96M16197

Vision Sensor
IV2 Series

Starting Guide (Control Panel)



The starting guide explains the basic contents from how to set the IV2 Series to how to start the operation.
For each function detail, refer to “IV2 Series User’s Manual (Control Panel)”.

- You can download the User’s Manual from the KEYENCE web site (http://www.keyence.com/).

Operation flow

Mounting, Connecting, and Wiring the Sensor with the Control Panel

Mount the sensor and control panel, and then connect and wire the cable.

Turning on the power

Turn on the power of the sensor and control panel, and then perform the initial startup process.
“Operation when the Power is Turned on” (Page 3)

Settings Navigator

Create the program to be used for operation in [Settings Navigator] (Sensor Setup).

STEP 1: Setting of image optimization

Set the image optimization settings for clearly imaging a target. Adjust the image settings to clearly define the differences between an “OK” and “NG” image. Set the trigger options, adjust the brightness and camera focal distance.
“STEP1 Setting Image Optimization” (Page 5)

STEP 2: Registration of a master image

Image an “OK” image and register the master image to serve as the reference of judgment.
“STEP2 Registering the Master Image” (Page 6)

STEP 3: Learning settings/Tool settings

Performs settings to judge a target.

- Learning settings (IV2-G30F only)
  Set the detection window and learn from various images to judge OK/NG.
  The target OK/NG will be judged based on the learning results.
  Up to 16 detection windows and 1 position adjustment window in one program can be set.
  “STEP3 Learning Settings (Learning Mode)” (Page 7)
- Tool Settings
  Set the tools onto the master image and set the threshold for judgment.
  Up to 16 detection tools and 1 Position Adjustment tool in one program can be set.
  “STEP3 Tool Settings (Standard Mode)” (Page 9)

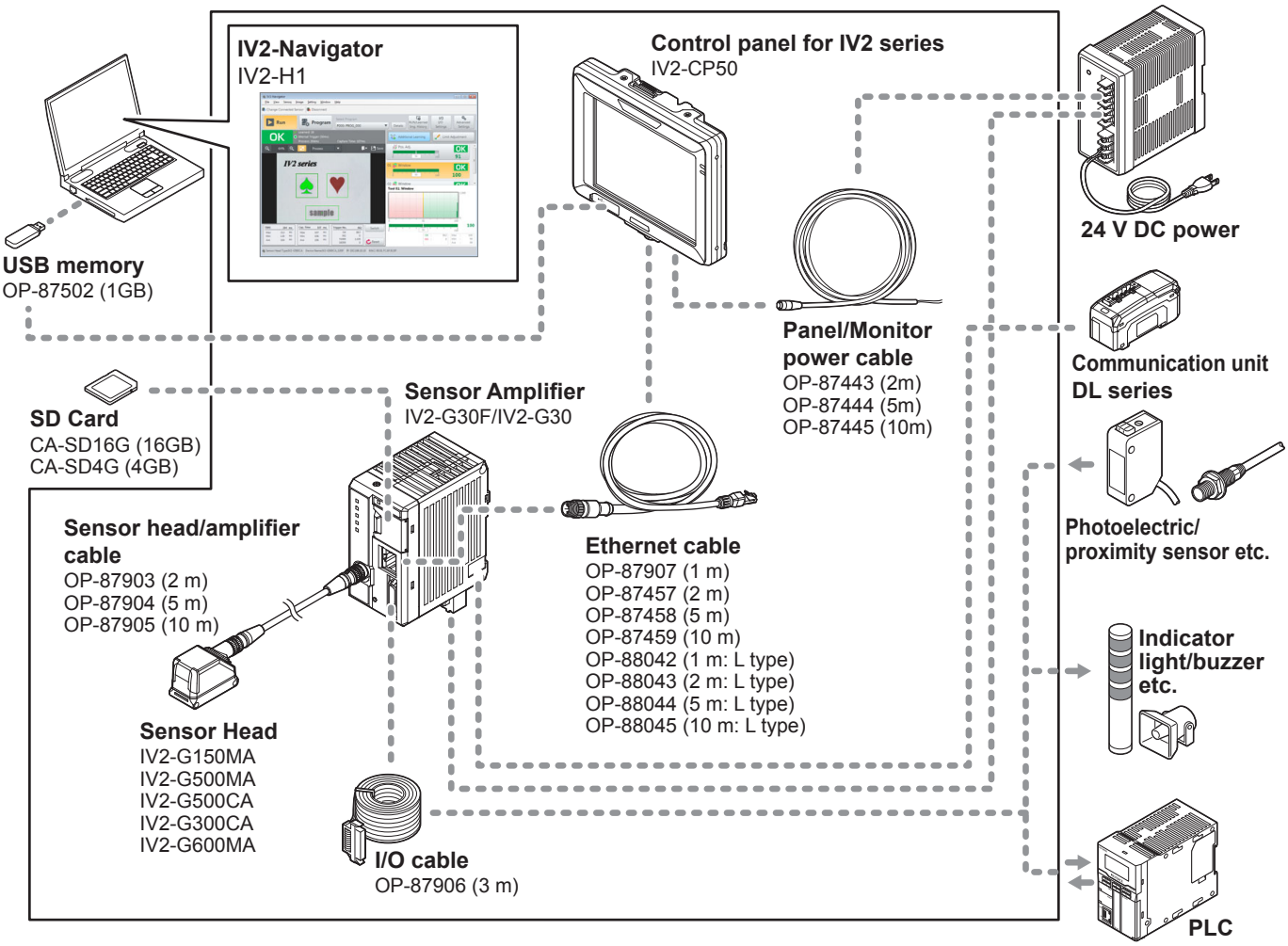
STEP 4: Output assignment

Assign the function to output to each output line.
“STEP4 Assigning the Output Content to the Output Line” (Page 14)

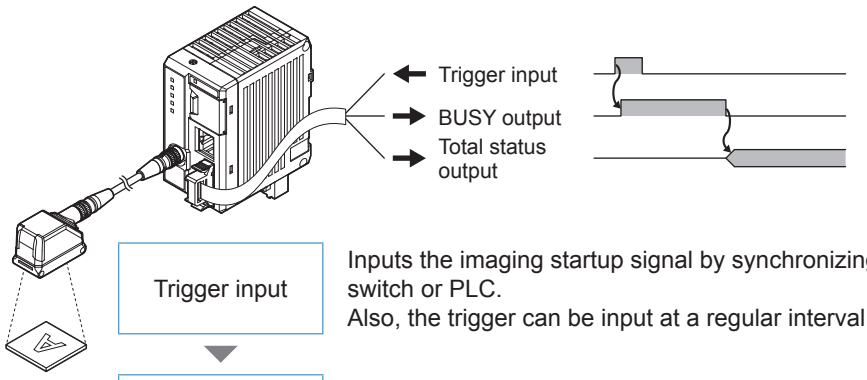
Starting the operation/adjustment

Switch the settings screen to the RUN screen, and start operation.
If the settings are not appropriate, perform additional learning or limit adjustment.
“Starting Operation” (Page 15)
“Performing the Auto Adjustment by the Additional Learning (Learning Mode)” (Page 17)
“Adjusting Thresholds for Judgment” (Page 19)

System Configuration



Judgment processing flow



Trigger input
Inputs the imaging startup signal by synchronizing to the target position from a photoelectric switch or PLC.
Also, the trigger can be input at a regular interval with the internal trigger function.

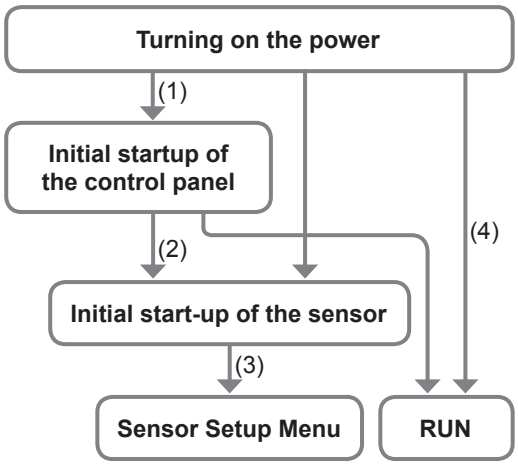
Imaging
Use the built-in light to obtain an image of the target with the CMOS image sensor.
BUSY output function turns ON.

Tool processing
According to the learning settings (learning mode) or settings of a detection tool (standard mode), the image of the target is scanned for detecting whether a target is high or low quality.
Up to 16 detection windows (learning mode) or detection tools (standard mode) can be set.
In addition, misaligned positions of the target can be corrected by using the position adjustment window/tool.
After the detection process is completed, the BUSY output function turns OFF.

Status output
Outputs the status result.
When the total status result is OK, the total status OK output is ON.
When the total status result is NG, the total status NG output is ON.

Save images
Saves the image (up to 1,000 images) to the image history memory in the sensor.
Conditions for saving the image can be selected from “NG only”, “OK close to NG and threshold”, or “All”.

Operation when the Power is Turned on



(1) When the power of the control panel is turned on for the first time, set the display language, date and time, and the connection method with the sensor.
“Operation at Initial Startup of the Control Panel” (Page 3)

(2) When the power of the sensor is turned on for the first time, set the polarity and date and time.
“Operation for initial startup of the sensor” (Page 3)

(3) The sensor setup menu screen opens. Set the operation condition in the Settings Navigator. After the settings are completed, operation begins.
“Starting the Settings Navigator” (Page 4)

(4) If the control panel and sensor setup has already been performed, move to operation automatically by turning on the power.
“Starting Operation” (Page 15)

Reference The sensor can be independently operated.

Operation at Initial Startup of the Control Panel

1 Turn on the power of the control panel.

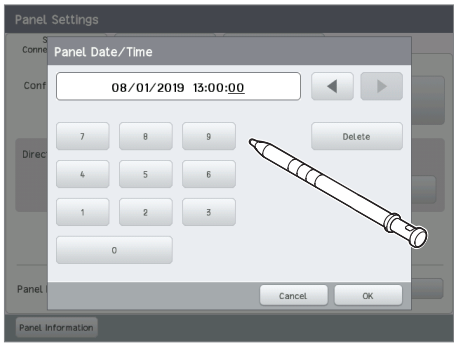
The screen to select the language opens.

2 Select the language to be displayed on the control panel and tap the [OK] button.

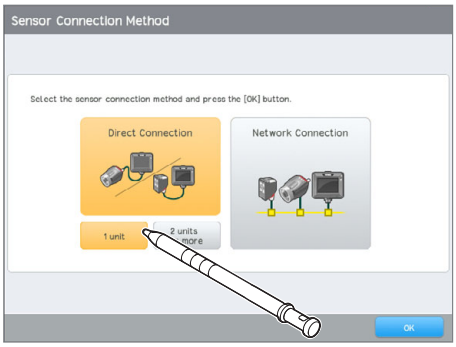


[English] is selected as the default setting.
Change from [English] and tap the [OK] button. The control panel will restart automatically.

3 Set the current date and time, and tap the [OK] button.



4 Tap the [1 unit] button and tap the [OK] button.

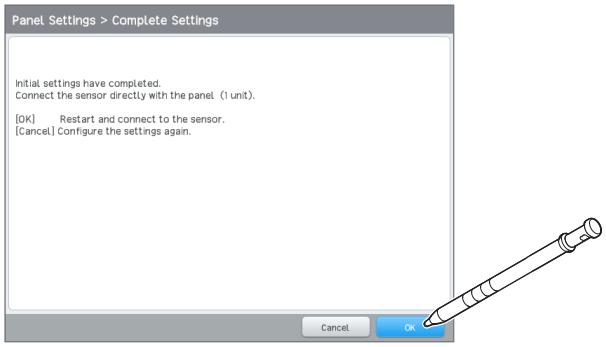


The Complete Configuration screen opens.

5 Turn on the power of the sensor.

Point **Turn on the power of the sensor before the control panel is restarted by tapping the [OK] button in step 6.**

6 Tap the [OK] button.



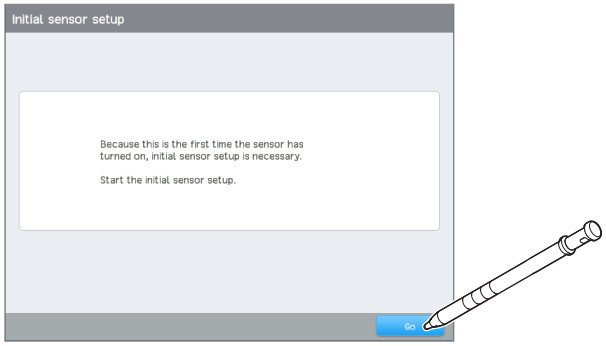
The control panel will be restarted to be connected with the sensor.

- When the control panel is connected with the sensor for the first time, perform the [Initial Sensor Setup] and set the polarity and date of the sensor.
“Operation for initial startup of the sensor” (Page 3)
- For the sensor connecting with the control panel after the second time, the operation screen or [Sensor Setup Menu] screen opens.

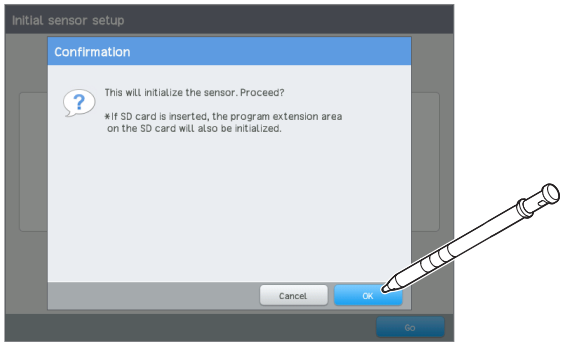
Operation for initial startup of the sensor

When connecting with the sensor in the default setting, [Initial Sensor Setup] is displayed.
Perform the initial sensor setup following the prompts on the screen. After it is completed, set the sensor in [Sensor Setup Menu].

1 Tap the [Go] button.

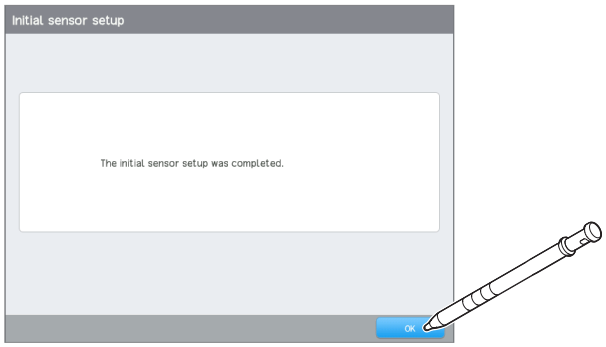


2 Tap the [OK] button.



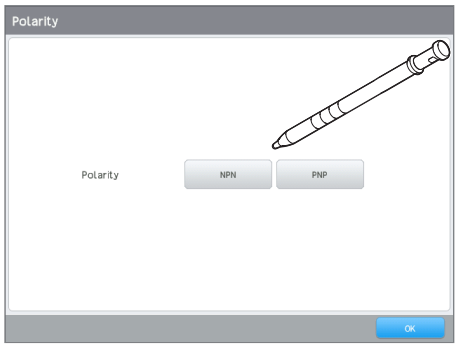
The Initial Sensor Setup begins. After initialization is completed, the initialization completion screen opens.

3 Tap the [OK] button.



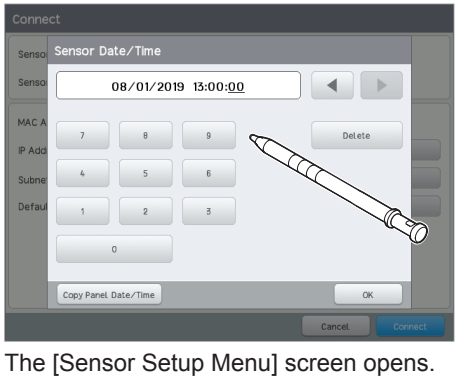
The [Polarity] screen opens.

4 Select the Polarity of the sensor and tap the [OK] button.



The [Sensor Date/Time] screen opens.

5 Set the current date and time, and tap the [OK] button.



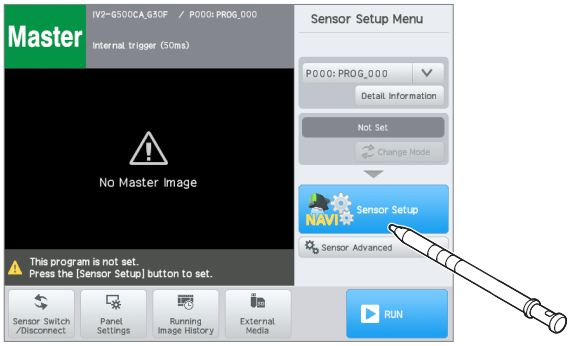
The [Sensor Setup Menu] screen opens.

6 Set the sensor judgment condition.

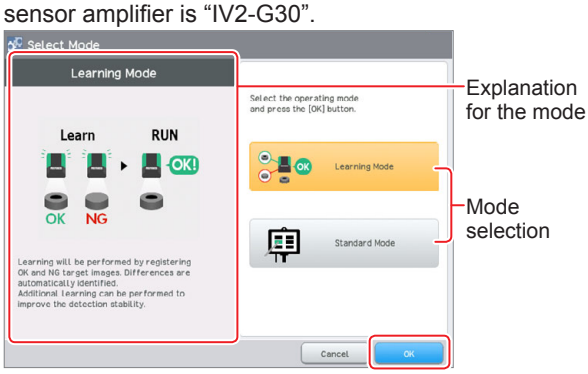
“Starting the Settings Navigator” (Page 4)

Starting the Settings Navigator

1 Tap the [Sensor Setup] button.



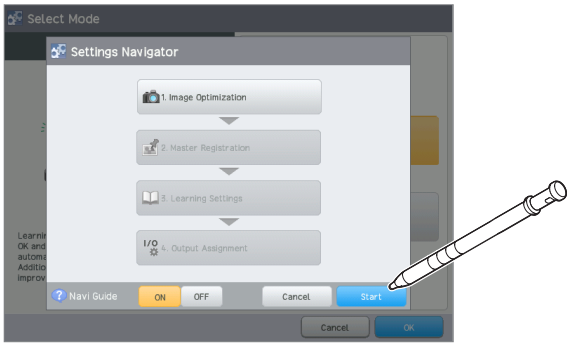
The [Select Mode] screen is displayed when the sensor amplifier is “IV2-G30F”. Select the mode (Learning Mode/ Standard Mode) to be used for judgment and tap [OK]. The [Select Mode] screen is not displayed when the sensor amplifier is “IV2-G30”.



Point **Refer to the explanation on the screen to select the mode**

The startup screen of the Settings Navigator opens.

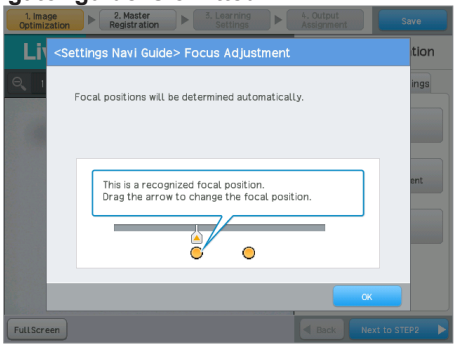
2 Tap the [Start] button.



The Settings Navigator guide screen opens.

3 Tap the [OK] button to proceed to “STEP1 Setting Image Optimization”.

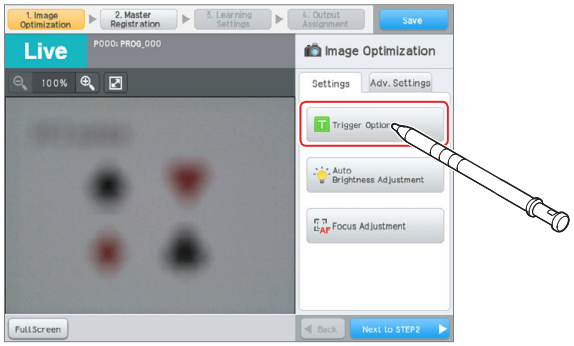
Point **When setting items are selected following the setting navigator, [Settings Navi Guide] appears. If [Settings Navi Guide] is displayed, check the contents and tap the [OK] button. In this manual, the explanation of the settings navigator guide is omitted.**



STEP1 Setting Image Optimization

STEP1-1 Setting the Trigger Options

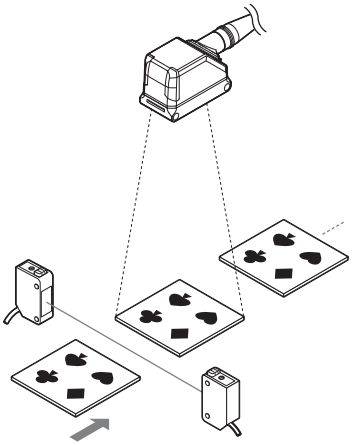
1 Tap the [Trigger Options] button.

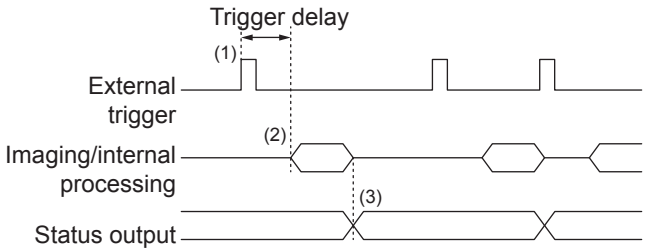


2 Select the trigger type.

Select the [Internal] or [External] button.

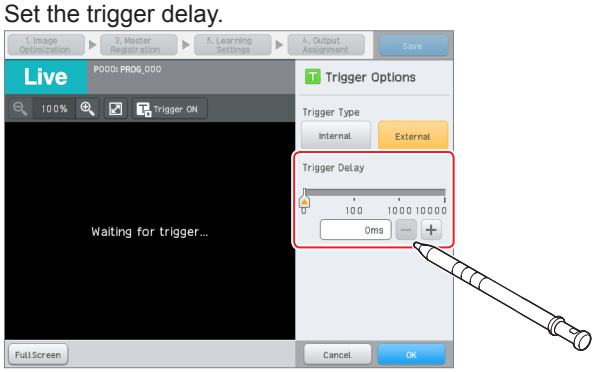
● **External trigger**



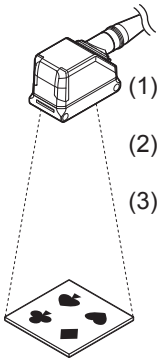


(1) Start imaging by inputting the trigger signal from another device.
When the trigger delay interval is set, the imaging start time will be delayed by the specified period.
(2) Performs internal processing after the imaging.
(3) Outputs the status result.

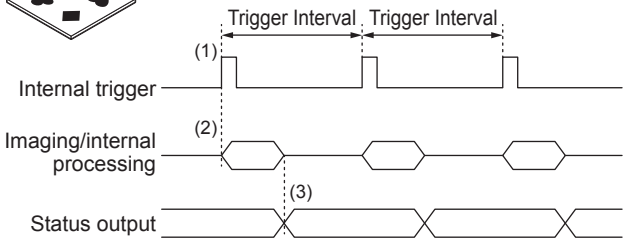
Set the trigger delay.



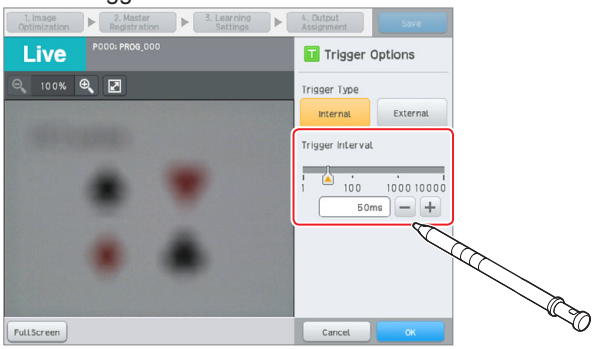
● **Internal trigger**



(1) The trigger interval is determined according to the trigger interval settings.
(2) Performs internal processing after the imaging.
(3) Outputs the status result.



Set the trigger interval.



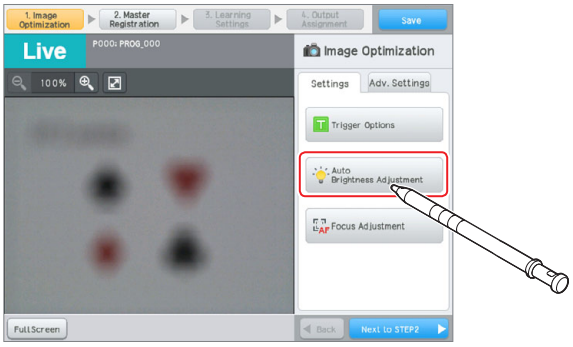
3 When setting is completed, tap the [OK] button.

The system returns to the main screen for the Image Optimization.

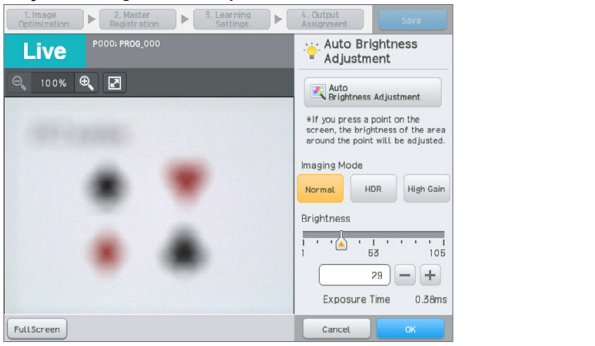
STEP1-2 Auto Brightness Adjustment

Image a target with the applicable brightness.

1 Tap the [Auto Brightness Adjustment] button.



After completing the adjustment, the [Auto Brightness Adjustment] screen opens.

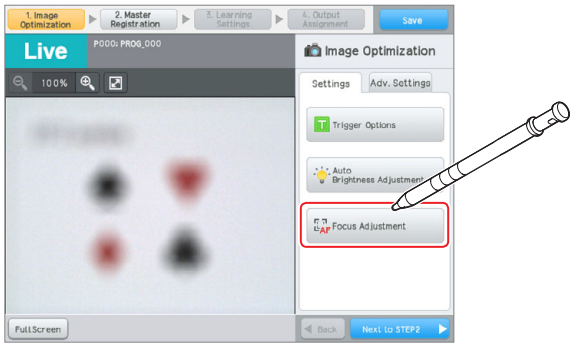


2 Tap the [OK] button.

The system returns to the main screen for the Image Optimization.

STEP1-3 Focus Adjustment

1 Tap the [Focus Adjustment] button.

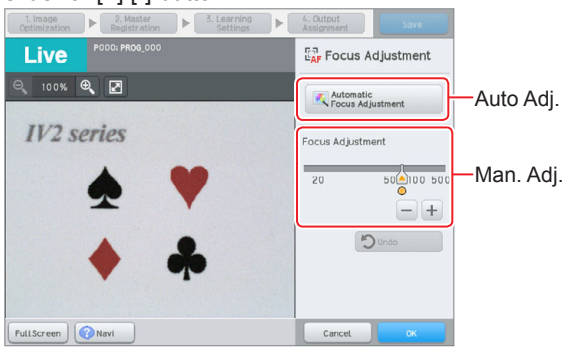


The focusing position is adjusted automatically.

2 Adjust the focusing position as needed.

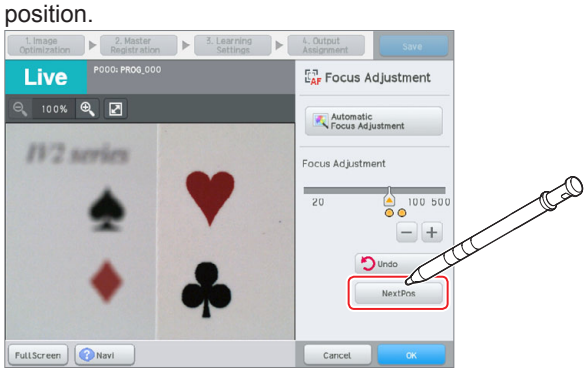
● **When the focusing position is to be adjusted again**

When adjusting automatically, tap the [Automatic Focus Adjustment] button.
When adjusting manually, perform adjustment with the slider or [+] [-] button.



● **When multiple focusing positions exist**

When there are multiple positions that can be focused, the sensor adjusts to the closest position to the sensor. The options of the position that can be focused will be indicated with (●) mark.
To change the focusing position to the optional position, tap the [Next Pos] or the options (●) of the focusing position.



3 When setting is completed, tap the [OK] button.

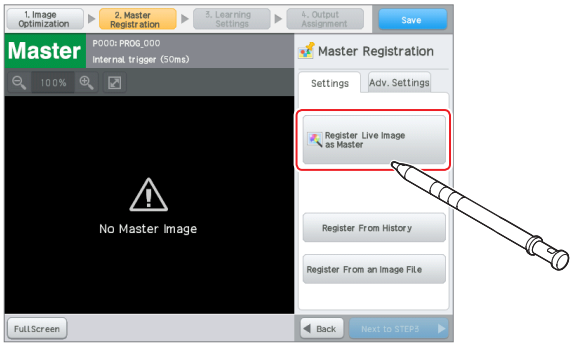
The system returns to the main screen for the Image Optimization.

4 Tap the [Next to STEP2] button to proceed to "STEP2 Registering the Master Image".

STEP2 Registering the Master Image

1 Place the target to be used as the reference of judgment in the imaging position.

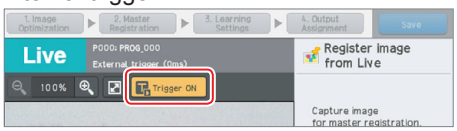
2 Tap the [Register Live Image as Master] button.



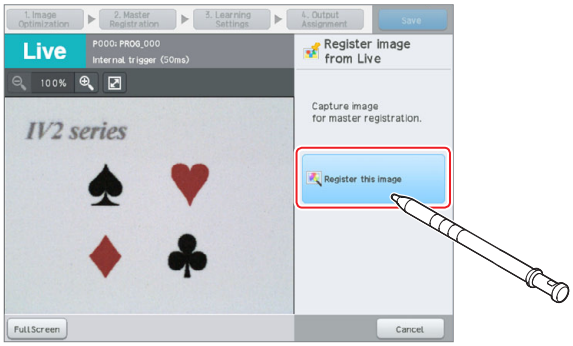
Switches to the [LIVE] screen.

3 Image the target.

If [Trigger Options] is set to [External], input an external trigger.
If an external trigger cannot be input, tap the [Trigger ON] button to take an image of the target with the internal trigger.

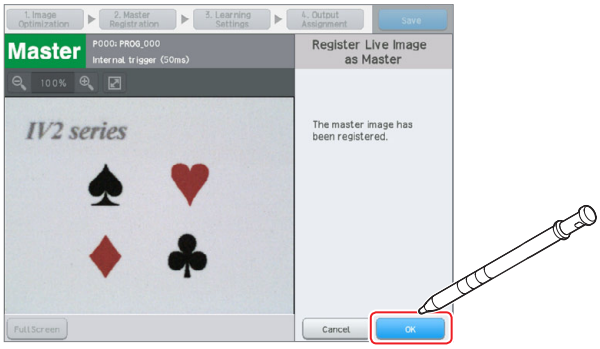


4 Confirm the displayed taken image and tap the [Register this image] button.



The confirmation dialog for the Master Registration appears.

5 Tap the [OK] button.



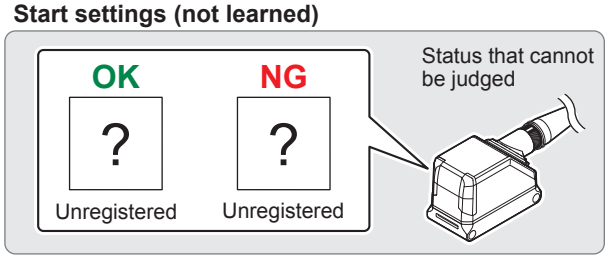
The master image will be registered and the sensor returns to the main screen for the Master Registration.

6 Tap the [Next to STEP3] button to proceed to "STEP3 Learning Settings (Learning Mode)" or "STEP3 Tool Settings (Standard Mode)".

STEP3 Learning Settings (Learning Mode)

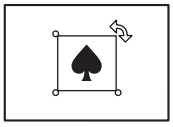
Learning mode is used to recognize the difference to identify automatically by registering “OK” images and “NG” images for learning.
By performing additional learning, stability can be improved as well.
“Performing the Auto Adjustment by the Additional Learning (Learning Mode)” (Page 17)

Start settings (not learned)

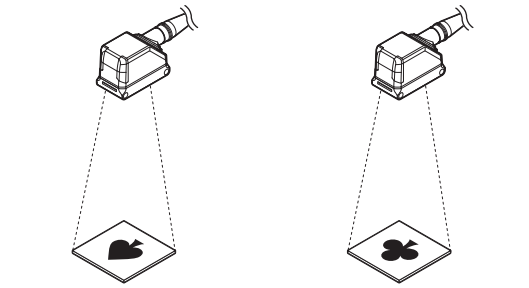


Learning Settings

“Detection Window Settings” (Page 7)

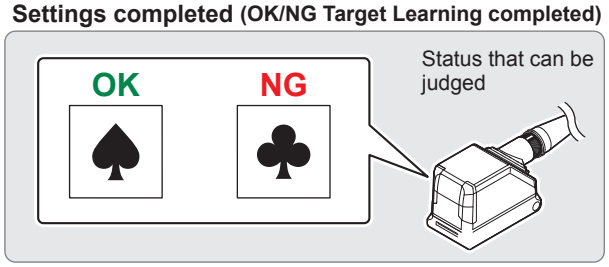


“OK/NG Target Learning” (Page 8)



Execute OK/NG Target Learning

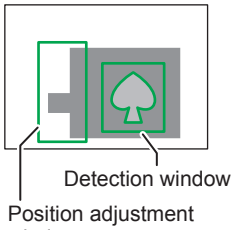
Settings completed (OK/NG Target Learning completed)



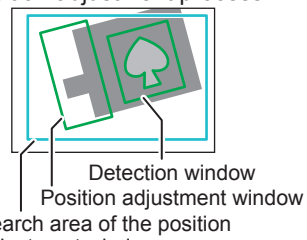
● Position Adjustment Window

This is the window to correct the differences in position determining (position gap) of a target to be examined.
The position adjustment is used in combination with the detection window.
“Correcting the Misaligned Target Position” (Page 13)

Window settings
Master Image

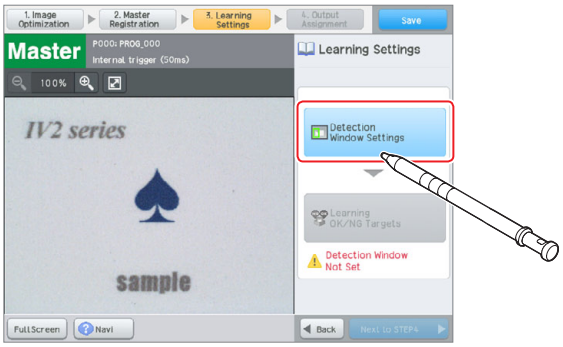


Processing during an operation
Position adjustment process

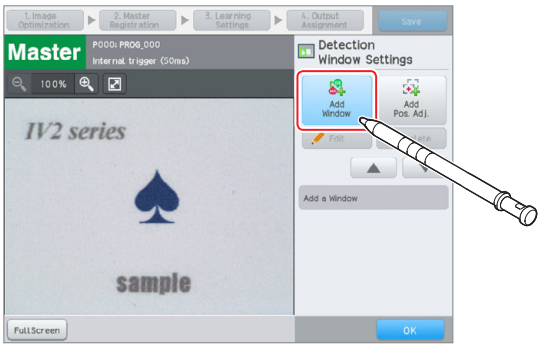


Detection Window Settings

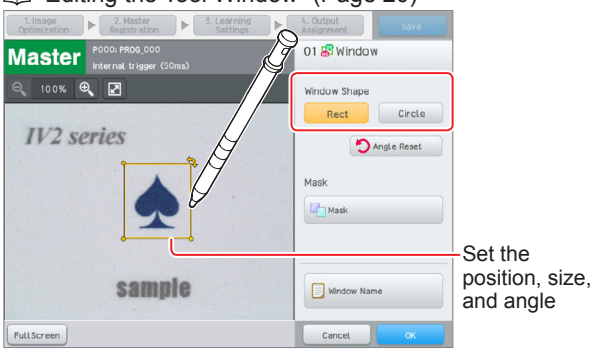
1 Tap the [Detection Window Settings] button.



2 Tap the [Add Window] button.



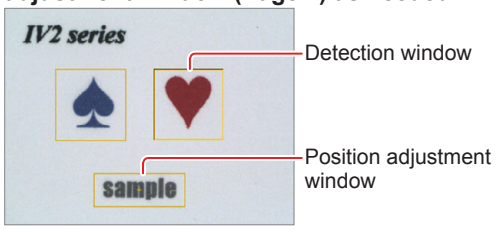
3 Select the detection window shape and set the position, size, and angle in accordance with a target.
“Editing the Tool Window” (Page 20)



Point **The detection window size should be set according to the size of the image where the difference between an “OK” and “NG” target is clear.**

4 Tap the [OK] button.
Returns to the [Detection Window Settings] screen.

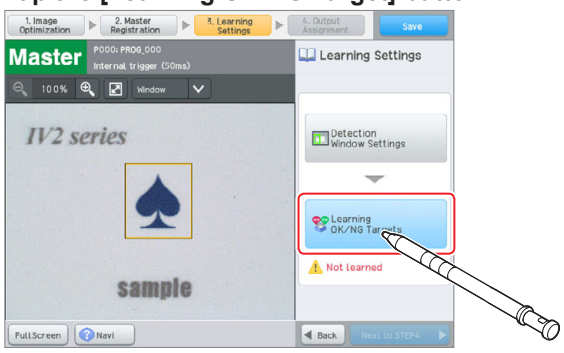
Point **Add the detection window and position adjustment window (Page 7) as needed.**



5 Tap the [OK] button.
Returns to the main screen of [Learning Settings].

OK/NG Target Learning

1 Tap the [Learning OK/NG Target] button.



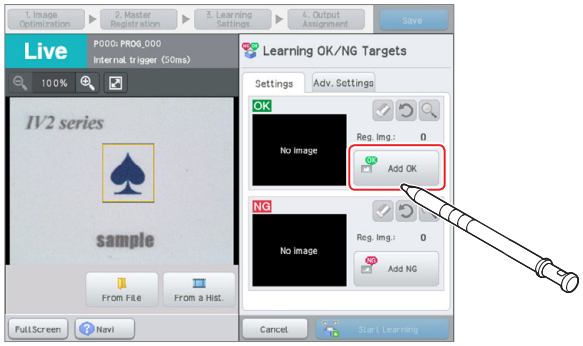
2 Image a target to be registered as OK.

If [Trigger Options] is set to [External], input an external trigger. If an external trigger cannot be input, tap the [T] button to take an image of the target with the internal trigger.

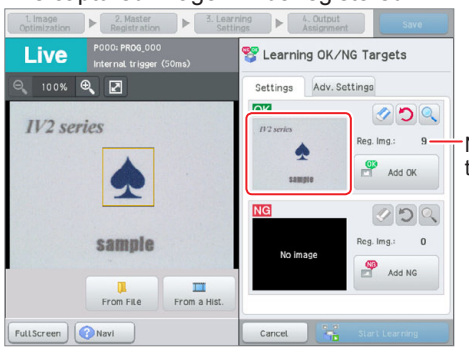
Point

If multiple detection windows are set, capture a target where all detection window judgments are OK.

3 Tap the [Add OK] button.



The captured image will be registered.



Number of the registered

Reference

- Multiple OK images can be registered.
- Learning can be made more effective by registering multiple images that are different in capture status (what is seen).
- If the [Variable Brightness] of the [Adv. Settings] tab is [ON], the sensor captures automatically 8 images whose brightnesses are changed for the first image.

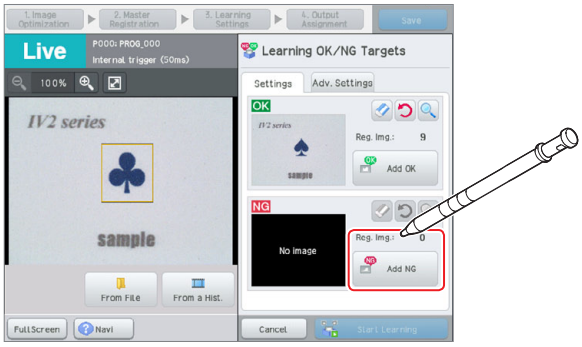
4 Image a target to be registered as NG.

The imaging method is the same as step 2.

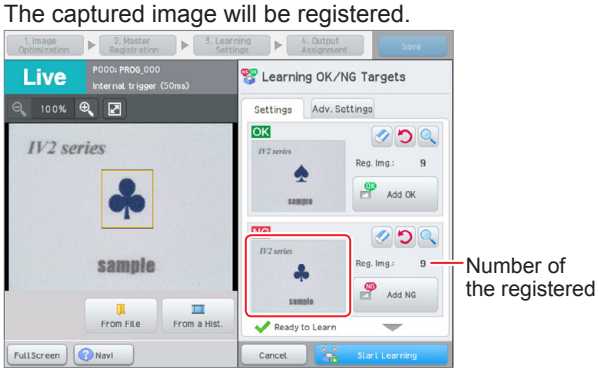
Point

- **If multiple detection windows are set, capture a target where all detection window judgments are NG.**
- **Make sure to register the target or background to be judged as NG. A target or background that is not registered may not be judged normally.**

5 Tap the [Add NG] button.



The captured image will be registered.

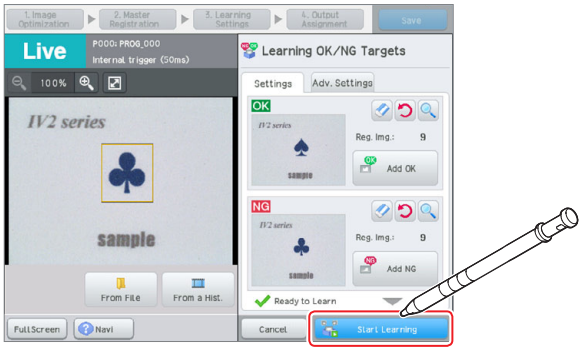


Number of the registered

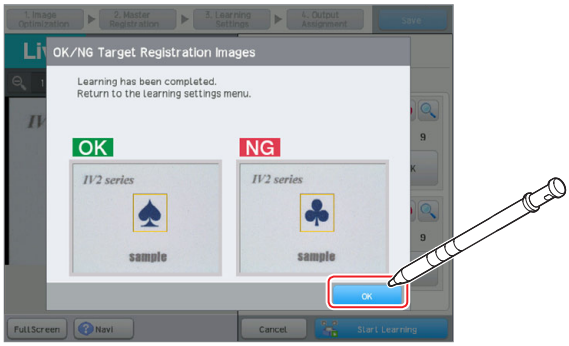
Reference

- Multiple NG images can be registered.
- Learning can be made more effective by registering multiple images that are different in capture status (what is seen).
- If the [Brightness Change Function] of the [Advanced Settings] tab is [ON], the sensor captures automatically 8 images whose brightnesses are changed for the first image.

6 Tap the [Start Learning] button.



7 Check the registered image and tap the [OK] button.



Returns to the main screen of [Learning Settings].

8 Tap the [Next to STEP4] button to proceed to "STEP4 Assigning the Output Content to the Output Line".

STEP3 Tool Settings (Standard Mode)

Types of tools

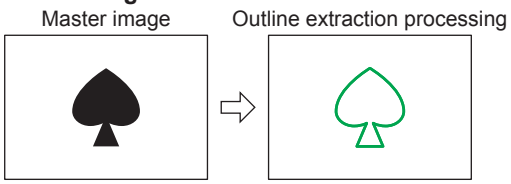
Reference For the details of the following tools, refer to “IV2 Series User’s Manual (Control Panel)”.

- Edge pixels
- Color Average/Brightness Average
- Width
- Diameter
- Edge
- Pitch
- High-speed position adjustment
- OCR
- Color Prohibition/Brightness Prohibition

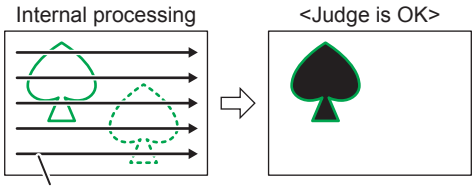
● Outline tool

A detection tool to calculate the matching rate for the target based on the outline information of a registered “OK” image.
Judges whether a target is OK or NG by setting the threshold for the matching rate.
“Judging with the Outline Tool” (Page 10)

Tool settings

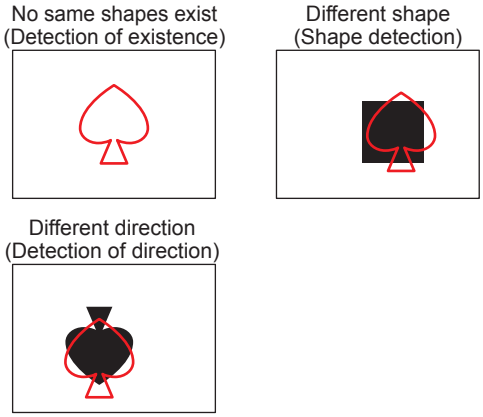


Processing and judgment during an operation



Searches the region for a target which has the outline of the same shapes as the outline of the “OK” image.

Example when the result was NG

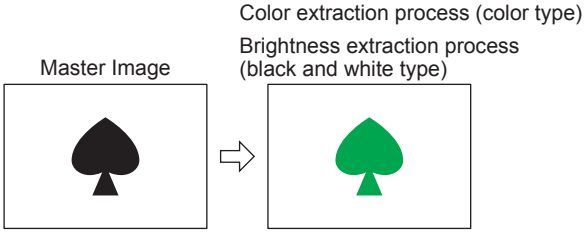


Reference The matching rate is indicated in 0 to 100. 100 indicates that an outline is completely matched. The matching rate decreases with more non-matching parts.

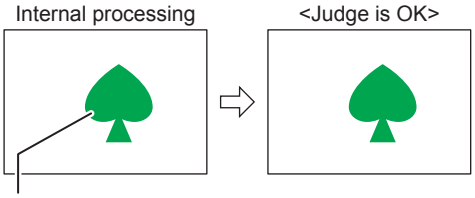
● Color Area/Area tool

A tool to calculate the matching rate of the area (number of pixels) of a target in comparison to the area (number of pixels) of a registered “OK” image (100%). Judges whether a target is OK or NG by setting the threshold for the matching rate.
If the sensor is a color type, the tool will be Color Area tool. The system judges the area for presence of pixels of a user-specified color.
If the sensor is a monochrome type, the tool will be the Area tool. The system judges the area for presence of pixels of a user-specified brightness.
“Judging by the Color Area/Area tool” (Page 11)

Tool settings

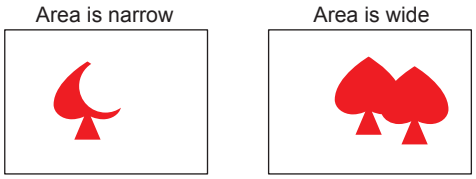


Processing and judgment during an operation



Compares the area of a target as defining an area of an “OK” image to 100 %.

Example when the result was NG



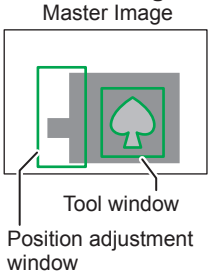
Reference

- The matching rate is indicated in 0 to 100 (default). 100 indicates that an area is completely matched. The matching rate decreases as the area of a target narrows.
- The setting for the display range and threshold for the matching rate can be changed to 0 to 200 or 0 to 999. Also, a target can be judged by setting an upper limit for the threshold.

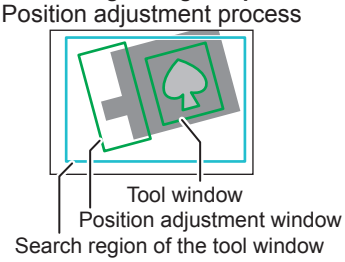
● Position adjustment tool

A tool used to correct for differences in position of a target. The position adjustment is used in conjunction with other detection tools.
“Correcting the Misaligned Target Position” (Page 13)

Window settings

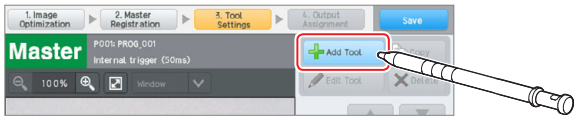


Processing during an operation

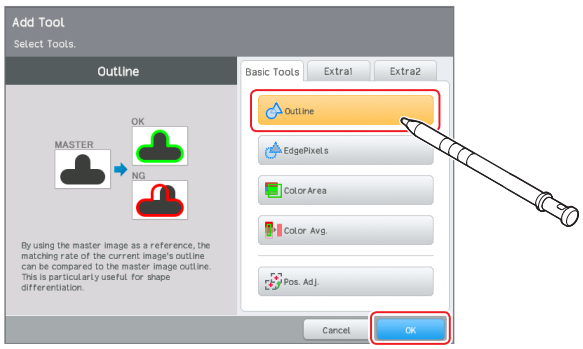


Judging with the Outline Tool

1 **Tap the [Add Tool] button.**

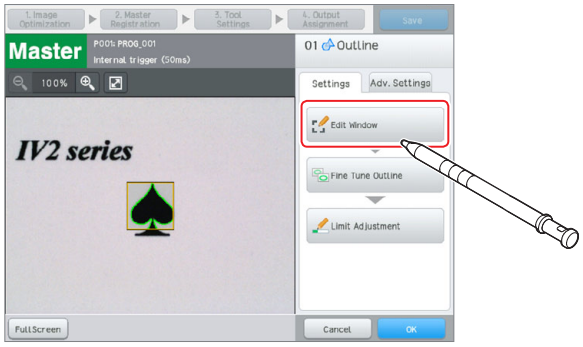


2 **Select the [Outline] and tap the [OK] button.**



The main screen for the Outline tool settings opens.

3 **Tap the [Edit Window] button.**

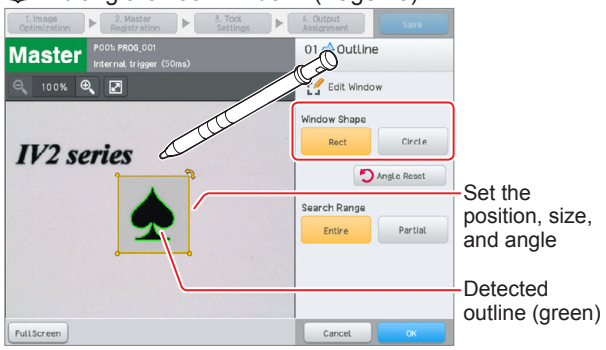


The screens to set [Window Shape] and [Search Region] appear.

Reference By tapping the tool window, the window edit can be performed as well.

4 **Select a tool window shape, position, size, and angle in accordance with the target.**

"Editing the Tool Window" (Page 20)



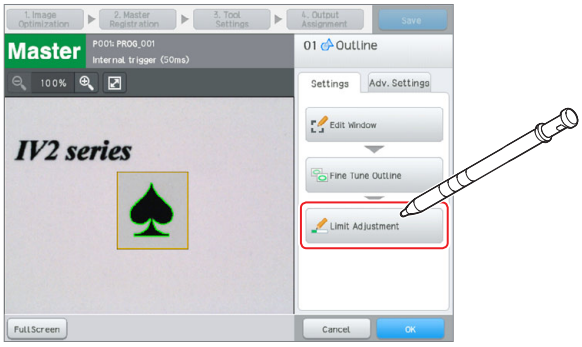
The detected outline is displayed in green.

Point **Set the position and size of the tool window according to the part that is dissimilar in shape.**

5 **When setting is completed, tap the [OK] button.**

The system returns to the main screen for the Outline tool settings.

6 **Tap the [Limit Adjustment] button.**



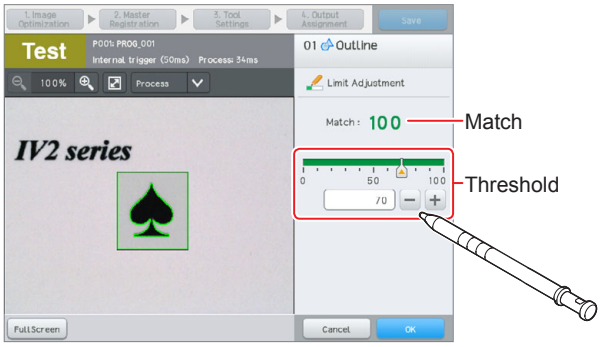
The sensor changes to Test mode.

7 **Take an "OK" image and a "NG" image.**

If [Trigger Options] is set to [External], input an external trigger.
If an external trigger cannot be input, tap the [Trigger ON] button to take an image of the target with the internal trigger.

8 **Adjust the threshold for anomaly detection by checking the matching rate.**

<Setting example>
If the matching rate of an "OK" image is higher than 90 and if the matching rate of a "NG" image is lower than 40, set the threshold to 65, the value intermediate between 40 and 90.



Reference
- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- In accordance with the status result of the tool, the display color of the tool changes.
- The threshold can be changed by using the slider or inputting values.
- The threshold can also be set by [Limit Adjustment] on the sensor setup menu screen.

"Adjusting Thresholds for Judgment" (Page 19)

9 **After setting is completed, tap the [OK] button.**

The system returns to the main screen for the Outline tool settings.

Reference Adjust the following settings as needed.
- Settings for the search region
- Settings for disabling outlines
- Setting for a sensitivity
- Settings for a tool name
- Advanced settings for the Outline tool

10 **Tap the [OK] button.**

The system returns to the main screen for tool settings.

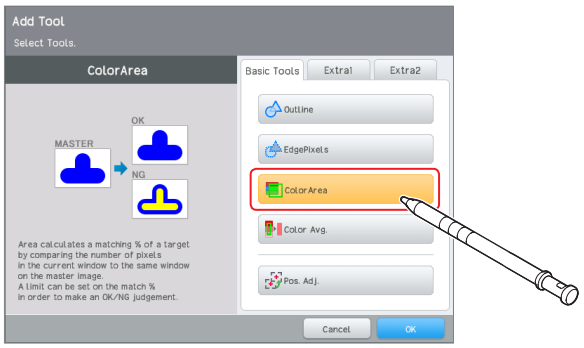
11 **After tool settings are completed, tap the [Next to STEP4] button to proceed to "STEP4 Assigning the Output Content to the Output Line".**

Judging by the Color Area/Area tool

1 **Tap the [Add Tool] button.**

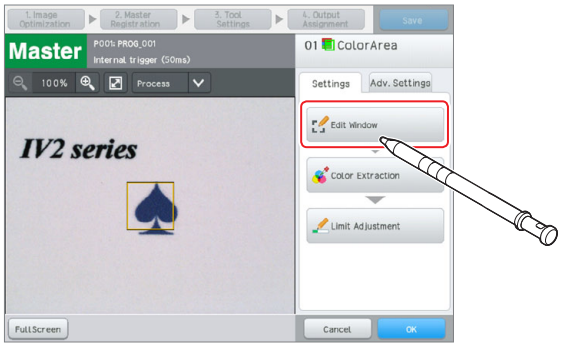


2 **Select [ColorArea] (color type) or [Area] (black and white type) and tap the [OK] button.**



The main screen for the ColorArea/Area tool settings appears.

3 **Tap the [Edit Window] button.**

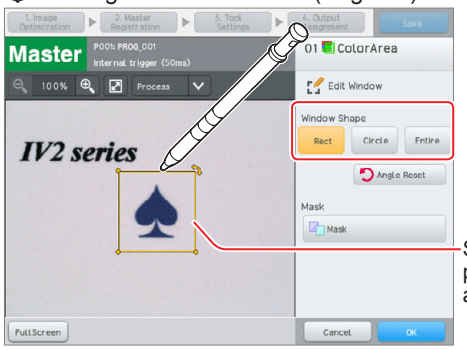


The screens to set [Window Shape] and [Mask] appear.

Reference By tapping the tool window, the window edit can be performed as well.

4 **Select the tool window shape, position, size, and angle according to the desired target.**

“Editing the Tool Window” (Page 20)



Set the position, size, and angle

5 **Tap the [OK] button.**

The system returns to the main screen for the ColorArea/Area tool settings.

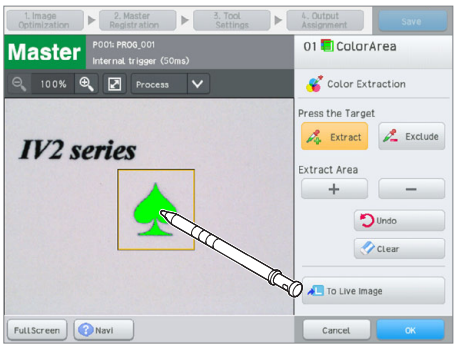
6 **Set the area from the target to be extracted.**

● **For color type**

Tap the [Color Extraction] button.

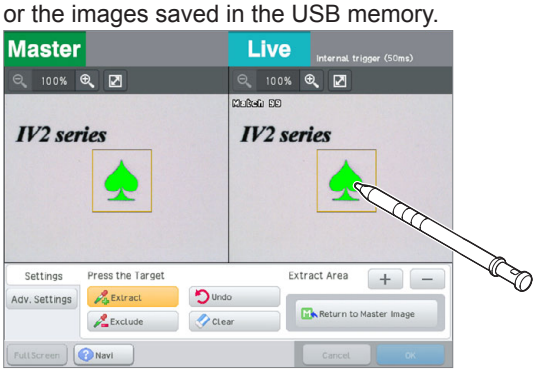


The screen to select a color to be extracted opens. Tap the color to be the reference of judgment for the color area.



The tapped color will be extracted.

- If the areas of color that have not been extracted are tapped repeatedly, the extraction range can be adjusted.
- Tap the [Exclude] button to specify a color excluded from the extracted color.
- Tap the [+]/[-] button of the extraction area, and the range of color to be extracted can be expanded/reduced.
- When a color extraction is to be performed again, tap the [Clear] button and then tap the color to be the reference of judgment.
- By tapping the [To Live Image] button, the range of color can be extracted based on the image saved as the Live Image, the images saved in the image history, or the images saved in the USB memory.

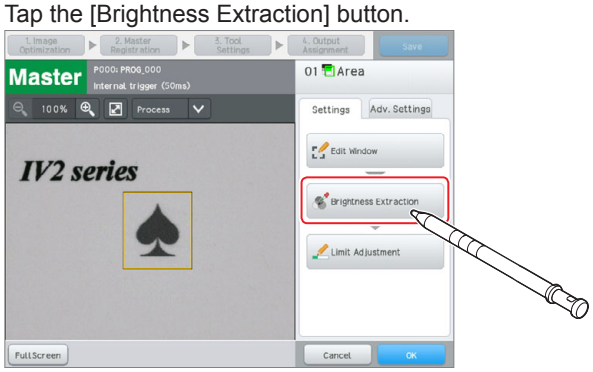


After setting is completed, tap the [Return to Master Image] button.

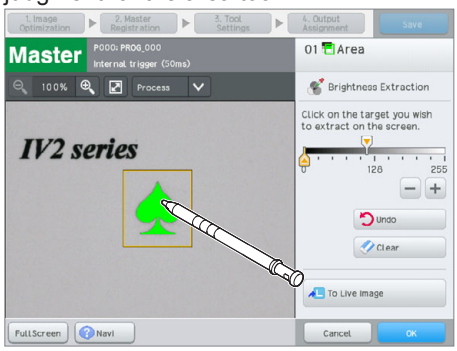
The system returns to the main screen for [Color Area].

● **For monochrome type**

Tap the [Brightness Extraction] button.

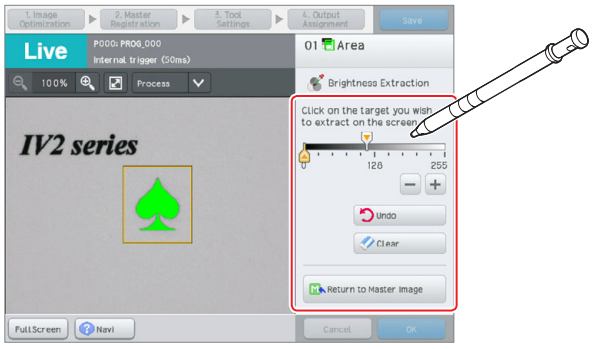


The screen to select brightness to be extracted opens.
Tap the brightness that will be used as the reference for judgment for the area tool.



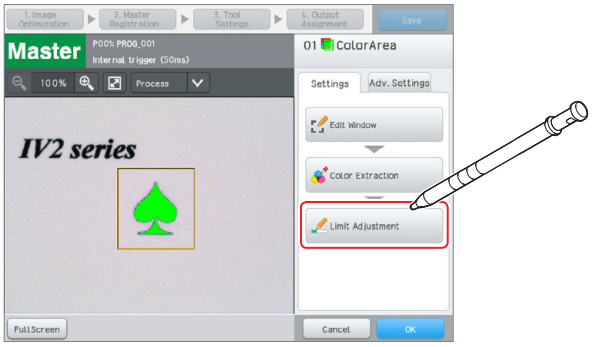
The tapped brightness will be extracted.

- If areas of brightness that have not been extracted are tapped, the extraction range can be expanded.
- Adjust the slider, and the range of the brightness to be extracted can be expanded/reduced.
- When brightness extraction is not sufficient and needs to be performed again, tap the [Clear] button and then tap the brightness to be used as the reference for judgment again.
- By tapping the [To Live Image] button, the range of the brightness to be extracted can be extracted from the Live image of the target.



After setting is completed, tap the [Return to Master Image] button.
The system returns to the main screen for [Area].

7 Tap the [Limit Adjustment] button.



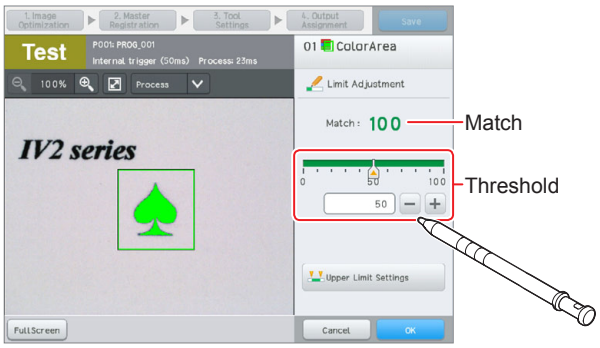
The sensor changes to Test mode.

8 Take an “OK” image and a “NG” image.

If [Trigger Options] is set to [External], input an external trigger.
If an external trigger cannot be input, tap the [Trigger ON] button to take an image of the target using the internal trigger.

9 Adjust the threshold for anomaly detection by checking the matching rate.

<Setting example>
If the matching rate of an “OK” image is higher than 90 and if the matching rate of a “NG” image is lower than 40, set the threshold to 65, the value intermediate between 40 and 90.



Reference

- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- In accordance with the status result of the tool, the display color of the tool changes.
- The threshold can be changed by using the slider or inputting values.
- The threshold can also be set by [Limit Adjustment] on the sensor setup menu screen.

“Adjusting Thresholds for Judgment” (Page 19)

10 After setting is completed, tap the [OK] button.

The system returns to the main screen for the ColorArea/Area tool settings.

Reference

Adjust the following settings as needed.

- Mask
- Settings for the upper limit settings
- Settings for a tool name
- Advanced function settings for the Color Area/Area tool

11 Tap the [OK] button.

The system returns to the main screen for tool settings.

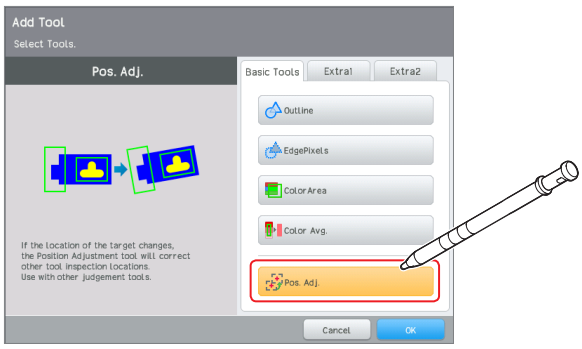
12 After tool settings are completed, tap the [Next to STEP4] button to proceed to “STEP4 Assigning the Output Content to the Output Line”.

Correcting the Misaligned Target Position

1 Tap the [Add Tool] button.

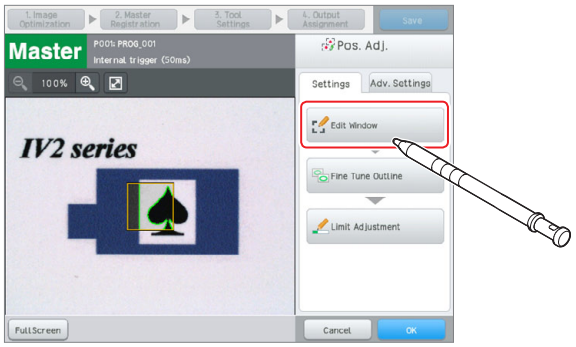


2 Select [Pos. Adj.] and tap the [OK] button.



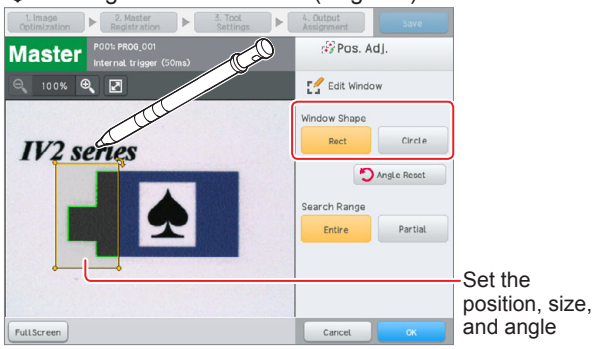
The main screen for the Position Adjustment tool settings opens.

3 Tap the [Edit Window] button.



4 Select the tool window shape, position, size, and angle according to the target.

"Editing the Tool Window" (Page 20)



The detected outline is displayed in green.

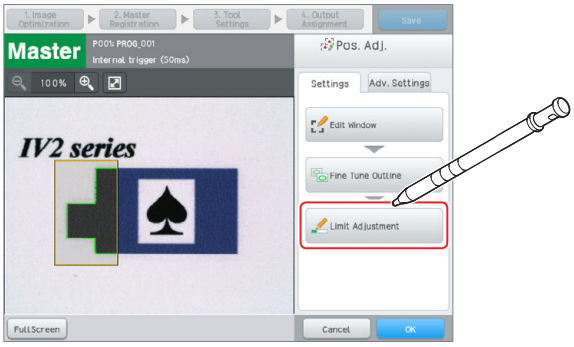
Point

Set the position and size of the position adjustment tool to capture as much of a part that is common amongst all targets as possible.

5 When setting is completed, tap the [OK] button.

The system returns to the main screen for the Position Adjustment tool settings.

6 Tap the [Limit Adjustment] button.

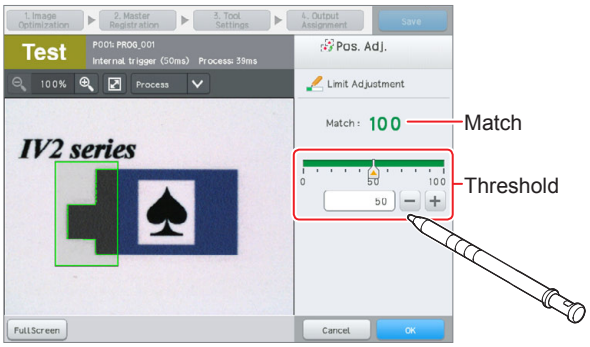


The sensor changes to Test mode.

7 Image the target.

If [Trigger Options] is set to [External], input an external trigger.
If an external trigger cannot be input, tap the [Trigger ON] button to take an image of the target with the internal trigger.

8 Adjust the threshold used to judge whether or not the position adjustment succeeds by checking the matching rate.



Reference

- If there are many variations of the target shape that the position adjustment window has been set to, set the threshold to a lower matching rate.
- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- In accordance with the status result of the tool, the display color of the tool changes.
- The threshold can be changed by using the slider or inputting values.
- The threshold can also be set by [Limit Adjustment] on the sensor setup menu screen.

"Adjusting Thresholds for Judgment" (Page 19)

9 When setting is completed, tap the [OK] button.

The system returns to the main screen for the Position Adjustment tool settings.

Reference

Adjust the following settings as needed.

- Settings for the search region
- Settings for disabling outlines
- Setting for a sensitivity
- Advanced function settings for the Position Adjustment tool

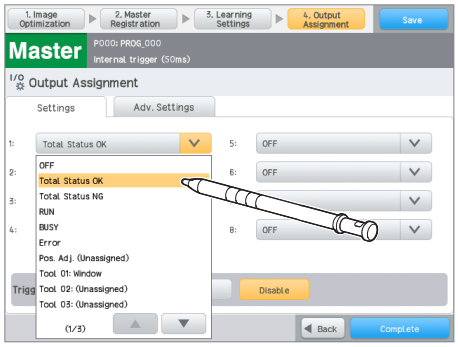
10 Tap the [OK] button.

The system returns to the main screen for tool settings.

11 After tool settings are completed, tap the [Next to STEP4] button to proceed to "STEP4 Assigning the Output Content to the Output Line".

STEP4 Assigning the Output Content to the Output Line

1 Tap the item name of an output line and select the output item.

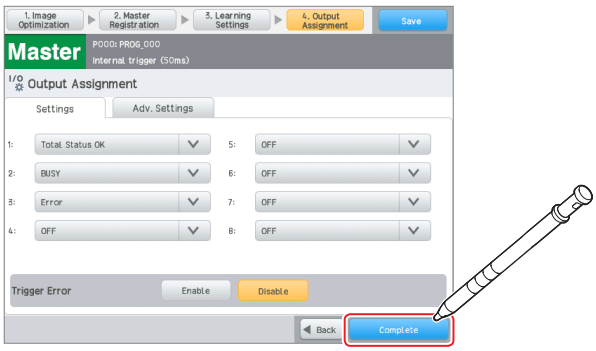


Setting range	Description
OFF	Do not output. Output will be constantly OFF.
Total Status OK	When the total status result of the tools which have been set is OK, the output turns ON. The total status condition can be selected from the following: • All Tools OK • Any Tool OK • Logic 1/2/3/4
Total Status NG	When the total status result is NG, the output turns ON.
RUN	When the sensor is running and no system error has occurred, the output turns ON.
BUSY	The output turns ON in the following cases. • Judgment process in progress (capture process/image process) • Switching programs • Registering the external master image • Data transferring to an SD card (in the case of settings enabled)
Ready	The output turns ON when the trigger can be accepted.
Strobe	When the status result is updated, the output turns ON.
Error	The output turns ON when the following errors occur. • System error • Startup memory readout error • Program switching error • External master registration error • SD card access error The following errors are output when settings are [Enable]. • Trigger Error • Strobe error • FTP error • SD card transfer error • SNTP sync error
SD card error	The output turns ON when the following errors occur. • SD card access error • SD card transfer error (when settings are [Enable])
Pos. Adj.	When the position adjustment process has occurred normally, the output turns ON.
Tool 01 to 16	When the specified detection window/tool judgment is OK, the output turns ON. Status results can be output for each detection window/tool.
Logic 1 to 4	When the status result of the specified logic is OK, the output turns ON.

● Default value

OUT1	Total Status OK (N.O.)
OUT2	BUSY (N.O.)
OUT3	Error (N.C.)
OUT4	OFF
OUT5	
OUT6	
OUT7	
OUT8	
Trigger Error	Disable OFF
Strobe error	
FTP error	
SD card transfer error	
SNTP sync error	

2 When setting is completed, tap the [Complete] button.



When changing the program settings, the confirmation dialog to save opens.

3 Tap the [Yes] button.

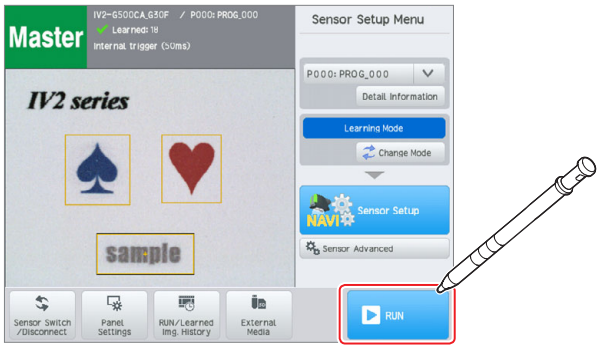
The settings in the Settings Navigator will be saved and the system returns to the sensor setup menu screen.

Reference

- By tapping the [No] button, the confirmation dialog to cancel the settings opens. By tapping the [OK] button, the setting contents close without saving the settings.
- By tapping the [Cancel] button, the system returns to the Settings Navigator screen.

Starting Operation

1 Tap the [RUN] button.

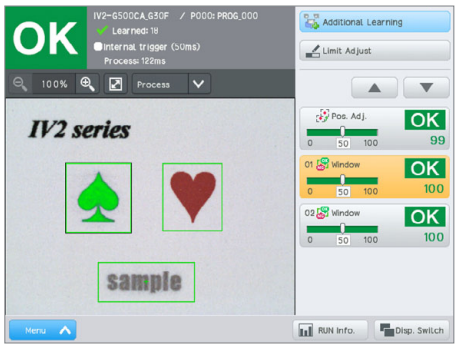


The run screen opens and operation starts.

Point

When selecting the external trigger, input the trigger signal from external devices.
“STEP1-1 Setting the Trigger Options” (Page 5)

2 Confirm that the operation screen opens on the control panel.



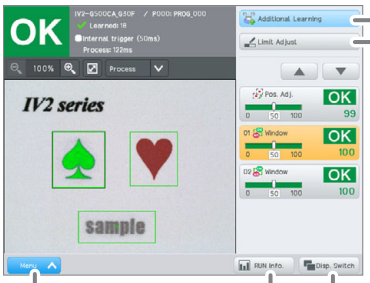
Point

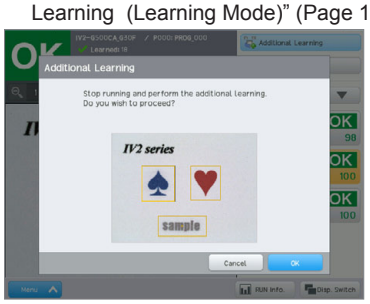
If the image or status result is not updated, refer to “IV2 Series User’s Manual (Control Panel)”.

Operation of the Operation Screen

Additional learning (learning mode only)
Perform additional learning of images.
“Performing the Auto Adjustment by the Additional Learning (Learning Mode)” (Page 17)

Run screen

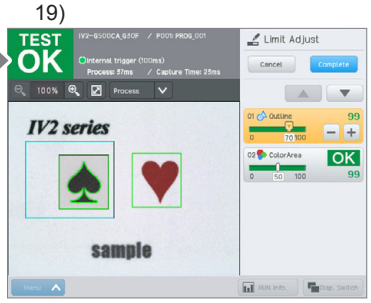




Show/Hide of the menu display

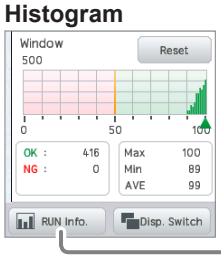
Display Switch
Switches the display method of the operation screen.
For details, refer to “IV2 Series User’s Manual (Control Panel)”.

Limit Adjustment
Adjusts the judgment threshold.
“Adjusting Thresholds for Judgment” (Page 19)

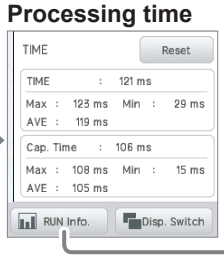


Operation Information
Displays the operation information.

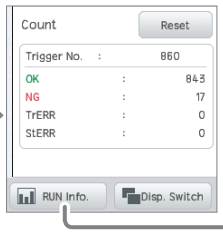
Histogram



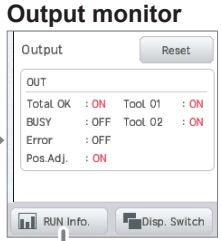
Processing time



Count



Output monitor

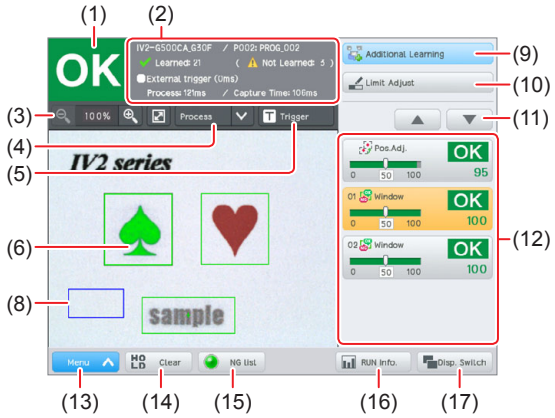


Ⓐ

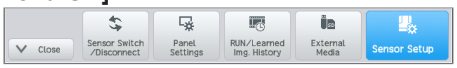
Menu Display of the Operation Screen

● For a [Learning Mode] program

[Menu OFF]

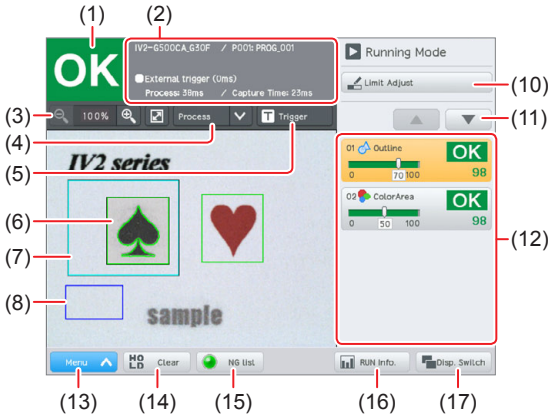


[Menu ON]

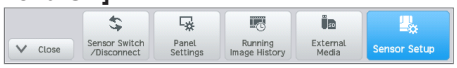


● For a [Standard Mode] program

[Menu OFF]



[Menu ON]



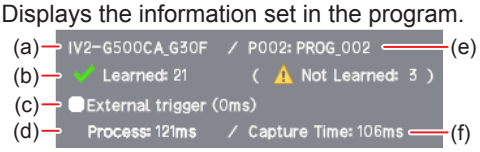
(1) OK/NG display

Displays the total status result.
The total status condition can be selected from [All Tools OK] / [Any Tool OK] / [Logic 1] to [Logic 4].

OK	Displayed when the total status result is OK.
NG	Displayed when the total status result is NG.
NG HOLD	Displayed when the total status result is NG where the NG hold function is set to [ON]. Holds the screen when judged as NG.

(2) Program information

Displays the information set in the program.



No.	Items
(a)	**Device name of sensor** Displays the device name of the sensor.
(b)	**Number of learned images (Learning mode only)** Displays the number of learned images and images not reflected by the learning algorithm.
(c)	**Trigger type (Trigger interval)** Displays the trigger type and interval.
(d)	**Processing time** Displays the time required for the sensor to process an image and output the status result. This is the time between receiving an external or internal trigger and outputting the status result. If the output setting is [One-Shot], the ON-delay time is not included.
(e)	**Program number: Program name** Displays the program number and program name of the selected program.
(f)	**Capture Interval** Displayed when the trigger accept timing is set to [Link with READY Output]. Displays the shortest interval that the sensor can accept the external trigger or internal trigger.

(3) Image tool bar

Tools to expand/reduce an image size are displayed.

(4) Display method of the detection window/tool window

Selects the display method of the detection window/tool window.

(5) [Trigger] button

If [External] is selected for [Trigger Options] or [Internal Trigger Control with IN1] is set to [Yes], the [Trigger] button will be displayed. A trigger is issued with each tap of the button. This button is used when the external trigger cannot be input.
The button can be set to be displayed or hidden.

(6) Detection window/Tool window

Displays a detection window/tool region that has been set. A detection window/tool region with a green frame has a status result of OK and one with a red frame has a status result of NG.
The detection window/tool window selected can be changed by tapping a different tool region.

(7) Search Range

If the search range of the selected tool is set to [Partial], the search range will be displayed with a light blue frame. If a position adjustment is set, the search range after position adjustment will be displayed.

(8) Brightness correction region

When the brightness correction is being set, the brightness correction region will be displayed with a blue frame.

(9) [Additional learning] button (learning mode only)

Includes the image displayed on screen into the learning algorithm.

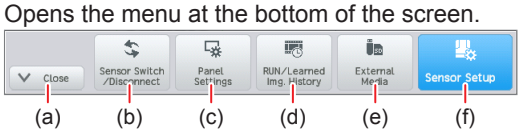
“Performing the Auto Adjustment by the Additional Learning (Learning Mode)” (Page 17)

(10) **[Limit Adjust] button**
Allows for the manual adjustment of the threshold of the detection window/tool.
“Adjusting Thresholds for Judgment” (Page 19)

(11) **Selection button**
Changes the selected detection window/tool window in the direction that was selected.

(12) **Detection window/tool list**
Displays the detection window/tool list for the items set in the program. The content that is displayed differs depending on the screen display method.

(13) **[Menu] button**
Opens the menu at the bottom of the screen.



No.	Name/function
(a)	**[Close]** Closes the menu.
(b)	• **[Change Connected Snsr/Terminate]** When [Direct Connection (2 units or more)] or [Network Connection] is selected, the [Change Connected Snsr/Terminate] button can be selected. The [Sensor Switch/Disconnect] button is used to change the sensor to which the control panel is connected. In addition, the control panel and the sensor can be disconnected. • **[Disconnect Sensor]** This can be selected at direct connection (1 unit). The control panel and the sensor can be disconnected.
(c)	**[Monitor Settings]** Opens the settings for the control panel.
(d)	**[Running/Learning Image History]** Displays the image history and learned image history (learning mode only).
(e)	**[External Media]** Opens the menu for the USB memory and SD card.
(f)	**[Sensor Setup]** The sensor exits Run Mode and the [Sensor Setup Menu] screen is displayed.

(14) **[HOLD Clear] button**
When the [NG Hold Function] is [ON] and the screen is held after the sensor detects a NG target, this button releases the NG Hold.

(15) **[NG Occurrence Sensor] button**
When the function [List of NG Sensor Occurrences] is used and a sensor on which a NG has occurred is registered on the list, the button will be displayed.
The number of NG occurrences on the registered sensor is displayed.

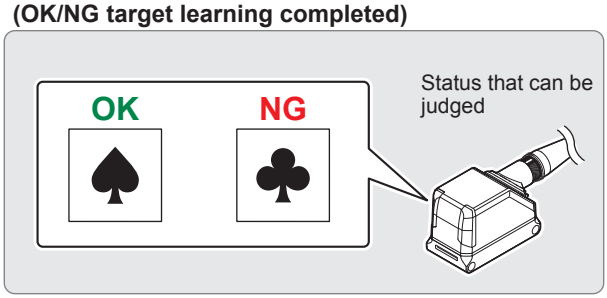
(16) **[RUN Info.] button**
Opens and displays the operation information of the sensor in the lower right of the screen.

(17) **[Display Switch] button**
Switches the display method of the operation screen.

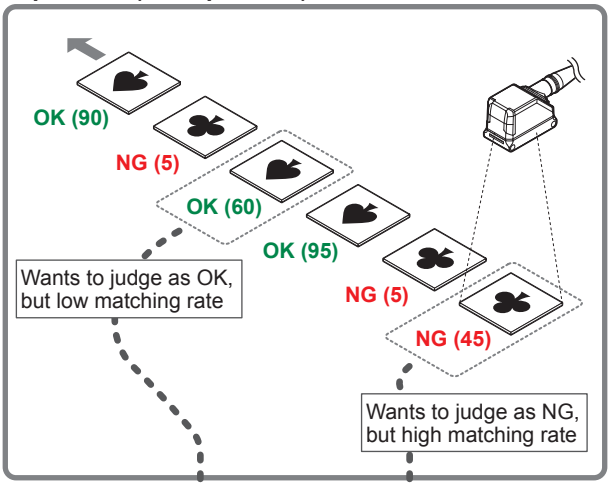
Performing the Auto Adjustment by the Additional Learning (Learning Mode)

By imaging a target where the detection is not stable or by using images from the history to learn, judgment can be adjusted automatically. By performing the additional learning of multiple images, the stability is improved automatically.

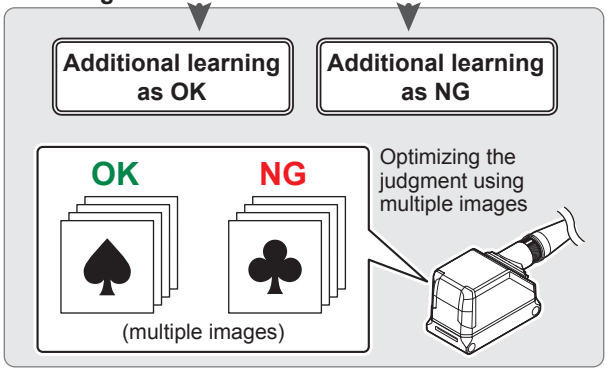
Settings completed
(OK/NG target learning completed)



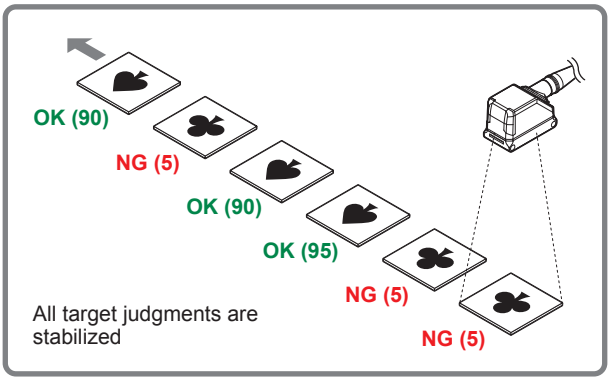
Operation (test operation)



Additional Learning



RUN



Reference For details for “additional learning” with high effectiveness, refer to “IV2 Series User’s Manual (Control Panel)”.

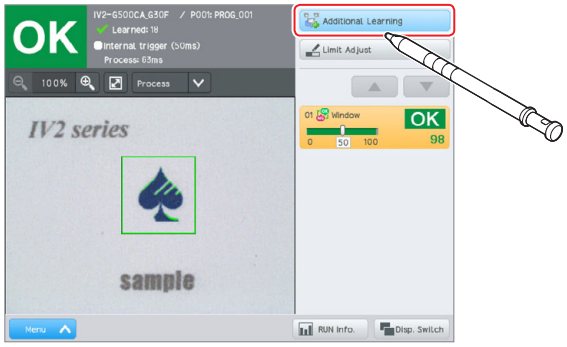
Additional learning by taken image

1 Display the operation screen.

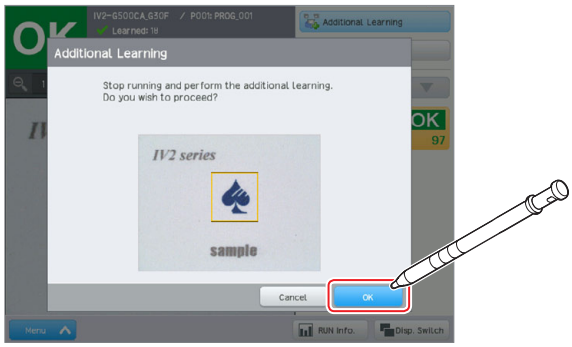
“Starting Operation” (Page 15)

2 Capture an image where the target is the object desired for additional learning.

3 Tap the [Additional Learning] button.

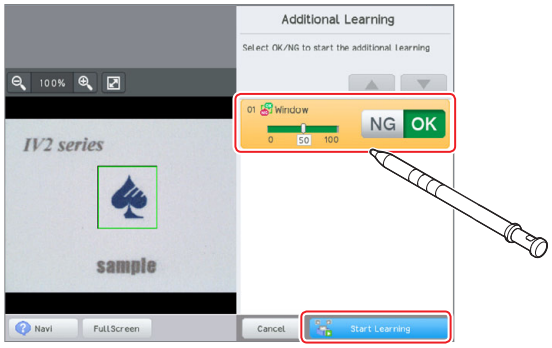


4 Tap the [OK] button.



The operation will stop.

5 Confirm the condition of the detection windows. Change the status result as needed, then tap the [Start Learning] button.



Point **When multiple detection windows are set, confirm/change all status results for the detection windows.**

The confirmation screen opens.

6 Tap the [OK] button.

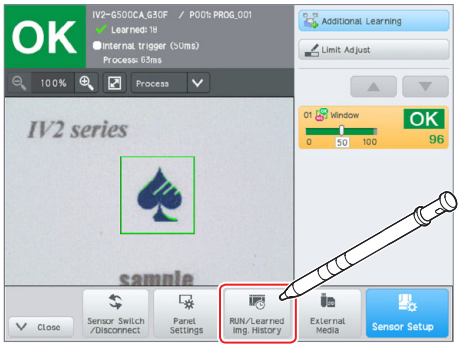
Learning will be performed.

7 After learning has been completed, tap the [OK] button.

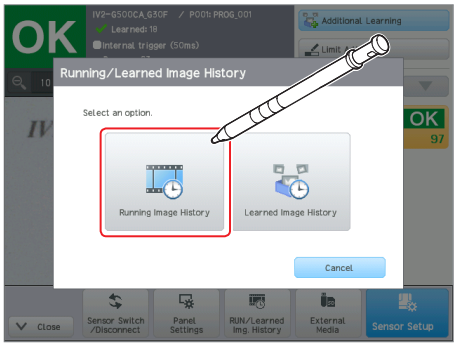
Returns to the Test screen.

Additional Learning from the running image history

1 Display the menu, and tap the [Running/Learned Image History] button.



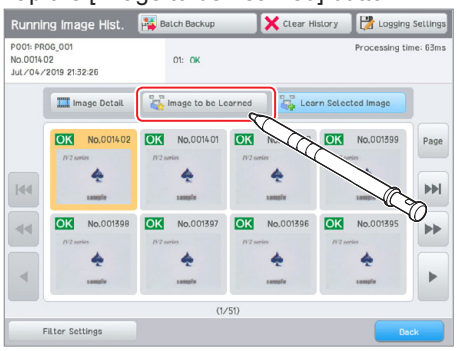
2 Tap the [Running Image History] button.



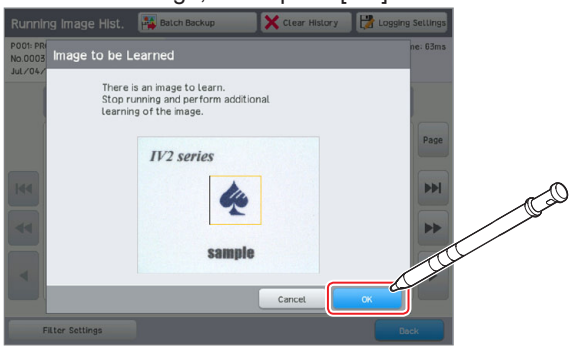
3 Select an image for additional learning.

● **When using [Image to be Learned]**

Tap the [Image to be Learned] button.



Images which have high impact on the learning algorithm are displayed automatically.
Confirm the image, and tap the [OK] button.

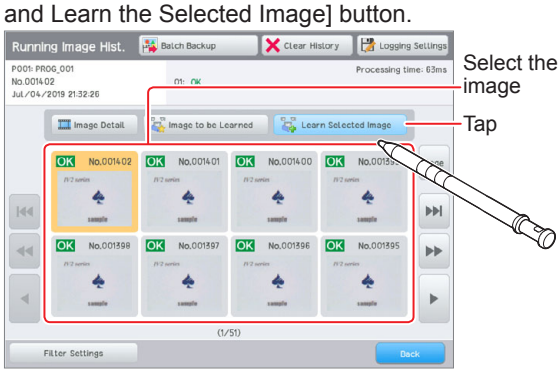


Reference The confirmation screen for stopping operation during Run mode will be displayed. Tap the [OK] button, and stop operation.

The [Additional Learning] screen opens.

● **When specifying an image for additional learning**

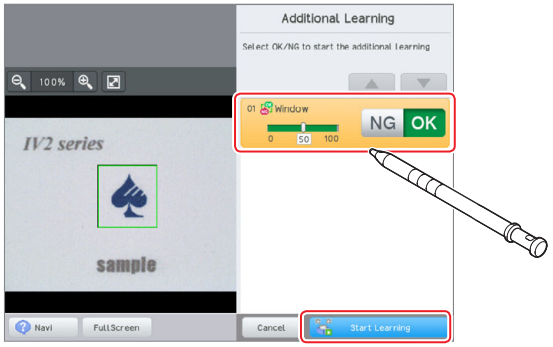
Select the image for additional learning, and tap the [Add and Learn the Selected Image] button.



Reference The confirmation screen for stopping the operation during Run mode will be displayed. Tap the [OK] button, and stop operation.

The [Additional Learning] screen opens.

4 Confirm the condition of the detection windows. Change the status result as needed, then tap the [Start Learning] button.



Point **When multiple detection windows are set, confirm/change all status results for the detection windows.**

5 Tap the [OK] button on the confirmation screen.

Learning will be performed.

6 After learning has been completed, tap the [OK] button.

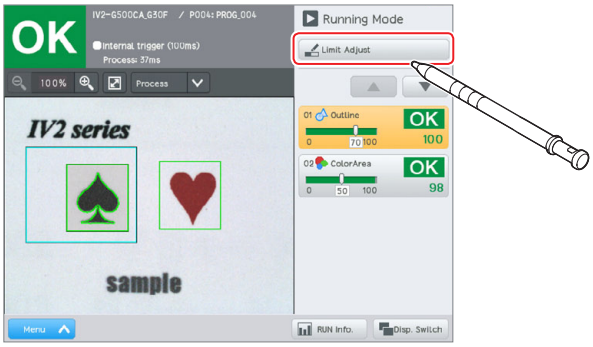
Returns to the [Running Image History] screen.

Adjusting Thresholds for Judgment

1 Display the operation screen.

“Starting Operation” (Page 15)

2 Tap the [Limit Adjust] button.



The confirmation screen opens.

3 Tap the [Yes] button.

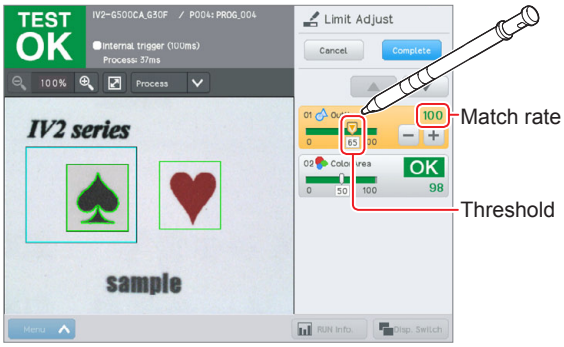
The operation stops and turns to “Test Operation”.

4 Image an “OK” or “NG” image to be the reference of judgment.

If [Trigger Options] is set to [External], input an external trigger.
If an external trigger cannot be input, tap the [Trigger ON] button to take an image of the target using the internal trigger.

5 Adjust the threshold by checking the matching rate.

<Setting example>
If the matching rate of an “OK” image is higher than 90 and if the matching rate of a “NG” image is lower than 40, set the threshold to 65, the value intermediate between 40 and 90.



Reference
- Select the tool to adjust the threshold when multiple tools are set in the program.
- A target is detected as OK if the matching rate is greater than the threshold, and detected as NG if the matching rate is lower than the threshold.
- The display color of the tool changes according to the status result of the tool.
- The threshold can be changed by using the slider or by inputting values.
- After the threshold is changed, a target is judged using the new threshold for the judgment process.

6 After adjustment is completed, tap the [Complete] button.

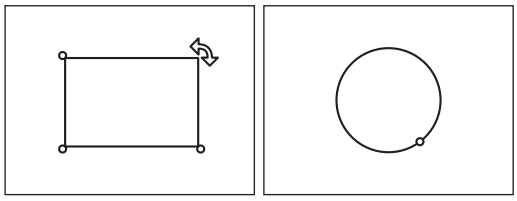
Returns to the Test screen.

Editing the Tool Window

● Selecting the shape of the tool window

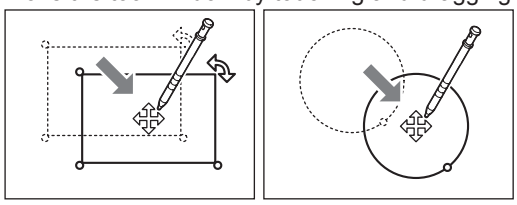
In the screen to set the detection tool, tapping the [Window Shape] button displays the screen to select the tool window shape.
[□ Rect] or [○ Circle] can be selected.

□Rect ○Circle



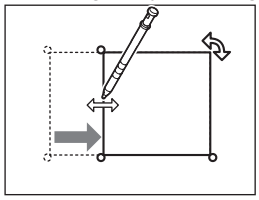
● Moving the tool window

By tapping inside the tool window, ✥ will be displayed. Move the tool window by touching and dragging it.

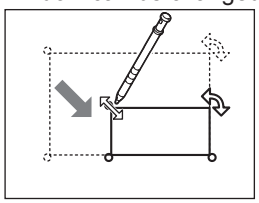


● Changing the size of the tool window

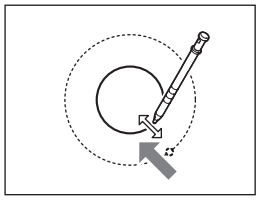
By touching either side of the tool window, ↕ or ↔ will be displayed. The height or width of the tool window can be changed by touching and dragging it.



By touching one of the corners of the tool window (except the upper right), ⤢ will be displayed. The size of the tool window can be changed by touching and dragging it.

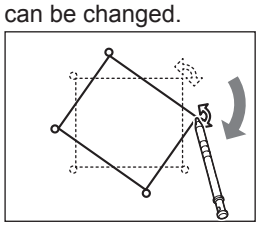


When the [○ Circle] is selected in the window shape settings, the size of the circle can be changed by touching and dragging the outline of the circle of the tool window.



● Changing the direction of the tool window

By touching and dragging the arrow mark on the upper right of the tool window, the direction of the tool window can be changed.



Symbols

The following symbols alert you to important messages in this starting guide.
Be sure to read these messages carefully.

Point **Indicates the caution for an operation which is sometimes performed mistakenly.**

Reference Indicates items with which you can understand the content more, or information that is useful to be known.

Cautions

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