrial robot and move it to a specified position. They can also read the current position of the industrial robot and load position information saved in its memory.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and click [ROBOT].

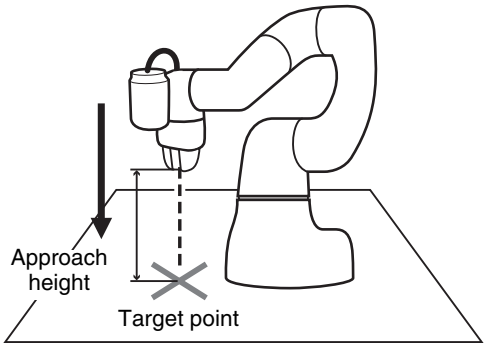
- The [Robot Control] window will open (📖 161). This step is not necessary if you do not need to operate the industrial robot.

2 Set the industrial robot's movement parameters as necessary.

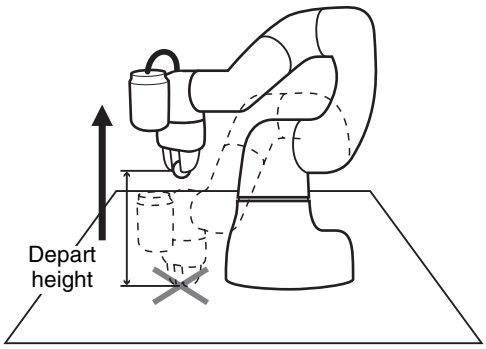
(1) Adjust the approach or departure distance.

[None]
Move the industrial robot without any adjustments.

[Approach]
Click [Approach] and enter the desired value. The industrial robot will move to a point at the entered distance in the direction of the tool coordinate system's –Zt axis (📖 162) relative to the target point and stop.



[Depart]
Click [Depart] and enter the desired value. The industrial robot will move from its current position to a point at the entered distance in the direction of the tool coordinate system's –Zt axis (📖 162) and stop.



(2) Click [Method] and select [CP (Straight Line)] or [PTP (Indirect)].

[CP (Straight Line)]
The industrial robot will move directly to the target point in a straight line.

[PTP (Indirect)]
The industrial robot will move to the target point using the path that requires the shortest time.

(3) Click [Speed] and select the desired speed level.
You can select [1%], [10%], [50%] or [100%].

3 To set the target point, select [Direct Input] or [P Variable].

[Direct Input]
Under [Position], click each field and enter the desired value to set the XYZ coordinates and Rx, Ry, Rz angles of the desired target point, according to the base coordinate system.
You can also click [Current Position] to get current position data from the industrial robot.

[P Variable]
Click [P] and enter the number of one of the industrial robot's P-type variables, where the desired position data was stored in advance. Click [Load] to update the [Position] fields with the position data from the industrial robot's memory. Click [Save] to save the position data currently set in the [Position] fields to the selected P-type variable.

4 After setting the target point, test the industrial robot's movement.

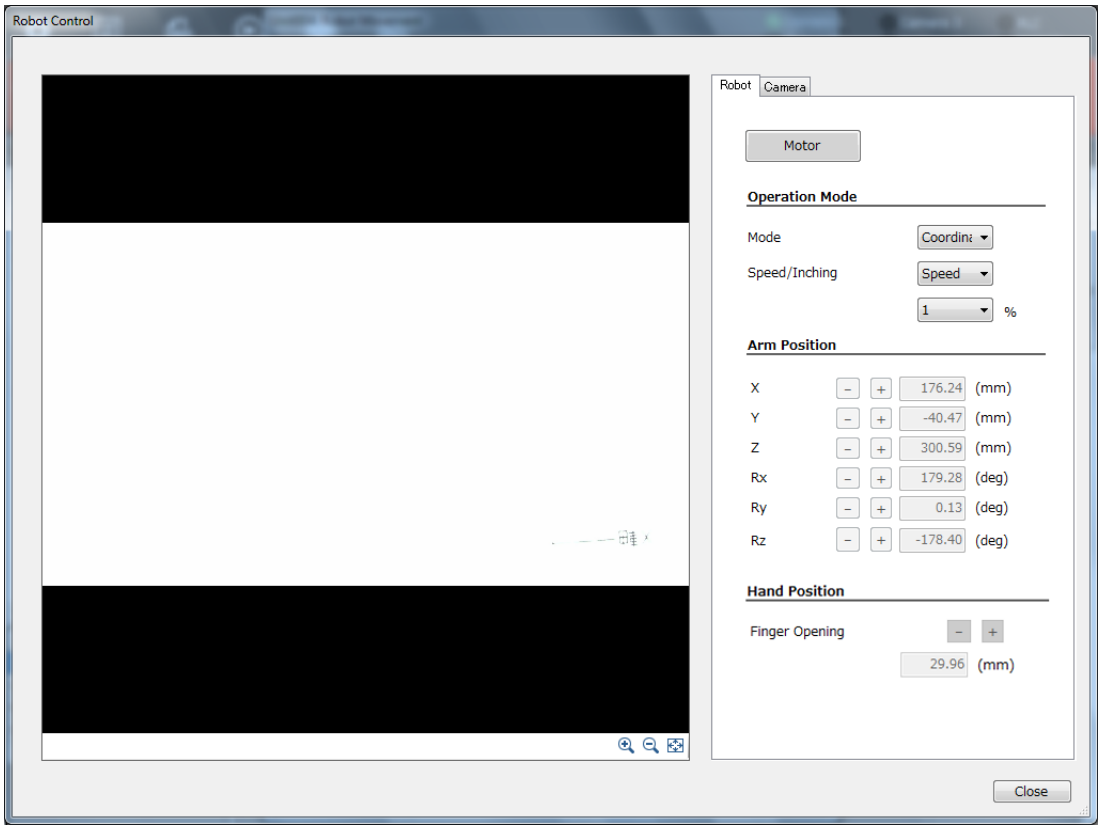
- Click [Run Test] to carry out a test run using the current settings.
- In order to operate the industrial robot, it has to be correctly set up and connected (📖 49, 70).

5 Set an execution condition in the [Others] tab (📖 99).

6 Click [OK].

Using the [Robot Control] Window to Operate the Industrial Robot

You can use the [Robot Control] window to operate some of the industrial robot's functions. For basic definitions and more details about the coordinate systems used by the industrial robot, refer to the industrial robot's instruction manual.



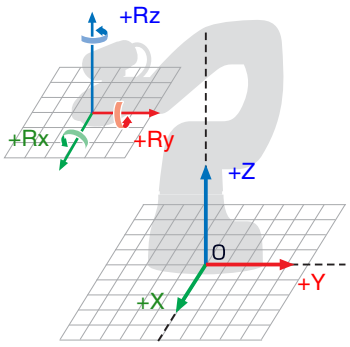
1 Select the [Robot] tab and click [Motor].

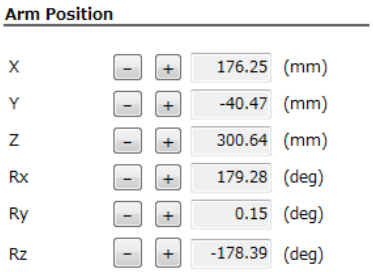
- The industrial robot's motor will turn on and the button will turn light green.
- Click [Motor] again to turn off the industrial robot's motor. (The button will turn gray.)

2 Click [Mode] and select the desired mode.

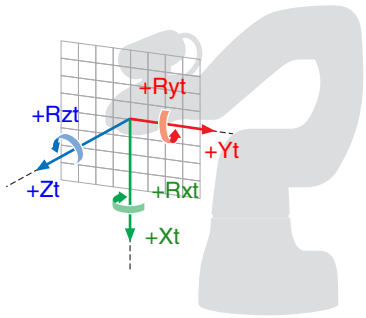
- This setting determines which coordinate system will be used to move the industrial robot.

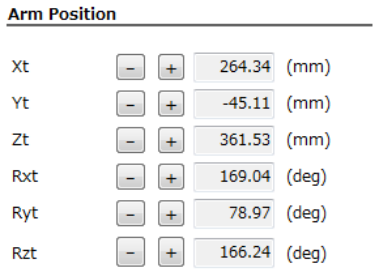
[Coordinates]
You will determine the position of the industrial robot's arm and the angle of its hand relative to the **base coordinate system** (whose origin point is located at the center of the industrial robot's base). Axes and angles on the base coordinate system are indicated in this manual as X, Y, Z, Rx, Ry, Rz.



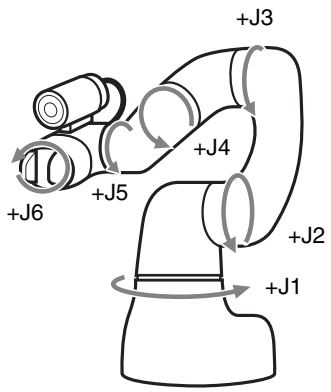


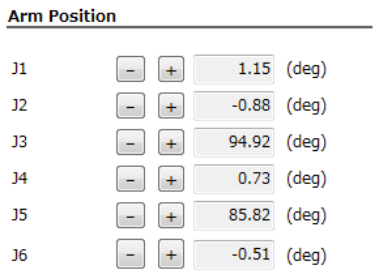
[Tool]
You will determine the position of the industrial robot's arm and the angle of its hand relative to the **tool coordinate system** (whose origin point is located at the center of the industrial robot's tool flange). Axes and angles on the base coordinate system are indicated in this manual as Xt, Yt, Zt, Rxt, Ryt, Rzt.





[Each Axis]
You will determine the position of the industrial robot's arm and the angle of its hand by adjusting the angle of each of its axes (J1 to J6).





3 Click [Speed/Inching] and select how much the industrial robot will move in a single inching operation.

- You can select [Speed] or [Inching].

[Speed]
Click the pulldown menu and select the industrial robot's inching speed. You can select [1], [5], [10], [50] or [100] %.

[Inching]
Click the pulldown menu and select the industrial robot's inching distance. You can select [1], [5], [10], [50] or [100] mm/degrees.

4 Move the industrial robot's arm to the desired position.

- The operation will differ depending on the operation mode selected in step 2.

[Coordinates]
Click [–] or [+] under each of the X, Y, Z coordinates and Rx, Ry, Rz angles.

[Tool]
Click [–] or [+] under each of the Xt, Yt, Zt coordinates and Rxt, Ryt, Rzt angles.
Be aware that while the buttons operate according to the tool coordinate system, the values displayed next to the buttons show the robot's position according to the base coordinate system.

[Each Axis]
Click [–] or [+] under each of the axes J1 to J6.

5 Set the desired opening for the robot hand's fingers.

- Click [–] or [+] under [Finger Opening] to adjust the opening.

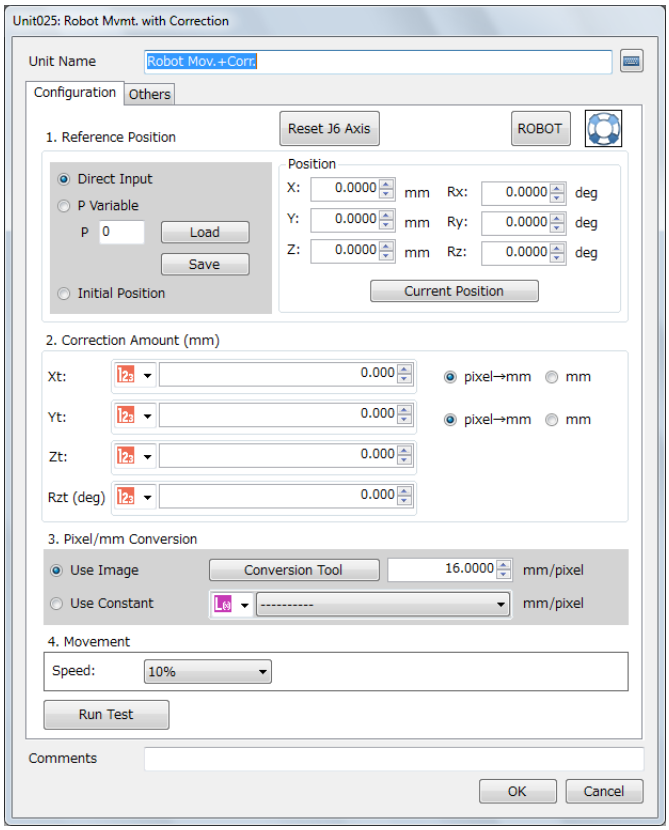
6 Select the [Camera] tab and set up camera 1.

- For details, refer to **Changing Camera Settings** (📖 28).
- The Canon industrial camera attached to the industrial robot must be registered as [Camera 1] (📖 26).

7 Click [Close].

[Robot Mvmt. with Correction] (R-COR) Operation Units

These operation units are also used to move a connected industrial robot to a specified position but you can set additional position correction amounts based, for example, on measurements and result values obtained from other operation units. (See also [Camera Coordinate Conversion] operation units, 📖 172)



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and click [ROBOT] (📖 161).

- This step is not necessary if you do not need to operate the industrial robot.

2 Set the industrial robot's reference position (its original target position).

- You can select [Direct Input], [P Variable] or [Initial Position].

[Direct Input]
Under [Position], click each field and enter the desired value to set the XYZ coordinates and Rx, Ry, Rz angles of the desired target point, according to the base coordinate system.
You can also click [Current Position] to get current position data from the industrial robot.

[P Variable]
Click [P] and enter the number of one of the industrial robot's P-type variables, where the desired position data was stored in advance. Click [Load] to update the [Position] fields with the position data from the industrial robot's memory. Click [Save] to save the position data currently set in the [Position] fields to the selected P-type variable.

[Initial Position]
The industrial robot's position when the operation unit's processing starts will be used as the reference position.

3 Set the position correction parameters.

- Under [2. Correction Amount (mm)], click [Xt], [Yt], [Zt] and [Rzt (deg)] and enter the desired values according to the tool coordinate system to set the position correction (📖 166).
  [Xt], [Yt], [Zt]: Select [Real Number], [Unit] (result value returned from an operation unit) or [Constant].
  [Rzt (deg)]: Select [Real Number], [Angle (deg)], [Unit] or [Constant].
- For [Xt] and [Yt], select also [pixel → mm] (conversion from pixels to mm) or [mm].

[Real Number] / [Angle (deg)]
Enter the desired value or angle.

[Unit]
Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

[Constant]
Select one of the registered constants (📖 35).

4 If necessary, specify the conversion ratio from pixels to mm under [3. Pixel/mm Conversion].

- This step is only necessary if you selected [pixel → mm] as the units in step 3. Otherwise, skip to step 6.
- You can select [Use Image] or [Use Constant].
- If you selected [Use Constant], or [Use Image] but entered the conversion ratio manually, skip to step 6.

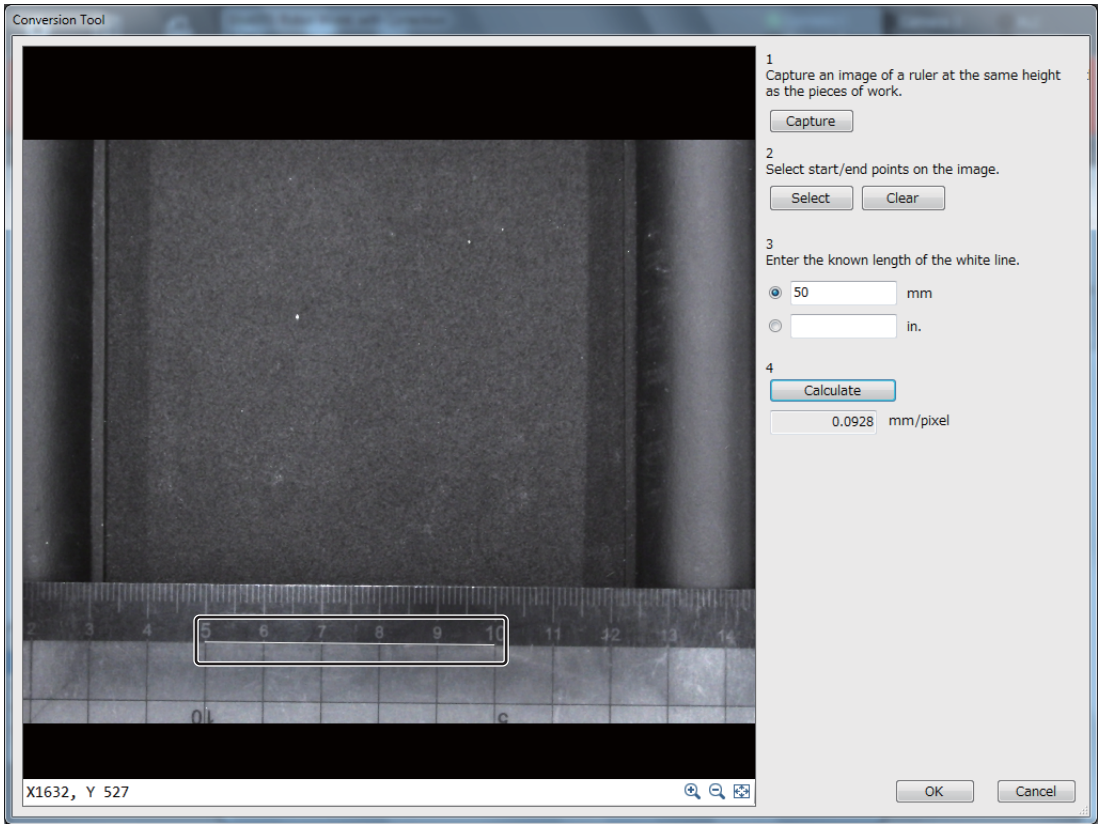
[Use Image]
Capture an image and use it to calculate the conversion ratio (step 5).
You can also click on the field and enter the desired value without using an image.

[Use Constant]
Select one of the registered constants (📖 35).

5 Use the conversion tool to calculate the conversion ratio from an image.

- This step is only necessary if you selected [Use Image] in the previous step.

(1) Click [Conversion Tool].
The conversion tool will open in a separate window.



(2) Capture an image of a ruler or other object with known measurement graduations.
Place the ruler or graduated object at the same height of the pieces of work and click [Capture]. Note that if the ruler is not at the correct height, the calculated conversion ratio may be incorrect.

(3) Draw a line on the displayed image connecting two points at a known distance.
Click [Select] and click on two points. When a white arrow appears, drag either end of the arrow to show a white line. Drag the ends of the line to place it over a straight line on the image whose length is known and then right-click to confirm.
To start over, confirm any line and then click [Clear].

(4) Enter the length of the white line shown on the image.
Select [mm] or [in.] and enter the known distance in the selected units.

(5) Click [Calculate] to calculate the pixel → mm conversion ratio for the selected image.

(6) Click [OK] to close the conversion tool and apply the conversion ratio calculated from the image.

6 Click [Speed] and select the desired speed level.

- You can select [1%], [10%], [50%] or [100%].

7 After setting the target point, test the industrial robot's movement.

- Click [Run Test] to carry out a test run using the current settings.
- In order to operate the industrial robot, it has to be correctly set up and connected (📖 49, 70).

8 Set an execution condition in the [Others] tab (📖 99).

9 Click [OK].

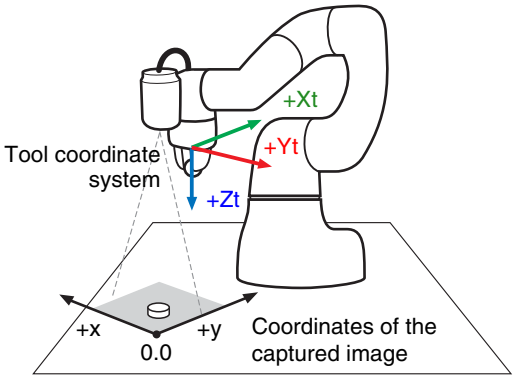
Setting the Amount of Movement Correction

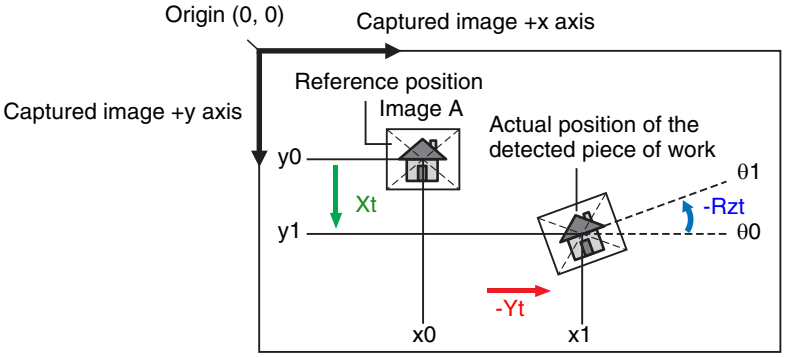
You can use the result values obtained after processing an image captured by the Canon industrial camera to determine the amount of correction needed when moving the industrial robot to a certain position.

To use the image processing results of a captured image

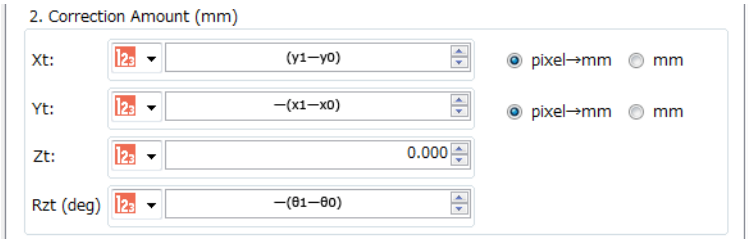
When a piece of work is not at the predetermined reference position set in step 2 (📖 163), you can capture an image and use image processing units to determine its actual location. You can then use the image processing results to set the position correction parameters in step 3.

Be aware that if the industrial robot's tool coordinates are not aligned with the coordinates of the Canon industrial camera, the position cannot be correctly adjusted. Before setting the reference position, be sure to click [Reset J6 Axis] so the J6 axis is not rotated at an angle. This ensures that the coordinates of the industrial robot and Canon industrial camera are correctly aligned.



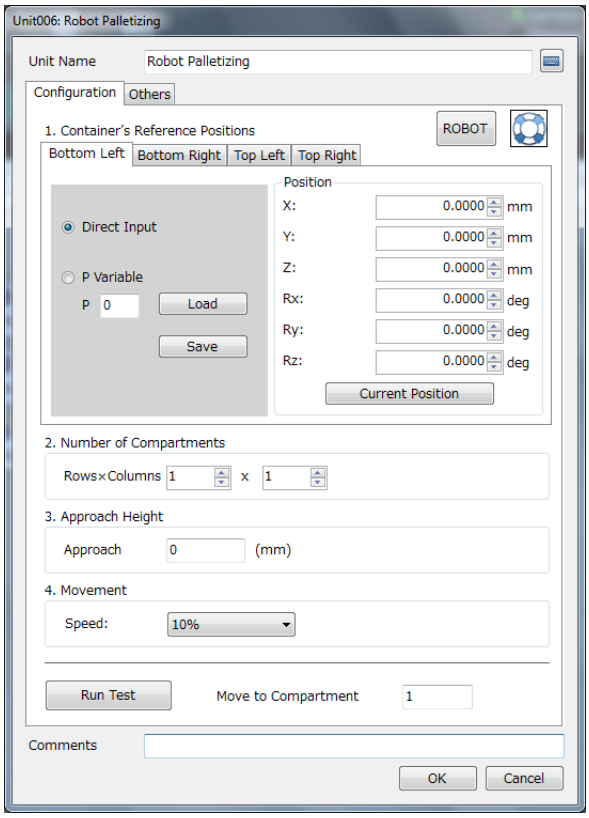


Example of the correction settings required to correct the target position from the reference position to the actual position of the detected piece of work, as shown in the previous diagram.



[Robot Palletizing] (R-PLT) Operation Units

These operation units are used to specify the four corners of a container and the number of subdivisions and then have the industrial robot move in sequence between the compartments, from bottom left to top right.



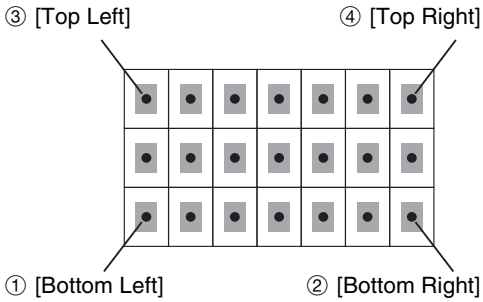
For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and click [ROBOT] (📖 161).

- This step is not necessary if you do not need to operate the industrial robot.

2 Under [1. Container's Reference Positions], set the reference positions of the four corners of the container.



- Click the [Bottom Left], [Bottom Right], [Top Left] and [Top Right] tabs and for each, enter the desired position. To set the position, select [Direct Input] or [P Variable].

  [Direct Input]
  Under [Position], click each field and enter the desired value to set the XYZ coordinates and Rx, Ry, Rz angles of the desired target point, according to the base coordinate system.
  You can also click [Current Position] to get current position data from the industrial robot.

  [P Variable]
  Click [P] and enter the number of one of the industrial robot's P-type variables, where the desired position data was stored in advance. Click [Load] to update the [Position] fields with the position data from the industrial robot's memory. Click [Save] to save the position data currently set in the [Position] fields to the selected P-type variable.

3 Specify the number of subdivisions in the container.

- Under [2. Number of Compartments], click [Rows] and [Columns] and enter the number of vertical and horizontal subdivisions, respectively.

4 Click [Approach] and enter the desired value in mm to set the approach height.

- The industrial robot will move to a point at the indicated distance along the tool coordinate system's –Zt axis (📖 162) from the coordinates calculated from [1. Container's Reference Positions] and [2. Number of Compartments], and stop there.

5 Click [Speed] and set the desired industrial robot speed level.

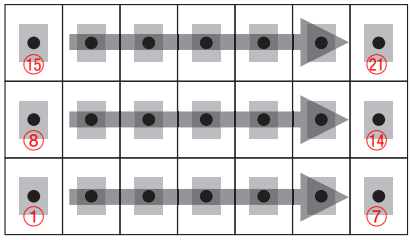
- You can select [1%], [10%], [50%] or [100%].

6 After completing the settings, test the industrial robot's movement.

- In order to operate the industrial robot, it has to be correctly set up and connected (📖 49, 70).

(1) Click [Move to Compartment] and enter the desired compartment number.
The number of compartments is determined by the values set for [Rows] and [Columns].

(2) Click [Run Test] to carry out a test run using the current settings.

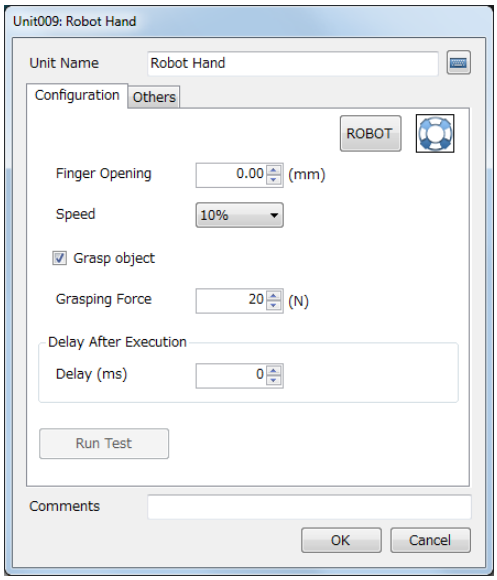


7 Set an execution condition in the [Others] tab (📖 99).

8 Click [OK].

[Robot Hand] (R-HND) Operation Units

These operation units are used to change the opening and movement speed of the industrial robot's hand unit.



Configuring the Operation Unit

1 Select the [Configuration] tab and click [ROBOT] (📖 161).

- This step is not necessary if you do not need to operate the industrial robot.

2 Set the robot hand's finger opening and movement parameters as necessary.

(1) Click [Finger Opening] and enter the desired value.

(2) Click [Speed] and set the hand's speed level.
You can select [1%], [10%], [50%] or [100%]

3 Set the robot hand's gripping force.

- To have the robot hand grasp an object, place a checkmark in the [Grasp object] box and enter the desired gripping force. After moving the fingers to the opening entered under [Finger Opening], the fingers will close until the applied load reaches the value entered under [Grasping Force].

4 To apply a delay after moving the robot's hand, click [Delay (ms)] and enter the desired value in milliseconds.

5 After completing the settings, test the robot's hand movement.

- Click [Run Test] to carry out a test run using the current settings.
- In order to operate the industrial robot, it has to be correctly set up and connected (📖 49, 70).

6 Set an execution condition in the [Others] tab (📖 99).

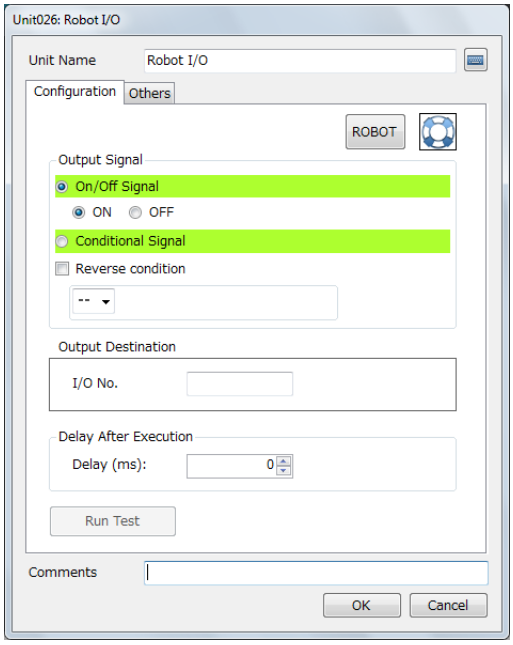
7 Click [OK].

Note

- Vision Edition can only operate the original electric gripper of the DENSO WAVE's COBOTTA robot.

[Robot I/O] (R-I/O) Operation Units

These operation units are used to send signals to the industrial robot's I/O variables.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and click [ROBOT] (📖 161).

- This step is not necessary if you do not need to operate the industrial robot.

2 Set the signal output.

- You can select [On/Off Signal] or [Conditional Signal].

[On/Off Signal]
To simply send out an unconditional "On" or "Off" signal, select [ON] or [OFF].

[Conditional Signal]
Sends a signal based on the judgment result of another operation unit. Select [Unit], select one of the operation units in the flowchart area, and then select [Judgment Result].
To reverse the condition (send an “ON” signal when the selected operation unit returns an NG judgment), place a checkmark in the [Reverse condition] box.

3 Set other output parameters.

(1) Click [I/O No.] and enter the number of the desired variable.

(2) To apply a delay after sending the signal, click [Delay (ms)] and enter the desired value in milliseconds.

4 After completing the settings, test the output signal.

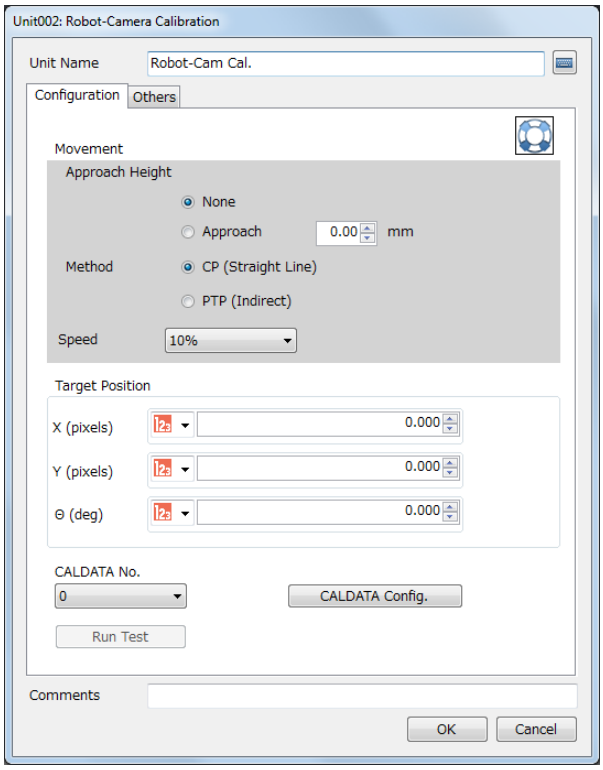
- Click [Run Test] to carry out a test run using the current settings.
- In order to operate the industrial robot, it has to be correctly set up and connected (📖 49, 70).

5 Set an execution condition in the [Others] tab (📖 99).

6 Click [OK].

[Robot-Camera Calibration] (RCCAL) Operation Units

These operation units are used to detect the pieces of work in an image captured by the mounted industrial camera and control the industrial robot so it can pick the pieces of work.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

The industrial robot must be configured in advance (📖 49). The industrial camera mounted on the robot must be registered as [Camera 1] (📖 27).

1 Set the industrial robot's movement parameters as necessary.

(1) Set the approach/depart values and movement method as explained for [Robot Movement] operation units (step 2, 📖 159).

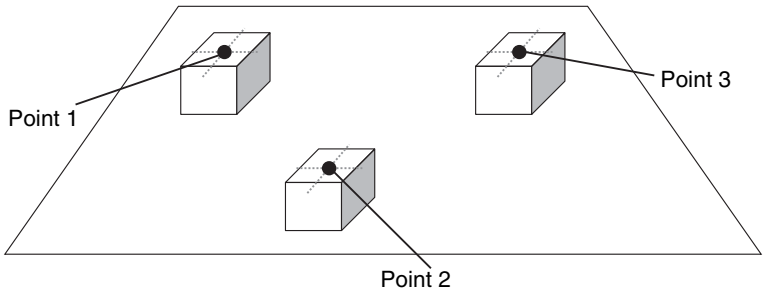
(2) Enter the coordinates and angle of the target point. For the angle, enter the rotation value of the J6 axis.

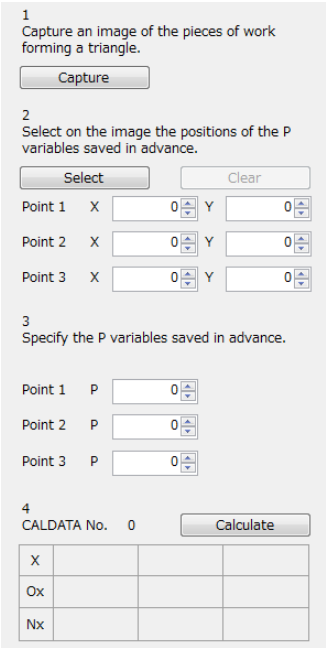
2 Click [CALDATA No.] and select the desired number.

- Indicate the number of the robot calibration data set (CALDATA) to use.
- Vision Edition will calibrate the positions of the industrial camera and industrial robot.
  To register new calibration data, continue to step 3. To use the stored calibration data, skip to step 4.

3 Click [CALDATA Config.].

- A dialog box explaining the necessary preparations will appear. Once you have completed the preparations, click [OK] to open the [CALDATA Configuration] dialog box.





(1) Click [Capture] to capture the pieces of work with Camera 1.

(2) Enter the coordinates of the 3 reference points.
Click [Select] and click on each of the reference points. The coordinates will be recorded.
Click [Clear] to delete the entered values and select the point again.

(3) Enter the numbers of the industrial robot's P-type variables, where the 3 reference positions of the industrial robot were saved in advance.

(4) Click [Calculate] to calculate the calibration values.
The calculated values will be sent to the industrial robot, overwriting the data in the CALDATA number selected in step 2. The values will also be displayed in the table on the screen.

(5) Click [Close].

4 After completing the settings, test the industrial robot.

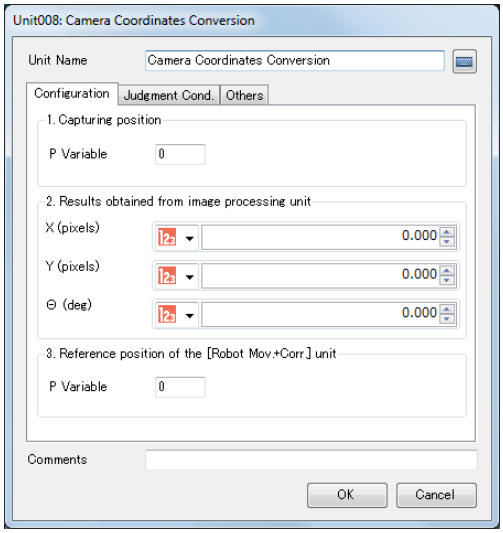
- Click [Run Test] to carry out a test run using the current settings.

5 Set an execution condition in the [Others] tab (📖 99).

6 Click [OK].

[Camera Coordinates Conversion] (CAMCC) Operation Units

When using an image captured by the Canon industrial camera to control the industrial robot on which it is mounted, these operation units are used to calculate the difference between the coordinates of the captured image and the robot's tool coordinate system.
You can then use the calculated values to adjust the position of a [Robot Mvmt. with Correction] operation unit (📖 163) to correctly control the robot.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

Adjust the position of the industrial robot's hand (the mounted industrial camera's lens plane) so it is parallel to the plane where the pieces of work are placed.

1 Indicate the image capturing position.

- Enter the number of one of the industrial robot's P-type variables, where the capturing position of the industrial camera was saved in advance.

2 Enter the coordinates obtained from an image processing unit or model matching unit.

- Indicate the measurement result values from the operation unit that captured the image.

3 Enter the industrial robot's reference position as set in a [Robot Mvmt. with Correction] operation unit.

- Enter the number of one of the industrial robot's P-type variables, where the initial position of the industrial robot was saved in advance.

4 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

  [Xo], [Yo], [RZo]
  Result values of the selected operation unit corrected to the tool coordinate system.

5 Set an execution condition in the [Others] tab (📖 99).

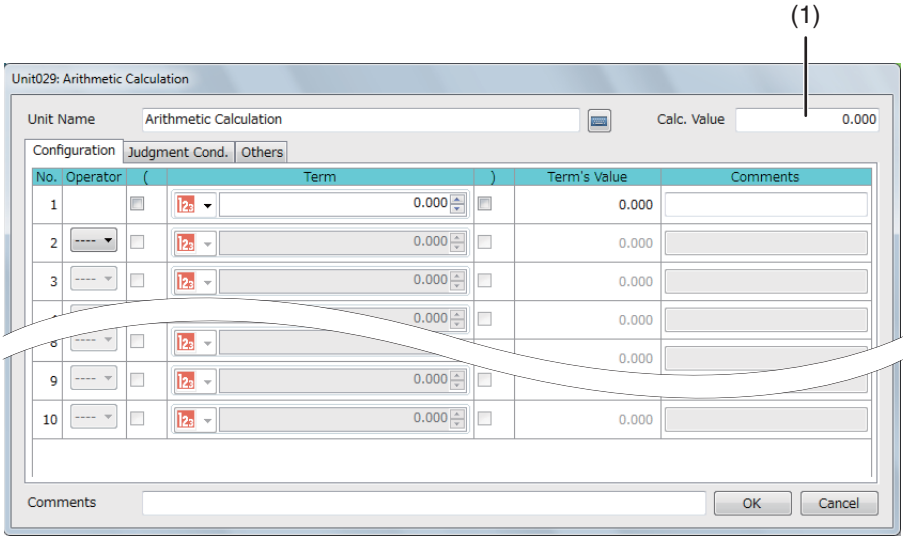
6 Click [OK].

Note

- This operation unit's Xo and Yo values (the correction settings) are in pixels. If necessary, use the conversion tool to convert the units from pixels to mm (steps 4 and 5, 📖 163).

[Arithmetic Calculation] (ARITH) Operation Units

These operation units are used to perform basic arithmetic calculations with up to 10 terms.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result

Configuring the Operation Unit

1 Select the [Configuration] tab and set the first term (No. 1) of the mathematical expression you want to calculate.

- For the term, you can select [Real Number], [Angle (deg)], [Formula], [Unit] (result value returned from an operation unit) or [Constant].
- To start or end a parenthetical expression, place a checkmark in the [( ] or [ )] box, respectively.
- After you set the term, its value will appear in the [Term's Value] column. Enter any specific comments about the term in the [Comments] column.

[Real Number] / [Angle (deg)]
Enter the desired value or angle.

[Formula]
Select a trigonometric operator [sin] (sine), [cos] (cosine) or [tan] (tangent) and enter the desired argument.

[Unit]
Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

[Constant]
Select one of the registered constants (📖 35).

2 Set terms No. 2 to No. 10 as necessary.

- Click [Operator] and select the desired operator (+, –, ×, ÷, or MOD) and then set the term as described in the previous step.
- [MOD] represents the modulo operation. It returns the remainder after the division of two numbers. (For example, 10 MOD 3 = 1, the remainder after dividing 10 by 3.)

3 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

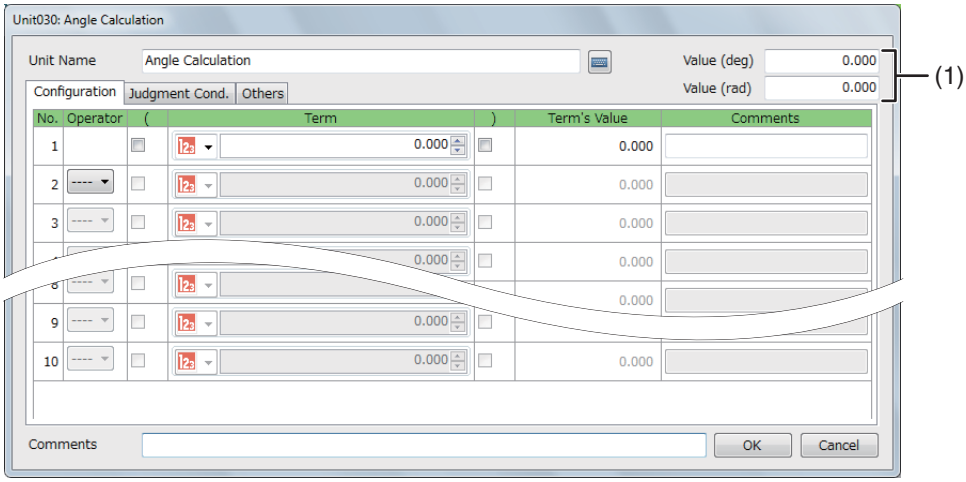
- You can set a condition based on the calculation's result ([Calc. Value]).

4 Set an execution condition and other options in the [Others] tab (📖 99).

5 Click [OK].

[Angle Calculation] (ANGCL) Operation Units

These operation units are used to perform calculations with up to 10 terms and return an angle value.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Result

Configuring the Operation Unit

1 Select the [Configuration] tab and set the first term (No. 1) of the mathematical expression you want to calculate.

- For the term, you can select [Real Number], [Formula], [Unit] (result value returned from an operation unit) or [Constant].
- To start or end a parenthetical expression, place a checkmark in the [( ] or [ )] box, respectively.
- After you set the term, its value will appear in the [Term's Value] column. Enter any specific comments about the term in the [Comments] column.

[Real Number]
Enter the desired value.

[Formula]
Select a trigonometric operator [sin] (sine), [cos] (cosine) or [tan] (tangent) and enter the desired argument.

[Unit]
Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

[Constant]
Select one of the registered constants (📖 35).

2 Set terms No. 2 to No. 10 as necessary.

- Click [Operator] and select the desired operator (+, −, ×, ÷, or MOD) and then set the term as described in the previous step.

- [MOD] represents the modulo operation. It returns the remainder after the division of two numbers. (For example, 10 MOD 3 = 1, the remainder after dividing 10 by 3.)

3 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

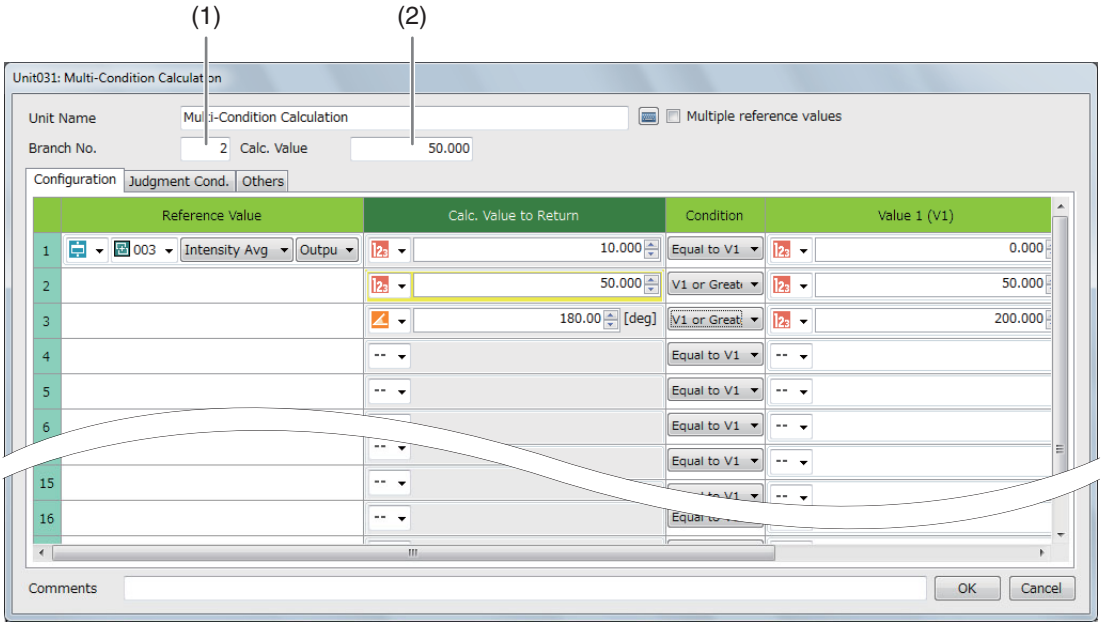
- You can set a condition based on the calculation's result ([Calc. Value]).
- At the top right of the operation unit setting window you can check the results in degrees and in radians. However, the [Calc. Value] for which you can set judgment conditions refers only to the calculated angle in degrees.

4 Set an execution condition and other options in the [Others] tab (📖 99).

5 Click [OK].

[Multi-Condition Calculation] (MCCLC) Operation Units

These operation units are used to return one of multiple values depending on multiple conditions. You can set up to 20 branches and values to return.
Conditions are evaluated in sequence from the top and the operation unit will return the calculated value set for the first branch option whose condition is met.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

(1) Selected branch number

(2) Returned value

Configuring the Operation Unit

To use the same reference value for all conditions

1 Select the [Configuration] tab and, under [Reference Value], select the reference value you want to use.

- You can select [Unit] (result value returned from an operation unit) or [Constant].

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use for the comparison. Available options will vary depending on the operation unit selected.

[Constant]
Select one of the registered constants (📖 35).

2 Click [Condition] and select the condition from the pulldown menu.

- The condition determines the comparison between the reference value and the comparison value(s). You can select [Equal to V1], [Not Equal to V1], [Greater than V1], [Less than V1], [V1 or Greater], [V1 or Less], [Between V1–V2] or [Not Between V1–V2].

3 Set the first comparison value.

- Under [Value 1 (V1)] you can select [Real Number], [Angle (deg)], [Formula], [Unit] or [Constant].

[Real Number] / [Angle (deg)]
Enter the desired value or angle.

[Formula]
Select a trigonometric operator [sin] (sine), [cos] (cosine) or [tan] (tangent) and enter the desired argument.

[Unit]
Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

[Constant]
Select one of the registered constants (📖 35).

4 Depending on the condition selected, set a second comparison value.

- If [Between V1-V2] or [Not Between V1-V2], set a second comparison value under [Value 2 (V2)] as described in step 3.

5 Set the value that will be returned if the condition is met.

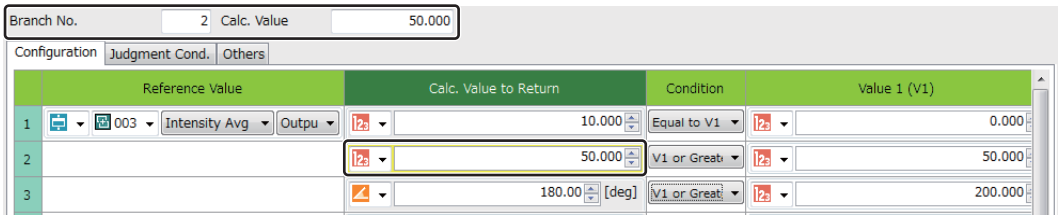
- Under [Calc. Value to Return] set the desired value as described in step 3.

6 Specify additional comparisons.

- Repeat steps 2 to 5 to set the conditions and result values to return for branches from number 2 onwards.

7 Check the number of the selected branch and the returned result.

- After setting multiple conditions, the [Calc. Value to Return] field of the first condition met will be highlighted in yellow. The number of the selected branch and the returned value will also appear in the [Branch No.] and [Calc. Value] fields.
- If no condition is met, 0 will be displayed in the [Branch No.] field and the field will turn red.



8 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[Calc. Value]
The value to return set for the branch whose condition was met.

[Branch No.]
The branch number of the condition that was met.

9 Set an execution condition and other options in the [Others] tab (📖 99).

10 Click [OK].

To use multiple reference values in conditions

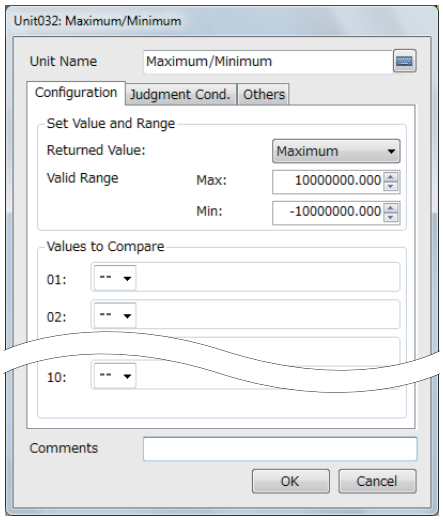
To be able to use different reference values depending on the branching condition, place a checkmark in the [Multiple reference values] box. The procedure for setting up the conditions is essentially the same as when using a single reference value (📖 175) but you will need to specify the reference value (step 1) for each branching condition.

Note

- Make sure the [Multi-Condition Calculation] operation unit is part of a flowchart correctly connected from start to end.

[Maximum/Minimum] (MX-MN) Operation Units

These operation units are used to return the largest/smallest value from up to 10 values that are within a specified range.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and set the conditions for the value to return.

(1) Click [Returned Value] and select [Maximum] or [Minimum] to return, respectively, the largest or smallest value from the compared values.

(2) Under [Valid Range], click [Max] and [Min] and enter the desired values.
Compared values outside the range will be excluded from the comparison.

2 Enter up to 10 values to be compared.

- Under each value you can select [Real Number], [Unit] (result value returned from an operation unit) or [Constant].

  [Real Number]
  Enter the desired value.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use.
  Available options will vary depending on the operation unit selected.

[Constant]
Select one of the registered constants (📖 35).

3 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

[Value No.]
The number of the compared value that matched all the conditions.

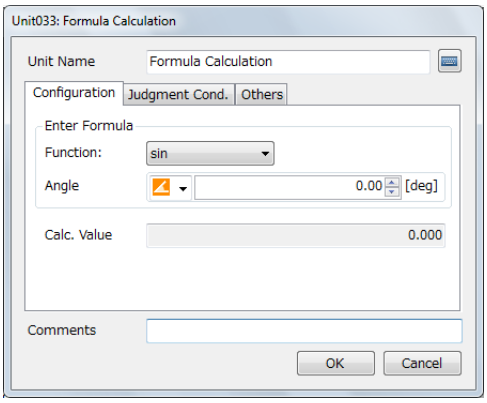
[Output Value]
The value among those compared that matched all the conditions.

4 Set an execution condition and other options in the [Others] tab (📖 99).

5 Click [OK].

[Formula Calculation] (FORMC) Operation Units

These operation units are used to calculate common mathematical expressions including trigonometrical functions, square roots, logarithms and rounding functions.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and set the mathematical function you want to calculate.

(1) Click [Function] and select [sin], [cos], [tan], [arcsin], [arccos], [arctan], [Abs Value] (absolute value), [ln (base e)] (natural logarithm), [log (base 10)] (logarithm), [Square Root], [Round] (rounding off to the nearest integer), [Round Down] (round down toward zero) or [Round up] (round up away from zero).

(2) Click [Angle] or [Value] and set the argument of the function.
For [sin], [cos] and [tan], you can select [Angle (deg)], [Unit] (result value returned from an operation unit) or [Constant]. For all other functions, you can select [Real Number], [Unit] or [Constant].

[Real Number] / [Angle (deg)]
Enter the desired value or angle.

[Unit]
Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

[Constant]
Select one of the registered constants (📖 35).

2 Check the calculated result in the [Calc. Value] field.

3 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

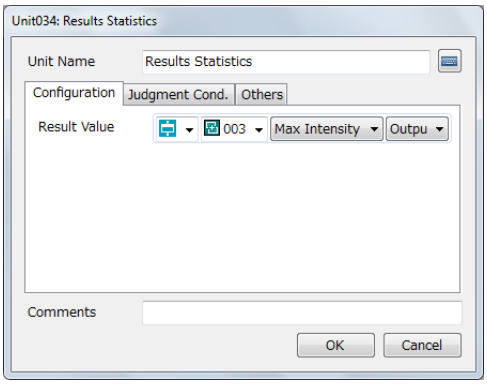
- You can set a condition based on the calculation's result ([Calc. Value]).

4 Set an execution condition and other options in the [Others] tab (📖 99).

5 Click [OK].

[Result Statistics] (RSTAT) Operation Units

These operation units are used to analyze the result values of the selected operation unit and return common statistical aggregates.



For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and select the unit whose results you want to analyze.

- Select [Unit] and select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

2 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values, calculated based on the accumulated result data of the selected operation unit.

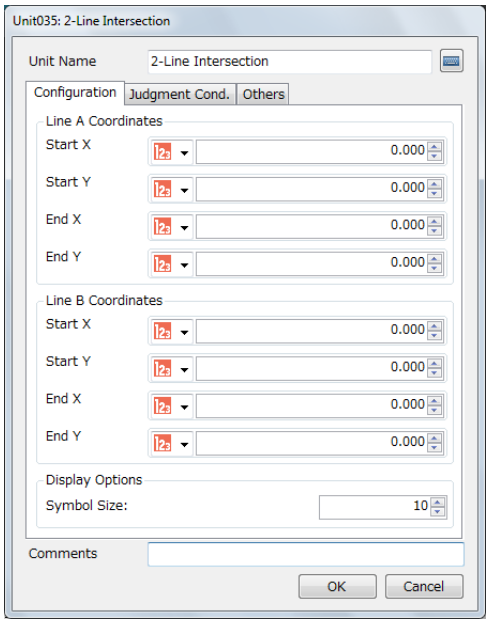
  [Maximum], [Minimum], [Average], [Total Sum]
  Maximum, minimum, average and total sum of the selected result value data.

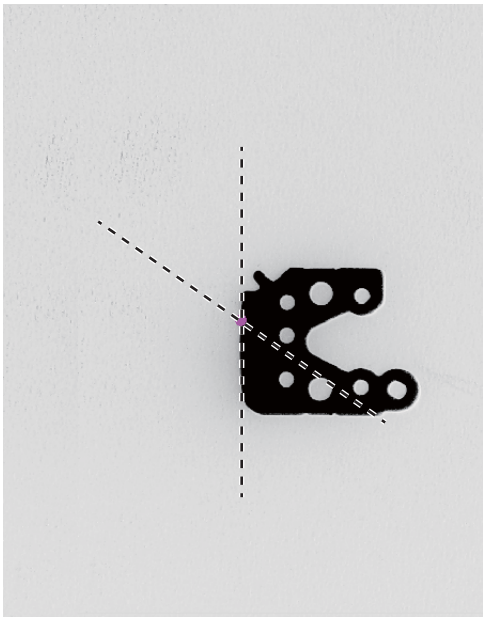
3 Set an execution condition in the [Others] tab (📖 99).

4 Click [OK].

[2-Line Intersection] (2-INT) Operation Units

These operation units are used to calculate the intersect between two straight lines given the coordinates of two points on each straight line.





For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and set the coordinates of the two straight lines.

- Enter the X and Y coordinates of the start and end points on each of the two straight lines. For each of the coordinates, you can select [Real Number], [Unit] (result value returned from an operation unit) or [Constant].

  [Real Number]
  Enter the desired value.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

2 Set the display options.

- Click [Symbol Size] and enter the desired value to set the size of the symbol used to indicate the intersection point.

3 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

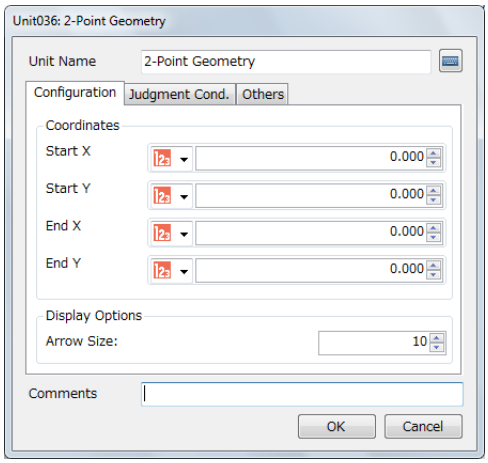
  [Intersect X], [Intersect Y]
  Coordinates of the intersect point.

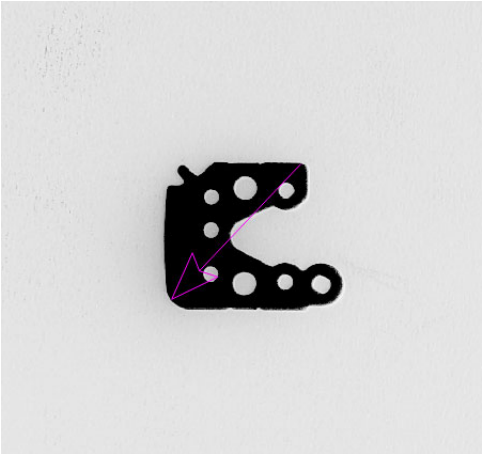
4 Set an execution condition and other options in the [Others] tab (📖 99).

5 Click [OK].

[2-Point Geometry] (2PGEO) Operation Units

These operation units are used to calculate the distance and midpoint between two given points and the angle between them.





For the descriptions of screen elements common to all operation units, refer to **Common Operation Unit Settings** (📖 88).

Configuring the Operation Unit

1 Select the [Configuration] tab and set the coordinates of the two points.

- Enter the X and Y coordinates of the start point and end point. For each of the coordinates, you can select [Real Number], [Unit] (result value returned from an operation unit) or [Constant].

  [Real Number]
  Enter the desired value.

  [Unit]
  Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

  [Constant]
  Select one of the registered constants (📖 35).

2 Set the display options.

- Click [Arrow Size] and enter the desired value to set the size of the arrow connecting the two points.

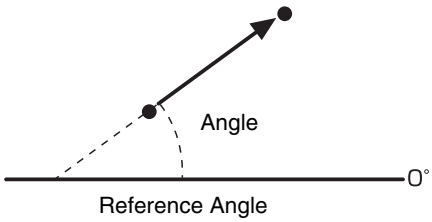
3 Select the [Judgment Cond.] tab and set the operation unit's judgment conditions.

- You can set one or more conditions based on the following result values.

  [Angle]
  Angle between the positive X axis (0°) and the arrow connecting the start point to the end point.

  [Distance]
  Distance between the start point and end point.

  [Center X], [Center Y]
  Coordinates of the midpoint between the start point and end point.



4 Set an execution condition and other options in the [Others] tab (📖 99).

5 Click [OK].

Chapter 4

System Settings and Saving

This chapter explains how to save logs of the result value data and images produced in the course of processing a job and how to change various Vision Edition system settings.

Saving Log Records

Vision Edition can log records of the data and images produced while processing jobs.

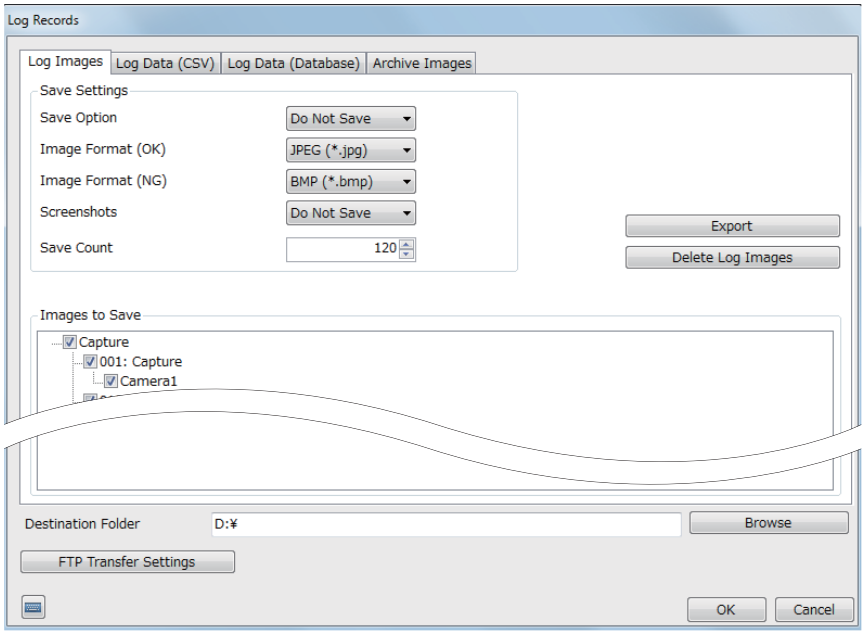
Log Images
Images captured during the processing of the job while the system is online. Images are saved automatically according to the selected settings (📖 184). You can then transfer the saved images to an FTP server (📖 193).

Log Data (CSV, database)
Result values returned by the various operation units during the processing of the job while the system is online. The data are saved automatically in a single log file according to the selected settings (📖 186). You can then transfer the saved data to an FTP server (📖 193) and/or output them to a database (📖 188).

Archive Images
Archive images are the images captured by each of the [Capture] operation units in the flowchart. You can select the archive image settings (📖 191) and save them when necessary.

Screenshots
You can save a screenshot (in JPEG format) of the entire main screen according to the selected settings (📖 184). You can then transfer the saved screenshots to an FTP server (📖 193).

Click ([Log Records]) in the main toolbar to open the [Log Records] window.



Saving and Exporting Log Images

You can save log images and export them to the image processing controller or a USB-compatible memory device. Log images are exported as a compressed (*.zip) file.

Selecting the Log Images and Screenshots to Save

1 Select the [Log Images] tab and set the condition for saving log images.

[Do Not Save]
Log images are not saved.

[Save All]
Log images are saved every time the flowchart is processed.

[Save Only OK]
Log images are saved only when processing the flowchart returns an OK result.

[Save Only NG]
Log images are saved only when processing the flowchart returns an NG result.

2 Select the format for the images saved.

- You can set the image format independently for OK results and NG results.
- Click [Image Format (OK)] and [Image Format (NG)] and for each, select [JPEG (*.jpg)], [PNG (*.png)] or [BMP (*.bmp)].

3 Select whether to save a screenshot of the main screen.

- Click [Screenshots] and select [Save] or [Do Not Save]. Screenshots are saved in JPEG format.

4 Click [Save Count] and enter the desired number of days.

- When there is not enough free hard drive space on the image processing controller, fewer than the number of days set may be saved.
- When new log images are saved after the number of days set, older log images will be deleted.

5 Select the captured images that will be saved as log images.

- All the [Capture] operation units in the current job, and the cameras used in each of them, will appear in the [Images to Save] area. Place checkmarks in the desired boxes to select all the cameras whose images you want to keep as log images.

6 Select where to save the data.

- Click [Browse], select the desired folder and click [OK]. The folder's path will be displayed under [Destination Folder].

7 Click [OK].

Exporting Log Images and Screenshots

1 Prepare a USB-compatible memory device and connect it to the image processing controller.

2 Select the [Log Images] tab and click [Export].

3 Enter the desired file name and click [Save].

- Select the folder where you want to save the log images, enter the file name and save the log images.
- Screenshots are also exported at the same time.
- When the confirmation message appears, click [OK].

4 Back in the [Log Records] window, click [OK].

Deleting Log Images and Screenshots

1 Select the [Log Images] tab and click [Delete Log Images].

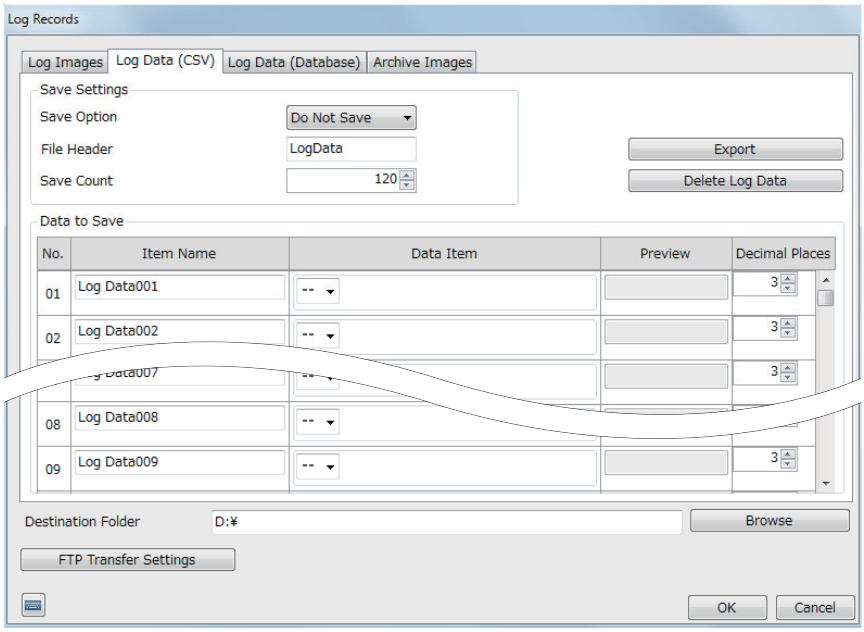
- When the confirmation message appears, click [OK].
- Screenshots are also deleted at the same time.

2 Back in the [Log Records] window, click [OK].

Saving and Exporting Log Data to a CSV File

You can save up to 200 values, including processing result values, as log data and export them to a USB-compatible memory device. Log data are exported as a compressed (*.zip) file.

Selecting the Log Data to Save



1 Select the [Log Data (CSV)] tab and set the condition for saving log data.

[Do Not Save]
Log data are not saved.

[Save All]
The selected values are saved every time the flowchart is processed.

[Save Only NG]
The selected values are saved only when processing the flowchart returns an NG result.

2 Click [File Header] and enter the desired text.

- The text entered will be used as the beginning of the filename of the log data file.

3 Click [Save Count] and enter the desired number of days.

- When there is not enough free hard drive space on the image processing controller, fewer than the number of days set may be saved.
- When new log data are saved after the number of days set, older log data files will be deleted.

4 Enter up to 200 data items that will be saved as log data.

- You can select the value, set the name of the data item in the data file and specify the desired precision (number of places after the decimal point).
- In the [Preview] field, you can check the actual value of each data item as it will be saved in the log data file.

(1) Click [Item Name] and enter the text to be used as the name of the column in the data file.

(2) Click [Data Item] and enter the desired value.

[Real Number]
Enter the desired value.

[Unit]
Select one of the operation units in the flowchart area and then select the result value you want to use. Available options will vary depending on the operation unit selected.

[Constant]
Select one of the registered constants (📖 35).

(3) Click [Decimal Places] and enter the desired number.

5 Click [OK].

Format of the log data file

Trigger time	Judgment result	Cycle time (ms)	Data item 1	Data item 2	...	Data item 200
20181210_101112_123	1	123.4	1234	0	...	0
20181210_111213_456	0	234.5	0	2345	...	0
20181210_123456_789	1	345.6	0	0	...	1210

Trigger time (local time/UTC)
Date and time of the start of the flowchart's processing. The trigger time is recorded twice, once following the local time settings set in the image controller processor and again in UTC (coordinated universal time) format.

Judgment result
Judgment result of the flowchart's processing: 1 = OK result, 0 = NG result.

Cycle time
Time it took to process the flowchart (in milliseconds).

Data item 1 to 200
Data items selected by the user. Zeroes will be filled for data items not set.

Exporting Log Data

1 Prepare a USB-compatible memory device and connect it to the image processing controller.

2 Select the [Log Data] tab and click [Export].

3 Enter the desired file name and click [Save].

- Select the folder where you want to save the log data file, enter the file name and save the file.
- When the confirmation message appears, click [OK].

4 Back in the [Log Records] window, click [OK].

Deleting Log Data

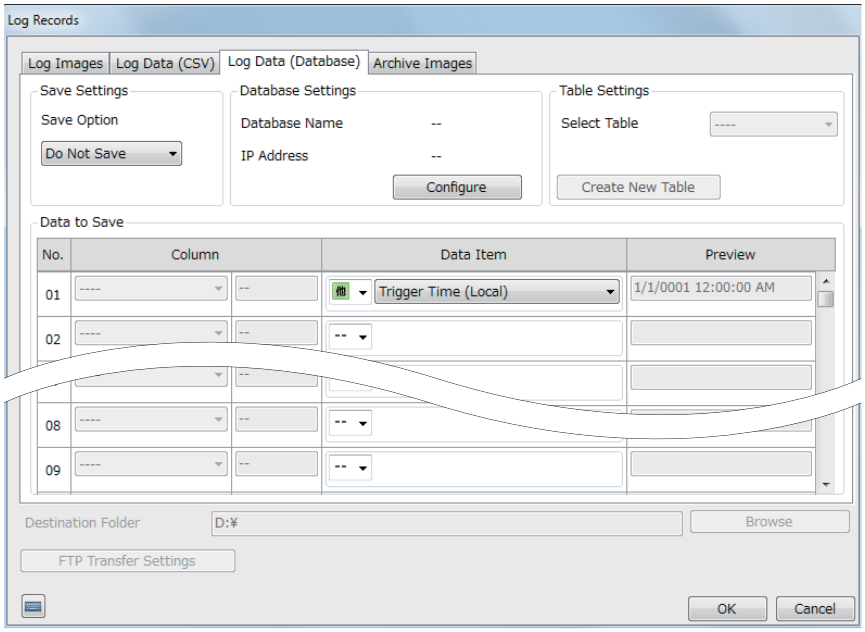
1 Select the [Log Data] tab and click [Delete Log Data].

- When the confirmation message appears, click [OK].

2 Back in the [Log Records] window, click [OK].

Saving Log Data to a Database

You can save processing result values produced by Vision Edition to a database. The database types that can be used are Microsoft SQL Server, Oracle Database and PostgreSQL.



Preparations

To save log data to a database, complete all the necessary settings on the database server and create a database in advance. If necessary, consult your system administrator for details.
Refer also to **Setting Up a Database** (📖 75).

Database settings

Setting	Value
IP address	Any, as long as it is on the same network as the image processing controller and it does not create an IP address conflict.
Port number	Any, as long as it is on the same network as the image processing controller and it does not create a port no. conflict.
Database name	Any, as long as it conforms to the naming rules of the database type used.
User name	Any, as long as it conforms to the rules of the database type used.
Password	Any, as long as it conforms to the rules of the database type used.

Creating a table for the log data using Vision Edition

The following is the structure of the table created using Vision Edition and an explanation of each column.

Table structure

[Log Data] number	Column name	Column type	Function
Log Data001	TriggerTime	Time	Trigger time (processing start time) in local time or UTC format.
Log Data002 to Log Data200	Dataxxx (where xxx is a number 001 to 199)	Float	When numeric values are stored.
		Text	When text data are stored.

Values that can be used per column type

“n” is the number of characters and is specified when the table is created.

Database type	Time type	Float type	Text type
Microsoft SQL Server	datetime2	float	nvarchar (n)
Oracle database	TIMESTAMP	NUMBER (18,3)	NVARCHAR2 (n)
PostgreSQL	timestamp	numeric (18,3)	varchar (n)

Creating a table for the log data without using Vision Edition

The following is the table structure needed to output log data from Vision Edition.

Table structure

[Log Data] number	Column name	Column type	Function
Log Data001	Any, as long as it conforms to the naming rules of the database type used.	Time	Trigger time (processing start time) in local time or UTC format.
Log Data002 to Log Data200		Float	For numeric values.
		Text	For text data.

Values that can be used per column type

In the following table “(p, s)” stands for (precision, scale) and "n" is the desired number of characters.

Database type	Time type	Float type	Text type
Microsoft SQL Server	datetime, datetime2	float / real	char (n), varchar (n), text, nchar (n), nvarchar (n), ntext
Oracle database	TIMESTAMP	NUMBER (p, s) / BINARY_FLOAT / BINARY_DOUBLE	CHAR (n), NCHAR (n), VARCHAR2 (n), NVARCHAR2 (n)
PostgreSQL	timestamp	numeric (p, s) / decimal (p, s) / real / double / precision	char (n), varchar (n), text

Selecting the Log Data to Save and Database

1 Select the [Log Data (Database)] tab and set the condition for saving log data.

- Click [Save Option] and select [Do Not Save], [Save All] or [Save Only NG].

2 Under [Database Settings], click [Configure] to configure the database settings.

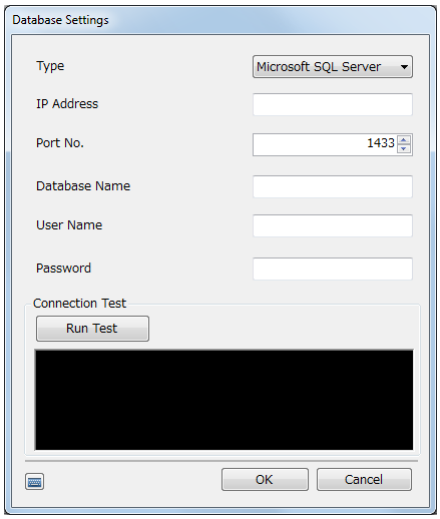
- The [Database Settings] dialog box will appear.

(1) Click [Type] and select the database type.

(2) Set the IP address, port number, database name, user name and password.

(3) Click [Run Test] to test the connection to the database. If the test was successful, a message indicating so will appear. If an error message appears, refer to **Troubleshooting** (📖 204).

(4) Click [OK].



3 Select the data items that will be saved to the database.

(1) Click [Data Item] and enter or select the desired value.
When you select [Others], you can select [Trigger Time (Local)], [Trigger Time (UTC)], [Judgment] or [Cycle Time]. In the [Preview] field, you can check the actual value of each data item as it will be saved in the database.

(2) Select the database table.

Creating a new table

1. Under [Database Settings], click [Create New Table].
   The [Create New Table] dialog box will appear.
2. Enter the table name.
3. Enter the maximum character length for text data items.
4. Click [OK].
   The column name will appear next to each data item selected.

Using an existing table

1. Click [Select Table] and select the desired table.
2. Select the columns where the data is to be saved.

4 Click [OK].

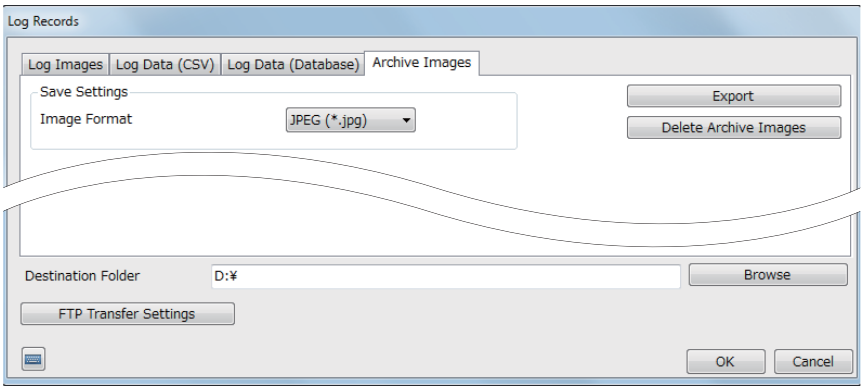
Saving Archive Images

Only when the Vision Edition system is offline, each of the [Capture] operation units in the flowchart can keep the last image captured (only) as an archive image. You may want to save permanent copies of the images to use them to test [Capture] operation units or to run simulations (📖 201). You can also export the archive images saved as a compressed (*.zip) file.

Saving and Exporting Archive Images

Selecting the Image Format

1 Click ([Log Records]) in the main toolbar to open the [Log Records] window.



2 Select the [Archive Images] tab and select the archive images format.

- Click [Image Format] and select [JPEG (*.jpg)], [PNG (*.png)] or [BMP (*.bmp)].

3 Click [OK].

Saving Archive Images

1 Click ([Archive latest images]) in the main toolbar.

Exporting Archive Images

1 Prepare a USB-compatible memory device and connect it to the image processing controller.

2 In the [Log Records] window, select the [Archive Images] tab and click [Export].

3 Enter the desired file name and click [Save].

- Select the folder where you want to save the archive images, enter the file name and save the images.
- When the confirmation message appears, click [OK].

4 Back in the [Log Records] window, click [OK].

Deleting Archive Images

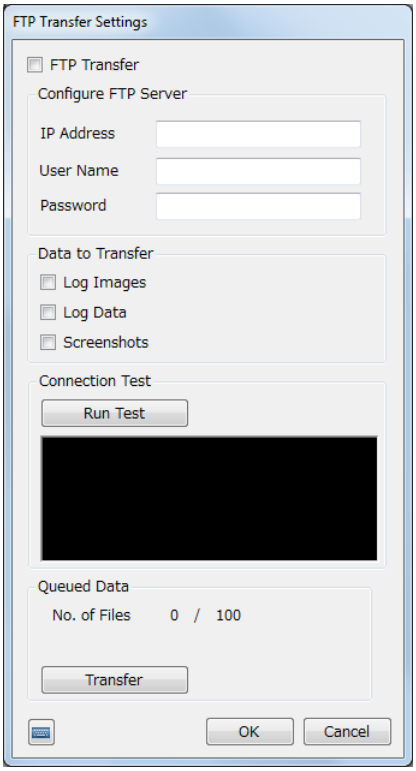
1 In the [Log Records] window, select the [Archive Images] tab and click [Delete Archive Images].

- When the confirmation message appears, click [OK].

2 Back in the [Log Records] window, click [OK].

FTP Transfer

Data saved to the image processing controller can be sent to an FTP server. The data that can be sent are log images, log data and screenshots (📖 184). The following procedures assume that the FTP server is configured and running properly.



Preparations for FTP Transfer

Some preparations are required before sending data to the FTP server.

1 Click ([Log Records]) in the main toolbar to open the [Log Records] window.

2 In the [Log Images] tab, click [FTP Transfer Settings].

- The [FTP Transfer Settings] dialog box will appear.

3 Enter the FTP server's IP address, user name and password.

- Click [IP Address], [User Name] and [Password] and enter the FTP server's information (the IP address is made up of four numbers separated by periods). If necessary, consult the system administrator.
- This software cannot be used to change the FTP server's IP address.

4 Select the types of data to send.

- Place a checkmark in the boxes of the desired types.
- Sending log images, log data and screenshots requires configuring the relevant settings in advance (📖 184, 186).

5 After completing the settings, test the connection.

- Click [Run Test] to test the connection between the image processing controller and FTP server.
- If a confirmation messages appears, the test was successful. If an error message appears, refer to **Troubleshooting** (📖 204).

Sending Data to the FTP Server

1. Place a checkmark in the [FTP Transfer] box.
2. Click [OK].

Sending Unsent Data

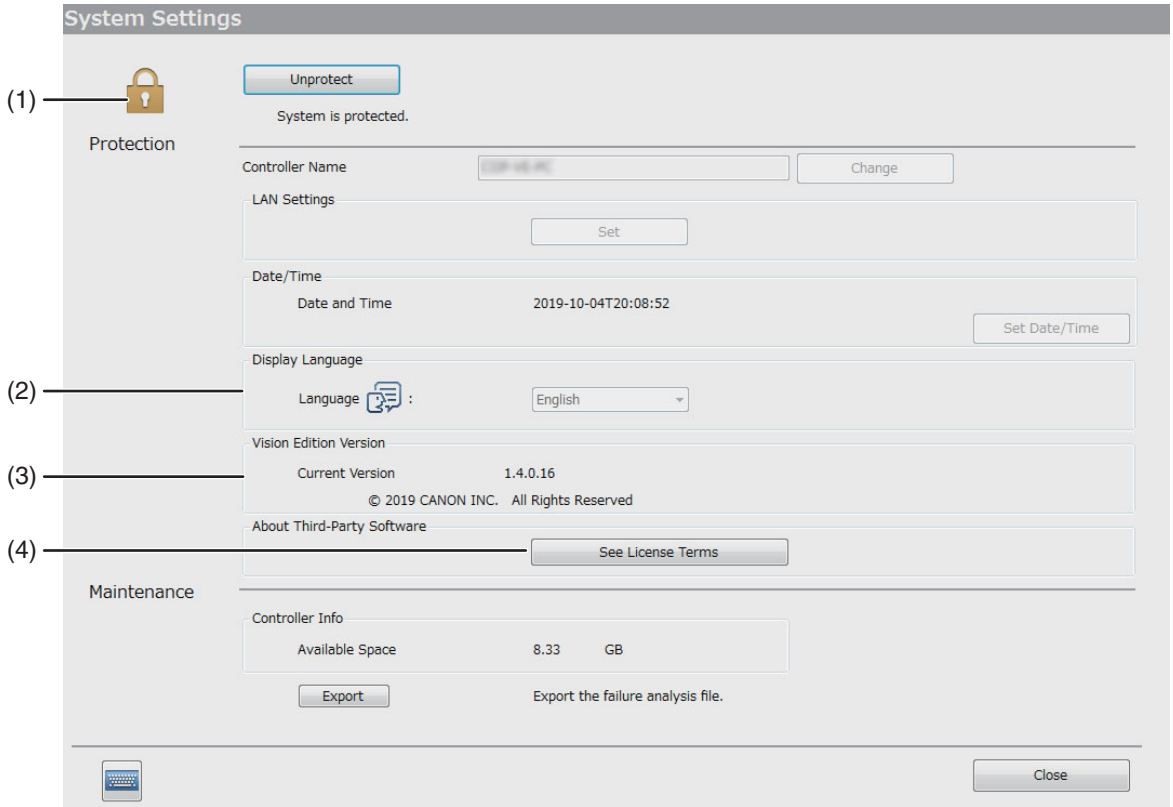
If there are files not sent to the FTP server, the quantity will be indicated by [No. of Files]. Up to 100 unsent files will be queued. Perform the following procedure to start transferring the files manually.

1. Click [Transfer].
2. Click [OK].

System Settings

Using the system settings you can protect and unprotect the system, change the image processing controller's name and network settings, adjust the date and time, and update the the software version. You can also export the failure analysis data files recorded in case of a critical failure.

Click ⚙ ([System Settings]) in the main toolbar to open the [System Settings] window.



(1) Current system protection status
🔒 indicates the system is protected; 🔓 indicates it is not protected.

(2) Currently selected display language

(3) Current version of the Vision Edition software

(4) License terms
Check the license terms of third-party free software.

Changing System Settings

1 Remove the system's protection to allow changes.

- Deactivate the FBWF (File Based Write Filter) or UWF (Unified Write Filter) function.
- You can check the current protection status of these functions in the main screen's status information area.
- For image processing controllers that do not support the system protection function, you can always change and save Vision Edition's system settings.

2 Change the necessary system settings.

To change the image processing controller's name

(1) Click [Change] next to the controller name.
The operating system's [System Properties] window will open.

(2) Change the computer's name.
The operating system's NetBIOS computer name will be used also as Vision Edition's [Controller Name]. The name change will be applied when you restart the computer. Be sure to save any Vision Edition settings before restarting the computer.

To change the network settings

(1) Click [Set] under [LAN Settings]
The operating system's [Network Connections] window will open.

(2) Select an active network adapter, right-click it and select [Properties] from the context menu.

(3) Select [Internet Protocol Version 4 (TCP/IPv4)], double click it and configure the IP address, subnet mask and default gateway used.

3 Click [Confirm Settings].

- A confirmation message about restarting the image processing controller will appear.

4 Click [OK].

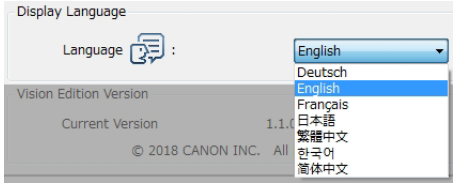
- The image processing controller will restart.

Changing the Display Language

If necessary, you can change the language used in Vision Edition's screens and messages.

1 Remove the system's protection (📖 195).

2 Click [Language] and select the desired language.



- A confirmation message will appear in the selected language.
- If you changed other system settings in addition to the language, these changes will be applied as well when the image processing controller restarts.

3 Click [OK].

- The image processing controller will restart in protected mode.
- When Vision Edition starts up again, the display language selected in step 2 will be used.

Updating the Vision Edition Software

1 Close all the applications running.

2 If the FBWF or UWF function is activated, turn off the protection of the system.

- Turn off the FBWF or UWF function and restart the computer.

3 Run the update file you saved in advance.

- Run the setup.exe file and follow the onscreen instructions to install the software update.

4 After the installation, check Vision Edition's [Current Version] to confirm the software version.

- After completing the software update, delete the update file.

Exporting the Failure Analysis Data File

In case of a critical failure, you can export the failure analysis data file (compressed (*.zip) file) in order to send it to technical support personnel.

1 Prepare a USB-compatible memory device and connect it to the image processing controller.

2 In the [System Settings] window (📖 195), click [Export] under [Maintenance].

3 Enter the desired file name and click [Save].

- Select the folder where you want to save the data file, enter the file name and save the data file.
- When the confirmation message appears, click [OK].

4 Click [Close].

Chapter 5

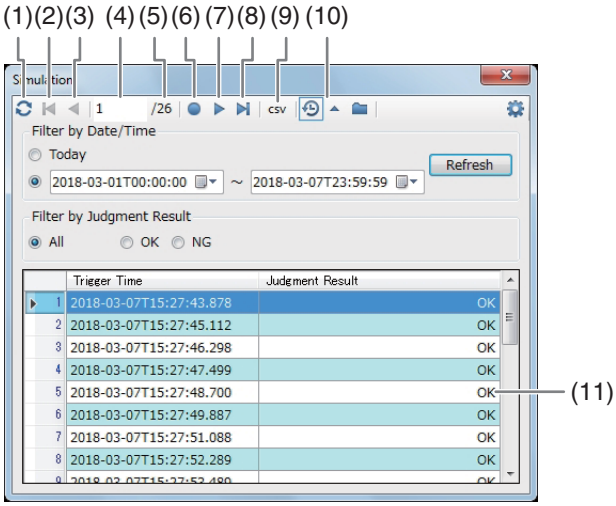
Simulation

This chapter explains how to use the built-in simulator.

Running a Simulation

You can run a simulation using previously saved log images and log data that you saved as described in the previous chapter (📖 184, 186) to replicate the processing of the flowchart as if Vision Edition were online. You can also run a simulation using image files saved on the image processing controller in order to test the flowchart's processing.

Click ([Simulation]) in the main toolbar to open the [Simulation] window.



(1) Refresh the information about image files used in the simulation

(2) Move to the first trigger data point

(3) Move to the previous trigger data point

(4) Currently selected trigger data point

(5) Total number of trigger data points

(6) Run the simulation

(7) Move to the next trigger data point

(8) Move to the last trigger data point

(9) Save the simulation results (📖 202)

(10) Show/hide simulation data settings

(11) List of historical log data

Running a Simulation with Log Data and Log Images

In order to run a simulation using log records, log images and log data from previous processing runs must have been saved in advance (📖 184, 186).

1 Click ([Use previously recorded images]).

- If the list of historical log data is not displayed, click [▼] to display it.

2 Set the applicable period for the log data to be used in the simulation.

- Click [Today] to use log record from previous processing runs performed the same day.
- To specify a certain period, click the (calendar) icon within the "From" and "To" fields and select the desired dates.

3 Click [Refresh].

- The trigger information from the selected period will be shown in the list of historical log data.

4 If necessary, filter the trigger information displayed.

- You can select [OK] or [NG] to filter the trigger data points.
- Select [All] to show all the trigger data points.

5 Select the log data to use for the simulation.

- Select the desired trigger data point from the list to use the log records obtained when the job was processed at the selected date and time.

6 Click [●] ([Run]) to run the simulation.

- You can also double-click the trigger data point in the list to run the simulation again.
- Clicking [|◀], [◀], [▶] or [▶|] will also run the simulation after selecting the applicable trigger data point.

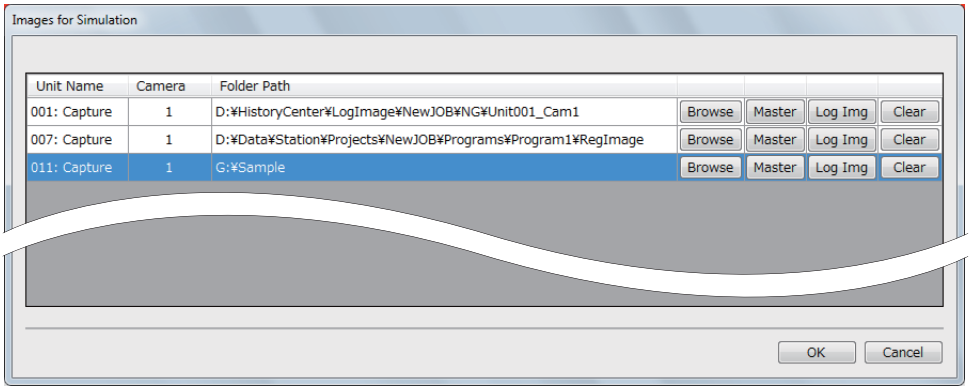
Running a Simulation with Other Image Files

1 Prepare the desired image files in advance.

- Connect the USB-compatible memory device to the image processing controller.

2 Click ⚙ ([Select images for simulation]).

- The [Images for Simulation] window will appear with a list of all the [Capture] operation units in the flowchart area.
- If a [Capture] operation unit uses more than one camera, the same operation unit name will appear multiple times in the list with different camera numbers.



3 Select the images to use in the simulation for each operation unit in the list.

- You can use image files saved in a folder, master images or log images.

Any Images
Click [Browse], select the folder that contains the desired image files and then click [OK]. The path of the selected folder will be displayed in the [Folder Path] field.

Master Images
Click [Master]. The path of the folder where master images are saved will be displayed in the [Folder Path] field.

Log Images
Click [Log Img]. The path of the folder where log images and data are saved will be displayed in the [Folder Path] field.

To clear the image selected
Click [Clear]. When the confirmation message appears, click [OK].

4 Click [OK].

5 Back in the [Simulation] window, click [●] ([Run]) to run the simulation.

- Clicking [|◀], [◀], [▶] or [▶|] will display the image to be used according on the operation and then run the simulation.

Saving Simulation Results

You can save the simulation results as a CSV file.

1 Click [CSV].

- A simulation will be run.
- This button is not available when you open the [Simulation] window by clicking ([Simulation]) in the editing window of image processing units and model matching units.

2 Select the folder where you want to save the file, enter the file name and click [Save].

Note

- The images used to run the simulation are not saved with the log images.

Chapter 6

Additional Information

This chapter contains tips and troubleshooting information to help you when you cannot obtain the expected results.

Troubleshooting

If you have a problem with the software, refer to this section.

Problem	Possible solutions
The software's screen does not appear on the connected display.	• You started the image processing controller after connecting the display. Disconnect the display cable connected to the image processing controller and reconnect it to the DisplayPort terminal (close to the USB terminals).
Cannot connect to the camera. The camera's image is not displayed.	• The camera is not correctly connected to the network. Check the camera's network settings. • The camera's IP address, port number, user name and password are not correctly set in Vision Edition. Check the network settings in the [Camera Settings] window (📖 27). • The LAN cable is connected to a LAN terminal other than the LAN1 terminal (center LAN terminal) on the image processing controller. Connect the cable to the image processing controller's LAN1 (center LAN terminal) terminal (📖 14).
Some capture settings are not available in the [Camera Settings] window.	• Available settings depend on the camera used.
After connecting a Canon network camera, cannot pan/tilt/zoom using Vision Edition.	• Disable the camera's event detection function (audio detection, moving object detection, etc.) to allow pan/tilt/zoom operations from Vision Edition.
Cannot communicate with the industrial robot.	• The industrial robot is not correctly connected to the network. Check the industrial robot's network settings. • The image processing controller is not correctly configured to communicate with the industrial robot. Check the external data settings (📖 70). • The LAN cable is connected to a LAN terminal other than the LAN1 terminal (center LAN terminal) on the image processing controller. Connect the cable to the image processing controller's LAN1 (center LAN terminal) terminal (📖 14).
Cannot communicate with the PLC.	• The PLC is not correctly connected to the network. Check the connection. • The image processing controller is not correctly configured to communicate with the PLC. Check the communication protocol and external data settings (📖 71, 72). • The LAN cable is connected to a LAN terminal other than the LAN1 terminal (center LAN terminal) on the image processing controller. Connect the cable to the image processing controller's LAN1 (center LAN terminal) terminal (📖 14).
After starting up the image processing controller, Vision Edition is automatically online.	• If the [Vision Edition online on startup] box in the [Job Settings] windows is checked, Vision Edition will start up automatically online (📖 21).
The main screen is in split screen view even though only one camera is registered.	• Remove cameras not in use under [1. Select Camera] in the [Master Image Settings] window (📖 32).
Cannot apply a trigger to the entire flowchart.	• The flowchart is not connected to the start and end points. Make sure the flowchart is correctly connected from start to end (📖 39).
Pieces of work are not detected.	• Check the model matching settings (📖 155, 157).
Pieces of work are detected twice.	• The [Overlap Rate] value set in the matching model unit's configuration is too high. Set a smaller value (📖 155, 157).
The judgment result shown on the main screen is always [NG].	• The main screen's judgment result is determined by the [Main Screen's Judgment Condition] setting in the [Main Screen Settings] window (📖 81). Check the current settings.
Cannot select a camera in the [NW Camera Mvmt. with Correction] or [Grid PTZ] operation unit.	• The connected camera is incompatible with those units. Connect a Canon network camera compatible with pan, tilt and zoom operations.

Problem	Possible solutions
Image processing units are not processed correctly.	• Except for [Color Detection] operation units, image processing units cannot process images in color. When registering the master image and when configuring the [Capture] operation unit used to capture the target image, set [B&W Conversion] to an option other than [No Conversion] (📖 33, 102).
A [Color Detection] operation unit cannot detect color correctly.	• In order to detect colors, the captured image used as target image must be a color image. When registering the master image and when configuring the [Capture] operation unit used to capture the target image, set [B&W Conversion] to [No Conversion] (📖 33, 102).
An error occurs when trying to operate the robot's hand with a [Robot Hand] operation unit.	• Perform a test of the robot hand's movement from the operation unit's configuration window (📖 168). If an error message appears, follow the instructions and check the settings of the industrial robot's hand (electric gripper).
An [Analog Meter Readout] operation unit cannot read the meter's value correctly.	• In the following cases, Vision Edition may not be able to read an analog meter's value correctly. – If the direction of the inspection region's [Angle Difference] setting (📖 151) does not match the + direction of the analog meter's needle. – If there are letters or other characters in the selected inspection region, or if the end opposite the needle tip protrudes into the inspected region. – If the analog meter has more than one sweeping needle. – If the analog meter's shape is not a perfect circle. – If the graduations are not linear.
Cannot transfer data to an FTP server.	• FTP transfer is not enabled. Make sure there is a checkmark placed in the [FTP Transfer] box (📖 194). • The IP address, user name or password for the FTP server is not set correctly. Configure the settings correctly in the [Log Records] window, under the [FTP] tab. • There is no data selected for transfer. Select the data to be transferred (📖 193). • The FTP server is not correctly connected to the network. Make sure that the LAN cables are correctly connected (📖 14) and that the network settings are correctly configured (📖 193). • The data to be sent has not been saved. Check the save settings for the data to be sent (📖 193).

List of Messages

Problem	Possible solutions
[xxxx] is already assigned to another job. ([xxxx] = job name)	• You attempted to assign the same job to multiple [JOB] positions in the [Job Settings] window. You can copy the desired job (📖 23) and assign the copied job to a different [JOB] position (📖 25).
All units must be connected in order to group them.	• You attempted to group operation units that are not connected in the flowchart area. Connect the operation units (📖 39) before grouping them (📖 39).
CALDATA values could not be calculated. Check the robot settings.	• Check that the industrial robot is correctly connected. • Check that the selected p-type variables do contain the correct position data for points 1 to 3. • Make sure the correct coordinates for points 1 to 3 on the image were entered.
Cannot connect to PLC when using an external trigger (robot).	• In the [External Connection Settings] window, the trigger was changed to [External Trigger (Robot)] while external device was set to [PLC]. Set the trigger to [External Trigger (PLC)] or set it to [Manual Trigger] and set the external device to [PLC].
Cannot connect to PLC. Check PLC status.	• The PLC is not turned on. Check that the PLC is on and re-establish the connection. • A connection to the network was established but communication with the PLC was unsuccessful. Check whether a PLC program is running. • The image processing controller is not correctly configured to communicate with the PLC. Check the communication protocol and external data settings (📖 71, 72).
Cannot connect to robot. Check the robot controller, connection, etc.	• You attempted to bring the Vision Edition system online when the industrial robot was not connected. Check the industrial robot's controller. • You double-clicked a robot control unit in the flowchart area but there was no response from the industrial robot. Check the connection status and settings of the robot controller, industrial robot, PoE hub and LAN cables.
Cannot connect to robot. Check external device's IP address.	• The industrial robot is not turned on. Check that the industrial robot is on and re-establish the connection. • The IP address for the industrial robot is not set correctly. Check the settings (📖 70) and re-establish the connection.
Cannot connect to the camera.	• Could not connect to the camera using the current settings. Enter the camera's correct IP address, port number, user name and password settings in the [Camera Settings] window (📖 27) and try to connect again.
Cannot connect to the FTP server. Check the FTP server's status.	• The FTP server is not turned on. Check that the FTP server is on and re-establish the connection. • The FTP server is not correctly connected to the network. Make sure that the LAN cables are correctly connected (📖 14) and that the network settings are correctly configured (📖 193) • The IP address, user name or password for the FTP server is not set correctly. Check the settings and re-establish the connection. • The FTP server cannot receive data due to its firewall settings. Check the settings and re-establish the connection.
Cannot copy items from a different unit type.	• You attempted to copy items from differing types of units. Select the same type of unit and copy the items again (📖 40).
Cannot move.	• You attempted to move an operation unit onto another operation unit in the flowchart area. Move the operation unit to an empty area of the flowchart.
Cannot register more than 150 master images.	• You cannot register more than 150 master images. If necessary, remove master images not in use (📖 34).
Cannot set the correct white balance.	• In the camera's configuration window, Vision Edition could not set the correct white balance using the one-shot WB function. Use a subject appropriate for setting the white balance (📖 30) and try to capture the subject again.

Problem	Possible solutions
Communication error. Check external device's IP address.	• The PLC is not turned on. Check that the PLC is on and re-establish the connection. • The IP address for the PLC is not set correctly. Check the settings (📖 71, 72) and re-establish the connection.
Communication successful. Cannot connect to PLC. Check PLC status.	• A connection to the network was established but communication with the PLC was unsuccessful. Check whether a PLC program is running. • The PLC is not correctly connected to the network. Make sure the PLC network settings are correctly configured.
Connected camera is not supported.	• You attempted to connect a camera not supported by Vision Edition. Use only supported cameras (📖 12).
Could not run test.	• When running a test for the [NW Camera Mvmt. with Correction] or [Grid PTZ] unit, the position settings exceeded the camera's possible range, causing the test to be unsuccessful. Check the test settings (applicable settings depend on the unit) and run the test again.
Could not transfer some files. Failed to transfer files.	• The FTP server is not turned on. Check that the FTP server is on and transfer the data again. • The FTP server is not correctly connected to the network. Make sure that the LAN cables are correctly connected (📖 14) and that the network settings are correctly configured (📖 193) • The IP address, user name or password for the FTP server is not set correctly. Check the settings and transfer the data again. • The FTP server cannot receive data due to its firewall settings. Check the settings and transfer the data again.
Edge detection error.	• An edge point could not be detected with the current settings. Check the operation unit's detection parameters.
Error calculating intensity's average or SD (σ).	• The [Shading Test] operation unit could not calculate the intensity level's average or standard deviation. Check the operation unit's region settings and judgment conditions and change them if necessary.
Error detecting an external trigger (database). Check the database status.	• The database server is turned off. Check the database server and try again. • The database server is not correctly connected to the network. Check the database server's LAN cable connection and network settings. • The database server's settings (IP address, user name, password, etc.) are incorrect. Check the settings and try again. • The database cannot receive external connections due to a firewall or other reasons. Check the firewall settings and try again.
Error detecting blobs.	• The [Blob Detection] operation unit could not detect any blobs. Check the operation unit's [Threshold] settings and detection parameters and change them if necessary.
Error detecting start edge. Error detecting end edge.	• The [Edge Width], [Angle Detection] or [Approximate Straight Edge] operation unit could not detect the start or end edge. Check the operation unit's detection parameters and change them if necessary.
Error measuring maximum/minimum intensity levels.	• The [Shading Test] operation unit could not measure the maximum and minimum intensity levels in the inspection region. Check the operation unit's settings and change them if necessary.
Failed to connect. To output log data to a database, change the settings as necessary.	• The database server is turned off. Check the database server and try again. • The database server is not correctly connected to the network. Check the database server's LAN cable connection and network settings. • The database server's settings (IP address, user name, password, etc.) are incorrect. Check the settings and try again. • The database cannot receive external connections due to a firewall or other reasons. Check the firewall settings and try again.
For connections with a PLC, set [Output Destination] to [PLC].	• In the [External Connection Settings] window, the output destination was changed to [No Output] or [Robot] while the trigger was set to [Manual Trigger] and the external device was set to [PLC]. To connect to a PLC with [Manual Trigger], change the output destination to [PLC].

Problem	Possible solutions
Grouping requirements not met.	• One or more branching units are included in the operation units you tried to group. Do not include branching units in the operation units selected for grouping.
Incompatible settings. Can't change the target image.	• In the settings of an image processing unit or matching model unit, you selected a [Capture] operation unit with incompatible B&W conversion settings as the [Target Image]. Check the settings.
Inspection region not set.	• No inspection region has been set. Set the inspection region (📖 89).
Insufficient free space. Cannot apply trigger. Try deleting unused job files.	• There is not enough free hard drive space on the image processing controller. Delete any jobs (📖 23) or log images (📖 185) that are no longer necessary to free some space and then try again to apply the trigger.
Insufficient free space. Cannot create job. Try deleting unused job/log files.	• There is not enough free hard drive space on the image processing controller. Delete any jobs (📖 23) or log images (📖 185) that are no longer necessary to free some space and then try again to create a new job.
Insufficient free space. Cannot save job. Try deleting unused job files.	• There is not enough free hard drive space on the image processing controller. Delete any jobs (📖 23) or log images (📖 185) that are no longer necessary to free some space and then try again to save the job.
Insufficient free space. Cannot switch online. Try deleting unused job files.	• There is not enough free hard drive space on the image processing controller. Delete any jobs (📖 23) or log images (📖 185) that are no longer necessary to free some space and then try again to switch the system online.
Items can only be copied from the same unit type as the source unit.	• You selected an operation unit different from the source unit. Select an operation unit of the same unit type as the source unit.
Maximum number of times a flowchart can be processed has been reached.	• You cannot process a flowchart more than 999 times. Change the flowchart's settings so it is not processed more than 999 times.
No archive images.	• You clicked [Export] in the [Archive Images] tab of the [Log Records] window (📖 191) when no archive images had been saved. Save archive images (📖 191) and then export them.
No code detected.	• The [1D Code Reader] or [2D Code Reader] operation unit could not detect a code in the inspected region. Check camera settings (📖 28), the code being captured and the operation unit's settings, and change them if necessary.
No data dictionary to export.	• You clicked [Export] in the [Data Dict.] tab of a [1D Code Reader] or [2D Code Reader] operation unit when the data dictionary contained no entries. Register valid text string entries before exporting the data dictionary (📖 137).
No edges detected.	• An edge point could not be detected with the current settings. Check the operation unit's detection parameters.
No log data.	• You clicked [Export] in the [Log Data] tab of the [Log Records] window (📖 186) when no log data had been saved. Make sure some log data are saved (📖 186) and then export them.
No log images.	• You clicked [Export] in the [Log Images] tab of the [Log Records] window (📖 184) when no log images had been saved. Make sure some log images are saved (📖 184) and then export them. • You attempted to run a simulation using log images when no log images had been saved. Make sure some log images are saved (📖 184) and then try to run the simulation again.
No master image set.	• You attempted to register a matching model when a master image had not been set. Select the master image you want to use for the model (📖 43).
No master images.	• You attempted to run a simulation using a master image when no master images had been registered. Register the necessary master images (📖 32) and then try to run the simulation again.
No operation unit selected.	• You attempted to copy or delete an operation unit without one selected. Select the desired operation unit and try the operation again (📖 39).
No region selected for model creation.	• You attempted to register a matching model when a region had not been set. Set a region around the part of the image you want to use for the model and try to create the matching model again (📖 43).

Problem	Possible solutions
Not enough open space to perform the operation.	• You double-clicked a group of operation units when there is not enough empty space in the flowchart area to open the group. Delete operation units not in use (📖 39) to open up some space in the flowchart area and then double-click on the group again.
Not enough points. At least 2 edge points needed to approximate a straight line.	• 2 or more edge points are necessary to derive an approximate straight edge but not enough edge points could be detected with the current settings. Check the operation unit's settings (📖 125).
Not enough points. At least 3 edge points are needed to derive a circle.	• 3 or more edge points are necessary to detect a circle but not enough edge points could be detected with the current settings. Check the operation unit's settings (📖 129).
Oracle Database runtime libraries are required to use a database of this type. See the Vision Edition Instruction Manual for details on how to obtain them.	• Required runtime libraries are missing. For details on how to obtain them, visit the Canon website (📖 75, 214).
Result exceeds the judgment conditions' range.	• The result value is outside the valid range set in the judgment conditions. Check the operation unit's judgment conditions and change them if necessary. • Check that the image can be captured correctly with the current camera settings (📖 28).
Robot not responding. Check the robot controller, connection, etc.	• A robot control unit or the [Robot Control] window tried to operate the industrial robot but there was no response. Check the connection status and settings of the robot controller, industrial robot, PoE hub and LAN cables.
Select 2 or more operation units.	• 2 or more operation units need to be selected in order to group them (📖 39). Select multiple operation units (📖 38).
SYSTEM ERROR xxxx (xxxx represents an error number)	• Contact a customer support center.
Target image to be processed is not displayed.	• The target image to be processed does not appear in the image display area. Select the desired [Capture] operation unit under [Target Image] (📖 88) or check the camera's connection and settings (📖 28).
Text read from the code is not in the data dictionary.	• The text string that the [1D Code Reader] or [2D Code Reader] operation unit read from the code is not in the registered data dictionary. Add the text string to the data dictionary (📖 137).
The camera selected for the external trigger (camera) is not a Canon network camera or its intelligent functions are not activated. Check the camera's settings.	• To use a network camera as a trigger, make sure the camera's event detection function (audio detection, moving object detection, etc.) is activated.
The camera's intelligent functions are activated. Unable to pan/tilt/zoom.	• To be able to pan/tilt/zoom with Vision Edition, make sure to turn off the camera's event detection function (audio detection, moving object detection, etc.)
The device is selected for [Trigger]. To end the connection, change the setting.	• In the [External Connection Settings] window, [External Device] was set to a device that differs from the one set for the trigger. To terminate the device's connection, set the trigger to a device that differs from [External Device].
The model could not be created. Change settings and retry.	• The matching model could not be created. Try to create the matching model again after changing the settings (📖 43).
Timeout error.	• Could not connect to the camera using the current settings. Enter the camera's correct IP address, port no., user name and password settings in the [Camera Settings] window (📖 27) and try to connect again.
Unexpected error.	• Restart the image processing controller and try the operation again. If the problem occurs again, contact a customer support center.
When using a manual trigger, cannot output data to the PLC selected in [External Device]. (Set [Output Destination] to [No Output].)	• In the [External Connection Settings] window, you attempted to set the [PLC] setting under [External Device] to [Open User Comm. (Siemens)] when the trigger is set to [Manual Trigger] and the output destination is [PLC]. To use the [Open User Comm. (Siemens)] setting, set the trigger to [External Trigger (PLC)].

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Trademark Acknowledgments

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Contact Information

For inquiries or questions regarding this product, please visit the official Canon website.

English
https://www.canon-europe.com/support/products/industrial-imaging-platform/

The information in this document is verified as of October 2019. Subject to change without notice.

DIE-0522-000C