PV Module Equipment

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Camera Inspection Manual

Omron FZ3

Revision 14.1

NPC Incorporated

Thank you for your selecting our product.
Please keep this manual handy for future reference.

Content

1. How to Create Alignment Template for OMRON FZ3

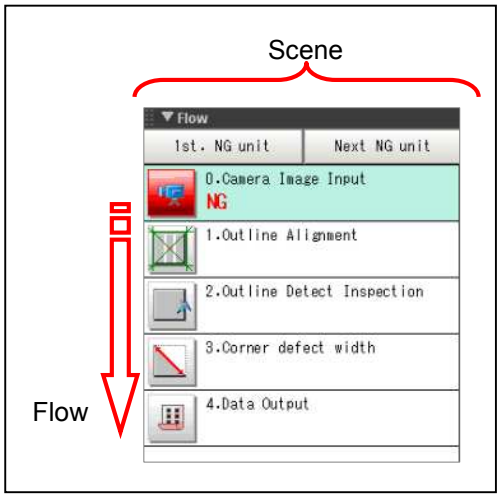
(For Tabbing & Stringing Machine: Busbar Inspection)

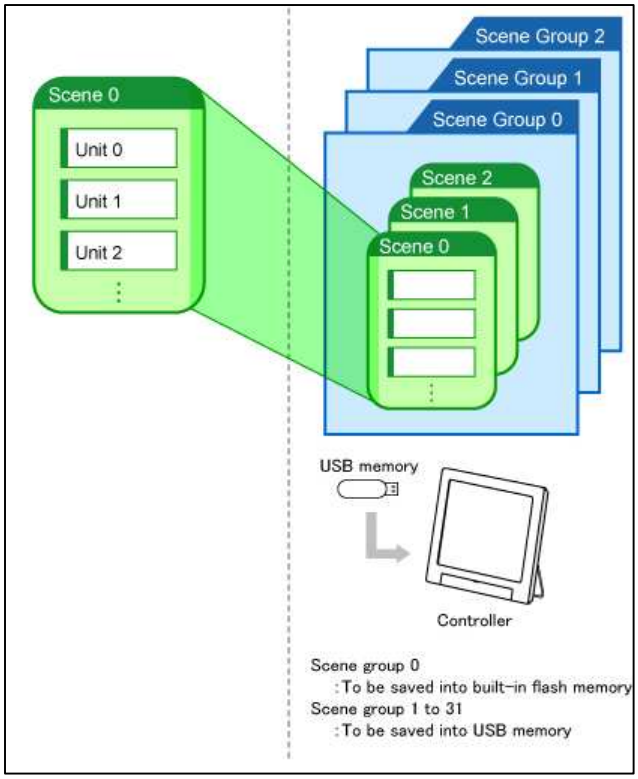
1-1. Outline

OMRON-FZ3 software automatically creates the flow for producing template which is necessary for the cell alignment inspection for tabbing & stringing machine. Use the flow for setting individual measuring items. The configuration of the created flow can be edited, too.

The flow of which each item has been set is called [Scene], and the group that has 101 scenes is called [Scene Group]. Up to 32 scenes can be set.

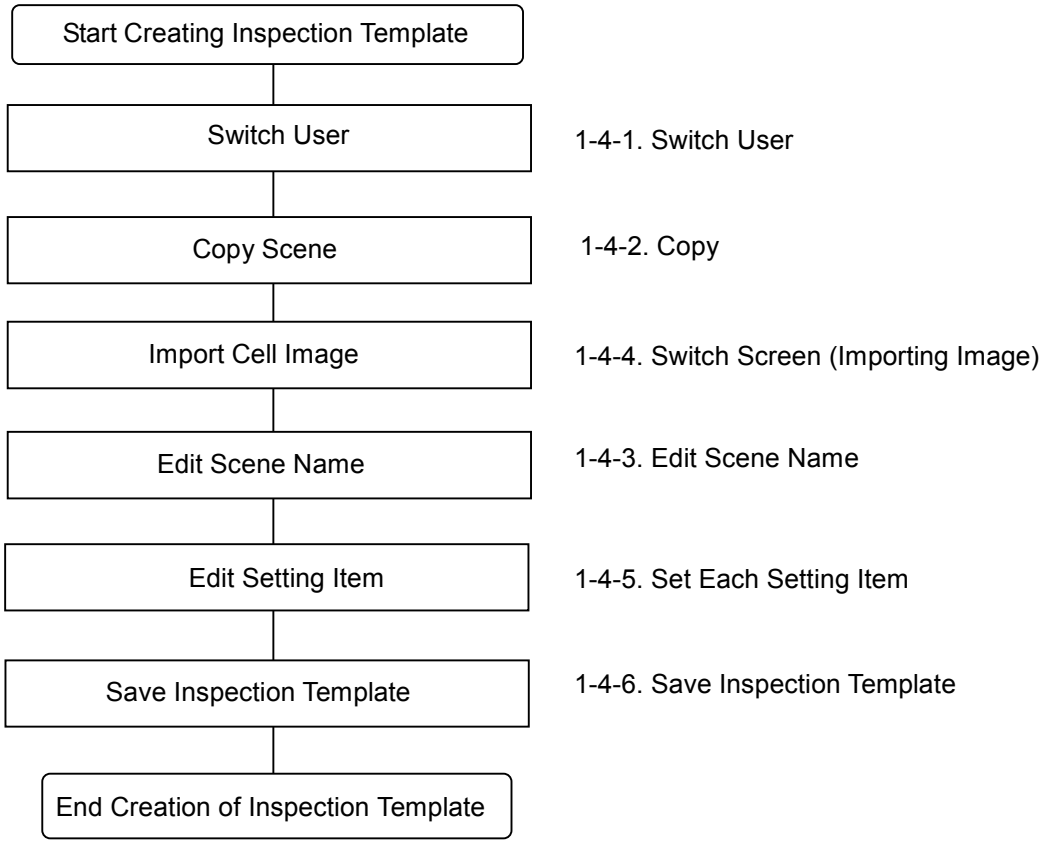
In the following page, the process to create template is shown in a flow chart.





	FZ3 does not have power switch. **FZ3 is interlocked to main body of tabbing & stringing machine.**
	Before turning off the main breaker, click [Data Save] button on the main screen to save the setting if you want to save the edited data.

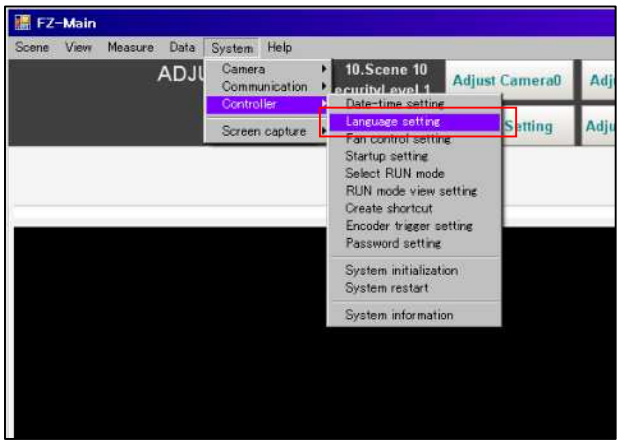
1-2. Flow Chart of Template Creation



1-3. Switch language display

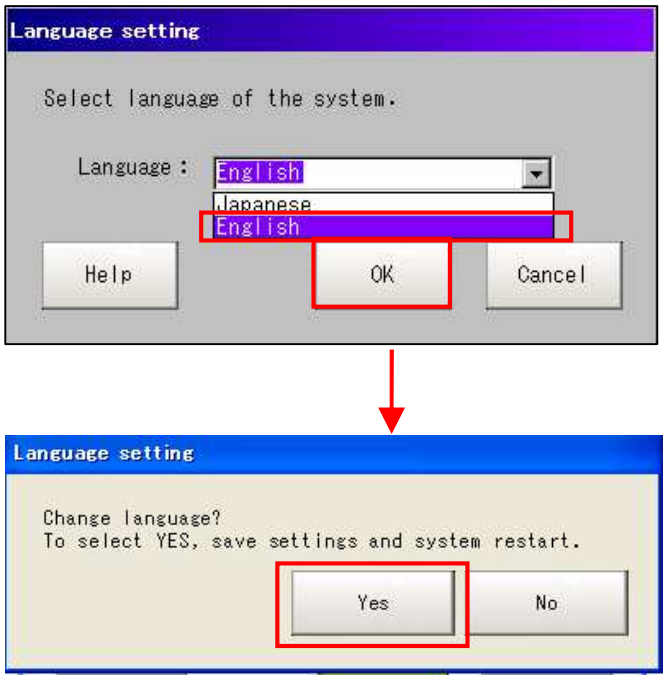
	The controller is restarted when language is switched, Click [Data Save] button to save the setting before switching languages.

(1) Click [Language Setting] in [Controller] of [System].



(2) Select the target language and click [OK] button, then the PC restarts. Check that the machine is not in auto mode and there is no problem with restarting the controller, and then click [Yes] button. Data will be saved and the controller restarts. After restarting, the language switches and the main screen is displayed again.

	Do not turn off the machine's power during saving and restarting.



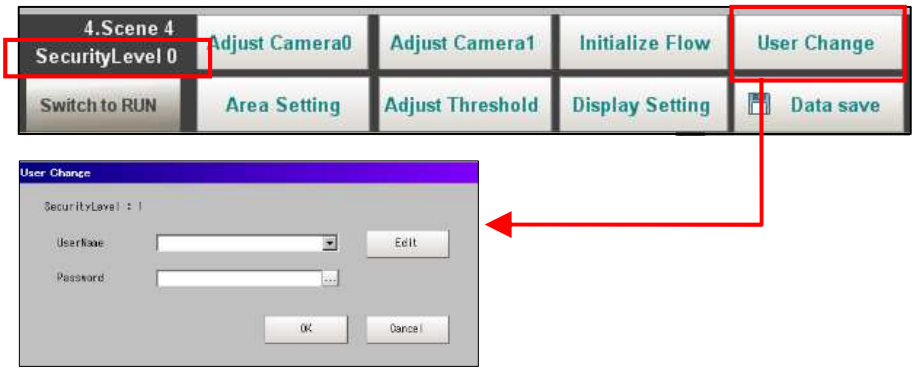
1-4. How to Create Template

Copy the scene if the settings are same as other inspection template (scene) apart from cell size. 5 steps are required for scene setting. Refer to: [1-4-1. Switch User], [1-4-2. Copy], [1-4-4. Switch Screen (Importing Image)]、[1-4-3. Edit Scene Name], [1-4-6. Save Inspection Template]

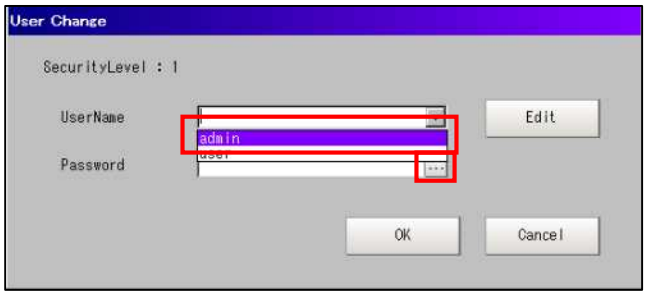
1-4-1. Switch User

Switch user setting and log in again, and then set the security level to “1”. Some items cannot be edited if the security level is “0”.

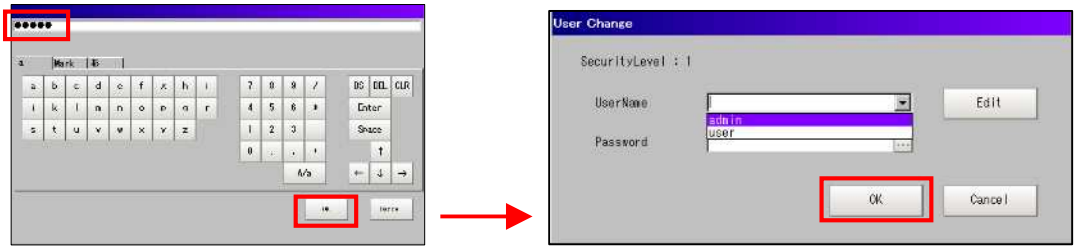
(1) Click [User Change] button on the main screen to display [User change] screen, then log in.



(2) Choose [admin] for user and click […] button for password.



(3) Enter the password on the password entry screen and click [OK] button.
The screen returns to [User Change]. Click [OK] button.
<Reference>
The initial password is “omron”.

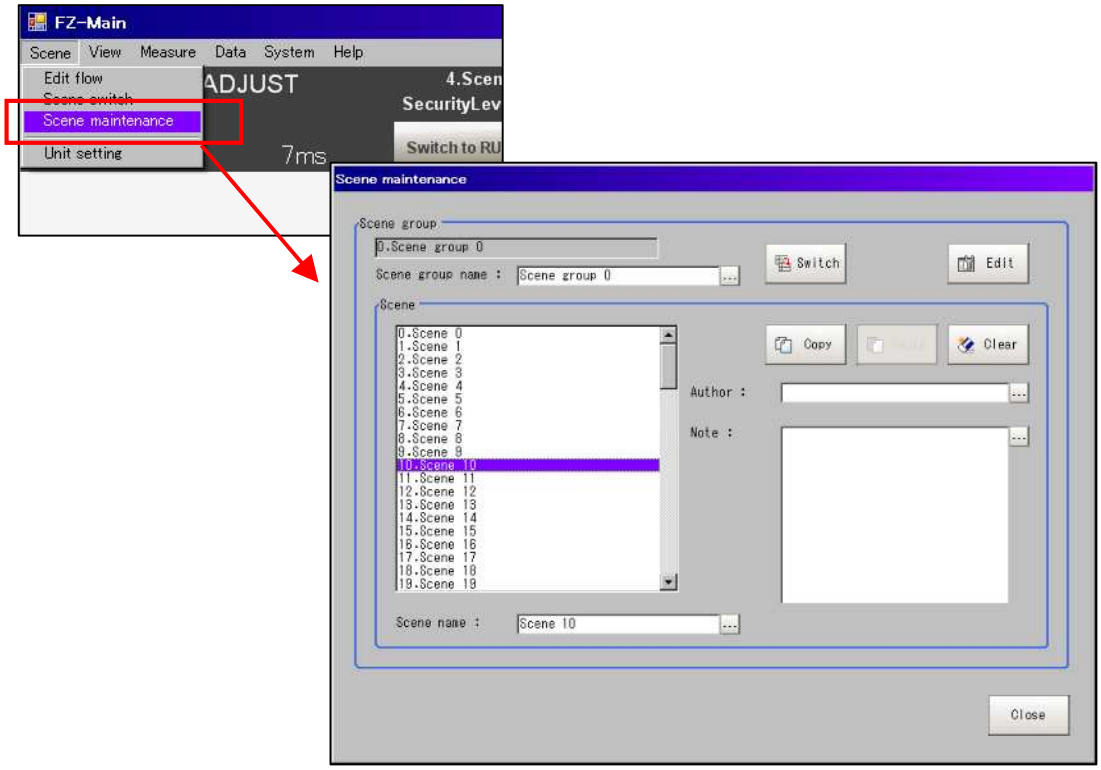


(4) The screen returns to the main screen. Check that [Security Level] is “1”.

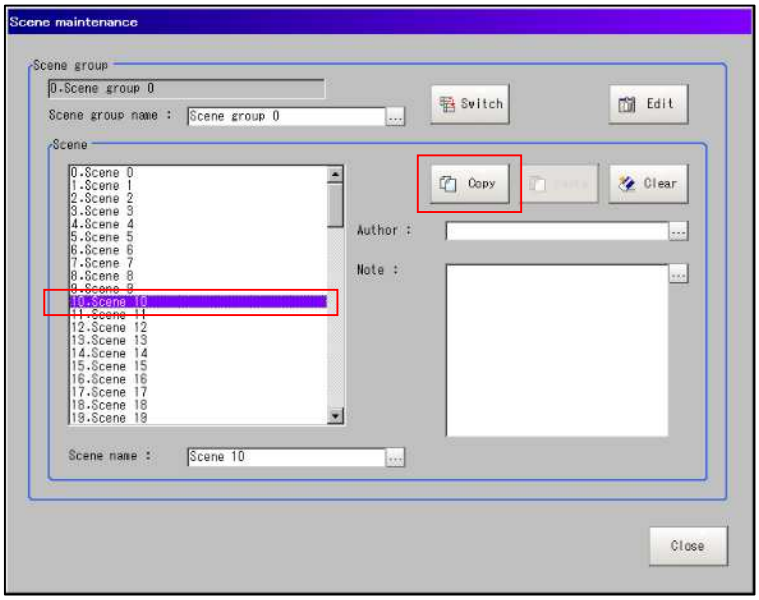
1-4-2. Copy

The following describes the case that the outline alignment template for 125 × 125 size cell has been stored in "Scene 10" and you want to create the outline alignment template for 150 × 150 size cell for "Scene 15".

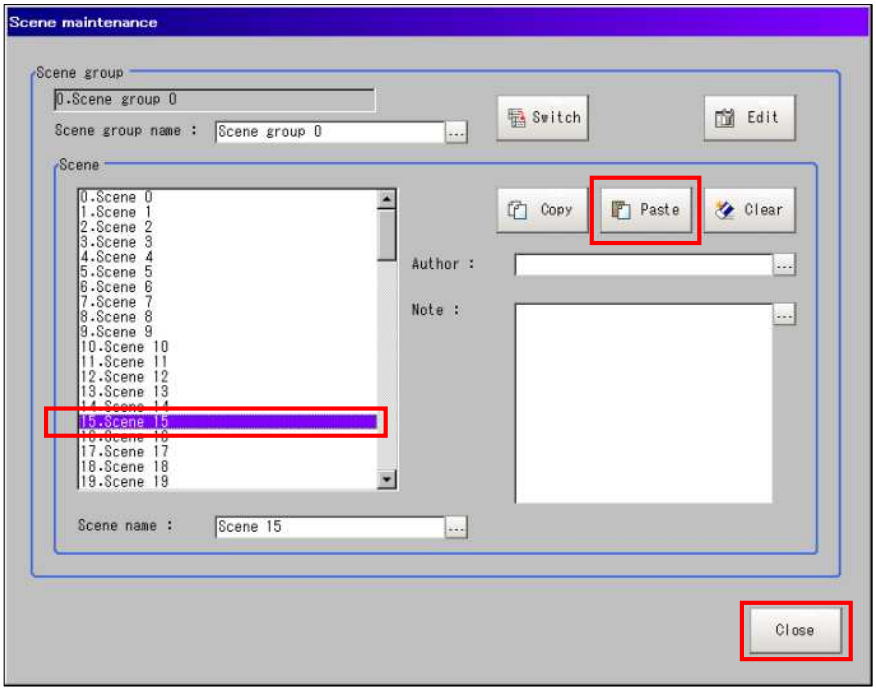
(1) Click [Scene maintenance] from the toolbar on the main screen to display [Scene maintenance] screen.

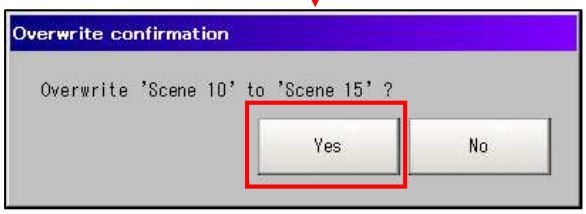


(2) Choose the source scene number and click [Copy] button.

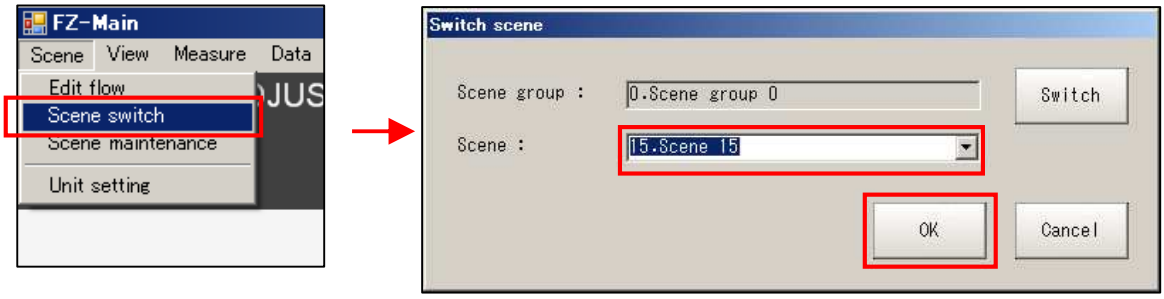


(3) Choose the destination scene number and click [Paste] button. The confirmation screen will be displayed. Click [Yes] button and [Close] button.





(4) The setting of “Scene 15” is exactly same as “Scene 10”. Capture the image of 150 × 150 size cell, click [Scene switch] of [Scene] on the toolbar, choose [Scene 15], and click [OK] button to display the main screen. For importing image, refer to [1-4-4. Switch Screen (Importing Image)].



	Do not use [Scene 0]. **Match the scene number with the scene number of the recipe on the touch screen.**

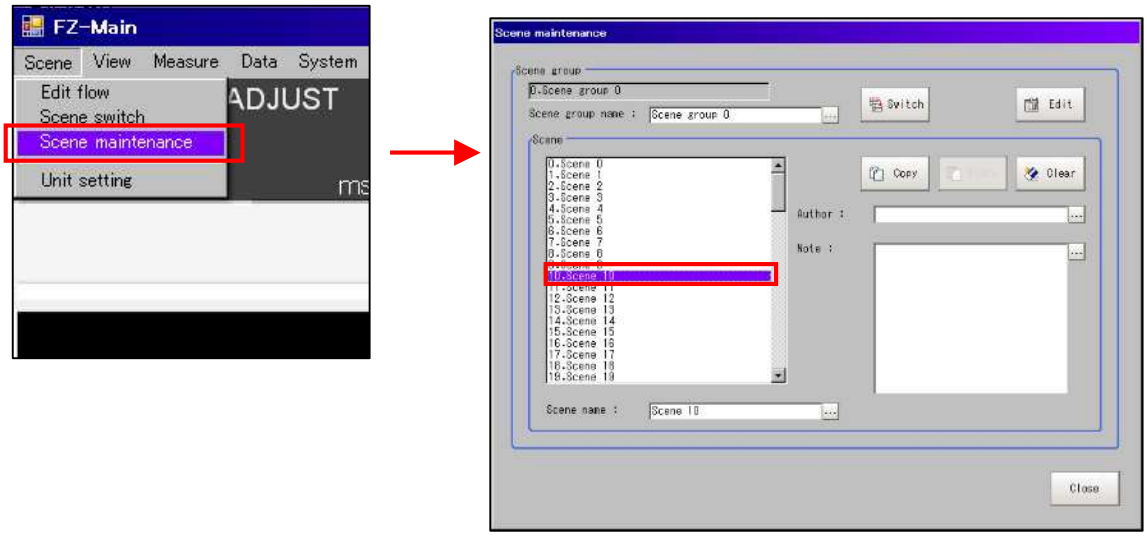
(5) Edit copied scene’s name. Refer to [1-4-3. Edit Scene Name].

1-4-3. Edit Scene Name

[Scene **group** 0] has 101 scenes which are numbered from 0 to 100. **Do not use [Scene 0].**

[Scene **group**] can be edited with [Edit] button. However, only [Scene **group** 0] is used for this machine.

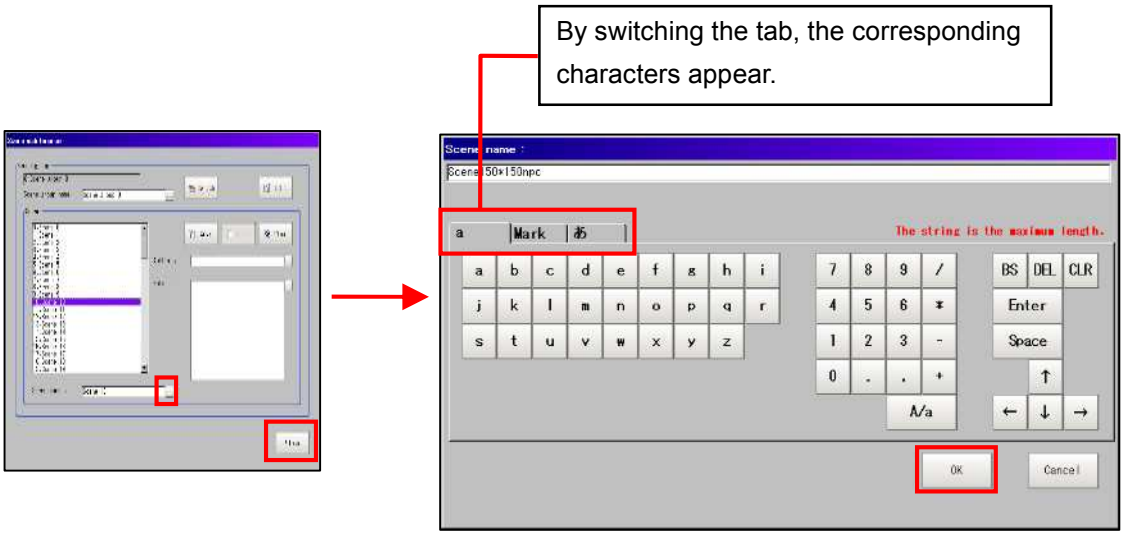
(1) Click [Scene maintenance] of [Scene] and choose the scene number to edit its name.



(2) Edit the name using the entry keyboard which appears by clicking [...] button next to [Scene group name].

After editing the name, click [OK] button, then it returns to [Scene maintenance] screen. Click [Close] button to return to the main screen.

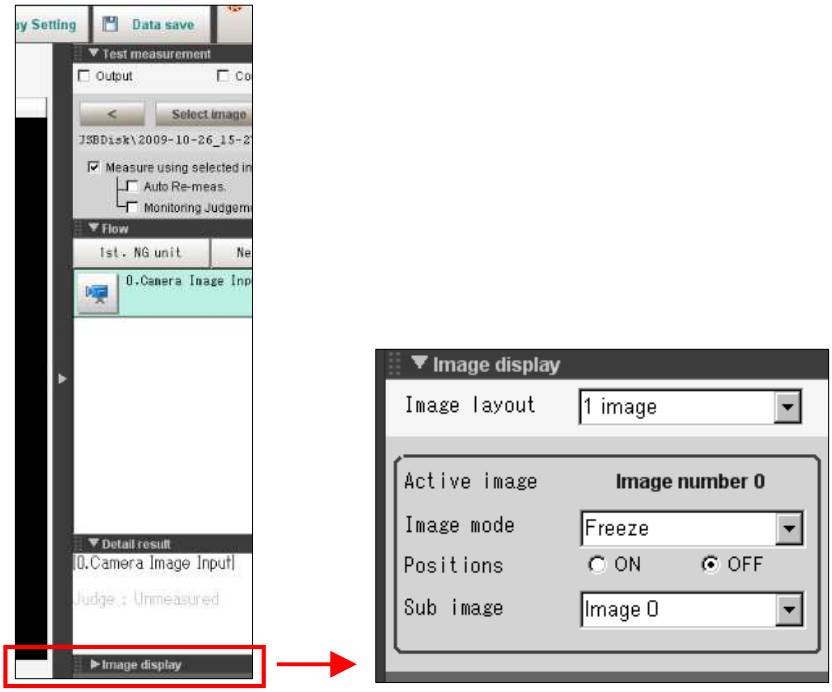
**The number of characters which can be entered is limited.



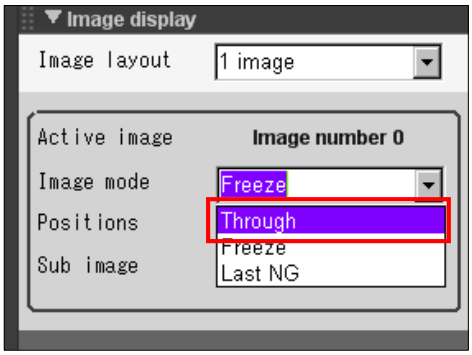
1-4-4. Switch Screen (Importing Image)

Switch the camera images in order to import image of the cell for template.

(1) Click [Image display] to show the detail of the display.



(2) Switch [Image mode] from [Freeze] to [Through].
The image which is currently on camera is displayed on the screen.

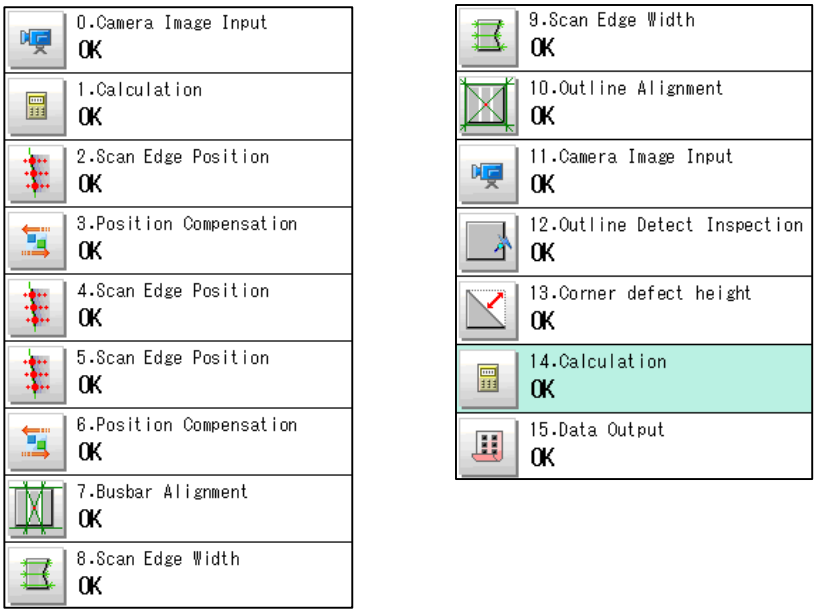


(3) Set a cell on the camera inspection position; turn on vacuum of LED table turn on the LED lamp with manual operation.
*Refer to the operating manual for manual operation.

(4) Edit each setting item of copied scene. Refer to: [1-4-5. Set Each Setting Item].

1-4-5. Set Each Setting Item

The scene copied for busbar inspection as in [1-4-2. Copy] has flow which has fifteen setting items.



Busbar Inspection Flow

*You can change flow order or setting item is each flow.
For editing flow, refer to: [1-4-5. Set Each Setting Item]

Flow Setting Item	Description
0.Camera Image Input	Adjust camera's shutter speed so that busbar image of cell in copied scene is sharply defined. Refer to: [1-4-5-1. [0. Camera Image Input]]
1.Calculation	Set the reference value to judge each inspection. Refer to: [1-4-5-2. [1.Calculation]]
2.Scan Edge Position	**Detect cell edge with light-dark change in the region.** This setting is necessary for correcting the gradient of cell's bottom edge measured in [3. Position Compensation]. Refer to: [1-4-5-3. [2.Scan Edge Position]]
3.Position Compensation	The cell edge location on the camera image (reference position) is set based on the gradient data of cell bottom edge (measurement position) detected in [2.Scan Edge Position]. **You do not need to edit setting if you copied scene.**

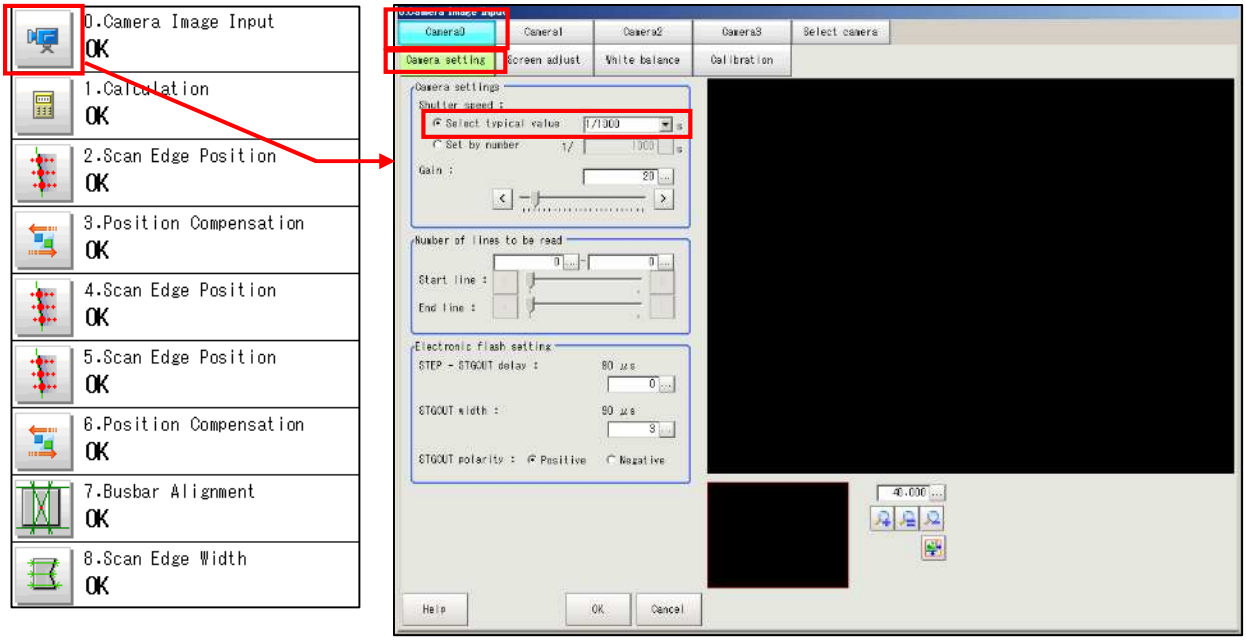
Flow Setting Item	Description
4. Scan Edge Position	This setting is to detect cell edge accurately, and it is necessary for correcting cell edge's gradient in [6. Position Compensation]. [6. Position Compensation] is for correcting left and bottom cell edges. [4.Scan Edge Position] is for cell's bottom edge, while [5. Scan Edge Position] is for left edge. Refer to: [1-4-5-5. [4.Scan Edge Position]]
5. Scan Edge Position	This setting is to detect cell edge accurately, and it is necessary for correcting cell edge's gradient in [6. Position Compensation]. [6. Position Compensation] is for correcting left and bottom cell edges. [4.Scan Edge Position] is for cell's bottom edge, while [5. Scan Edge Position] is for left edge. Refer to: [1-4-5-6. [5. Scan Edge Position]]
6. .Position Compensation	The cell edge location on the camera image is set in order to capture the entire cell image. You need to change the reference position according to the cell size. Reference position is the location of the cell edges set in [4.Scan Edge Position] and [5.Scan Edge Position] on the camera image. Refer to: [1-4-5-7. [6. Position Compensation]]
7.Busbar Alignment	This setting is for measuring cell center misalignment with reference to busbar position. Refer to: [1-4-5-8. [7.Busbar Alignment]]
8. Scan Edge Width	This setting is necessary to measure the difference between width and height of the cell. [8.Scan Edge Width] is for measuring width of the cell. Values set in [8.Scan Edge Width] and [9. Scan Edge Width] are used for [1.Calculation]. Refer to: [1-4-5-9. [8.Scan Edge Width]]
9.Scan Edge Width	This setting is necessary to measure the difference between width and height of the cell. [9.Scan Edge Width] is for measuring height of the cell. Values set in [8.Scan Edge Width] and [9. Scan Edge Width] are used for [1.Calculation]. Refer to: [1-4-5-10. [9.Scan Edge Width]]
10.Outline Alignment	This setting is to reject cell if the difference between the cell center based on busbar print position measured in [7.Busbar Alignment] and the cell center based on cell outline is bigger than the value set in [1.Calculation]. Refer to: [1-4-5-11. [10.Outline Alignment]]
11.Camera Image Input	This setting is to reduce shutter speed of the camera in order to get darker cell image for [12.Outline Detect Inspection]. Refer to: [1-4-5-12. [11.Camera Image Input]]
12.Outline Detect Inspection	It is the setting for detecting location where the perimeter and shape differ with the outline, after extracting cell outline automatically and while tracing the extracted outline points. Refer to: [1-4-5-13. [12.Outline Detect Inspection]]
13.Corner Defect Height	In the outline detect inspection, the locations that are indented in relation to the perimeter edge is detected. However, detection can be difficult at the chamfer of a cell corner area where there is no indentation. Therefore, the distance from vertex of the cell circumscribed rectangle to the corner is measured to detect the chamfer defects. Refer to: [1-4-5-14. [13.Corner Defect Height]]

Flow Setting Item	Description
14.Calculation	This setting is to enter expression to judge each inspection. You do not need to edit setting if you copied scene. Refer to: [1-4-5-15. [14.Calculation]]
15.Data Output	This setting is for the signal to be transmitted to PLC. Refer to: [1-4-5-16. [15.Data Output]]

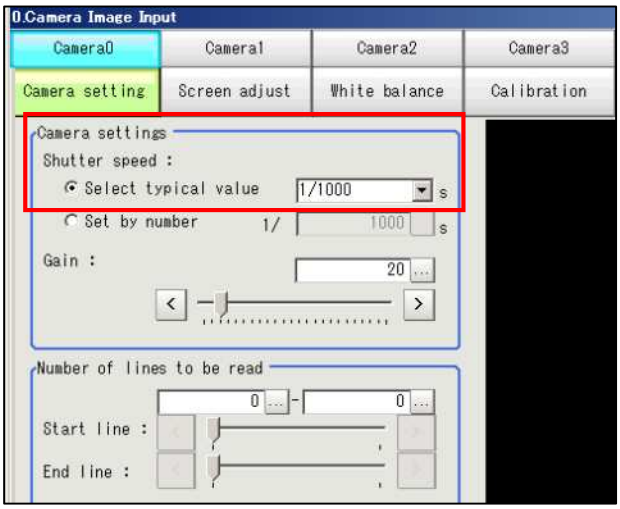
1-4-5-1. [0. Camera Image Input]

Adjust camera's shutter speed so that busbar image of cell in copied scene is sharply defined.

(1) Click [0.Camera Image Input] icon button in the flow, and choose [Camera 0] and [Camera setting] screen.



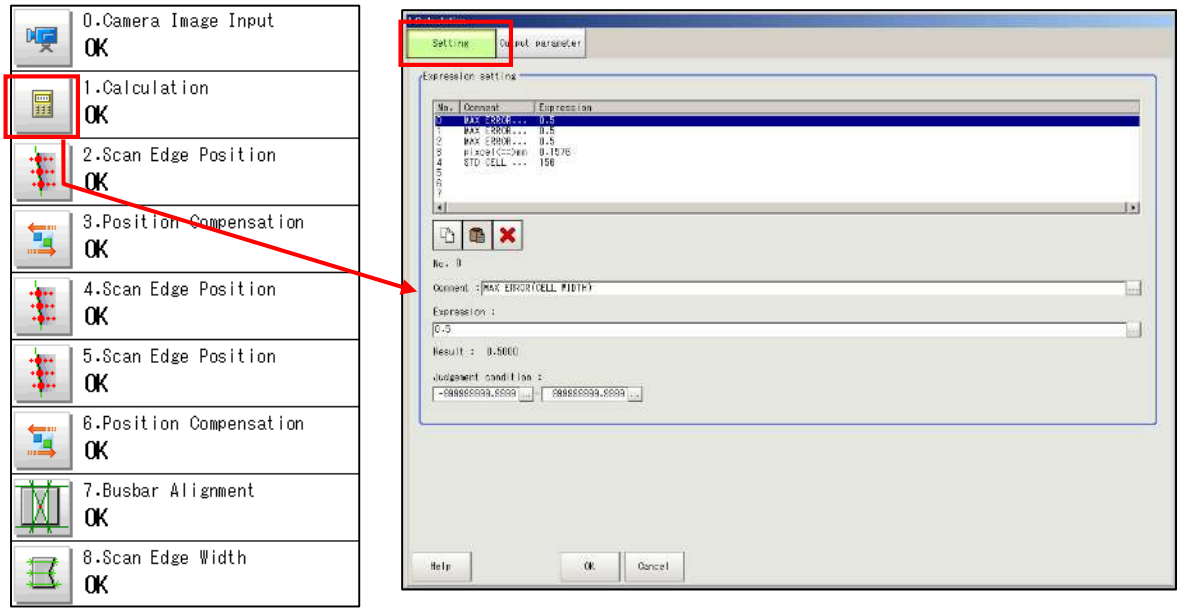
(2) Adjust shutter speed on [Camera settings] so that busbar image is clearly defined.



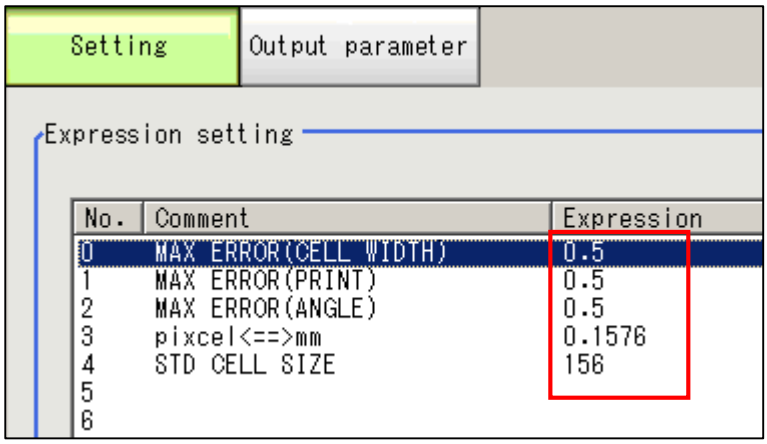
1-4-5-2. [1.Calculation]

Set the reference value to judge each inspection.

(1) Click [1.Calculation] icon button in the flow and display [Setting] screen.



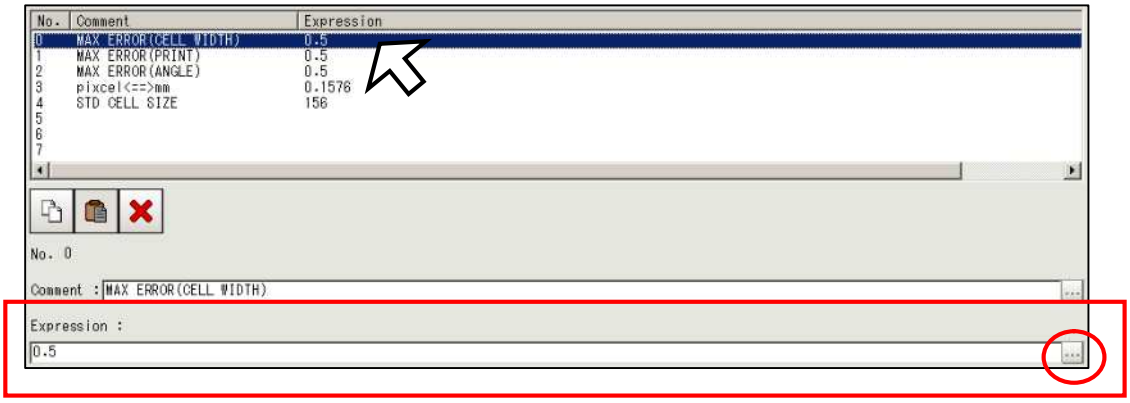
(2) Setting items for No.0 to No.4 are as follows.



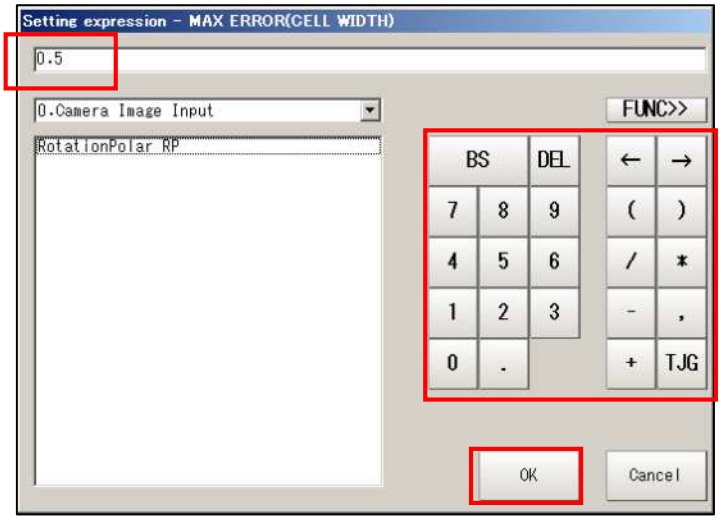
No.0	Input cell outline alignment's tolerance.
No.1	Input busbar print position's tolerance.
No.2	Input cell angle's tolerance.
No.3	Input converted value between 1 pixel and mm. (You need not to edit the setting.)
No.4	Input cell size in use in millimeter.

*Refer to following pages for how to input.

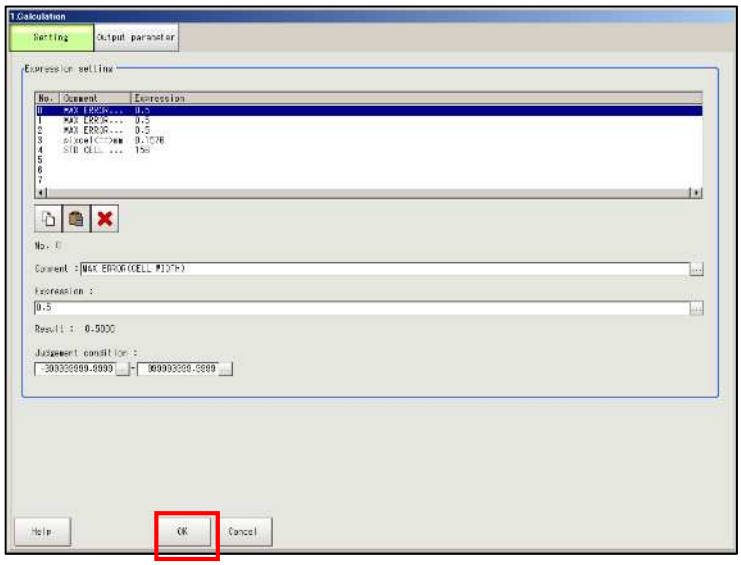
(3) Choose the expression number to be edited and click […] button of [Expression].



(4) Enter tolerance value with keypad and clock [OK] button.



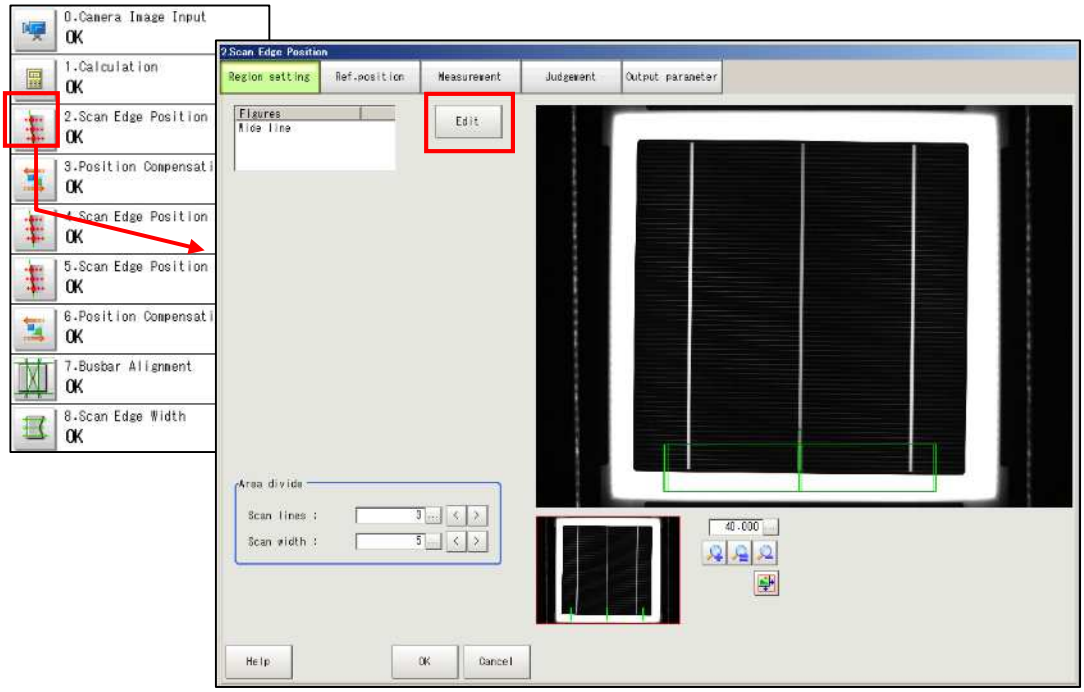
(5) After filling each setting item, click [OK] button on [Setting] screen.



1-4-5-3. [2.Scan Edge Position]

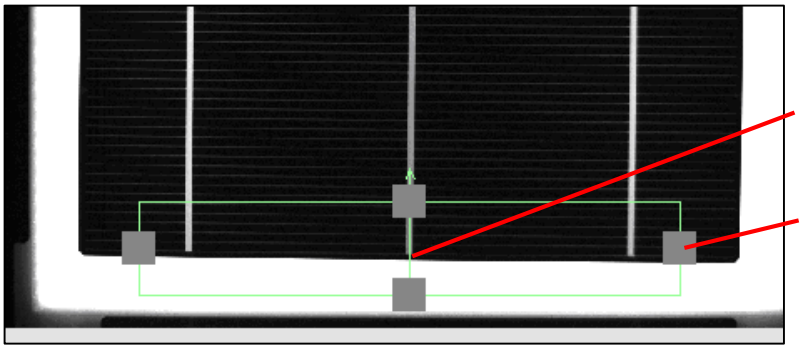
Setting of [2.Scan Edge Position] is designed **to detect cell edge with light-dark change in the region.** This setting is necessary for correcting gradient of cell bottom edge measured in [3. Position Compensation]. In this setting, the region is adjusted in [Region setting] screen and then the parameter is checked in [Measurement] screen.

(1) Click [2.Scan Edge Position] icon button in the flow and click [Edit] button on [Region setting] screen.

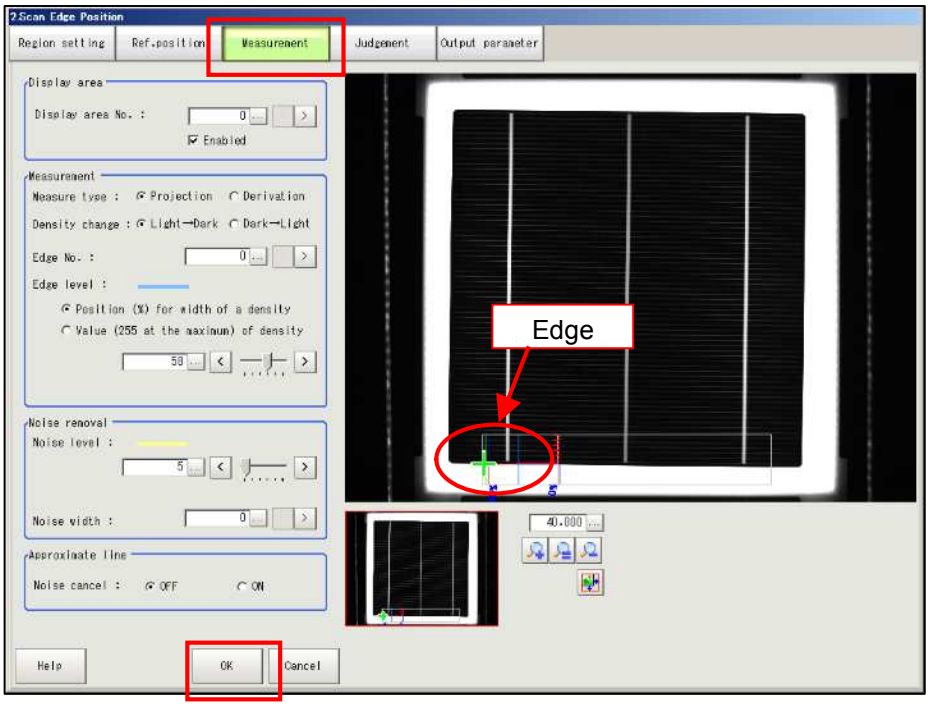


(2) Display the region to be edited by zooming in the image and shifting the red rectangle on the left in the picture below with the mouse.

(3) The green lines indicate the region to be measured, while gray rectangles indicate the midpoint of the region. The region size changes by dragging the gray rectangle on cell image. The region shifts by dragging the center green line. Include enough wide part of bottom cell edge to detect cell's gradient accurately, as shown in the picture below.

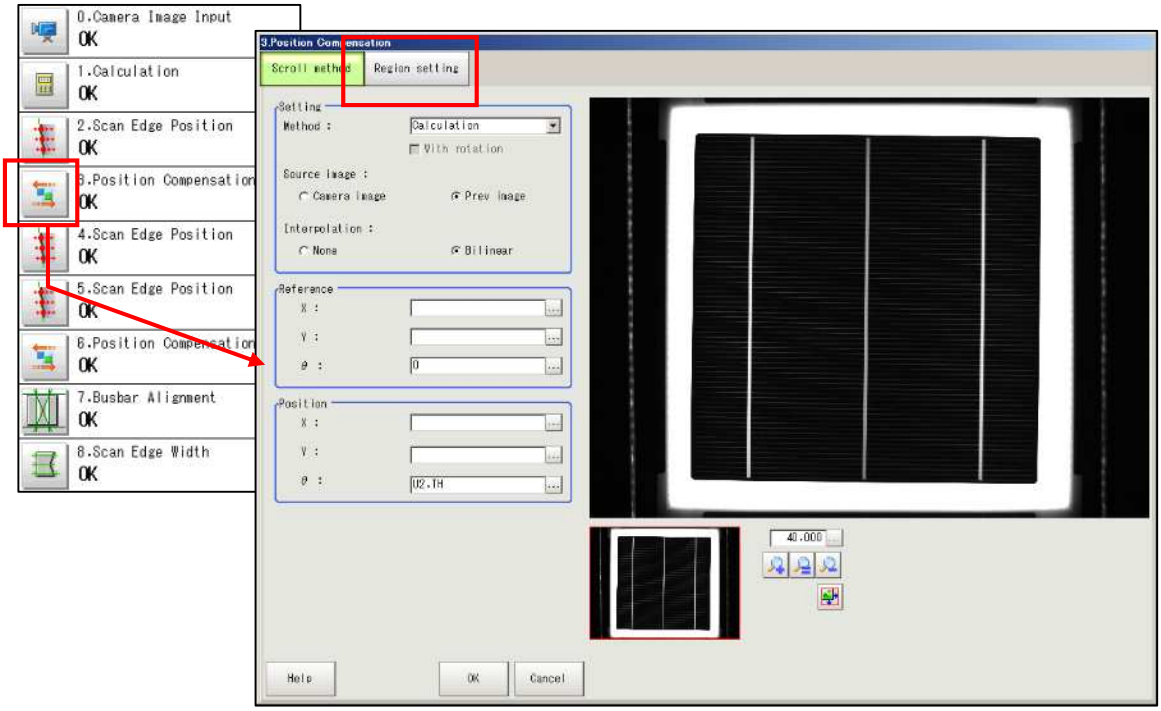


(4) Click [Measurement] tab to check if edge is detected accurately. If detected, click [OK] button to display the main screen.



1-4-5-4. [3.Position Compensation]

In [3. Position Compensation], the cell edge location on the camera image (reference position) is set based on the gradient data of cell bottom edge (measurement position) detected in [2.Scan Edge Position]. **You do not need to edit setting if you copied scene.**



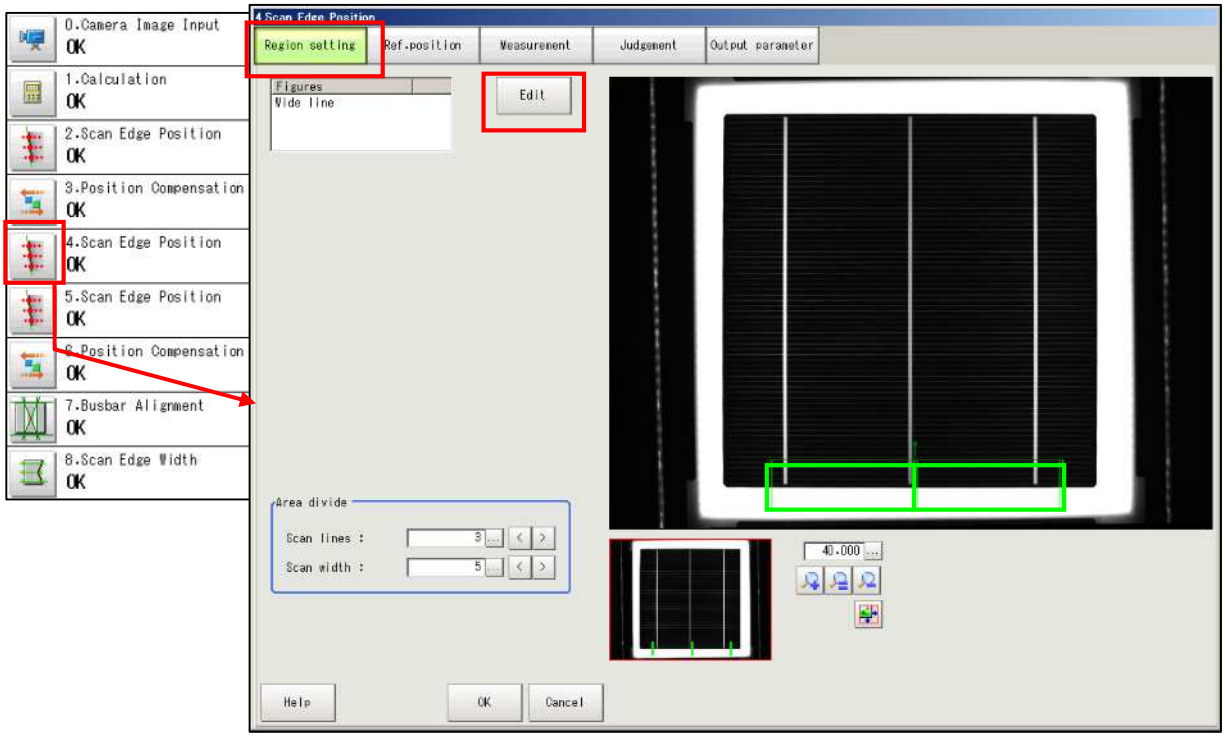
1-4-5-5. [4.Scan Edge Position]

In this setting, the region is adjusted in [Region setting] screen and then the parameter is checked in [Measurement] screen.

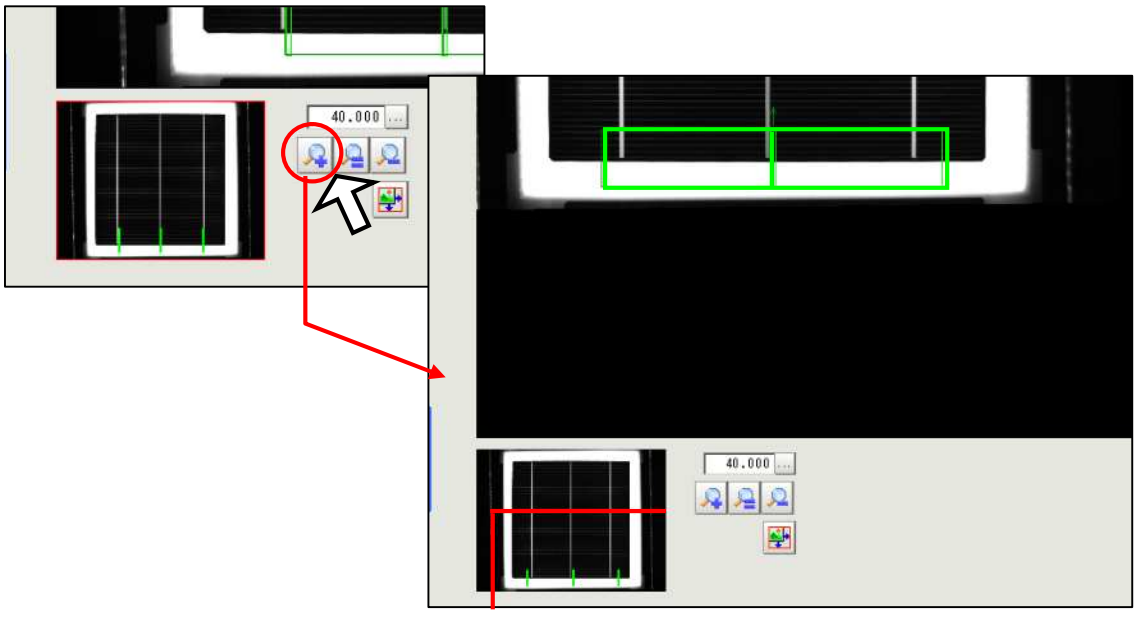
This setting is to detect cell edge accurately, and it is necessary for correcting cell edge's gradient in [6. Position Compensation].

[6. Position Compensation] is for correcting left and bottom cell edges. [4.Scan Edge Position] is for cell's bottom edge, while [5. Scan Edge Position] is for left edge.

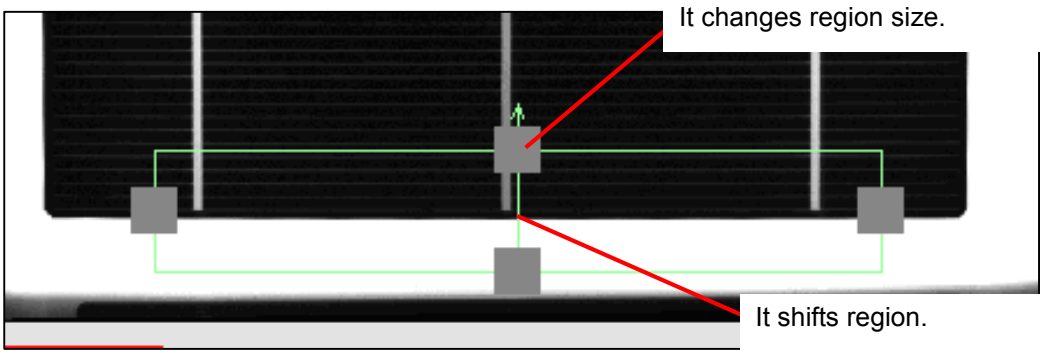
(1) Click [4.Scan Edge Position] icon button in the flow and click [Edit] button on [Region setting] screen.



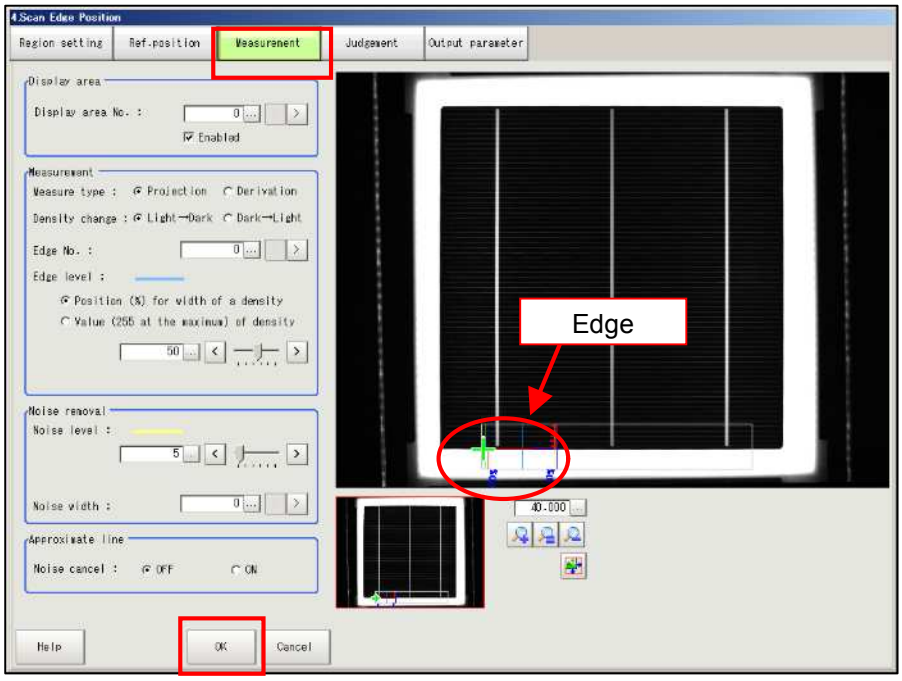
(2) Display the region to be edited by zooming in the image and shifting the red rectangle on the left in the picture below with the mouse.



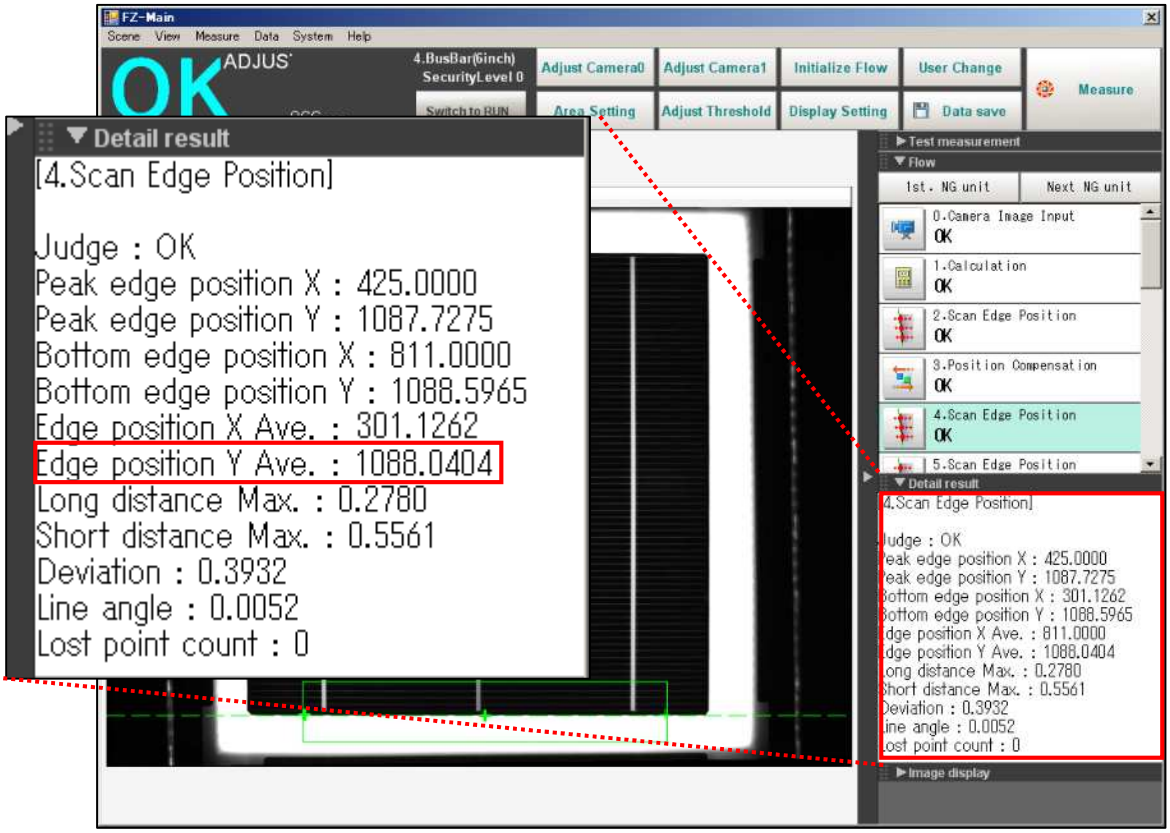
(3) The green lines indicate the region to be measured, while gray rectangles indicate the midpoint of the region. The region size changes by dragging the gray rectangle on cell image. The region shifts by dragging the center green line. Include some part of cell's bottom edge to detect cell's gradient accurately as shown below.



(4) Click [Measurement] tab to check if edge is detected accurately. If detected, click [OK] button to display the main screen.



(5) Click [Measure] button on the main screen and write down the value on [Edge Position Y Ave.] for entering cell's reference position in [6.Position Compensation].



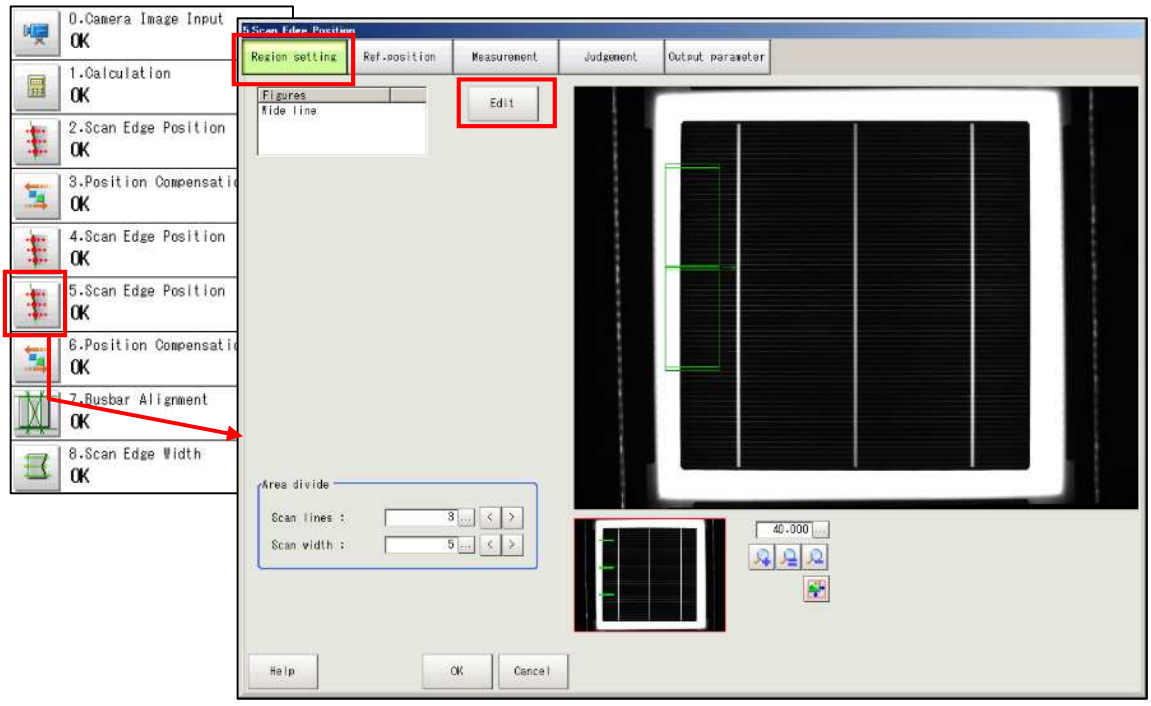
1-4-5-6. [5. Scan Edge Position]

In this setting, the region is adjusted in [Region setting] screen and then the parameter is checked in [Measurement] screen.

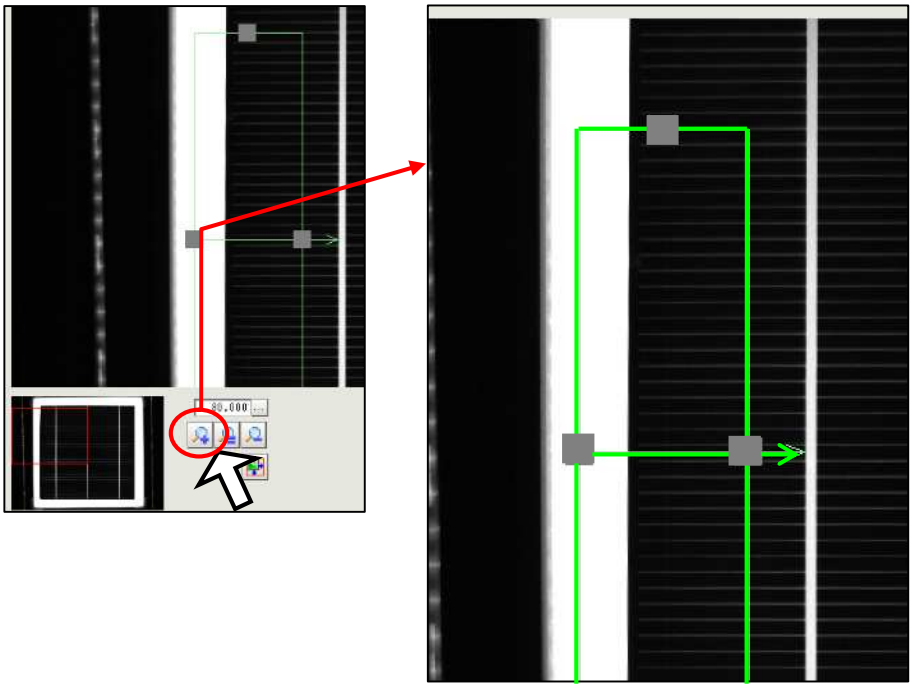
This setting is to detect cell edge accurately, and it is necessary for correcting cell edge's gradient in [6. Position Compensation].

[6. Position Compensation] is for correcting left and bottom cell edges. [4.Scan Edge Position] is for cell's bottom edge, while [5. Scan Edge Position] is for left edge.

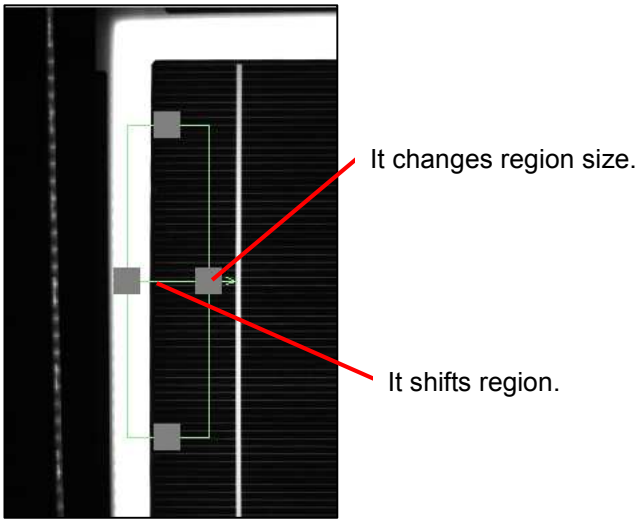
(1) Click [5.Scan Edge Position] icon button in the flow and click [Edit] button on [Region setting] screen.



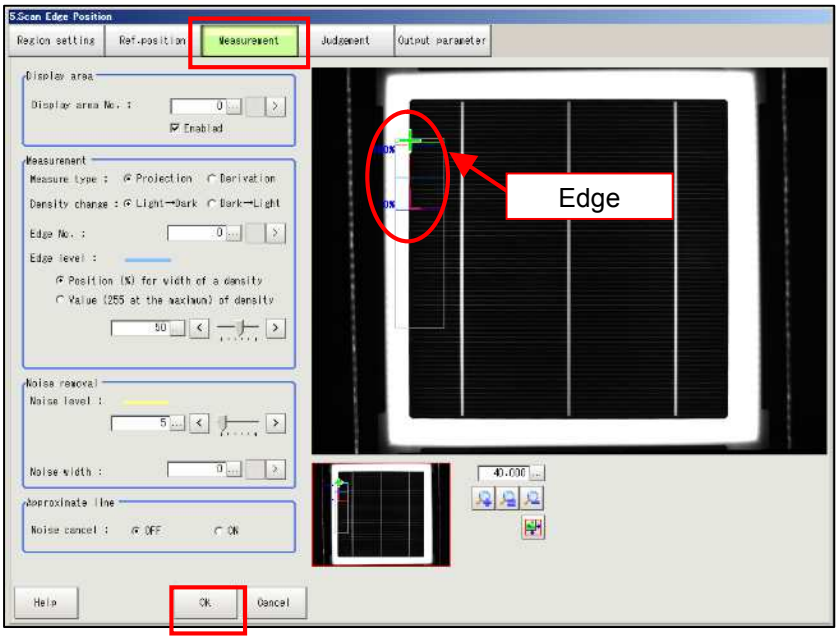
(2) Display the region to be edited by zooming in the image and shifting the red rectangle on the left in the picture below with the mouse.



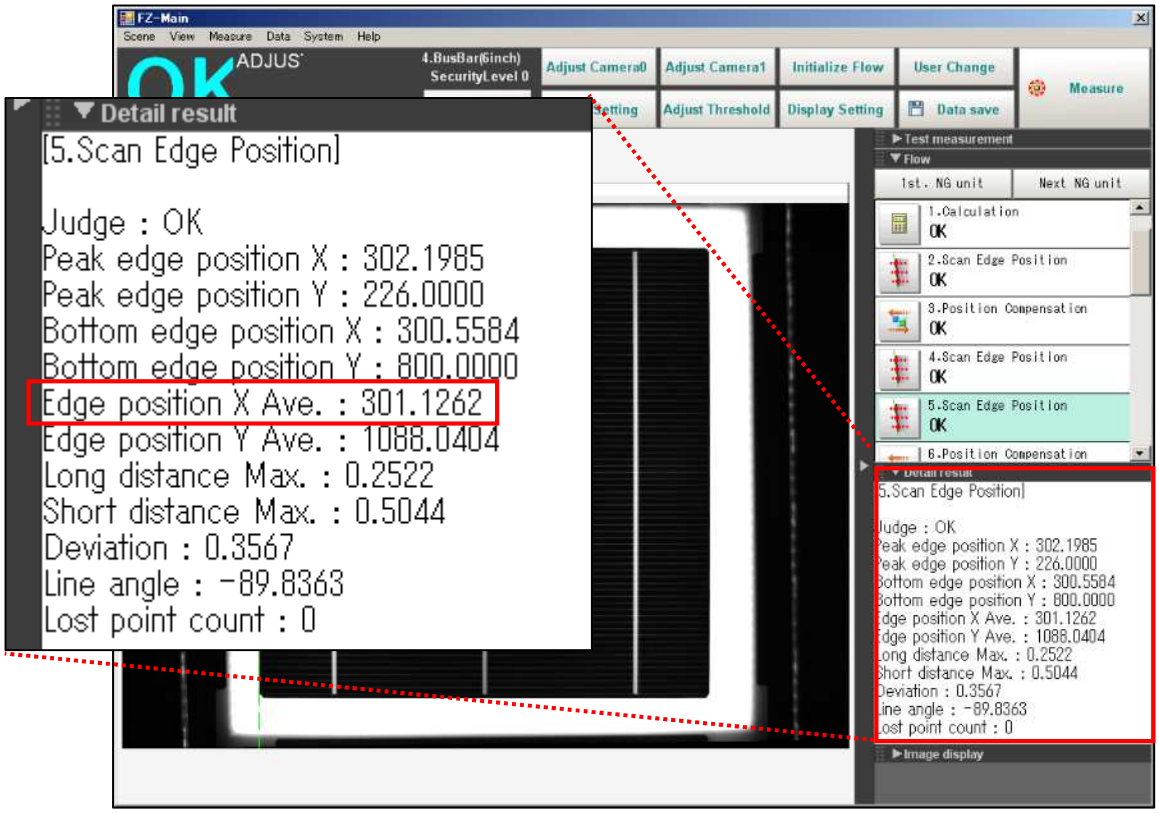
(3) The green lines indicate the region to be measured, while gray rectangles indicate the midpoint of the region. The region size changes by dragging the gray rectangle on cell image. The region shifts by dragging the center green line. Include some part of cell's left edge to detect cell's gradient accurately, as shown in the picture below.



(4) Click [Measurement] tab to check if edge is detected accurately. If detected, click [OK] button to display the main screen.



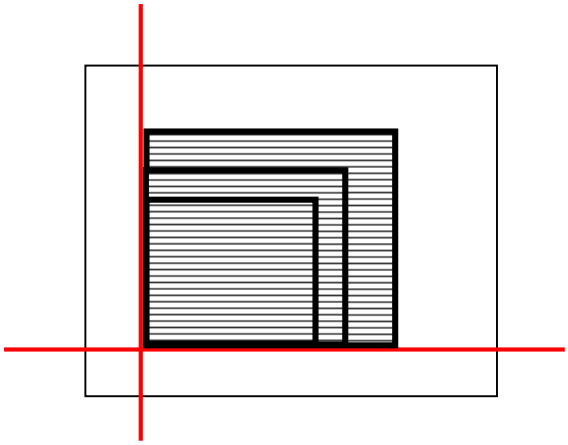
(5) Click [Measure] button on the main screen and write down the value on [Edge Position X Ave.] for entering cell's reference position in [6.Position Compensation].



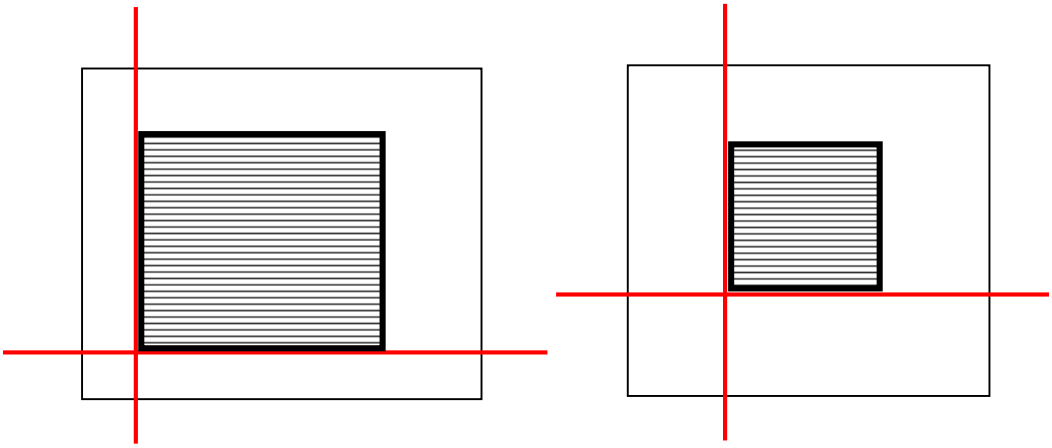
1-4-5-7. [6. Position Compensation]

In [Position Compensation], the cell edge location on the camera image is set in order to capture the entire cell image. You need to change the reference position according to the cell size.
Reference position is the location of the cell edges set in [4.Scan Edge Position] and [5.Scan Edge Position] on the camera image.

If the same reference position (indicated with red lines) is set for the cells of different sizes, the cell images are eccentrically located as shown below.

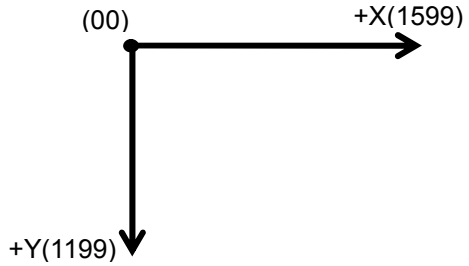


To center cells of different sizes on camera image, set the reference position of each cell according to cell size in this setting.

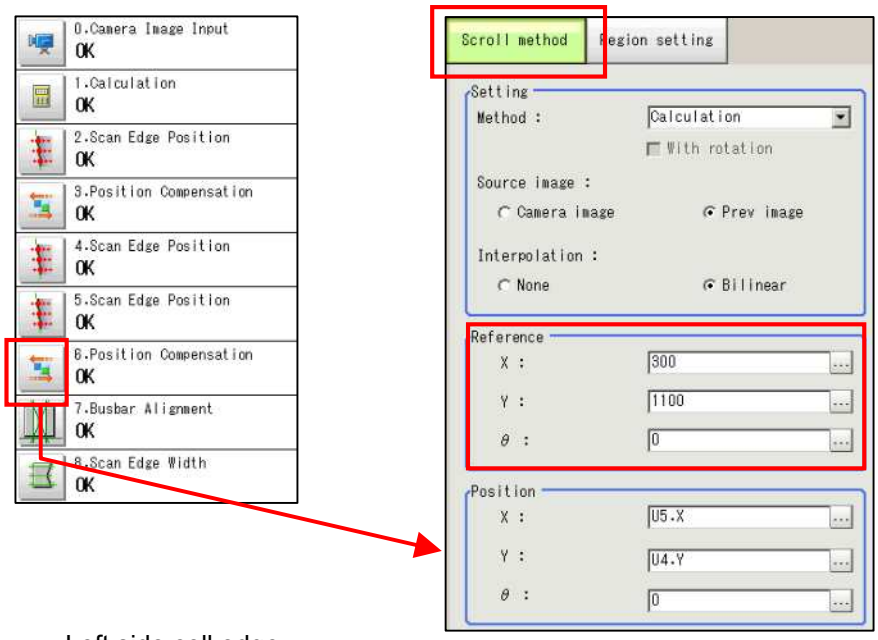


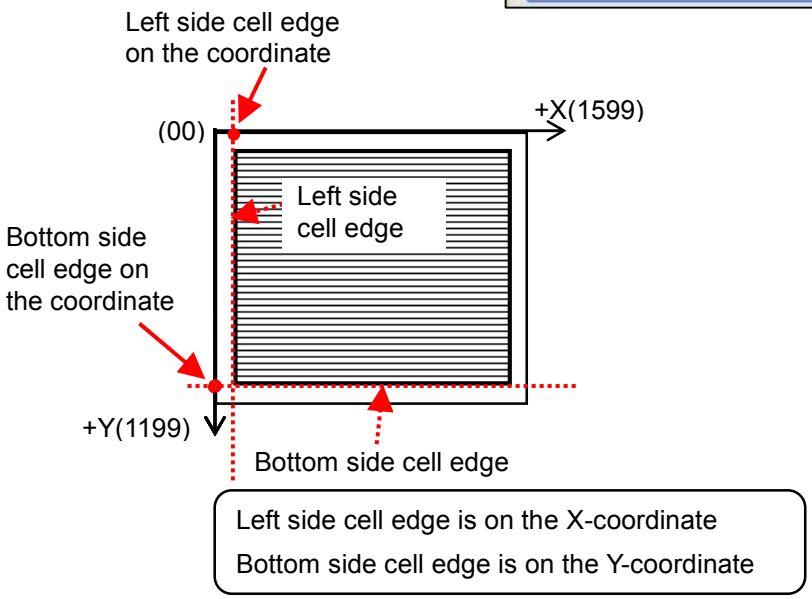
Refer to the following page for the detail setting of the reference position.

The coordinate on Omron's camera is shown below.



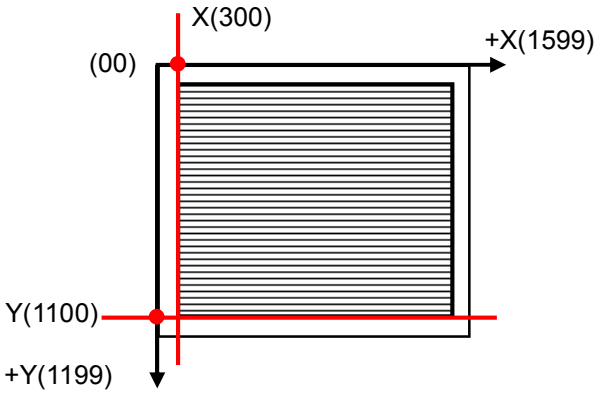
(1) Click the icon button of [6.Position Compensation] to display [Scroll method] screen for setting [Reference].

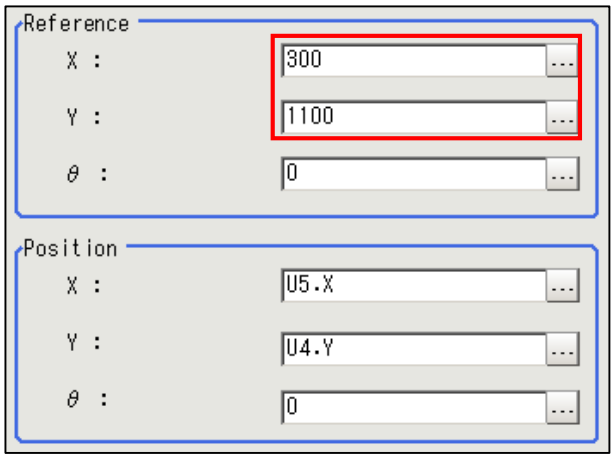




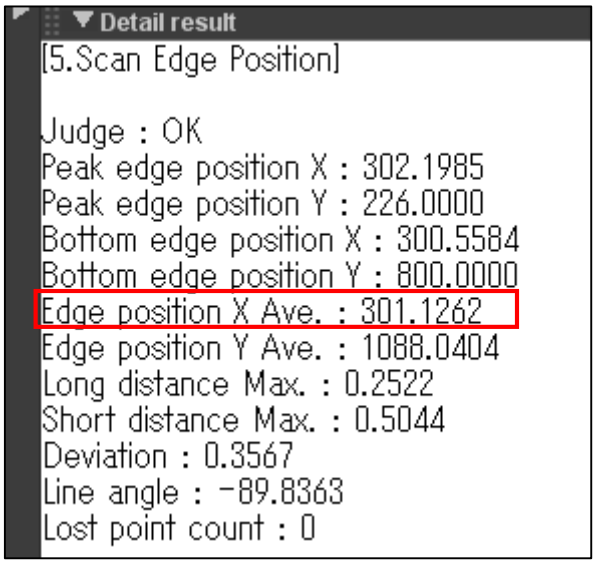
Reference（X,Y）	X：position of the left side cell edge detected in [5.Edge Position] on the X-coordinate in the compensated image Y：position of the bottom side cell edge detected in [4.Edge Position] on the Y-coordinate in the compensated image

(2) To set the cell image as shown in the drawing below, perform the following steps:
Click […] button of [Reference] X and enter the value (A) in [Edge Position X Ave.] measured in [5.Scan Edge Position].
Click […] button of [Reference] Y and enter the value (B) in [Edge Position Y Ave.] measured in [4.Scan Edge Position]. These values are for reference position of measured cell.

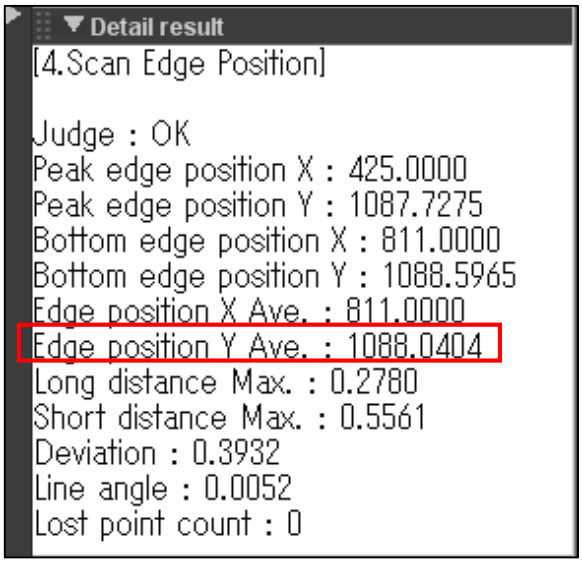




(A)



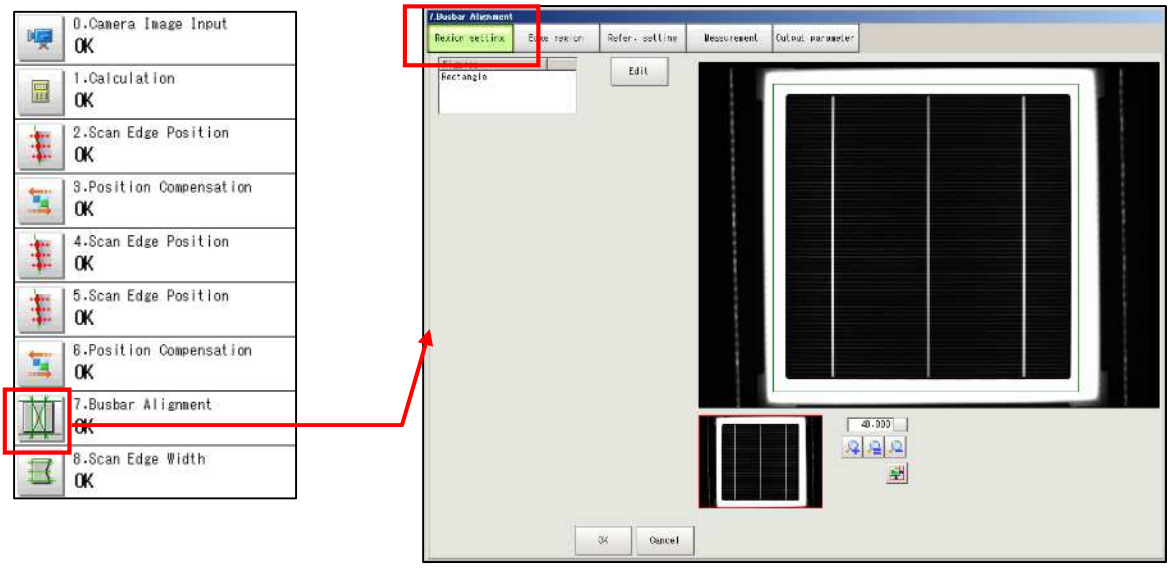
(B)



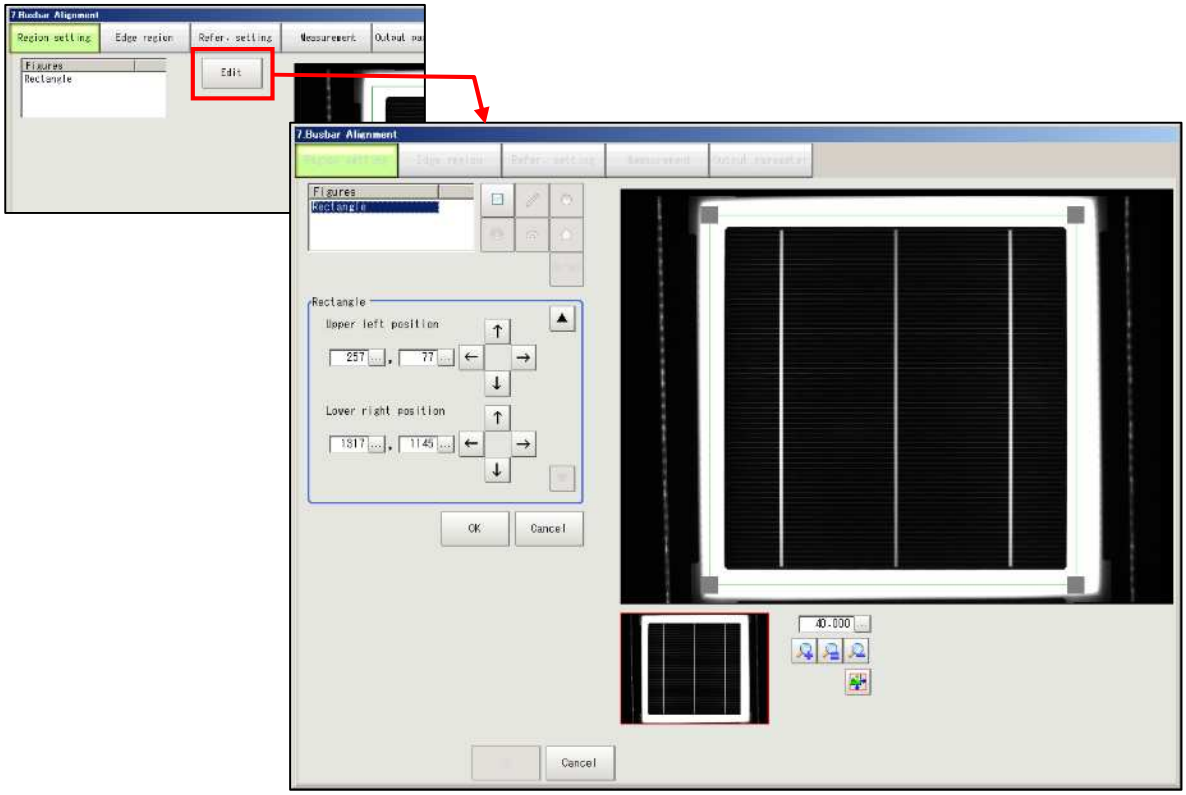
1-4-5-8. [7.Busbar Alignment]

This setting is for measuring cell center misalignment with reference to busbar position.

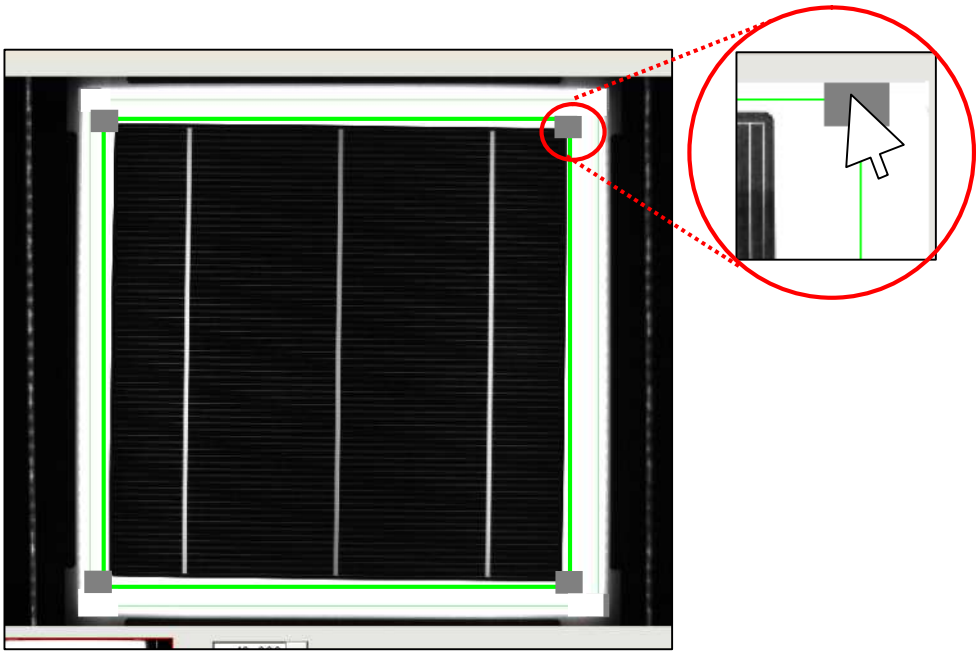
(1) Click [3.Scan Edge Position] icon button in the flow and display [Region setting] screen.



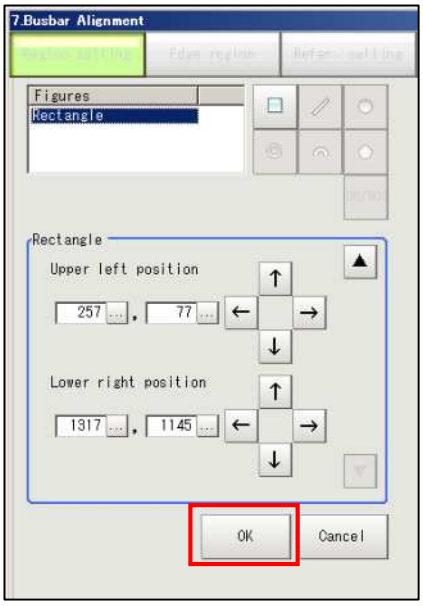
(2) Click [Edit] button and display region setting screen.

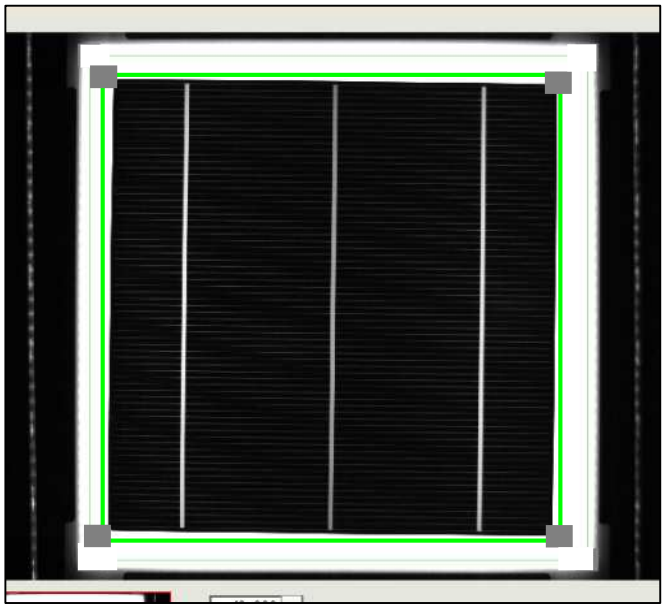


(3) The rectangle enclosed by green lines represents the measurement region. Adjust the measurement region around 3 to 5mm from the cell edge, dragging the small square on each corner of the rectangle with the mouse.

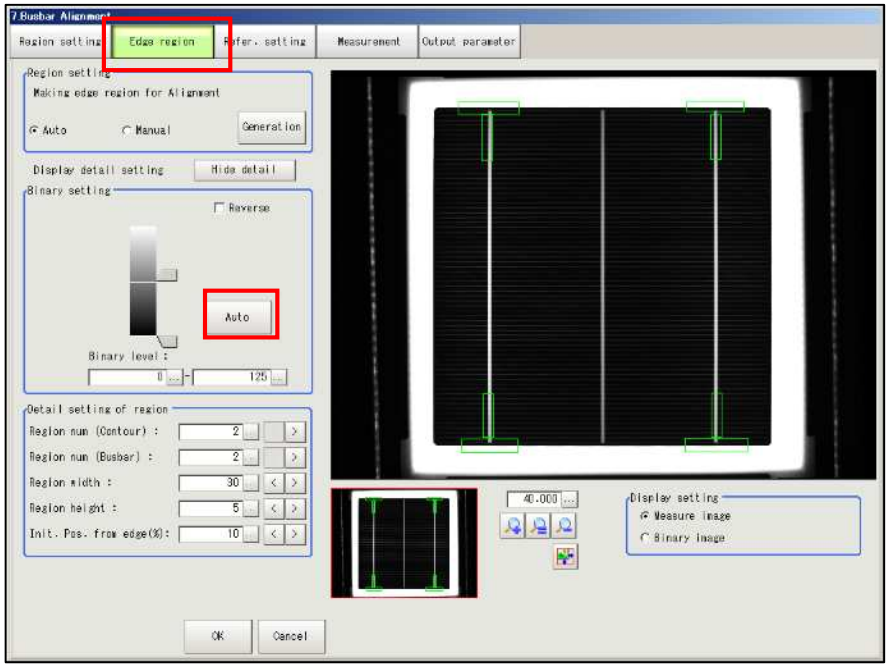


(4) Click [OK] button to set the edited region.

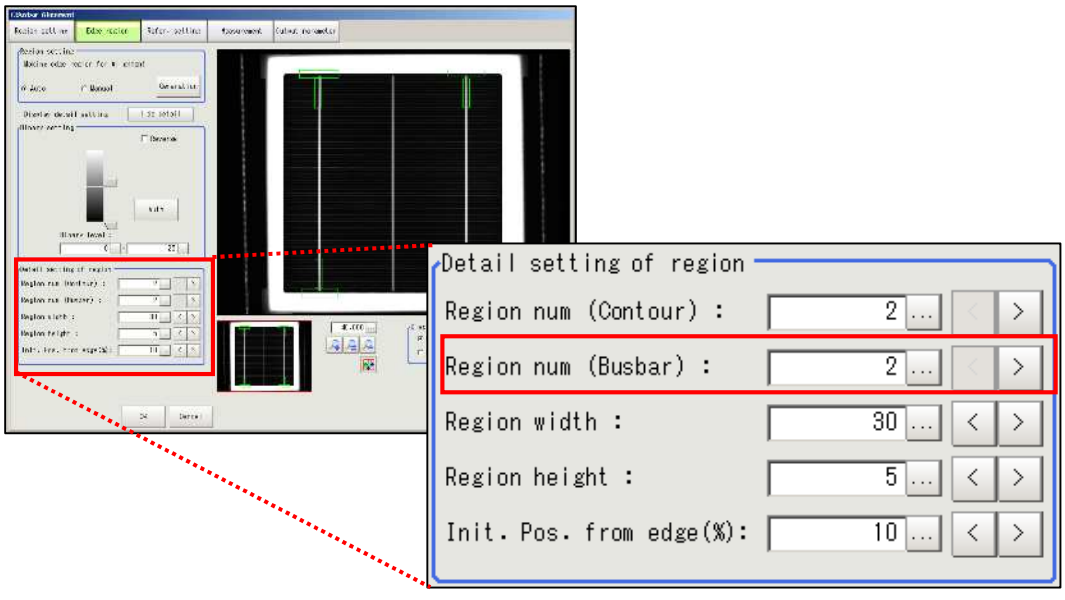




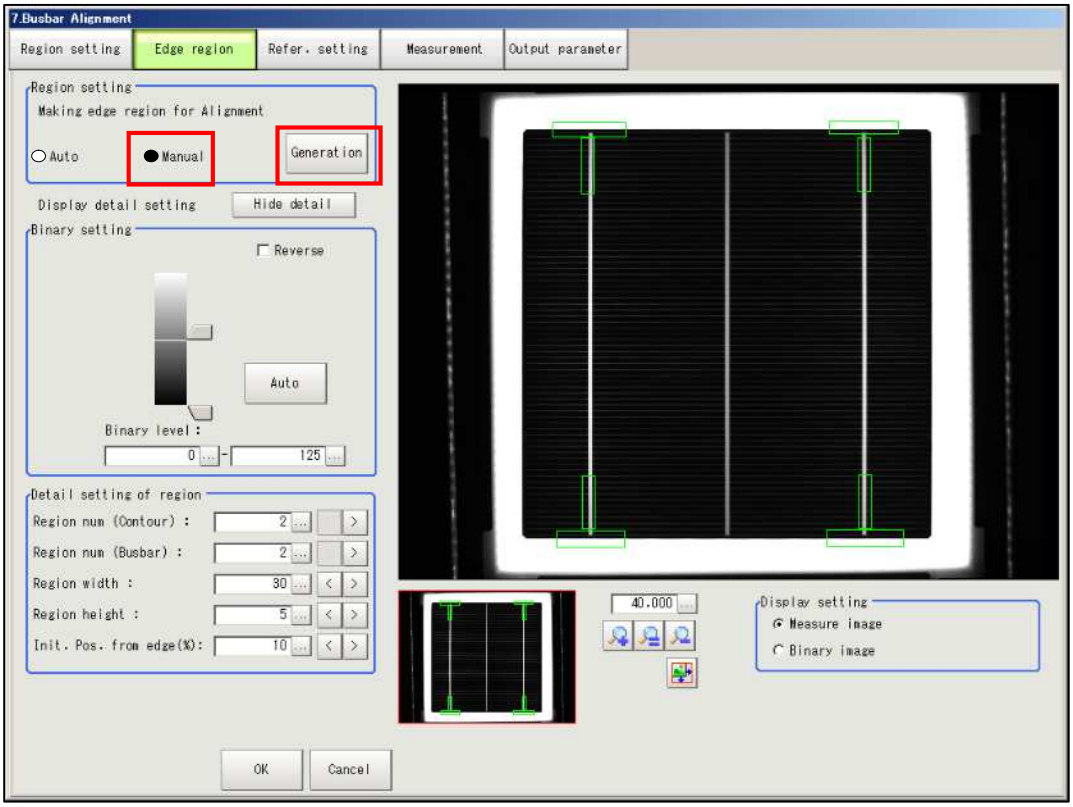
(5) Click [Edge region] and [Auto] button.



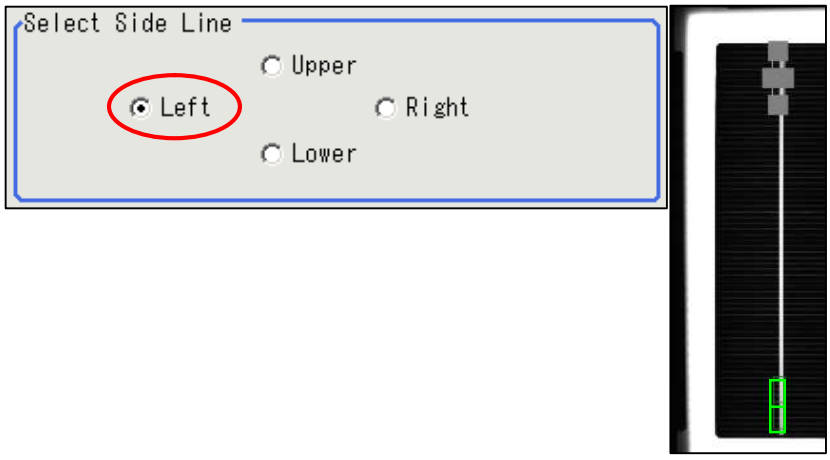
(6) Click […] button of [Region num (Busbar)] in [Detail setting of region] and enter “2”.
It is recommended to enter the number of busbar that is near LED light, not the whole number of busbar.

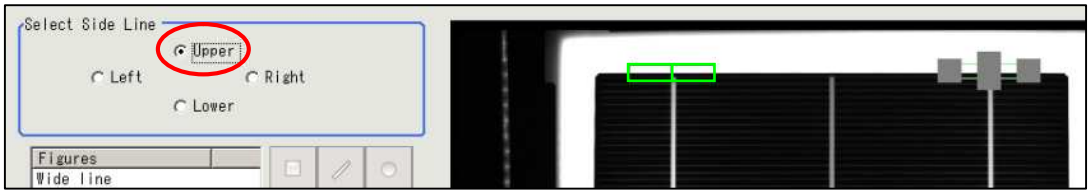


(7) Click [Manual] button of [Region setting] and [Generation] button.



(8) Set eight regions in total. When making edge region, choose side to be edited from [Select Side Line], zoom the image and note the contents in the following pages.



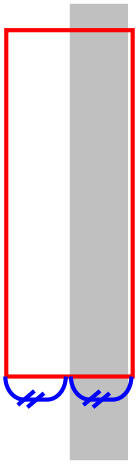


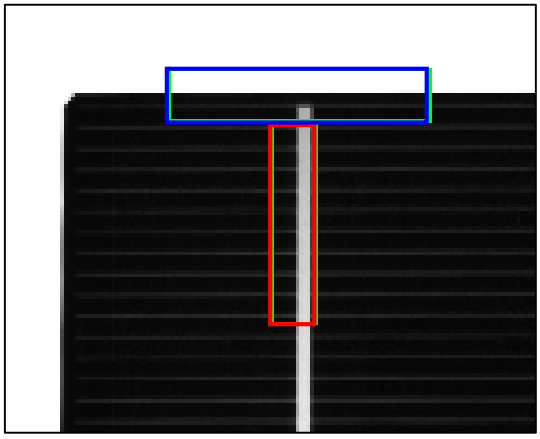
* Before clicking [Generation] button, check the following settings.

【Region setting indicated with red rectangle】

Setting the region indicated with red rectangle is necessary to recognize busbar position.

Set four regions so that the outline of the busbar is at the center of each region.



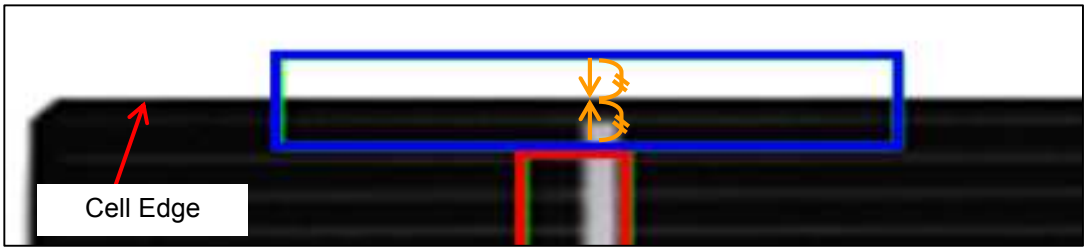


***Gray: Busbar Red: Region

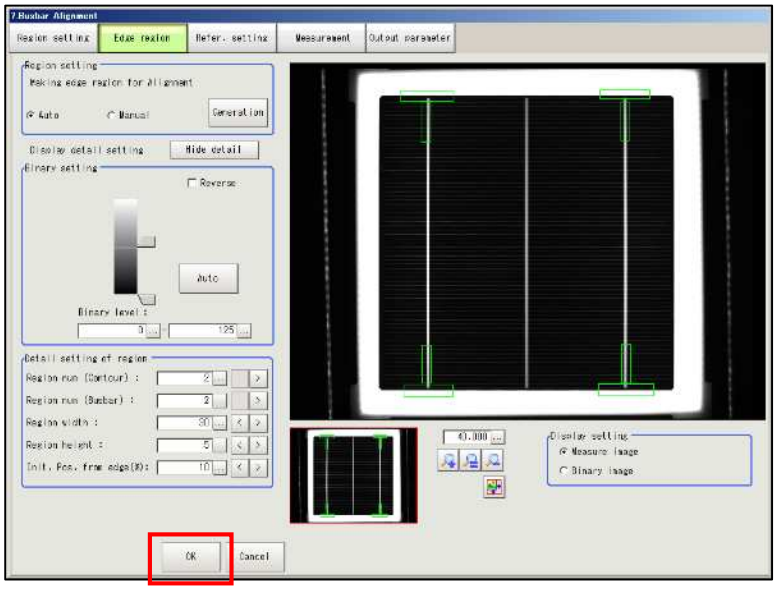
【Region setting indicated with blue rectangle】

Setting the region indicated with blue rectangle is necessary to recognize cell edge.

Set four regions so that the cell edge is at the center of each region.

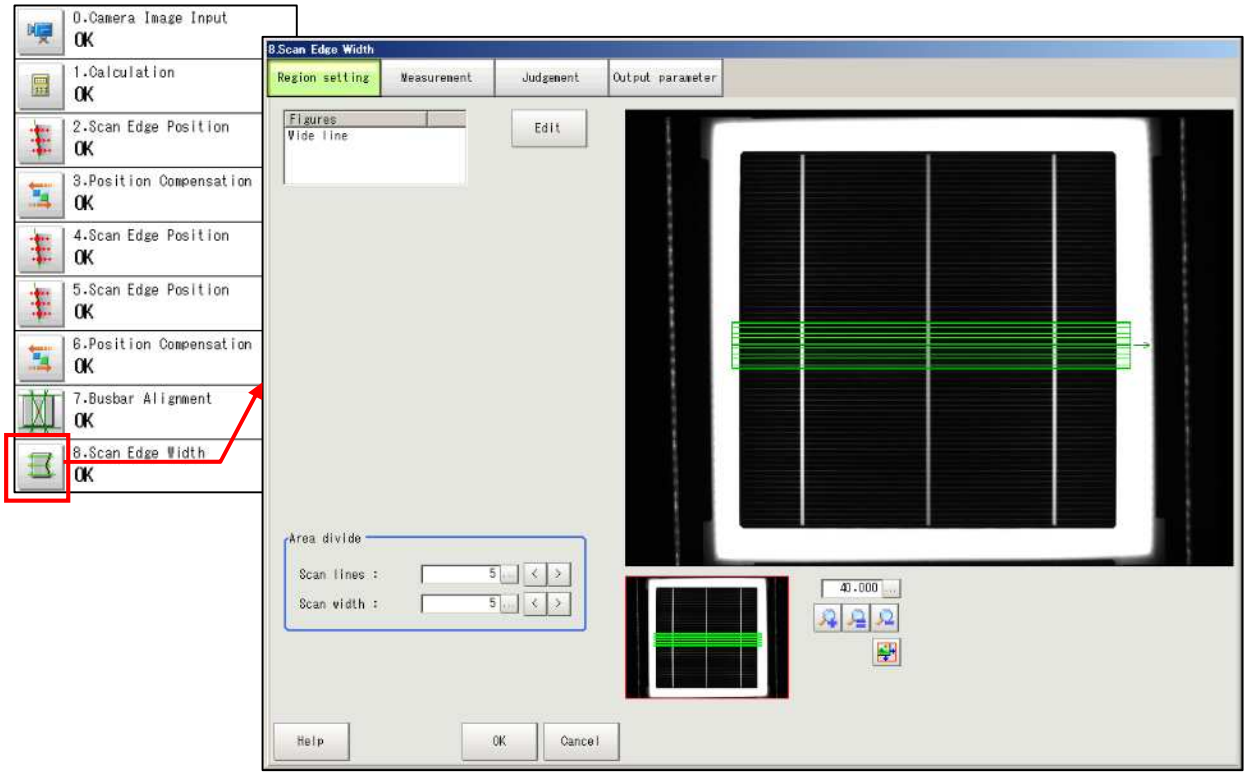


(9) After setting, click [OK] button.

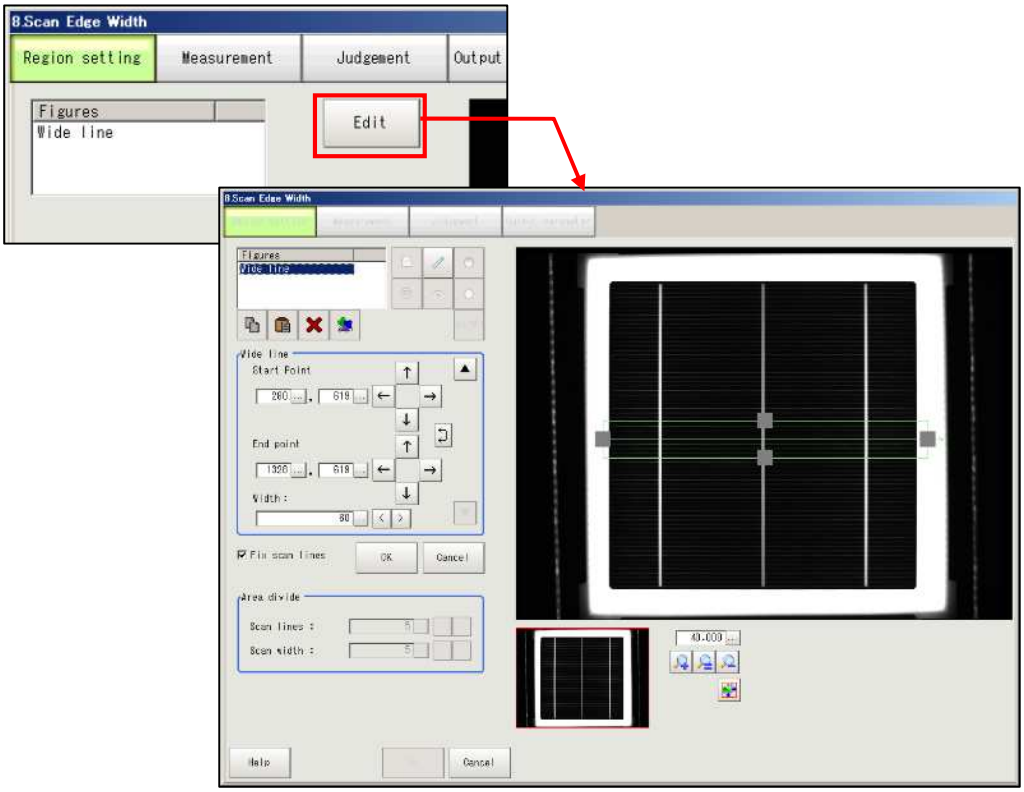


1-4-5-9. [8.Scan Edge Width]

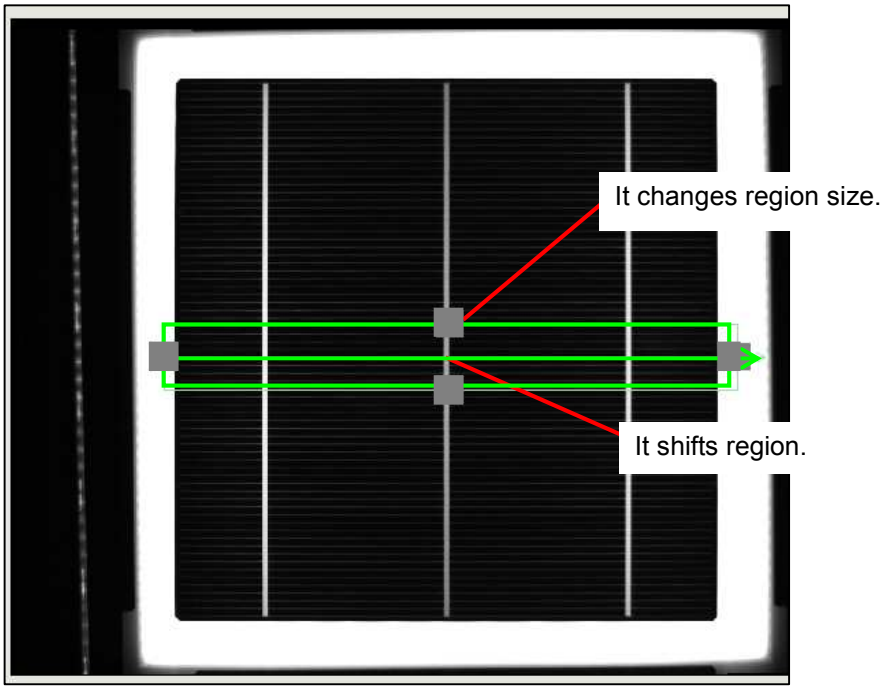
This setting is necessary to measure the difference between width and height of the cell. [8.Scan Edge Width] is for measuring width of the cell, while [9.Scan Edge Width] is for the height. Values set in [8.Scan Edge Width] and [9. Scan Edge Width] are used for [1.Calculation].



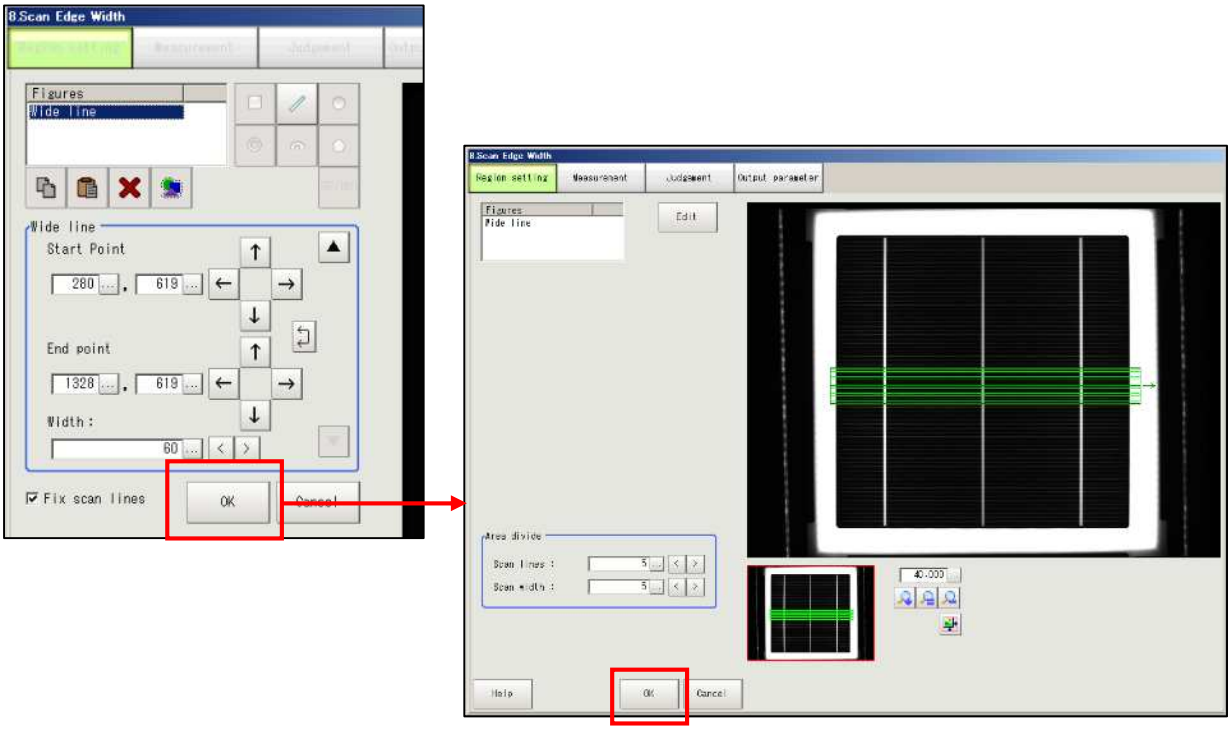
(1) Click [Edit] button and display region setting screen.



(2) The green lines indicate the region to be measured, while gray rectangles indicate the midpoint of the region. The region size changes by dragging the gray rectangle on cell image. The region shifts by dragging the center green line. Include the horizontally whole center part of the cell with a margin of 3 to 5mm from the cell edge.

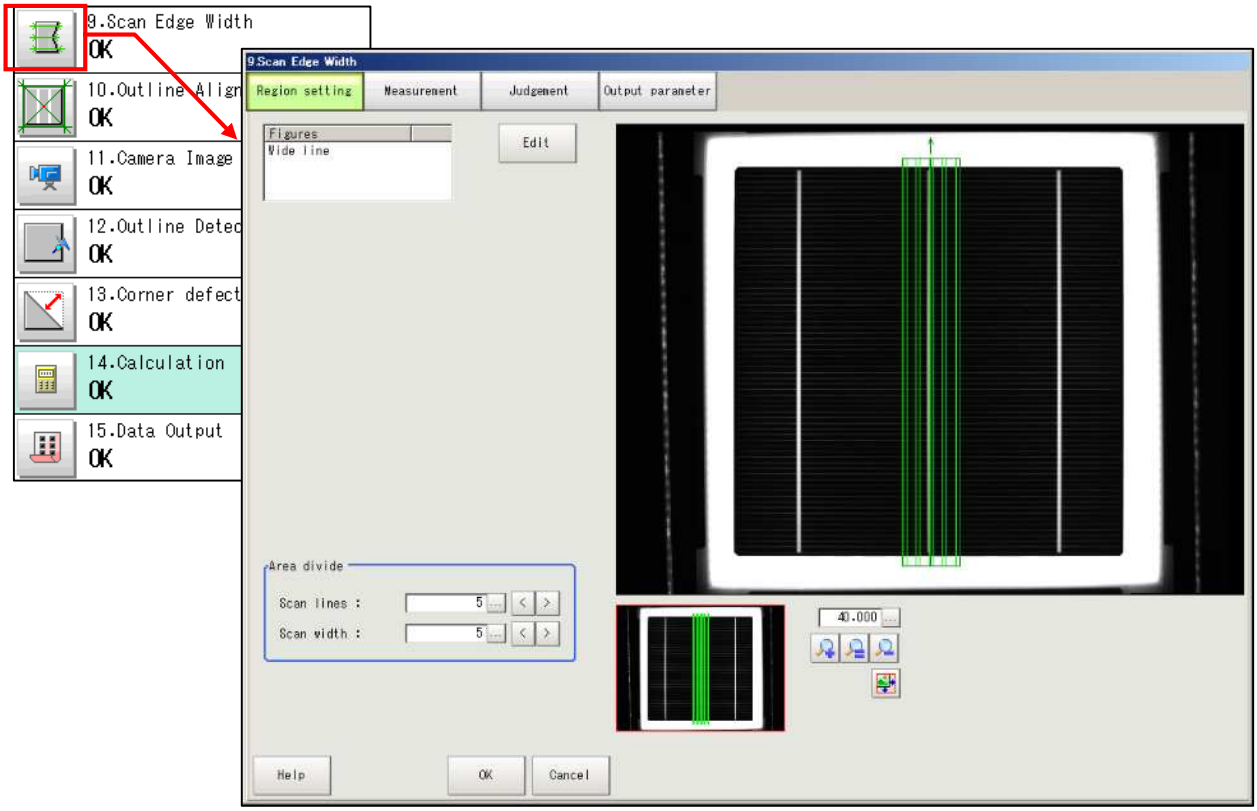


(3) After setting region, click [OK] button, and then, click [OK] button on [Region setting] screen.



1-4-5-10. [9.Scan Edge Width]

Set for cell height in the same way as in [1-4-5-9. [8.Scan Edge Width]].

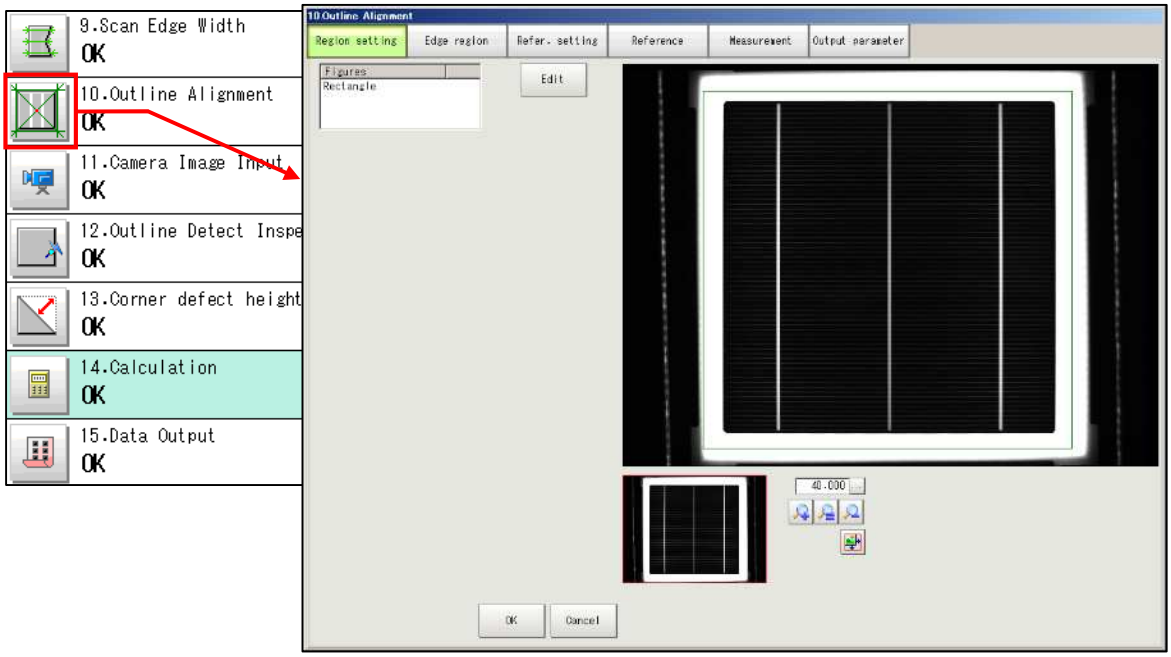


1-4-5-11. [10.Outline Alignment]

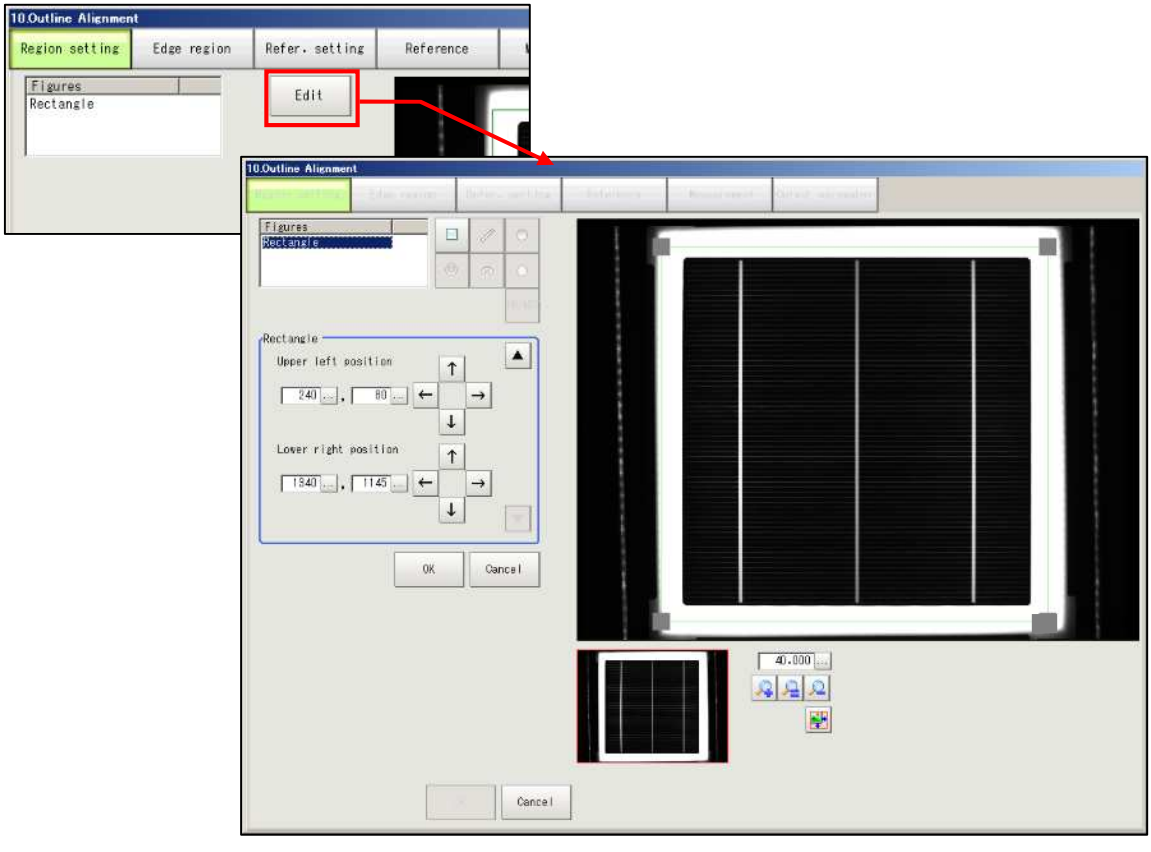
In this screen, only [Region setting] and [Edge region] are edited.

This setting is necessary to reject cell if the difference between the cell center based on busbar print position measured in [7.Busbar Alignment] and the cell center based on cell outline is bigger than the value set in [1.Calculation].

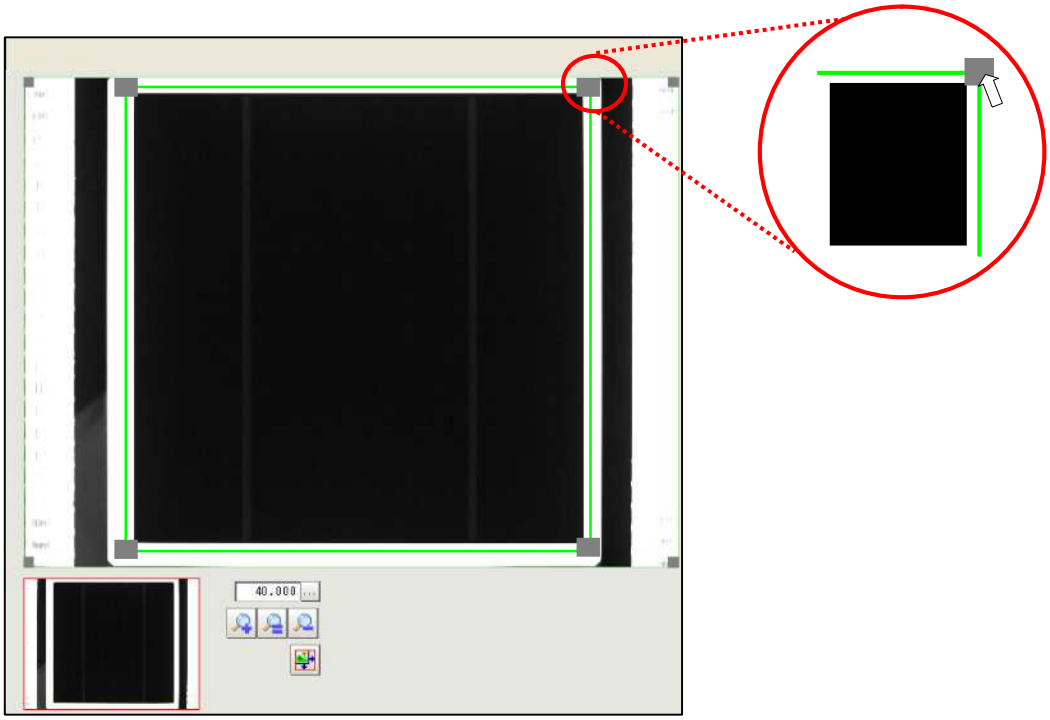
(1) Click [10.Outline Alignment] icon button in the flow and display [Region setting] screen.



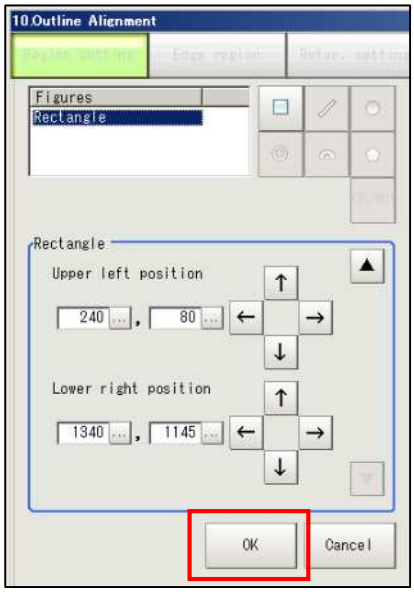
(2) Click [Edit] button on [Region setting] screen to display the setting screen for measurement region.

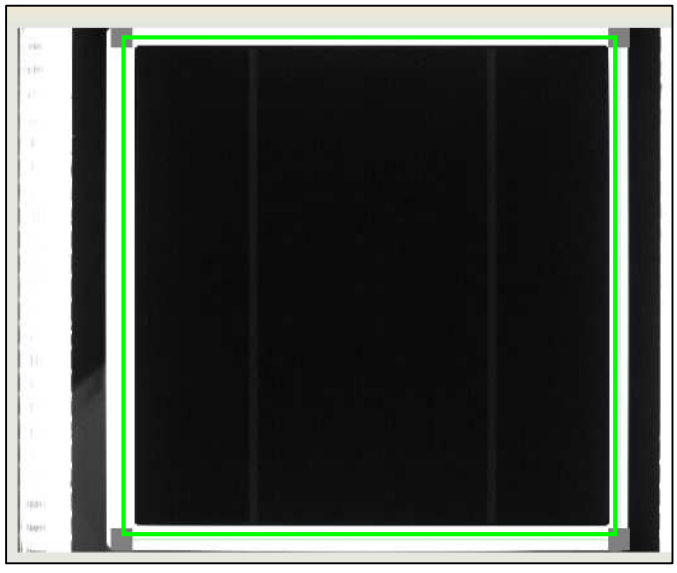


(3) The rectangle enclosed by green lines represents the measurement region. Adjust the measurement region around 3 to 5mm from the cell edge, dragging the small square on each corner of the rectangle with the mouse.

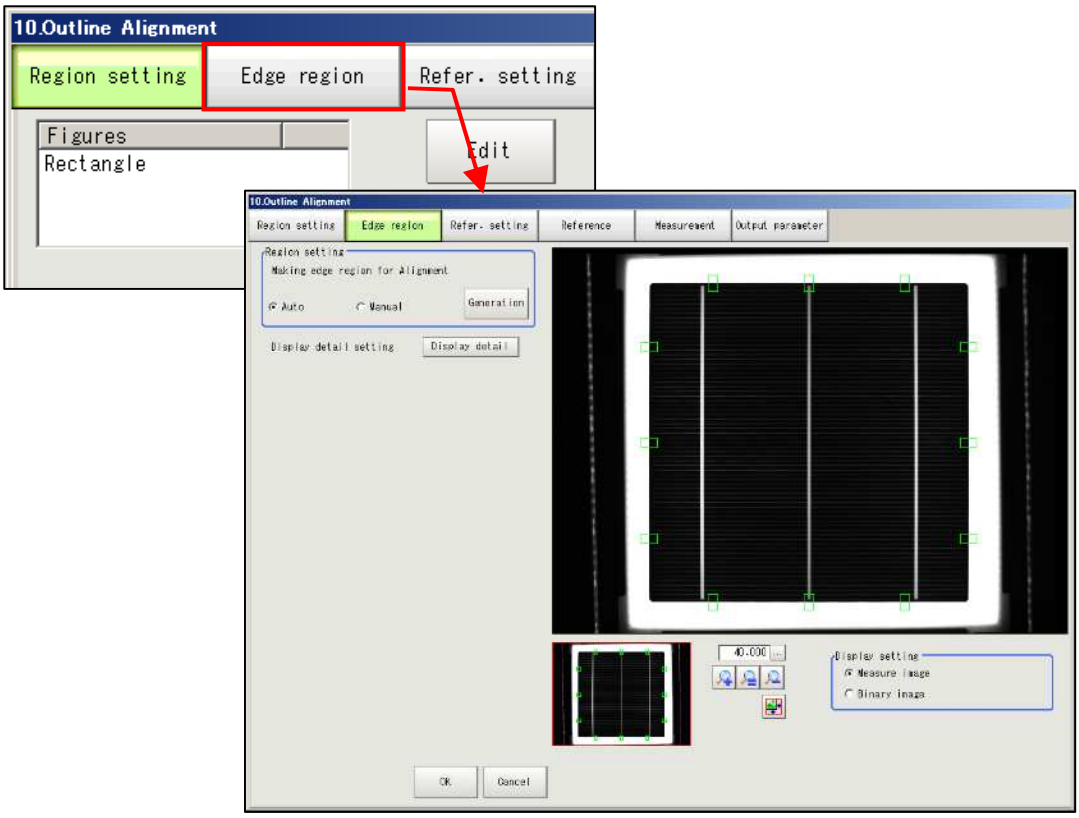


(4) Click [OK] button to set the edited region.

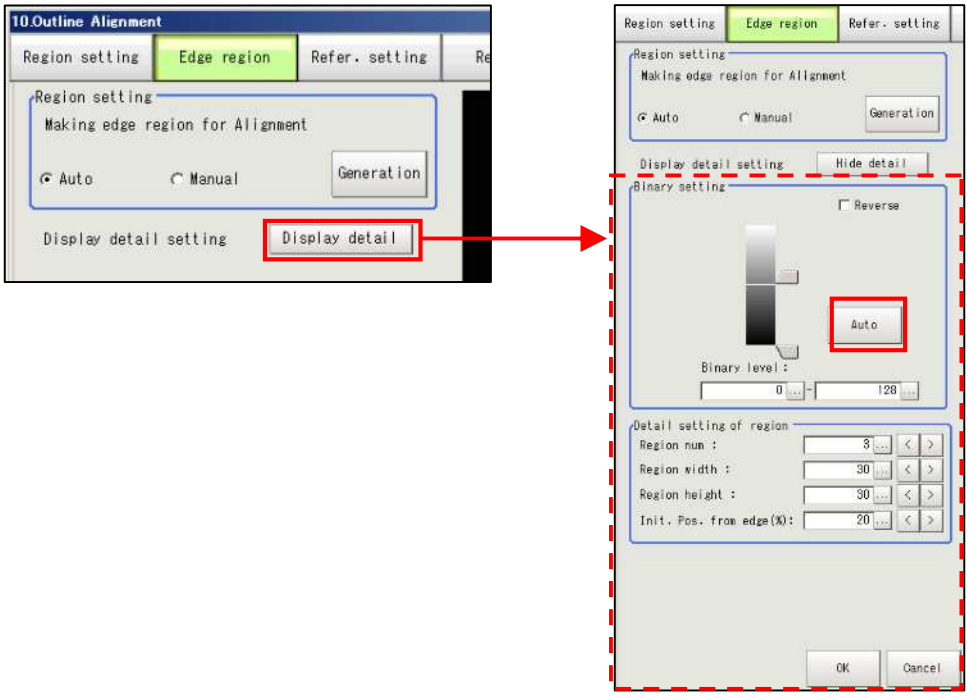




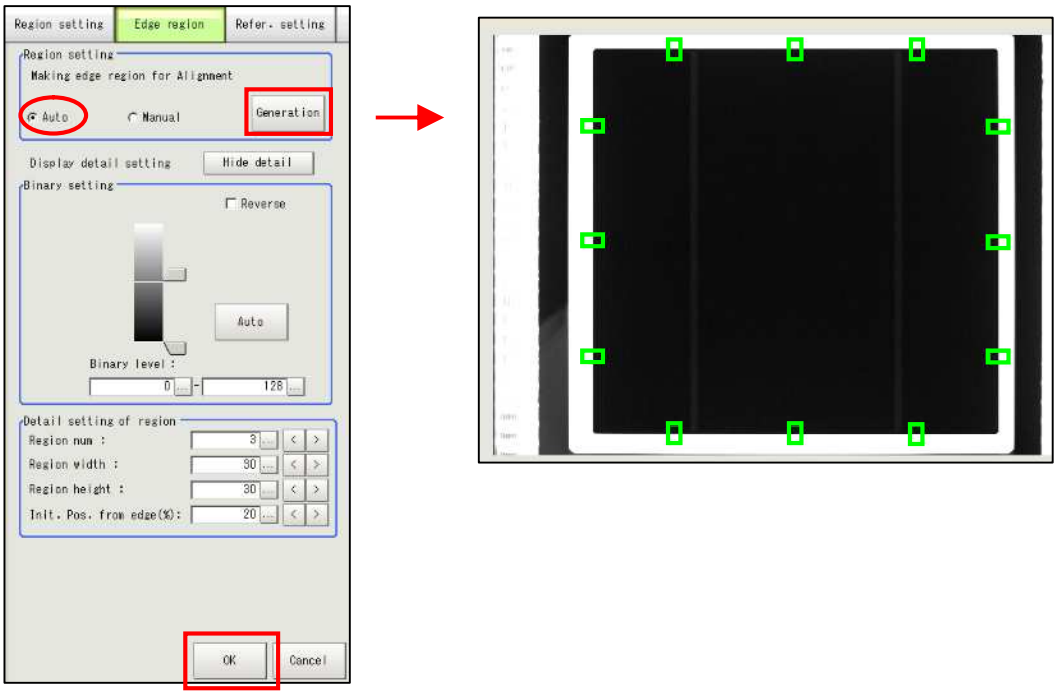
(5) Click [Edge region] tab to display the edge measurement region for alignment.



(6) Click [Display detail] button to show the region setting parameter. Click [Auto] button of [Binary setting].

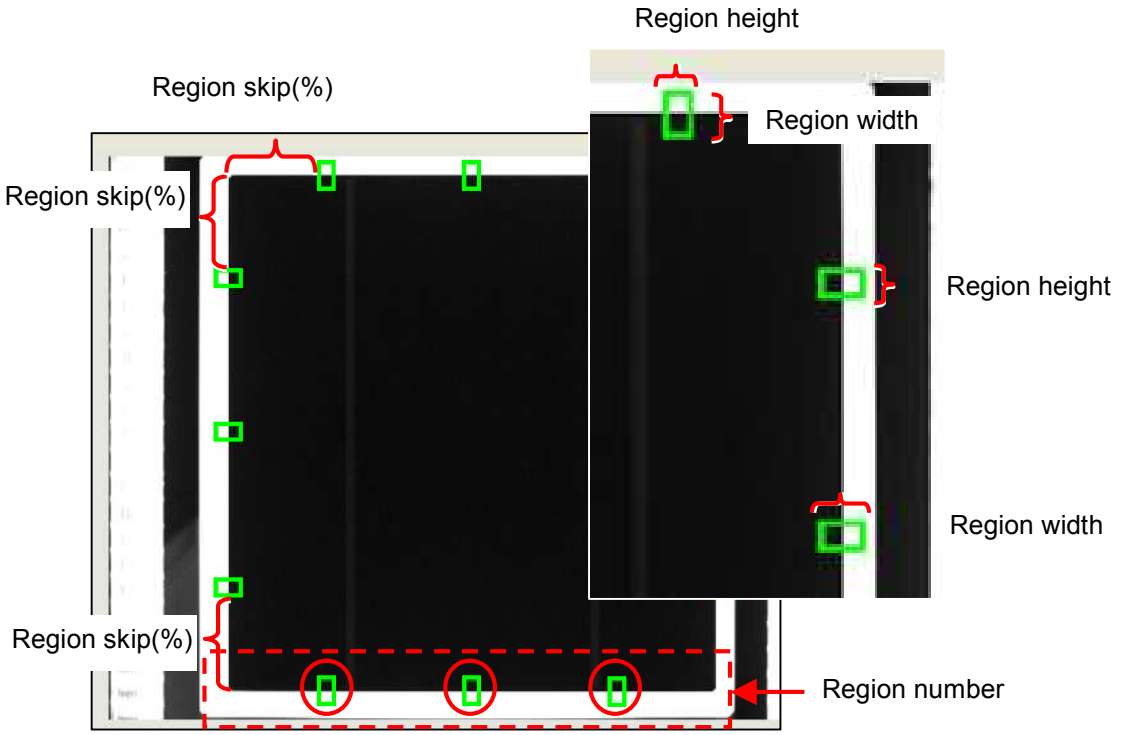


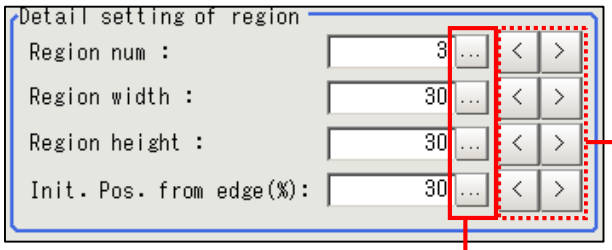
(7) Choose [Auto] button on the [Region setting] field and click [Generation] button. The edge region for the alignment is displayed automatically. If the setting is appropriate, click [OK] button.
(Refer to the following pages if you want to edit the region manually.) The main screen will be displayed.
Setting on [Refer. setting], [Measurement], and [Output parameter] screens is not necessary.



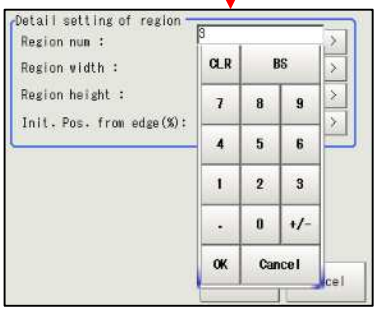
Detail Setting of Region

	In order to set the edited region as [Edge region], click [Generate] button. The region will be regenerated.





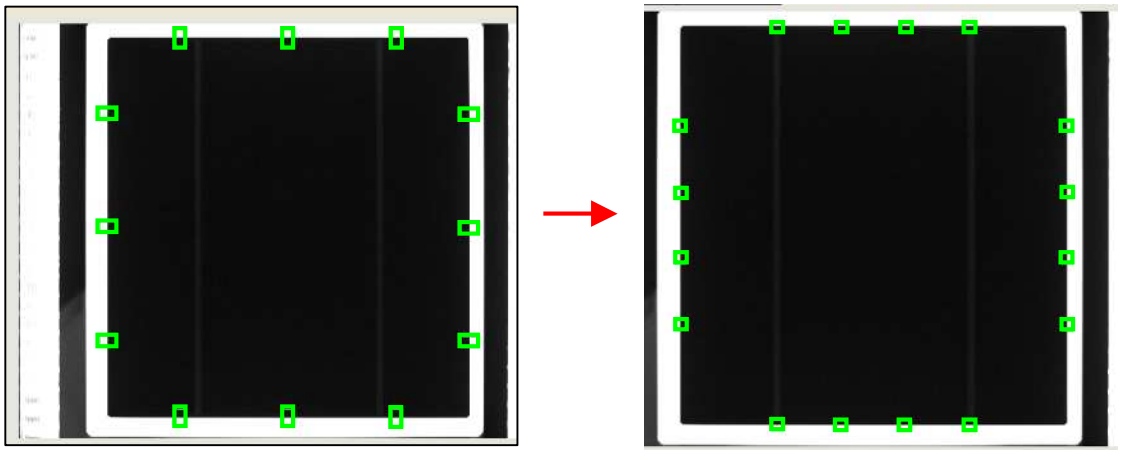
You can change the value by one.



Entry keyboard is displayed.

Region num	The number of edge regions on side line. The region number is set to [3] in the above picture.
Region width	Width is the region side which is vertical to the cell edge. The guideline width for 6 inch cell is “20~30”. (Wider region is preferable as long as the region is inside the white plate.)
Region height	Height is the region side which is parallel to the cell edge.
Init. Pos. from edge (%)	The position from which an edge region of the side line will be generated. (Unit :%)

If region setting is edited after automatic edit of [Edge region], the image changes as follows:



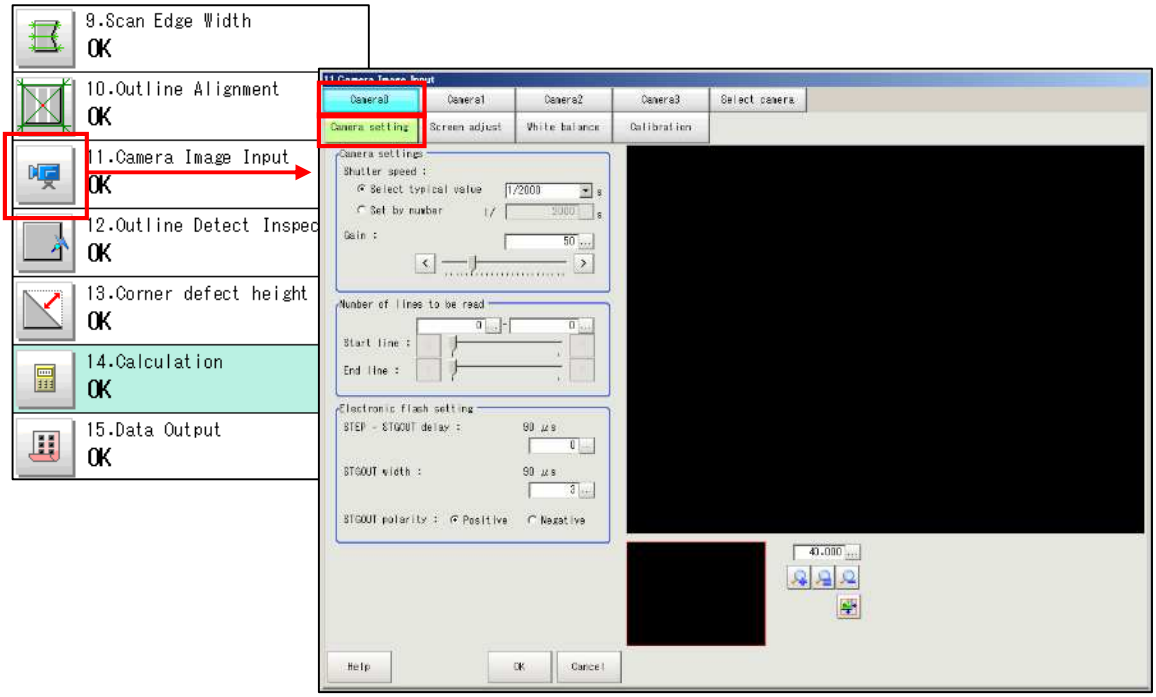
Automatically set [Edge region]

[Edge region] set on the detail setting of the region.

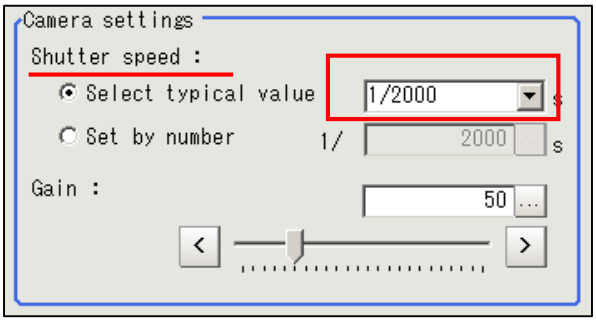
1-4-5-12. [11.Camera Image Input]

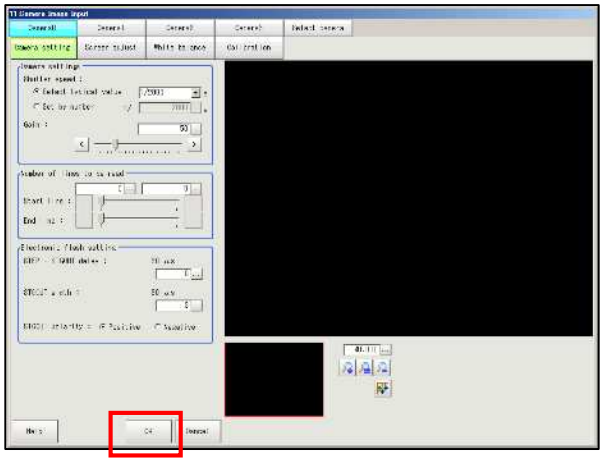
This setting is to reduce shutter speed of the camera in order to get darker cell image for [12.Outline Detect Inspection].

(1) Click [11.Camera Image Input] icon button in the flow, and choose [Camera 0] and [Camera setting] screen.



(2) Adjust [Shutter speed] of [Camera settings], and click [OK] button if there is no problem.

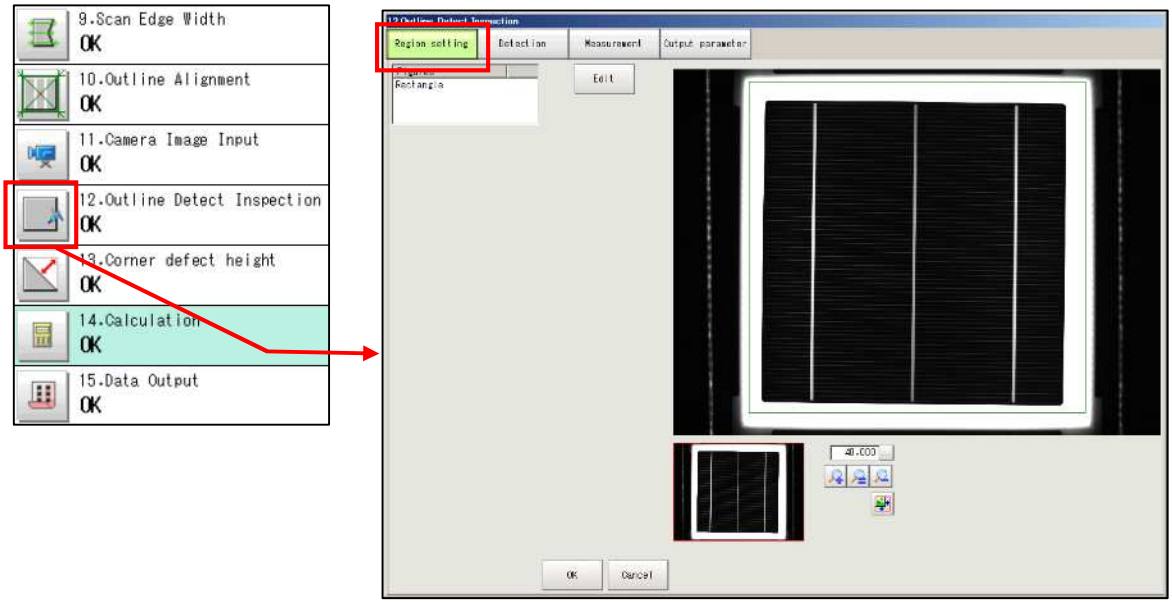




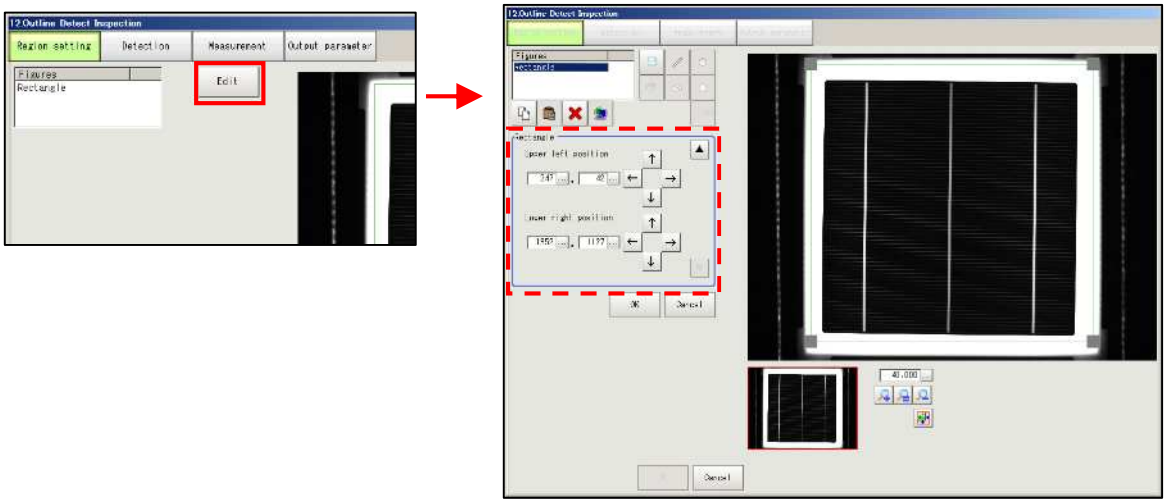
1-4-5-13. [12.Outline Detect Inspection]

It is the setting for detecting location where the perimeter and shape differ with the outline, after extracting cell outline automatically and while tracing the extracted outline points.

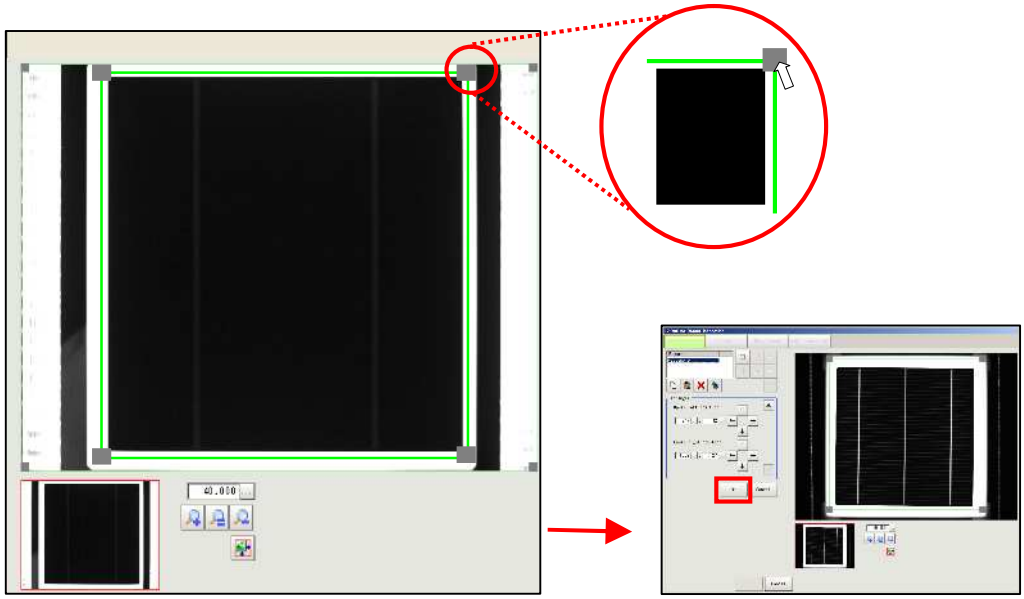
(1) Click [12.Outline Detect Inspection]'s icon button to display the outline detect inspection screen. Edit only [Region setting] among four setting parameter in the outline detect inspection.



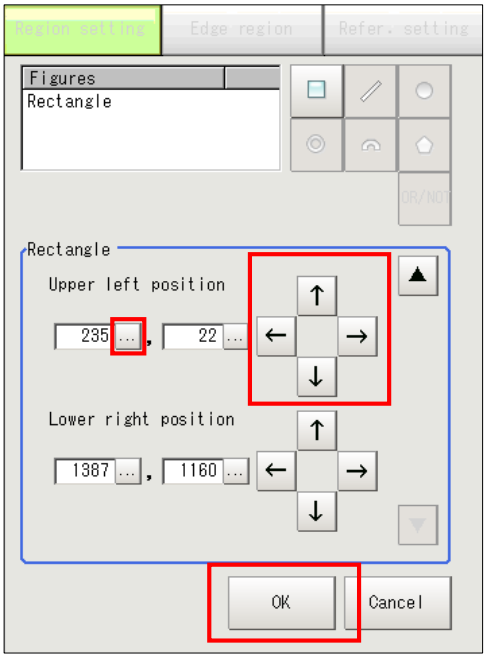
(2) Click [Edit] button on [Region setting] screen to display the region setting items.



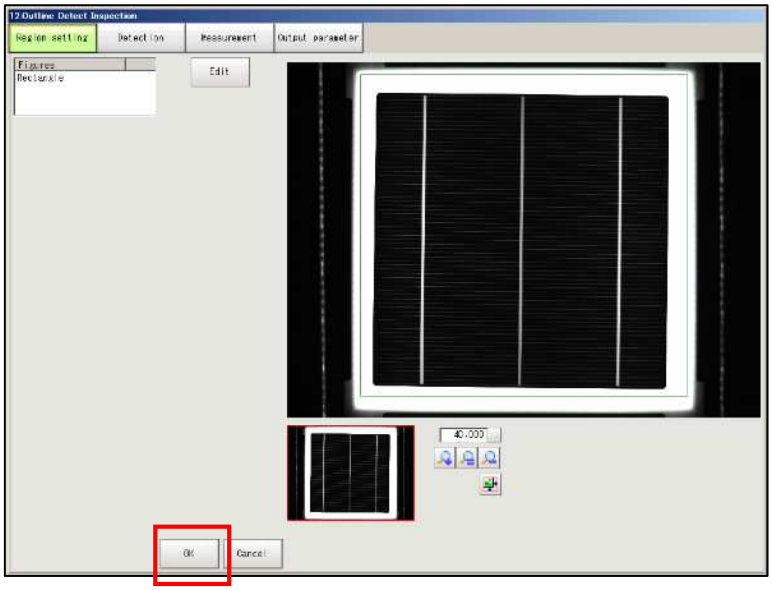
(3) The rectangle enclosed by green lines represents the measurement region for outline detect inspection. The whole measurement target object needs to be included in the rectangle. Adjust the measurement region around 3 to 5mm from the cell edge, dragging the small square on each corner of the rectangle with the mouse.
Click [OK] button to set the edited region. Proceed to (4) for fine adjustment.



(4) For fine adjustment, adjust with allow buttons or […] button in the picture below. Click [OK] button to decide the region.

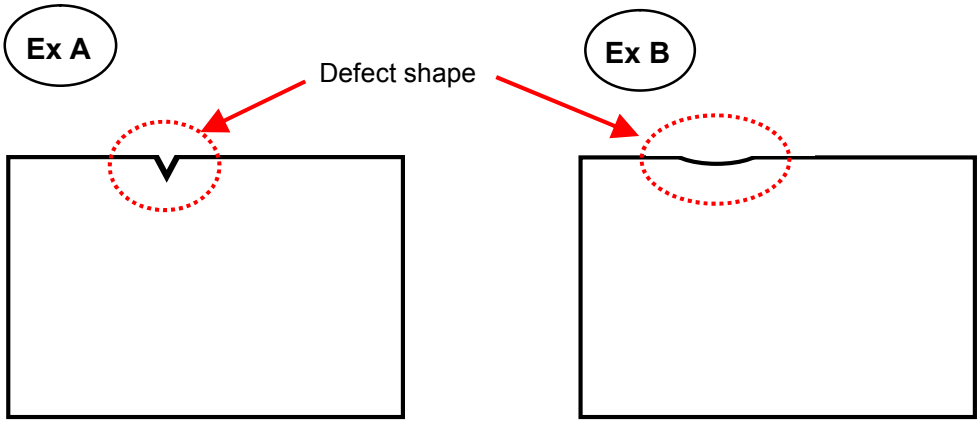


(5) After clocking [OK] button on (3) or (4), click [OK] button on [Outline Detect Inspection] screen to decide the setting for the whole measurement. It changes to the main screen.
Setting of [Output parameter] is not necessary. For [Detection] and [Measurement], edit as needed after checking the condition of the produced string cell.
Refer to (6) for [Detection] setting, (7) for [Measurement].

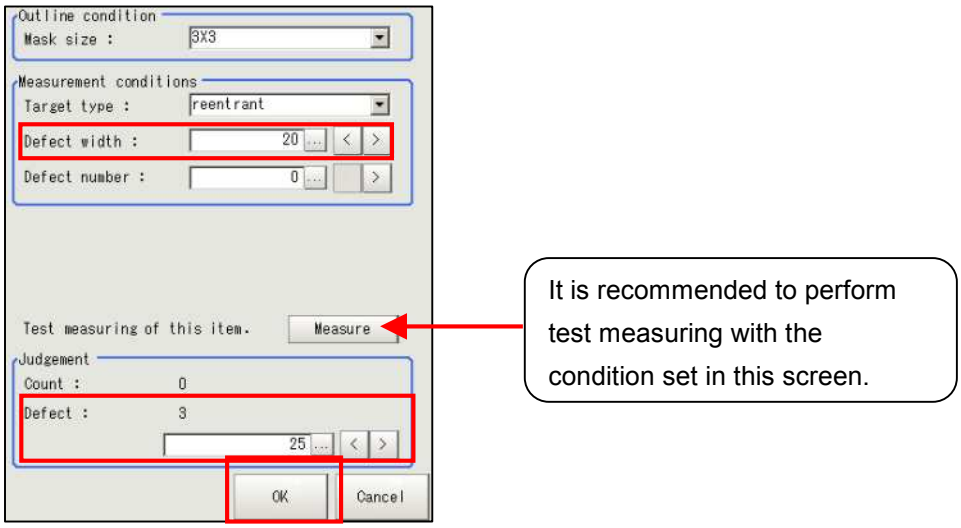


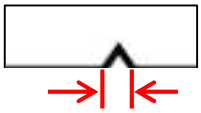
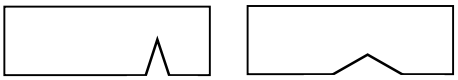
(6) Produce a string cell with the setting decided in (5) and check the condition of the string cell.
If the defect cell is judged as an acceptable cell, adjust with [Defect width] in [Measurement conditions] and [Defect] in [Judgment] on [Outline Detect Inspection] screen.

The defect as in Ex.A is easily detected in [Outline Detect Inspection]. However, the defect with smooth curve may be difficult to detect. This setting is useful in this case.

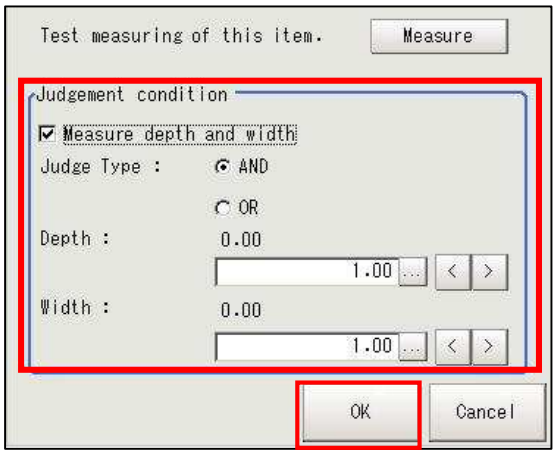


Click [Detection] tab in [Outline Detect Inspection] screen to display the setting screen.
You need not to edit setting if scene is copied.
Set [Defect width] in [Measurement condition] and [Defect] in [Judgment]. Click [OK] button to decide the set value.



Defect width	Settable between 1 and 1000. The guideline value is “20”. Sets the target defect width which to be detected. The defect is detected by comparing each outline point with the outline point in this range.  Defect width
Defect	Settable between 1 and 180. The guideline value is “25”. The defect higher than the value in [Defect] is detected. [Defect] is the difference between the peripheral outline points. (Sharpness of the defect)  High defect Low defect

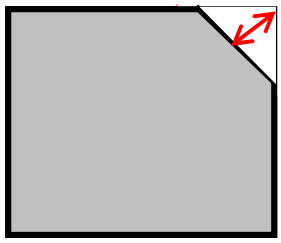
(7) Produce a string cell with the setting decided in (5), and check the condition of the string cell.
To change the threshold value (defect width and depth) between the rejected cell and the accepted cell, **prepare a sample cell which has the defect of the minimum size to be detected**. Check [Measure depth and width] and select judge type from [AND] and [OR] to set judgment condition. Adjust [Depth] and [Width]. Click [OK] to decide the setting.



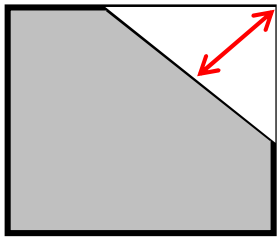
1-4-5-14. [13.Corner Defect Height]

In the outline detect inspection, the locations that are indented in relation to the perimeter edge is detected. However, detection can be difficult at the chamfer of a cell corner area where there is no indentation, as shown below.

In [Corner defect height], the distance from vertex of the cell circumscribed rectangle to the corner (indicated with red arrow) is measured to detect the chamfer defects.

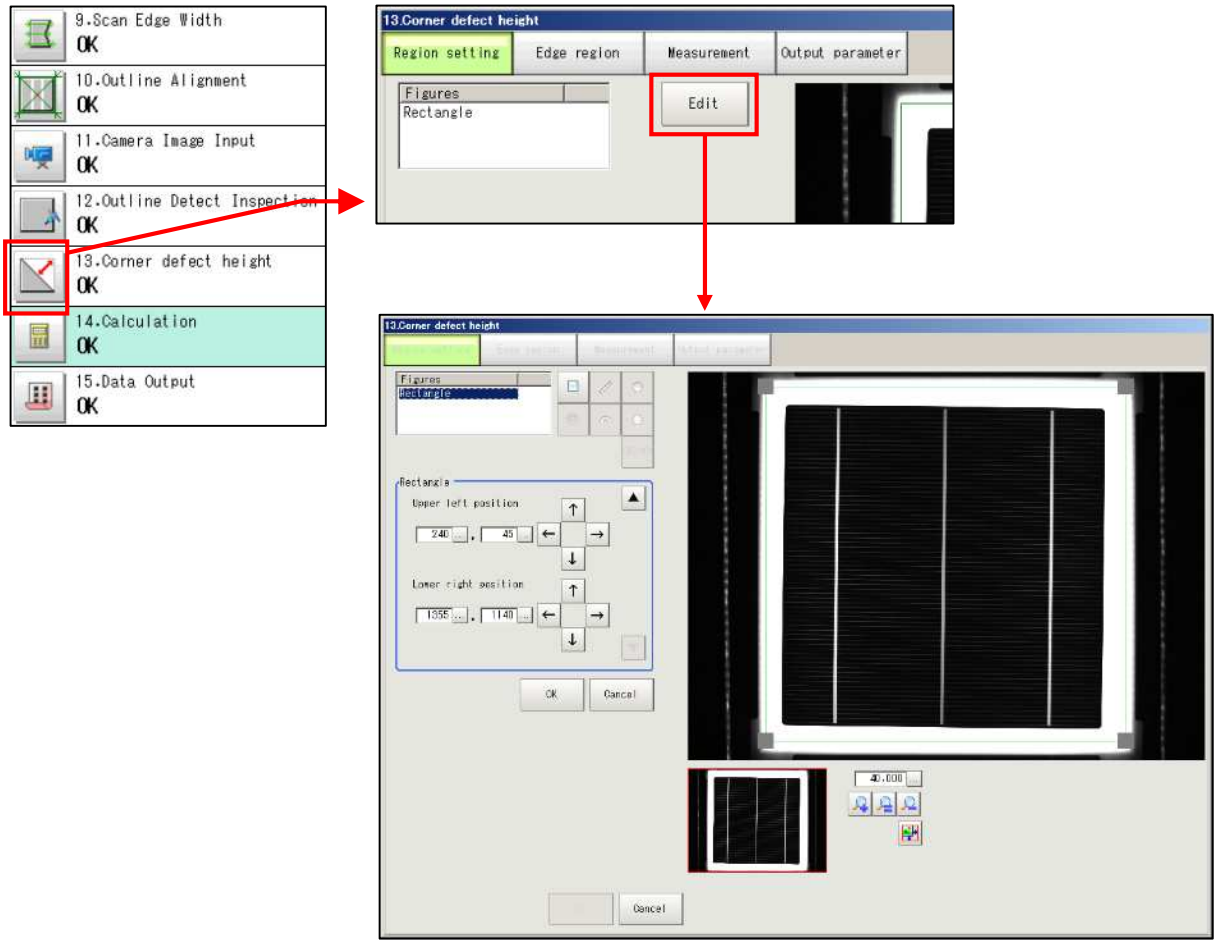


Corner of acceptable cell

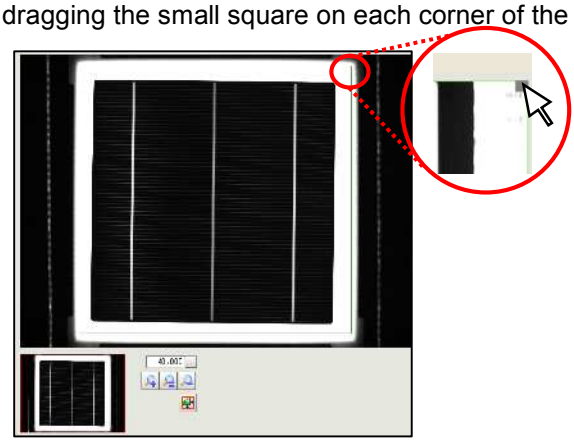


Chamfered corner of unacceptable cell

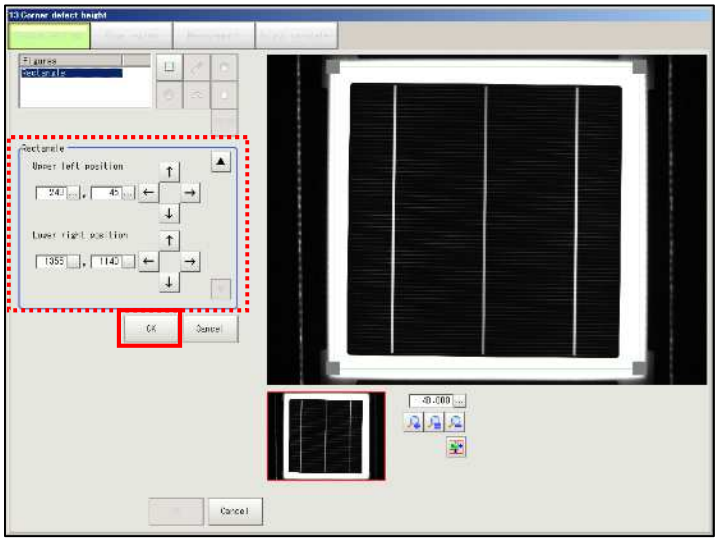
(1) Click [Corner defect height]'s icon button on the main screen to display [Corner defect height] screen. In this screen, only [Region setting] and [Measurement] are to be edited. Click [Edit] button on [Region setting] screen.



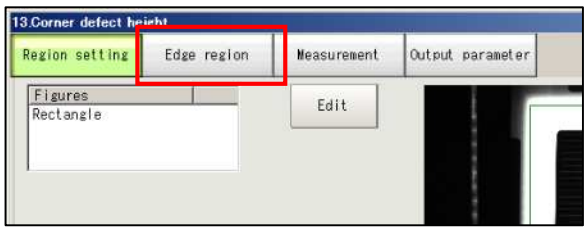
(2) The rectangle enclosed by green lines represents the measurement region for corner defect **height**. The whole measurement target object needs to be included in the rectangle. Adjust the measurement region by dragging the small square on each corner of the rectangle with the mouse.



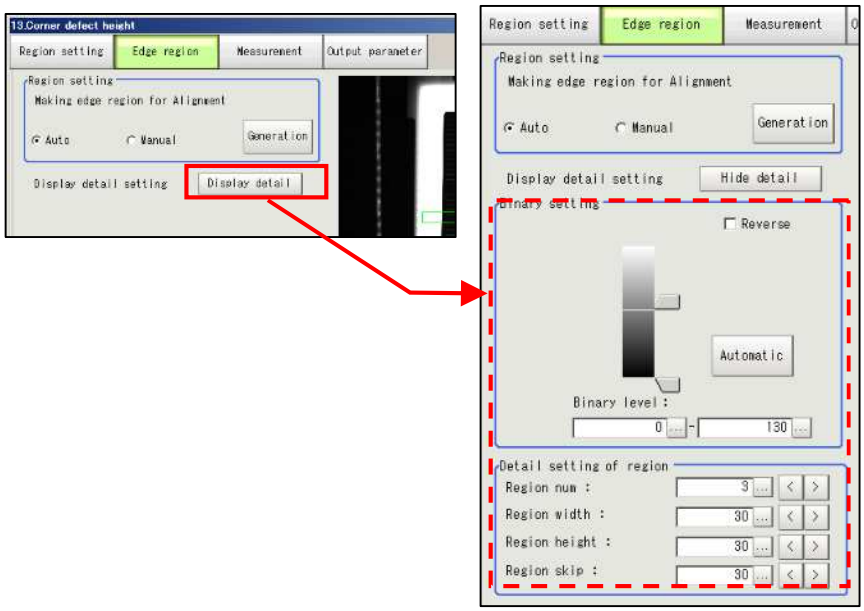
(3) Click [OK] button in the setting region is appropriate. For fine adjustment, adjust with allow buttons or […] button in the picture below. Click [OK] button to decide the region.



(4) Click [Edge region] tab to set the edge region. This setting is necessary to calculate the center coordinates and slanting of the cell.

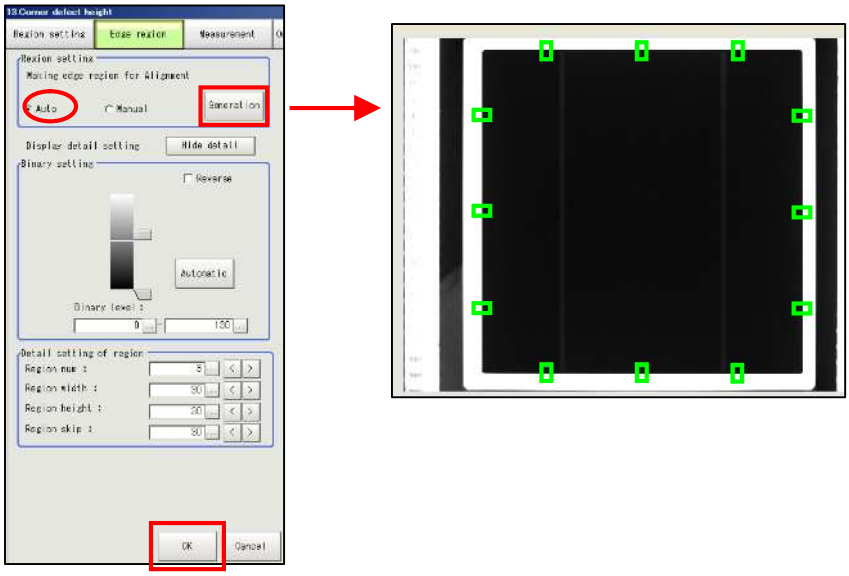


(5) Click [Display detail] button to display detail setting parameters.



(6) Click [Automatic] button on [Binary Setting].

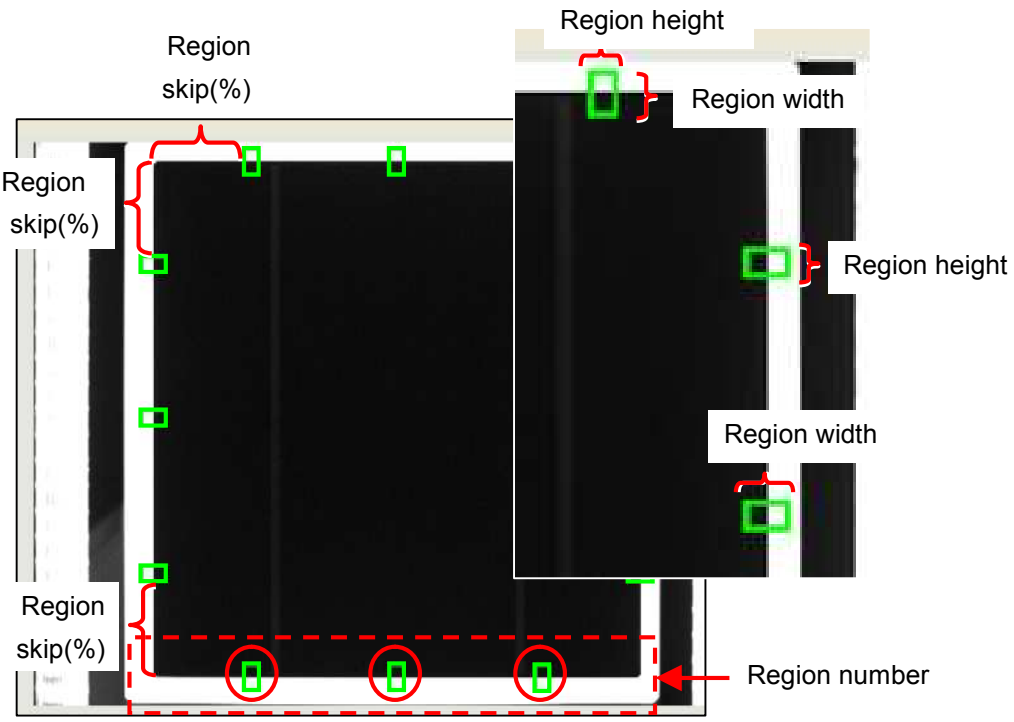
(7) Check [Auto] button in [Region setting] and click [Generation] button to set the edge regions automatically. (Refer to the following pages to edit the region.)

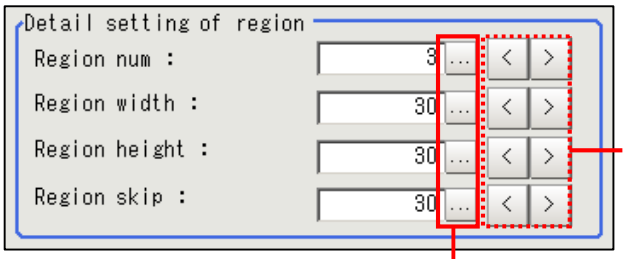


＝Reference＝

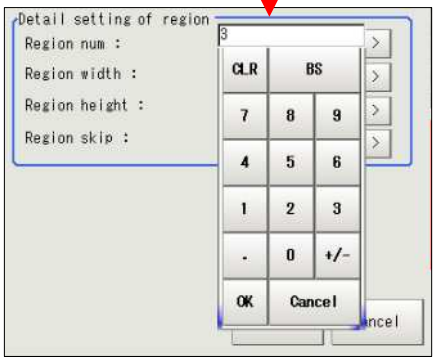
＜Region detail setting＞

*** When editing [Edge region], click [Generation] button to regenerate the region.**





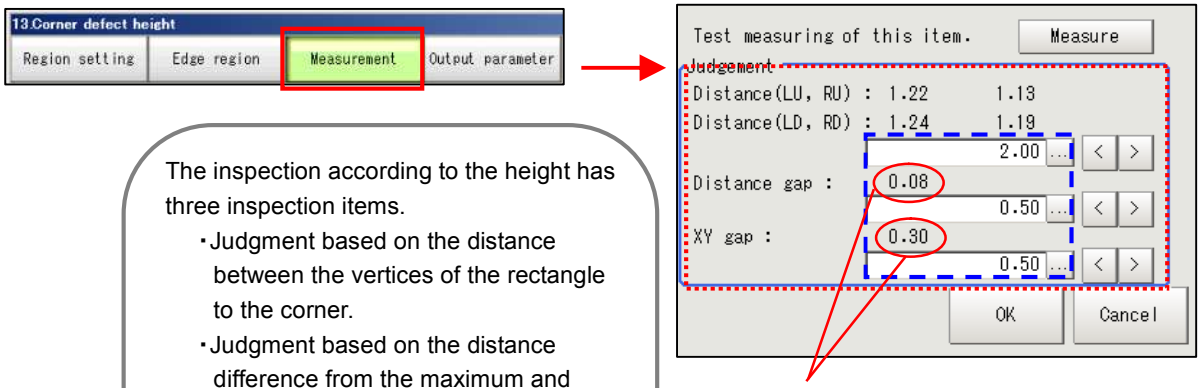
Change the value by 1.



Entry keyboard is displayed.

Region num	The number of edge regions on side line. The region number is set to [3] in the above picture.
Region width	Width is the region side which is vertical to the cell edge. The guideline width for 6 inch cell is “20~30”.
Region height	Height is the region side which is parallel to the cell edge.
Init. Pos. from edge (%)	The position from which an edge region of the side line will be generated. (Unit :%)

(8) Click [Measurement] tab to display the setting screen. In this screen, the parameters for [Judgment] are set. (Factory setting is shown in the picture below.)



The inspection according to the height has three inspection items.

- Judgment based on the distance between the vertices of the rectangle to the corner.
- Judgment based on the distance difference from the maximum and minimum corner.
- judgment based on the difference between the height and the width.

Completing the above three items clears [Corner defect height].

***Measurement result no less than the value in [Judgment] is judged as**

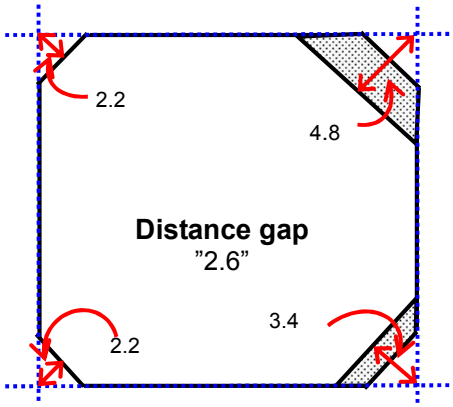
The automatic calculated gap indicates.

* Refer to the drawings in the following page.

Distance	Sets the corner distance range to be judged as acceptable. It is the distance between the vertices of the rectangle to the corner. *** Measurement result no less than the value in [Judgment] is judged as unacceptable.** For Ex B, set “4.81” to complete the distance judgment. Entering “4.8” or less than it causes the distance of the top-right corner to be judged as unacceptable. For Ex A, enter “2.2” or more. If “2.2” is entered, the corner distances of the top left and the bottom two corners are judged as unacceptable.
Distance gap	Set the corner difference range judged as acceptable. It is the difference between the maximum and minimum distance between the vertices of the rectangle to the corner.*** Measurement result no less than the value in [Judgment] is judged as unacceptable.** Distance gap: the difference between the maximum and minimum distances among the distances at the four corners. For Ex B, the corner difference is “1.3”. Set “1.31” to complete the distance gap judgment. Entering “1.3” or less than it causes the distance gap is judged as unacceptable. For Ex. A, enter “2.61” or more. If “2.6” or less is entered, the distance gap is judged as unacceptable.
XY gap	Set the vertical and horizontal distance difference (the absolute value expressing the difference between entire vertical and horizontal length of the cell) judged as acceptable.*** Measurement result no less than the value in [Judgment] is judged as unacceptable.** For Ex C, set “2.00” to complete the XY gap judgment, as the vertical and horizontal distance difference of the acceptable is “0.00”. As seen in the drawing of its right, the cell whose vertical distance difference is “3.50” exceeds the set value, therefore judged as unacceptable.

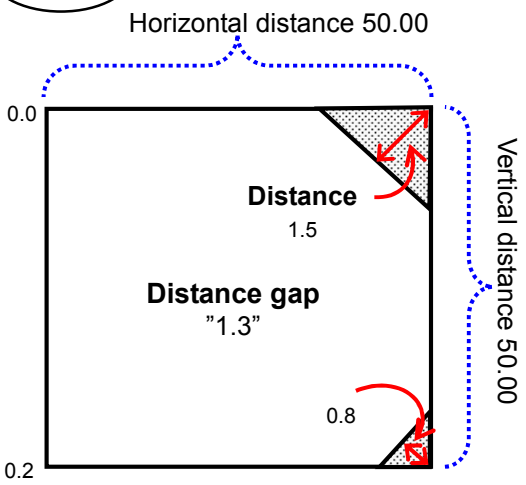
Ex A

・・・The location where the cell is broken.



The corners of the cell are cut from the beginning; the corner depth (distance) is “2.2”; the chamfer defect whose corner depth (distance) is “4.8” at the top right and “3.4” at the bottom right. As a result, the distance gap is “2.6”.

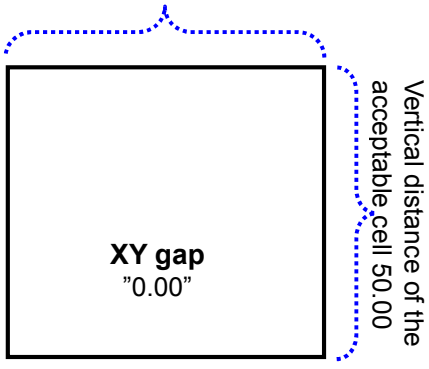
Ex B



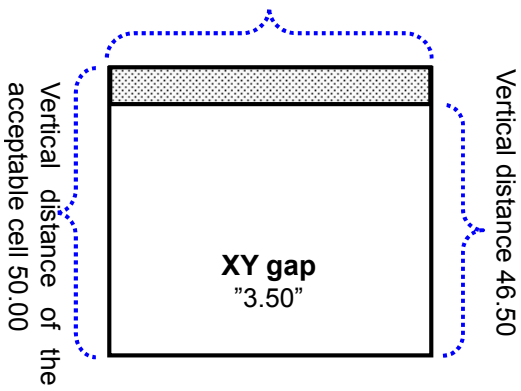
The corner of the acceptable cell is square; the chamfer defect whose depth is “1.5” at the top right, “0.8” at the bottom right and “0.2” at the bottom left. As a result, the distance gap is “1.3”.

Ex C

・・・The location where the cell is broken.

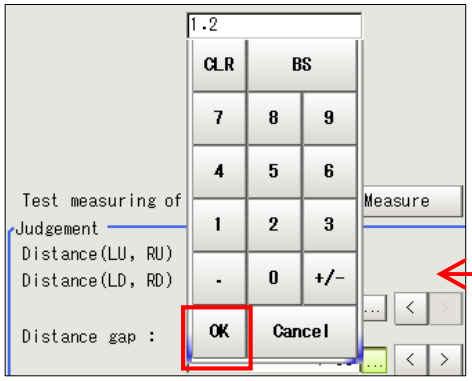


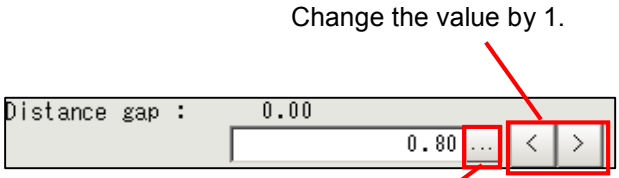
When the horizontal distance is “50.00” and the vertical distance is “50.00”, the XY gap of the cell is “0.00”.



With the same setting as the cell in the left, the XY gap of this cell is “3.50” as the vertical distance is only “46.50” due to the breakage at the upper side.
(Obtained by subtracting the horizontal distance from the vertical distance)

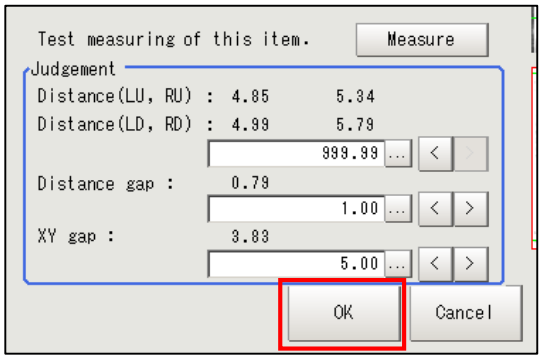
(9) Preparing the cell with the minimum defect, enter the value in the parameters and click [OK] button.





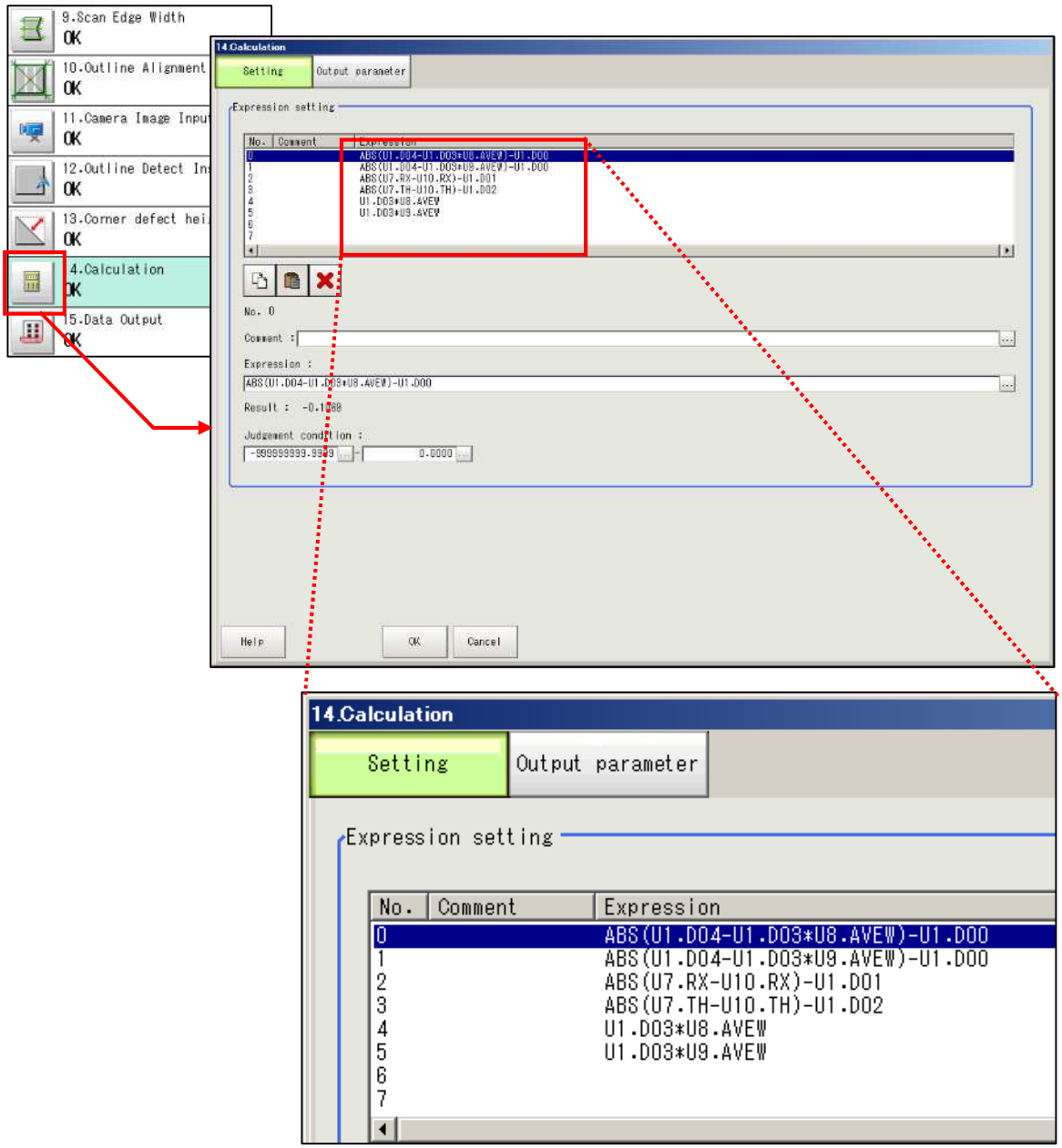
To enter the number of decimal places, click […] button to display the keyboard.

(10) Click [OK] button after editing. Editing [Corner defect **height**] is completed and the main screen is displayed again.



1-4-5-15. [14.Calculation]

You don't need to edit the setting.



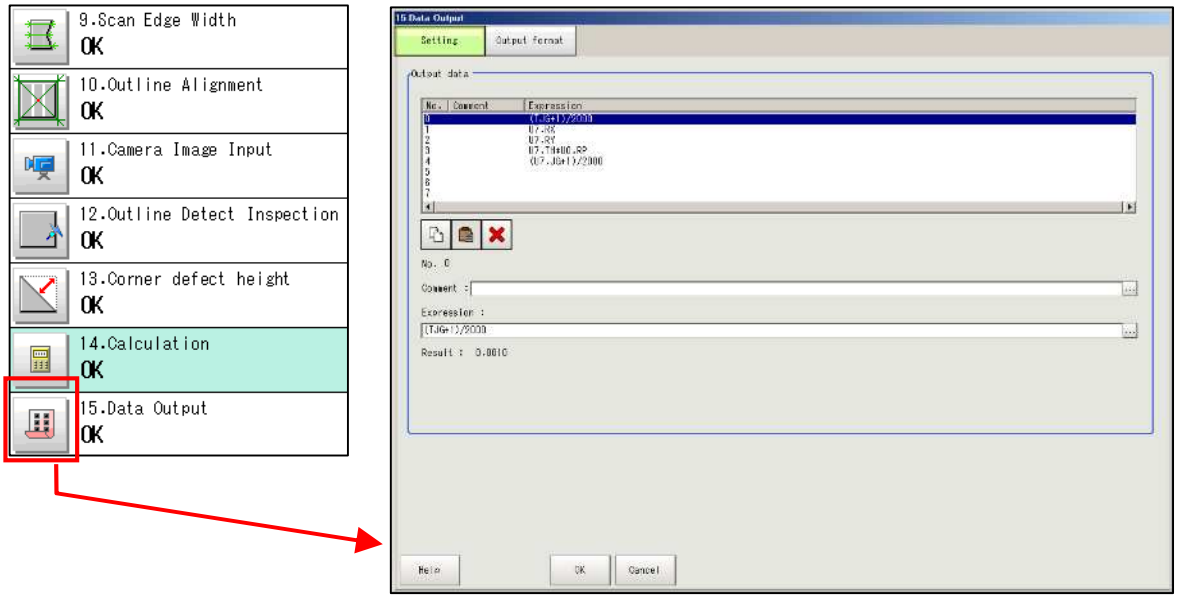
1-4-5-16. [15.Data Output]

This setting is for the signal to be transmitted to PLC.

Check [Calculation] and [Output format] which are already copied from the template master.

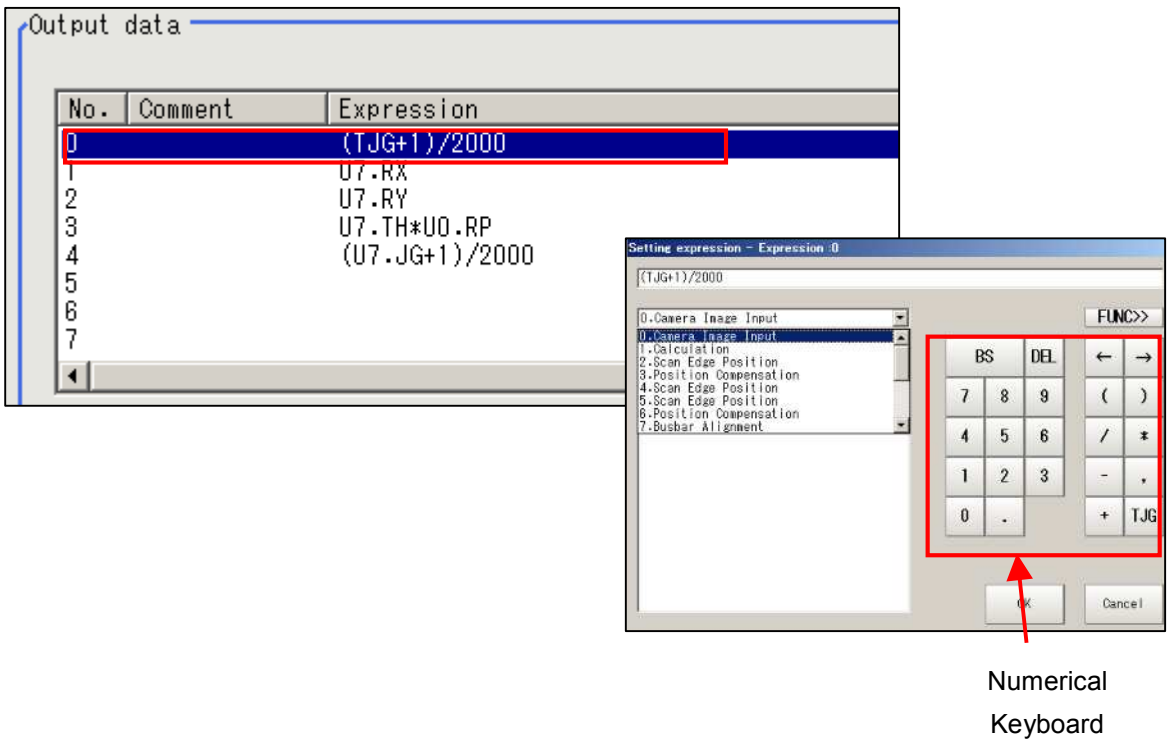
You don't need to change the setting.

(1) Click the icon button of [15.Data Output] to display [Data Output] screen.

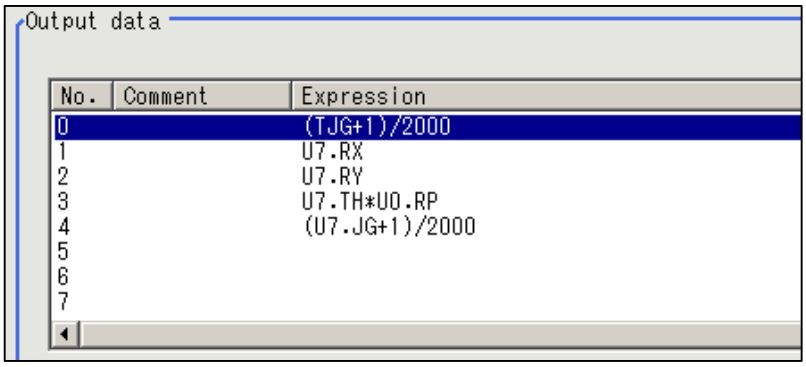


(2) Check that expressions are entered in No.0 to 4 as shown below.

If you need to enter expression, choose the corresponding number and enter expressions with keyboard after clicking […] button.

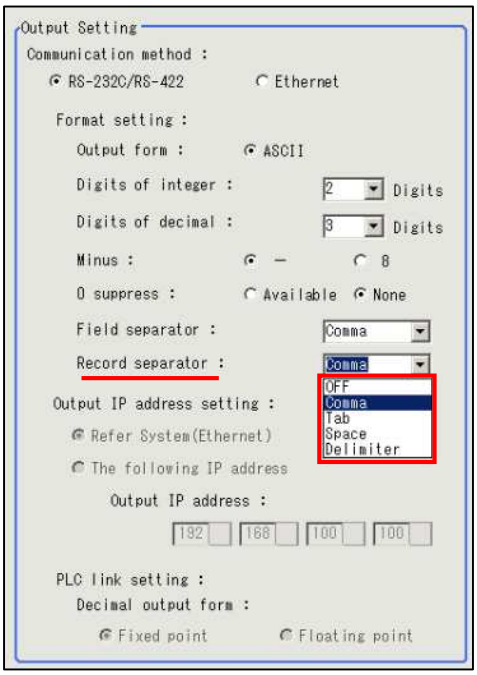


Numerical Keyboard



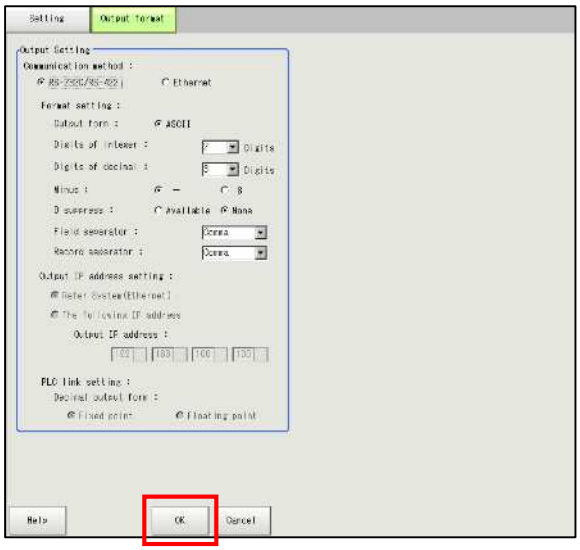
No.0	To send each inspection's result to PLC. Enter "(TJG+1)/2000)".
No.1	Enter "U7.RX"
No.2	Enter "U7.RY"
No.3	Enter "U7.TH * U0.RP"
No.4	Enter "(U7.JG+1)/2000"

(3) Click [Output format] tab to display [Output Setting] screen. Set [Record separator] to [Comma].



	Perform this setting every time you set for the serial data output.

(4) Click [OK] button on [Output format] screen.



All setting is completed.

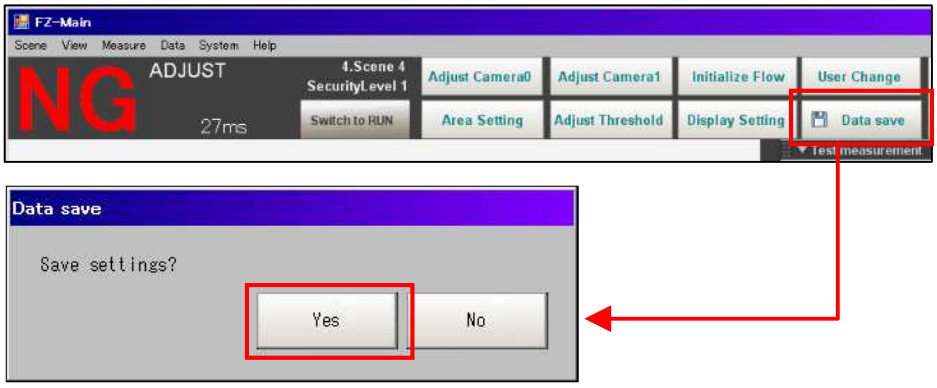
We recommend saving the edited data after all the settings. Refer to [1-4-6. Save Inspection Template] to save the data.

1-4-6. Save Inspection Template

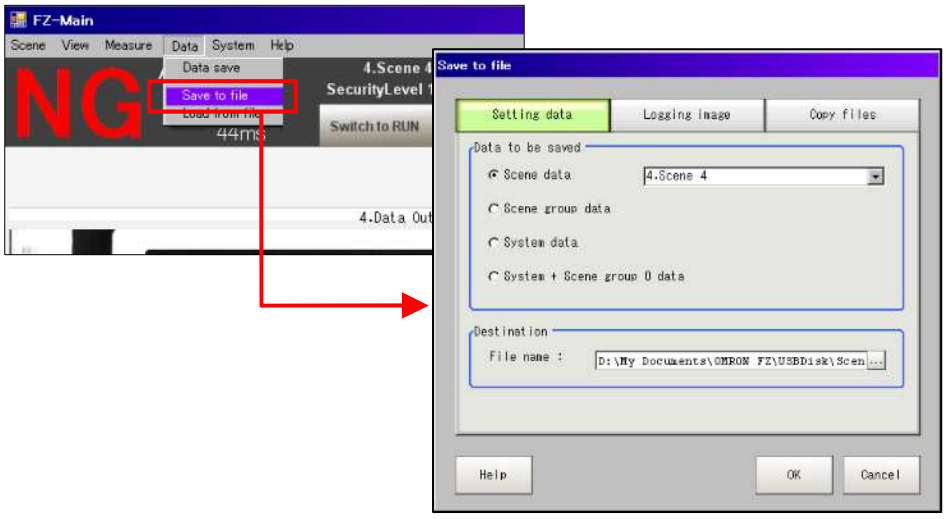
Saves edited templates to register them in the scene No. as templates.

	Alignment template's setting is stored in RAM, as Omron FZ3 does not use hard disk. **Clicking [Data Save] button on the main screen saves the setting already stored in the RAM in the flash memory. Therefore, the setting will be lost if the machine power is turned off before [Data Save] button is clicked.** **It is recommended to save data frequently by clicking [Data Save] button in order to avoid loss of data due to sudden trip.**

(1) Click [Data Save] button on [FZ-Main] screen. Click [Yes] button of the confirmation screen to save the data in the flash memory and register the edited inspection template.
Data in RAM will be erased when the machine power is turned off, but the data in the flash memory is still saved.

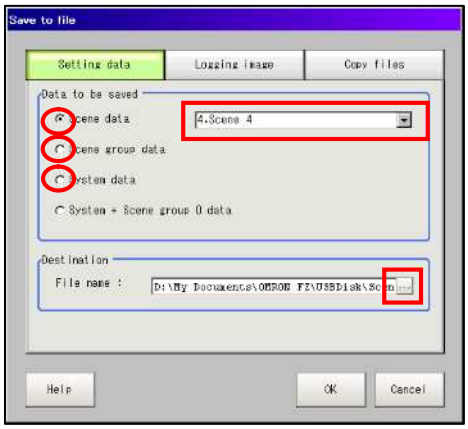


(2) Created template data is stored in the machine, but it is recommended to back up the data. Click [Save to file] from [Data] on the toolbar to display [Save to file] screen to choose the data to be saved and its destination.

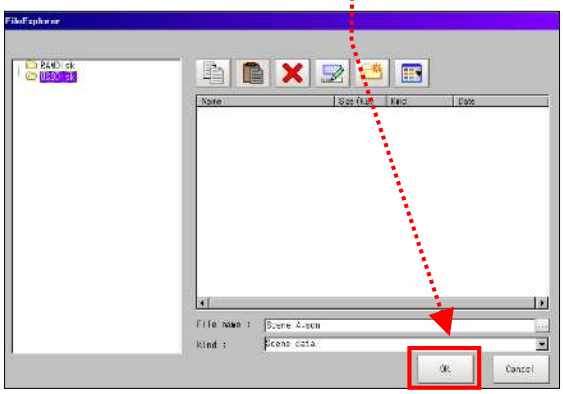


(3) Insert USB into the machine.

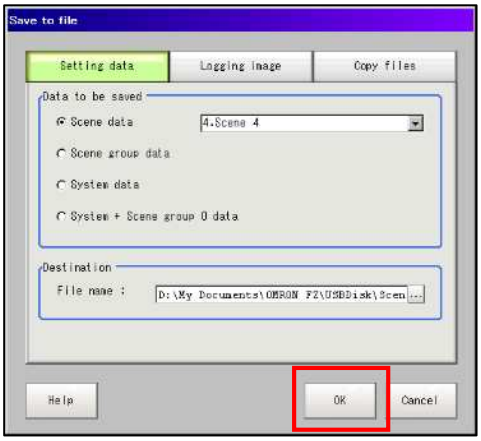
(4) To save the scene number (scene data) stored in FZ3, click [Scene data] and choose the data to be saved from the pull-down menu.
Choose [Scene group data] to save the whole scene group.
It is recommended to save [System data] as well.
After choosing the data to be saved, click […] button to choose the destination



(5) Choose [USBDisk] and click [OK] button to return to [Save to file] screen.



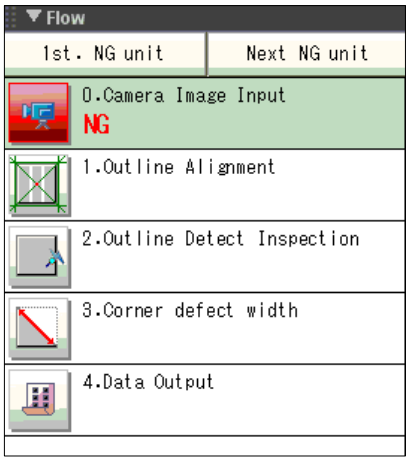
(6) Click [OK] button on [Save to file] screen to save the data in the designated destination and it returns to the main screen.



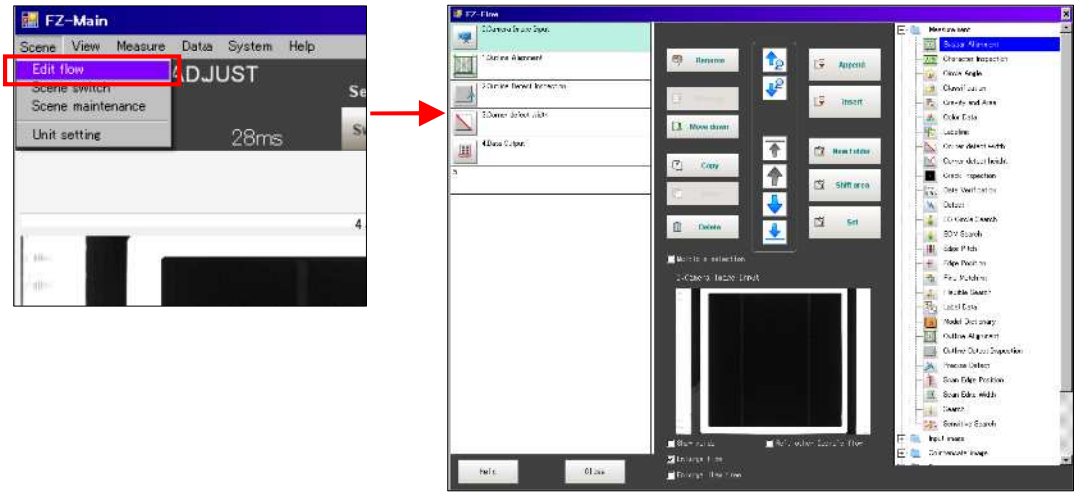
1-4-7. Edit Flow

The order of the flow and items can be edited.

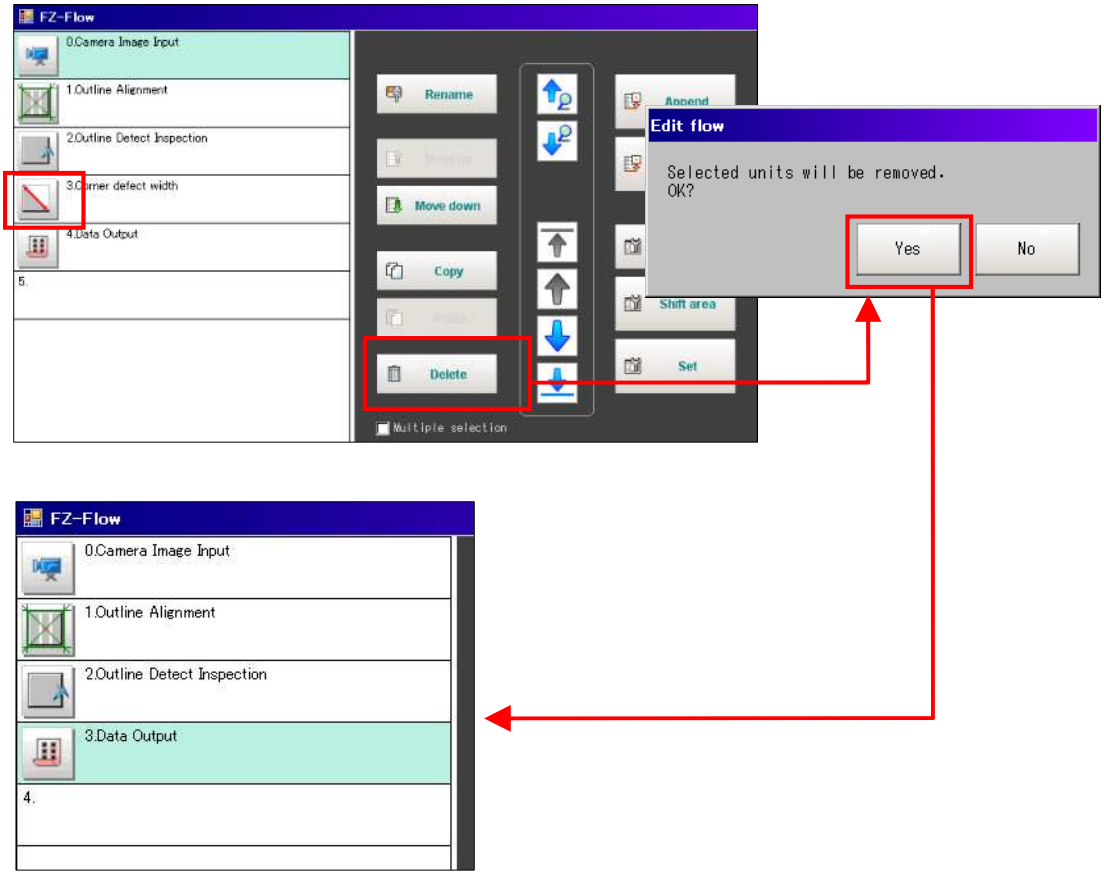
The following describes how to **change [3.Corner defect width]** to **[3. Corner defect height]** in the flow.



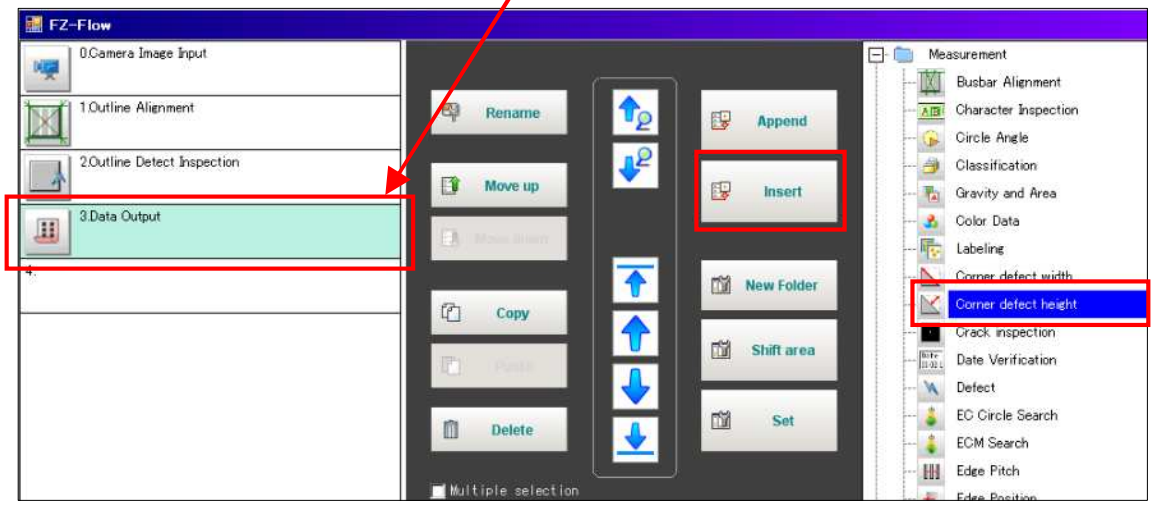
(1) Click [Edit Flow] of [Scene] in the toolbar of [FZ-Main] screen to display [FZ-Flow] screen.



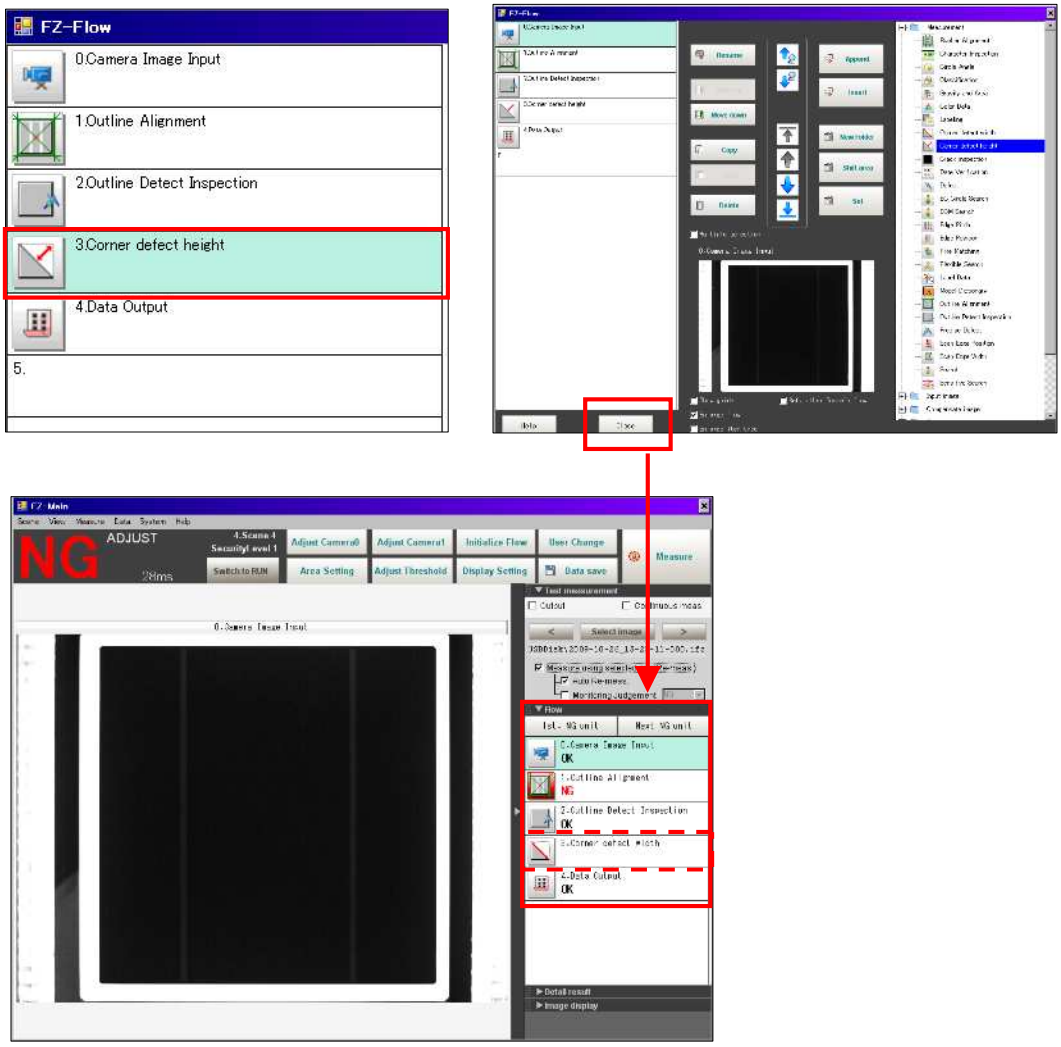
(2) Click [3. Corner defect width] and [Delete]. Click [Yes] button on the confirmation screen to delete [3. Corner defect width] from the flow list in its left.



(3) Choose (click) the number before which the new item is to be inserted. Then, choose the item to be inserted from [Measurement] folder in the right and click [Insert] button.



(4) After checking [3. Corner defect height] has been inserted in the flow, click [Close] button on [FZ-Flow] screen. It returns to the main screen. Check that the flow has been changed.



(5) This is the end of editing flow. However, **<u>parameter setting of the newly added item is necessary</u>**.

(6) After editing, make sure to click [Data Save] button on the main screen to read the setting. Refer to [1-4-6. Save Inspection Template] for detail.

(7) It is recommended to save (backup) the data when editing the template. Refer to [1-4-6. Save Inspection Template] for detail.

2. How to Create Alignment Template for OMRON FZ3

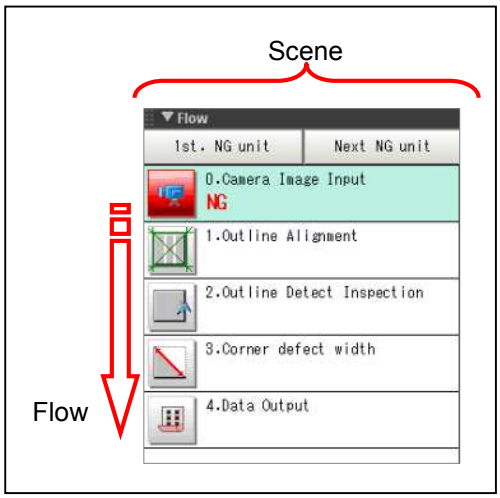
(For Tabbing & Stringing Machine: Alignment Inspection)

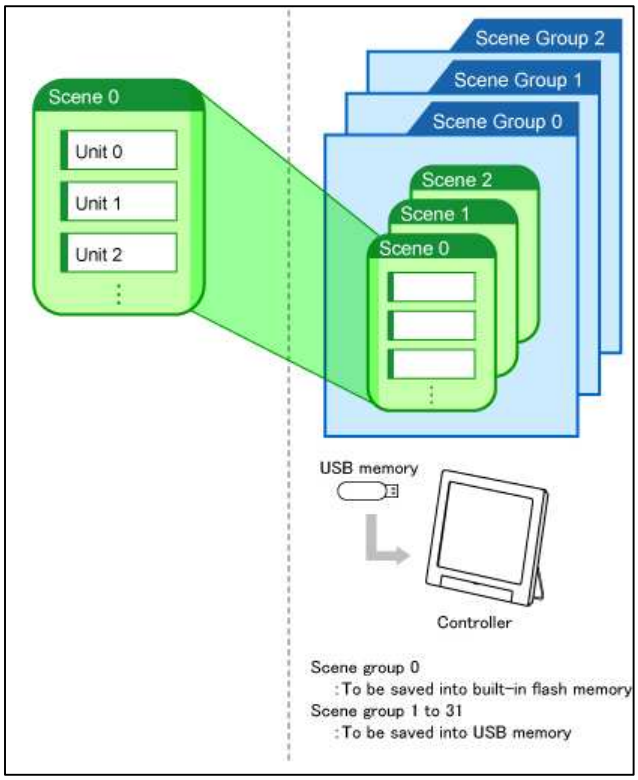
2-1. Outline

OMRON-FZ3 software automatically creates the flow for producing template which is necessary for the cell alignment inspection for tabbing & stringing machine. Use the flow for setting individual measuring items. The configuration of the created flow can be edited, too.

The flow of which each item has been set is called [Scene], and the group that has 101 scenes is called [Scene Group]. Up to 32 scenes can be set.

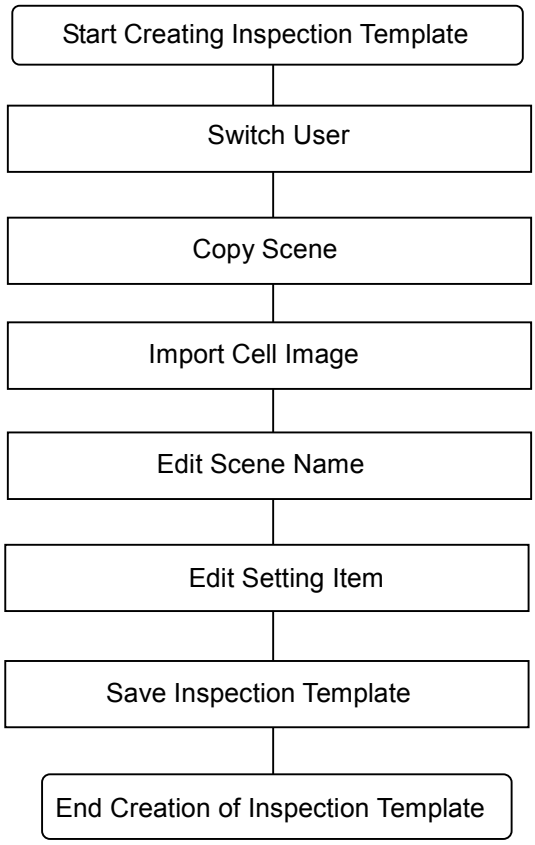
In the following page, the process to create template is shown in a flow chart.





	FZ3 does not have power switch. **FZ3 is interlocked to main body of tabbing & stringing machine.**
	Before turning off the main breaker, click [Data Save] button on the main screen to save the setting if you want to save the edited data.

2-2. Flow Chart of Template Creation



2-4-1. Switch User

2-4-2. Copy

2-4-4. Switch Screen (Importing Image)

2-4-3. Edit Scene Name

2-4-5. Set Each Setting Item

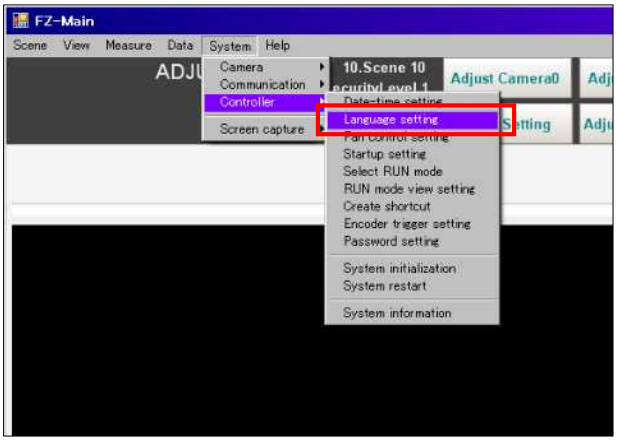
* Configuration of Inspection item in the flow is editable. Refer to [2-4-7. Edit Flow]

2-4-6. Save Inspection Template

2-3. Switch language display

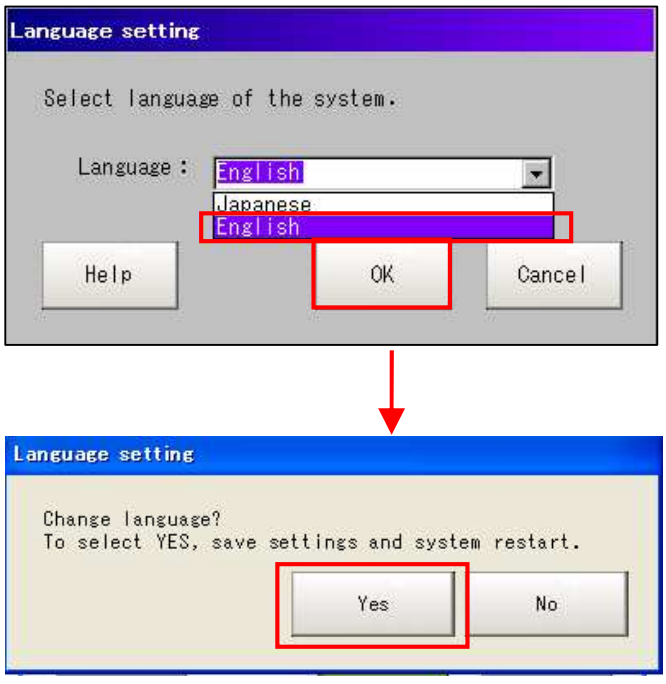
	The controller is restarted when language is switched, Click [Data Save] button to save the setting before switching languages.

(1) Click [Language Setting] in [Controller] of [System].



(2) Select the target language and click [OK] button, then the PC restarts. Check that the machine is not in auto mode and there is no problem with restarting the controller, and then click [Yes] button. Data will be saved and the controller restarts. After restarting, the language switches and the main screen is displayed again.

	Do not turn off the machine's power during saving and restarting.



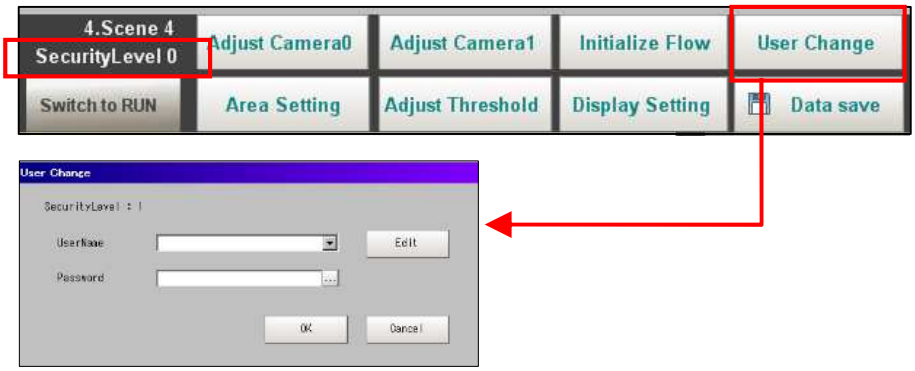
2-4. How to Create Template

Copy the scene if the settings are same as other inspection template (scene) apart from cell size. 5 steps are required for scene setting. Refer to: [2-4-1. Switch User] [2-4-2. Copy] [2-4-3. Edit Scene Name] [2-4-4. Switch Screen (Importing Image)] [2-4-6. Save Inspection Template]

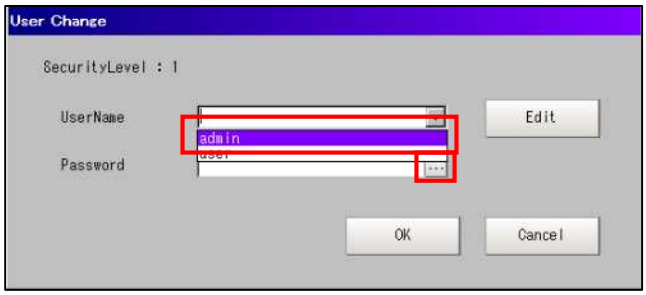
2-4-1. Switch User

Switch user setting and log in again, and then set the security level to “1”. Some items cannot be edited if the security level is “0”.

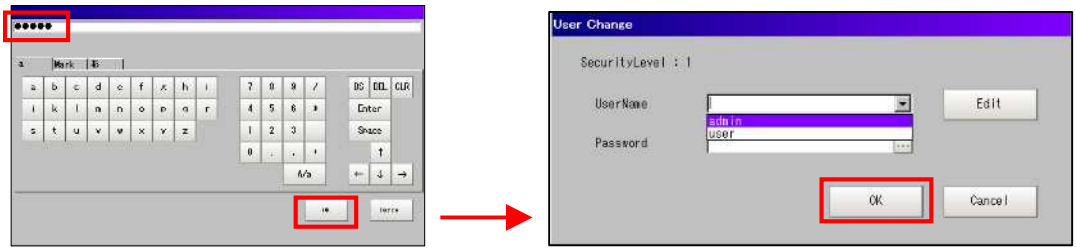
(1) Click [User Change] button on the main screen to display [User change] screen, then log in.



(2) Choose [admin] for user and click […] button for password.



(3) Enter the password on the password entry screen and click [OK] button.
The screen returns to [User Change]. Click [OK] button.
<Reference>
The initial password is “omron”.

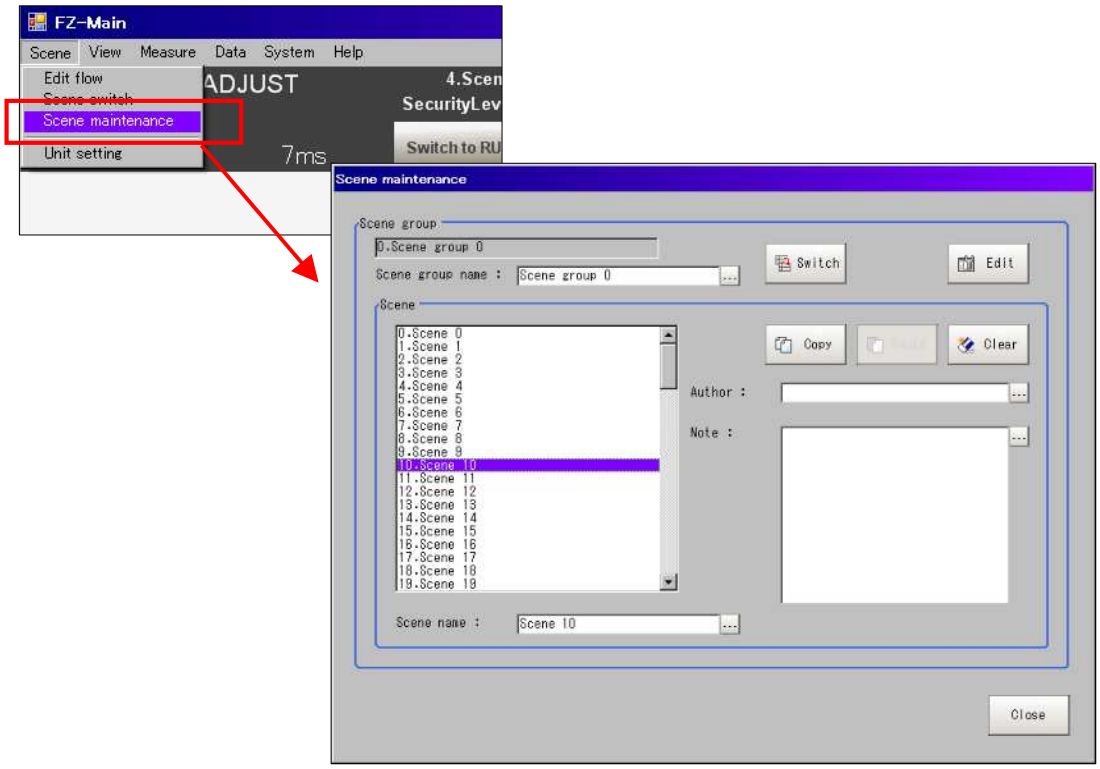


(4) The screen returns to the main screen. Check that [Security Level] is “1”.

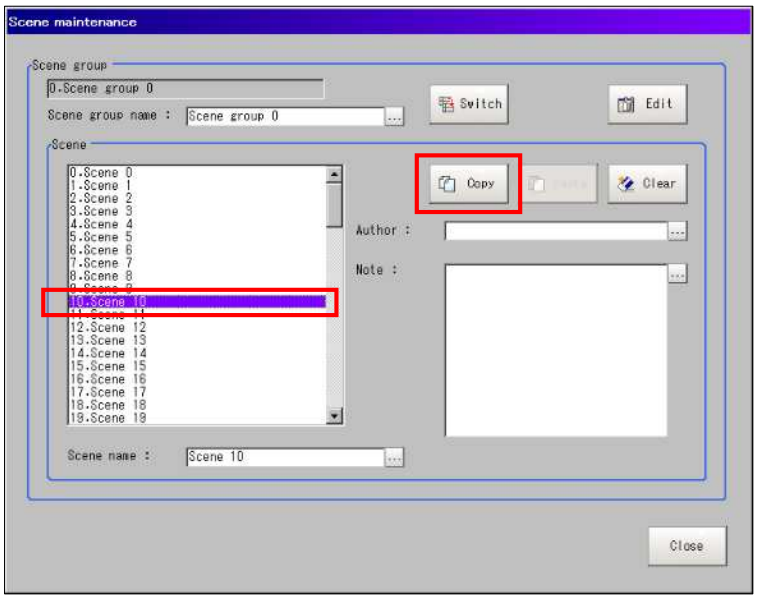
2-4-2. Copy

The following describes the case that the outline alignment template for 125 × 125 size cell has been stored in "Scene 10" and you want to create the outline alignment template for 150 × 150 size cell for "Scene 15".

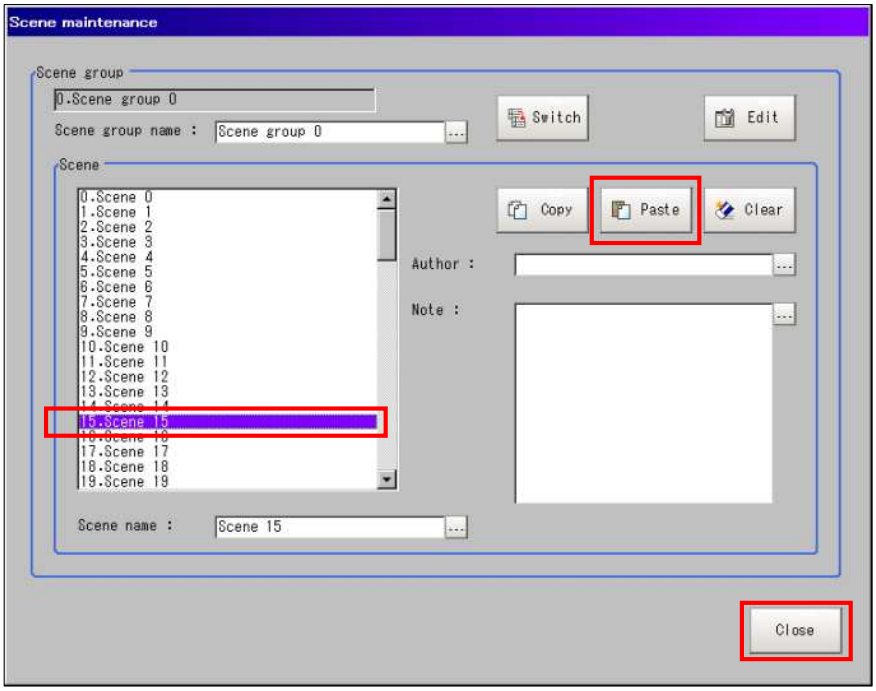
(1) Click [Scene maintenance] from the toolbar on the main screen to display [Scene maintenance] screen.

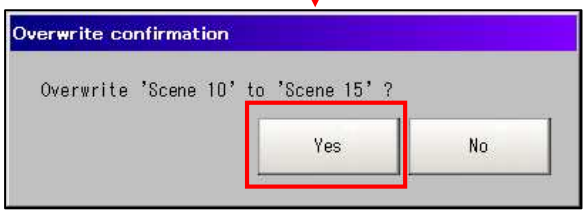


(2) Choose the source scene number and click [Copy] button.

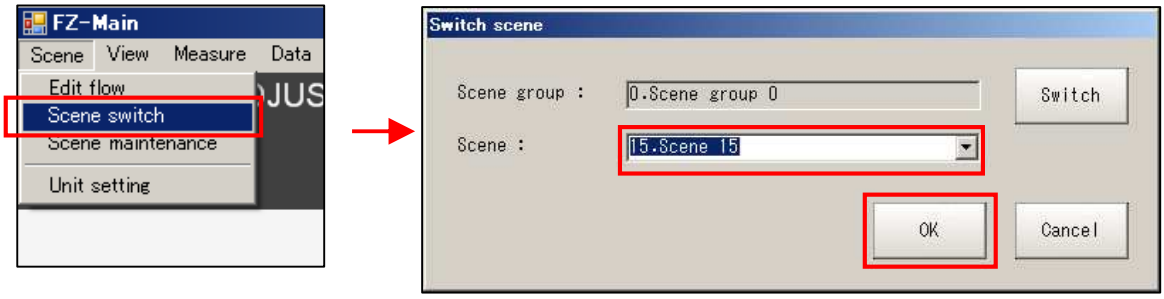


(3) Choose the destination scene number and click [Paste] button. The confirmation screen will be displayed. Click [Yes] button and [Close] button.





(4) The setting of “Scene 15” is exactly same as “Scene 10”. Capture the image of 150 × 150 size cell, click [Scene switch] of [Scene] on the toolbar, choose [Scene 15], and click [OK] button to display the main screen. For importing image, refer to [2-4-4. Switch Screen (Importing Image)].



	Do not use [Scene 0]. **Match the scene number with the scene number of the recipe on the touch screen.**

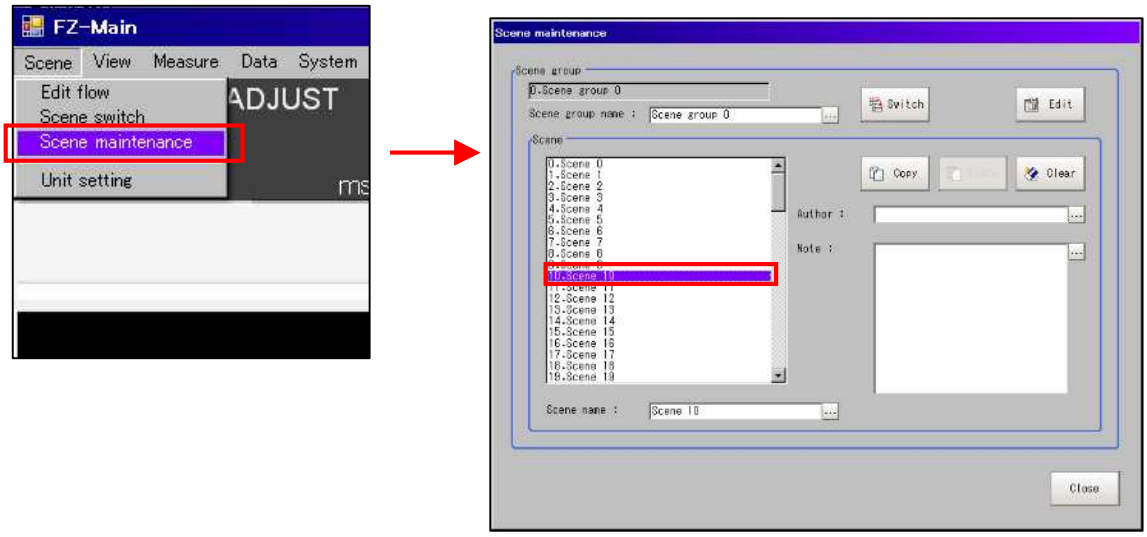
(5) Edit copied scene’s name. Refer to [2-4-3. Edit Scene Name].

2-4-3. Edit Scene Name

[Scene **group** 0] has 101 scenes which are numbered from 0 to 100. **Do not use [Scene 0].**

[Scene **group**] can be edited with [Edit] button. However, only [Scene **group** 0] is used for this machine.

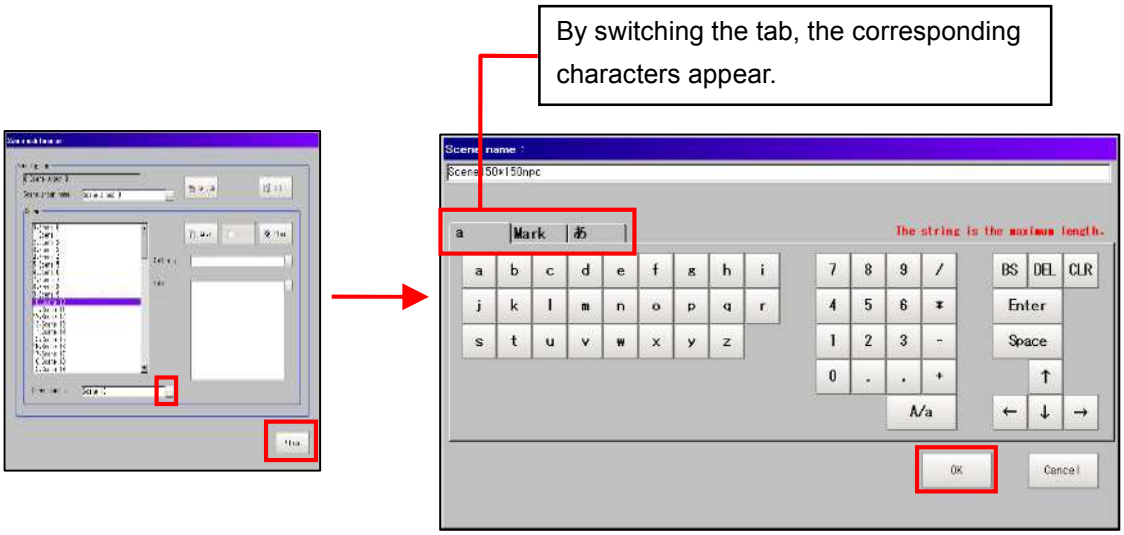
(1) Click [Scene maintenance] of [Scene] and choose the scene number to edit its name.



(2) Edit the name using the entry keyboard which appears by clicking [...] button next to [Scene group name].

After editing the name, click [OK] button, then it returns to [Scene maintenance] screen. Click [Close] button to return to the main screen.

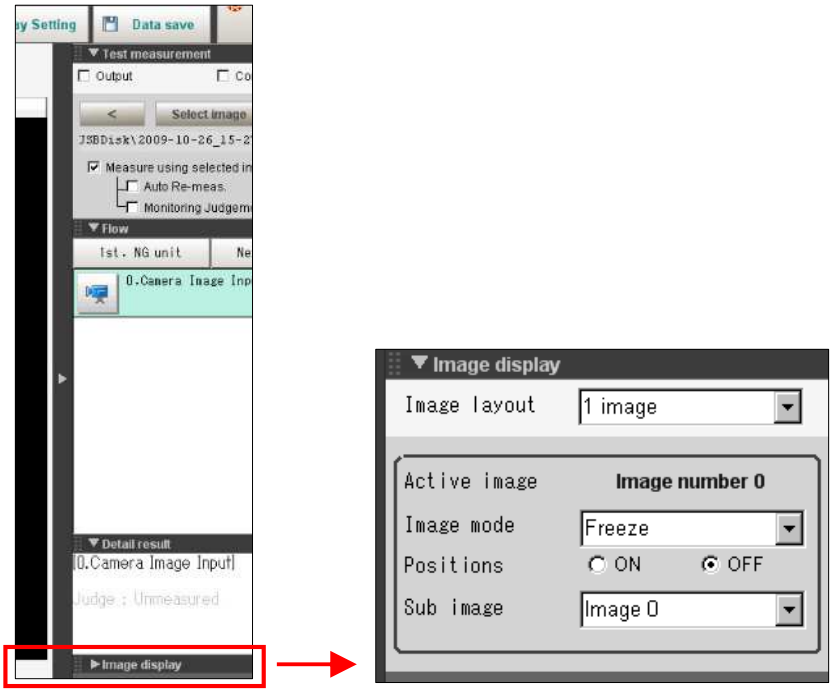
**The number of characters which can be entered is limited.



2-4-4. Switch Screen (Importing Image)

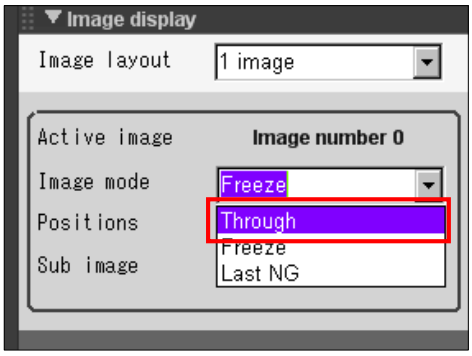
Switch the camera images in order to import image of the cell for template.

(1) Click [Image display] to show the detail of the display.



(2) Switch [Image mode] from [Freeze] to [Through].

The image which is currently on camera is displayed on the screen.



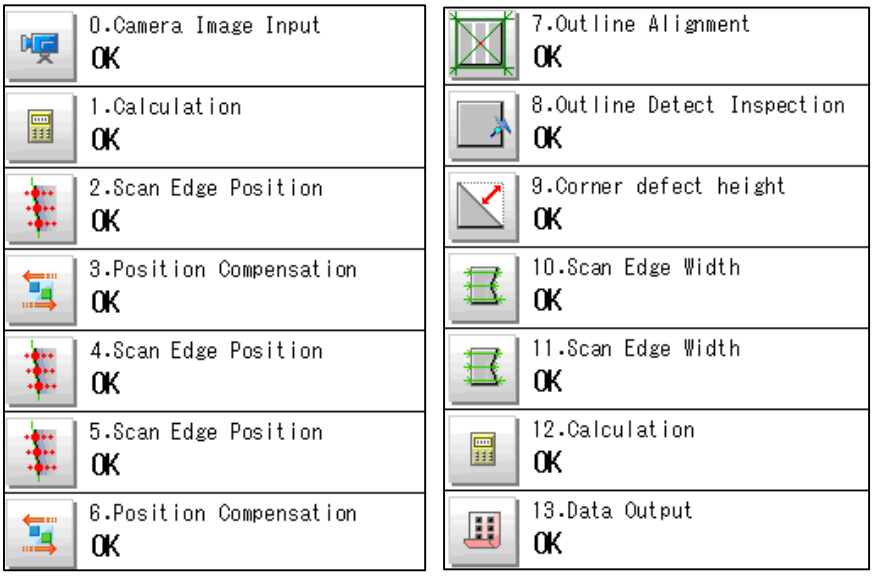
(3) Set a cell on the camera inspection position; turn on vacuum of LED table turn on the LED lamp with manual operation.

*Refer to the operating manual for manual operation.

(4) Edit each setting item of copied scene. Refer to: [2-4-5. Set Each Setting Item].

2-4-5. Set Each Setting Item

The scene copied for outline alignment inspection as in [2-4-2. Copy] has flow which has fourteen setting items.



Outline Alignment Inspection Flow

*You can change flow order or setting item is each flow.

For editing flow, refer to: [2-4-7. Edit Flow]

Flow Setting Item	Description
0.Camera Image Input	Capture and set the image of cell in copied scene. You don't need to change the setting, as the scene is copied.
1.Calculation	Set the reference value to judge each inspection. Refer to :[2-4-5-2. [1.Calculation]]
2.Scan Edge Position	**Detect cell edge with light-dark change in the region.** This setting is necessary for correcting gradient of cell's bottom edge measured in [3. Position Compensation]. Refer to:[2-4-5-3. [2.Scan Edge Position]]
3.Position Compensation	Set cell edge location on the camera image (reference position) in reference to the gradient data of cell bottom edge (measurement position) detected in [2.Scan Edge Position]. **You do not need to edit setting if you copied scene.**

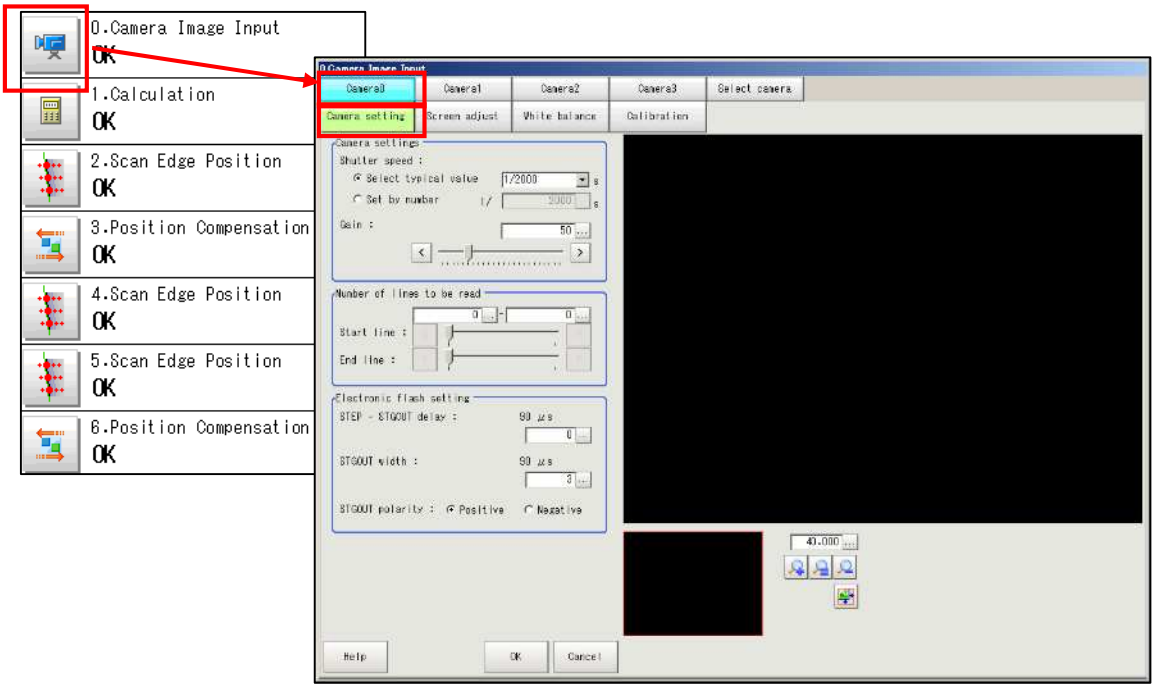
Flow Setting Item	Description
4.Scan Edge Position	This setting is to detect cell edge accurately, and it is necessary for correcting cell edge's gradient in [6. Position Compensation]. [6. Position Compensation] is for correcting bottom and left cell edges. [4.Scan Edge Position] is for cell's bottom edge, while [5. Scan Edge Position] is for left edge. Refer to:[2-4-5-5. [4.Scan Edge Position]]
5. Scan Edge Position	This setting is to detect cell edge accurately, and it is necessary for correcting cell edge's gradient in [6. Position Compensation]. [6. Position Compensation] is for correcting bottom and left cell edges. [4.Scan Edge Position] is for cell's bottom edge, while [5. Scan Edge Position] is for left edge. Refer to:[2-4-5-6. [5.Scan Edge Position]]
6.Position Compensation	The cell edge location on the camera image is set in order to capture the entire cell image. You need to change the reference position according to the cell size.力 Reference position is the location of the cell edges set in [4.Scan Edge Position] and [5.Scan Edge Position] on the camera image. Refer to:[2-4-5-7. [6.Position Compensation]]
7.Outline Alignment	The setting to measure cell outline. Refer to:[2-4-5-8. [7.Outline Alignment]]
8.Outline Detect Inspection	It is the setting for detecting location where the perimeter and shape differ with the outline, after extracting cell outline automatically and while tracing the extracted outline points. Refer to:[2-4-5-9. [8. Outline Detect Inspection]]
9.Corner Defect Height	In the outline detect inspection, the locations that are indented in relation to the perimeter edge is detected. However, detection can be difficult at the chamfer of a cell corner area where there is no indentation. Therefore, the distance from vertex of the cell circumscribed rectangle to the corner is measured to detect the chamfer defects. Refer to:[2-4-5-10. [9. Corner Defect Height]]
10.Scan Edge Width	This setting is necessary to measure the difference between width and height of the cell. [10.Scan Edge Width] is for measuring width of the cell. Values set in [10.Scan Edge Width] and [11. Scan Edge Width] are used for [12.Calculation]. Refer to:[2-4-5-11. [10.Scan Edge Width]]
11. Scan Edge Width	This setting is necessary to measure the difference between width and height of the cell. [11.Scan Edge Width] is for measuring height of the cell. Values set in [10.Scan Edge Width] and [11. Scan Edge Width] are used for [12.Calculation]. Refer to:[2-4-5-12. [11.Scan Edge Width]]
12.Calculation	This setting is to enter expression to judge each inspection. You do not need to edit setting if you copied scene. Refer to:[2-4-5-13. [12.Calculation]]
13.Data Output	This setting is for the signal to be transmitted to PLC. Refer to:[2-4-5-14. [13.Data Output]]

2-4-5-1. [0.Camera Image Input]

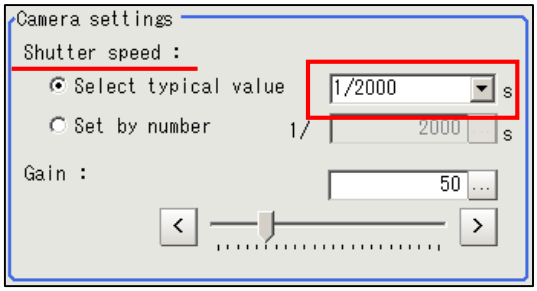
Capture and set the image of cell in copied scene.

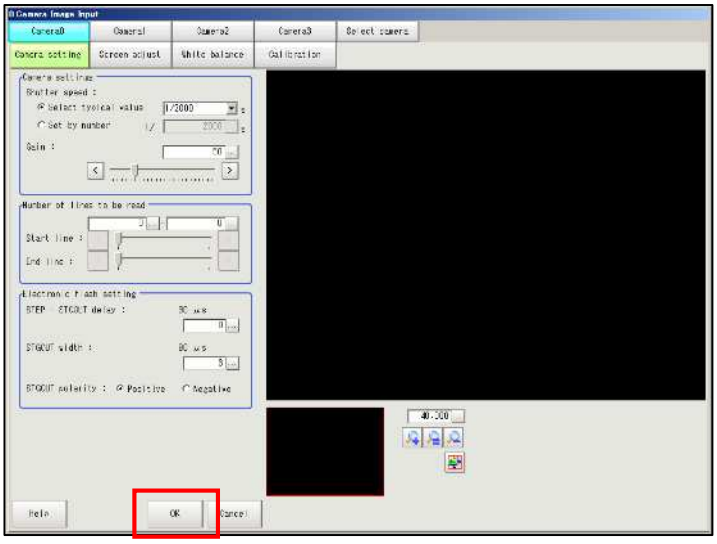
You don't need to change the setting, as the scene is copied.

(1) Click [0.Camera Image Input] icon button in the flow, and choose [Camera 0] and [Camera setting] screen. Check that the shutter speed is"1 /2000".



(2) Adjust shutter speed on [Camera settings]. If there is no problem, click [OK] button.

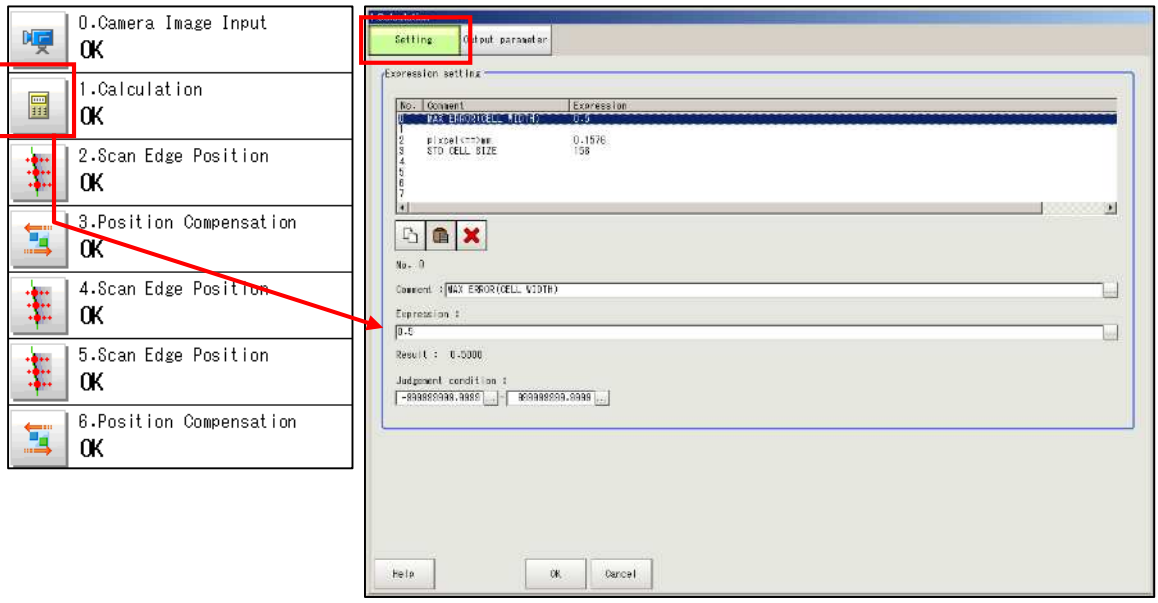




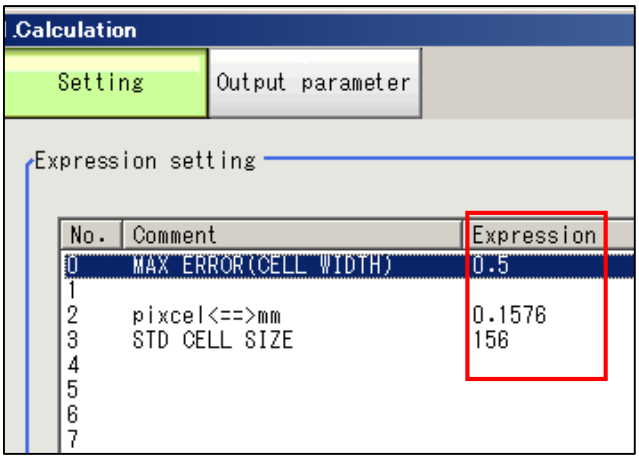
2-4-5-2. [1.Calculation]

Set the reference value to judge each inspection.

(1) Click [1.Calculation] icon button in the flow and display [Setting] screen.



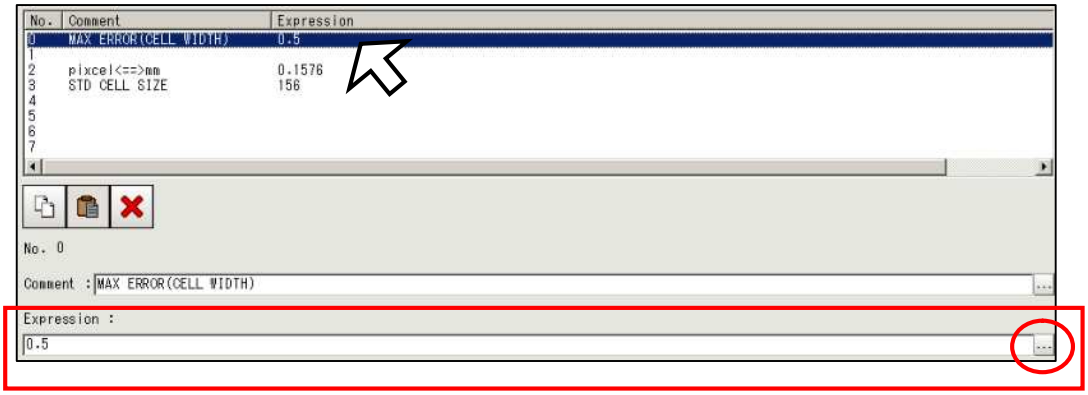
(2) Setting items for No.0 to No.3 are as follows.



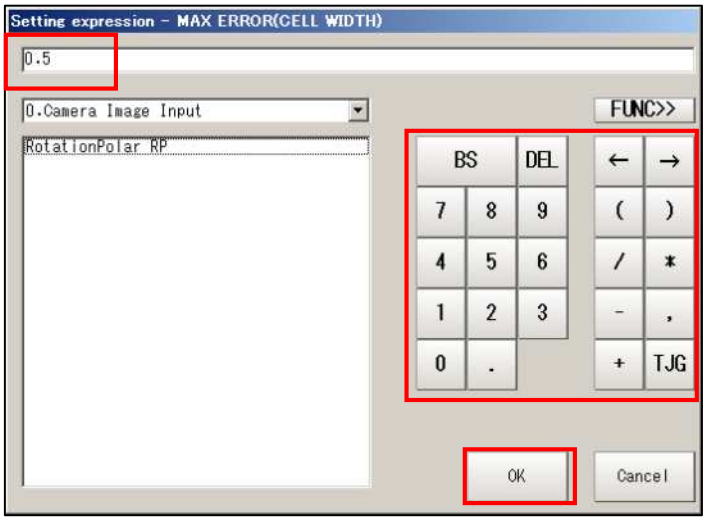
No.0	Inputs cell outline alignment's tolerance.
No.2	Inputs converted value between 1 pixel and mm. (You need not to edit the setting.)
No.3	Inputs cell size in use in millimeter.

* Refer to following pages for how to input.

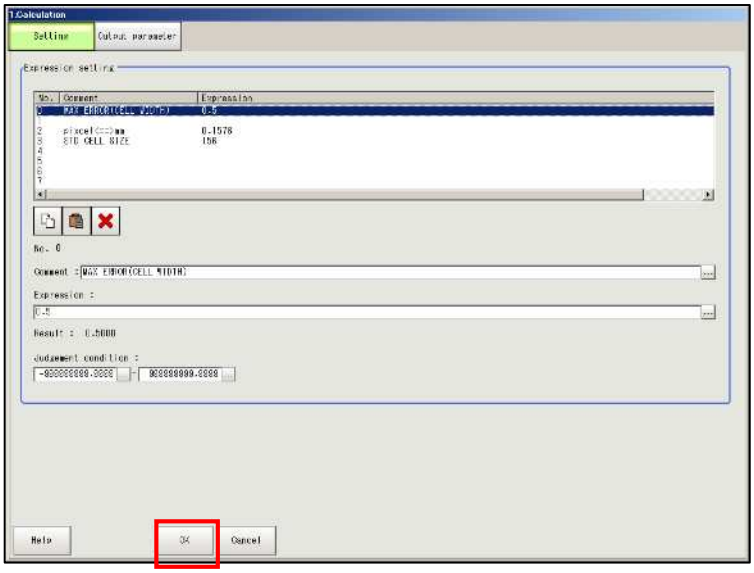
(3) Choose the expression number to be edited and click […] button of [Expression].



(4) Enter tolerance value with keypad and clock [OK] button.



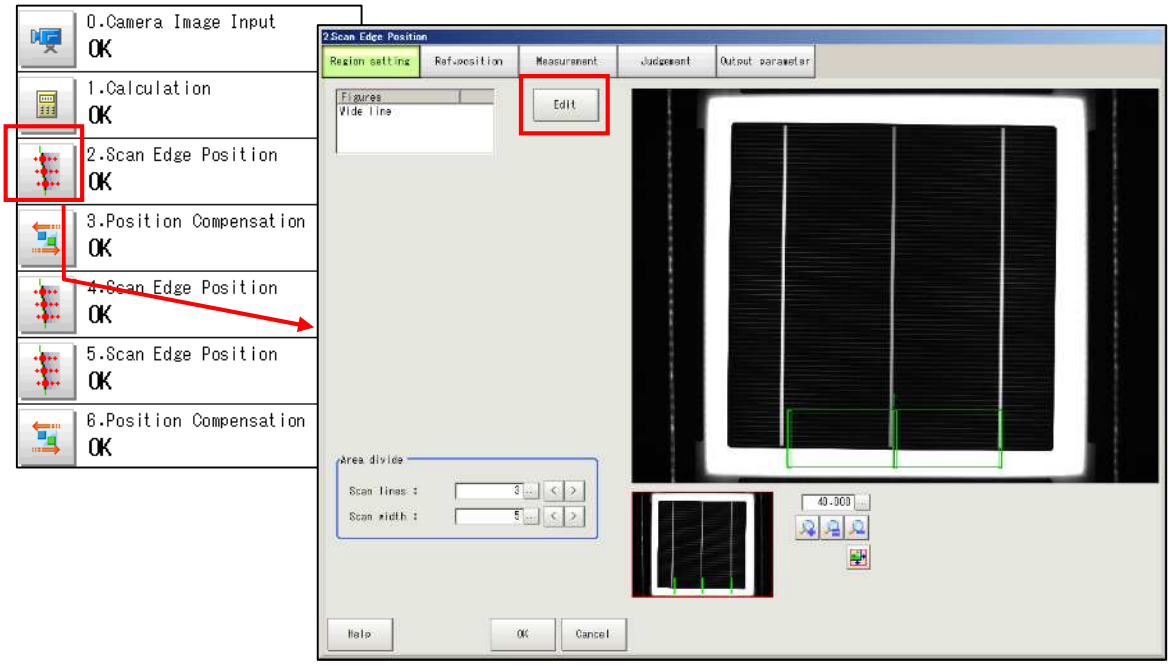
(5) After filling each setting item, click [OK] button on [Setting] screen.



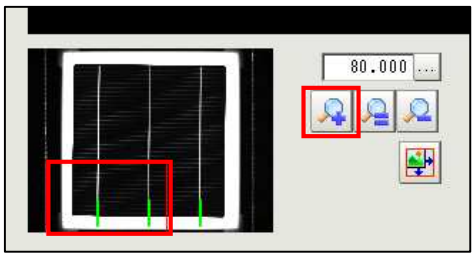
2-4-5-3. [2.Scan Edge Position]

Setting of [2.Scan Edge Position] is designed **to detect cell edge with light-dark change in the region.** This setting is necessary for correcting gradient of cell's bottom edge measured in [3. Position Compensation]. In this setting, the region is adjusted in [Region setting] screen and then the parameter is checked in [Measurement] screen.

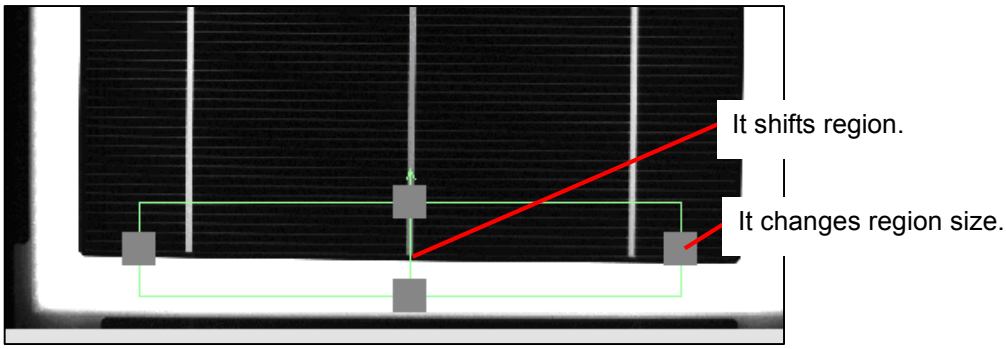
(1) Click [2.Scan Edge Position] icon button in the flow and click [Edit] button on [Region setting] screen.



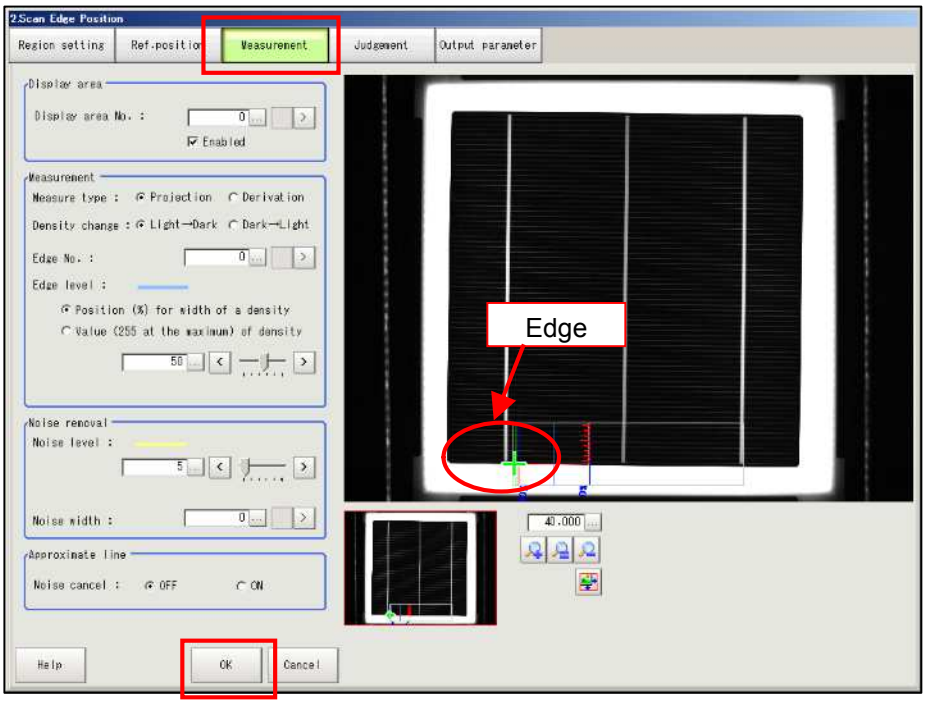
(2) Display the region to be edited by zooming in the image and shifting the red rectangle on the left in the picture below with the mouse.



(3) The green lines indicate the region to be measured, while gray rectangles indicate the midpoint of the region. The region size changes by dragging the gray rectangle on cell image. The region shifts by dragging the center green line. Include enough wide part of bottom cell edge to detect cell's gradient accurately, as shown in the picture below.

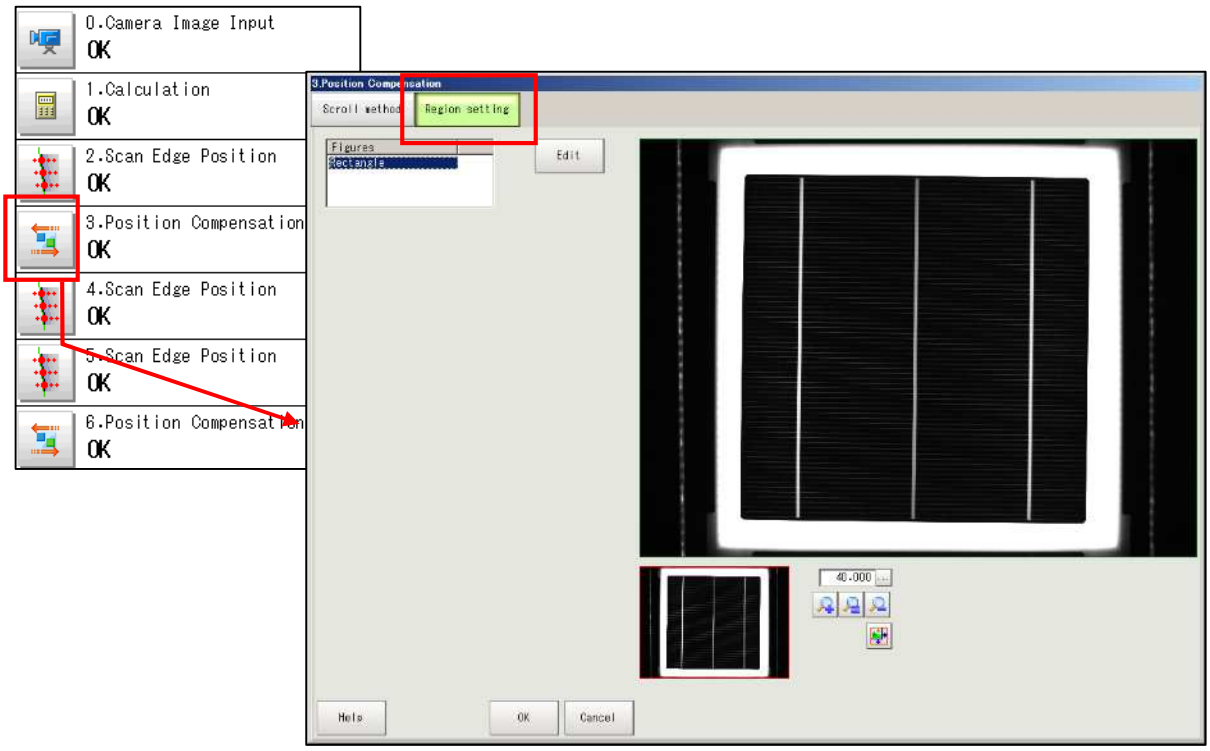


(4) Click [Measurement] tab to check if edge is detected accurately. If detected, click [OK] button to display the main screen.



2-4-5-4. [3.Position Compensation]

In [3. Position Compensation], the cell edge location on the camera image (reference position) is set based on the gradient data of cell bottom edge (measurement position) detected in [2.Scan Edge Position]. **You do not need to edit setting if you copied scene.**

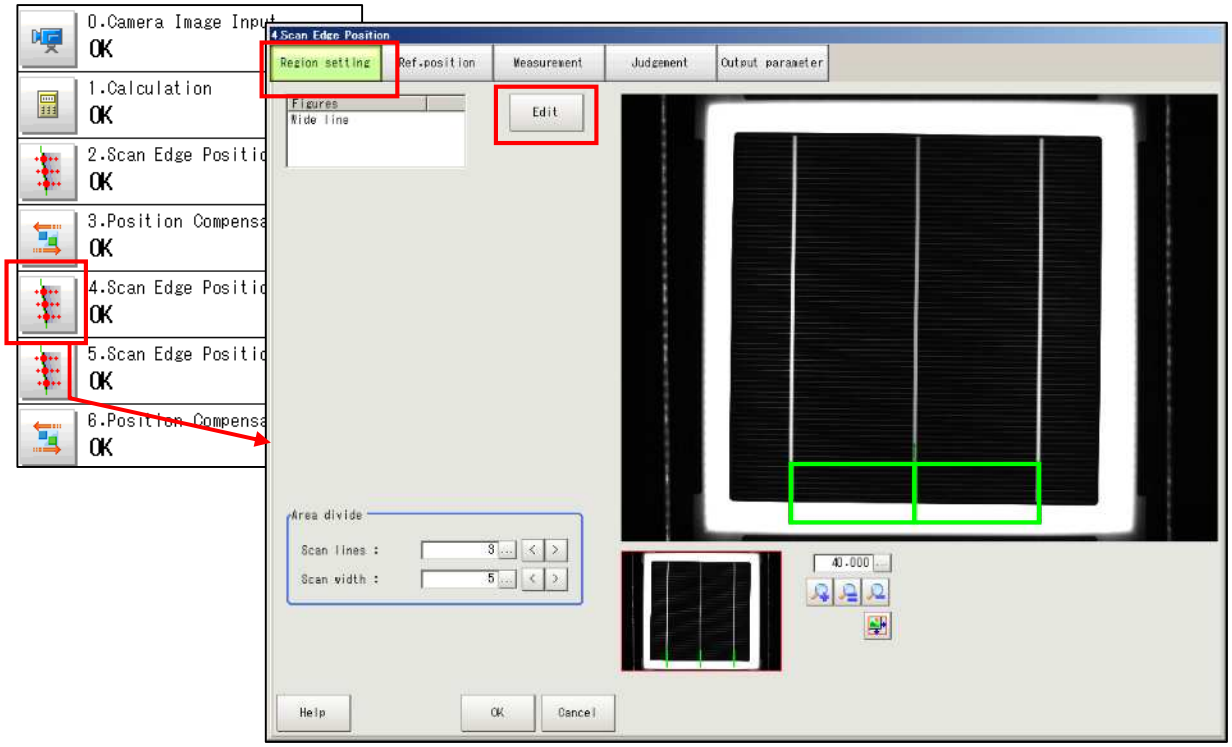


2-4-5-5. [4.Scan Edge Position]

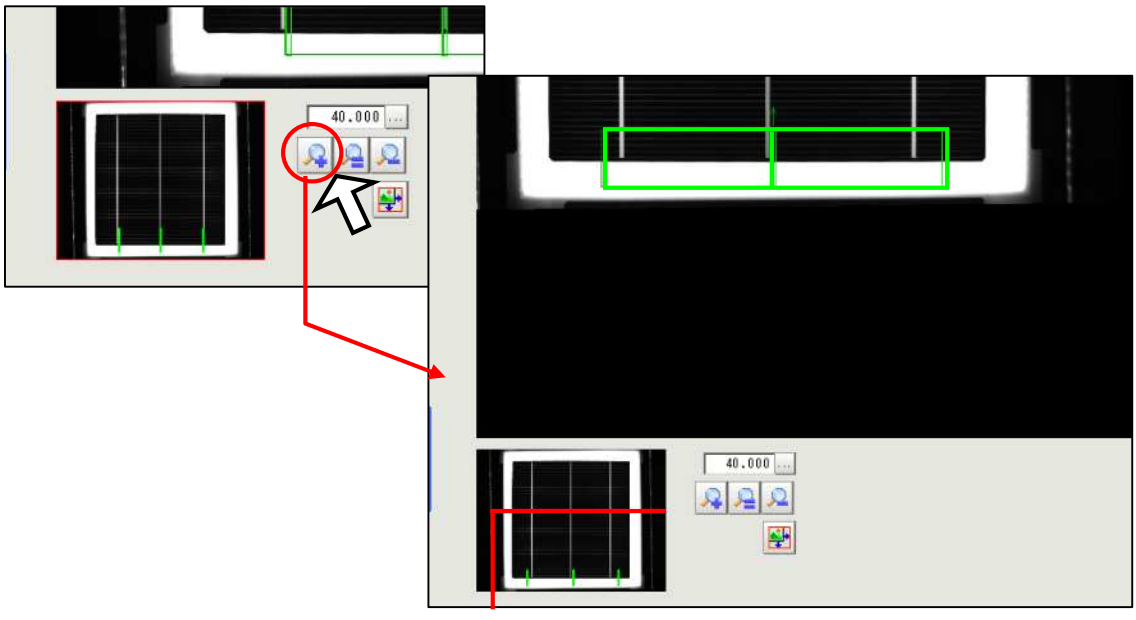
In this setting, the region is adjusted in [Region setting] screen and then the parameter is checked in [Measurement] screen. This setting is to detect cell edge accurately, and it is necessary for correcting cell edge's gradient in [6. Position Compensation].

[6. Position Compensation] is for correcting bottom and left cell edges. [4.Scan Edge Position] is for cell's bottom edge, while [5. Scan Edge Position] is for left edge.

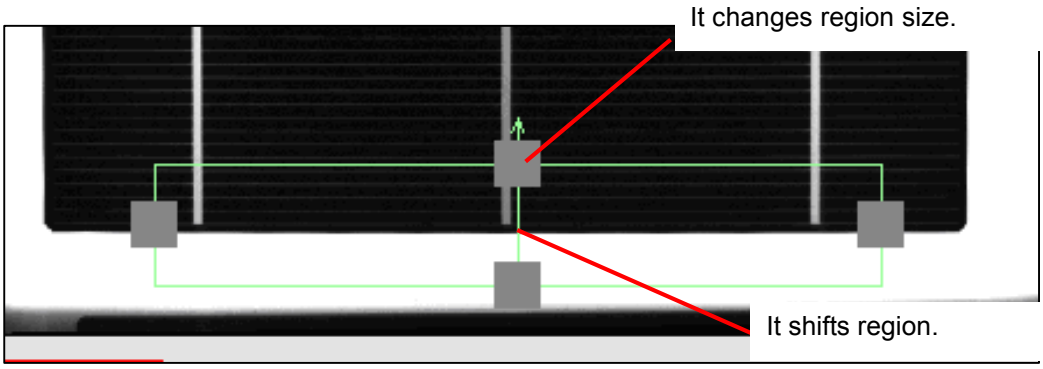
(1) Click [4.Scan Edge Position] icon button in the flow and click [Edit] button on [Region setting] screen.



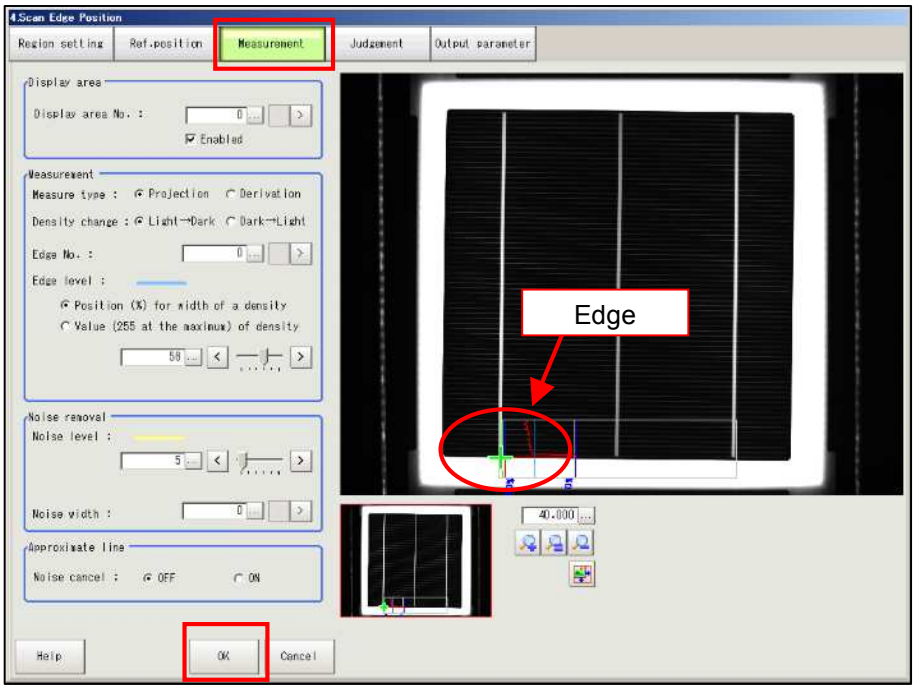
(2) Display the region to be edited by zooming in the image and shifting the red rectangle on the left in the picture below with the mouse.



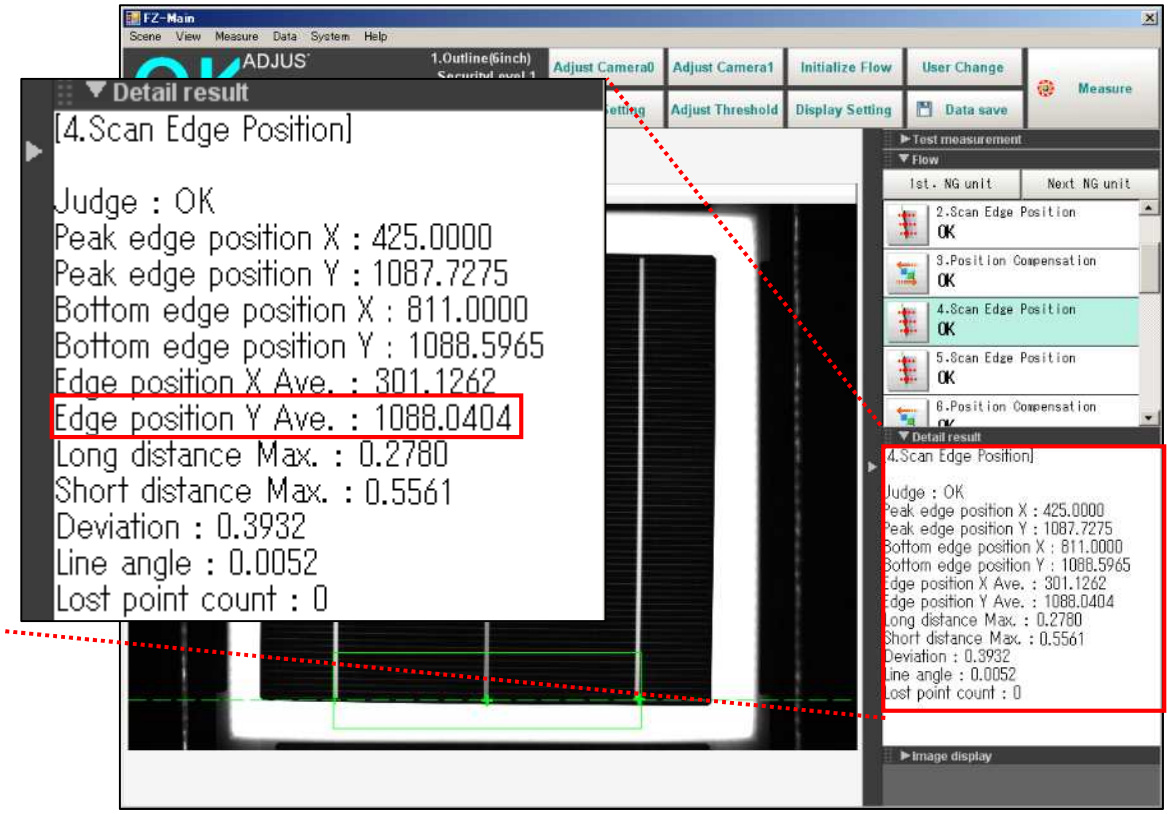
(3) The green lines indicate the region to be measured, while gray rectangles indicate the midpoint of the region. The region size changes by dragging the gray rectangle on cell image. The region shifts by dragging the center green line. Include some part of cell's bottom edge to detect cell's gradient accurately as shown below.



(4) Click [Measurement] tab to check if edge is detected accurately. If detected, click [OK] button to display the main screen.



(5) Click [Measure] button on the main screen and write down the value on [Edge Position Y Ave.] for entering cell's reference position in [6.Position Compensation].

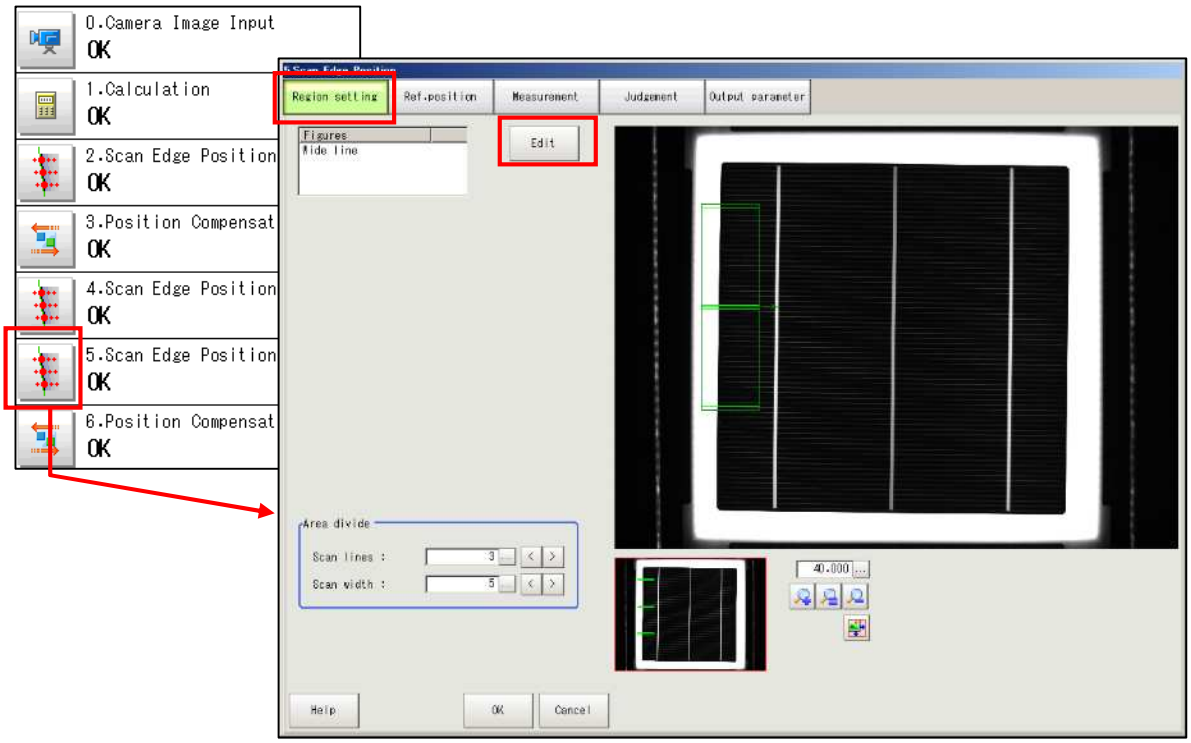


2-4-5-6. [5.Scan Edge Position]

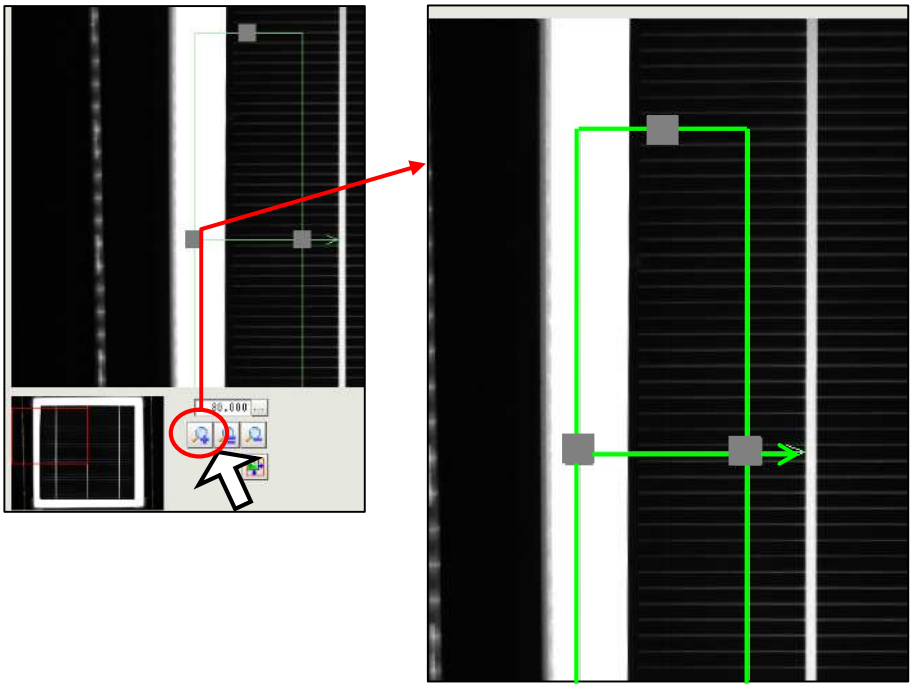
In this setting, the region is adjusted in [Region setting] screen and then the parameter is checked in [Measurement] screen. This setting is to detect cell edge accurately, and it is necessary for correcting cell edge's gradient in [6. Position Compensation].

[6. Position Compensation] is for correcting bottom and left cell edges. [4.Scan Edge Position] is for cell's bottom edge, while [5. Scan Edge Position] is for left edge

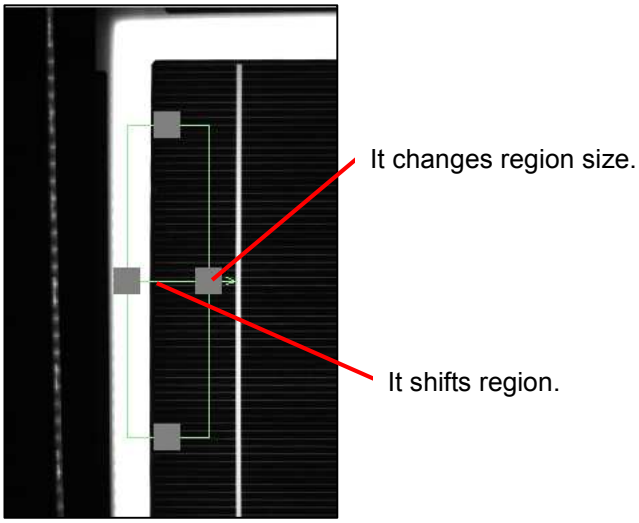
(1) Click [5.Scan Edge Position] icon button in the flow and click [Edit] button on [Region setting] screen.



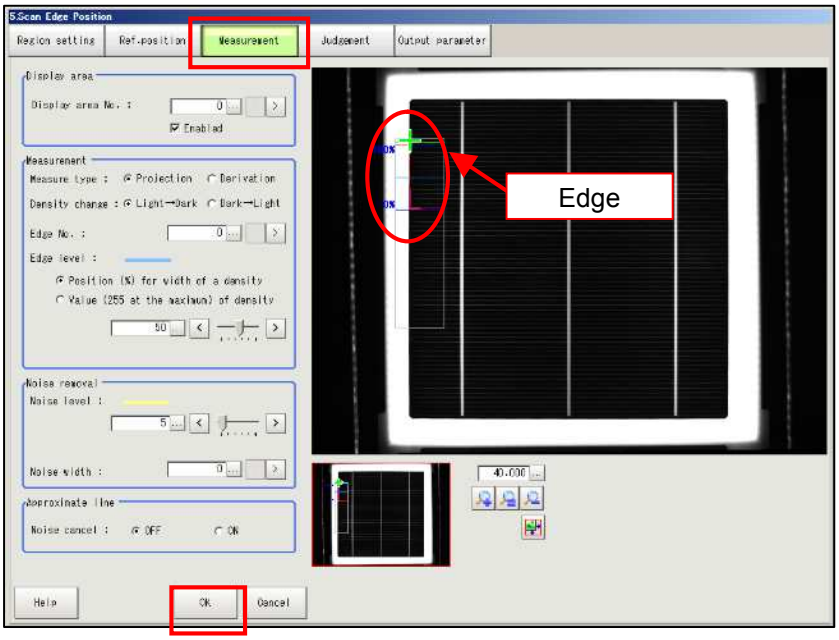
(2) Display the region to be edited by zooming in the image and shifting the red rectangle on the left in the picture below with the mouse.



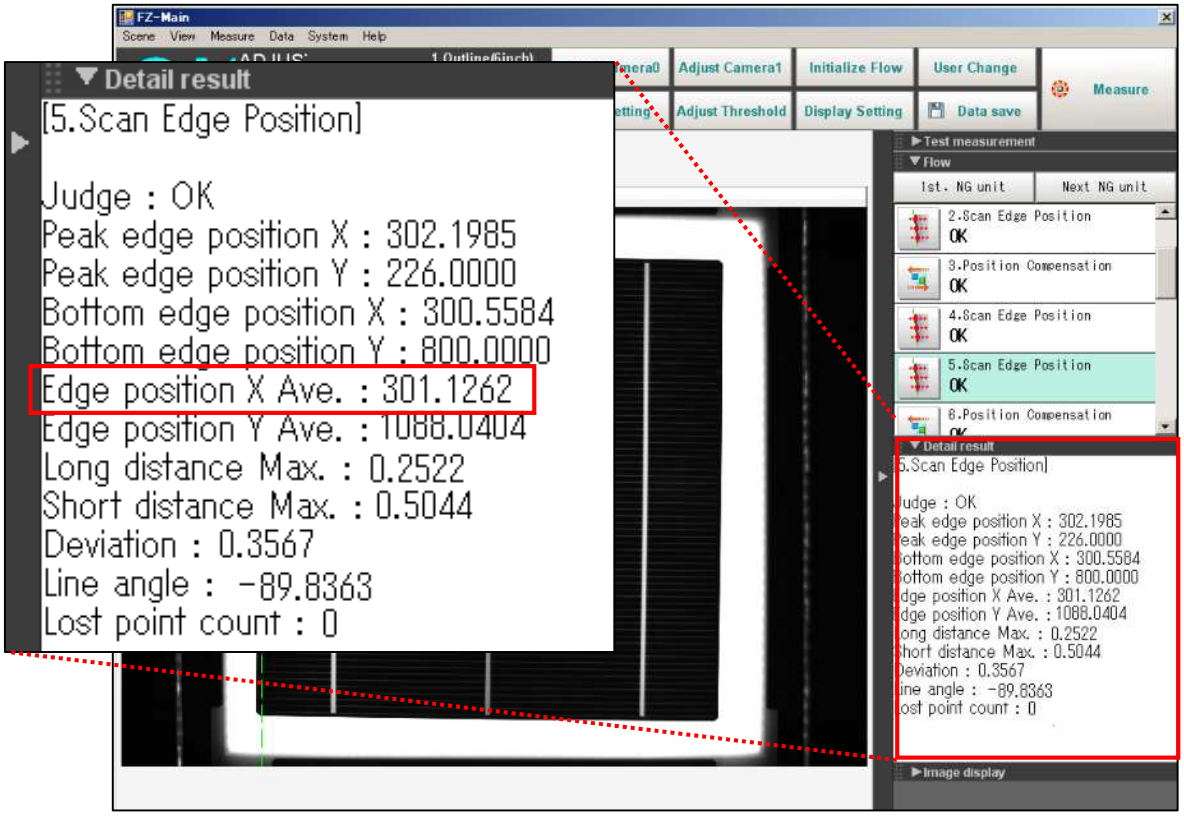
(3) The green lines indicate the region to be measured, while gray rectangles indicate the midpoint of the region. The region size changes by dragging the gray rectangle on cell image. The region shifts by dragging the center green line. Include some part of cell's left edge to detect cell's gradient accurately, as shown in the picture below.



(4) Click [Measurement] tab to check if edge is detected accurately. If detected, click [OK] button to display the main screen.



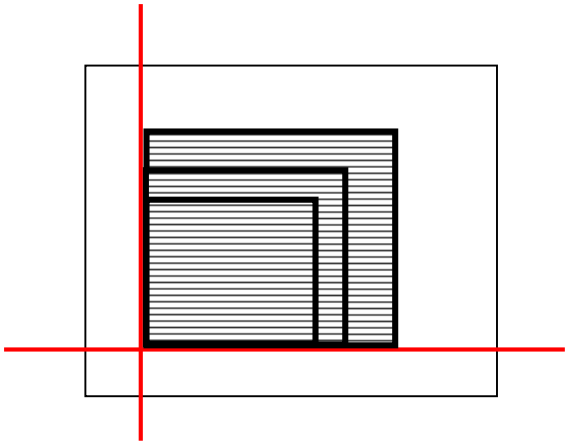
(5) Click [Measure] button on the main screen and write down the value on [Edge Position X Ave.] for entering cell's reference position in [6.Position Compensation].



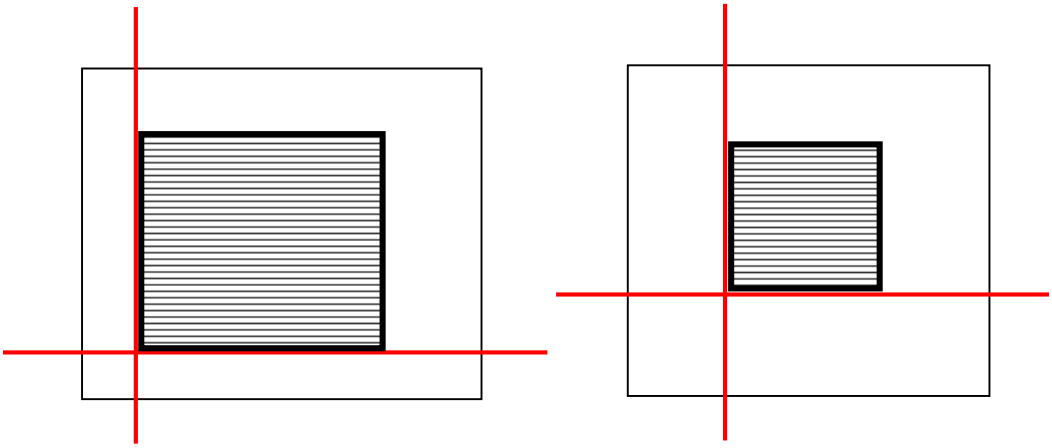
2-4-5-7. [6.Position Compensation]

In [Position Compensation], the cell edge location on the camera image is set in order to capture the entire cell image. You need to change the reference position according to the cell size.
Reference position is the location of the cell edges set in [4.Scan Edge Position] and [5.Scan Edge Position] on the camera image.

If the same reference position (indicated with red lines) is set for the cells of different sizes, the cell images are eccentrically located as shown below.

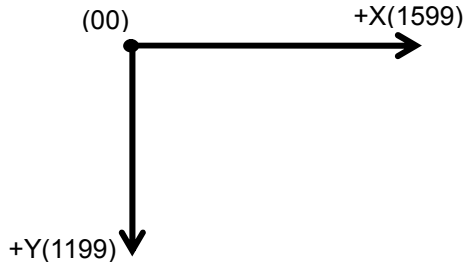


To center cells of different sizes on camera image, set the reference position of each cell according to cell size in this setting.

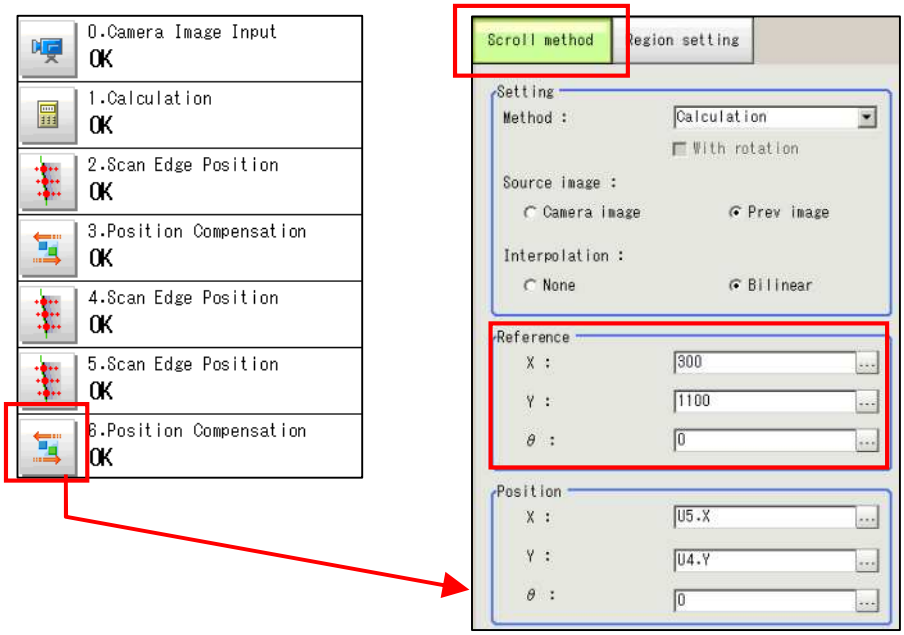


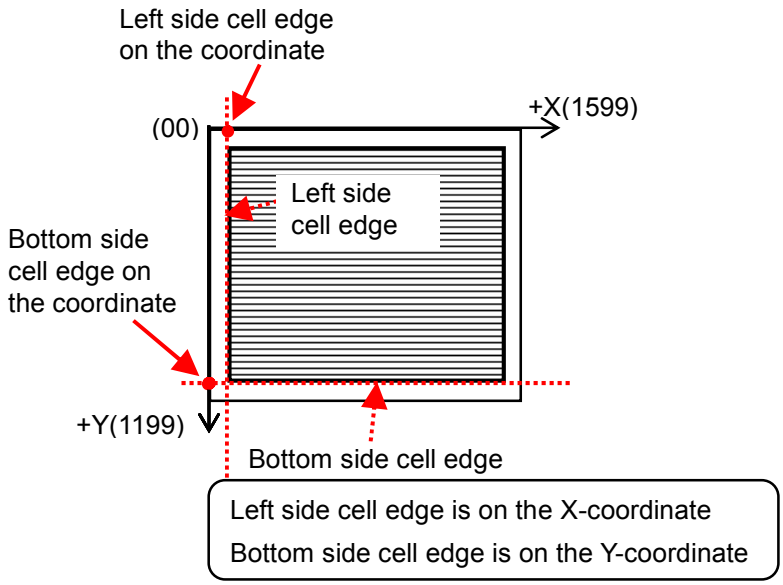
Refer to the following page for the detail setting of the reference position.

The coordinate on Omron's camera is shown below.



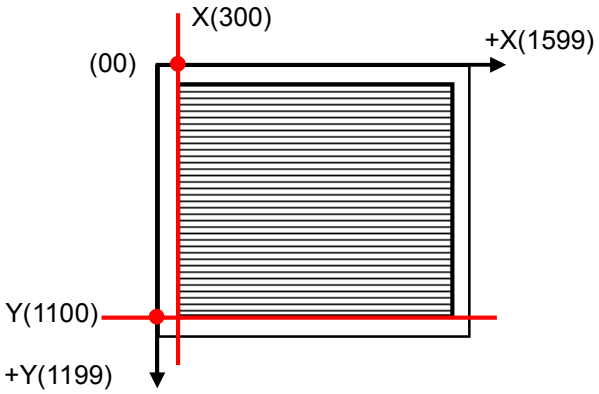
(1) Click the icon button of [6.Position Compensation] to display [Scroll method] screen for setting [Reference].

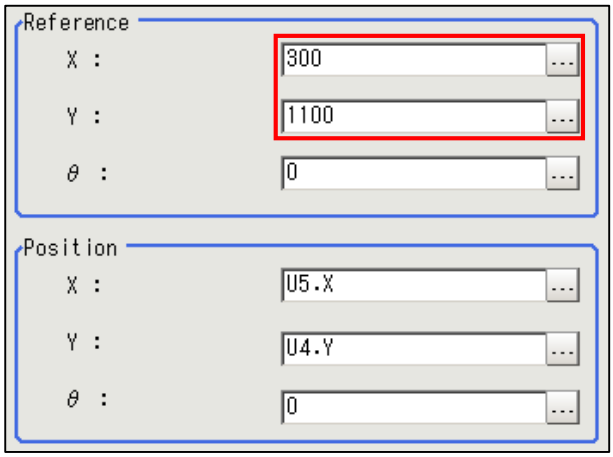




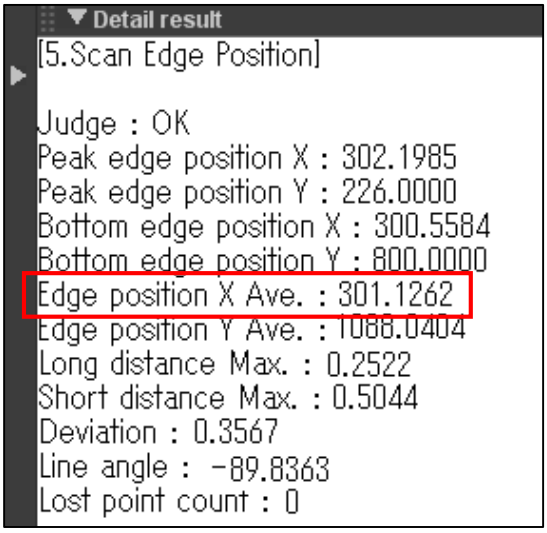
Reference（X,Y）	X：position of the left side cell edge detected in [5.Edge Position] on the X-coordinate in the compensated image Y：position of the bottom side cell edge detected in [4.Edge Position] on the Y-coordinate in the compensated image

(3) To set the cell image as shown in the drawing below, perform the following steps:
Click […] button of [Reference] X and enter the value (A) in [Edge Position X Ave.] measured in [5.Scan Edge Position].
Click […] button of [Reference] Y and enter the value (B) in [Edge Position Y Ave.] measured in [4.Scan Edge Position]. These values are for reference position of measured cell.

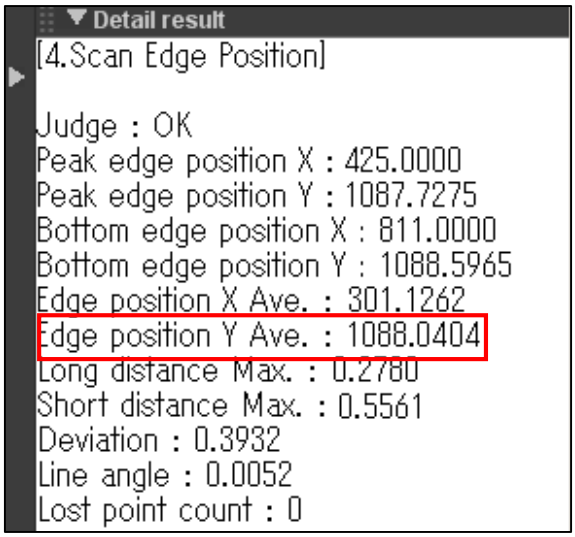




(A)



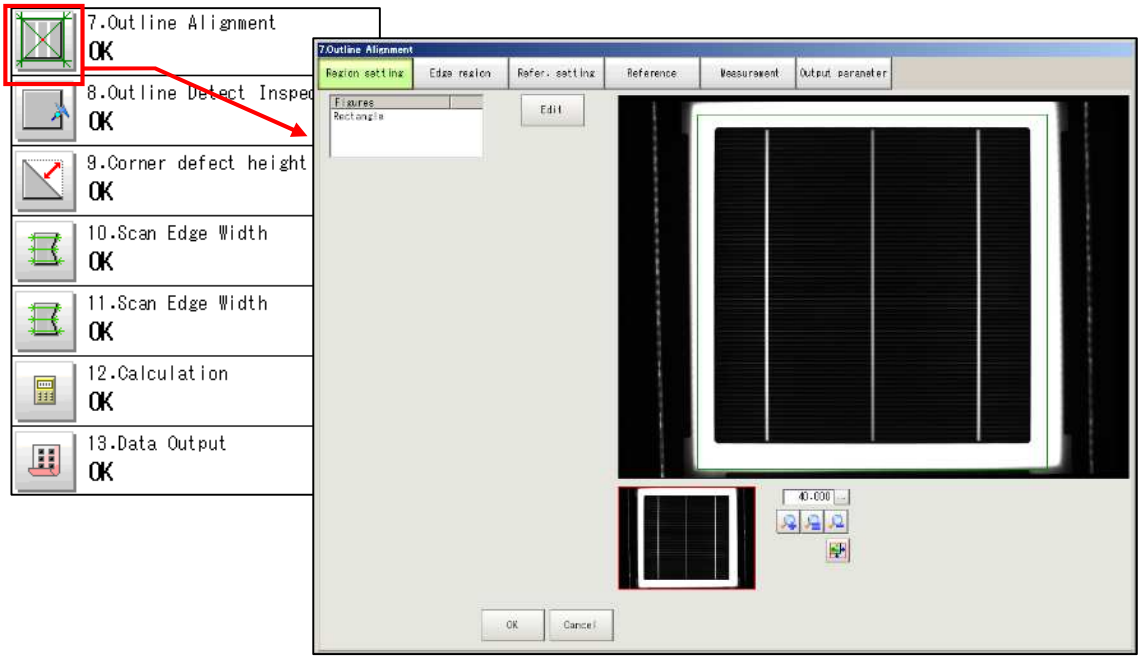
(B)



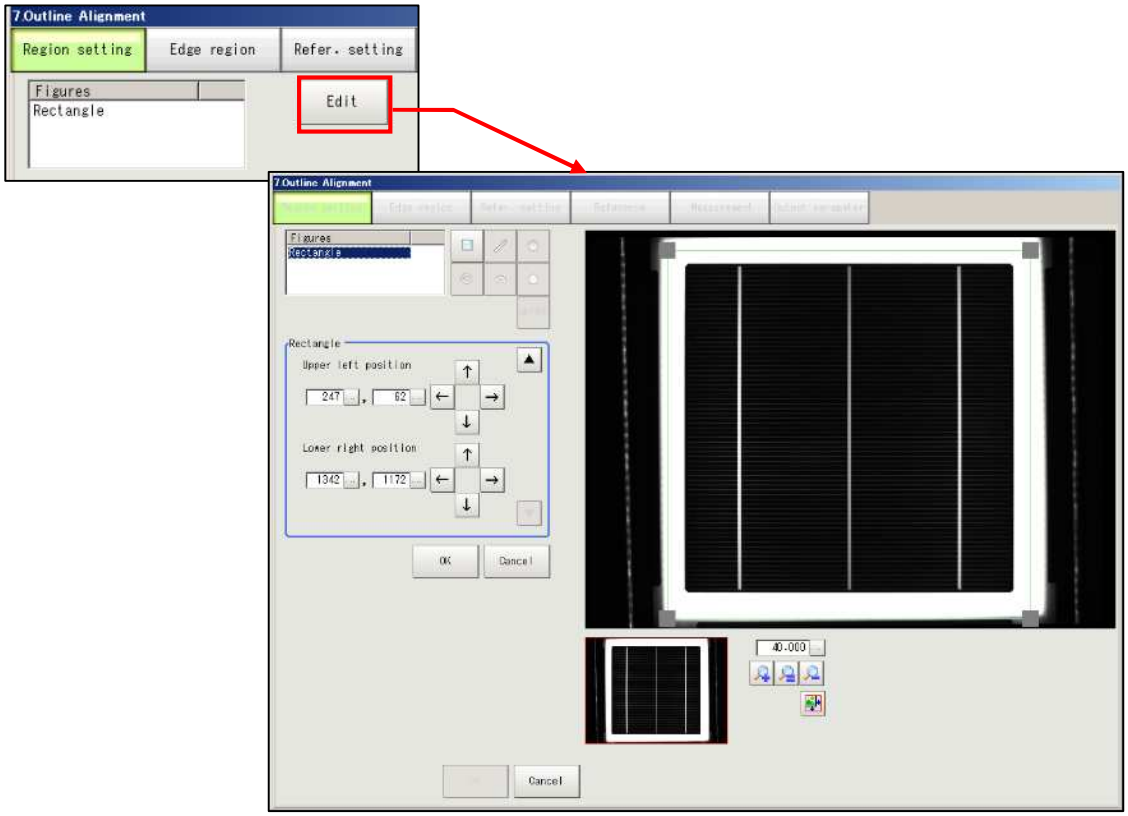
2-4-5-8. [7.Outline Alignment]

In this screen, only [Region setting] and [Edge region] are edited.

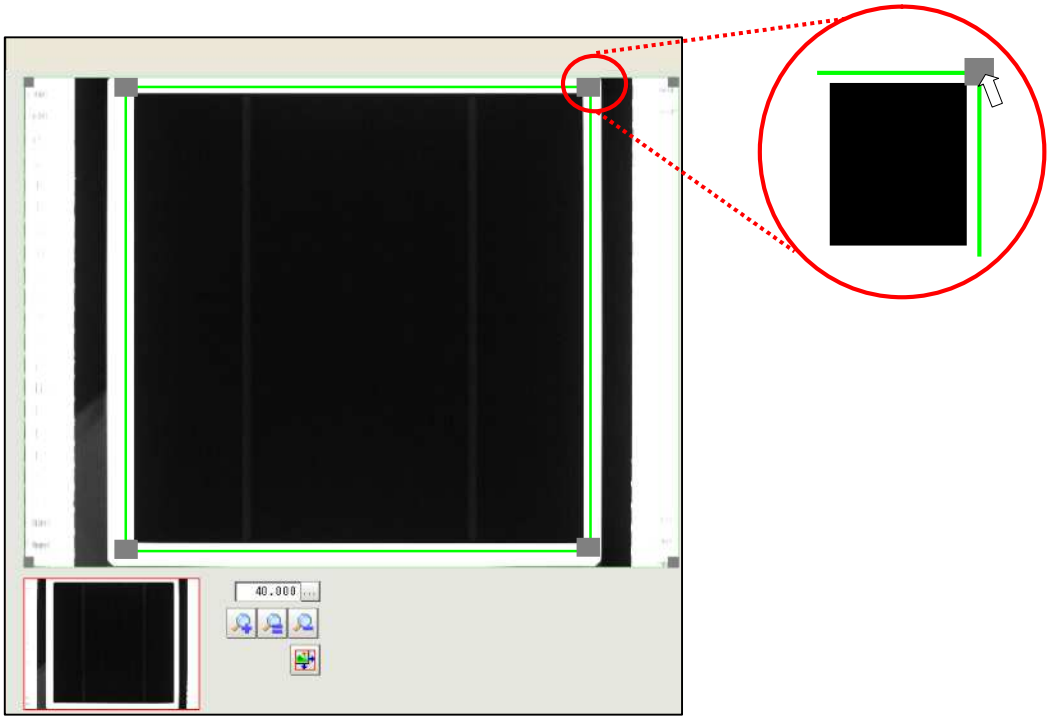
(1) Click [7.Outline Alignment] icon button in the flow and display [Region setting] screen.



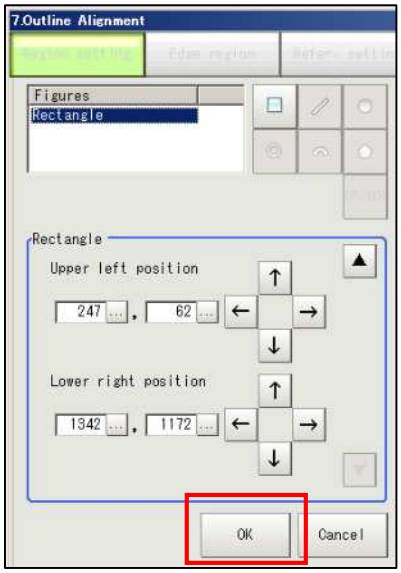
(2) Click [Edit] button on [Region setting] screen to display the setting screen for measurement region.

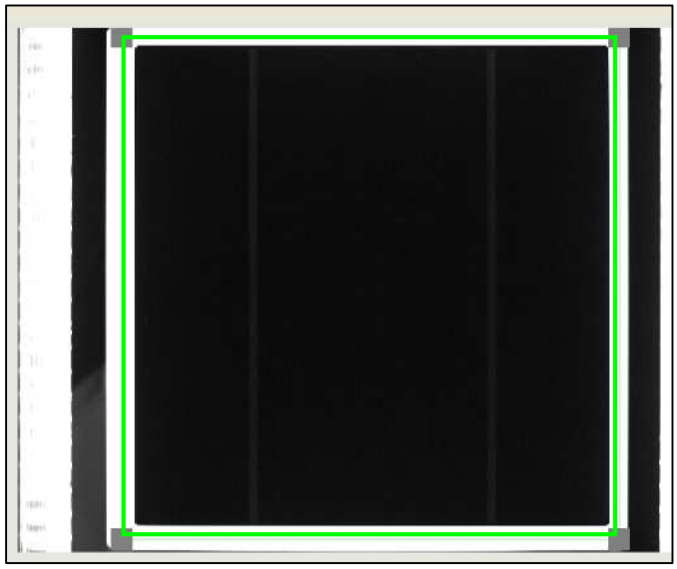


(3) The rectangle enclosed by green lines represents the measurement region. Adjust the measurement region around 3 to 5mm from the cell edge, dragging the small square on each corner of the rectangle with the mouse.

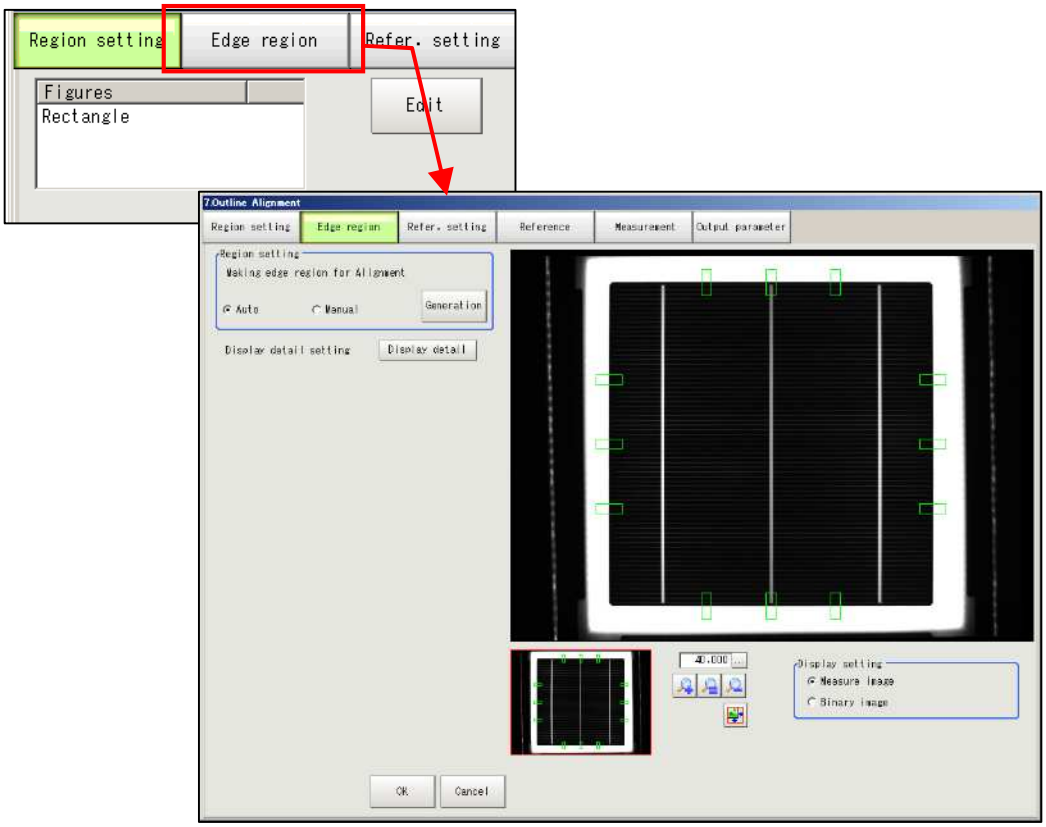


(4) Click [OK] button to set the edited region.

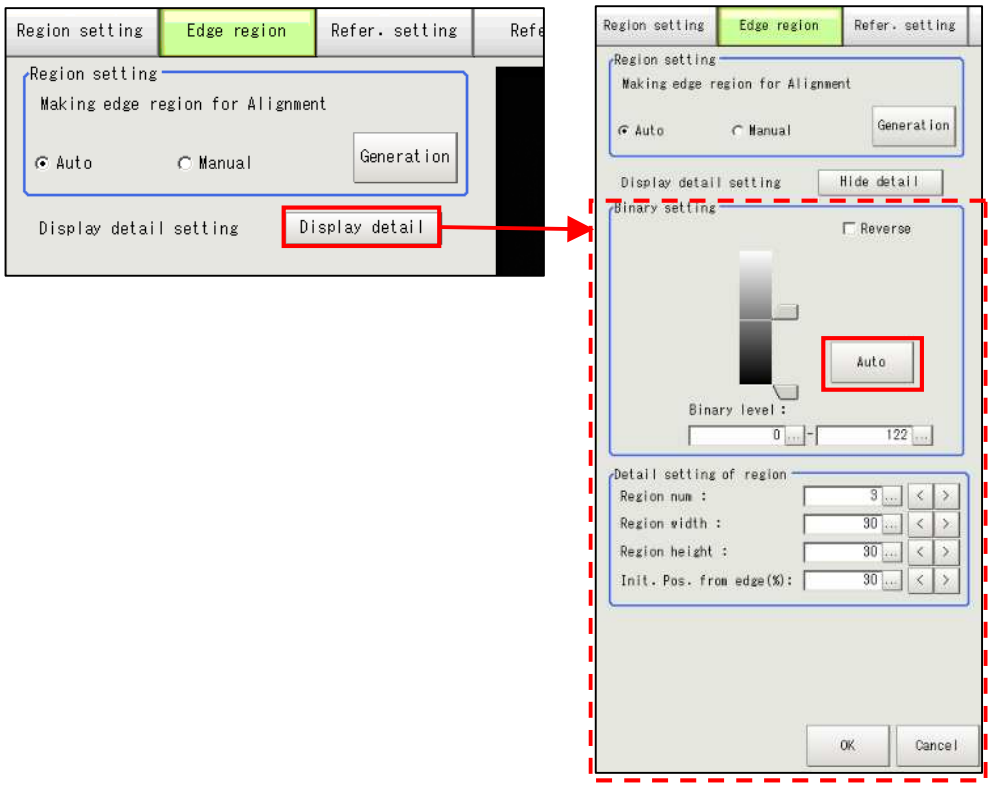




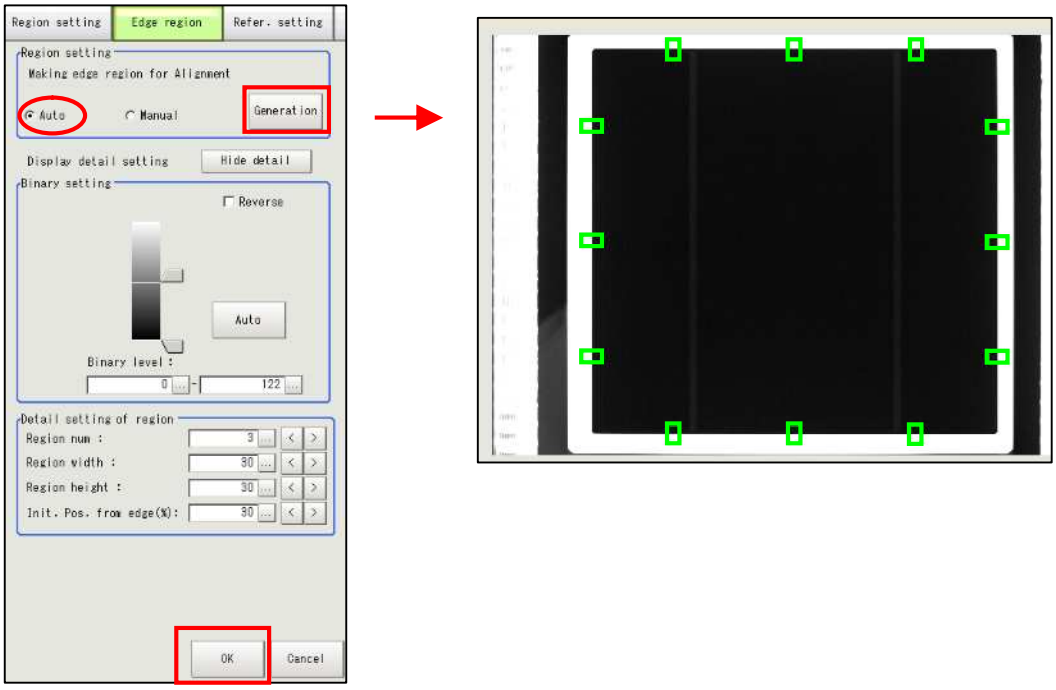
(5) Click [Edge region] tab to display the edge measurement region for alignment.



(6) Click [Display detail] button to show the region setting parameter. Click [Auto] button of [Binary setting].

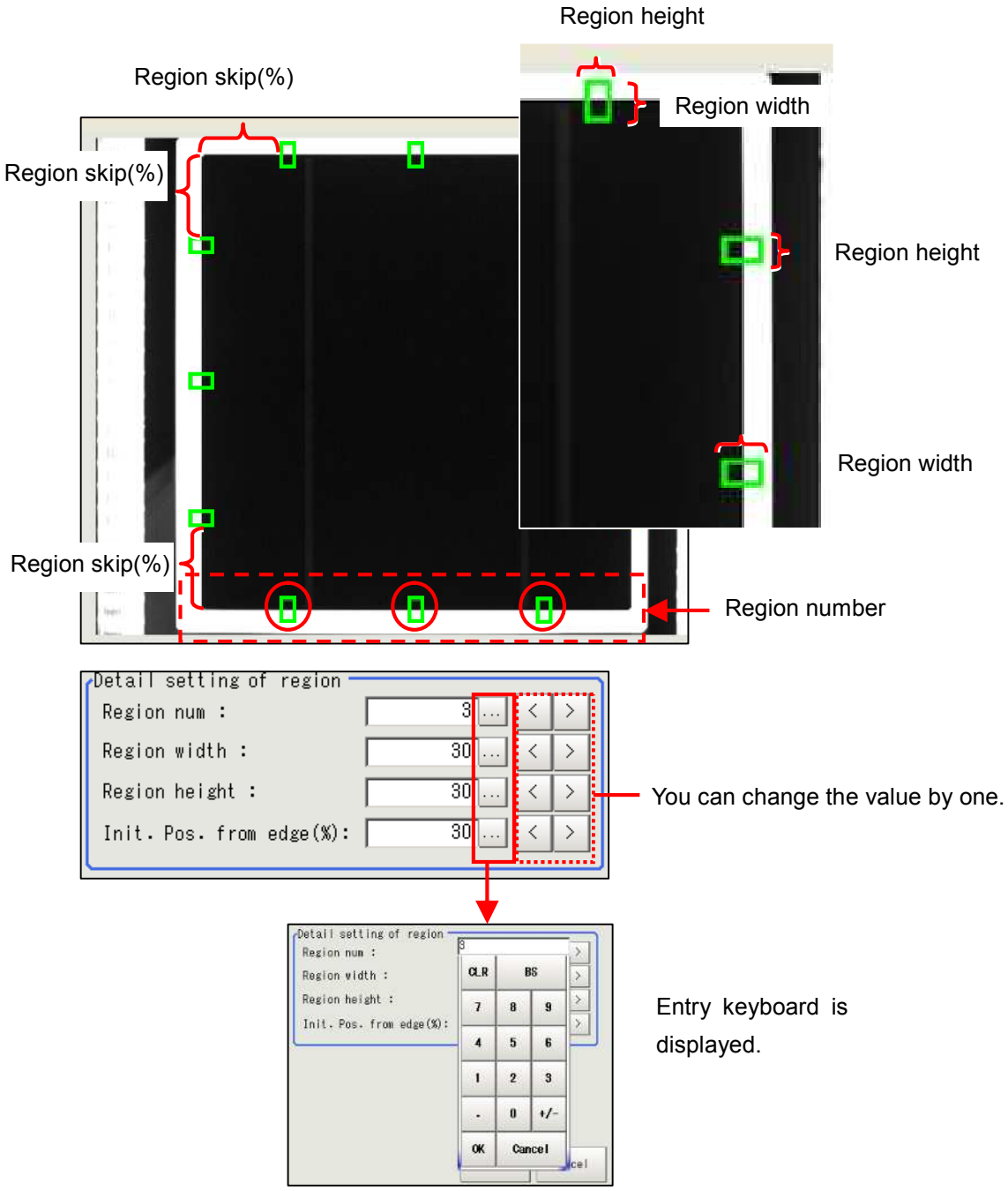


(7) Choose [Auto] button on the [Region setting] field and click [Generation] button. The edge region for the alignment is displayed automatically. If the setting is appropriate, click [OK] button.
(Refer to the following pages if you want to edit the region manually.) The main screen will be displayed.
Setting on [Refer. setting], [Measurement], and [Output parameter] screens is not necessary.



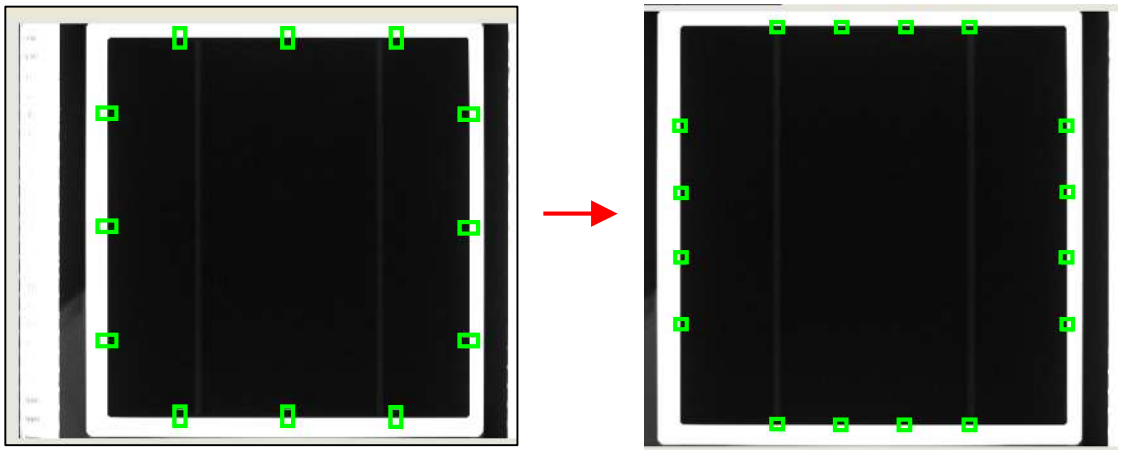
Detail Setting of Region

	In order to set the edited region as [Edge region], click [Generate] button. The region will be regenerated.



Region num	The number of edge regions on side line. The region number is set to [3] in the above picture.
Region width	Width is the region side which is vertical to the cell edge. The guideline width for 6 inch cell is “20~30”. (Wider region is preferable as long as the region is inside the white plate.)
Region height	Height is the region side which is parallel to the cell edge.
Init. Pos. from edge (%)	The position from which an edge region of the side line will be generated. (Unit :%)

If region setting is edited after automatic edit of [Edge region], the image changes as follows:



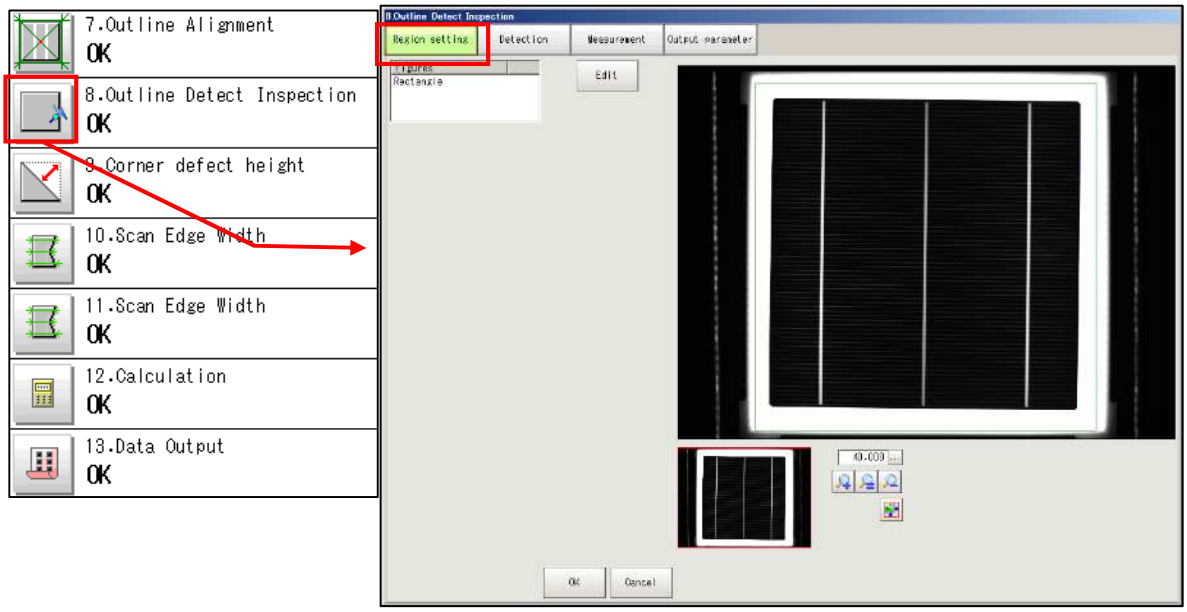
Automatically set [Edge region]

[Edge region] set on the detail setting of the region.

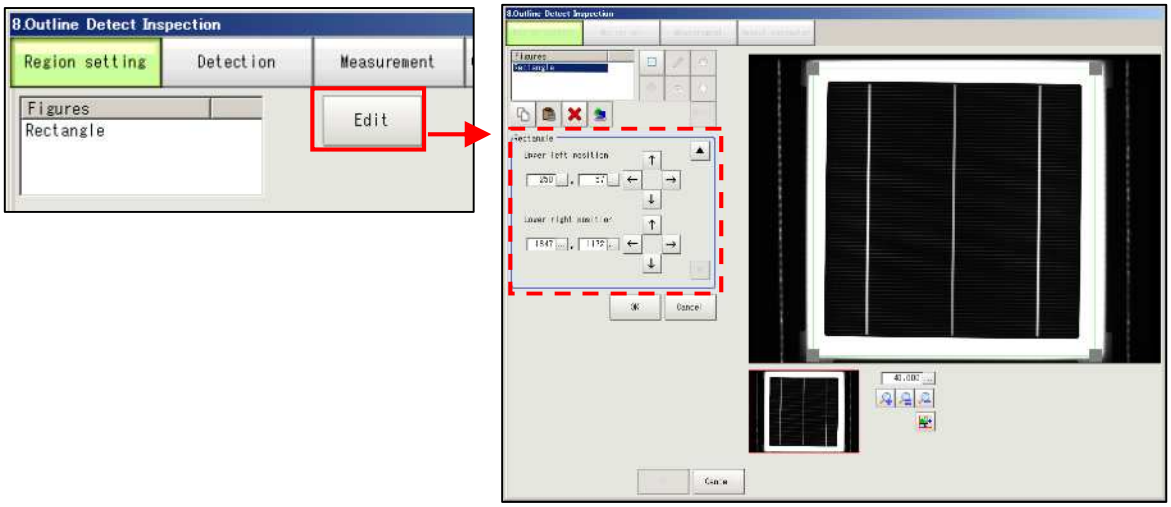
2-4-5-9. [8. Outline Detect Inspection]

It is the setting for detecting location where the perimeter and shape differ with the outline, after extracting cell outline automatically and while tracing the extracted outline points.

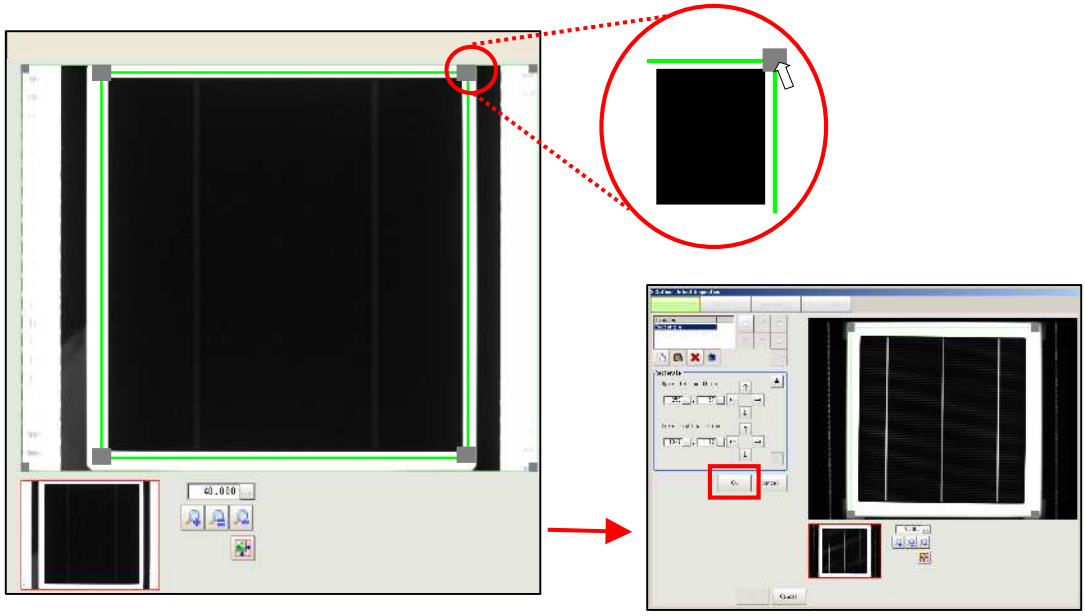
(1) Click [8.Outline Detect Inspection]'s icon button to display the outline detect inspection screen. Edit only [Region setting] among four setting parameter in the outline detect inspection.



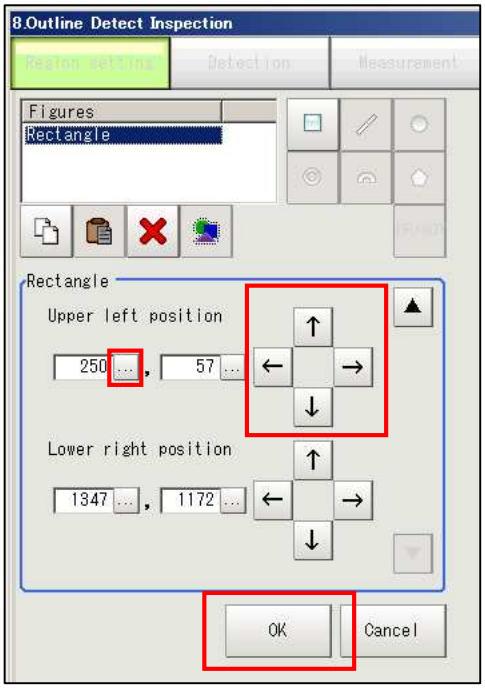
(2) Click [Edit] button on [Region setting] screen to display the region setting items.



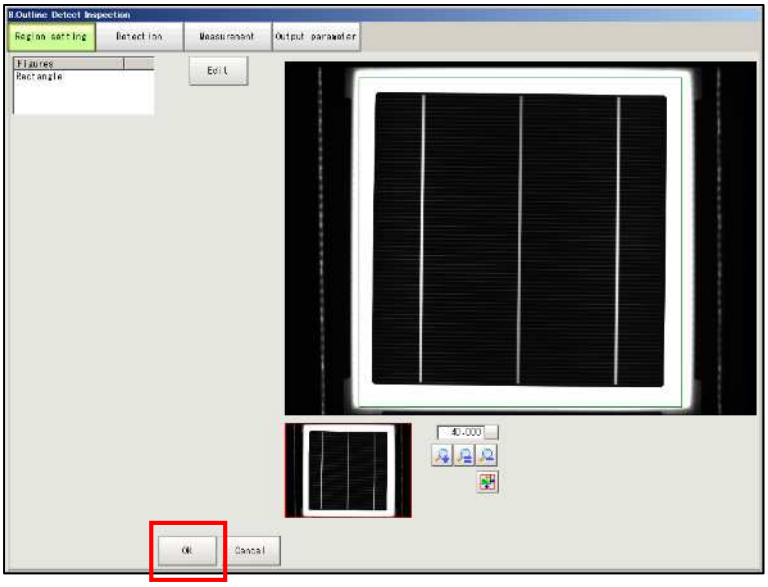
(3) The rectangle enclosed by green lines represents the measurement region for outline detect inspection. The whole measurement target object needs to be included in the rectangle. Adjust the measurement region around 3 to 5mm from the cell edge, dragging the small square on each corner of the rectangle with the mouse.
Click [OK] button to set the edited region. Proceed to (4) for fine adjustment.



(4) For fine adjustment, adjust with allow buttons or […] button in the picture below. Click [OK] button to decide the region.

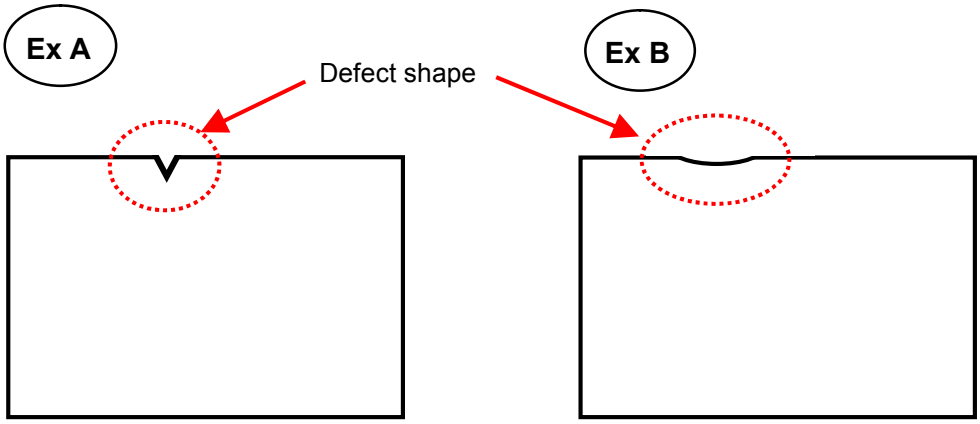


(5) After clocking [OK] button on (3) or (4), click [OK] button on [Outline Detect Inspection] screen to decide the setting for the whole measurement. It changes to the main screen.
Setting of [Output parameter] is not necessary. For [Detection] and [Measurement], edit as needed after checking the condition of the produced string cell.
Refer to (6) for [Detection] setting, (7) for [Measurement].

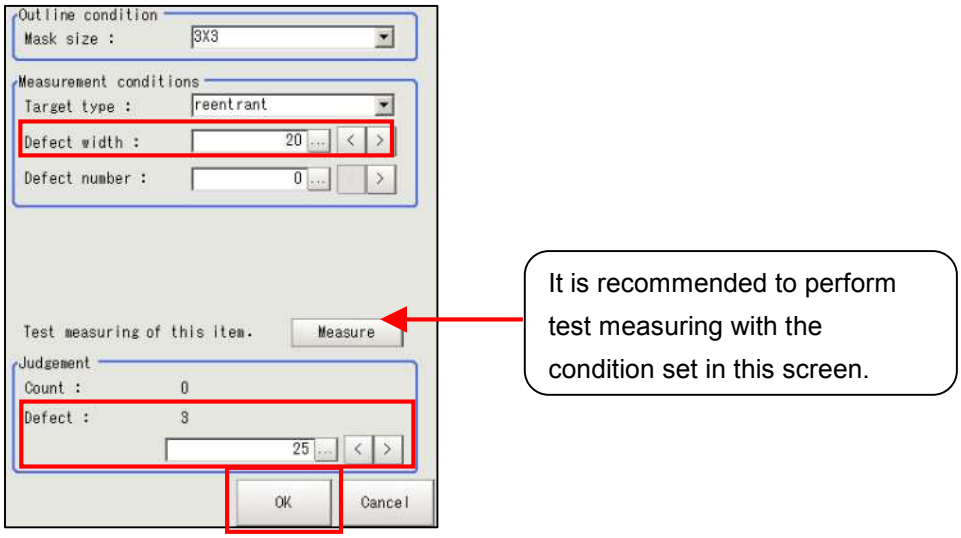


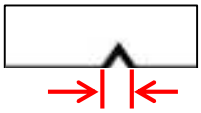
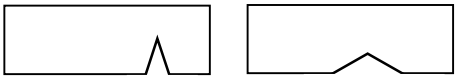
(6) Produce a string cell with the setting decided in (5) and check the condition of the string cell.
If the defect cell is judged as an acceptable cell, adjust with [Defect width] in [Measurement conditions] and [Defect] in [Judgment] on [Outline Detect Inspection] screen.

The defect as in Ex.A is easily detected in [Outline Detect Inspection]. However, the defect with smooth curve may be difficult to detect. This setting is useful in this case.

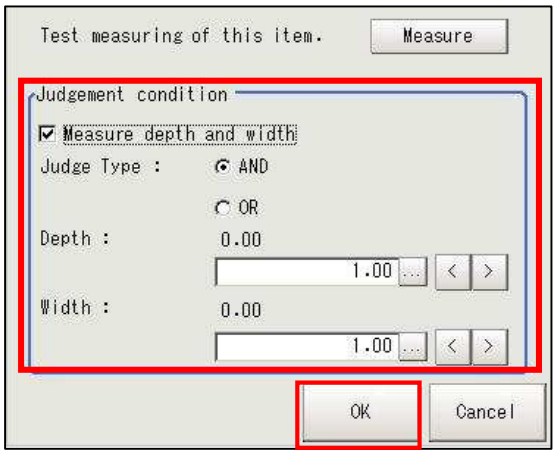


Click [Detection] tab in [Outline Detect Inspection] screen to display the setting screen.
You need not to edit setting if scene is copied.
Set [Defect width] in [Measurement condition] and [Defect] in [Judgment]. Click [OK] button to decide the set value.



Defect width	Settable between 1 and 1000. The guideline value is “20”. Sets the target defect width which to be detected. The defect is detected by comparing each outline point with the outline point in this range.  Defect width
Defect	Settable between 1 and 180. The guideline value is “25”. The defect higher than the value in [Defect] is detected. [Defect] is the difference between the peripheral outline points. (Sharpness of the defect)  High defect Low defect

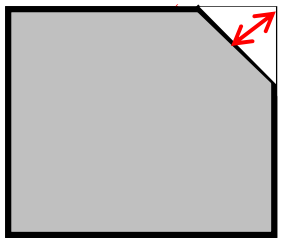
(8) Produce a string cell with the setting decided in (5), and check the condition of the string cell.
To change the threshold value (defect width and depth) between the rejected cell and the accepted cell, **prepare a sample cell which has the defect of the minimum size to be detected**. Check [Measure depth and width] and select judge type from [AND] and [OR] to set judgment condition. Adjust [Depth] and [Width]. Click [OK] to decide the setting.



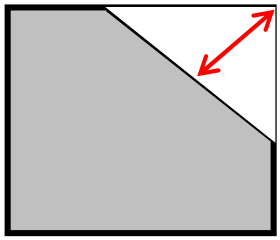
2-4-5-10. [9. Corner Defect Height]

In the outline detect inspection, the locations that are indented in relation to the perimeter edge is detected. However, detection can be difficult at the chamfer of a cell corner area where there is no indentation, as shown below.

In [Corner defect height], the distance from vertex of the cell circumscribed rectangle to the corner (indicated with red arrow) is measured to detect the chamfer defects.

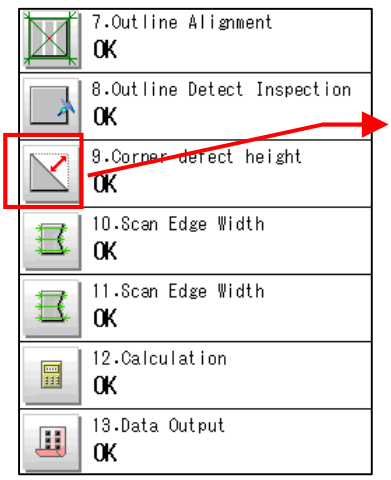


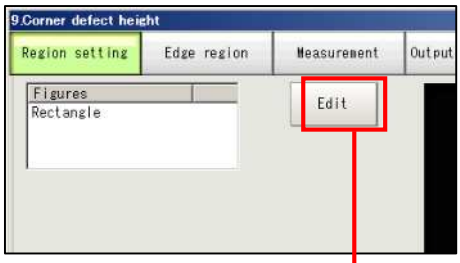
Corner of acceptable cell

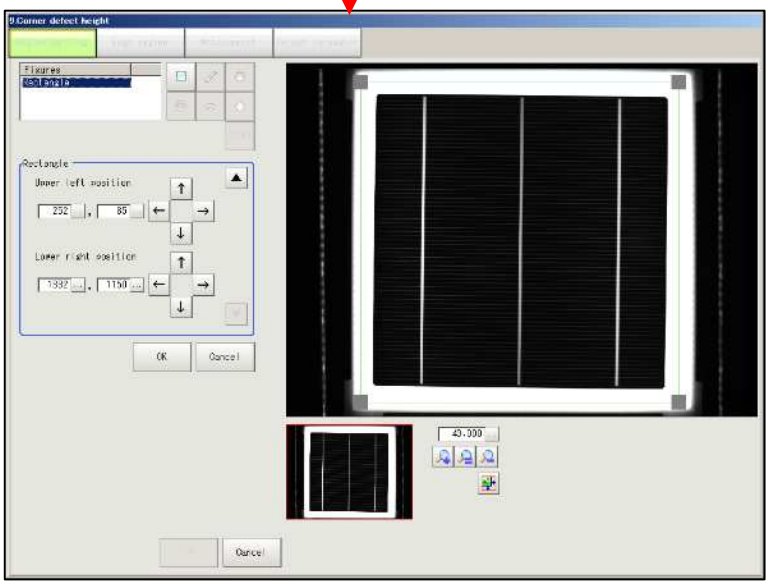


Chamfered corner of unacceptable cell

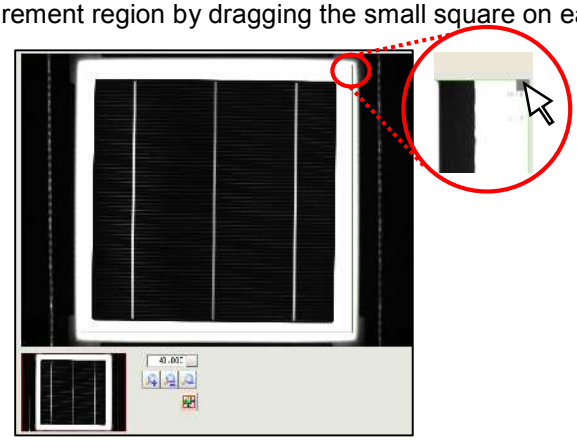
(1) Click [Corner defect height]'s icon button on the main screen to display [Corner defect height] screen. In this screen, only [Region setting] and [Measurement] are to be edited. Click [Edit] button on [Region setting] screen.



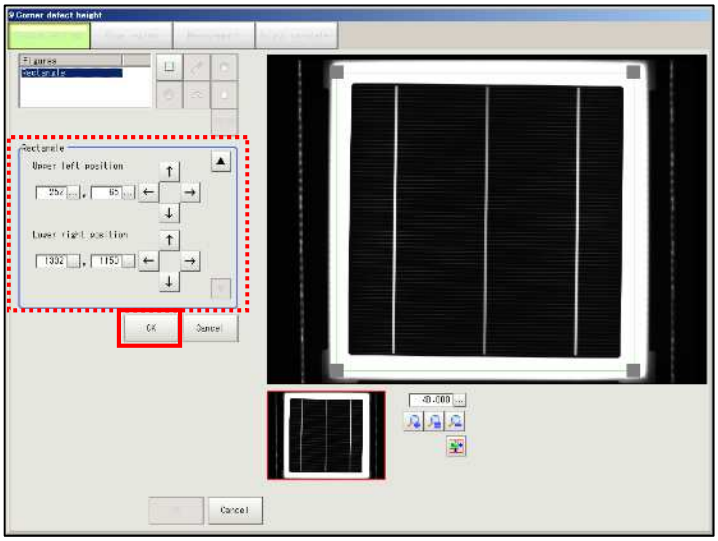




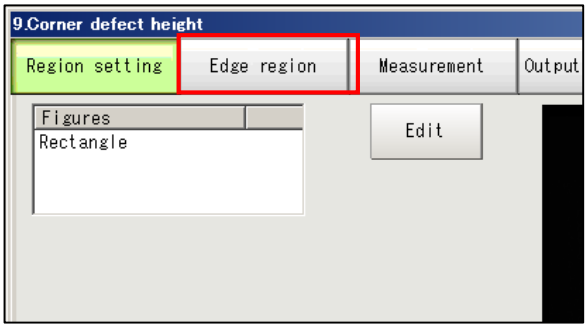
(2) The rectangle enclosed by green lines represents the measurement region for corner defect **height**. The whole measurement target object needs to be included in the rectangle. Adjust the measurement region by dragging the small square on each corner of the rectangle with the mouse.



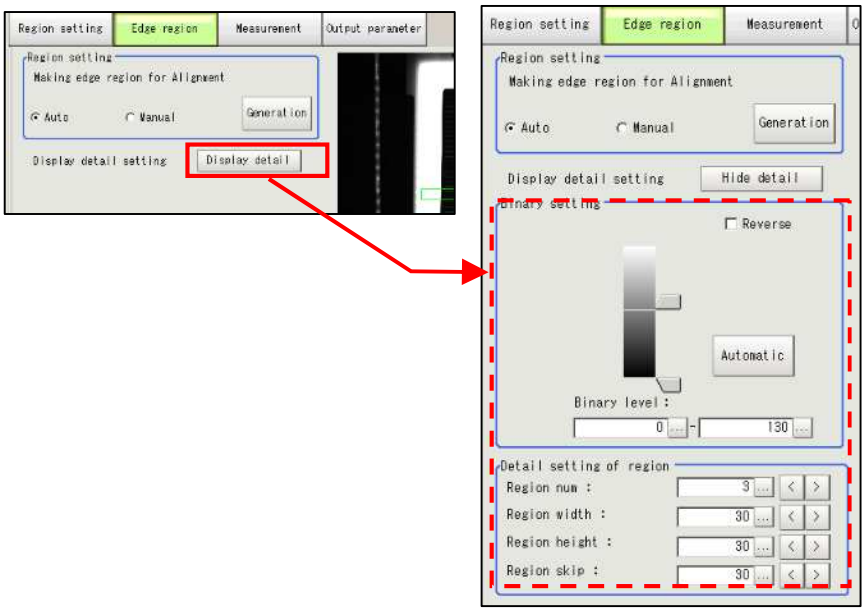
(3) Click [OK] button in the setting region is appropriate. For fine adjustment, adjust with allow buttons or […] button in the picture below. Click [OK] button to decide the region.



(4) Click [Edge region] tab to set the edge region. This setting is necessary to calculate the center coordinates and slanting of the cell.

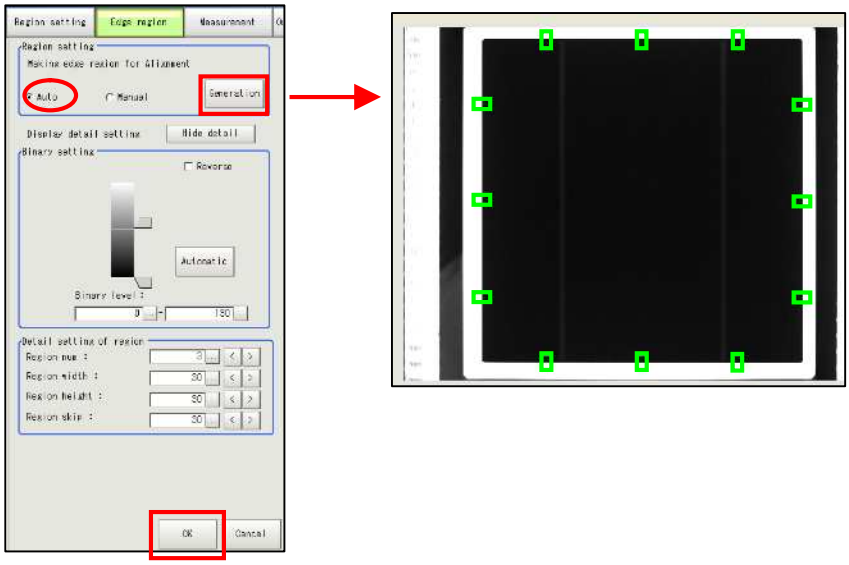


(5) Click [Display detail] button to display detail setting parameters.



(6) Click [Automatic] button on [Binary Setting].

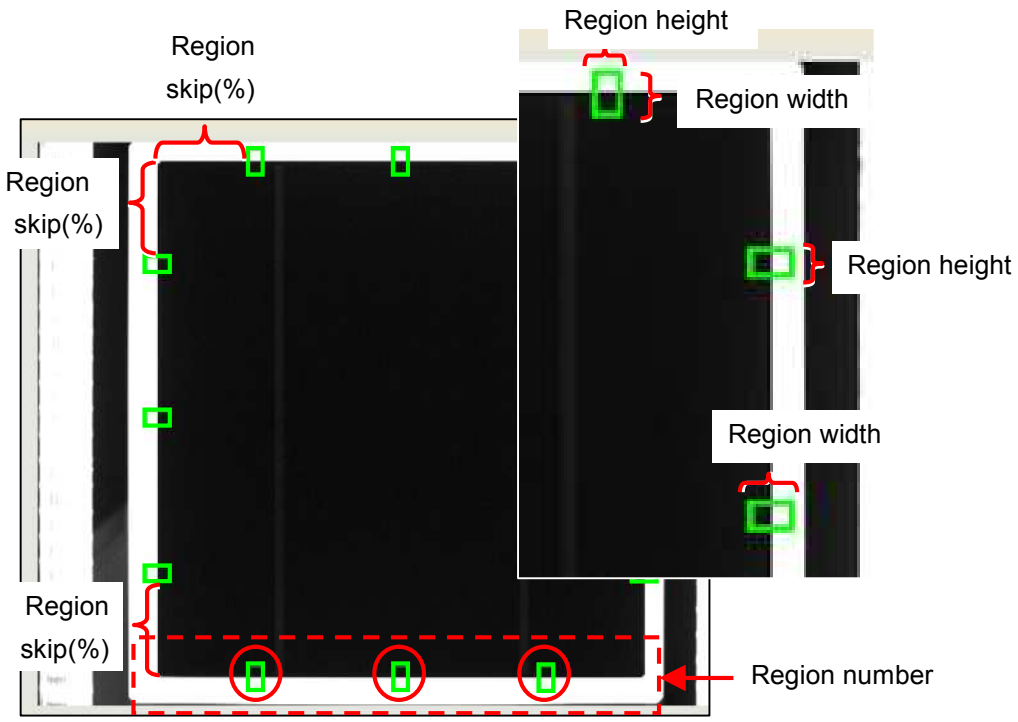
(7) Check [Auto] button in [Region setting] and click [Generation] button to set the edge regions automatically. (Refer to the following pages to edit the region.)

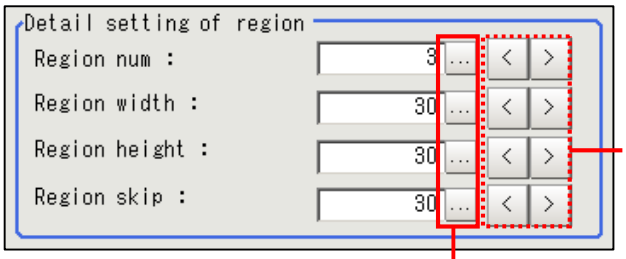


＝Reference＝

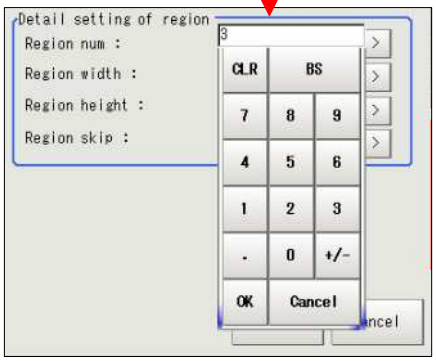
＜Region detail setting＞

*** When editing [Edge region], click [Generation] button to regenerate the region.**





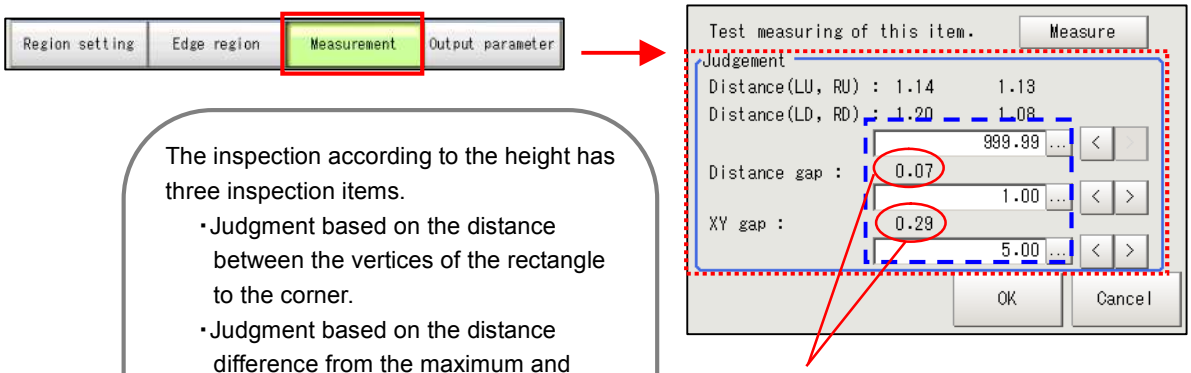
Change the value by 1.



Entry keyboard is displayed.

Region num	The number of edge regions on side line. The region number is set to [3] in the above picture.
Region width	Width is the region side which is vertical to the cell edge. The guideline width for 6 inch cell is “20~30”.
Region height	Height is the region side which is parallel to the cell edge.
Init. Pos. from edge (%)	The position from which an edge region of the side line will be generated. (Unit :%)

(8) Click [Measurement] tab to display the setting screen. In this screen, the parameters for [Judgment] are set. (Factory setting is shown in the picture below.)



The inspection according to the height has three inspection items.

- Judgment based on the distance between the vertices of the rectangle to the corner.
- Judgment based on the distance difference from the maximum and minimum corner.
- judgment based on the difference between the height and the width.

Completing the above three items clears [Corner defect height].

***Measurement result no less than the value in [Judgment] is judged as**

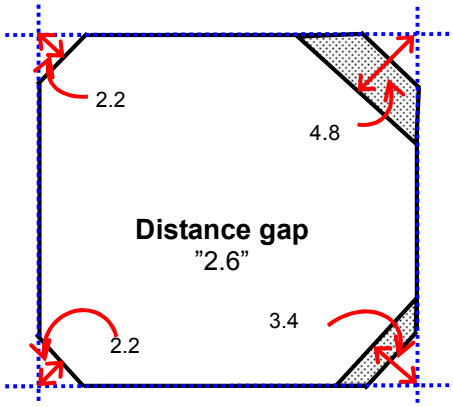
The automatic calculated gap indicates.

* Refer to the drawings in the following page.

Distance	Sets the corner distance range to be judged as acceptable. It is the distance between the vertices of the rectangle to the corner. *** Measurement result no less than the value in [Judgment] is judged as unacceptable.** For Ex B, set “4.81” to complete the distance judgment. Entering “4.8” or less than it causes the distance of the top-right corner to be judged as unacceptable. For Ex A, enter “2.2” or more. If “2.2” is entered, the corner distances of the top left and the bottom two corners are judged as unacceptable.
Distance gap	Set the corner difference range judged as acceptable. It is the difference between the maximum and minimum distance between the vertices of the rectangle to the corner.*** Measurement result no less than the value in [Judgment] is judged as unacceptable.** Distance gap: the difference between the maximum and minimum distances among the distances at the four corners. For Ex B, the corner difference is “1.3”. Set “1.31” to complete the distance gap judgment. Entering “1.3” or less than it causes the distance gap is judged as unacceptable. For Ex. A, enter “2.61” or more. If “2.6” or less is entered, the distance gap is judged as unacceptable.
XY gap	Set the vertical and horizontal distance difference (the absolute value expressing the difference between entire vertical and horizontal length of the cell) judged as acceptable.*** Measurement result no less than the value in [Judgment] is judged as unacceptable.** For Ex C, set “2.00” to complete the XY gap judgment, as the vertical and horizontal distance difference of the acceptable is “0.00”. As seen in the drawing of its right, the cell whose vertical distance difference is “3.50” exceeds the set value, therefore judged as unacceptable.

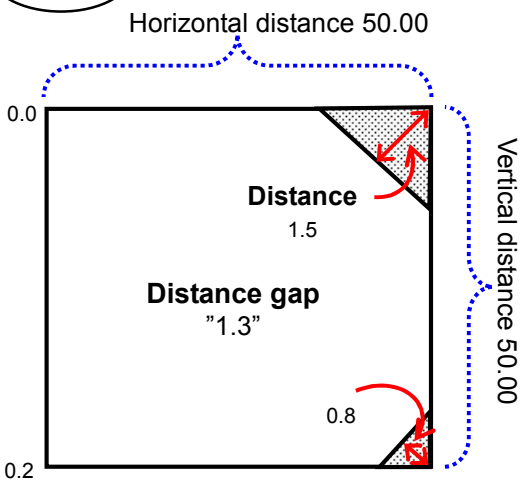
Ex A

・・・The location where the cell is broken.



The corners of the cell are cut from the beginning; the corner depth (distance) is “2.2”; the chamfer defect whose corner depth (distance) is “4.8” at the top right and “3.4” at the bottom right. As a result, the distance gap is “2.6”.

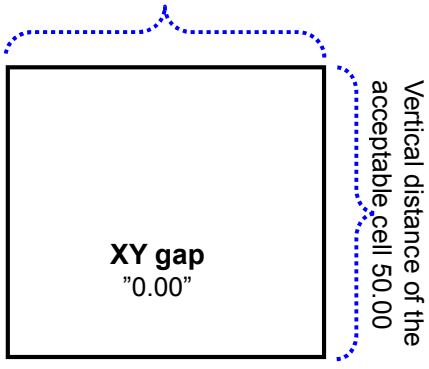
Ex B



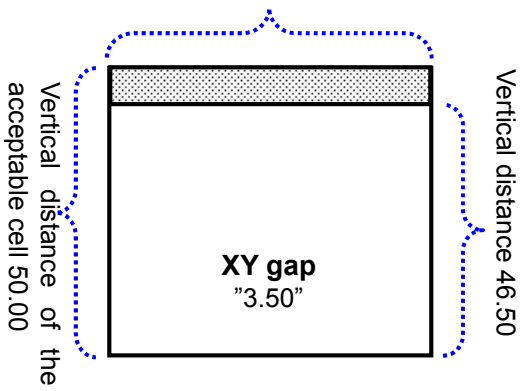
The corner of the acceptable cell is square; the chamfer defect whose depth is “1.5” at the top right, “0.8” at the bottom right and “0.2” at the bottom left. As a result, the distance gap is “1.3”.

Ex C

・・・The location where the cell is broken.

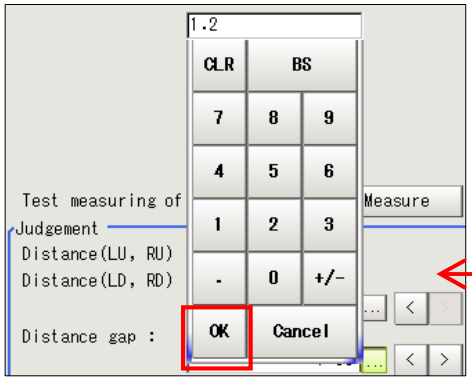


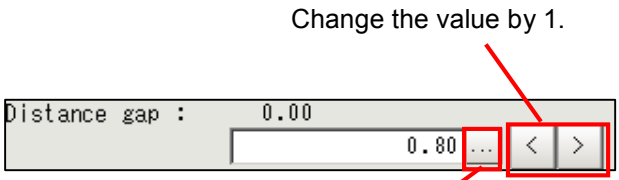
When the horizontal distance is “50.00” and the vertical distance is “50.00”, the XY gap of the cell is “0.00”.



With the same setting as the cell in the left, the XY gap of this cell is “3.50” as the vertical distance is only “46.50” due to the breakage at the upper side.
(Obtained by subtracting the horizontal distance from the vertical distance)

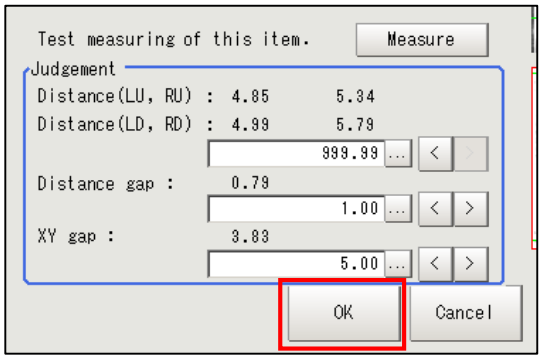
(9) Preparing the cell with the minimum defect, enter the value in the parameters and click [OK] button.





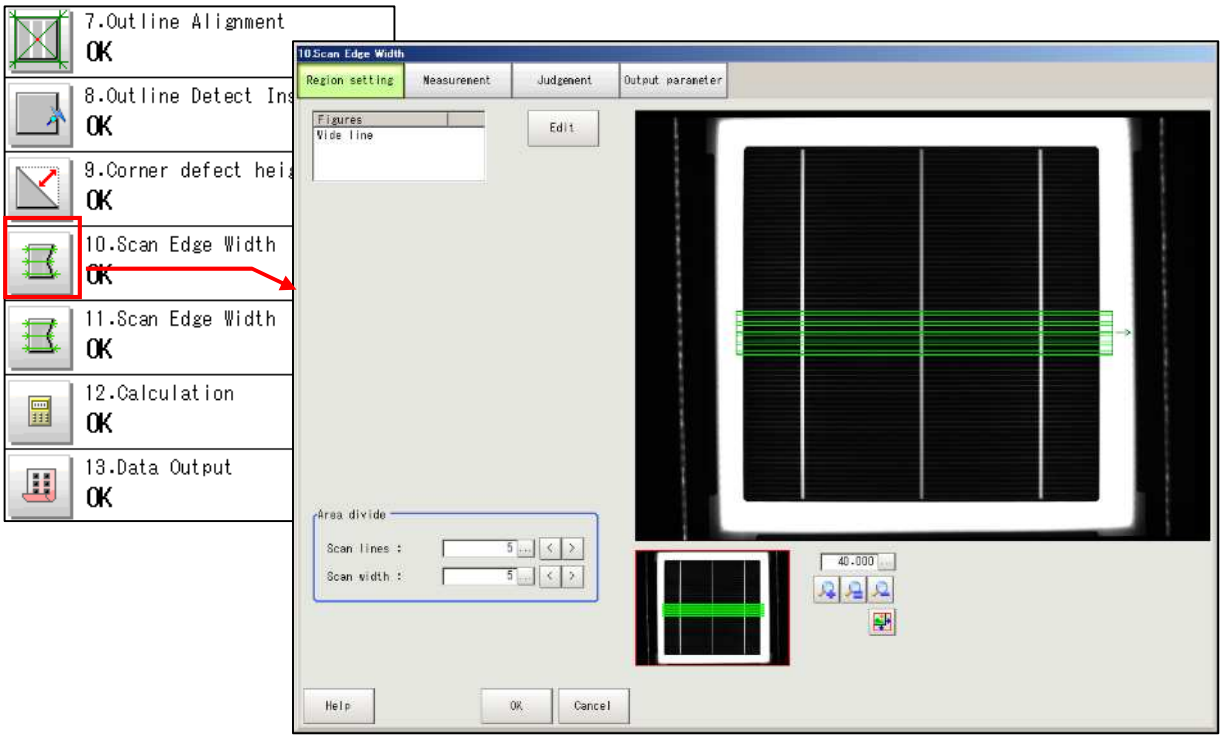
To enter the number of decimal places, click […] button to display the keyboard.

(10) Click [OK] button after editing. Editing [Corner defect **height**] is completed and the main screen is displayed again.

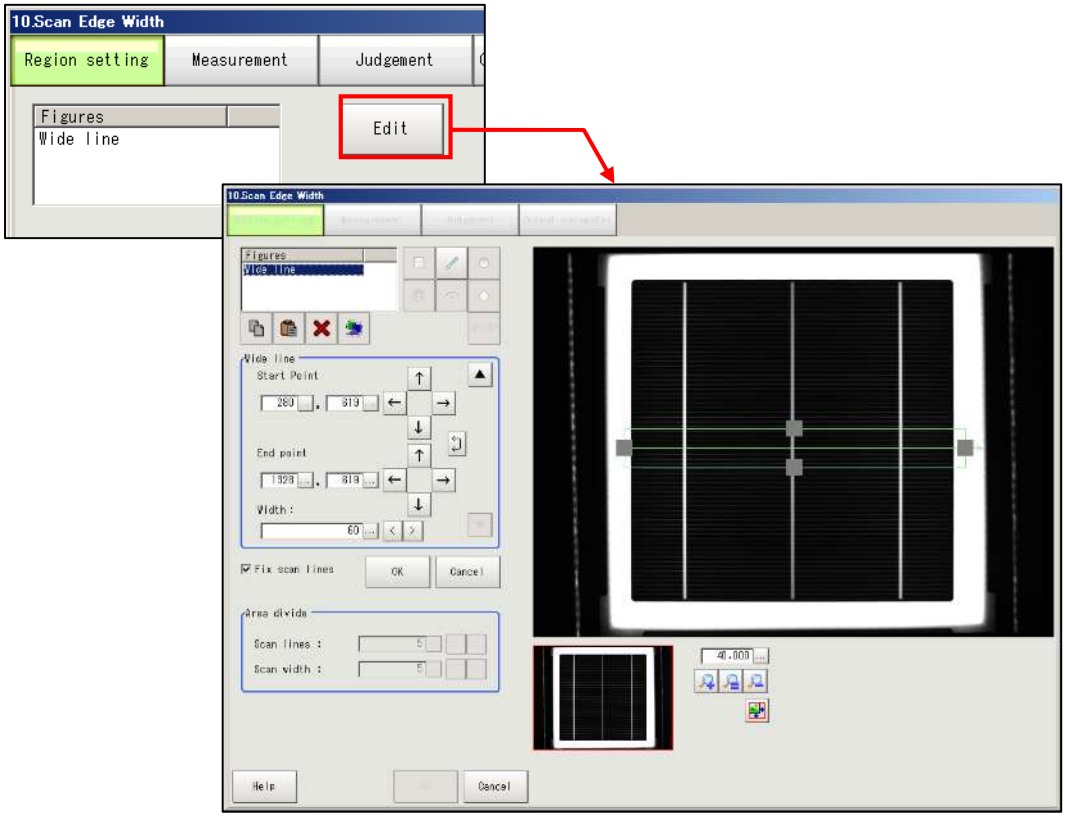


2-4-5-11. [10.Scan Edge Width]

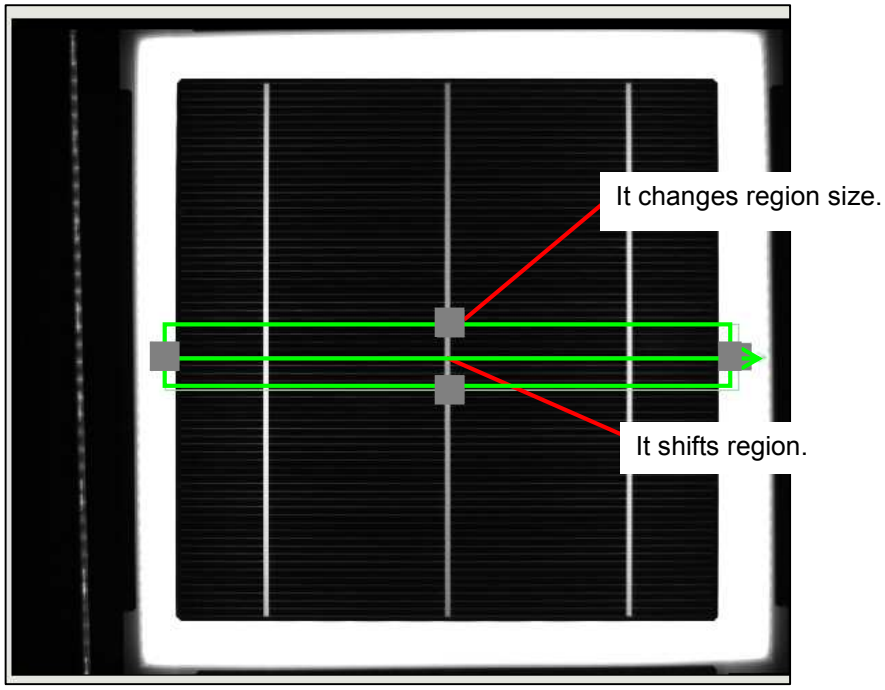
This setting is necessary to measure the difference between width and height of the cell. [10.Scan Edge Width] is for measuring width of the cell, while [11.Scan Edge Width] is for the height. Values set in [10.Scan Edge Width] and [11. Scan Edge Width] are used for [12.Calculation].



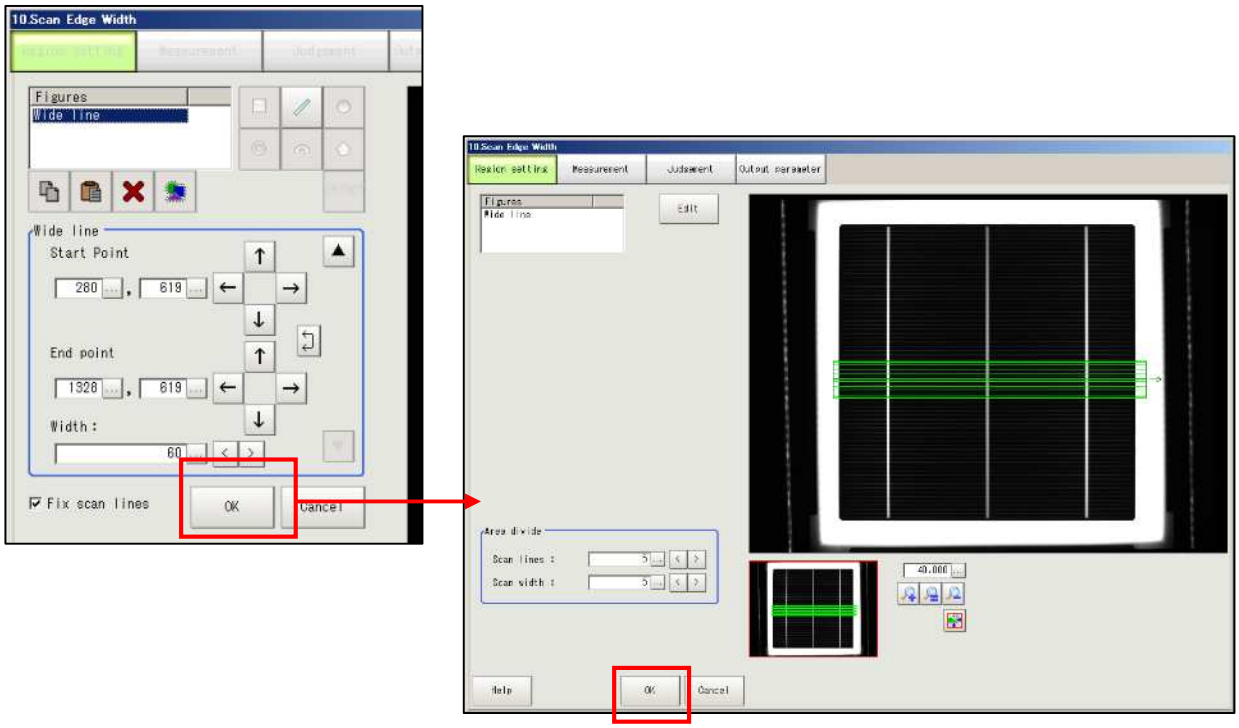
(1) Click [Edit] button and display region setting screen.



(2) The green lines indicate the region to be measured, while gray rectangles indicate the midpoint of the region. The region size changes by dragging the gray rectangle on cell image. The region shifts by dragging the center green line. Include the whole center part of the cell with a margin of 3 to 5mm from the cell edge.

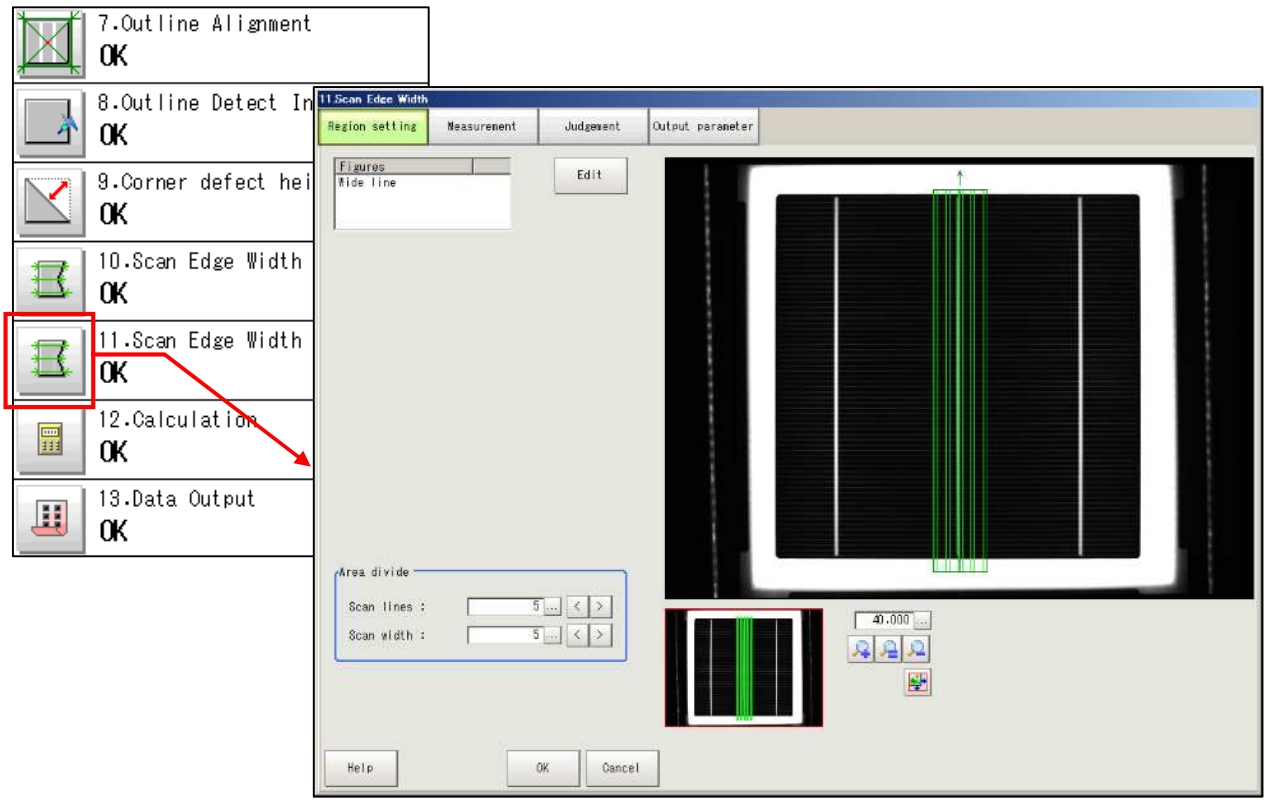


(3) After setting region, click [OK] button, and then, click [OK] button on [Region setting] screen.



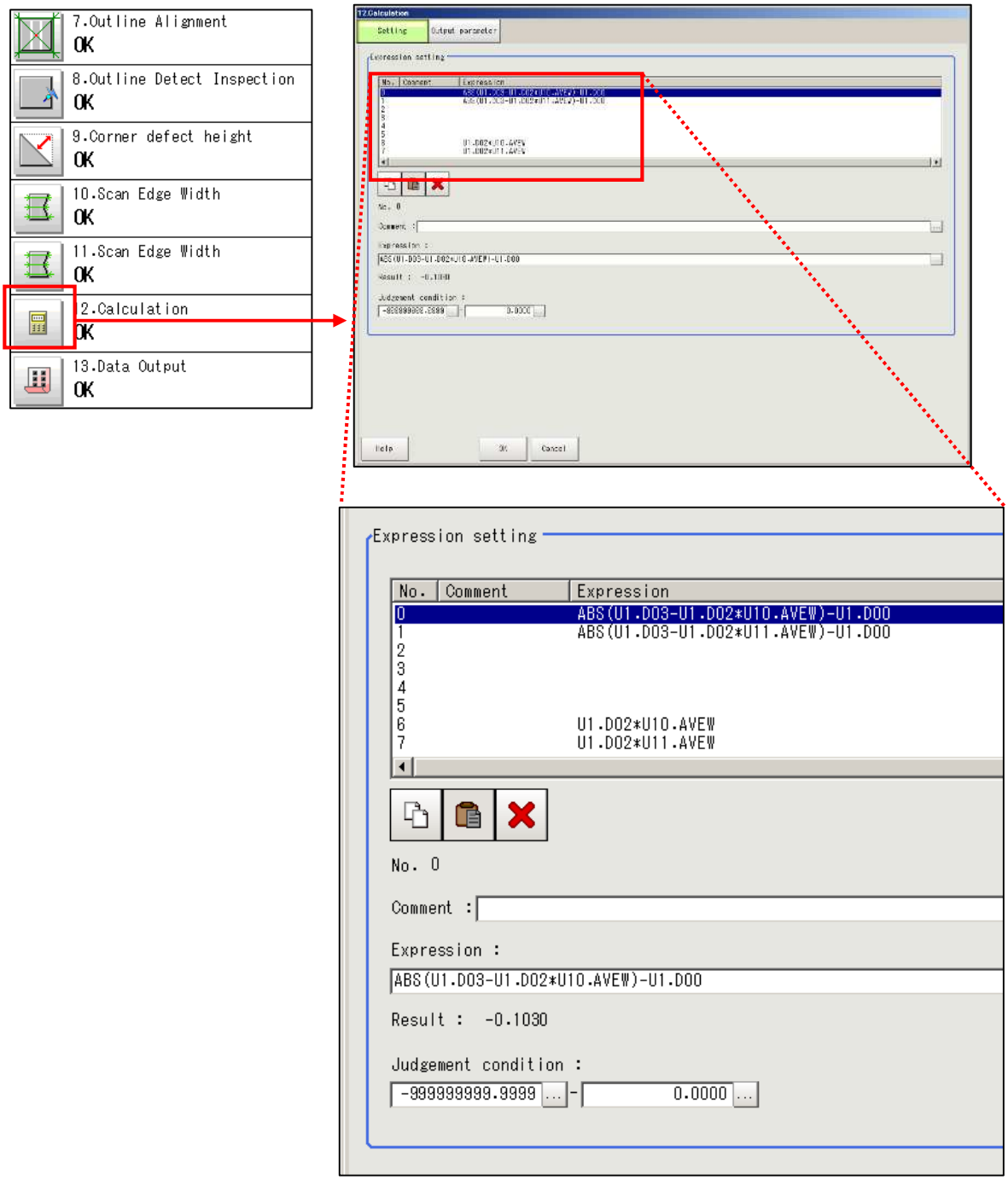
2-4-5-12. [11.Scan Edge Width]

Set for cell height in the same way as in [2-4-5-11. [10.Scan Edge Width]]



2-4-5-13. [12.Calculation]

You don't need to edit the setting.

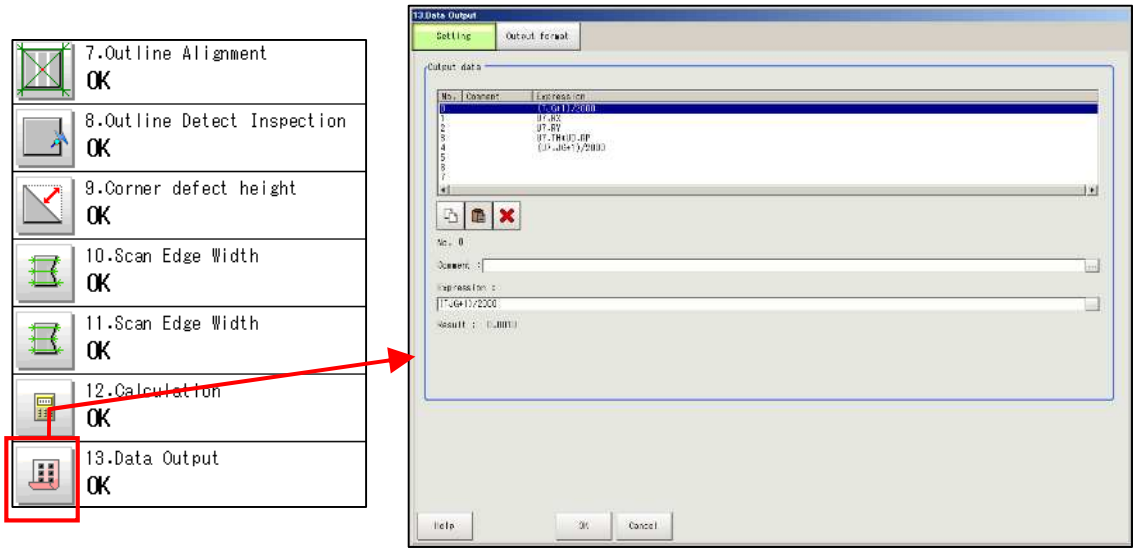


2-4-5-14. [13.Data Output]

This setting is for the signal to be transmitted to PLC.

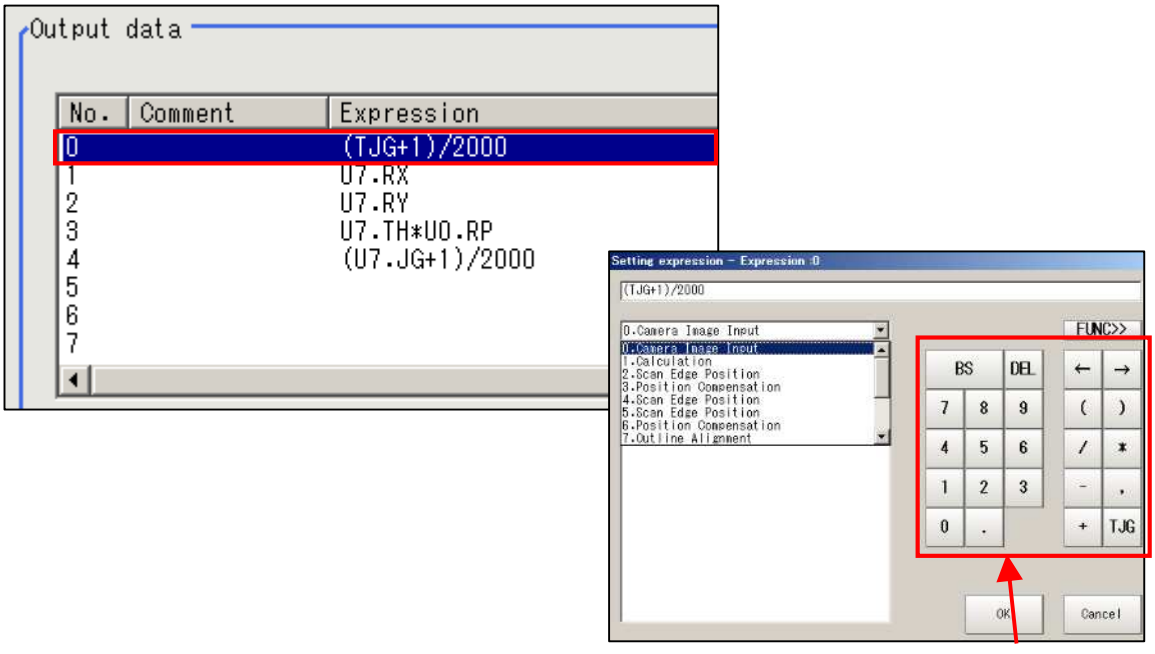
Check [Calculation] and [Output format] which are already copied from the template master.

(1) Click the icon button of [13.Data Output] to display [Data Output] screen.



(2) Check that expressions are entered in No.0 to 4 as shown below.

If you need to enter expression, choose the corresponding number and enter expressions with keyboard after clicking […] button.

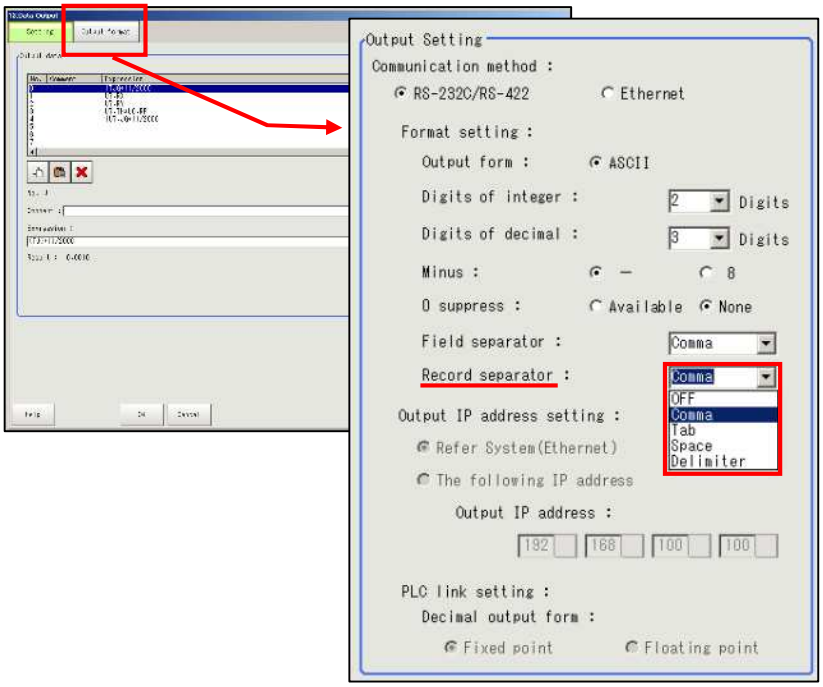


Numerical Keyboard

No.	Comment	Expression
0		(TJG+1)/2000
1		U7.RX
2		U7.RY
3		U7.TH*U0.RP
4		(U7.JG+1)/2000
5		

No.0	To send each inspection's result to PLC. Enter "(TJG+1)/2000)".
No.1	Enter "U7.RX"
No.2	Enter "U7.RY"
No.3	Enter "U7.TH * U0.RP"
No.4	Enter "(U7.JG+1)/2000"

(3) Click [Output format] tab to display [Output Setting] screen. Set [Record separator] to [Comma].



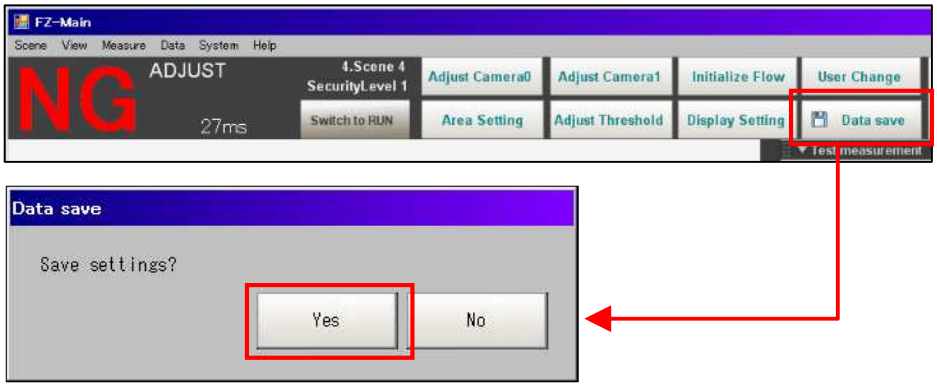
Perform this setting every time you set for the serial data output.

2-4-6. Save Inspection Template

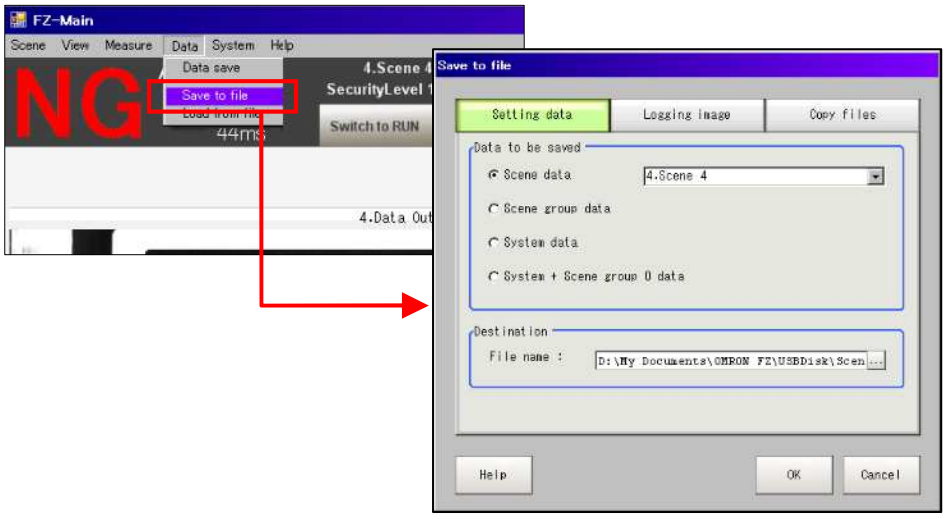
Saves edited templates to register them in the scene No. as templates.

	Alignment template's setting is stored in RAM, as Omron FZ3 does not use hard disk. **Clicking [Data Save] button on the main screen saves the setting already stored in the RAM in the flash memory. Therefore, the setting will be lost if the machine power is turned off before [Data Save] button is clicked.** **It is recommended to save data frequently by clicking [Data Save] button in order to avoid loss of data due to sudden trip.**

(1) Click [Data Save] button on [FZ-Main] screen. Click [Yes] button of the confirmation screen to save the data in the flash memory and register the edited inspection template.
Data in RAM will be erased when the machine power is turned off, but the data in the flash memory is still saved.

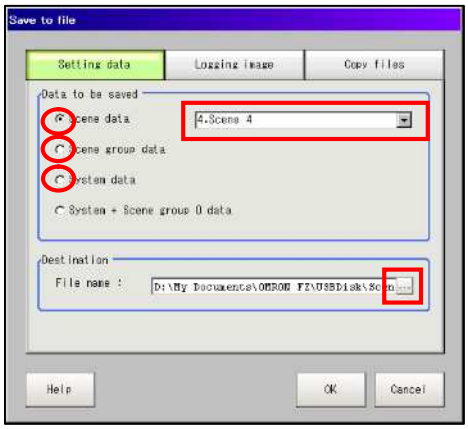


(2) Created template data is stored in the machine, but it is recommended to back up the data. Click [Save to file] from [Data] on the toolbar to display [Save to file] screen to choose the data to be saved and its destination.

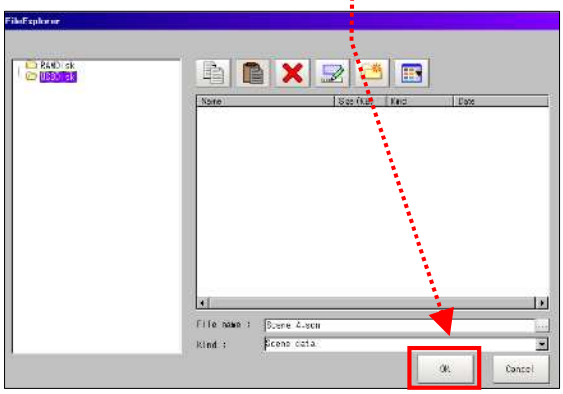


(3) Insert USB into the machine.

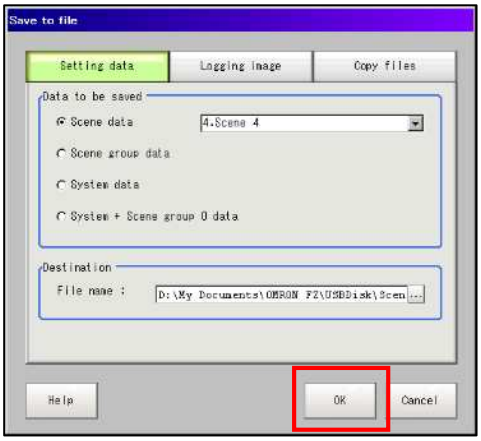
(4) To save the scene number (scene data) stored in FZ3, click [Scene data] and choose the data to be saved from the pull-down menu.
Choose [Scene group data] to save the whole scene group.
It is recommended to save [System data] as well.
After choosing the data to be saved, click […] button to choose the destination



(5) Choose [USBDisk] and click [OK] button to return to [Save to file] screen.



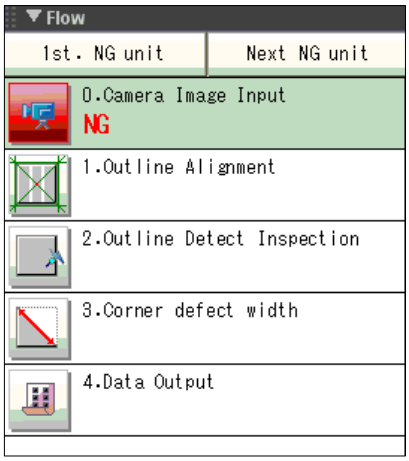
(6) Click [OK] button on [Save to file] screen to save the data in the designated destination and it returns to the main screen.



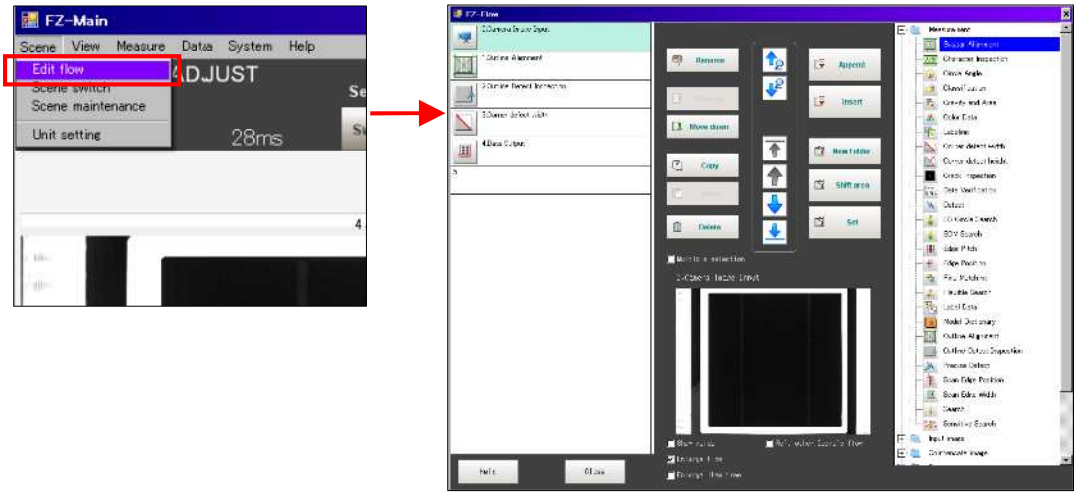
2-4-7. Edit Flow

The order of the flow and items can be edited.

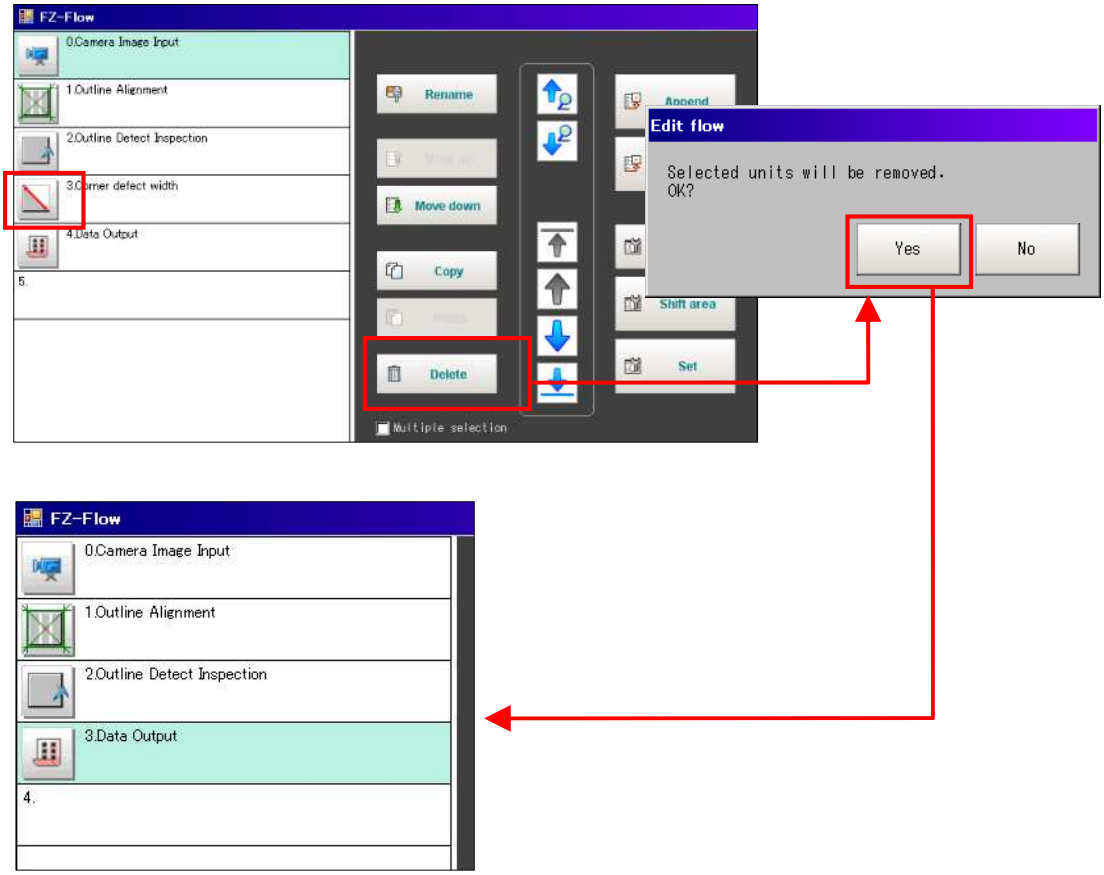
The following describes how to **change [3.Corner defect width]** to **[3. Corner defect height]** in the flow.



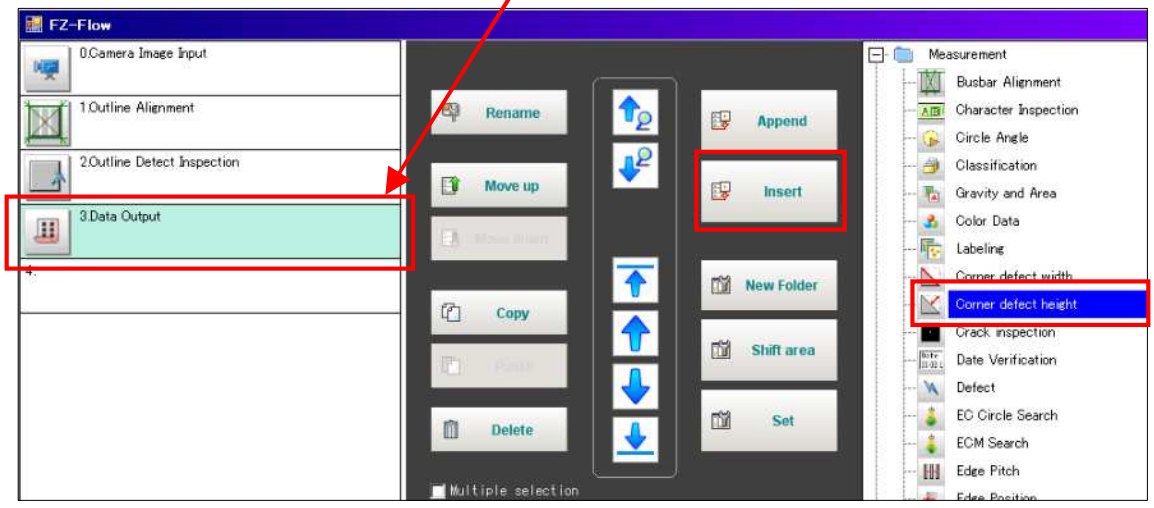
(1) Click [Edit Flow] of [Scene] in the toolbar of [FZ-Main] screen to display [FZ-Flow] screen.



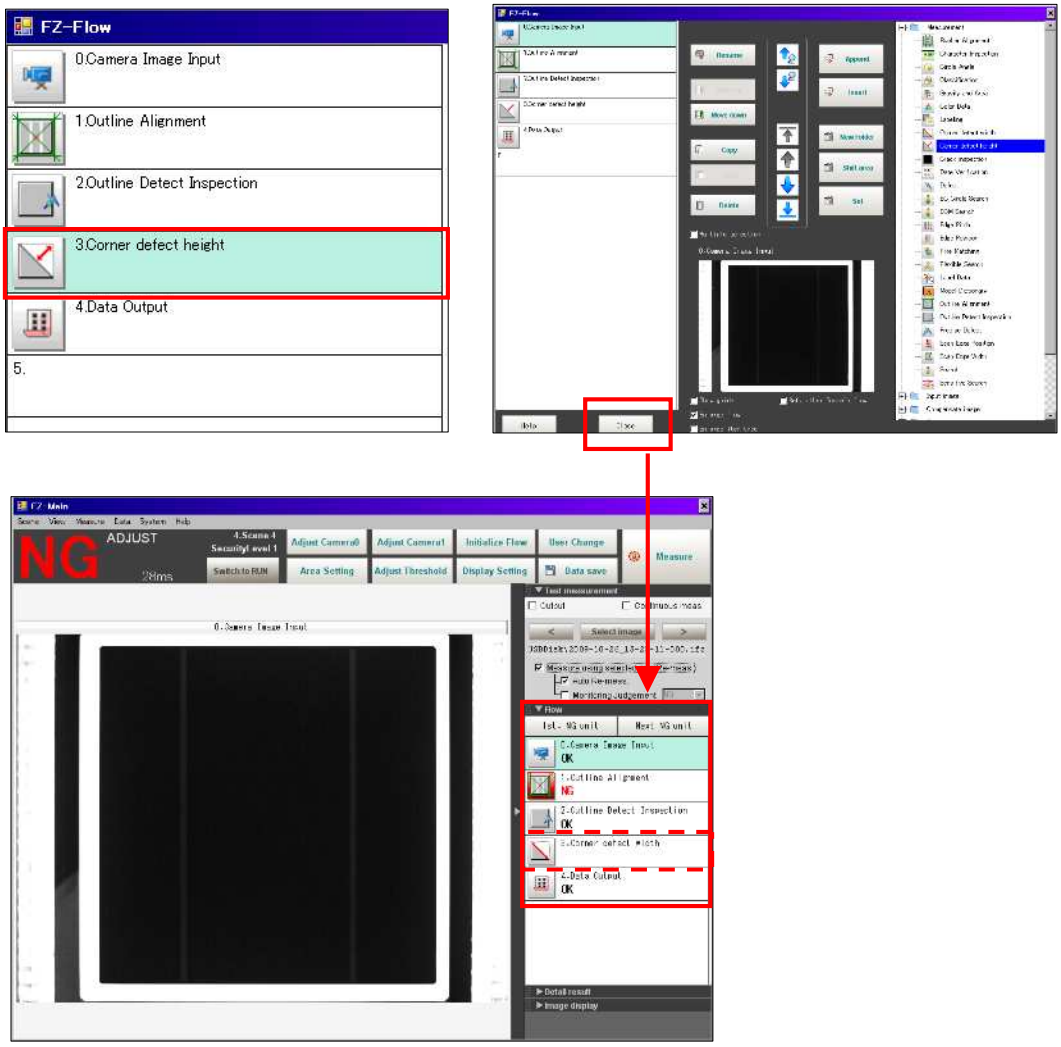
(2) Click [3. Corner defect width] and [Delete]. Click [Yes] button on the confirmation screen to delete [3. Corner defect width] from the flow list in its left.



(3) Choose (click) the number before which the new item is to be inserted. Then, choose the item to be inserted from [Measurement] folder in the right and click [Insert] button.



(4) After checking [3. Corner defect height] has been inserted in the flow, click [Close] button on [FZ-Flow] screen. It returns to the main screen. Check that the flow has been changed.



(5) This is the end of editing flow. However, **parameter setting of the newly added item is necessary**.

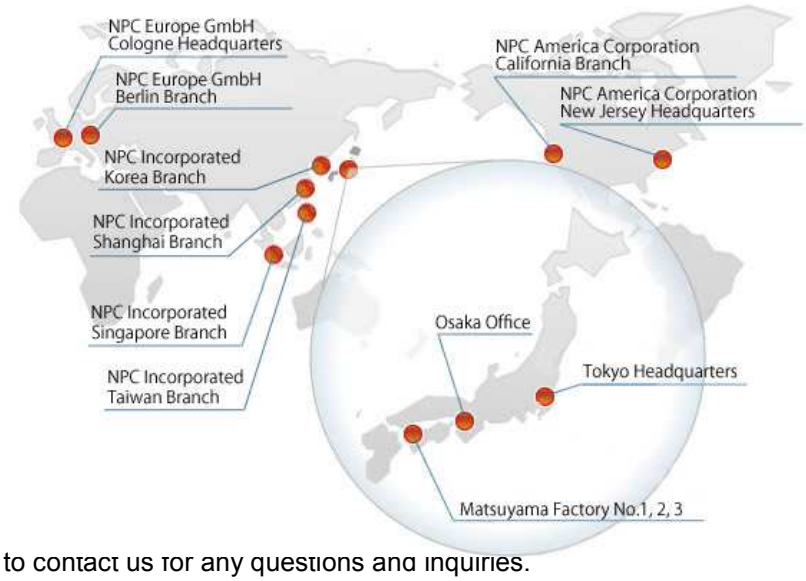
(6) After editing, make sure to click [Data Save] button on the main screen to read the setting. Refer to [2-4-6. Save Inspection Template] for detail.

(7) It is recommended to save (backup) the data when editing the template. Refer to [2-4-6. Save Inspection Template] for detail.

MEMO

3. Contact

Network



Don't hesitate to contact us for any questions and inquiries.

NPC Incorporated

Tokyo Headquarters	1-1-20 Minami-senju, Arakawa-ku, Tokyo 116-0003, Japan Phone +81-3-3802-5041 Fax +81-3-3801-0721
Osaka Office	Room 407, 4F Toyo Building, 3-1-15 Kitahanadaguchi-cho, Sakai-ku, Sakai-shi, Osaka 590-0074, Japan Phone +81-72-232-8130 Fax +81-72-232-8131
Singapore Branch	400 Orchard Road #06-19 Orchard Towers, Singapore 238875 Phone +65-6735-7601 Fax +65-6737-3639
Shanghai Branch	Room 1502A, North Tower, #300 Xuanhua Road, Changning Qu, Shanghai, China 200050 Phone +86-21-5273-8287 Fax +86-21-5273-8287
Taiwan Branch	17F-4, No. 295, Sec. 2, Guang- Fu Rd., Hsin-Chu City 30017, Taiwan, Republic of China Phone +886-3-5715202 Fax +886-3-5715212
Korea Branch	# 1007, Samho Marathon Bldg., 1015-1, Ingye-dong, Paldal-gu, Suwon-si, Gyeonggi-do, 442-833, Korea Phone +82-31-233-5042 Fax +82-31-239-5042

NPC America Corporation

NPC America Corporation New Jersey Headquarters	560 Sylvan Avenue, Englewood Cliffs, NJ 07632, USA Phone +1-201-227-9400 Fax +1-201-227-9474
NPC America Corporation California Branch	2102 Business Center Drive Suite 119-B Irvine, CA 92612, USA Phone +1-949-253-5851 Fax +1-949-253-5852

NPC Europe GmbH

NPC Europe GmbH Cologne Headquarters	Bismarckstrasse 27-29, 50672 Cologne, Germany Phone +49-221-270889-0 Fax +49-221-270889-10
NPC Europe GmbH Berlin Branch	Margaretenstrasse 13a, 12203 Berlin, Germany Phone +49-30-8058-0867 Fax +49-30-8058-0867