

3D AOI Programming Manual

SAKI

[SJ00DCM05-05E]

Introduction

Thank you for purchasing the product of Saki Corporation.

Before using the product, please read this manual carefully together with the supplied manuals to ensure the prolonged life with the proper handling and the operation of this system.

Notations used in this manual

| Notation | Meaning |
|----------------|--|
| DANGER | “DANGER” indicates an imminently hazardous situation which could be threat to life or cause serious injury. |
| WARNING | “WARNING” indicates a potentially hazardous situation which could be threat to life or cause serious injury. |
| CAUTION | “CAUTION” indicates a potentially hazardous situation which could result in injury or equipment (including peripheral) damage. |
| NOTE | “NOTE” indicates an advice on operation. |

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Saki Corporation 3D AOI Programming Manual (Original Instructions)

3D AOI Programming Manual

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Basic Operation

1 Basic Operation of the Inspection Software

1.1 Starting/Quitting the Inspection Software

This section describes how to start/quit the inspection software.

1.1.1 Starting the Inspection Software

Step1: Activate the system by reference to Operation Manual.

NOTE The PC in the machine is powered on in conjunction with the main breaker.

NOTE When using BF2-Editor, manually turn on the PC.

Step2: When the Operating System (hereinafter “OS”) is activated and the login screen appears on the LCD monitor, enter the following login name and password.

Login Name : SAKICORP

Password : sakicorp

NOTE **Login Name** and **Password** are case-sensitive.



Figure 1-1 Login Screen

Step3: After successful login, the inspection software launches automatically.

NOTE If the software fails to start automatically, double-click the inspection machine's shortcut icon on the desktop to start the inspection software.

When using BF2-Editor, double-click the **BF2-Editor** shortcut icon on the desktop to start the inspection software.

Step4: The dialog shown below appears.

Select Group and Board and click **Load board data**.

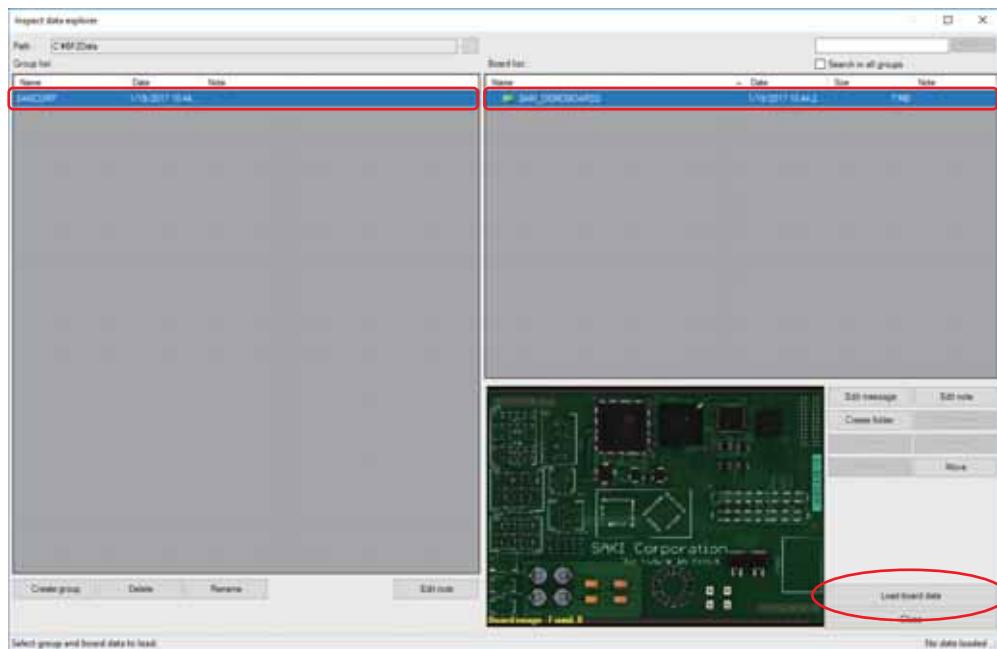


Figure 1-2 Loading an Inspection Data

Step5: If an inspection data is changed, the dialog shown in Figure 1-4 appears.

The library exists per group, and one library is shared and used within the same group. When using a library, changes in the recipes and shapes within the inspection data can be easily deployed to other inspection data in the same group.

After editing the recipes and shapes in the inspection data, the dialog shown in Figure 1-3 appears.

Click **Yes** to save the changes into the currently opened inspection data and library.

Clicking either **Save as local library** or **Save as local component** saves the contents of the update to only the currently opened inspection data without making any changes to the library. If you would like to apply changes only to the currently opened inspection data, use either **Save as local library** or **Save as local component**.

Save as local library targets the currently opened inspection data, and applies the changes to another inspection window using the same shape and recipe. **Save as local component** applies changes only to the inspection window which you are currently trying to save.

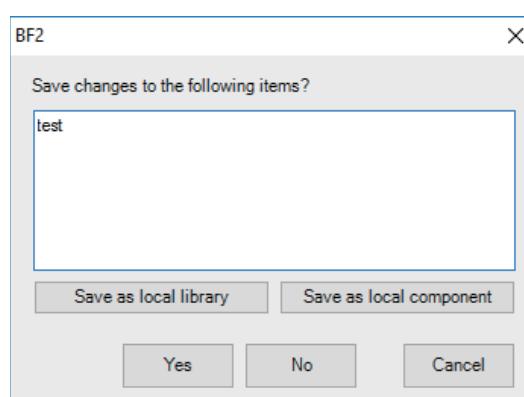


Figure 1-3 Saving the changes

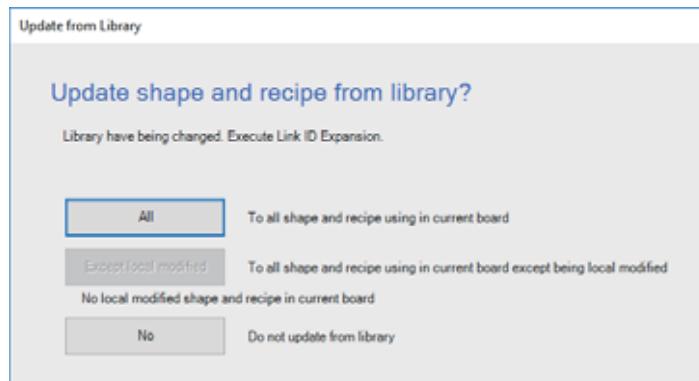


Figure 1-4 Update from Library

If the contents of the inspection data being opened are older than the library, the dialog shown in Figure 1-4 appears.

Click **All** to update all of the shapes and recipes in the inspection data being opened with the library contents.

Click **Except local modified** to use the library contents to update the shapes and recipes in the inspection data being opened which do not uses **Save as local library** and **Save as local component**.

Except local modified is only valid for inspection data which uses **Save as local library** and **Save as local component**.

Click **No** to open the inspection data without applying a library update.

- Step6: The inspection machine is in the emergency stop mode when it is activated.
Cancel the emergency stop mode by reference to Operation Manual.

NOTE This step is not necessary when using BF2-Editor.

1.1.2 Quit the Inspection Software

- Step1: Click **BF2** button on the upper left side of the window to open the menu and click **Exit BF2**.

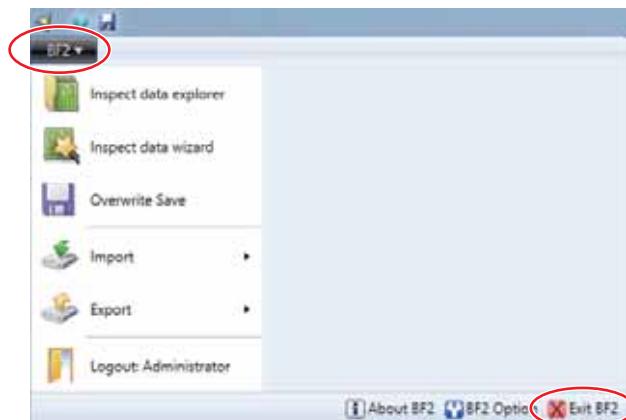


Figure 1-5 Quit the Inspection Software 1

Step2: The dialog shown below appears.

Yes Goes to Step3.

Cancel Returns to the original screen.

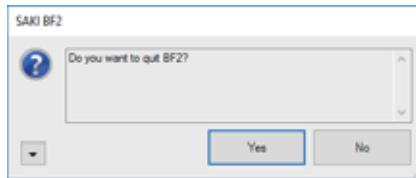


Figure 1-6 Quit the Inspection Software 2

Step3: The dialog shown below appears.

Yes Overwrites the inspection data and quits the inspection software.

No Quits the inspection software without saving the inspection data.

Cancel Returns to the original screen without saving the inspection data.

NOTE Saving the inspection data is recommended when the data is modified.

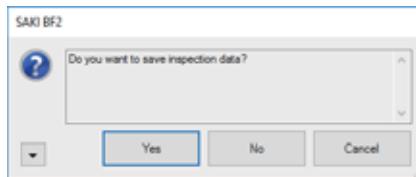


Figure 1-7 Quit the Inspection Software 3

Step4: Select (Start button) > **Power** > **Shut down** on the desktop screen of OS and wait for a while until the OS to shutdown.

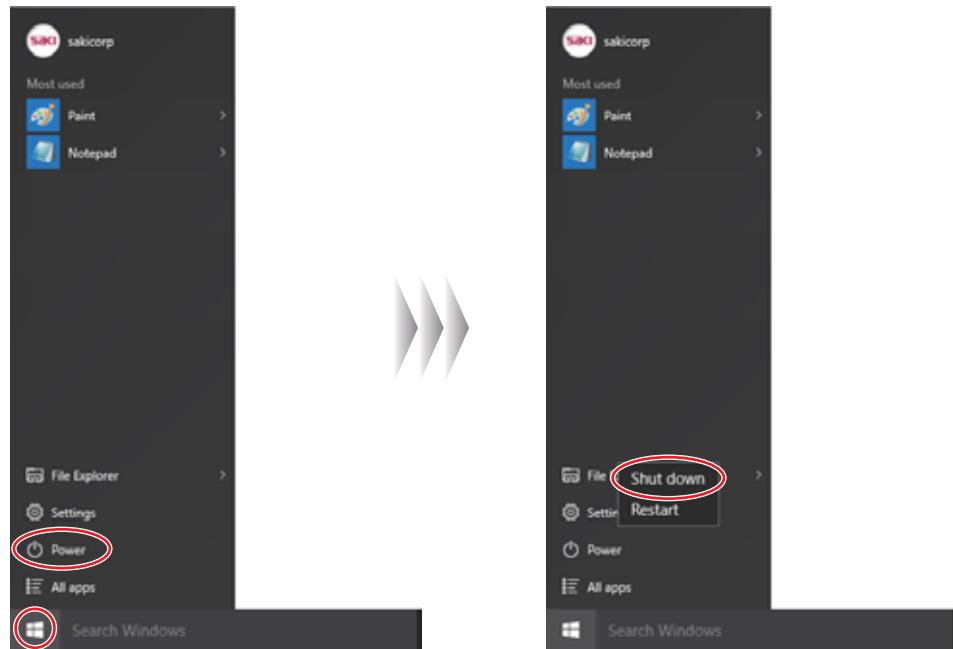


Figure 1-8 Shut down

Step5: Power off the inspection machine by reference to Instruction Manual.

NOTE This step is not necessary when using BF2-Editor.

1.2 Window Details

This section describes the details of the inspection software window.

NOTE The below illustration shows the default window layout.
The window layout can be changed freely.

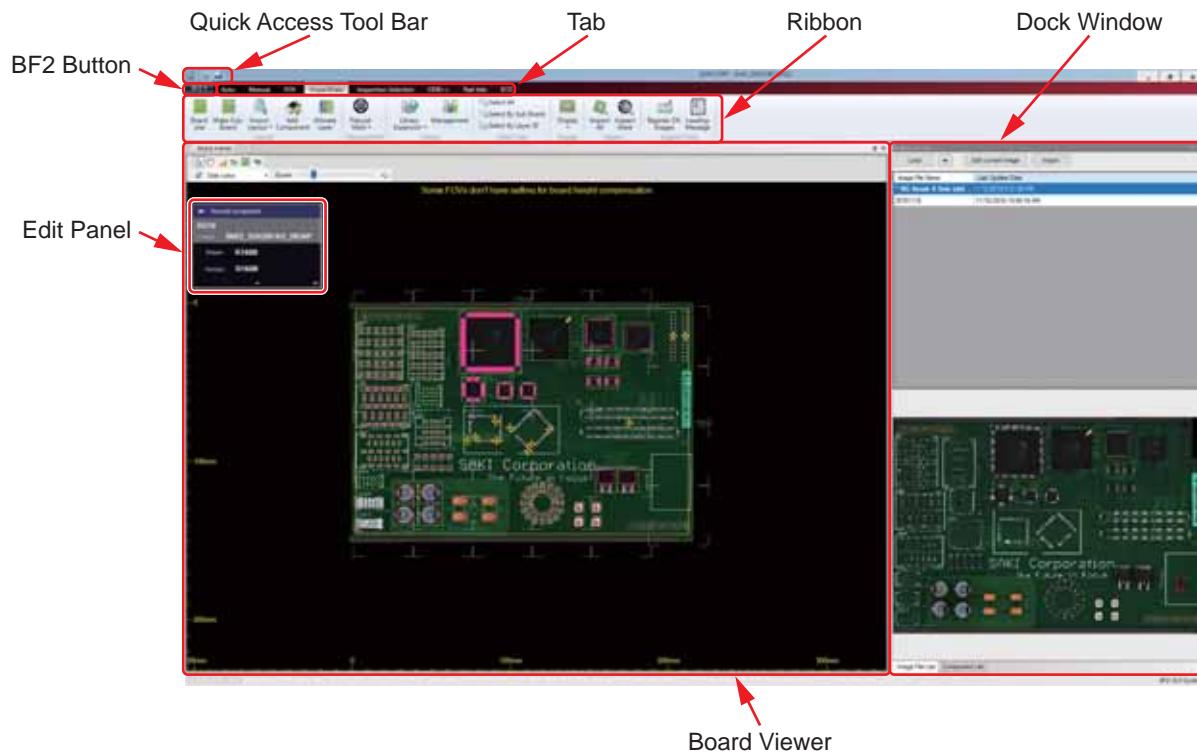


Figure 1-9 Window Details

| Item | Description |
|-----------------------|---|
| BF2 Button | Used for saving and selecting an inspection data. |
| Quick Access Tool Bar | Used for Overwrite Save and displaying Help. |
| Tab | Switches the ribbon. |
| Ribbon | Allows the functions for inspections to be used. |
| Dock Window | Displays inspection data settings and inspection results. |
| Edit Panel | Used for editing and adding component data. |
| Board Viewer | Displays a PCB image and inspection data. |

Table 1-1 Descriptions

1.3 Selecting an Inspection Data File

Step1: Make sure that there is no PCB on the scan table of the machine.

NOTE This step is not necessary when using BF2-Editor.

Step2: Click **BF2** button on the upper left side of the window to open the menu and click **Inspect data explorer**.



Figure 1-10 Selecting an Inspection Data File 1

Step3: Select **Group** and **Board** and click **Load board data**.

NOTE The file extension for an inspection group file is “.bfs”.

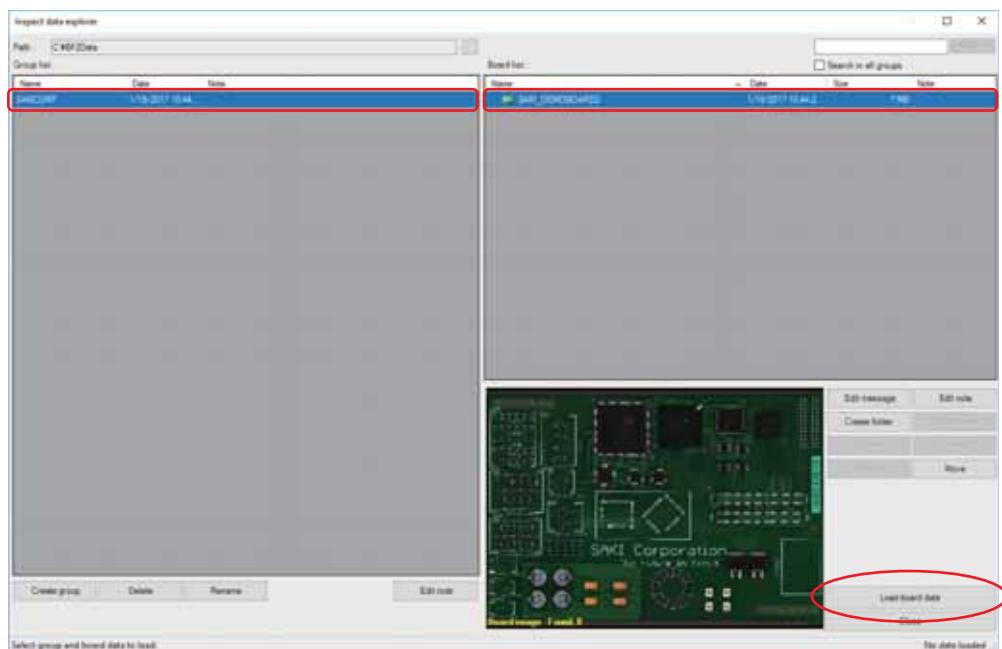


Figure 1-11 Selecting an Inspection Data File 2

Step4: If the library is changed, the dialogs shown below appear.
For details, refer to Step5 of **1.1.1 Starting the Inspection Software**.

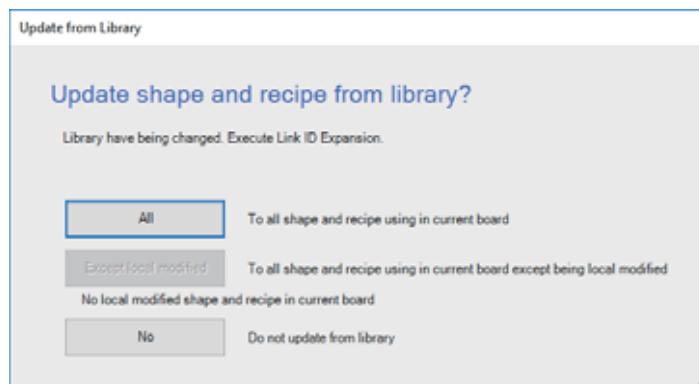


Figure 1-12 Update from Library

Step5: Set the conveyor rail width of the machine by reference to Operation Manual.

NOTE This step is not necessary when using BF2-Editor.

1.4 Saving the Inspection Data File

1.4.1 Overwriting an Inspection Data File

Click **BF2** button on the upper left side of the window and select **Overwrite Save**.

Alternately, click  on the quick access tool bar.

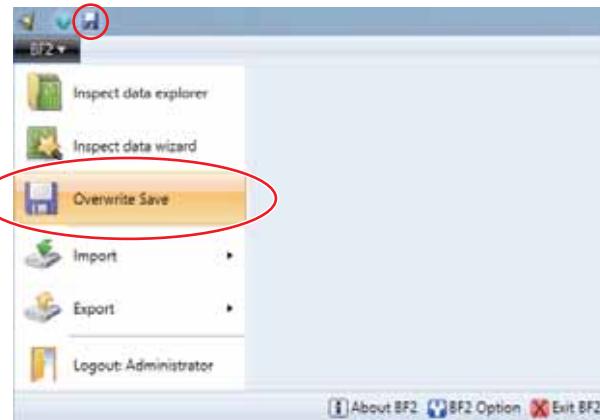


Figure 1-13 Overwriting an Inspection Data File

1.4.2 Saving an Inspection Data File as a New File

Step1: Click **BF2** button on the upper left side of the window to open the menu and click **Inspect data explorer**.



Figure 1-14 Saving an Inspection Data File as a New File 1

Step2: Specify a destination to save the data and click **Save as**.

NOTE The file extension for an inspection group file is “. bfs”.

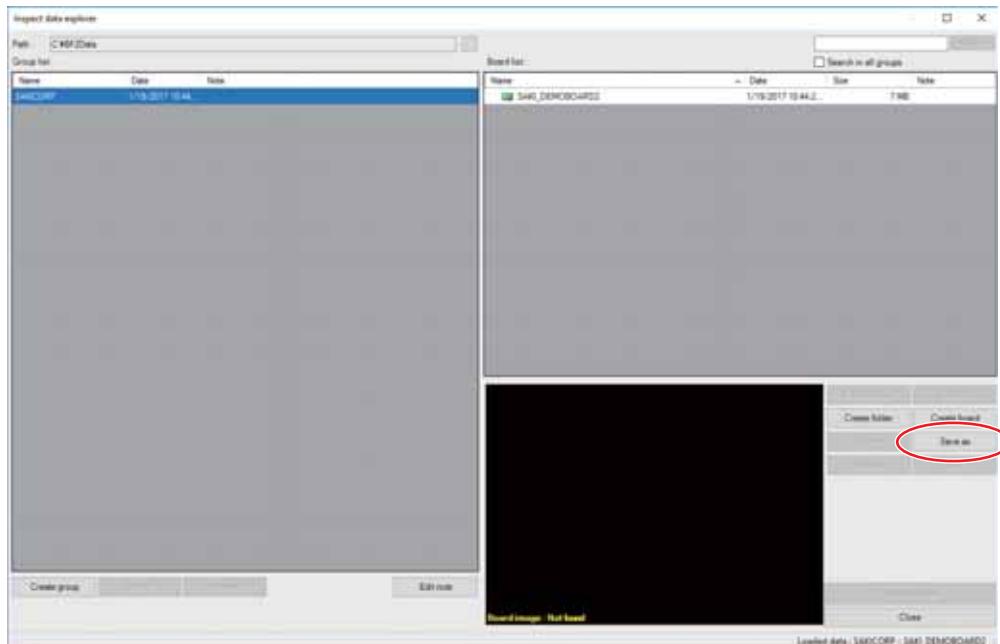


Figure 1-15 Saving an Inspection Data File as a New File 2

Step3: Enter a board name and click **OK**.

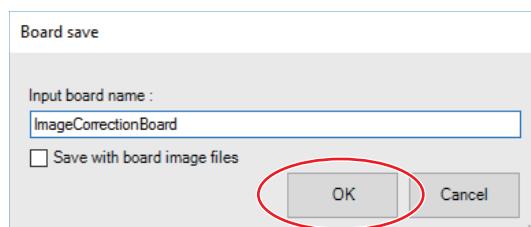


Figure 1-16 Saving an Inspection Data File as a New File 3

1.5 Basic operation in Inspect Data Explorer

1.5.1 Window Detail

Here describes the inspect data explorer window details.

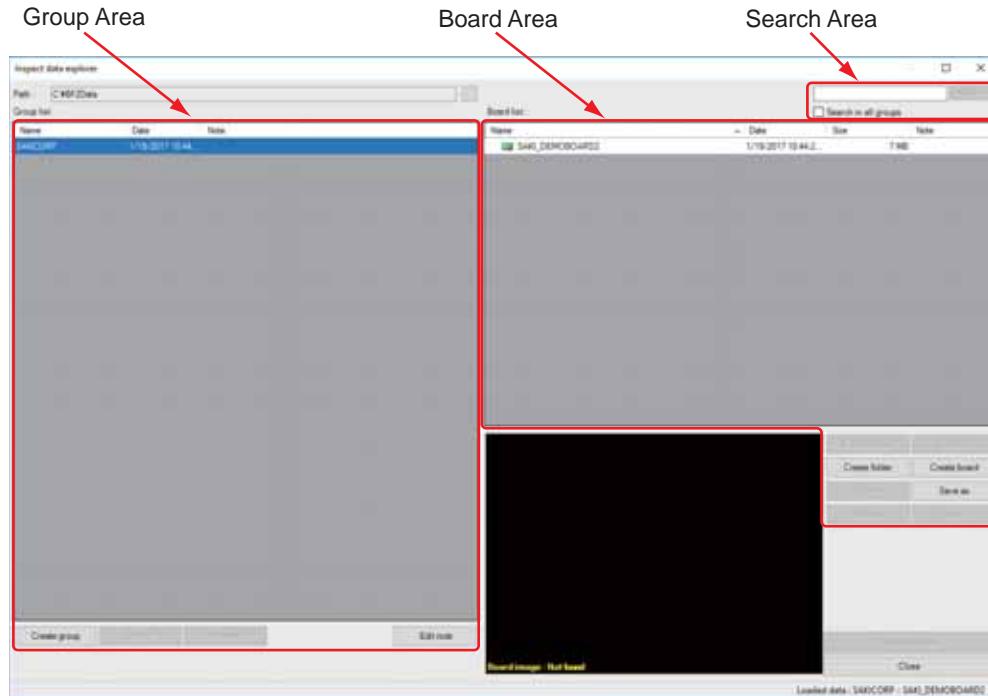


Figure 1-17 Window Details

| Item | Description | |
|-------------|---|---|
| Path | Displays the path of the data folders that is being expanded in the inspection data explorer. | |
| Group Area | Group list | Displays group list. |
| | Create group | Create the new group and board data. For details, refer to 1.5.4 Creating a New Group . |
| | Delete | Delete the all data of selected group. For details, refer to 1.5.5 Deleting a Group . |
| | Rename | Changes the name of the selected group. For details, refer to 1.5.6 Changing a Group Name . |
| | Edit note | Edits the note of the selected group. For details, refer to 1.5.7 Editing a Group Note . |
| Search Area | Search | Search by board name. |
| | Search in all groups | Specifies the area to search. Check to target all groups for searching. Uncheck to target only the selected group for searching. |

| Item | Description |
|-----------------|--|
| Board Area | Board list Displays the board data and folders that are currently selected in a list. |
| | Edit message There is a function that displays the message passed to the next operator when the board data has finished being load. Edit the above message. For details, refer to 1.5.8 Setting a Displaying Message . |
| | Create folder Creates a new folder in the currently selected group. For details, refer to 1.5.9 Creating a New Folder . |
| | Delete Delete selected board data or folder. For details, refer to 1.5.10 Deleting a Board Data and 1.5.11 Deleting a Folder . |
| | Rename Change the name of selected board data or folder. For details, refer to 1.5.12 Changing a Board Data Name and 1.5.13 Changing a Folder Name . |
| | Edit note Change the name of selected board data or folder. For details, refer to 1.5.14 Editing a Note of Board Data and Folder . |
| | Create board Creates new board data in the currently selected group. For details, refer to 1.5.15 Creating a Board Data . |
| | Save as Saves the board data currently being edited with an arbitrary name. For details, refer to 1.4.2 Saving an Inspection Data File as a New File . |
| | Move Moves the selected board data or folder to an arbitrary folder in the group. For details, refer to 1.5.17 Moving a Board Data and Folder . |
| Load board data | Loads the selected board data and displays the inspection software screen. For details, refer to Step4 to Step6 of 1.1.1 Starting the Inspection Software . |
| Close | Close the inspect data explorer and moves to inspection software screen. |

Table 1-2 Descriptions

1.5.2 Displaying Inspect Data Explorer

Here describes how to displays the inspect data explorer.

Click **BF2** button on the upper left side of the window to open the menu and click **Inspect data explorer**. Inspect data explorer is appears.

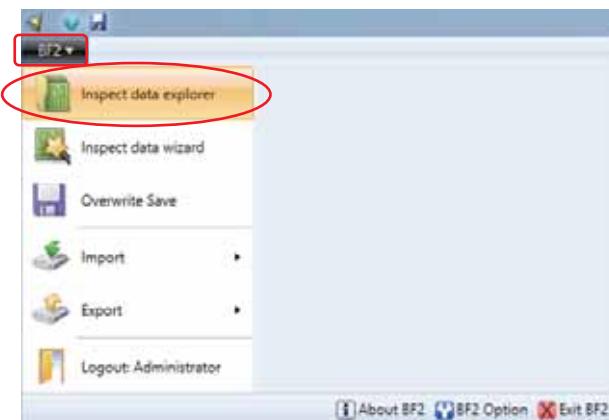


Figure 1-18 Displaying Inspect Data Explorer

1.5.3 Loading Board Data

For the procedures for loading an arbitrary board data, refer to **1.3 Selecting an Inspection Data File**.

1.5.4 Creating a New Group

Here describes how to create group and board data.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Click **Create group**.

Step3: Enter a New Group name and a New board name and click **OK**.

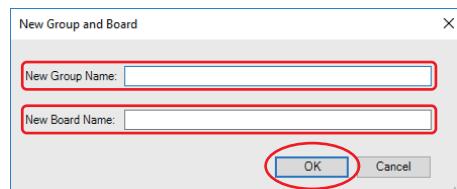


Figure 1-19 Create a New Group

1.5.5 Deleting a Group

Here describes how to delete the group.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Select a group and click **Delete** on group area.

NOTE

When a board of a group is being load, **Delete** cannot be selected.

In this case, load the board of another group before Step 2.

For the procedures for loading board data, refer to **1.3 Selecting an Inspection Data File**.

Step3: The dialog shown below appears. Click **OK**.

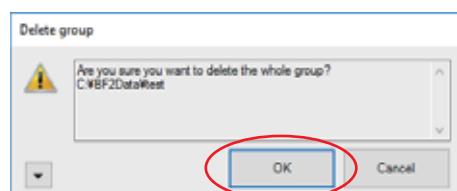


Figure 1-20 Delete a Group

1.5.6 Changing a Group Name

Here describes how to change the group name.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Select a group and click **Rename** on Group area.

NOTE

When a board of a group is being load, **Rename** cannot be selected.

In this case, load the board of another group before Step 2.

For the procedures for loading board data, refer to **1.3 Selecting an Inspection Data File**.

Step3: The dialog shown below appears. Enter a group name and click **OK**.

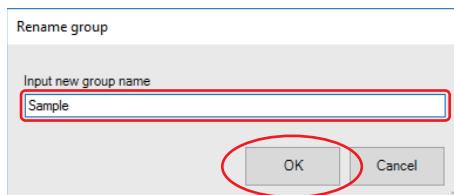


Figure 1-21 Changing a Group Name

1.5.7 Editing a Group Note

Here describes how to edit group note.

Placing an arbitrary comment allows for confirmation to be performed in the inspection data explorer.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Select a group and click **Edit note** on group area.

Step3: Edit note and click **OK**.

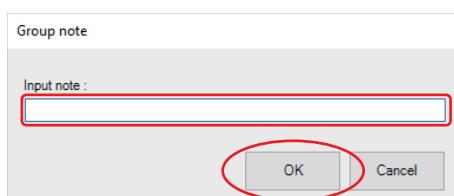


Figure 1-22 Editing Group Note

1.5.8 Setting a Displaying Message

There is a function that displays the message passed to the next operator when the board data has finished being load.

Here describes how to set the message and the procedures for displaying the message.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Select a board data and click **Edit note** on group area.

NOTE

Messages can also be edited from the **Inspect Data** tab.

Select **Edit message** from the **Inspect Data** tab.

Step3: The dialog shown below appears. Set a message by reference to Table 1-3 and click **Save**.

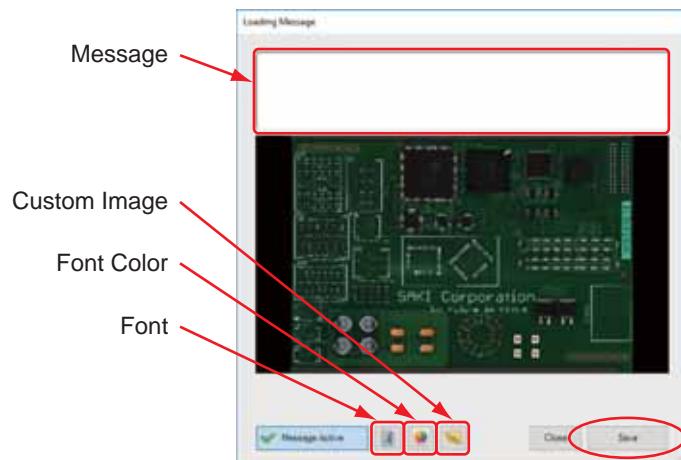


Figure 1-23 Setting a Displaying Message 1

| Item | Description |
|----------------|--|
| Message | Enter message |
| Custom Image | Sets board image |
| Font Color | Sets font color of message |
| Font | Sets font of message |
| Message Active | Enables to display a message when a board data is loaded |
| Close | Finish editing message |
| Save | Saves message |

Table 1-3 Descriptions

Step4: The set message is displayed when the inspection data is loaded while **Message Active** is checked.



Figure 1-24 Setting a Displaying Message 2

1.5.9 Creating a New Folder

Here describes how to create a new folder.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Select a group and click **Create folder**.

Step3: Enter a folder name and click **OK**.

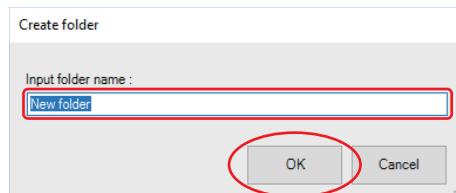


Figure 1-25 Create a New Folder

1.5.10 Deleting a Board Data

Here describes how to delete a board data.

Step1: Refer to **1.3 Selecting an Inspection Data File** to load board data of the same group of the data to be deleted.

Step2: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step3: Select a board data to delete and click **Delete** on Board Area.

1.5.11 Deleting a Folder

Here describes how to delete a folder.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Select a folder to delete and click **Delete** on Board Area.

NOTE When deleting a folder, the board data moves to the upper directory without being deleted.

1.5.12 Changing a Board Data Name

Here describes how to change a board name.

Step1: Load a board data to change the name by reference to **1.3 Selecting an Inspection Data File**.

Step2: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step3: Select loaded board data and click **Rename** on Board Area.

Step4: Enter a board name and click **OK**.

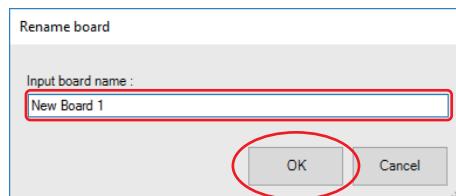


Figure 1-26 Changing Board Name

1.5.13 Changing a Folder Name

Here describes how to change a folder name.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Select a folder and click **Rename** on Board Area.

Step3: Enter a folder name and click **OK**.

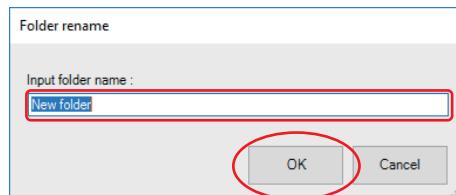


Figure 1-27 Changing a Folder Name

1.5.14 Editing a Note of Board Data and Folder

Here describes how to edit a note of board data and folder.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Select a board data or folder and click **Edit note** on Board Area.

Step3: Edit note and click **OK**.

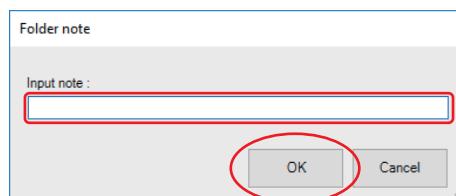


Figure 1-28 Editing a Note of Board Data and Folder

1.5.15 Creating a Board Data

Here describes how to create board data.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Click **Create board**.

NOTE

To create board data in an another group, load the board data of desired group before open the inspect data explorer as described in the previous step.

For the procedures for loading board data, refer to **1.3 Selecting an Inspection Data File**.

Step3: The dialog shown below appears. Click **Yes**.

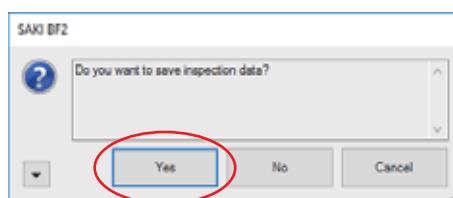


Figure 1-29 Create a Board Data 1

Step4: Enter a board name and click **OK**.

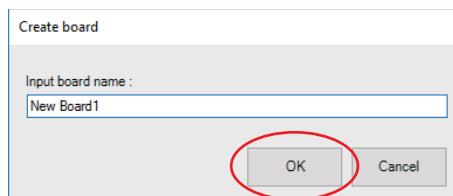


Figure 1-30 Create a Board Data 2

1.5.16 Saving a Board Data File as a New File

Saving a board data as a new file, refer to **1.4.2 Saving an Inspection Data File as a New File**.

1.5.17 Moving a Board Data and Folder

Here describes the procedures for moving board data and folders within the group.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Select a board data or folder and click **Move**.

Step3: Specifies new path and click **OK**.

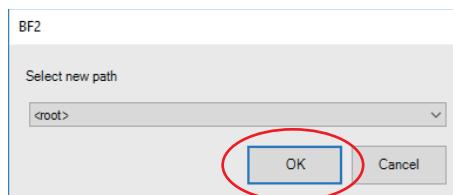


Figure 1-31 Moving a Board Data and Folder

1.5.18 Changing a Data Folder

Here describes how to change the data folder on the inspect data explorer.

Step1: Open the inspect data explorer by reference to **1.5.2 Displaying Inspect Data Explorer**.

Step2: Click  on the upper center of the dialog.

The folder tree is shown on the left side of the dialog.

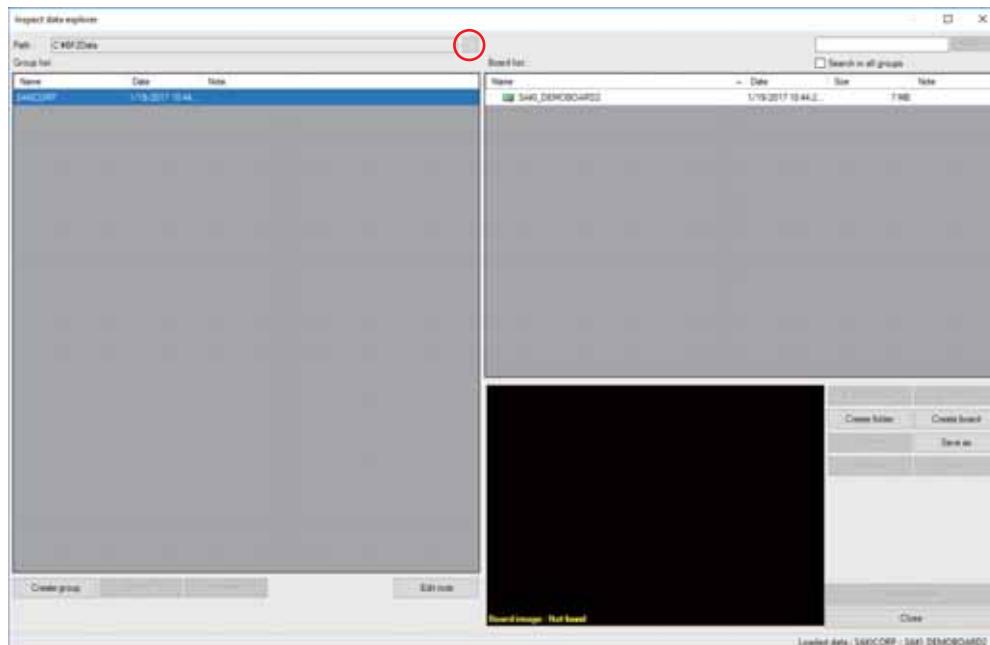


Figure 1-32 Changing a Data Folder 1

Step3: Select a folder from the folder tree.

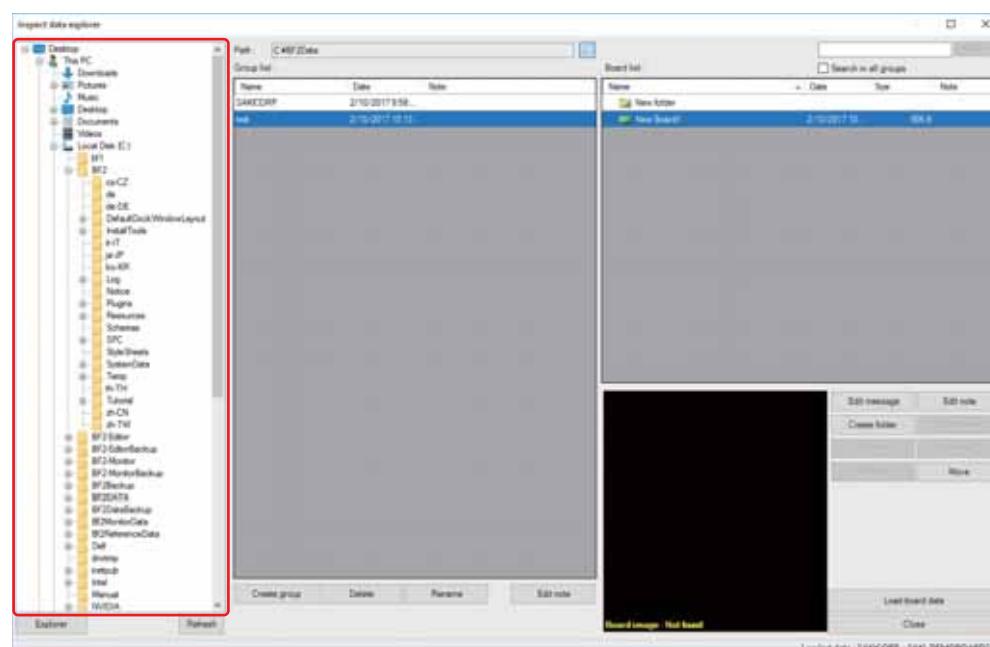


Figure 1-33 Changing a Data Folder 2

2 Operations in Board Viewer

2.1 Basic Operations in Board Viewer

This section describes the basic operations in **Board Viewer**.

2.1.1 Moving a Display Area

Step1: Click  (Hand tool) located on the top of Board Viewer.

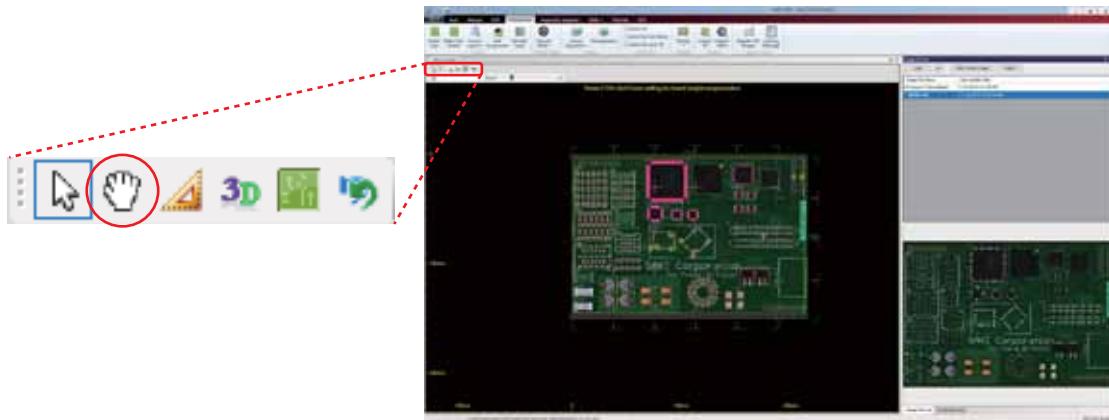


Figure 2-1 Moving a Display Area

Step2: Drag the mouse on **Board Viewer**. The display area moves.

NOTE The display area can also be moved by dragging the mouse with pressing the mouse wheel or with pressing the space key.

NOTE In **Board Viewer** of the **Inspect Data** tab, the display area moves to a corner of the image by clicking .

The buttons appear when placing the mouse pointer on a corner of an image.

2.1.2 Zooming in/out an Image

Use the **Zoom** slide bar to zoom in/out an image. The slide bar is located on the top of **Board Viewer**.

NOTE An image is also zoomed in/out by scrolling the mouse wheel.

NOTE An image fits to the window size by clicking  (Fit to window) located on the right side of the **Zoom** slide bar.

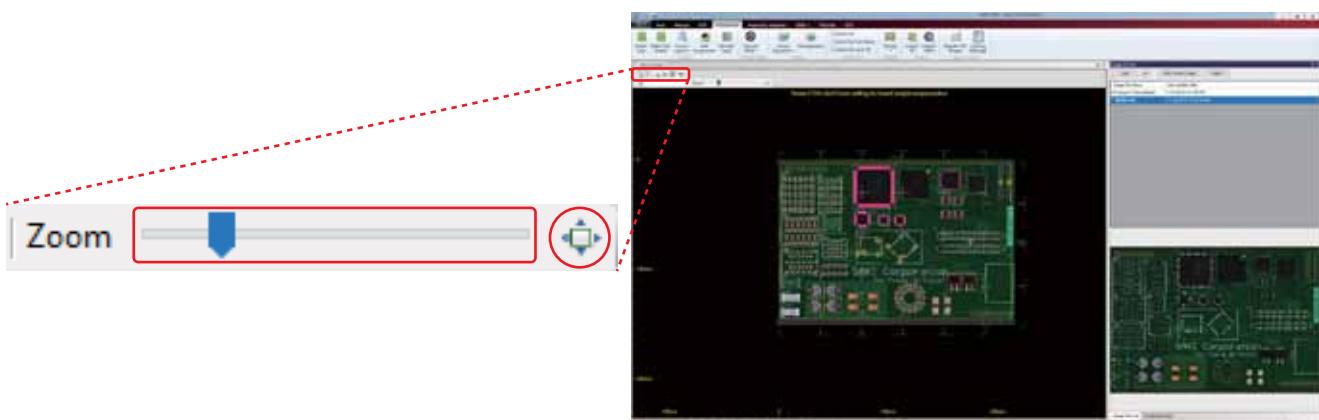


Figure 2-2 Zooming in/out an Image

2.1.3 Measuring Dimensions of the Selected Area

Step1: Click  (Ruler) located on the top of **Board Viewer**.

The dialog shown in Figure 2-4 appears on the upper left side of **Board Viewer**.

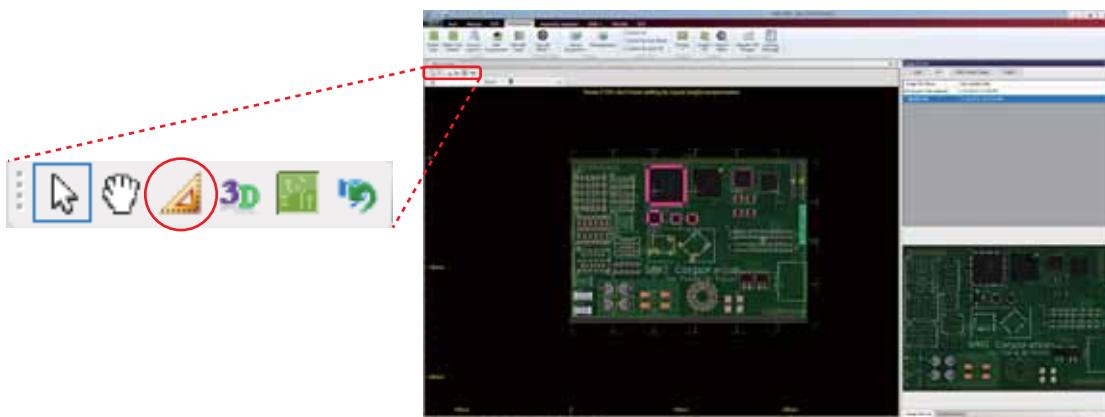


Figure 2-3 Measuring Dimensions 1



Figure 2-4 Measuring Dimensions 2

Step2: Select any desired area by mouse-dragging. The dimensions of the selected area are displayed on Board Viewer. To quit the measuring mode, click  (close).

NOTE Clicking **Show Grid** displays a full-sized grid on **screen**.

NOTE If measuring multiple areas, select another area by mouse-dragging without quitting the measuring mode. To delete the dimension values, click .

NOTE To display the RGB color information of the selected area, click . (Refer to Figure 2-6)

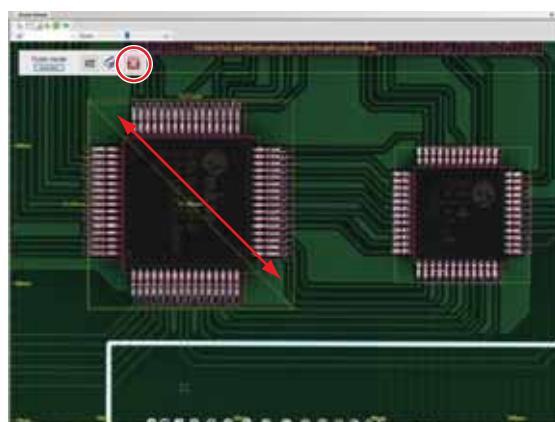


Figure 2-5 Measuring Dimensions 3

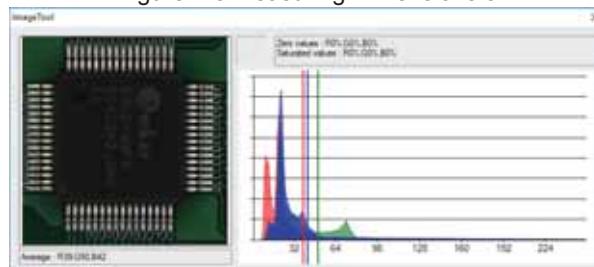


Figure 2-6 RGB Color Information

2.1.4 Confirming the Position of the Display Area on the PCB

Click  (Board Navigator) located on the top of **Board Viewer**.

The dialog shown in Figure 2-8 appears on the upper right side of **Board Viewer**.

The yellow square on the board navigator indicates the position of the display area on the PCB.

NOTE

If the yellow square is moved by mouse-dragging on the board navigator, the display area also moves on **Board Viewer**.



Figure 2-7 Board Navigator 1



Figure 2-8 Board Navigator 2

2.1.5 Displaying the Command History

Click  (Command History) located on the top of **Board Viewer**. The dialog shown in Figure 2-10 appears on the lower right side of **Board Viewer**. The dialog shows the history of commands.

The current state is marked with ▶ and previous commands are shown above the current state.

To go back to a previous state, select a previous command.

NOTE

Press **Ctrl** + **Z** to undo the action, press **Ctrl** + **Y** to redo the action.

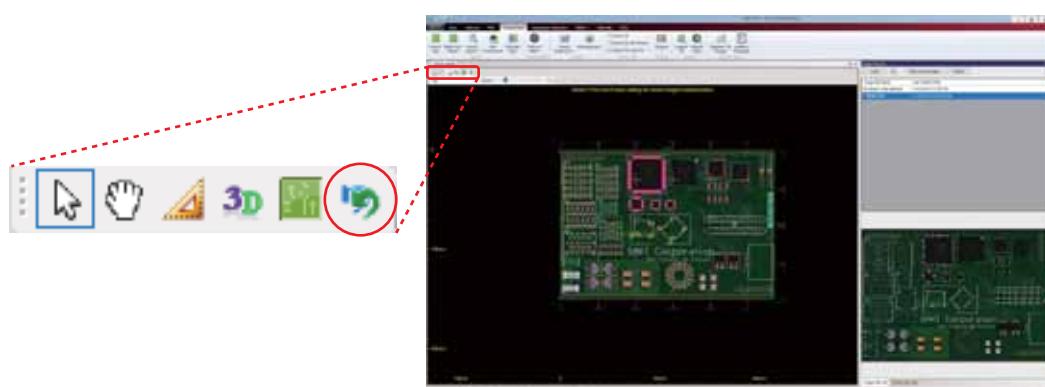


Figure 2-9 Command History 1

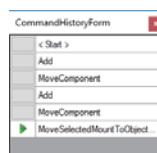


Figure 2-10 Command History 2

2.2 Switching the Image Display

2.2.1 Switching the Lighting

To switch the lighting of the image, select another lighting from the drop-down list located on the top of **Board Viewer**.



Figure 2-11 Switching the Lighting

2.2.2 3D Displaying of the Selected Area

Step1: Click **3D** (3D Viewer) located on the top of **Board Viewer**.

The dialog shown in Figure 2-13 appears on the upper left side of **Board Viewer**.

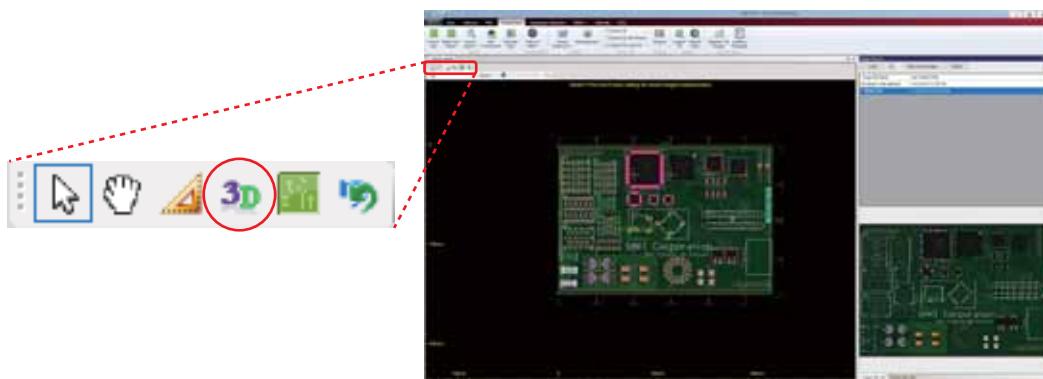


Figure 2-12 3D Viewer 1

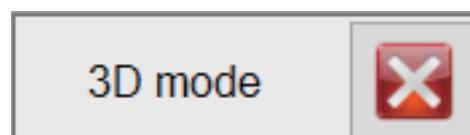


Figure 2-13 3D Viewer 2

Step2: Select an area by mouse-dragging.

Step3: Drag the selected area by the mouse. The image on the selected area rotates.

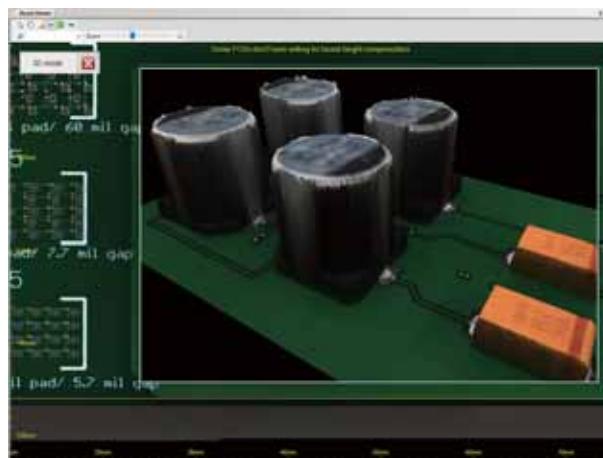


Figure 2-14 3D Viewer 3

Step4: To quit the 3D mode, click (close).

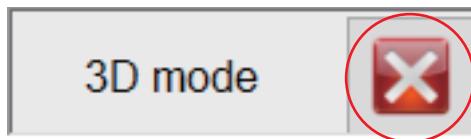


Figure 2-15 Close

Inspection Data

1 Making an Inspection Data

1.1 Flow Chart for Data Making

An inspection data of this product consists of below data, and the procedure of making an inspection data is basically as shown in Figure 1-1.

Board Data

Board Data is a data used for inspections. Information of a board, component, and FOV is included.

Library

Library is a series of data used for component inspections, such as **Shape** and **Recipe**.

Group

Group is a series of **Board Data** which shares the same **Library**.

Shape

Shape is a shape data of a component. Size data of a component body, electrode, lead, etc. are included.

Shape and **Recipe** can be shared among multiple **Board Data** in the same **Group**.

Recipe

Recipe specifies an inspection area, algorithm, and its threshold.

Link ID

Link ID refers to a specific combination of a Shape and a Recipe.

Components with the same Link ID have the same Shape and Recipe, so a Shape and a Recipe created with one component can be easily expanded to components with the same Link ID.

General Component Name

General Component Name is an extension of the link ID and it is used when you would like to classify components by component type.

Even if the link ID within the CAD data is different, components for which the same shape and recipe are to be assigned share General Component Name.

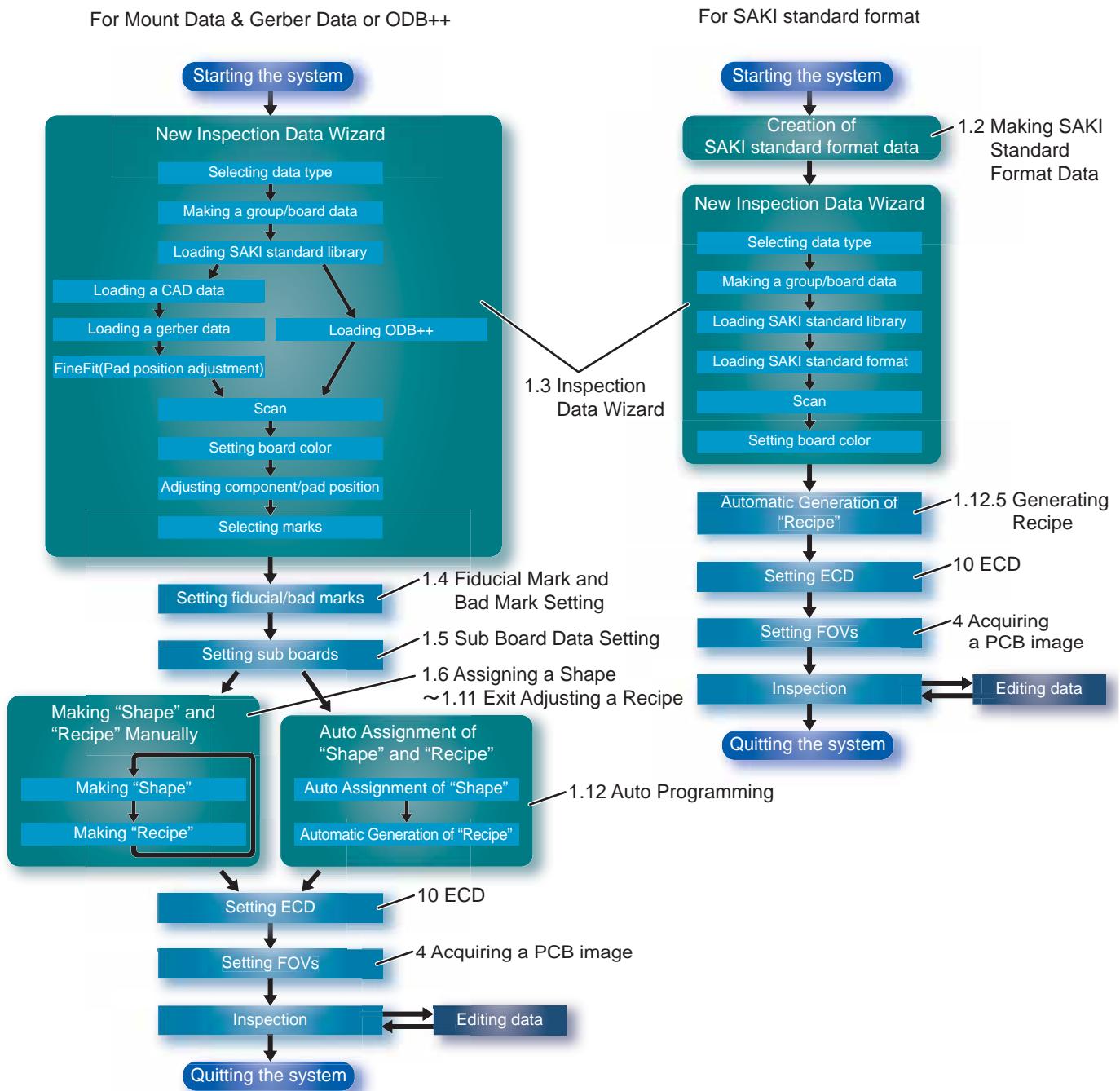


Figure 1-1 Flow Chart for Data Making

1.2 Making SAKI Standard Format Data

Using SAKI standard format is recommended to make inspection data easily.

The application ePM-AOI is used to make SAKI standard format data.

ePM-AOI is the application which reads PCB design data (e.g., Gerber data, Mount data, and ODB++) and convert it to SAKI standard format data (extension is “.json”).

The making flow of SAKI standard format data is as follows.

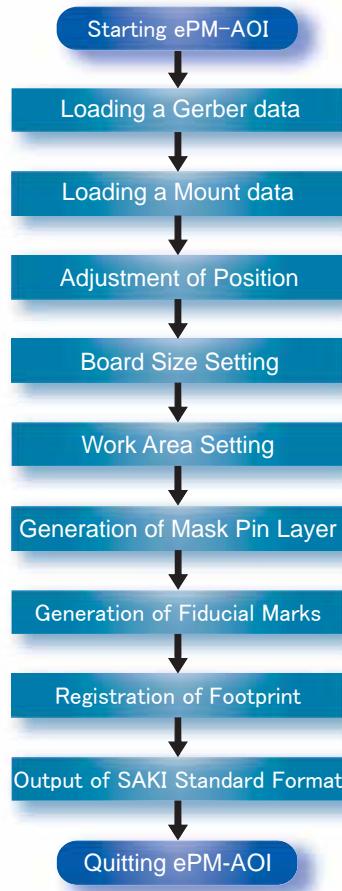


Figure 1-2 Flow Chart of Making SAKI Standard Format

1.2.1 ePM-AOI Window Details

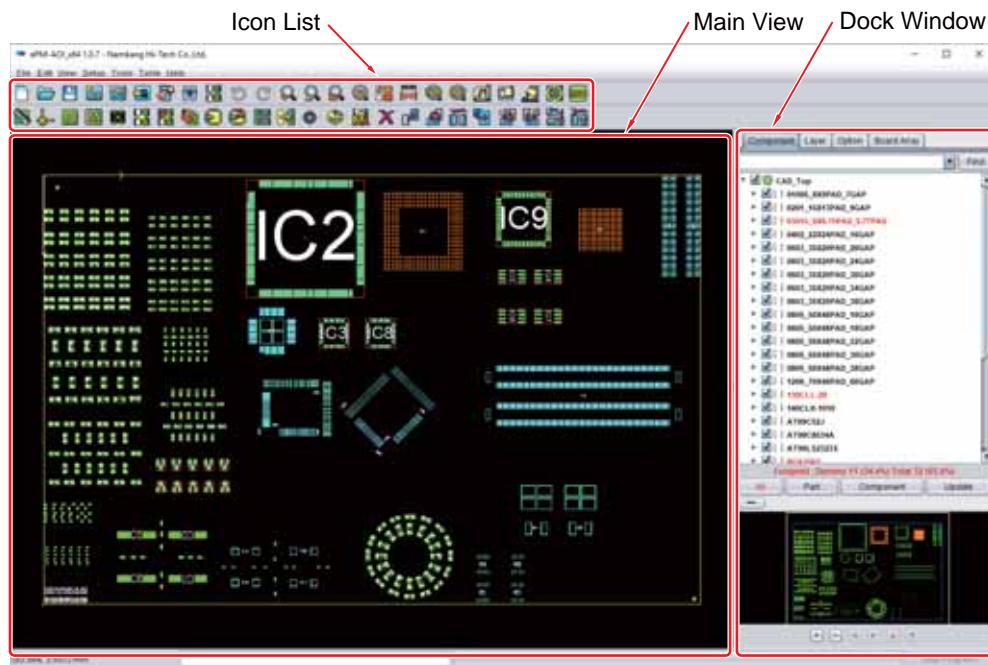


Figure 1-3 ePM-AOI Window

| Item | Description |
|-------------|---|
| Icon List | Allows the functions for making SAKI standard format data to be used. |
| Main View | Displays PCB design data (Gerber data or mount data) which has been read. |
| Dock Window | Makes the setting for making SAKI standard format data. |

Table 1-1 Descriptions

1.2.2 SAKI Standard Format Data Making Procedure

Step1: Double-click the **ePM-AOI** shortcut icon on the desktop.

NOTE

License key is necessary to use **ePM-AOI**.

Check the license key is inserted to USB port on PC.



Figure 1-4 ePM-AOI Shortcut Icon



Figure 1-5 ePM-AOI Startup Screen

Step2: Click (Gerber) on the icon list.

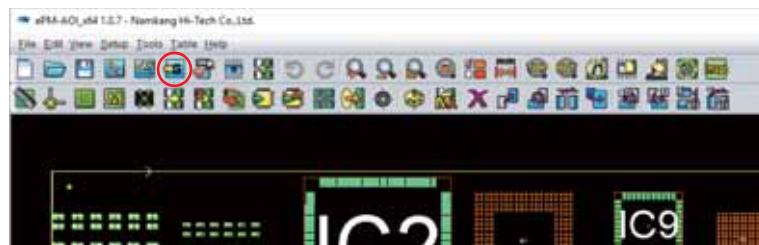


Figure 1-6 SAKI Standard Format Data Making Procedure 1

Step3: The dialog shown below appears.

Select the gerber data to load and click **Import**.

NOTE

Gerber data can be loaded by drag and drop the file to main view.

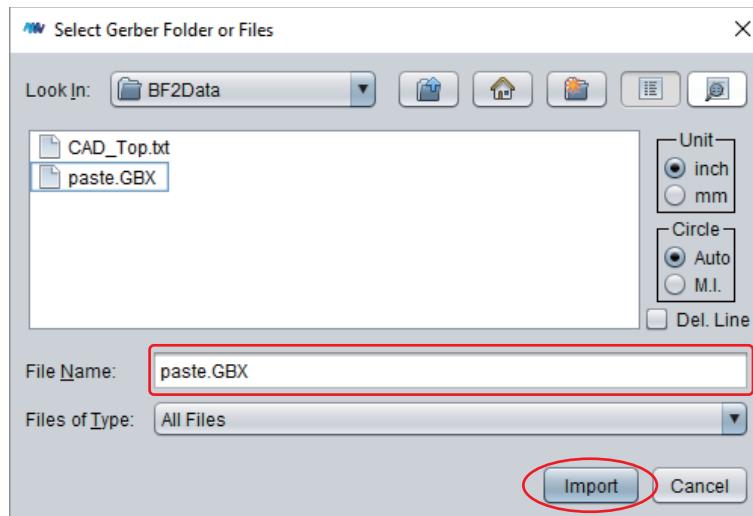


Figure 1-7 SAKI Standard Format Data Making Procedure 2

Step4: Click  (CPL Wizard) on the icon list.

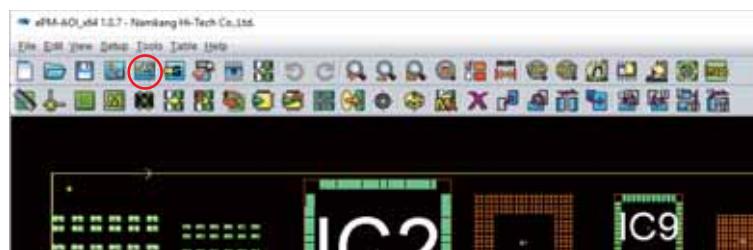


Figure 1-8 SAKI Standard Format Data Making Procedure 3

- Step5: The dialog shown below appears.
Select the mount data to load and click **Open**.

NOTE Mount data can be loaded by drag and drop the file to main view.

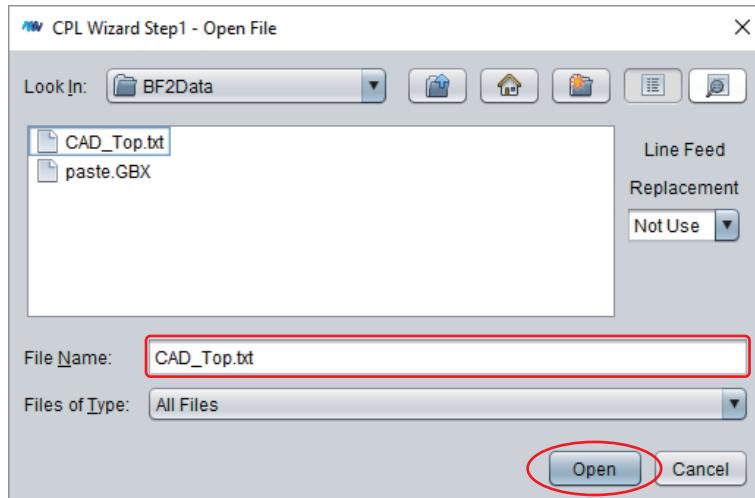


Figure 1-9 SAKI Standard Format Data Making Procedure 4

- Step6: The dialog shown below appears and loaded mount data is displayed on the upper side of the dialog.
Check which row of the mount data are corresponding to the reference name and etc, and select item from the drop down list at the bottom of the dialog.
After all settings are completed, click **Appending Import**.

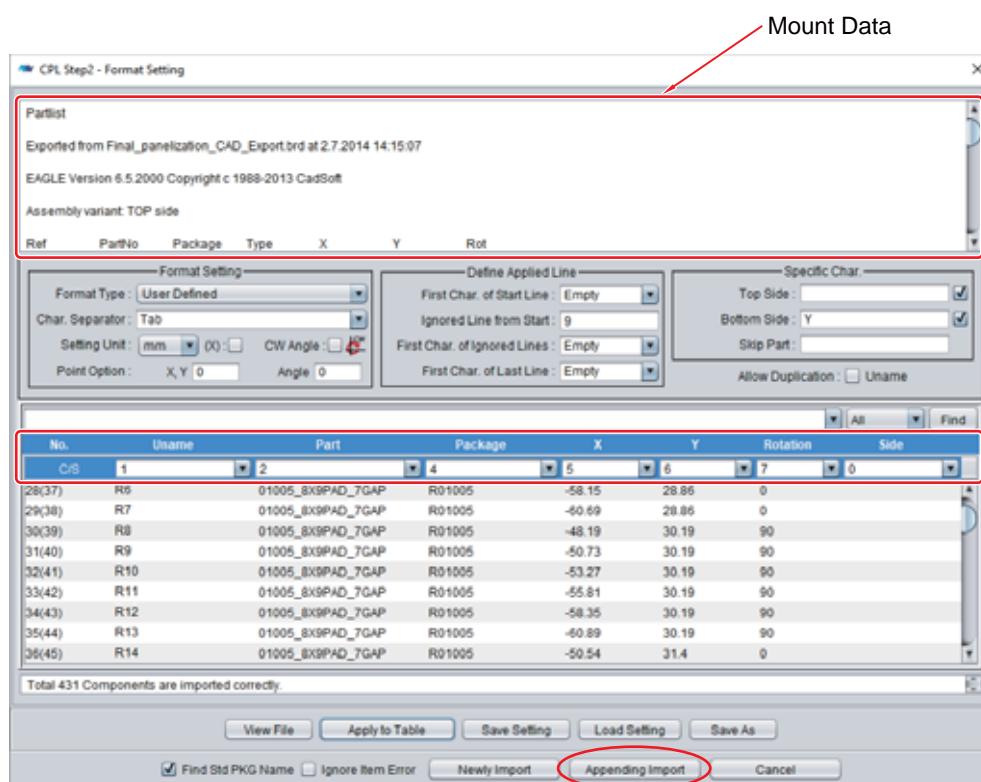


Figure 1-10 SAKI Standard Format Data Making Procedure 5

| Item | Description |
|----------|---|
| Uname | Select the row of reference name. |
| Part | Select the row of Link ID. |
| Package | Select the row of general component name. |
| X | Select the row of X coordinates. |
| Y | Select the row of Y coordinates. |
| Rotation | Select the row of component angle. |
| Side | Select the row of mount side. |

Table 1-2 Descriptions

Step7: Locate gerber data and mount data at the same coordinate.

After gerber data and mount data are loaded, click  (Fit CAD Centroid & Gerber) on the icon list.

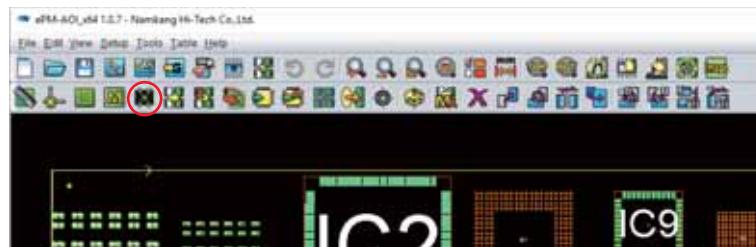


Figure 1-11 SAKI Standard Format Data Making Procedure 6

Step8: Click the component which to be basis of positioning on main view.

On the **doc window > Option tab > Component Name**, the selected component name is displayed.

NOTE Display area is moved by right-drag on main view.

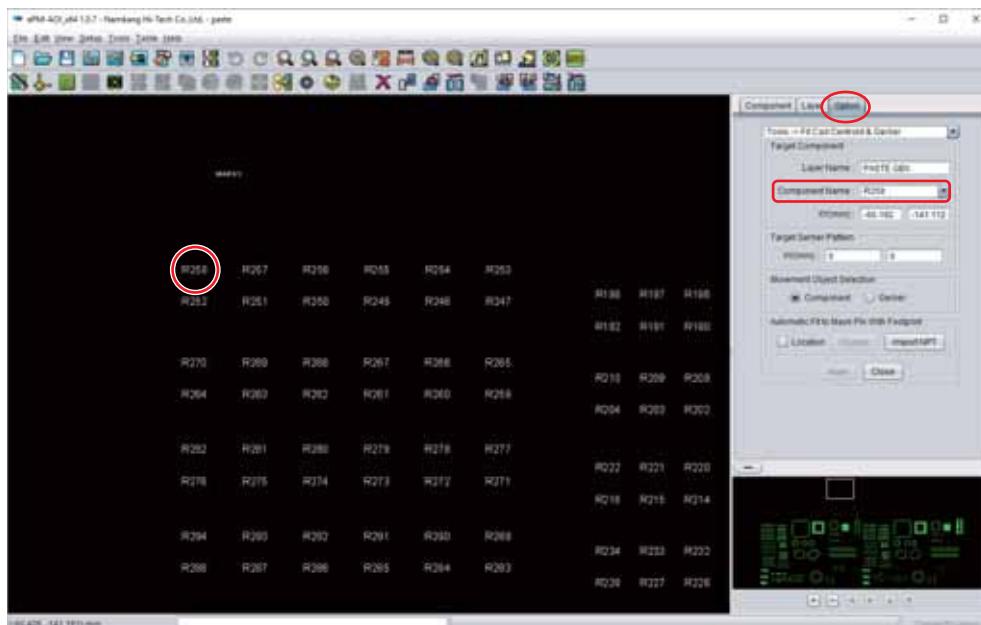


Figure 1-12 SAKI Standard Format Data Making Procedure 7

- Step9: Select the footprint which is corresponding to the component selected in Step8 by dragging on mainview. The selected footprint is colored red.
 On the **doc window > Option tab > Target Gerber Pattern**, the coordinate is displayed.

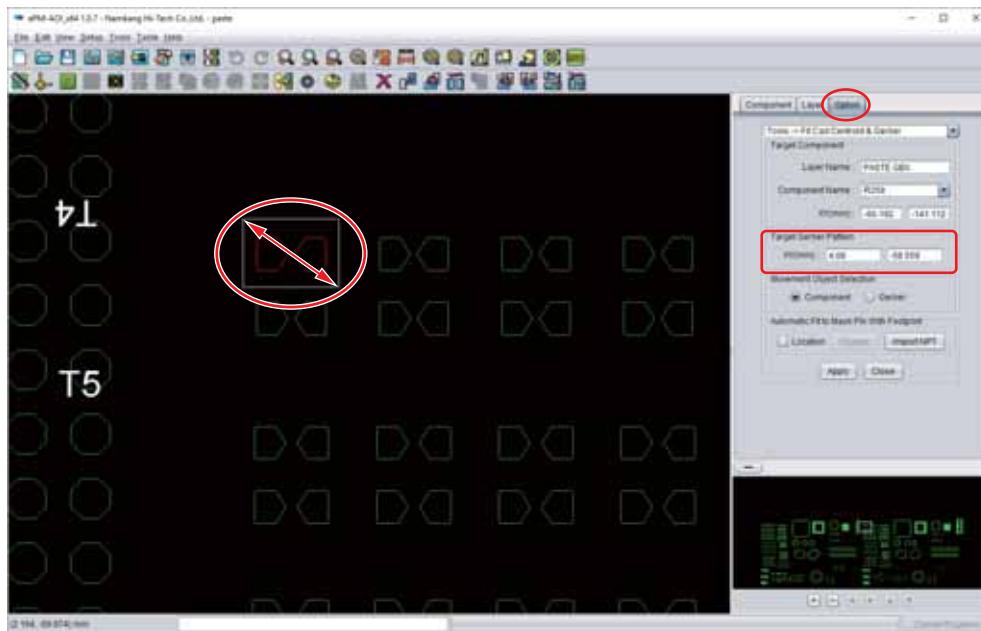


Figure 1-13 SAKI Standard Format Data Making Procedure 8

- Step10: On the **doc window > Option tab > Movement Object Selection**, select the data to be moved from **Component** (Mount data) or **Gerber** (Gerber data).
 After the setting is completed, click **Apply**.

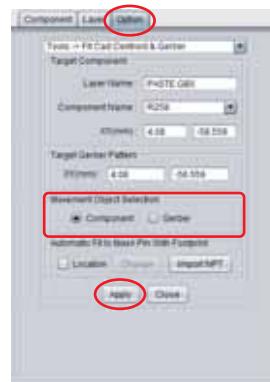


Figure 1-14 SAKI Standard Format Data Making Procedure 9

- Step11: Click (Board Size) on the icon list.

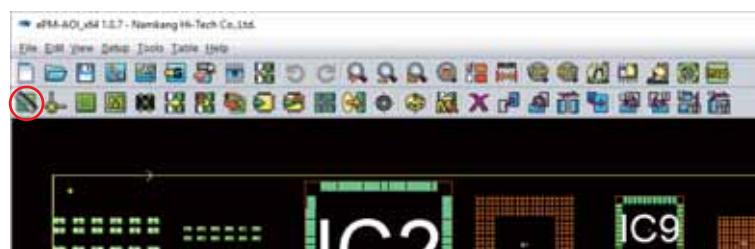


Figure 1-15 SAKI Standard Format Data Making Procedure 10

Step12: On the doc window > Option tab > **Size**, enter the board size and click **Apply**.

NOTE The board size can be set by dragging on main view.

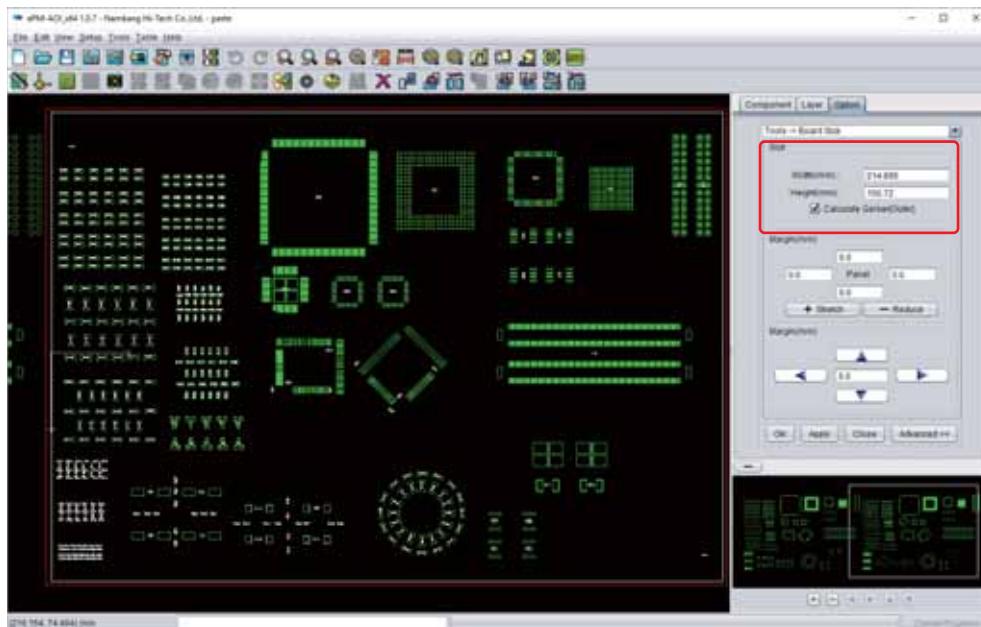


Figure 1-16 SAKI Standard Format Data Making Procedure 11

Step13: Click  (Work Area) on the icon list.

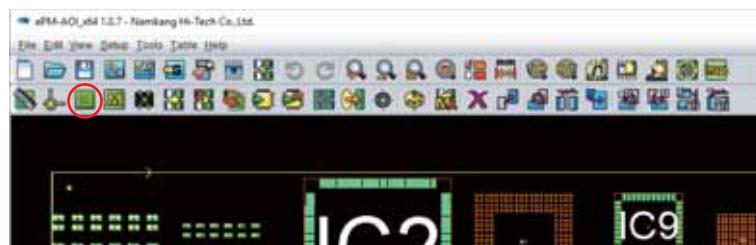


Figure 1-17 SAKI Standard Format Data Making Procedure 12

Step14: Set one sub board area on main view by dragging.

After the setting is completed, click **OK** on Option tab of doc window.

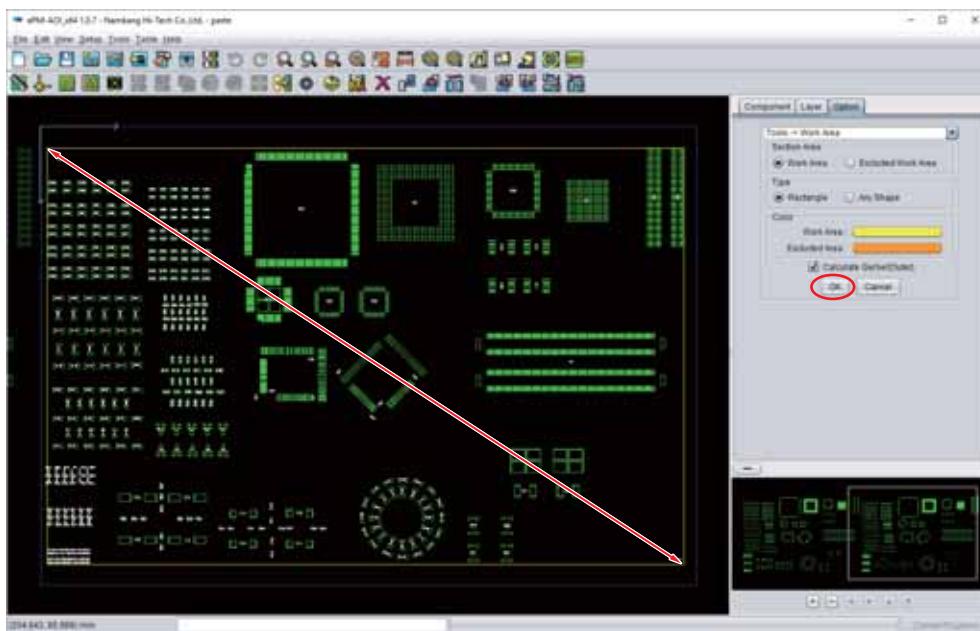


Figure 1-18 SAKI Standard Format Data Making Procedure 13

Step15: Click **M**(Generate mask pin) on the icon list.

The mask pin is generated automatically and progress bar is displayed on the bottom of dialog during generating mask pin.

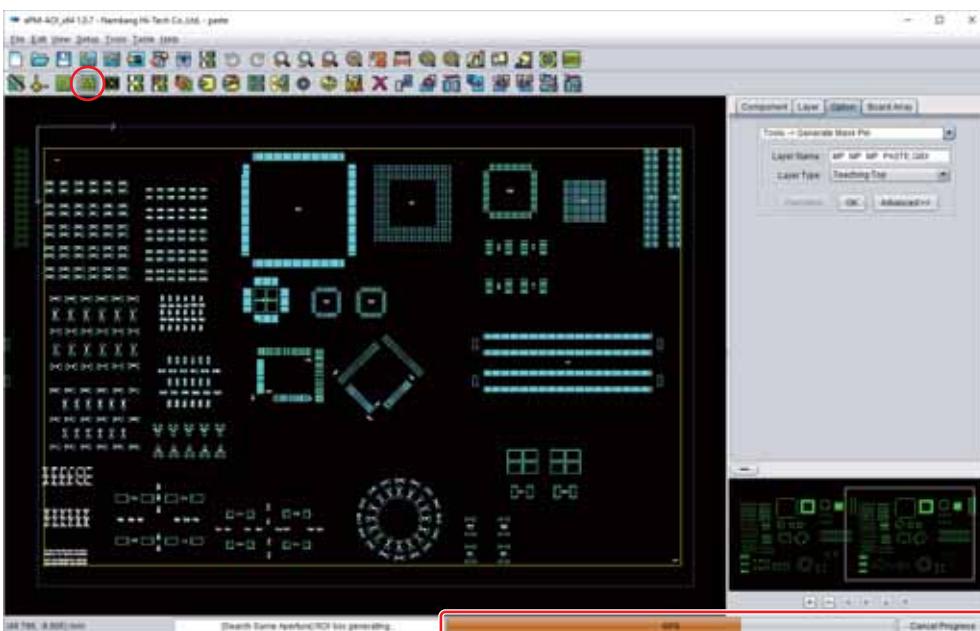


Figure 1-19 SAKI Standard Format Data Making Procedure 14

Step16: Click  (Fiducial mark) on the icon list.

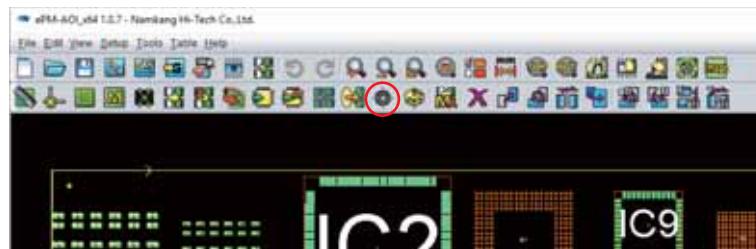


Figure 1-20 SAKI Standard Format Data Making Procedure 15

Step17: Select the fiducial mark on main view by dragging.

After the setting is completed, set the shape and size of fiducial mark on the **doc window** > **Option** tab > **Feature(mm)**. For details, refer to Table 1-3.

After the setting is completed, click **Generation**.

Set the shape and size for all fiducial marks.

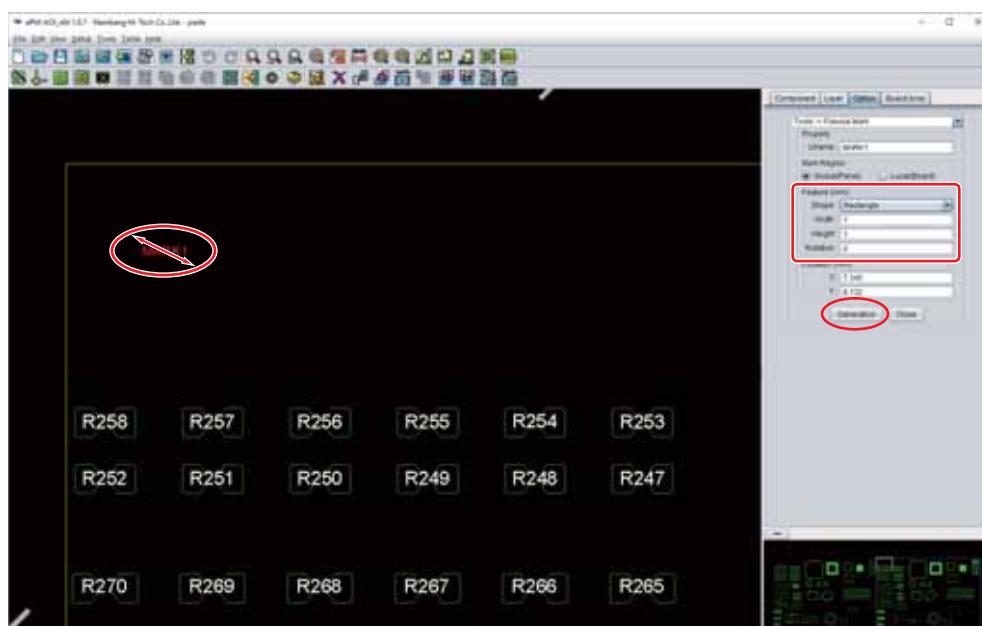


Figure 1-21 SAKI Standard Format Data Making Procedure 16

| Item | Description |
|----------|--|
| Shape | Select the shape of fiducial mark from Polygon , Oblong , Circle and Rectangle . |
| Width | Enter the size of fiducial mark. Unit is [mm]. |
| Height | Enter the size of fiducial mark. Unit is [mm]. |
| Rotation | Enter 0 . |

Table 1-3 Descriptions

Step18: Click (Automatic add footprint) on the icon list.

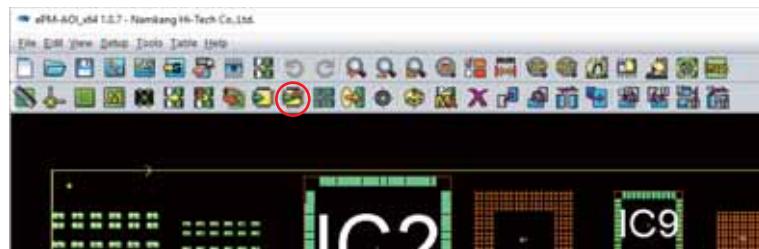


Figure 1-22 SAKI Standard Format Data Making Procedure 17

Step19: Click **Execution** on Option tab of doc window.

The package information of component which is recognized from footprint is placed automatically.

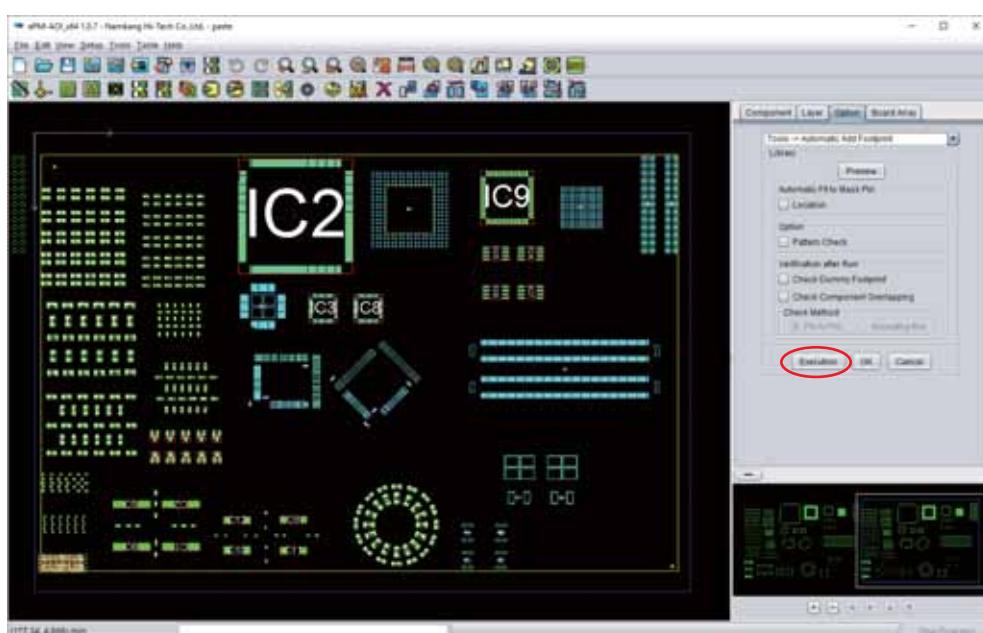


Figure 1-23 SAKI Standard Format Data Making Procedure 18

Step20: Assign the package information of component which information is not assigned automatically.

Click (Add footprint) on the icon list.

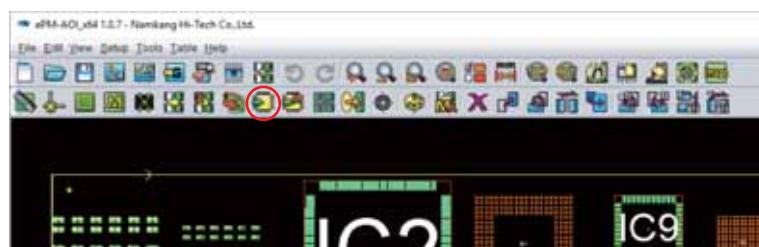


Figure 1-24 SAKI Standard Format Data Making Procedure 19

Step21: Select the pad set as package on main view by dragging.

After the setting is completed, set the package type on the **doc window > Option tab > Package type**. And click **Add Footprint**.

Repeat this step until the package information is assigned to all component.

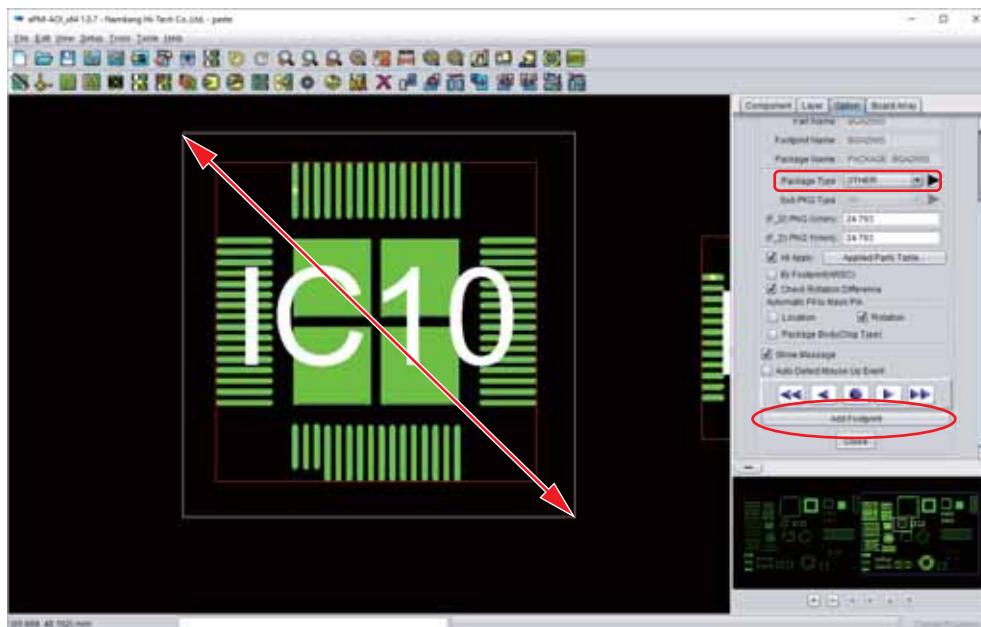


Figure 1-25 SAKI Standard Format Data Making Procedure 20

Step22: Click (Export) on the icon list.

SAKI Standard Format Data is output.

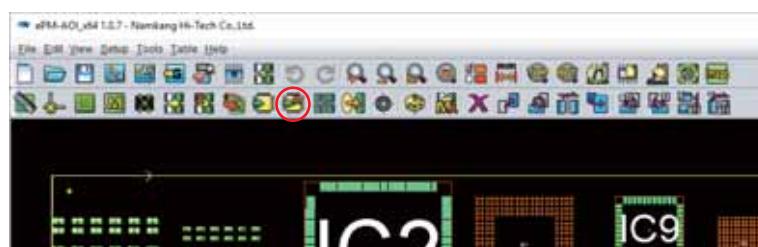


Figure 1-26 SAKI Standard Format Data Making Procedure 21

1.3 Inspection Data Wizard

This section describes how to make an inspection data with **Inspection Data Wizard**.

The procedure differs between the case of using mount data and gerber data, the case of using ODB++ data and the case of using SAKI standard format.

Step1: Click BF2 on the upper left of the window and select Inspection Data Wizard.

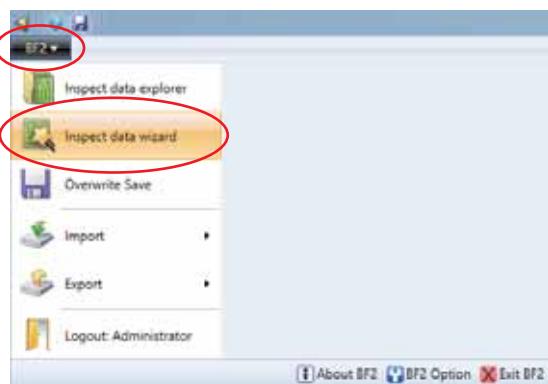


Figure 1-27 Inspection Data Wizard 1

Step2: If an inspection data is opened, the dialog shown below appears.

- | | |
|---------------|--|
| Yes | Overwrites the inspection data and proceeds to Step3. |
| No | Proceeds to Step3 without saving the inspection data. |
| Cancel | Returns to the original screen without saving the inspection data. |

NOTE

Saving the inspection data is recommended when the data is modified.

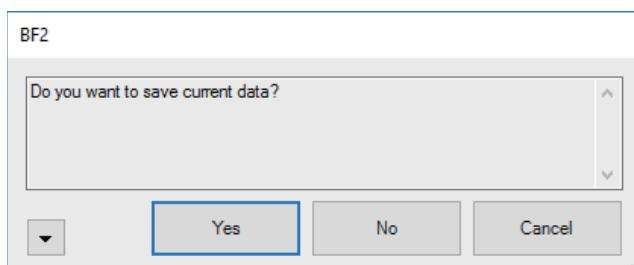


Figure 1-28 Inspection Data Wizard 2

Step3: The dialog shown below appears.

Select data type from **Mount data & gerber data** or **ODB++** or **SAKI standard format** and click **Next**.

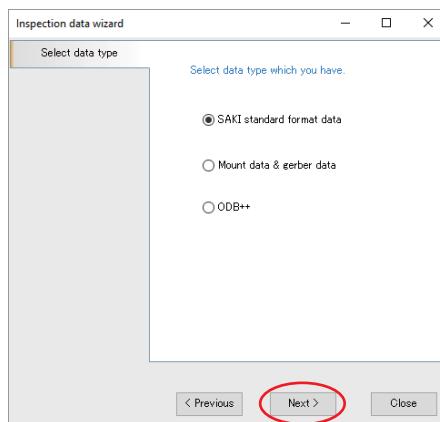


Figure 1-29 Inspection Data Wizard 3

Step4: The dialog shown below appears.

When Making a New Group

Specify a destination to save the inspection data on **Destination**.

Enter a location to save the file, or click on the right side of the text-box to select a folder.

Fill out **Group** and **Board** and click **Next**.

When Adding a Board Data to an Existing Group

Select an inspection data folder on **Destination** and select a group folder on **Group**.

Enter the group name or click on the right side of the text-box to select a folder.

Fill out **Board** and click **Next**.

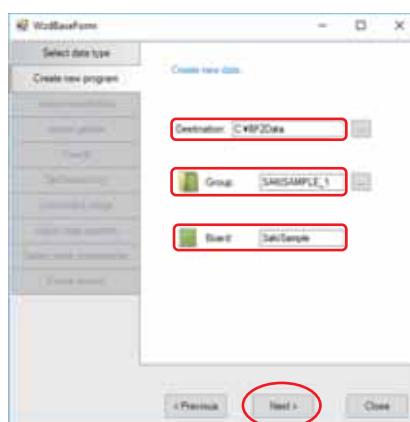


Figure 1-30 Inspection Data Wizard 4

Step5: When new group is created in Step 4, the dialog shown below appears. Click **Yes**.

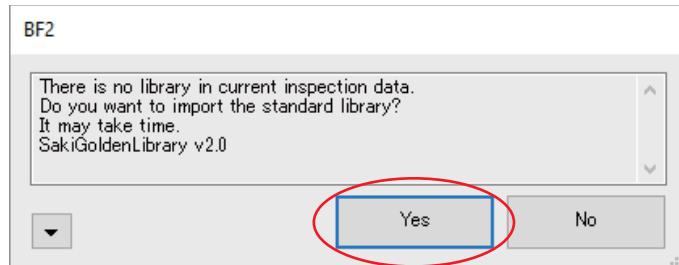


Figure 1-31 Inspection Data Wizard 5

NOTE

When group is newly created, the import of user custom library is available.

Select **BF2 Option > Inspection Data > Library** and select **Custom** from **Initial Library** drop-down list.

And click **Change** on the right side of **Custom Initial Library Path** and select user library file (.libprj format).

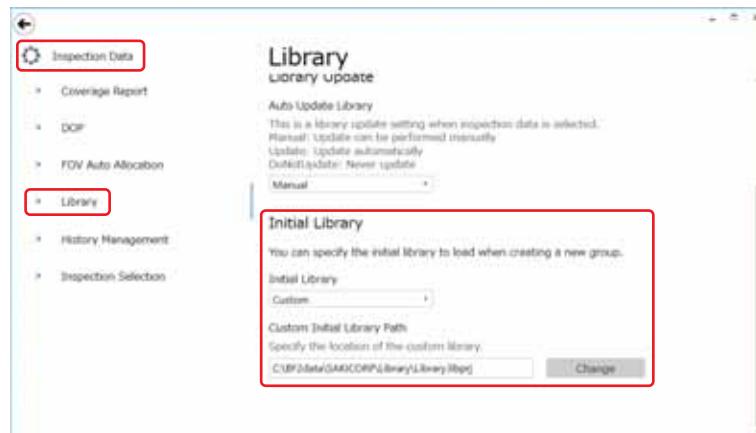


Figure 1-32 Custom Library Import

Step6: From below load inspection data.

Proceeds to **1.3.1 Loading Inspection Data (SAKI standard format data)** when **SAKI standard format** is selected in step3.

Proceeds to **1.3.2 Loading inspection data (Mount data & Gerber data)** when **Mount data & gerber data** is selected in step3.

Proceeds to **1.3.3 Loading inspection data (ODB++)** when **ODB++** is selected in step3.

1.3.1 Loading Inspection Data (SAKI standard format data)

- Step1: Click on the right side of text-box and select SAKI standard format data to load.
After the data is selected, click **Next**.

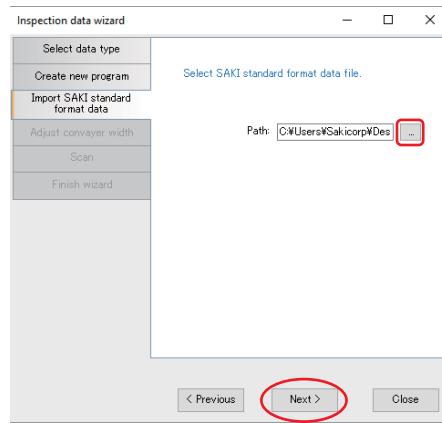


Figure 1-33 Select SAKI standard format Data

- Step2: Click **Change rail width**.

NOTE This dialog is not displayed in BF2-Editor.

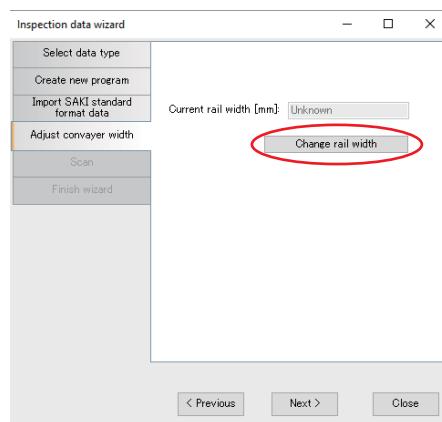


Figure 1-34 Adjusting the Rail Width 1

Step3: The dialog shown below appears.

Click **Board search** to check any board is not inside machine.

Enter a board width into **Absolute** and click **Set**.

The conveyor rail width is adjusted.

When the adjustment is completed, click **Close** to close the dialog.

Click **Next** in Step2 dialog.

NOTE This dialog is not displayed in BF2-Editor.

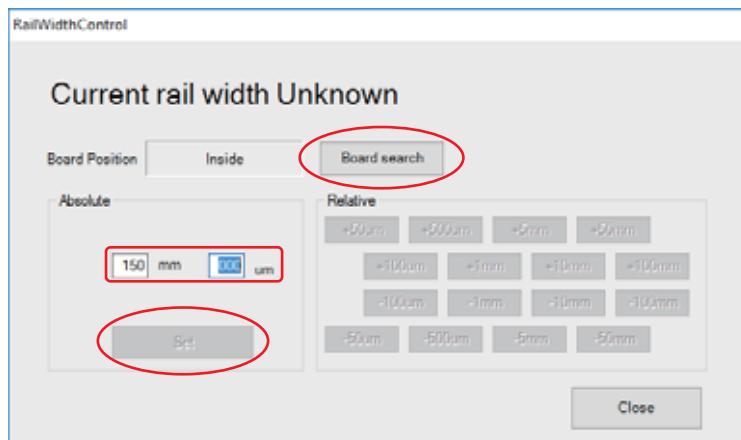


Figure 1-35 Adjusting the Rail Width 2

Step4: Place a PCB on the conveyor rail from the PCB inlet of the machine and click **Load/Unload**.

Click **Scan** after a PCB is loaded. Click **Next**.

NOTE This dialog is not displayed in BF2-Editor.

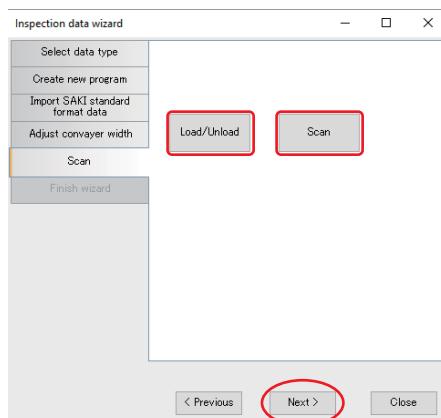


Figure 1-36 Load and Scan PCB

In Case of BF2-Editor

The dialog shown below appears.

Click on the right side of **Board image path** text-box and select board image file.

Click **Import** to read image and click **Next**

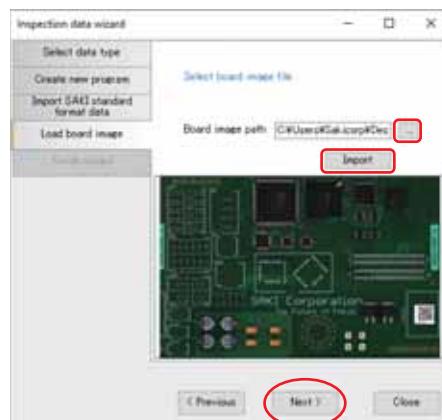


Figure 1-37 Board Image Selection

Step5: Click **Finish** and the wizard closes.

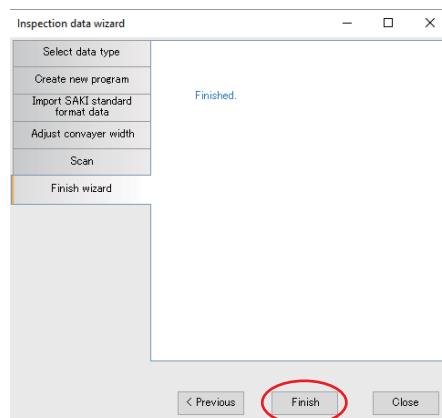


Figure 1-38 Finish Inspection Data Wizard 1

Step6: The dialog shown below appears.

When **Yes** is clicked, shape auto assign dialog appears.

Assign library by reference to **1.12 Auto Programming**.

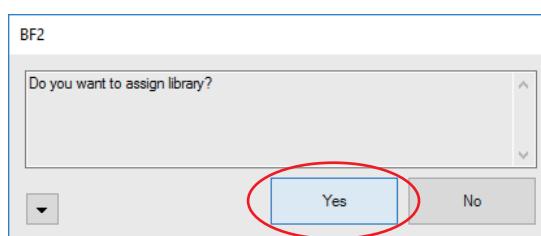


Figure 1-39 Finish Inspection Data Wizard 2

1.3.2 Loading Inspection Data (Mount data & Gerber data)

Step1: Click  on the right side of text-box and select CAD data to load.

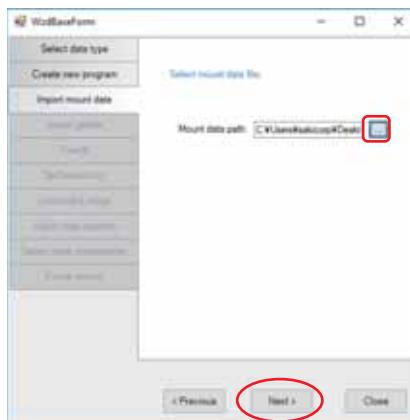


Figure 1-40 Select CAD Data

Step2: The dialog shown below appears. Click  (New) on the **Select Format**.

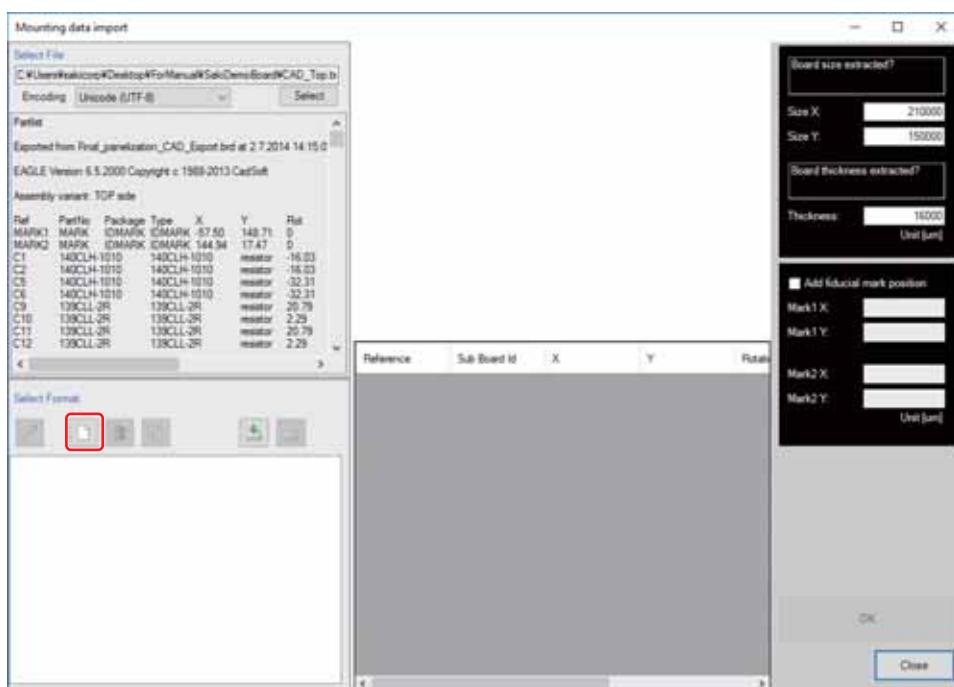


Figure 1-41 Create New File 1

Step3: The dialog shown below appears.

Enter format name and click **OK**.

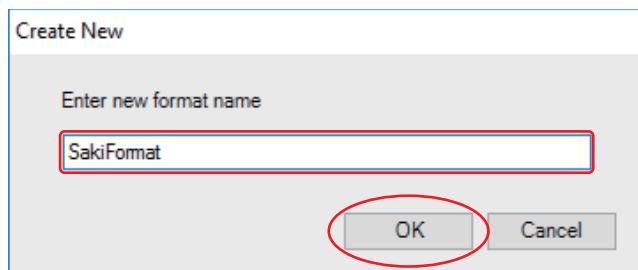


Figure 1-42 Create New File 2

Step4: The dialog shown below appears.

Select newly added format from the list at left bottom of dialog, and click (Edit).

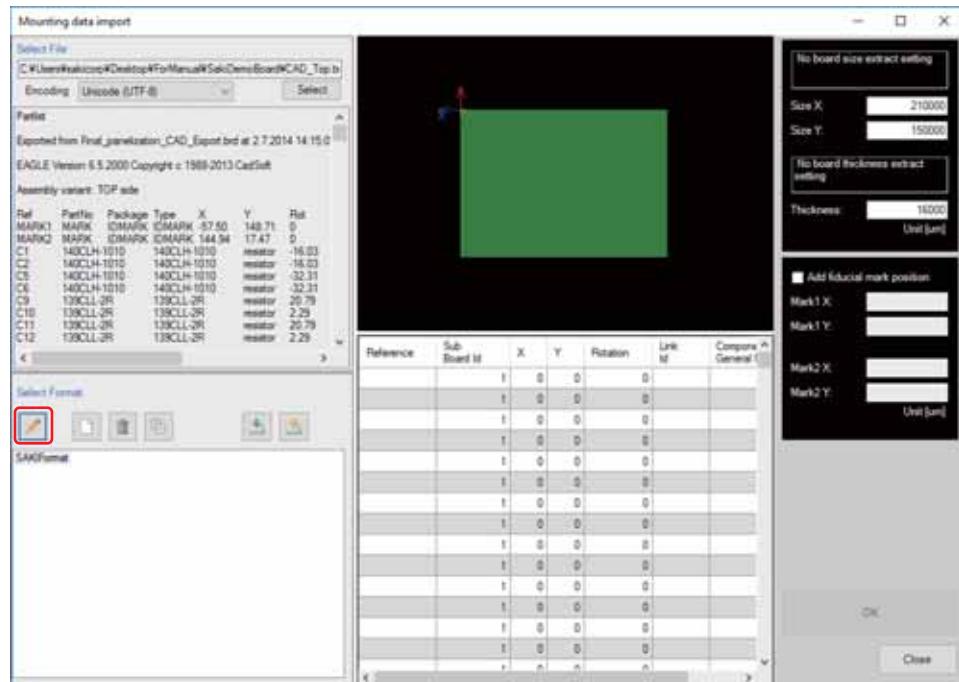


Figure 1-43 Format Edit

Step5: The dialog shown below appears.

Contents of the loaded CAD data file are displayed in the **Line** list-box on the left side of dialog.
Set each items on right side of dialog by reference to Table 1-4 and click **Next**.

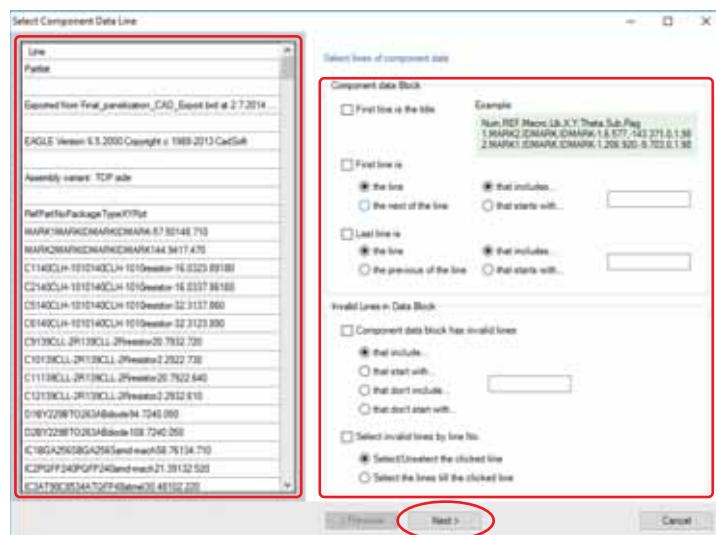


Figure 1-44 Selecting Components Information Line

| | Item | Description |
|-----------------------------|--|---|
| Component data Block | First lines is the title | Check this item if the first line of the component data defines contents of the data. |
| | First line is | Selects a line in accordance with the radio button settings and specifies the selected line as the top line of the component data. |
| | Last line is | Selects a line in accordance with the radio button settings and specifies the selected line as the bottom line of the component data. |
| | the line & that includes... | Searches for a line which includes a word entered in the text-box and selects the found line. |
| | the line & that starts with... | Searches for a line which starts with a word entered in the text-box and selects the found line. |
| | the next of the line & that includes... | Searches for a line which includes a word entered in the text-box and selects the next line of the found line. |
| | the next of the line & that starts with... | Searches for a line which starts with a word entered in the text-box and selects the next line of the found line. |
| Invalid Lines in Data Block | Component data block has invalid lines | Check this item if the component data has the line that does not include component information . Lines are grayed out in accordance with the radio button settings. |
| | that includes... | Selects lines which include a word entered in the text-box. |
| | that start with... | Selects lines which start with a word entered in the text-box. |
| | that don't include... | Selects lines which do not include a word entered in the text-box. |
| | that don't start with... | Selects lines which do not start with a word entered in the text-box. |
| | Select invalid lines by line No. | Check this item if specifying invalid lines by left-clicking. Lines are grayed out in accordance with the radio button settings. Since the lines are specified by the line numbers, the format may become inapplicable to another CAD data. |
| | Select/Unselect the clicked line | Selects the clicked line. To cancel, click again. |
| | Select the lines till the clicked line | Selects the all lines from the top to clicked line. |

Table 1-4 Descriptions

| | |
|----------|--|
| CAD Data | Board+ BoardSize_X,220.000 BoardSize_Y,150.000 Component+ (The first line of the component data is always the next line of Component+) Num,REF,Macro,Lib,X,Y,Theta,Sub,Flg (The title line is included in the component data) 1,MARK2,MARK,MARK-1,6.577,-143.371,0,1,98 2,MARK1,MARK,MARK-1,206.920,-9.703,0,1,98 ... |
| Setting | Check First line is . Enter Component+ into the text-box. Check the next of the line and that includes.... Check First line is the title . |

Table 1-5 Example 1

| | |
|----------|---|
| CAD Data | BSIZEX150000Y300000 ORX5000Y5000 C"R101"X101223Y050234T090 (The component data always starts from C) C"C202"X059526Y189256T270 ... C"IC5" X033564Y253654T000 END (The last line is not the component data) |
| Setting | Check First line is . Enter C into the text-box. Check the line and that starts with.... Check Last line is . Enter C into the text-box. Check the line and that starts with.... |

Table 1-6 Example 2

| | |
|----------|---|
| CAD Data | ... 374,U35,DS90LV031ATM,SOP8PIN,152.467,-27.459,90,1,2 (The component data always include ",") 375,U35,DS90LV031ATM,SOP8PIN,152.467,-27.459,90,1,2 <PAGE4> (The lines which do not include "," are not component data.) 376,U4,TL7705ACPS,SOP4PINS,36.094,-99.379,180,1,1 377,U5,TL7705ACPS,SOP4PINS,172.382,-101.121,0,1,2 ... |
| Setting | Check Component data block has invalid lines . Enter " into the text-box. Check that don't include . |

Table 1-7 Example 3

- Step6: Make sure that the component data lines are highlighted in white and other lines are grayed out on the **Line** section of Figure 1-44.
Click **Next**.

NOTE If the title line is set, the line is highlighted in blue.

- Step7: The component data lines are displayed in the Line list-box.
 Select the data format to classify parameters like component name and position etc.

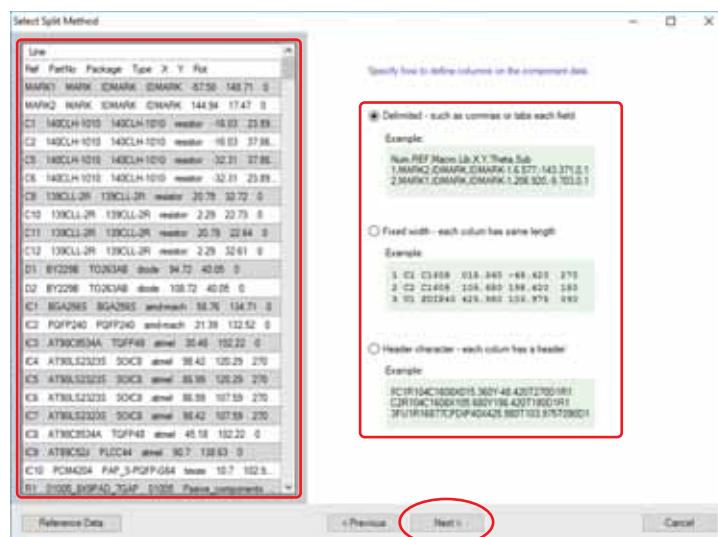


Figure 1-45 Selecting a Data Format

When the Data Separated by Separator such as Commas, Tabs, or Spaces

Check **Delimited** in the dialog shown in Figure 1-45 and click **Next**.

The dialog shown below appears. Select a delimiter in Separators.

The data is automatically separated by parameters. After all the setting under **Separators** is completed, click **Next**.

NOTE If double quotation marks are included in the CAD data, check **Treat as one string when surrounded by double quotations**.

NOTE If two (or more) characters are used as one separator, check **Treat successive separators as one separator**.

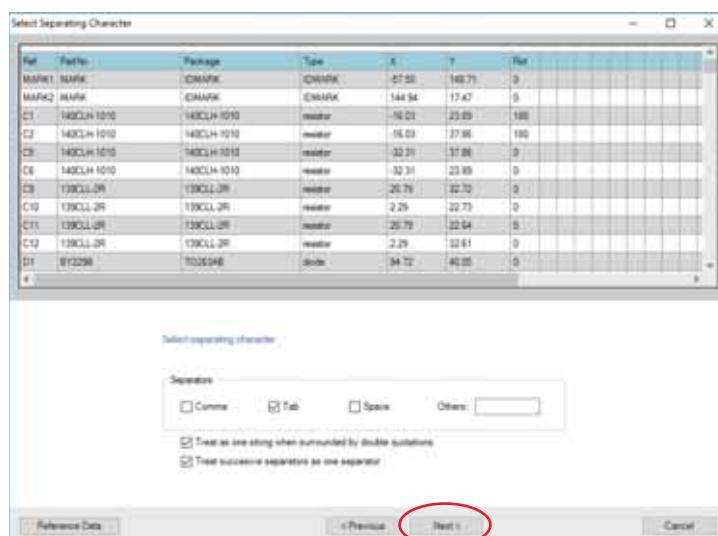


Figure 1-46 Selecting a Separator

When the Data Separated by the Fixed Width

Check **Fixed width** in Figure 1-45 and click **Next**. The dialog shown below appears.

Adjust the column widths by dragging the boundary of the header to separate the data.

After all the setting is completed, click **Next**.

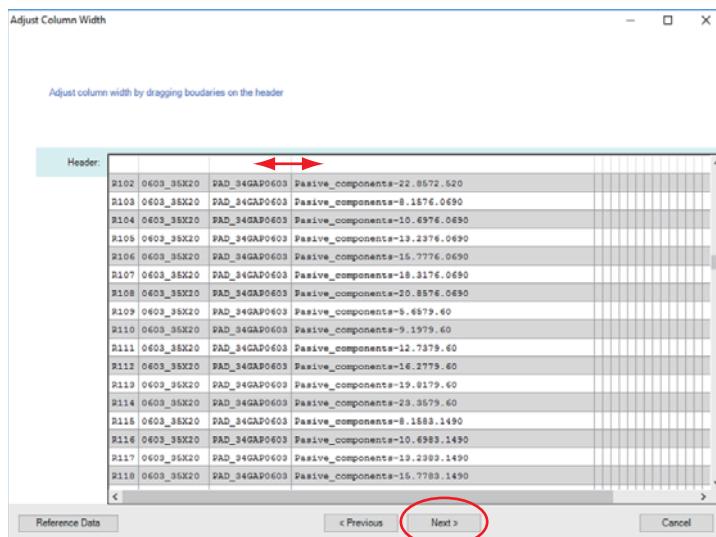


Figure 1-47 Adjusting the Column Widths

When the Data Separated by the First Character

Check **Header character** in Figure 1-45 and click **Next**. The dialog shown below appears.

Enter the first characters in the Head character text-boxes located on the upper side of the dialog.

The data is automatically separated by parameters.

After all the setting is completed, click **Next**.

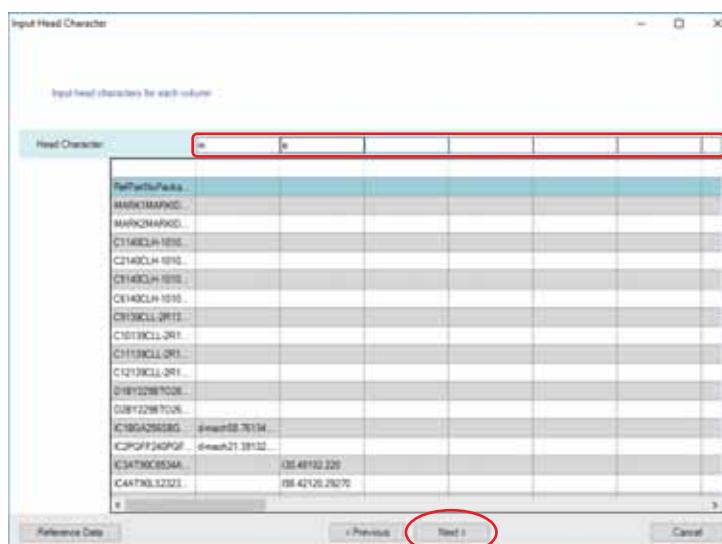


Figure 1-48 Entering the First Characters

- Step8: Click a header of a column. Parameters to define data are displayed.
 Assign a parameter to each column. After all the setting is completed, click **Next**.

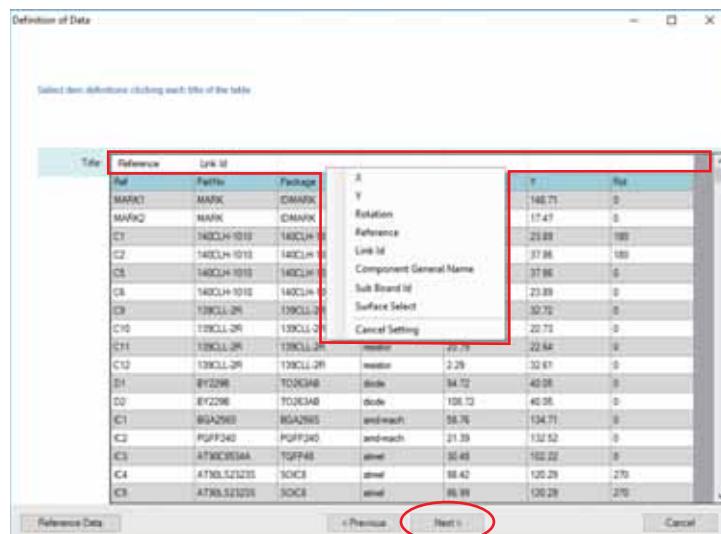


Figure 1-49 Defining the Data

| Item | Description |
|------------------------|---|
| X | Selects if the column indicates X-axis positions of components. |
| Y | Selects if the column indicates Y-axis positions of components. |
| Rotation | Selects if the column indicates mounting angles of components. |
| Reference | Selects if the column indicates references of components. |
| Link Id | Selects if the column indicates Link ID of components. (e.g., Macro name) |
| General Component Name | Selects if the column indicates General Component Name of components. |
| Sub Board Id | Selects if the column indicates sub board numbers of components. |
| Surface Select | Selects if the column indicates mounting surfaces of components. |
| Cancel Setting | Selects if the column indicates canceling the settings. |

Table 1-8 Descriptions

- Step9: Select a conversion method for component coordinates and mounting angles from the drop-down lists of **XY Coordinate** and **Rotation** on Figure 1-50. After all the setting is completed, click **Next**.

NOTE In **XY Coordinate** and **Rotation** drop-down list, **Other** can be selected for entering a multiplier directly.

NOTE If a number is entered into **Offset angle**, the specified amount of the offset is added to all component installation angles.

NOTE If **Surface Select** (the parameter to specify the mounting surface for a double-side PCB) is set, enter the character which indicates the PCB side to be inspected into the text-box of **Surface**.

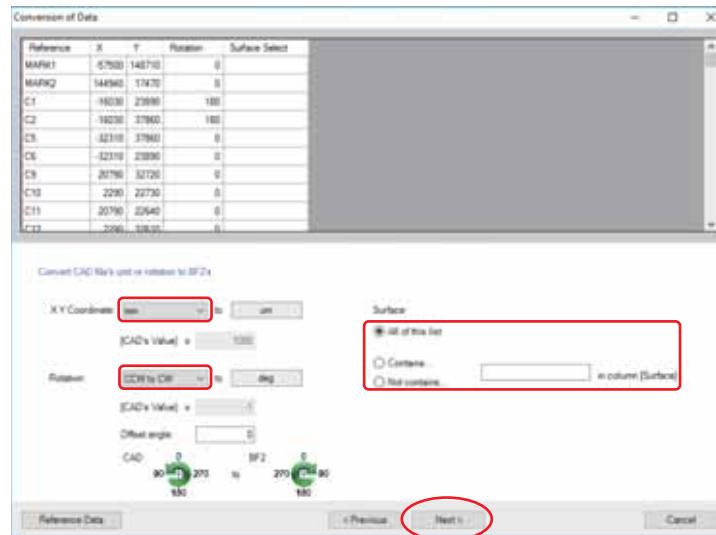


Figure 1-50 Data Conversion

- Step10: If the PCB size is included in the data, specify the corresponding line by reference to Table 1-9. The data will be extracted automatically from next time.
After all the setting is completed, confirm that the PCB size is extracted correctly. Click **Next**.

NOTE

Click **Next** in case the board size is not automatically extracted and need to manually enter later.

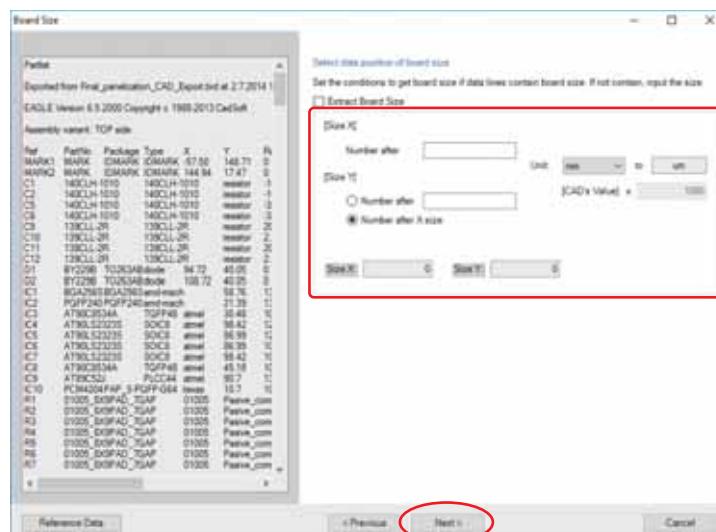


Figure 1-51 Acquiring the PCB Size

| Item | | | Description |
|--------------------|--------------------|---------------------|--|
| Extract Board Size | Extract Board Size | | Check this item to acquire the lengths in the X direction and Y direction of the PCB. |
| | [Size X] | Number after | Enter the preceding characters of the X-axis length of the PCB. The extracted value is displayed in Size X . |
| | [Size Y] | Number after | Enter the preceding characters of the Y-axis length of the PCB. The extracted value is displayed in Size Y . |
| | | Number after X size | Check this item if the Y-axis length of the PCB is written just after the X-axis length. The extracted value is displayed in Size Y . |
| | Unit | | Select a unit used in the CAD data from the drop-down list. To select Other and directly enter multiplier is also possible. |
| Extract Thickness | Extract Thickness | | Check this item if extracting the PCB thickness. |
| | Number after | | Enter the preceding characters of the PCB thickness. |
| | Unit | | Select a unit used in the CAD data from the drop-down list. To select Other and directly enter multiplier is also possible. |

Table 1-9 Descriptions

| | |
|----------|---|
| CAD Data | Board+ BoardSize_X,220.000 (The next value of BoardSize_X is always the X-axis length of the PCB) BoardSize_Y,150.000 (The next value of BoardSize_Y is always the Y-axis length of the PCB) |
| Setting | Enter BoardSize_X into Number after of [Size X] . Enter BoardSize_Y into Number after of [Size Y] . (In this case, the number is also located on directly after the X-axis length. The same operation can be performed by checking Number after X size). Select mm from the drop-down list of Unit . |

Table 1-10 Example

Step11: Adjust the data to match the origins and positions between the CAD data and the actual machine. After the adjustment is completed, click **Next**.

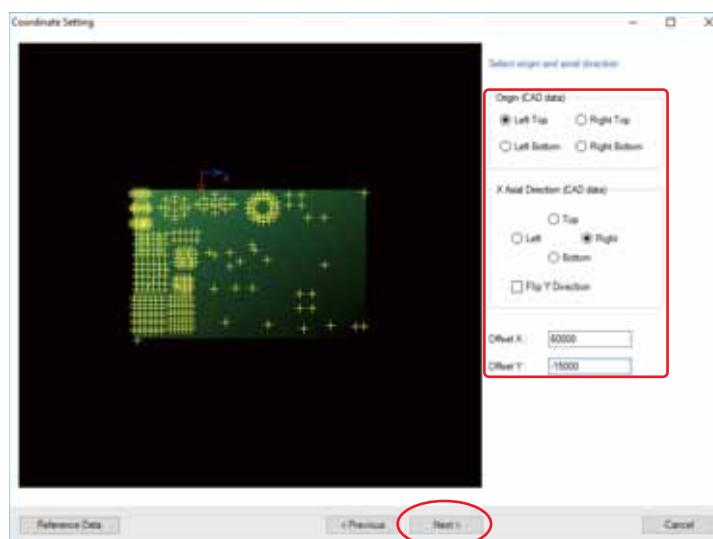


Figure 1-52 Coordinate Setting

| Item | | Description |
|------------------------------------|------------------|---|
| Origin (CAD data) | Left Top | Check when the CAD data origin is the upper left corner. |
| | Right Top | Check when the CAD data origin is the upper right corner. |
| | Left Bottom | Check when the CAD data origin is the lower left corner. |
| | Right Bottom | Check when the CAD data origin is the lower right corner. |
| X Axial Direction (CAD data) | Top | Check when the X-axis value of the CAD data increases upward. |
| | Bottom | Check when the X-axis value of the CAD data increases downward. |
| | Left | Check when the X-axis value of the CAD data increases leftward. |
| | Right | Check when the X-axis value of the CAD data increases rightward. |
| | Flip Y Direction | Inverts the Y-axis of the CAD data. |
| Offset X | | Moves the CAD data in the X-axis. The offset value can be set in the text-box on the right. |
| Offset Y | | Moves the CAD data in the Y-axis. The offset value can be set in the text-box on the right. |

Table 1-11 Descriptions

Step12: Confirm that component data is displayed on the board image, and values are entered to **Size X** and **Size Y**. A board image is located on the center of the dialog. **Size X** and **Size Y** are located on the right side of the dialog.

If incorrect values are entered, edit the setting or enter the correct value to each text-box.
All the setting is completed, click **OK**.

NOTE

If fiducial mark data are not included in the component data, check **Add fiducial mark position** and enter coordinates. Fiducial marks are created on the specified positions.

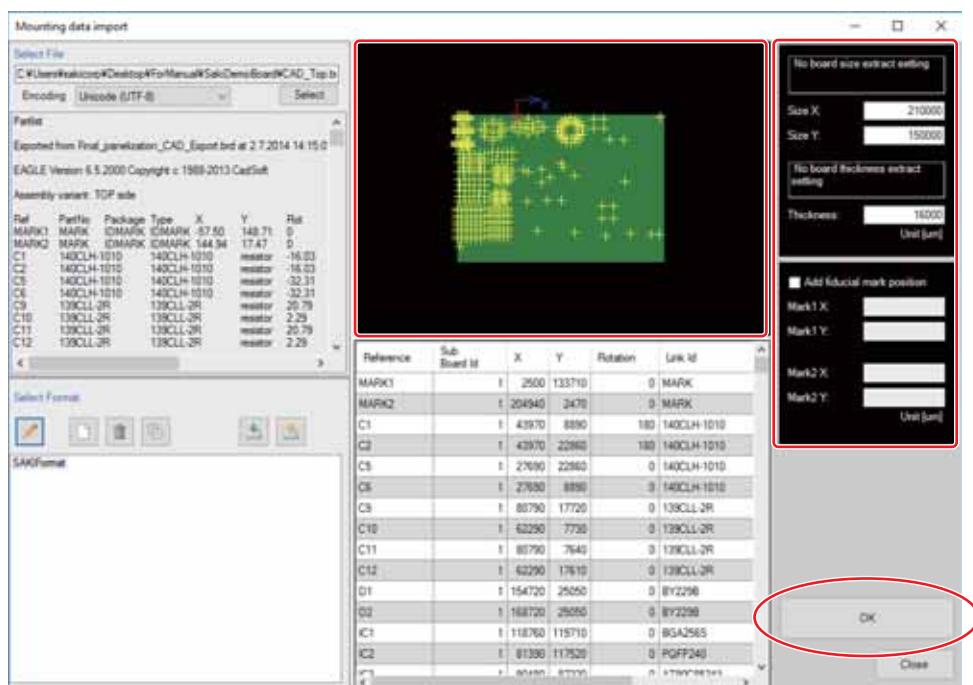


Figure 1-53 Edit

Step13: If invalid characters (e.g., "\", "/", ".", "*", "?", "<", ">", "|", or ".") are included in a reference name or Link ID, the dialog shown below appears and the reference names and Link IDs are corrected automatically. Check the corrected names and edit them if necessary. Click **OK**.

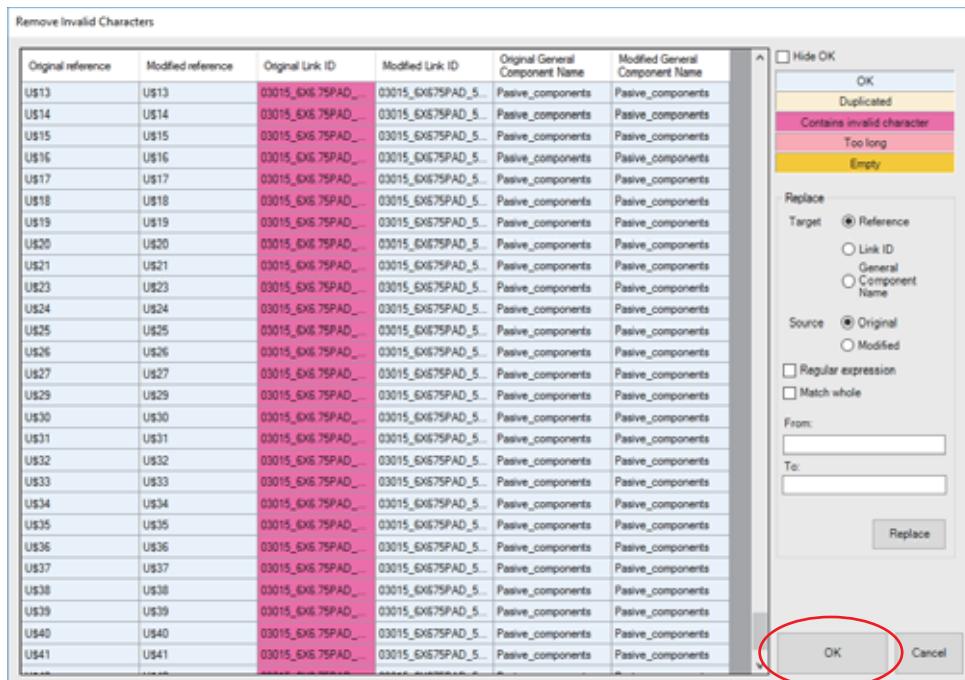


Figure 1-54 Correcting Reference and Link ID.

| Item | | Description | | |
|--------------------|--------|--|---|--|
| Original reference | | Indicates the original reference names. | | |
| Modified reference | | Indicates reference names modified by the auto-correction. | | |
| Original Link ID | | Indicates the original Link IDs. | | |
| Modified Link ID | | Indicates Link IDs modified by the auto-correction. | | |
| Hide OK | | Hides reference names and Link IDs which do not need correction. | | |
| Replace | Target | Reference | Sets reference names as the search target. | |
| | | Link ID | Sets Link IDs as the search target. | |
| | | General Component Name | Sets General Component Name as the search target. | |
| | Source | Original | Sets the current reference names or Link IDs as the search target. | |
| | | Modified | Sets the modified reference names or Link IDs as the search target. | |
| Regular expression | | Allows regular expressions to be used for searching. | | |
| Match whole | | Check this item when searching references or Link IDs which completely match to the word entered in From . | | |
| From | | Specifies the word to search. | | |
| To | | Specifies the word to replace. | | |
| Replace | | Searches the word entered in From among reference names or Link IDs, and replaces the found word by the word entered in To . | | |

Table 1-12 Descriptions

Step14: Click (Add) and select gerber file. Selected gerber file is displayed in list.
Assign a parameter to each column. After all the setting is completed, click Next.
Check gerber file to load and click **Next**.

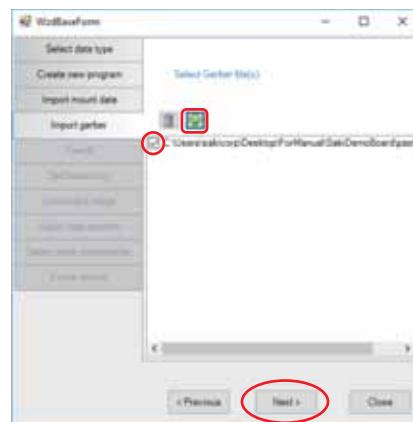


Figure 1-55 Selecting Gerber File

Step15: Checked gerber file is displayed. Adjust gerber data position if necessary.
After adjustment is completed, click **OK**.

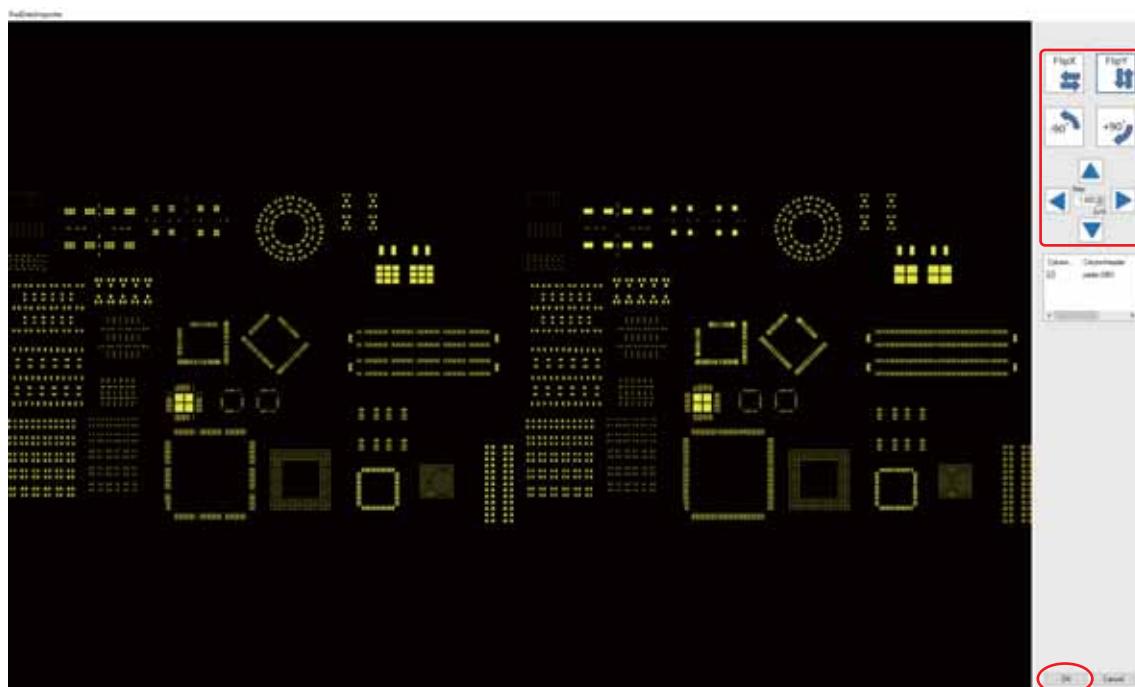


Figure 1-56 Loading Gerber File

Step16: Click **Launch fine fit.**



Figure 1-57 Fine fit 1

Step17: Select a pad by dragging diagonally across the pad.

Selected pad position is used as reference position.

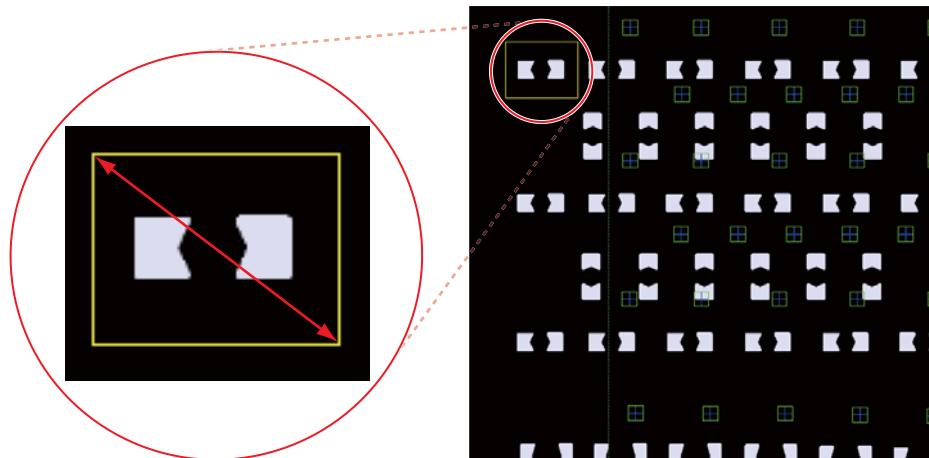


Figure 1-58 Fine fit 2

Step18: Drag the selected pads to the position of the corresponding component.

When a pad is dragged close to the same shape component corresponding to the pad, a red dotted line is displayed.

Drop it when the pad and the corresponding component are displayed with red dotted line.

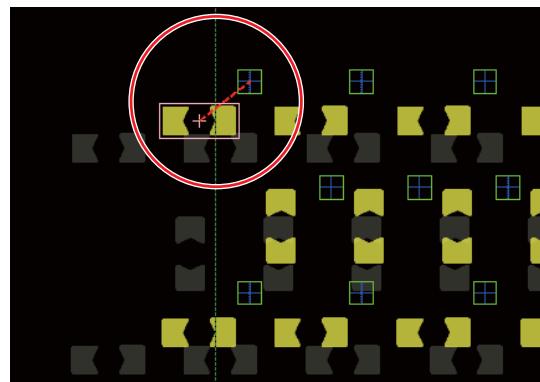


Figure 1-59 Fine fit 3

Step19: The dialog shown below appears, click **Yes**.

NOTE

It is possible to adjust gerber data position again if click **No**.

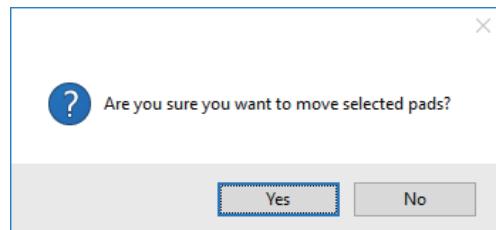


Figure 1-60 Fine fit 4

Step20: Set board size and click **Next**.

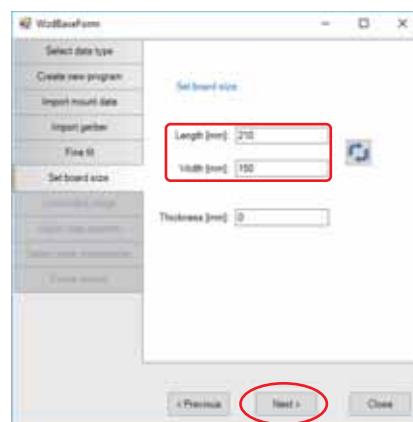


Figure 1-61 Setting Board Size

Step21: Click **Change rail width**.

NOTE

This dialog is not displayed in BF2-Editor.



Figure 1-62 Adjusting the Rail Width 1

Step22: The dialog shown below appears.

Click **Board search** to check any board is not inside machine.

Enter a board width into **Absolute** and click **Set**.

The conveyor rail width is adjusted.

When the adjustment is completed, click **Close** to close the dialog.

Click **Next** in Figure 1-62.

NOTE This dialog is not displayed in BF2-Editor.

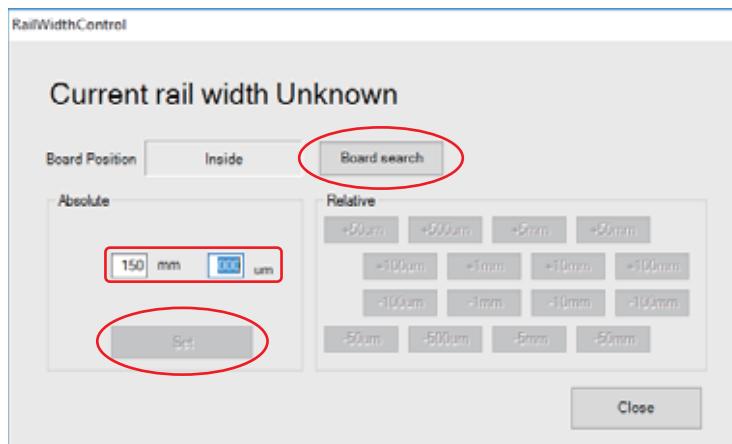


Figure 1-63 Adjusting the Rail Width 2

Step23: Place a PCB on the conveyor rail from the PCB inlet of the machine and click **Load/Unload**.

Click **Scan** after a PCB is loaded. Click **Next**.

NOTE This dialog is not displayed in BF2-Editor.

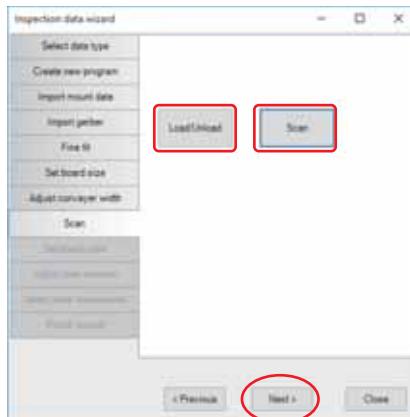


Figure 1-64 Load and Scan PCB

In Case of BF2-Editor

The dialog shown below appears.

Click on the right side of **Board image path** text-box and select board image file.

Click **Import** to read image and click **Next**

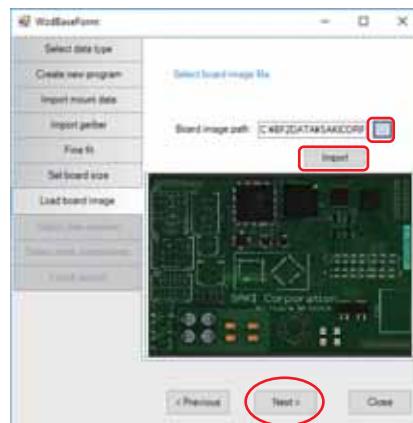


Figure 1-65 Board Image Selection

Step24: Click **Set board color**.

NOTE This dialog is not displayed in BF2-Editor.



Figure 1-66 Board Color Setting 1

Step25: The dialog shown blow appears.

Check **Enable Board Color Rects** and click the board color area on image.

Select **Apply average as board color**.

Also click anti board color area on image and select **Apply average as anti board color**.

After all the setting is completed, click **OK** and click **Next** on Figure 1-66.

NOTE This dialog is not displayed in BF2-Editor.

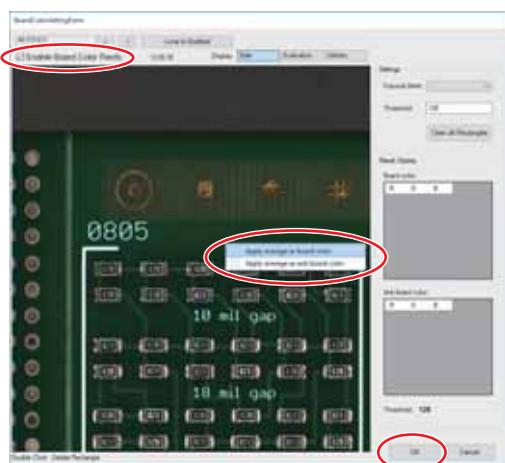


Figure 1-67 Board Color Setting 2

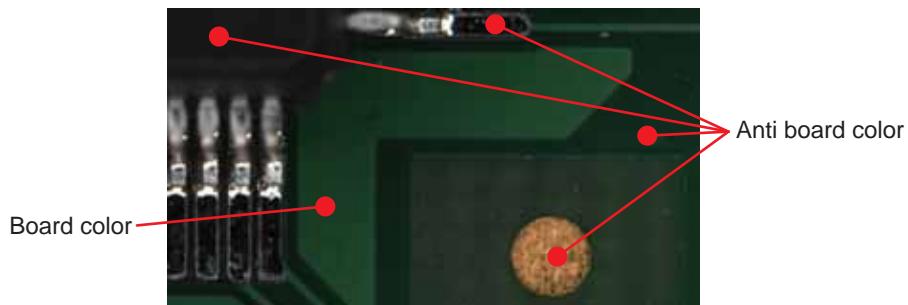


Figure 1-68 Board Color Example

| Item | | Descriptions |
|----------------|----------------------|---|
| | < | Switch to previous FOV. |
| | > | Switch to next FOV. |
| Display | Side | Displays the images of SideLight. |
| | Evaluation | Displays the board color area in white based on the board color and Anti Board color settings. |
| | Validity | Areas with a brightness greater than the Threshold are displayed in white and all other areas in black on the Evaluation image. |
| Setting | Fiducial Mark | Set fiducial mark. |
| | Threshold | Set threshold setting for black/white display. |
| | Clear All Rectangles | Deletes all Board color and Anti Board color settings. |
| Result Display | Board color | A list of board colors set with Apply average as board color . |
| | Anti board color | A list of board colors set with Apply average as anti board color . |

Table 1-13 Descriptions

Step26: Adjust position of component and pad by reference to Table1-14.

After all the adjustment is completed, click **Next**.

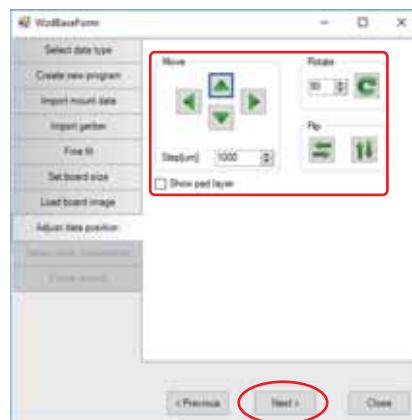


Figure 1-69 Data Position Adjustment

| Item | Descriptions |
|----------------|---|
| Move | Moves the component and pad data to the specified direction. The moving value is specified in Step[um] text-box. |
| Rotate | Rotates the data to clockwise. The rotation angle is specified in the text-box. |
| Flip | Inverts the component and pad data. |
| Show pad layer | Switches pad layer displaying. |

Table 1-14 Descriptions

Step27: Select the fiducial mark.

Click **Mark type** column to set the component type from **Normal component**, **Fiducial mark**, and **Bad mark**.

After all the component setting is completed, click **Next**.

NOTE Default setting of **Mark type** is **Normal component**.

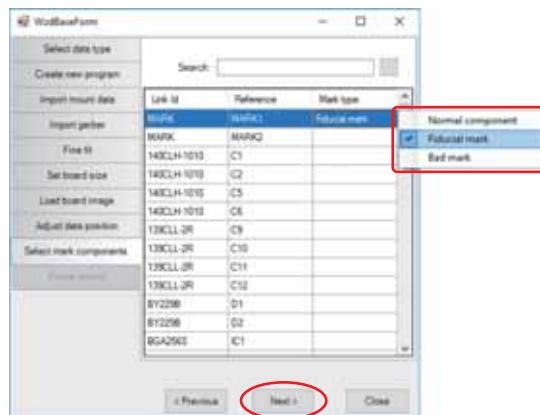


Figure 1-70 Fiducial Mark Setting

Step28: Click **Finish** and the wizard closes.

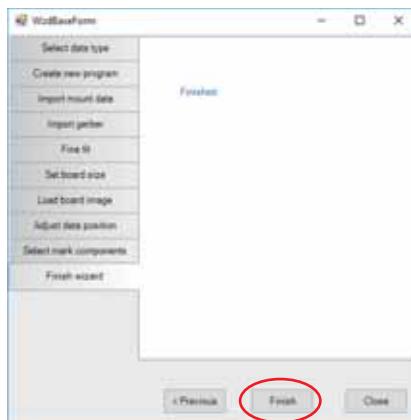


Figure 1-71 Finish Inspection Data Wizard 1

Step29: The dialog shown below appears.

When **Yes** is clicked, shape auto assign dialog appears.

Assign library by reference to **1.12 Auto Programming**.

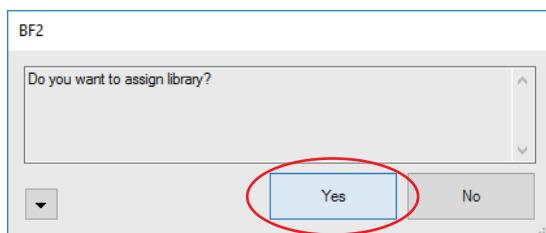


Figure 1-72 Finish Inspection Data Wizard 2

1.3.3 Loading Inspection Data (ODB++)

Step1: Click on the right side of text-box and select ODB++ data to load.

After ODB++ data is selected, click **Next**.

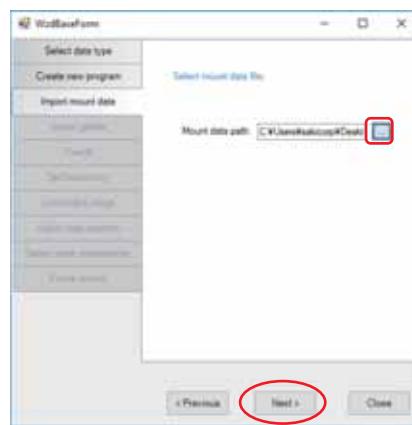


Figure 1-73 Select ODB++ Data

Step2: Select the component putting layer from **Components** drop-down list and the pad layer from **Pastes** drop-down list.

After all the setting is completed, click **Next**.

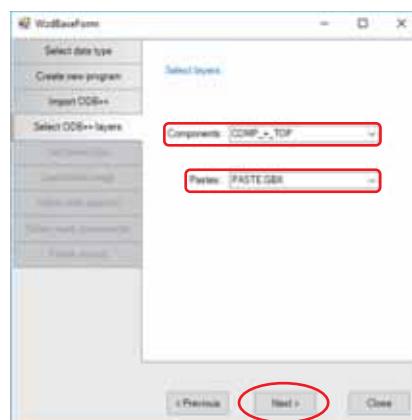


Figure 1-74 Select Layer

Step3: By reference to since Step20 of **1.3.2 Loading inspection data (Mount data & Gerber data)** and load inspection data.

1.4 Fiducial Mark and Bad Mark Setting

1.4.1 Set the Marks

Here describes how to set fiducial marks and bad marks.

Step1: Select the **InspectData** tab.



Figure 1-75 InspectData

Step2: Select a component data to be set as a fiducial mark or bad mark from **Board Viewer**.

NOTE If there is no component data which can be set as a fiducial mark or bad mark, create a new component data for setting marks.
For details, refer to **3.2.2 Adding a Component Data**.

Step3: The edit panel appears on **Board Viewer**.

When Fiducial Mark/Bad Mark Data Coordinates are Included in the CAD Data

Proceed to Step4.

When No Fiducial Mark/Bad Mark Data Coordinates are Included in the CAD Data

Select **Normal Component > Fiducial mark or Bad mark**.

The dialog shown below appears. Click **Yes**.

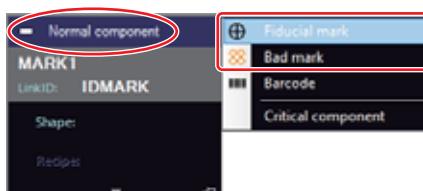


Figure 1-76 Edit Panel 1

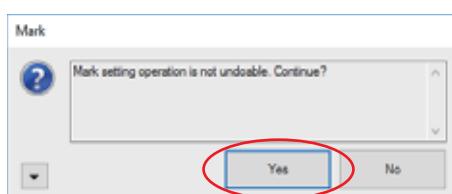


Figure 1-77 Confirmation Dialog

Step4: Confirm that the selected component is set as the fiducial mark or bad mark and click Recipe.



Figure 1-78 Edit Panel 2

Step5: From the dock window, select **Window Tree > Library > Library**.
Click on the upper side of **Window Tree**.

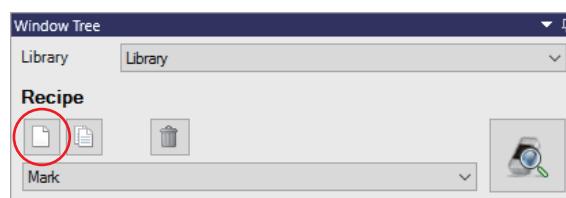


Figure 1-79 Add New

Step6: Enter a recipe name and click **OK**.

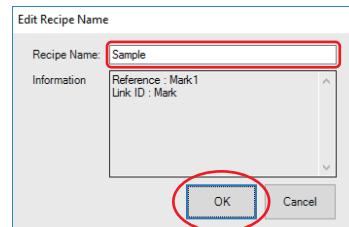


Figure 1-80 Editing a Recipe Name

Step7: From **Recipe selection preview**, click **Assign**.

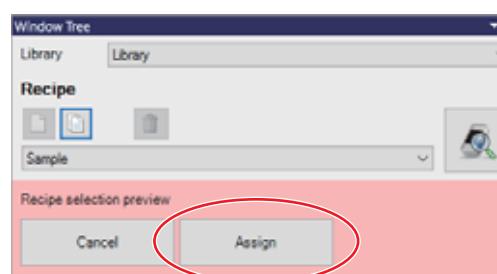


Figure 1-81 Assign

Step8: Click **Add** on the edit panel. A new inspection window is added.

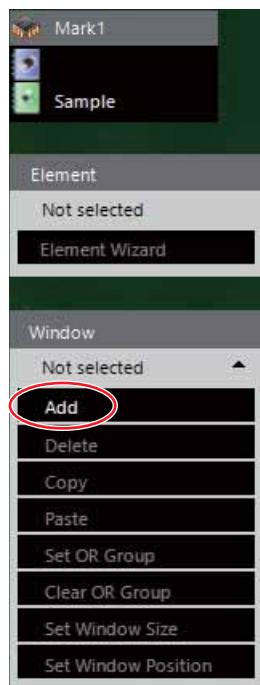


Figure 1-82 Edit Panel 3

Step9: From the dock window, select **Parameter Editor** > **Algorithm** to open the drop-down list. Select an algorithm which can detect a **Shift** value (e.g., **Circular Fiducial**, **Square Fiducial**).

NOTE For details of algorithms, refer to **Part III Inspection Algorithm**.

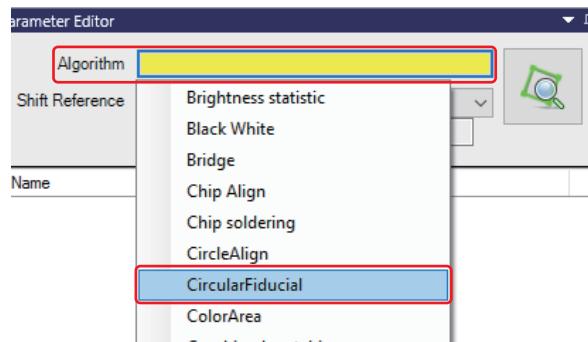


Figure 1-83 Selecting an Algorithm

Step10: Adjust the inspection window size to surround the fiducial mark/bad mark.

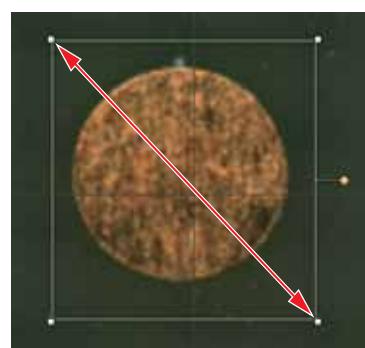


Figure 1-84 Adjusting the Inspection Window

Step11: Select a lighting from **Image filter** and click .

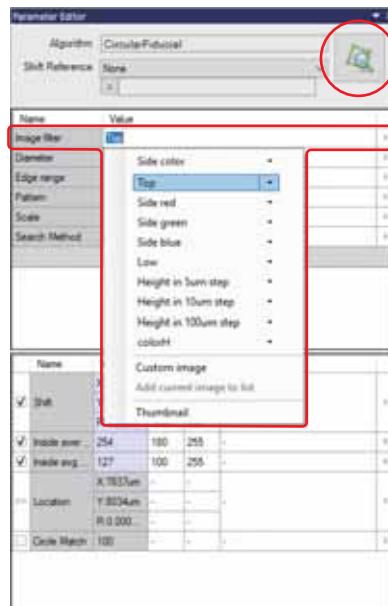


Figure 1-85 Selecting a Lighting

Step12: Check that the fiducial mark/bad mark is detected.

NOTE If the fiducial mark/bad mark cannot be detected, change the lighting or adjust the parameters of the algorithm.

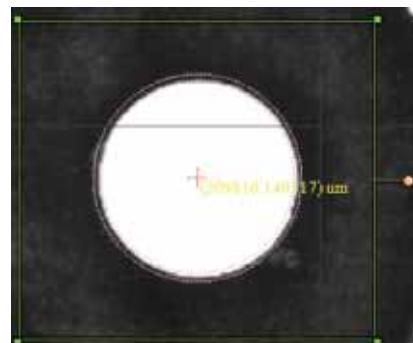


Figure 1-86 Detecting the Mark

Step13: From **Edit Recipe** tab, select the **Exit** group > **Exit**.

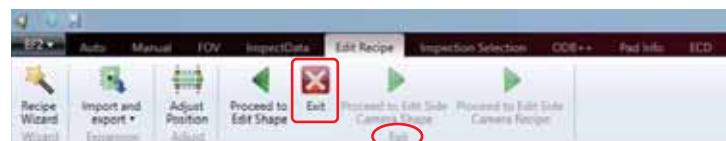


Figure 1-87 Finish Editing 1

Step14: Click **Yes**.

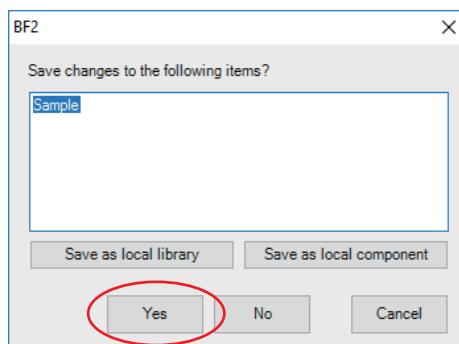


Figure 1-88 Finish Editing 2

Step15: If necessary, make more marks by repeating to Step2 to Step14.

NOTE If two fiducial marks are set on the PCB image, component data positions and angles are adjusted when starting an inspection. If three marks are set, warpage of the PCB is also adjusted.

1.4.2 Manual Assignment of Mark

Here describes how to assign the created fiducial mark and bad mark by using the board example shown below.

The fiducial mark in orange is created as sub-board fiducial mark.

The Panel fiducial mark (The red mark in the below figure) revises each fiducial mark position.

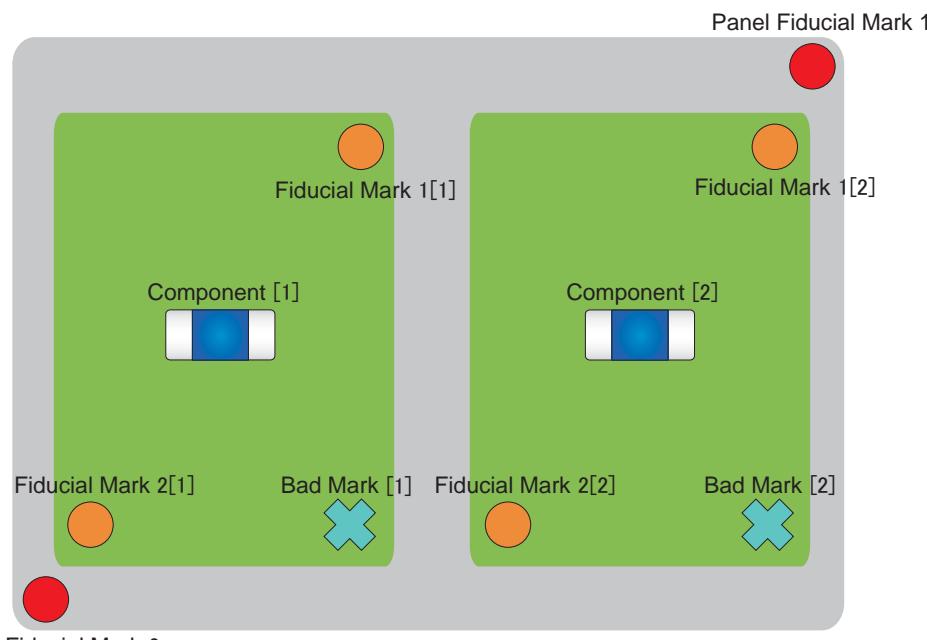


Figure 1-89 Assigning a Fiducial Mark

Step1: From **InspectData** tab, select the **Fiducial Mark** group > **Fiducial Mark**.
The dialog shown in Figure 1-91 appears.

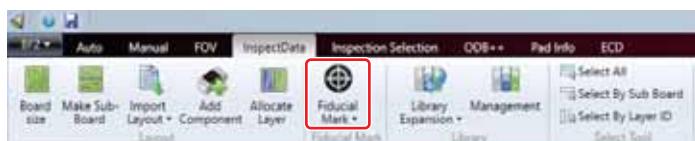


Figure 1-90 Manual assignment of mark 1

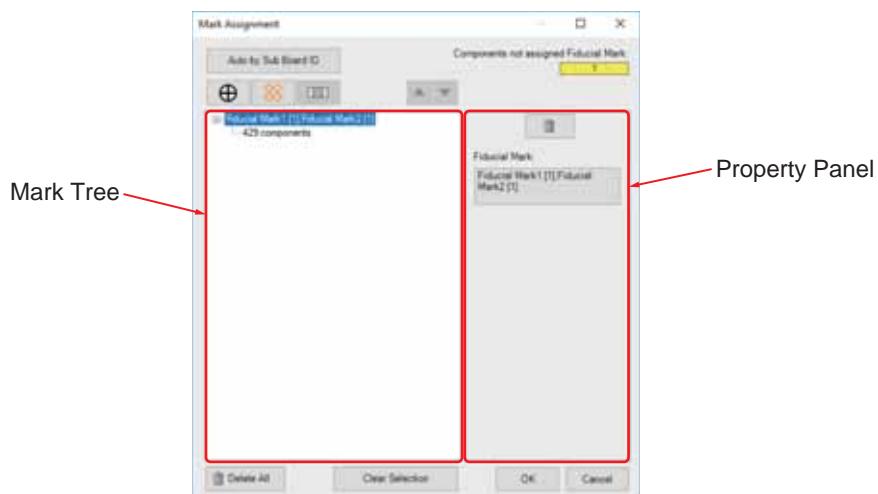


Figure 1-91 Manual assignment of mark 2

| Item | Description |
|---------------------------------------|---|
| Auto by Sub Board ID | Set fiducial mark and bad mark to components. |
| Mark Tree | Displays relation between fiducial mark, bad mark, and components. |
| Property Panel | Edits selected item in mark tree. |
| | Adds a fiducial mark in specified place in mark tree. |
| | Adds a bad mark in specified place in mark tree. |
| | Adds a component in specified place in mark tree. |
| | Moves the position in mark tree. |
| Components not assigned Fiducial Mark | Displays the number of components not assigned fiducial mark. |
| | Deletes selected item in mark tree. |
| Delete All | Deletes all items in mark tree. |
| Clear Selection | Cancels item select. When adding new item to top of mark tree, deselect the item is necessary. |

Table 1-15 Descriptions

Step2: Click  (Add fiducial mark) and check panel fiducial mark and click **OK**.
Although Bad mark select dialog appears automatically, click **Cancel**.

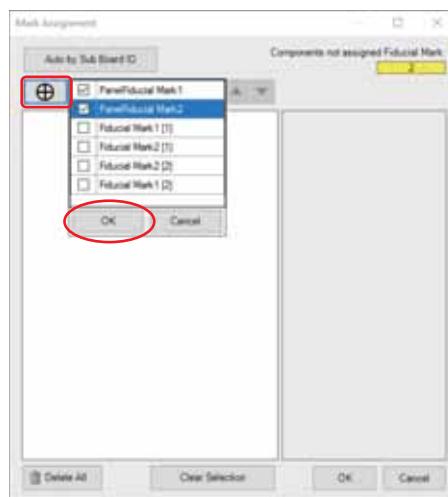


Figure 1-92 Manual Assignment of Mark 3

Step3: Assigning fiducial mark for sub board 1 by manual.
Click  (Add fiducial mark) and check fiducial marks for sub board 1.
Click **OK**.

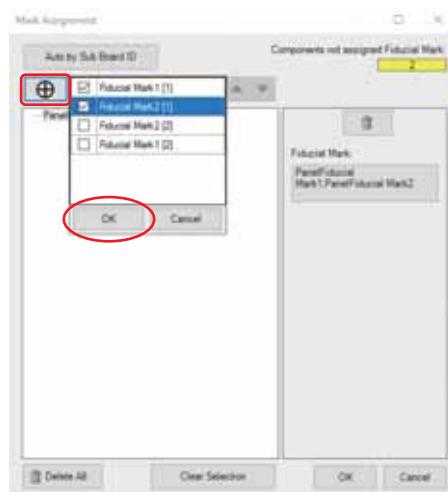


Figure 1-93 Manual Assignment of Mark 4

- Step4: Bad mark select dialog appears.
Check bad mark for sub board 1, and click **OK**.

NOTE When put bad mark manually, click  (Add bad mark).

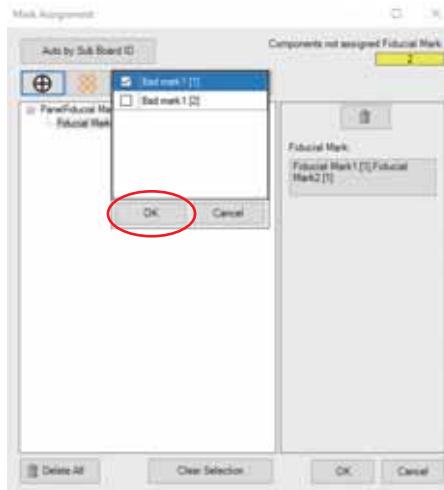


Figure 1-94 Manual Assignment of Mark 5

- Step5: The dialog shown below appears.
Check **Sub board** and set to **1**.
After all the setting is completed, click **OK**.

NOTE When set components to sub board manually,
click  (Add component).

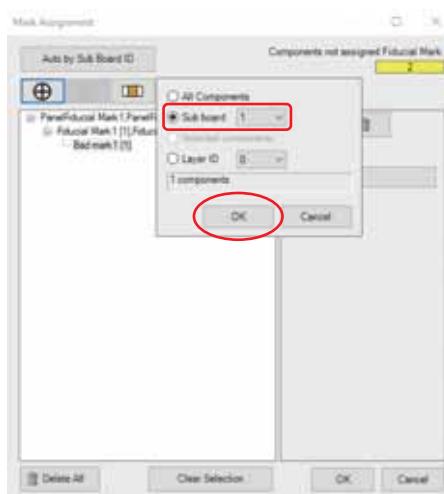


Figure 1-95 Manual Assignment of Mark 6

Step6: Assigning marks for sub board 2 by manual.

Select **PanelFiducial Mark1, PanelFiducial Mark2** on the top of mark tree.

Assign the marks of sub board 2 by reference to Step2 to Step 5.

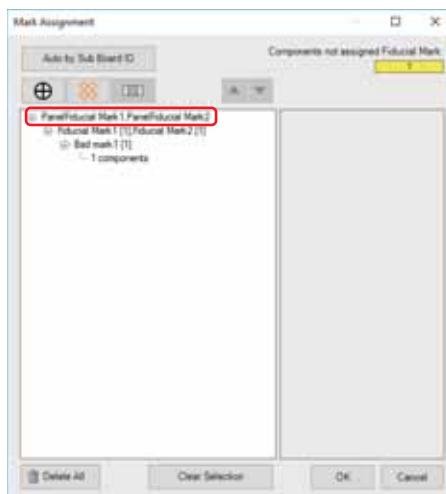


Figure 1-96 Manual Assignment of Mark 7

Step7: Assigning marks for sub board 2 is completed, click **OK** to close Mark Assignment dialog.

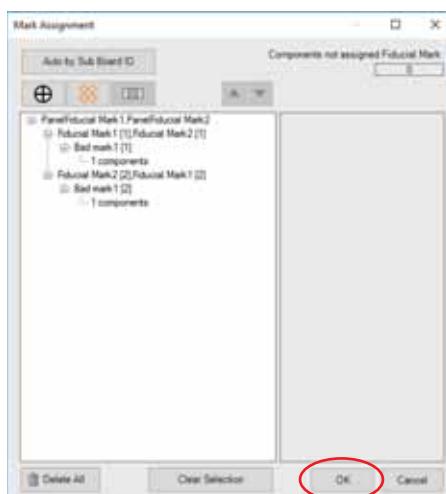


Figure 1-97 Manual Assignment of Mark 8

1.4.3 Automatic Assignment of Mark

Assign proper mark to each components automatically based on sub board ID.

Step1: From **InspectData** tab, select the **Fiducial Mark** group > **Fiducial Mark**.

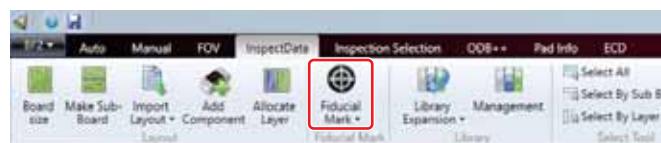


Figure 1-98 Automatic Assignment of Mark 1

Step2: The dialog shown below appears.

Click **Auto by Sub Board ID**.

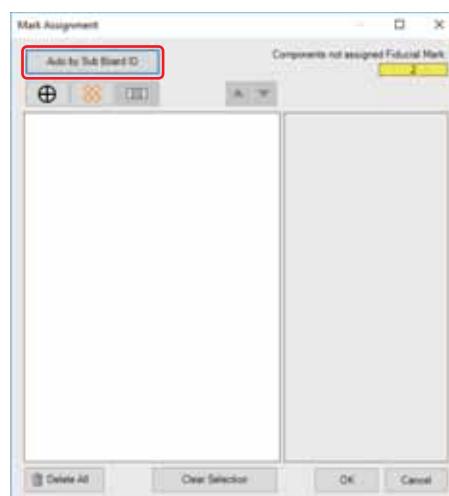


Figure 1-99 Automatic Assignment of Mark 2

Step3: The dialog shown below appears and marks are assigned to all components automatically.

Click **OK** to close dialog.

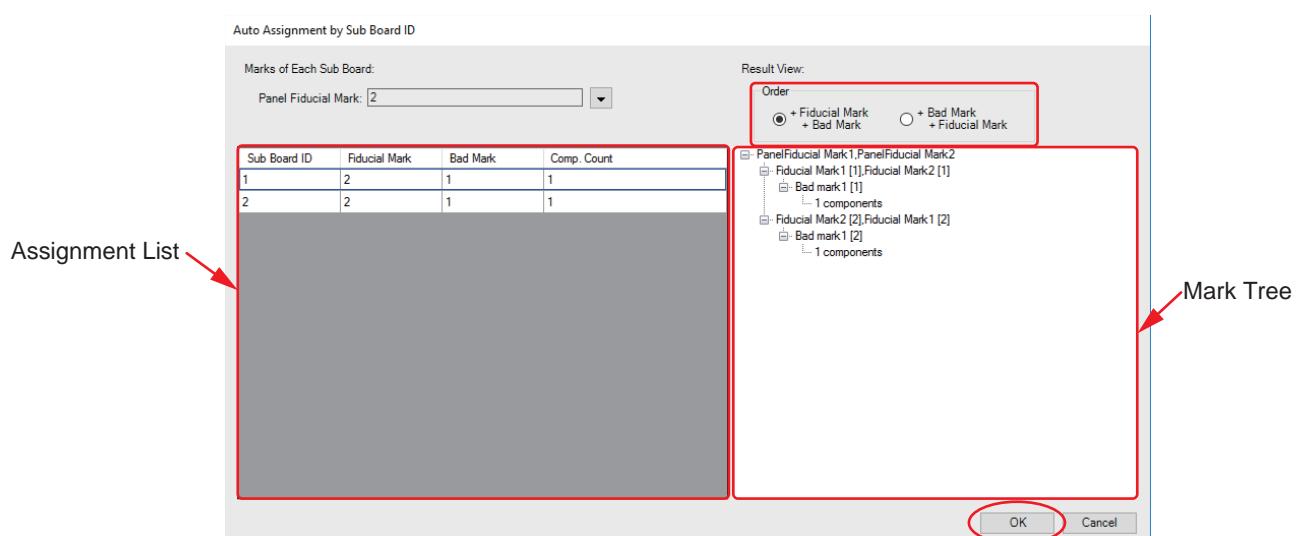


Figure 1-100 Automatic Assignment of Mark 3

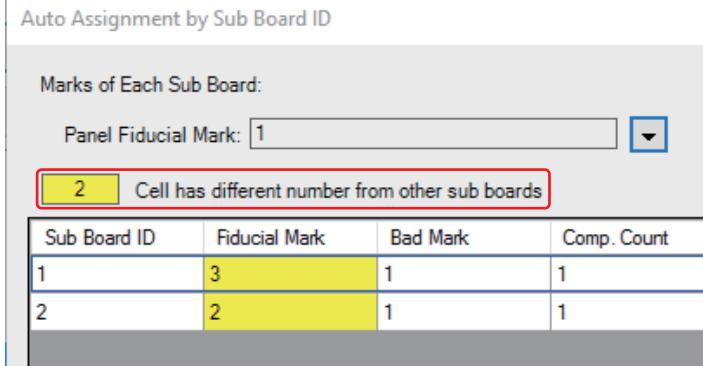
| Item | Description |
|---|--|
| Cell has different number from other sub boards | <p>Appears when mark assignment is not completed normally.</p> <p>CAUTION Mark assignment is not completed normally if any mark is not existing in sub board, or mark setting has any mismatch. For details, refer to 1.4.4 Irregular Case.</p>  |
| Panel Fiducial Mark | The number of panel fiducial mark is displayed. |
| Order | Specifies inspection order for fiducial mark and bad mark. |
| Assignment List | The numbers of fiducial mark, bad mark, and component for each sub board are displayed. When the number of mark on a sub board and on other sub board are different, corresponding cell is highlighted in yellow. |
| Mark Tree | Automatic mark assignment result is displayed. |

Table 1-16 Descriptions

1.4.4 Irregular Case

When Mark is not Existing on Sub Board

When mark is not existing on sub board, or mark setting is not correct, automatic assignment of mark is not completed normally.

When the number of mark on a sub board is different from the one on other sub board, the corresponding cell is highlighted in yellow. And the number of yellow cell is shown in red frame as below.

Check if mark is not deleted accidentally, or mark is set to sub board ID properly.

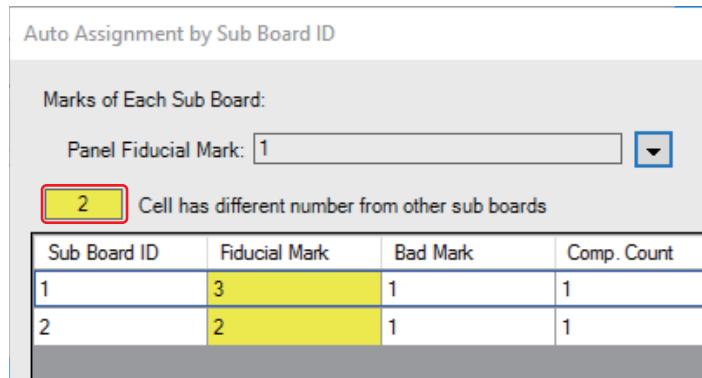


Figure 1-102 Irregular Case 1

When the Sub Board ID for Panel Fiducial Mark and the Sub Board ID for Normal Fiducial Mark are Duplicated

When the sub board ID for panel fiducial mark and the sub board ID for normal fiducial mark are duplicated, automatic assignment of mark is not completed normally.

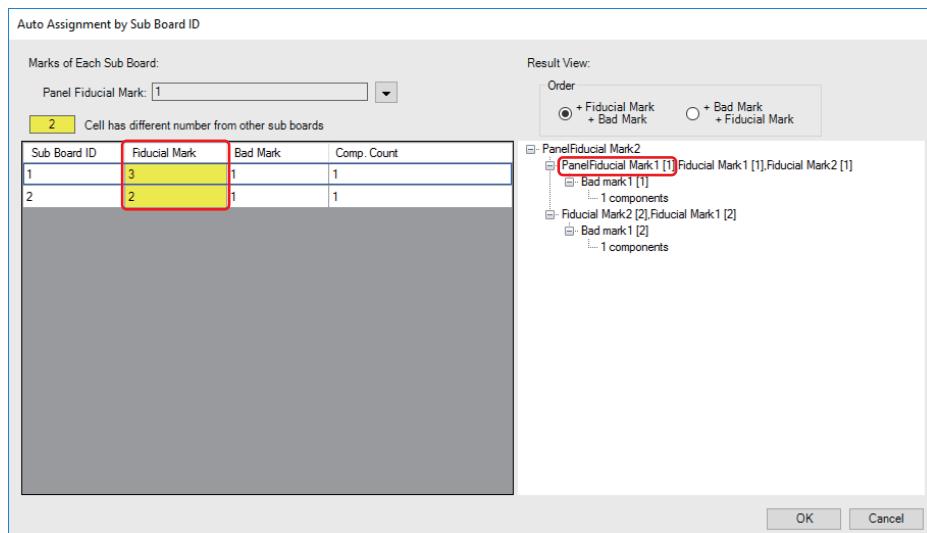


Figure 1-103 Irregular Case 2

The sub board ID of panel fiducial mark should be different from the sub board ID of other fiducial mark. But panel fiducial mark setting is changed without changing sub board ID by clicking in right side of panel fiducial mark.

The list of fiducial mark is displayed. Check panel fiducial mark and click **OK**.

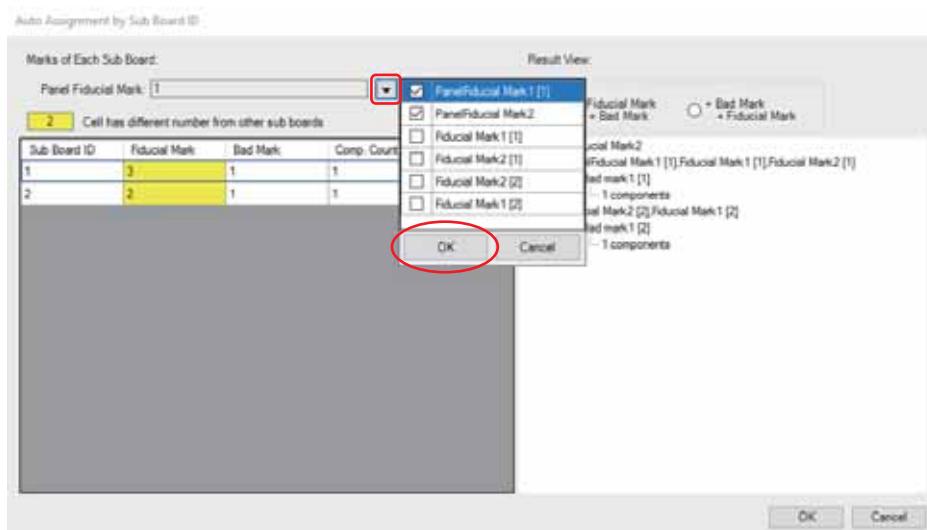


Figure 1-104 Irregular Case 3

The panel fiducial mark is assigned correctly.

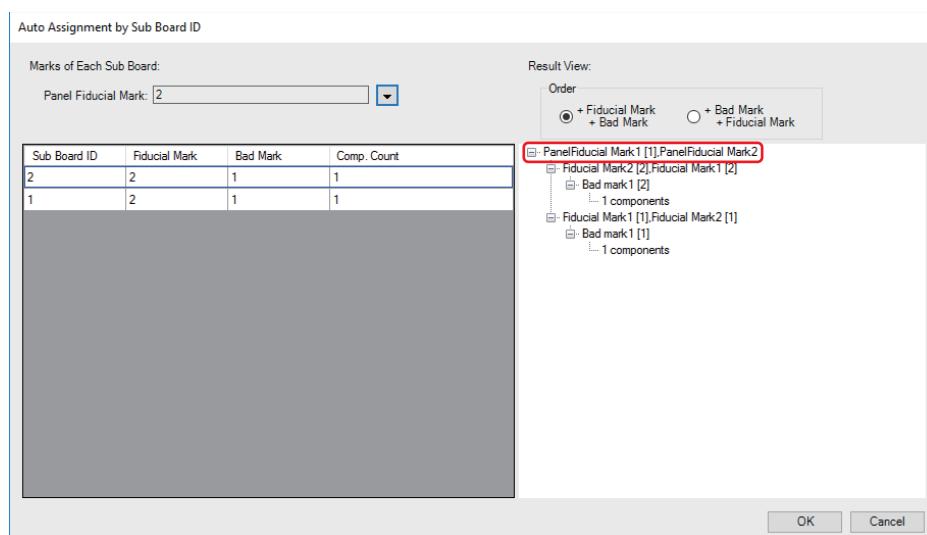


Figure 1-105 Irregular Case 4

1.4.5 Makes Fiducial Mark Compensation

If component data which can be set as a fiducial mark is not present in the CAD data, component data needs to be manually added as a fiducial mark based on the captured image of the actual Board. A gap with the original fiducial mark location occurs when component data is manually added as a fiducial mark.

Use this function to correct the gap described above.

Step1: Create a new fiducial mark at the position of the fiducial mark on the image by reference to **1.4.1 Set the Marks.**

Step2: From **InspectData** tab, select the **Fiducial Mark** group > **Fiducial Mark** > **Adjust Mark Position**.

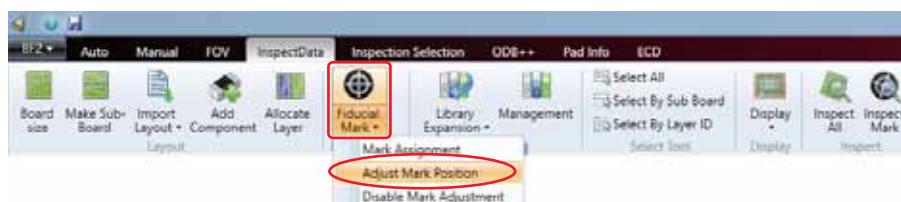


Figure 1-106 Adjust Mark Position

Step3: The dialog shown below appears.

Drag the green-colored window to match the center position of the fiducial mark.

After all the setting is completed, click **Next**.

NOTE Scroll the mouse to zoom in/out the screen.

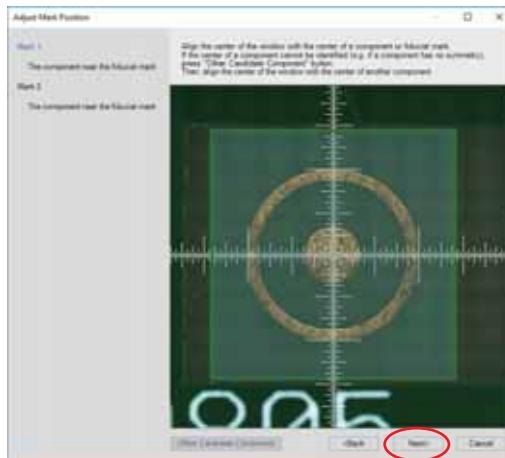


Figure 1-107 Adjusting Mark Position 1

Step4: The dialog shown below appears.

The component closest to the fiducial mark set in Step3 is displayed on the screen.

Adjust the element size by mouse-dragging its corner so that it matches to the component image.

Click **Other Candidate Component** if the shape of the component appears distorted and does not match the center position.

The component which is the second closest to the fiducial mark set in Step3 is displayed.

Clicking **Other Candidate Component** displays a maximum of ten candidates before returning to the first candidate. Click **Back** to return to Step3.

After all the setting is completed, click **Next**.



Figure 1-108 Adjusting Mark Position 2

Step5: Repeat Step3 and Step4 as per the number of fiducial marks.

The dialog shown below appears after completing the setting. Click OK.

Fiducial mark moves to appropriate coordinate. After all the setting is completed, set the fiducial mark by reference to **1.4.2 Manual Assignment of Mark** and **1.4.3 Automatic Assignment of Mark**.

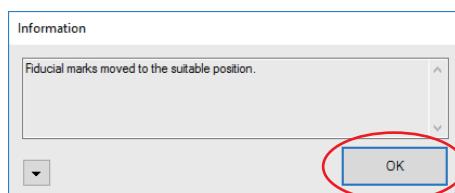


Figure 1-109 Adjusting Mark Position 3

1.4.6 Manual Adjustment of fiducial mark position during Auto Mode

When fiducial mark error occurs during Auto Mode, Auto Mode can be continued by adjusting fiducial mark position manually.

Step1: Select the InspectData tab.

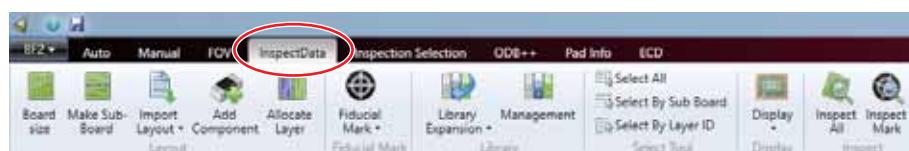


Figure 1-110 Manual Adjustment of fiducial mark position during Auto Mode 1

Step2: Select a fiducial mark on **Board Viewer**.

The edit panel appears and click **Component setting**.

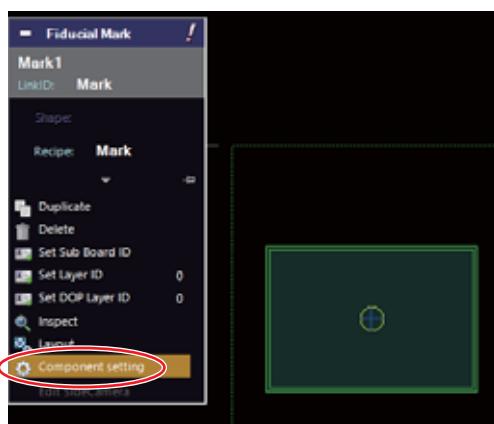


Figure 1-111 Manual Adjustment of fiducial mark position during Auto Mode 2

Step3: The dialog shown below appears.

To continue Auto Mode by adjusting fiducial mark position manually after fiducial mark error occurs, select **Call operator** from **When inspection fails in Auto mode** drop-down list.

When **Stop auto operation** is selected, Auto Mode is stopped if fiducial mark occurs during Auto Mode.

After all the setting is completed, click **OK**.

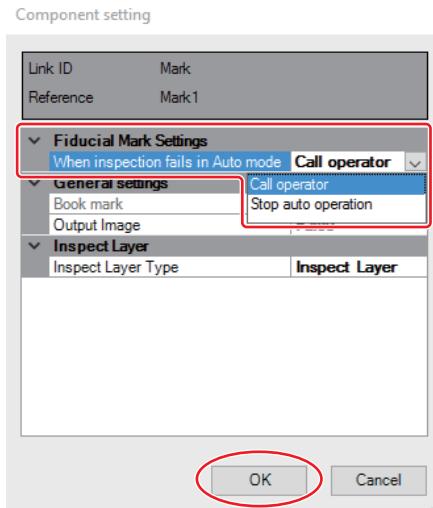


Figure 1-112 Manual Adjustment of fiducial mark position during Auto Mode 3

NOTE

When **Call operator** is selected from **When inspection fails in Auto mode** drop-down list, signal tower and buzzer works depending on signal tower setting. Select **BF2 Option > Machine Settings > Machine > Signal tower setting** and click **Change** to set **Automatic operation waiting** setting.

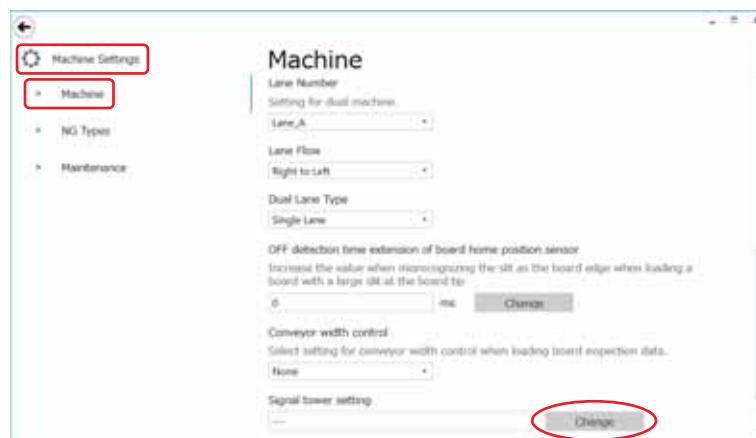


Figure 1-113 Manual Adjustment of fiducial mark position during Auto Mode 4

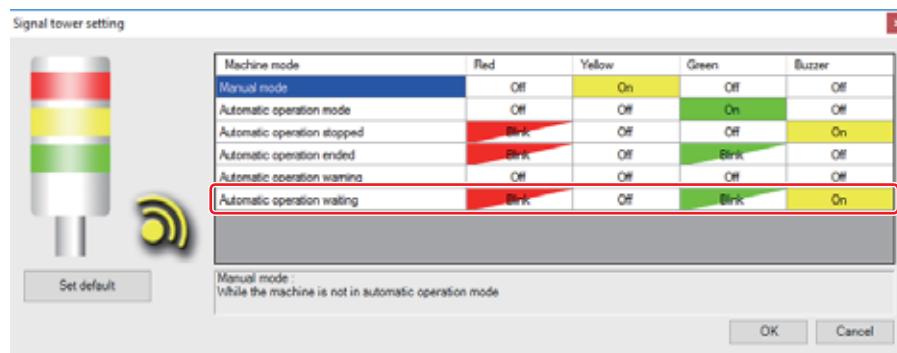


Figure 1-114 Manual Adjustment of fiducial mark position during Auto Mode 5

NOTE

When **Stop auto operation** is selected from **When inspection fails in Auto mode** drop-down list, signal tower and buzzer work by following the setting of **Automatic operation stopped**.

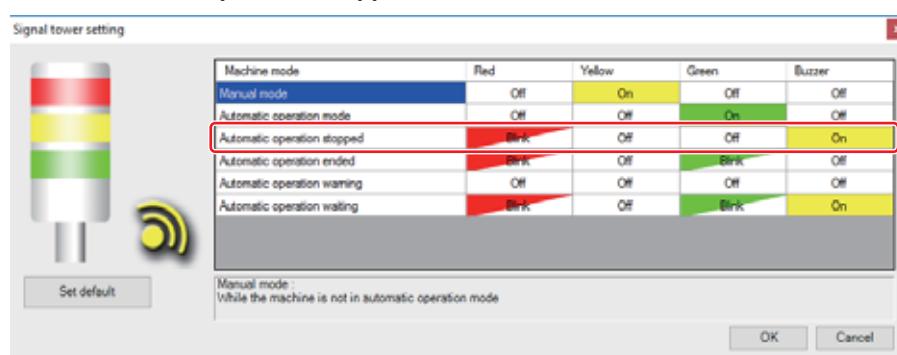


Figure 1-115 Manual Adjustment of fiducial mark position during Auto Mode 6

- Step4: The dialog shown below appears when fiducial mark occurs during Auto Mode. Move the center of window to fiducial mark manually, and click **OK** or press **Enter**. Auto Mode is restarted.

NOTE

Scroll the mouse to scale the screen.

NOTE

Click **Stop buzzer** at bottom left of dialog to stop buzzer.

NOTE

Click **Cancel** at bottom right of dialog to **interrupt Auto Mode**.

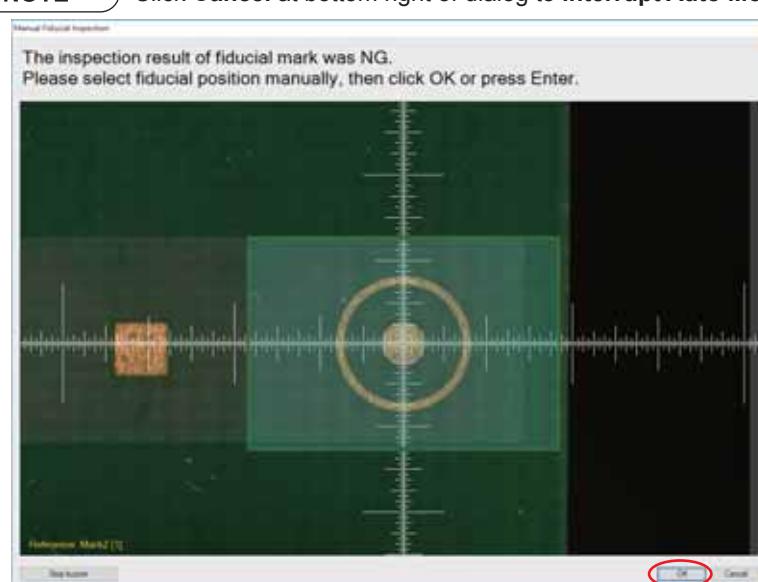


Figure 1-116 Manual Adjustment of fiducial mark position during Auto Mode 7

1.5 Sub Board Data Setting

This section describes how to make a sub board data.

When Sub Board Data is Included in Gerber Data

Step1: From **InspectData** tab, Select the **Layout** group > **Make Sub-Board**.



Figure 1-117 Make Sub-Board

Step2: The dialog for setting a sub board appears.

Click **Pad selection mode**.

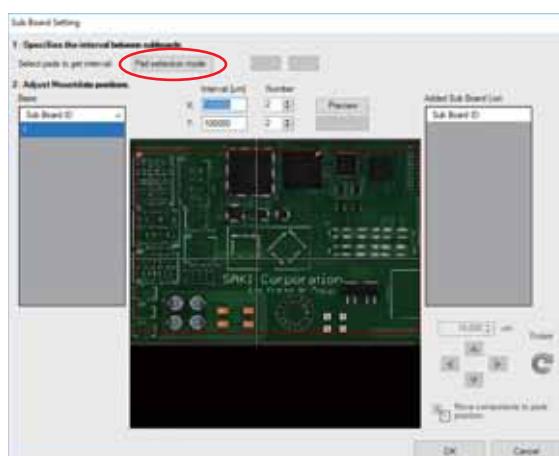


Figure 1-118 Sub Board Setting

Step3: Select a pad in reference sub board by dragging diagonally across the pad as below.
After selecting a pad, click **1st**.

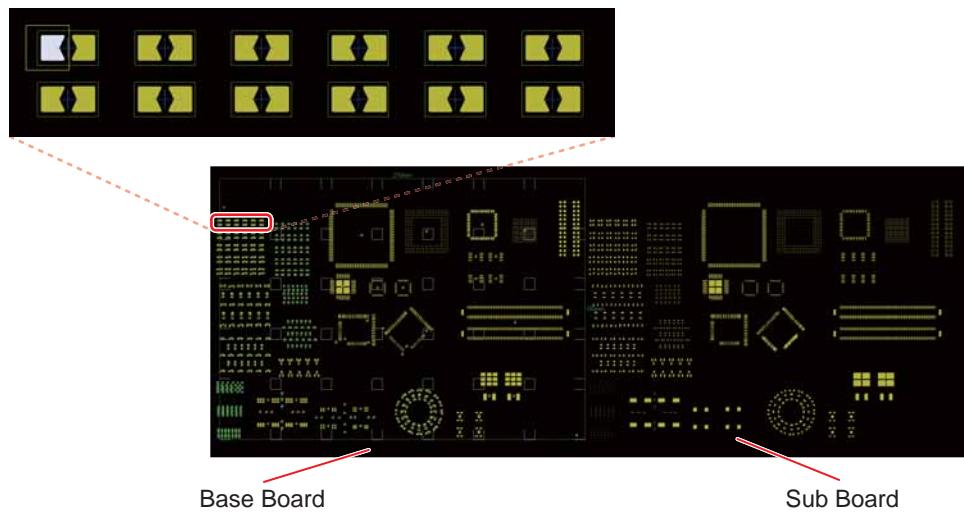


Figure 1-119 Pad Select 1

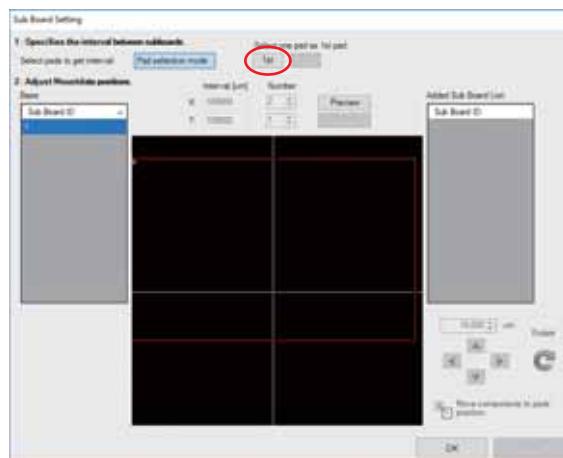


Figure 1-120 Registration of 1st Pad

- Step4: Select a pad which is corresponding to selected pad in Step3 on sub board to expand data.
 After selecting a pad, click **2nd**.
 The number of **Interval** is input automatically.

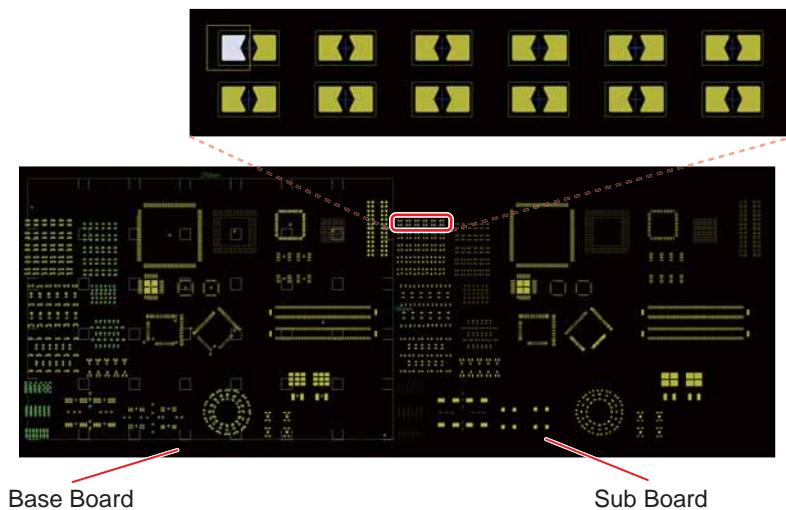


Figure 1-121 Pad Select 2

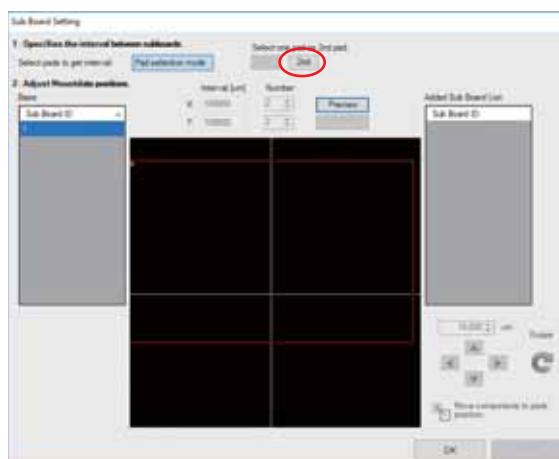


Figure 1-122 Registration of 2nd Pad

Step5: Select sub board ID from **Base** list box, and click **Preview**.

Sub board data is displayed on board viewer as below.

NOTE

Displayed sub board data can be cleared by clicking **Clear**.

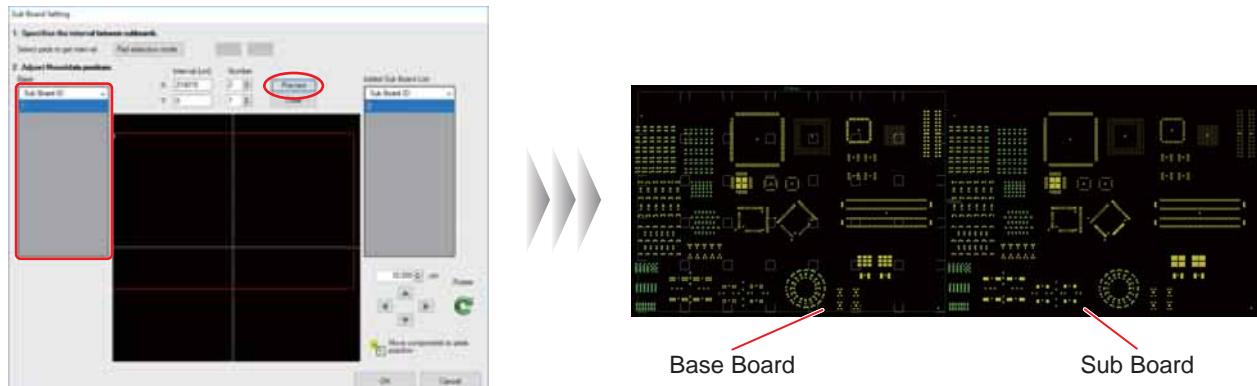


Figure 1-123 Displaying sub board mount data

Step6: Select a sub board ID to adjust position from **Added Sub Board List**.

Adjust position by reference to Table1-17.

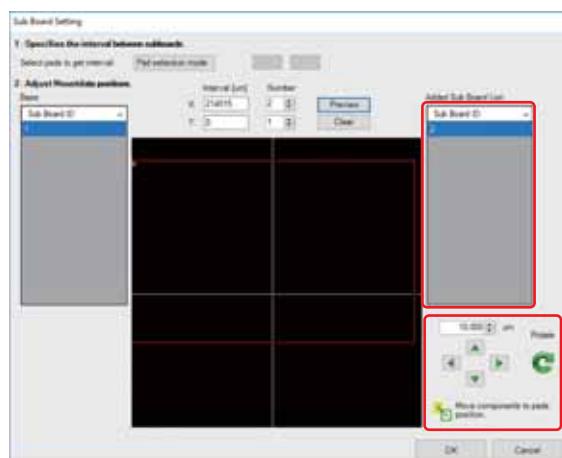


Figure 1-124 Adjustment of sub board mount data

| Item | | Description | |
|---|-----------------------------------|--|---|
| Specifies the interval between subboards. | Pad selection mode | When pad of sub board is existing the gap between sub boards is acquired from pad. | |
| Adjust Mountdata positions. | Base | Specifies a sub board number to be copied. | |
| | Interval | X | Specifies the X-axis interval between sub boards. |
| | | Y | Specifies the Y-axis interval between sub boards. |
| | Number | X | Specifies a number of sub boards in the X-axis. |
| | | Y | Specifies a number of sub boards in the Y-axis. |
| | Preview | Displays the preview of a setting. | |
| | Clear | Reset the preview screen. | |
| | Added Sub Board List | Displays the number of the sub board to be expanded. | |
| | | Moves the selected sub board to the specific direction.(*) | |
| | | Rotates the selected sub board 90 degrees.(*) | |
| | Move components to pads position. | Adjusts component data to the center of gerber data. | |

Table 1-17 Descriptions

CAUTION

(*)Before move or rotate mount data, click **Preview** to display sub board setting result.
And select target sub board.

When Sub Board Data is not Included in Gerber Data

Enter the gap between sub boards to **Interval** and proceed Step5 to Step6.

1.6 Assigning a Shape

1.6.1 Overview of Shape

Shape is a data of a component shape mounted on a board.

A shape data consists of data called **Element**, such as Body, Electrode, and Lead.

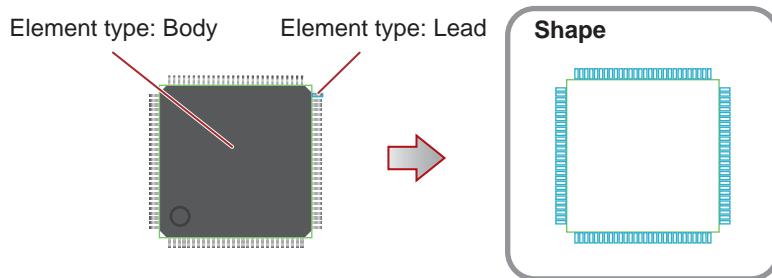


Figure 1-125 Overview of Shape

Each **Element** has an **Element ID**. When one of the **Elements** is edited, the same modification is also applied to **Elements** which share the same **Element ID**.

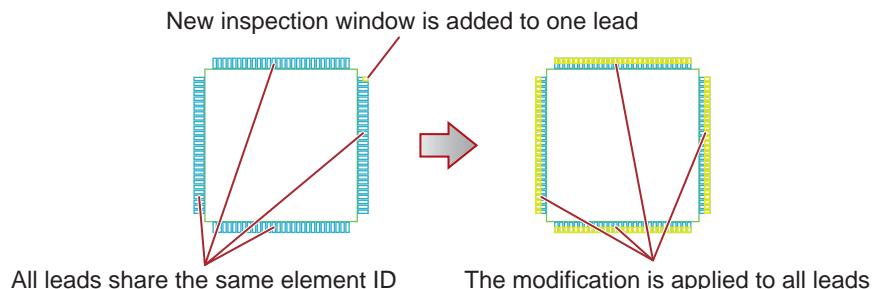


Figure 1-126 Editing a Shape

The following chart shows the operation procedure for assigning a shape.

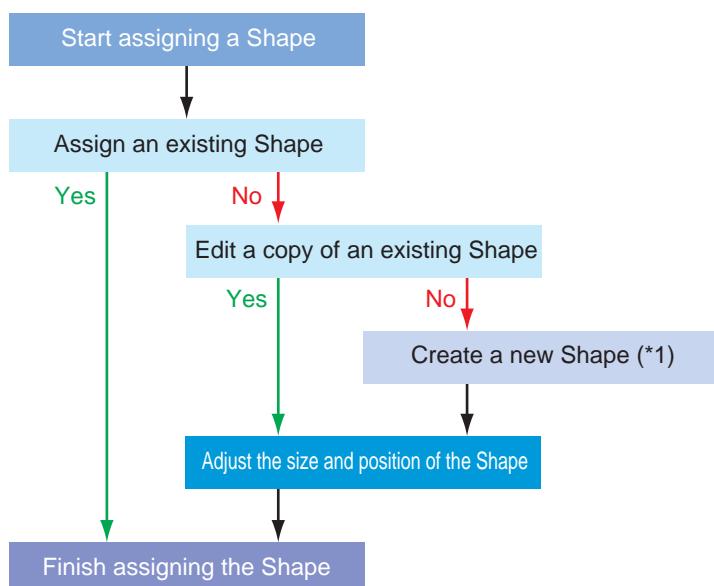


Figure 1-127 Assigning a Shape

NOTE

(*1) Shape can be made more precisely by **Shape Wizard**.

To use **Shape Wizard** is recommended to make new Shape.

For details, refer to **1.6.6 Making a Shape by Shape Wizard**.

1.6.2 Window Details

Here describes and illustrates the Edit shape screen.

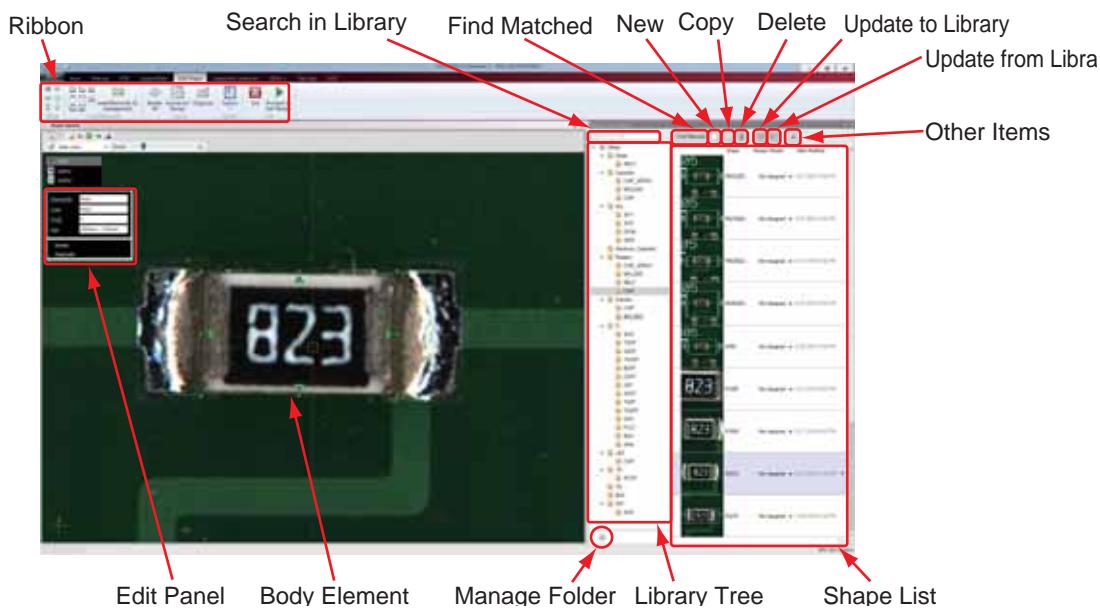


Figure 1-128 Window Details

| Item | | Description |
|-------------------|------------------------|---|
| Body Element | | Indicates an element of a component body. The element also used for adjusting a Shape. For details, refer to 1.7 Adjusting a Shape . |
| Ribbon | Body | Used for adjusting a Shape. |
| | Lead/Electrode | For details, refer to 1.7 Adjusting a Shape . |
| | Layout | |
| | Option | |
| | Exit | Finishes editing a Shape and return to the InspectData tab. For details, refer to 1.8 Closing the Edit Shape Screen . |
| Edit Panel | Proceed to Edit Recipe | Finishes editing a Shape and proceed to the Edit recipe screen. For details, refer to 1.8 Closing the Edit Shape Screen . |
| | | Used for adjusting a Shape. For details, refer to 1.7 Adjusting a Shape . |
| Search in Library | | Searches a Shape whose name includes the text entered in the text-box. |
| Find Matched | | Searches a Shape whose shape is similar to the selected component data. |
| New | Blank | Adds a square body element as a Shape. |
| | Shape wizard | Makes a Shape with the wizard. For details, refer to 1.6.6 Making a Shape by Shape Wizard . |
| Copy | | Copies the selected Shape. |
| Delete | | Deletes the selected Shape. |

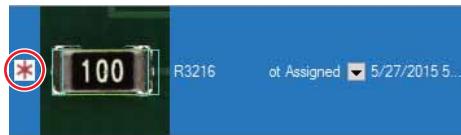
| Item | | Description | |
|---------------------|---------------|---|---|
| Update to Library | | The update is not saved to Library but only to the opened inspection data if Save as local library is clicked when exiting. ★ mark is displayed on the left of Shape list if the update has not been registered in Library. | |
| Update from Library | |  | |
| Other Items | Rename | Changes the name of the selected Shape. | |
| | Move | Moves the selected Shape to the selected folder. | |
| | View | List | Displays Shape names and updated dates. |
| | | Image List | Displays Shape names, updated dates, and images of Shape. |
| Library Tree | | Displays folders saved in the selected library. | |
| Shape List | | Displays Shapes saved in the selected folder. | |
| Manage Folder | New Folder | Adds a new folder to the library tree. | |
| | Delete Folder | Deletes the selected folder from the library tree. | |

Table 1-18 Descriptions

1.6.3 Opening the Edit Shape Screen

Step1: Select the **InspectData** tab.



Figure 1-130 InspectData

Step2: Select a component data which a Shape is to be assigned to from **Board Viewer**.

The edit panel appears on **Board Viewer**. Select **Shape**.

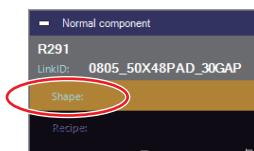


Figure 1-131 Edit Panel

1.6.4 Assigning an Existing Shape

Here describes how to assign a Shape saved in a library to a component data.

CAUTION Changing an existing Shape setting in Library may affect the inspection result of another component. If an existing Shape needs to be kept and used for other components, copy and edit the Shape by reference to **1.6.5 Copying an Existing Shape**.

Step1: Open the Edit shape screen by reference to **1.6.3 Opening the Edit Shape Screen**.

Step2: Click **Find Matched** in **Shape Library Editor** and select a component type.

Shapes which are matched to the selected component type are displayed in the shape list.

NOTE To search a Shape by its name, enter the name in the **Search in Library** text-box on the upper left side of **Shape Library Editor**.

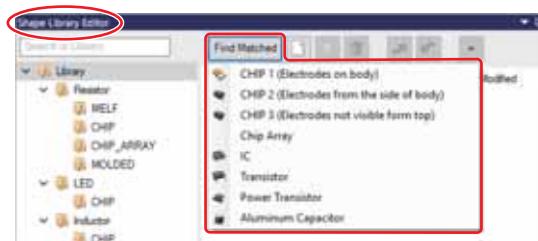


Figure 1-132 Assigning an Existing Shape 1

Step3: Select a Shape from the Shape list.



Figure 1-133 Assigning an Existing Shape 2

Step4: Click **Assign** in **Shape selection preview**.

The Shape is assigned to all component data sharing the same Link ID.



Figure 1-134 Assigning an Existing Shape 3

Step5: Close the Edit shape screen by reference to **1.8 Closing the Edit Shape Screen**.

1.6.5 Copying an Existing Shape

Here describes how to copy a shape saved in Library and assign selected component.

Follow below steps if an existing shape needs to be kept and used for another component.

Step1: Select a Shape to be copied by reference to Step1 to Step3 of **1.6.4 Assigning an Existing Shape**.

Step2: Click **Copy** in **Shape Library Editor**.



Figure 1-135 Copying an Existing Shape 1

Step3: Enter a Shape name and click **OK**.

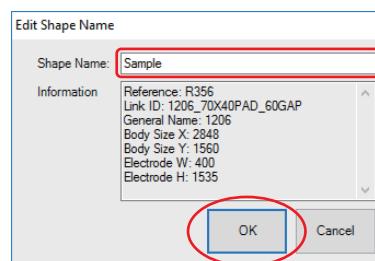


Figure 1-136 Copying an Existing Shape 2

Step4: Click **Assign** in **Shape selection preview**.

The Shape is assigned to all component data sharing the same Link ID.



Figure 1-137 Copying an Existing Shape 3

Step5: Adjust the Shape by reference to **1.7 Adjusting a Shape**.

Step6: Close the Edit shape screen by reference to **1.8 Closing the Edit Shape Screen**.

1.6.6 Making a Shape by Shape Wizard

Here describes how to make a new Shape by the Shape wizard and how to assign it to a selected component. If there is no Shape which can be assigned to the selected component, follow the procedure below and make a new Shape.

Step1: Open the Edit shape screen by reference to **1.6.3 Opening the Edit Shape Screen**.

Step2: From the library tree of **Shape Library Editor**, select a folder to save the new Shape.

NOTE To add/delete a folder, click  (Manage folder) and select the relevant menu item.

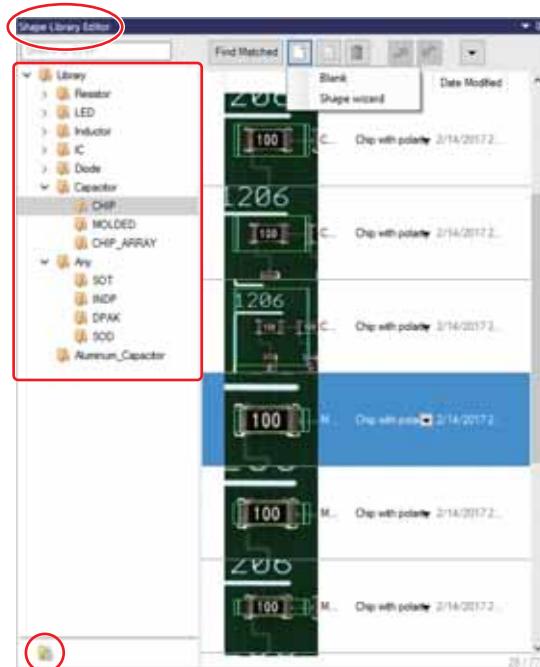


Figure 1-138 Shape Wizard 1

Step3: Select  (New) > **Shape wizard**.

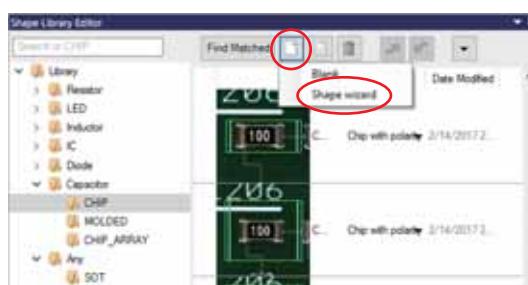


Figure 1-139 Shape Wizard 2

- Step4: Adjust the body element (green rectangle) size to make it match with the component body.
Click **Next**.



Figure 1-140 Shape Wizard 3

- Step5: Select a component type from **Component type**.

One of **None**, **Electrode**, **Electrode array**, **Multi array**, or **Lead array** is automatically set to each side of the Body element in accordance with the selected component type.

Make sure the correct element is set to each side of the Body element and click **Next**.

If an element is incorrect, change the element by reference to Table 1-19.

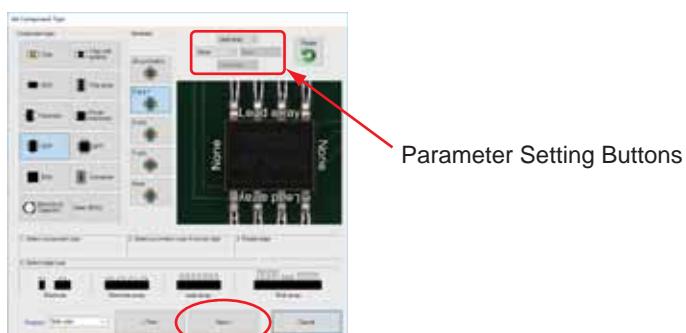


Figure 1-141 Shape Wizard 4

| Item | | Description |
|--------------------------|---------------|--|
| Component type | | Specifies a component type of a Shape. If there are no applicable component types, select Other . Set the elements with items in Symmetry and the parameter setting buttons. |
| Symmetry | All symmetric | Sets the same element to every side of the Body element by the same layout. The element set in the top side is also set to other sides. This setting is suitable for components such as QFP. |
| | X and Y | Sets the same element to opposite sides (top and bottom/left and right) of the Body element by the same layout. The element set in the top side is also set to the bottom side, and the element set in the left side is also set to the right side. This setting is suitable for many components including SOP and chips. |
| | X only | Sets the same element to the left side and the right side of the Body element by the same layout. The element set in the left side is also set to the right side. Elements on the top side and the bottom side can be set individually. |
| | Y only | Sets the same element to the top side and bottom side of the Body element by the same layout. The element set in the top side is also set to the bottom side. Elements on the left side and the right side can be set individually. |
| | None | Elements on every side can be set individually. |
| Parameter Setting Button | | Sets the element on each side of the Body element individually. Each button corresponds to each side of the Body element. The drop-down list opens when a button is clicked. |
| Rotate | | Rotates parameter settings 90 degrees to counter-clockwise. |

Table 1-19 Descriptions

Step6: The dialogs shown below appear in accordance with the selected parameter.

NOTE If the different element is set to each side, the dialog shown below appears in turn.

When Electrode is Selected

Move the blue vertical line to the center of the pad and move the blue horizontal line and gray vertical line to the boundary of the pad. Click **Next**.

NOTE The electrode shape is aligned with the center of body element when **Centering after wizard** is checked.

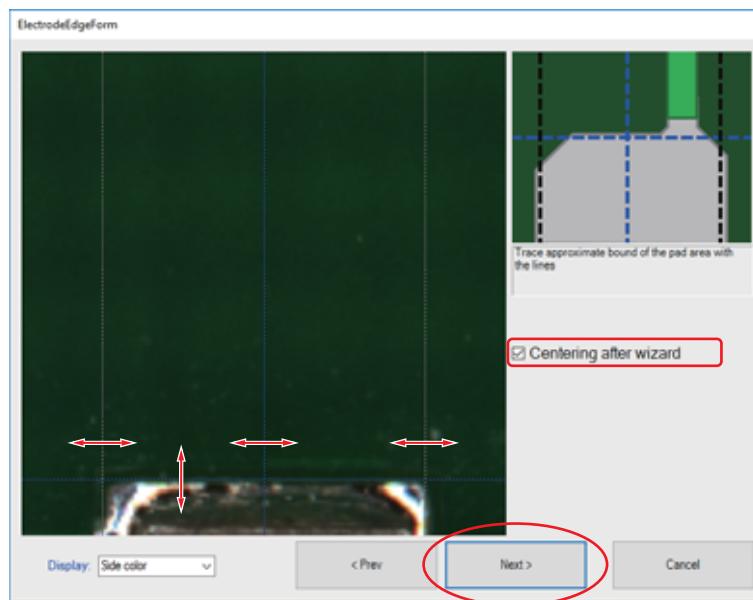


Figure 1-142 Electrode

When Lead Array or Electrode Array is Selected

Enter the number of the leads (electrodes) into Count and the pitch between leads (electrodes) into Pitch with referring to the zoom out view displayed on the lower right side of the dialog. Move the blue vertical lines to the centers of the pads and move the blue horizontal lines and gray vertical lines to the boundaries of the pads in the upper left side and right side windows. Click **Next**.

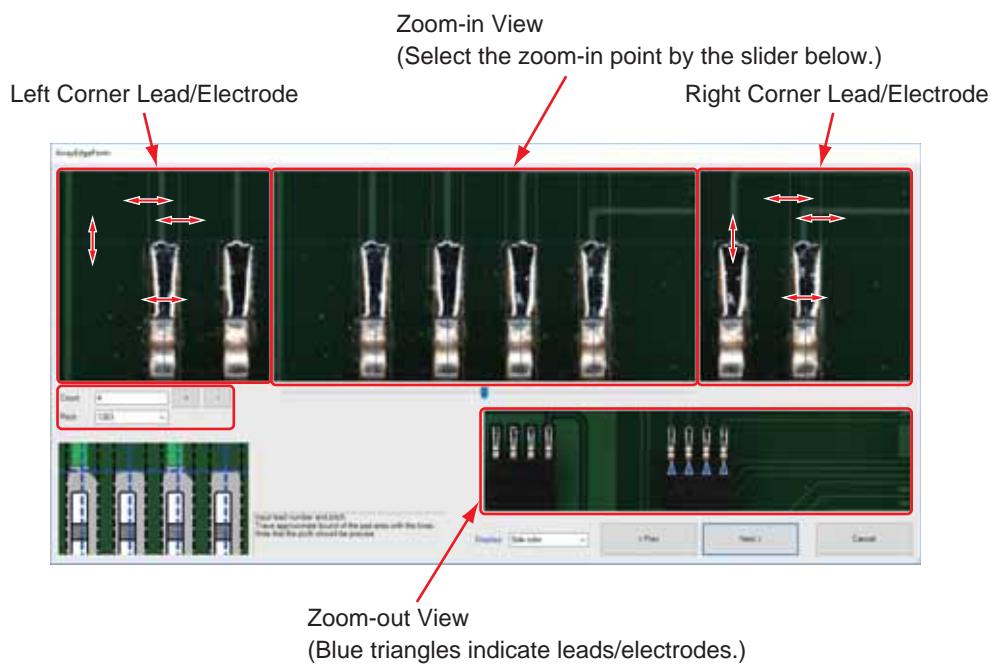


Figure 1-143 Lead Array/Electrode Array

When Multi Array is Selected

Select multi array type from the left top of dialog by reference to Table1-20.

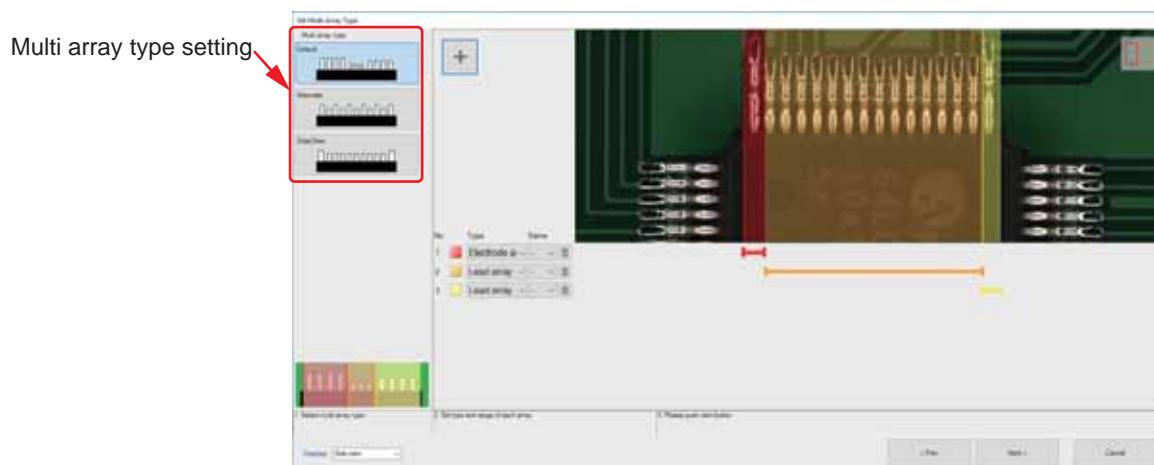


Figure 1-144 Multi Array

| item | Description |
|-----------|---|
| Default | Creates the shape for irregular element. |
| Altenate | Creates the shape when different elements are alternately arranged. |
| SideOther | Creates the shape when only both end elements are different. |

Table 1-20 Descriptions

[i] Default

Set the ranges where the same type of array or electrodes are continuous by reference to Table 1-21. After all the setting is completed, click **Next**.

The dialog shown in Figure 1-143 appears and make the range settings.

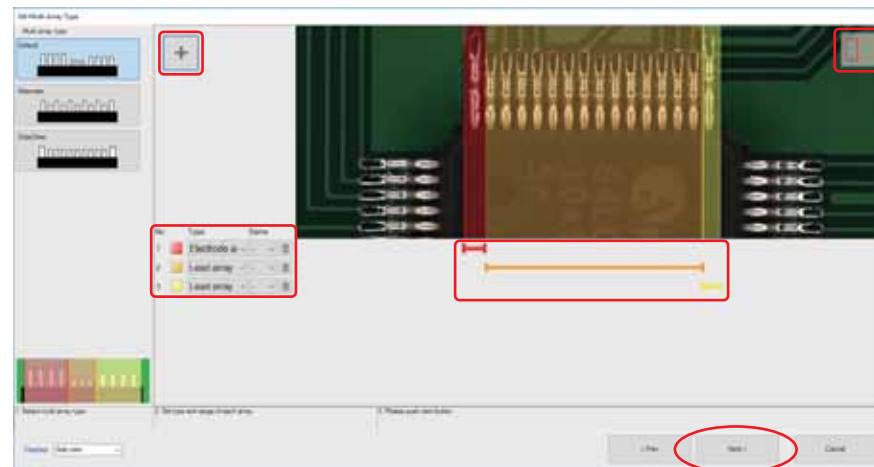


Figure 1-145 Multi Array (Default)

| item | Description |
|------|--|
| | The number of ranges is increased. When this button is clicked, new color appears on dialog for grouping. |
| No | Shows the number of each range. |
| Type | Specifies element type for each range. Lead Array, Electrode Array, or Electrode are available. |
| Same | Select the number of range which has same size array from Same drop-down list. Once number is selected, the color will also change to follow the selected range. |
| | Specifies setting if fill the range. |
| | By mouse-dragging of both end, the range is changed. |

Table 1-21 Descriptions

[ii] Alternate

Click **Next**. The dialog shown in Figure 1-143 appears and make the settings.

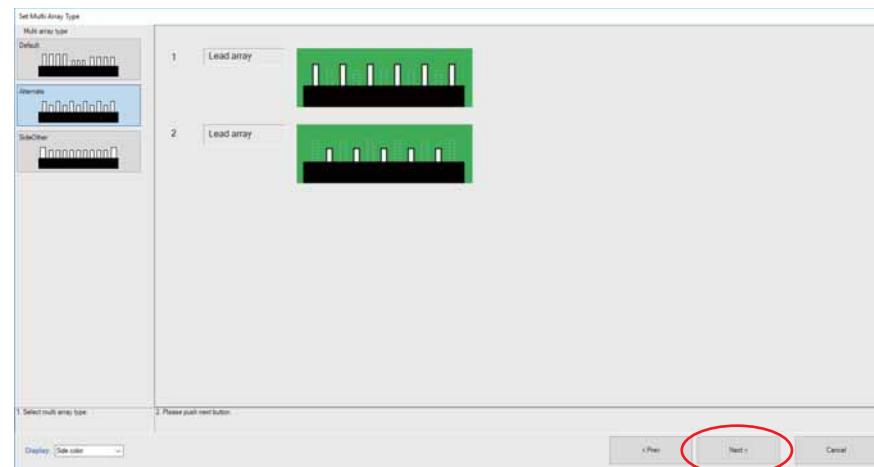


Figure 1-146 Multi Array (Alternate)

[iii] SideOther

Set **Lead array** or **Electrode array** from **Side** drop-down and **Other** drop-down list.

After all the setting is completed, click **Next**.

The dialog shown in **When Lead Array or Electrode Array is Selected** appears and make the settings.

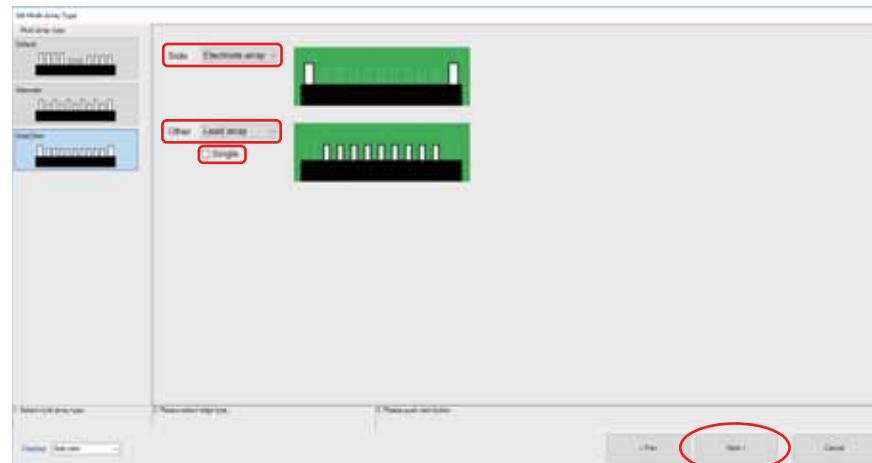


Figure 1-147 Multi Array (SideOther)

| item | Description |
|--------|---|
| Side | Specifies the type of element for both ends. |
| Other | Specifies the type of element other than both ends. |
| Single | Check if the number of element other than both ends is one. |

Table 1-22 Descriptions

When None is selected

Automatically proceeds to Step7.

Step7: Enter a Shape name and click **OK**.

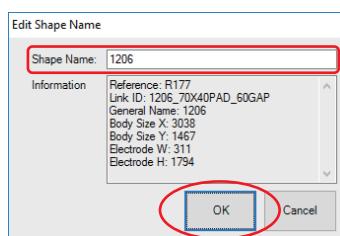


Figure 1-148 Shape Wizard 5

Step8: Click **Assign** on **Shape selection preview** of **Window Tree**.

The Shape is assigned to all component data sharing the same Link ID.



Figure 1-149 Shape Wizard 6

Step9: Close the Edit shape screen by reference to **1.8 Closing the Edit Shape Screen**.

1.6.7 Making a Shape Manually

Here describes how to make a Shape manually. If the Shape cannot be made by the Shape wizard, follow the below procedure and make a new Shape.

CAUTION In this function, only the square Body element is made. Adjust the Shape by reference to **1.7 Adjusting a Shape**.

Step1: Open the Edit shape screen by reference to **1.6.3 Opening the Edit Shape Screen**.

Step2: Select **New > Blank**.



Figure 1-150 Making a Shape Manually 1

Step3: Enter a Shape name and click **OK**.

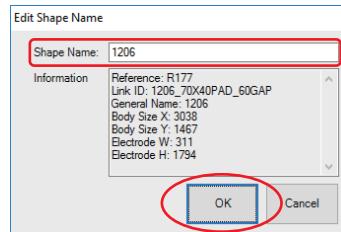


Figure 1-151 Making a Shape Manually 2

Step4: Click **Assign** on **Shape selection preview of Window Tree**.

The Shape is assigned to all component data sharing the same Link ID.



Figure 1-152 Making a Shape Manually 3

Step5: Adjust the Shape by reference to **1.7 Adjusting a Shape**.

Step6: Close the Edit shape screen by reference to **1.8 Closing the Edit Shape Screen**.

1.7 Adjusting a Shape

This section describes how to edit and adjust a Shape.

For editing a Shape, **Ribbon**, **Edit panel**, and **Body element** are mainly used.

1.7.1 Window Details

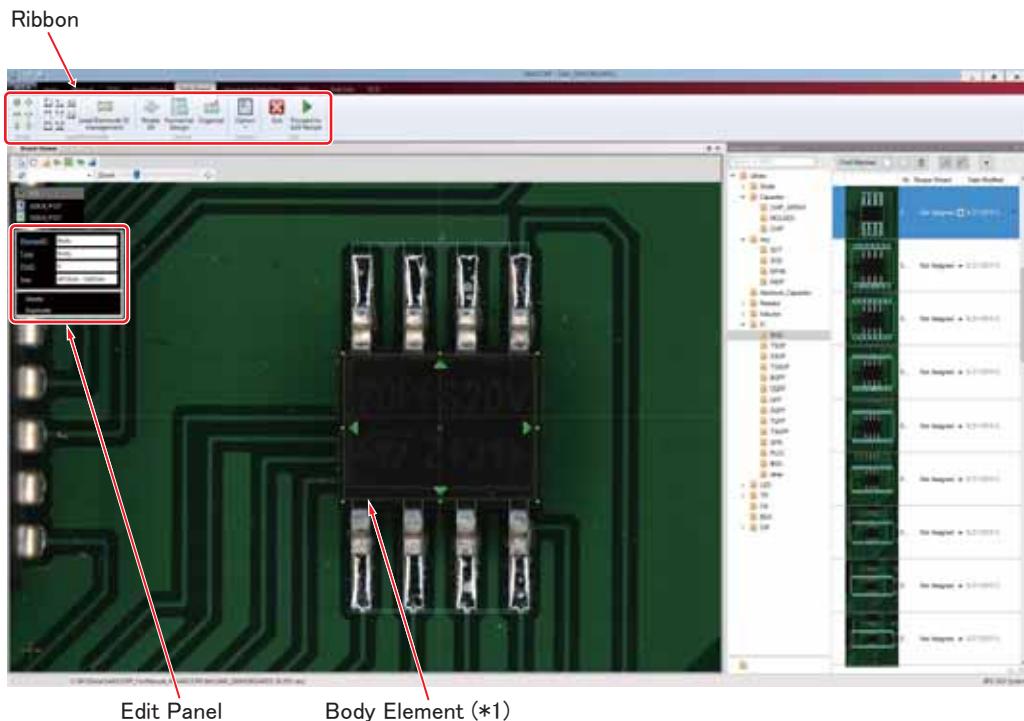


Figure 1-153 Window Details

| Item | | Description |
|------------------------------|--------|--|
| Body Element | | Adds/Deletes elements. For details, refer to 1.7.4 Adding an Element from the Body Element . |
| Body | [+] | Enlarges the Body element by 10%. (*2) |
| | [+] | Enlarges the Body element width by 10%. (*2) |
| | [+] | Enlarges the Body element length by 10%. (*2) |
| | [+] | Shrinks the Body element by 10%. (*2) |
| | [+] | Shrinks the Body element width by 10%. (*2) |
| | [+] | Shrinks the Body element length by 10%. (*2) |
| Ribbon | [+][+] | Enlarges the length of the lead/electrode element by 10%. (*2) |
| | [+][+] | Enlarges the width of the lead/electrode element by 10%. (*2) |
| | [+][+] | Enlarges the pitch between the lead/electrode elements by 10%. (*2) |
| | [+][+] | Shrinks the length of the lead/electrode element by 10%. (*2) |
| | [+][+] | Shrinks the width of the lead/electrode element by 10%. (*2) |
| | [+][+] | Shrinks the pitch between the lead/electrode elements by 10%. (*2) |
| | [+] | Adds one lead/electrode to every side of the Body element. |
| | [X] | Deletes one lead/electrode from every side of the Body element. |
| Lead/Electrode ID management | | Used for changing IDs of leads and electrodes. For details, refer to 1.7.5 Lead/Electrode ID Management . |

| Item | | | Description |
|------------|------------|--|---|
| Ribbon | Layout | Rotate All | Rotates all elements in the Shape 90 degrees to clockwise. |
| | | Numerical Design | Used for changing elements number, size, and form to be changed. For details, refer to 1.7.3 Adding Elements by Numerical Design . |
| | | Organize | Used for adjusting elements positions. For details, refer to 1.7.6 Adjusting Element Positions . |
| | Option | Stick to body | When checked, lead and electrode elements stick to the Body element. If the elements need to be detached, remove a check mark from this item. |
| Edit Panel | Element ID | Select or input | Used for changing an element ID. |
| | | Apply the same value to... all elements on this side with the same type | Apply the same modification to all elements on the same side and sharing the same Type . |
| | | all elements with the same type | Apply the same modification to all elements with the same Type . |
| | Type | | Indicates an element type. Type can be changed by clicking the text-box. |
| | Pin ID | Set this as #1 and count up clock-wise | Sets the Pin ID of the selected element to 1 and give numbers to other pins clockwise. |
| | | Set this as #1 and count up counter-clock-wise | Sets the Pin ID of the selected element to 1 and give numbers to other pins counter-clockwise. |
| | | Input | Assigns the Pin ID entered in the text-box to the selected element. |
| | Size | Input | Changes the selected element size to the entered value. |
| | | Apply the same value to... all elements on this side with the same type | Apply the same modification to all elements on the same side and sharing the same Type . |
| | | all elements with the same type | Apply the same modification to all elements with the same Type . |
| | Delete | | Deletes the selected element. |
| | Duplicate | | Copies the selected element. |

Table 1-23 Descriptions

NOTE

(*1) To display the menu items of the Body element, click the green triangles on the element sides.

(*2) The adjusting value becomes 2% when clicking the item with pressing **Ctrl**.

1.7.2 Adjusting an Element Size

Here describes how to adjust an element size.

If the Shape is made manually, adjust the Body element size at first by following this procedure.

Step1: Select an element to adjust from **Board Viewer**.

Step2: Adjust the element size so it matches to the component image by mouse-dragging the corner of the element.

NOTE Elements sizes can also be adjusted from the Body group, Lead/Electrode group of the ribbon, and Size of the edit panel. For details, refer Table 1-23.

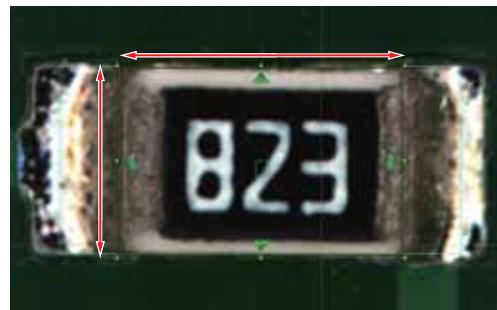


Figure 1-154 Adjusting an Element Size

NOTE When multiple elements such as leads and electrodes are selected at the same time, the size adjusting behavior differs in accordance with where to be dragged. If the outer white square is dragged, the pitches between the elements are changed but the elements sizes are not changed. If the inner colored rectangle is dragged, the elements sizes are changed without changing the pitch.

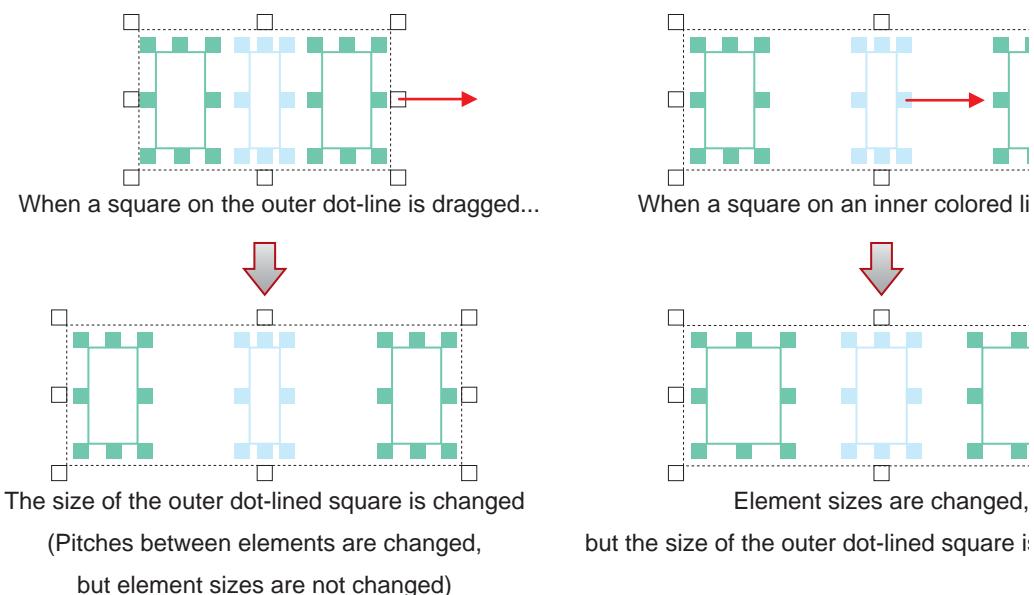


Figure 1-155 Adjusting Sizes of Multiple Elements

1.7.3 Adding Elements by Numerical Design

Here describes how to add elements by the Numerical Design function. This function is suitable for when adding the same number of leads/electrodes to two or more sides of the Body element of a symmetric Shape (e.g., IC component).

Step1: Select a Body element from **Board Viewer**.

Step2: From **Edit Shape** tab, select the **Layout** group > **Numerical Design**.

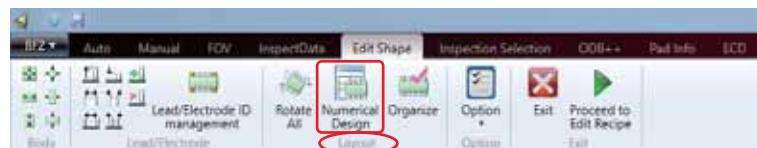


Figure 1-156 Numerical Design 1

Step3: Make the setting by reference to Table 1-24. After all the setting is completed, click **Close**.

| Shape Numeric Design Form | |
|----------------------------|------|
| Body X [μm] | 4610 |
| Body Y [μm] | 3463 |
| Lead/Electrode num X | 4 |
| Lead/Electrode num Y | 0 |
| Lead/Electrode Total | 8 |
| Lead/Electrode Pitch [μm] | 1270 |
| Lead/Electrode Length [um] | 2718 |
| Lead/Electrode Width [um] | 442 |
| Close | |

Figure 1-157 Numerical Design 2

| Item | Description |
|----------------------------|--|
| Body X [μm] | Specifies the Body element width. |
| Body Y [μm] | Specifies the Body element length. |
| Lead/Electrode num X | Specifies the number of leads/electrodes attached to the top/bottom side. e.g., If 4 is entered, 4 lead and bridge elements are added to the top and bottom side of the Body element. |
| Lead/Electrode num Y | Specifies the number of leads/electrodes attached to the left/right side. e.g., If 4 is entered, 4 lead and bridge elements are added to the left and right side of the Body element. |
| Lead/Electrode total | Specifies the total number of leads/electrodes included in the Shape. |
| Lead/Electrode Pitch [μm] | Specifies the pitch between leads/electrodes included in the Shape. |
| Lead/Electrode Length [um] | Specifies the length of leads/electrodes included in the Shape. |
| Lead/Electrode Width [um] | Specifies the width of leads/electrodes included in the Shape. |

Table 1-24 Descriptions

1.7.4 Adding an Element from the Body Element

Here describes how to add elements by the Body element menu.

This function is suitable for when adding the different number of leads/electrodes to each side of the Body element in a asymmetric Shape (e.g., transistor).

Step1: Select a Body element from **Board Viewer**.

Step2: Green triangles are displayed on each side of the Body element.

Click the triangle corresponding to the side which an element to be added and make the setting from the pop-up menu.

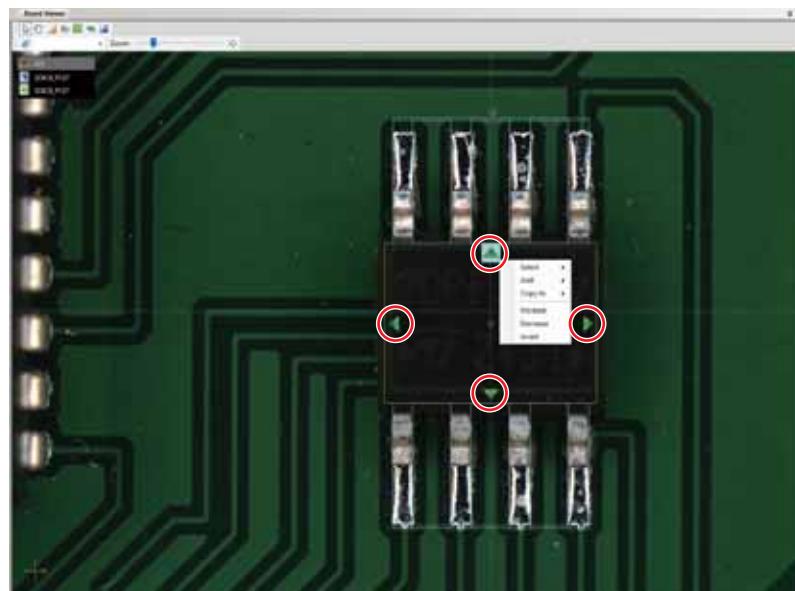


Figure 1-158 Body Element

| Item | | Description | | | |
|--------------|---------|---|--|--|--|
| Body Element | Select | Select all | Selects all elements included in the selected side. | | |
| | | Select lead and bridge | Selects all elements for leads and bridges included in the selected side. | | |
| | | Select lead | Selects all elements for leads included in the selected side. | | |
| | | Select bridge | Selects all elements for bridges included in the selected side. | | |
| | | Select electrode | Selects all elements for electrodes included in the selected side. | | |
| | | Select electrode and bridge | Selects all elements for electrodes and bridges included in the selected side. | | |
| | Add | Add leads | Adds elements for leads and bridges to the selected side. | | |
| | | Add electrodes | Adds elements for electrodes to the selected side. | | |
| | Copy to | Copy to top | Copies all elements included in the selected side to the specific side. | | |
| | | Copy to right | | | |
| | | Copy to left | | | |
| | | Copy to bottom | | | |
| | | Copy to all | | | |
| Increase | | Increase/decrease the number of elements for leads/electrodes of the selected side. | | | |
| Decrease | | | | | |
| Invert | | Inverts the positions of elements for leads/electrodes of the selected side. | | | |

Table 1-25 Descriptions

Step3: Adjust each element size by reference to **1.7.2 Adjusting an Element Size**.

1.7.5 Lead/Electrode ID Management

Here describes how to change IDs of leads and electrodes.

This function is suitable for when performing different inspections to each side of a component or when performing the different inspection only to the corner leads or electrodes.

Step1: From **Edit Shape** tab, select the **Lead/Electrode** group > **Lead/Electrode ID management**.

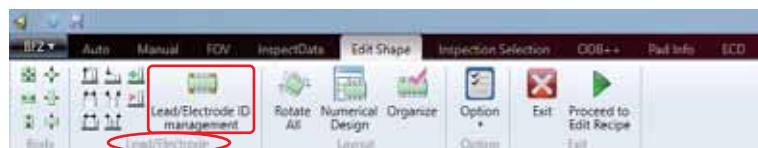


Figure 1-159 Lead/Electrode ID Management 1

Step2: Make the setting by reference to Table 1-26. After all the settings are completed, click **OK**.

CAUTION Make sure to adjust the position of lead/electrode elements after adjusting the position of the Body element.

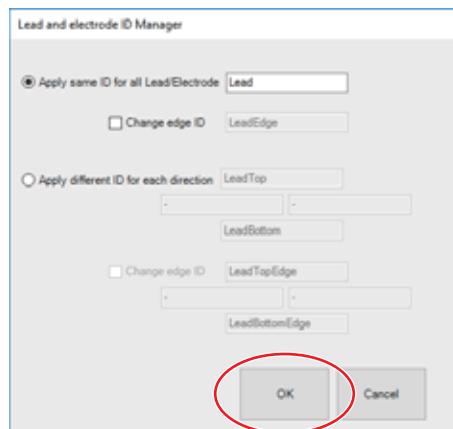


Figure 1-160 Lead/Electrode ID Management 2

| Item | Description |
|---------------------------------------|---|
| Apply same ID for all Lead/Electrode | Applies the element ID entered to the text-box on the right side to all leads/electrodes of a Shape. |
| Change edge ID | Applies a different element ID only to corner leads or electrodes. |
| Apply different ID for each direction | Applies a different element ID to each side of leads or electrodes. Each ID can be specified on the corresponding text-box on the right side. |
| Change edge ID | Applies a different element ID only to corner leads or electrodes. |

Table 1-26 Descriptions

1.7.6 Adjusting Element Positions

Here describes how to adjust positions of elements including the Body element.

If an element position is inappropriate, an inspection may not be performed correctly.

Make sure to adjust element positions correctly especially when a Shape is made manually.

Step1: From **Edit Shape** tab, select the **Layout** group > **Organize**.

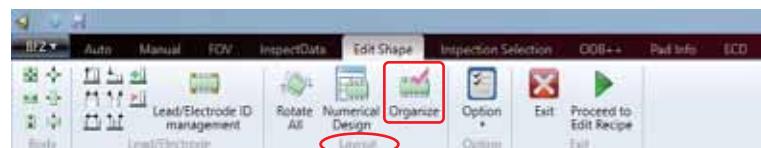


Figure 1-161 Organize

Step2: Make the setting by reference to Table 1-27. After all the settings are completed, click **OK**.

CAUTION Make sure to adjust the position of lead/electrode elements after adjusting the position of the Body element.

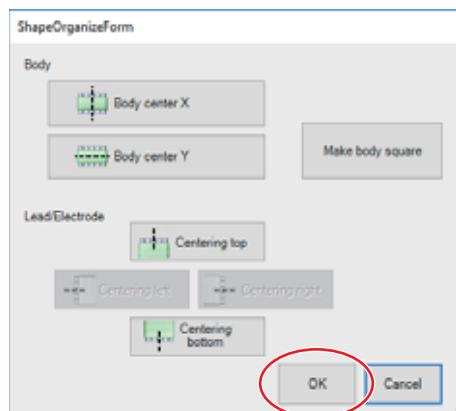


Figure 1-162 Shape Organize Form

| Item | Description |
|------------------|--|
| Body center X | Aligns the X-axis center of the Body element to the X-axis center of the component data. |
| Body center Y | Aligns the Y-axis center of the Body element to the Y-axis center of the component data. |
| Make body square | Changes the Body element to square. |
| Centering top | Aligns lead/electrode elements to the center of the specified side of the Body element. |
| Centering left | |
| Centering right | |
| Centering bottom | |

Table 1-27 Descriptions

1.7.7 Notes on Adjusting Shapes

Here describes some points which should be careful when adjusting Shapes with some examples.

Chip Components

When adjusting a chip component Shape, be careful about the followings.

- The center of the Body element matches to the center of the component data.
- The electrode element is on the center line of the component data.

NOTE The Body element and electrode element form does not have to be exactly the same as the component image.

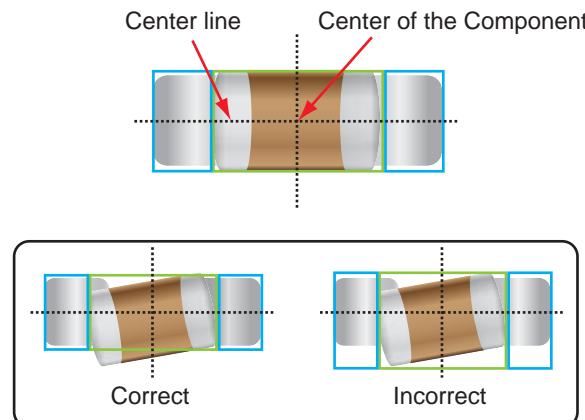


Figure 1-163 Chip Components

IC Components

When adjusting an IC component Shape, be careful about the followings.

- The center of the Body element matches to the center of the component data.
- The center of the lead and bridge element array is on the center line of the component.
- The pitch between lead elements is exactly the same as the pitch of the actual component.
- (Only for QFP) The Body element is square (horizontal and vertical widths are the same).

NOTE The Body element and electrode element form does not have to be exactly the same as the component image.

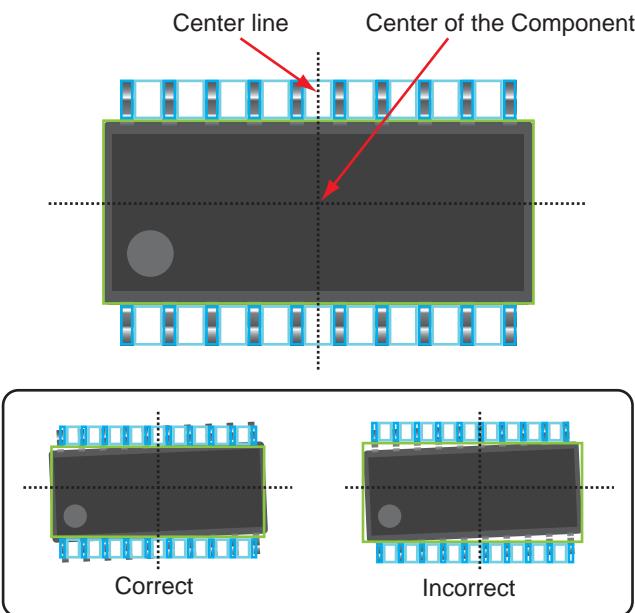


Figure 1-164 IC Components

Transistors

When adjusting a transistor Shape, be careful about the followings.

- The center of the Body element matches to the center of the component data.
- The electrode element is on the center line of the component data.
- The center of the lead and bridge element array is on the center line of the component.
- The pitch between lead elements is exactly the same as the pitch of the actual component.

NOTE

The Body element and electrode element form does not have to be exactly the same as the component image.

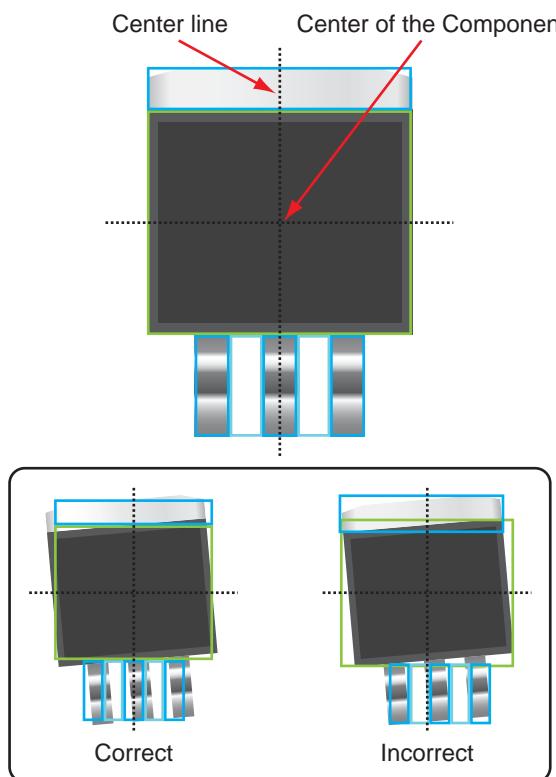


Figure 1-165 Transistors

1.8 Closing the Edit Shape Screen

This section describes how to close the Edit shape screen. After closing the Edit shape screen, it can proceed to the Edit recipe screen or return to the main screen.

NOTE

It is possible to open the Edit recipe screen from the main screen.

Step1: To proceed to the **Edit recipe screen**, select the **Exit** group > **Proceed to Edit Recipe** from **Edit Shape** tab.

To return to the **InspectionData** tab, from **Edit Shape** tab, select the **Exit** group > **Exit**.



Figure 1-166 Closing the Edit shape screen 1

Step2: The dialog shown below appears. Select Item.

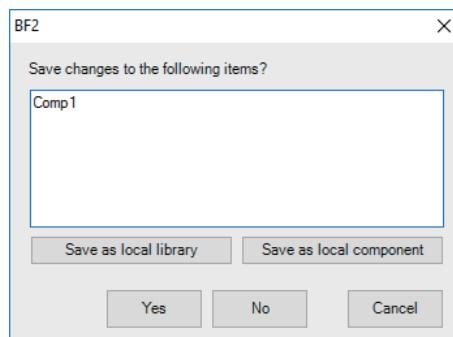


Figure 1-167 Closing the Edit shape screen 2

Save as local library

Save the Changes only to the opened inspection data and not to the library.

In this case, changes are not applied to other inspection data within the same group.

Save as local library targets inspection data currently opened, and the changes are applied to other inspection windows using the same shapes and recipes.

Save as local component

Save the Changes only to the opened inspection data and not to the library.

In this case, changes are not applied to other inspection data within the same group.

Save as local component applies changes only to the inspection window currently being saved.

Yes

Enters the changes into the library.

The changes are applied to other inspection data in the same group when the changes are entered to the library.

No

Discards all the changes.

Cancel

Returns to shape editing.

1.9 Assigning a Recipe

1.9.1 Overview of Recipe

Recipe is inspection settings for each **Shape**.
In Recipe, an inspection window is set to each element, and an algorithm is assigned to the inspection window. The window size can also be adjusted.

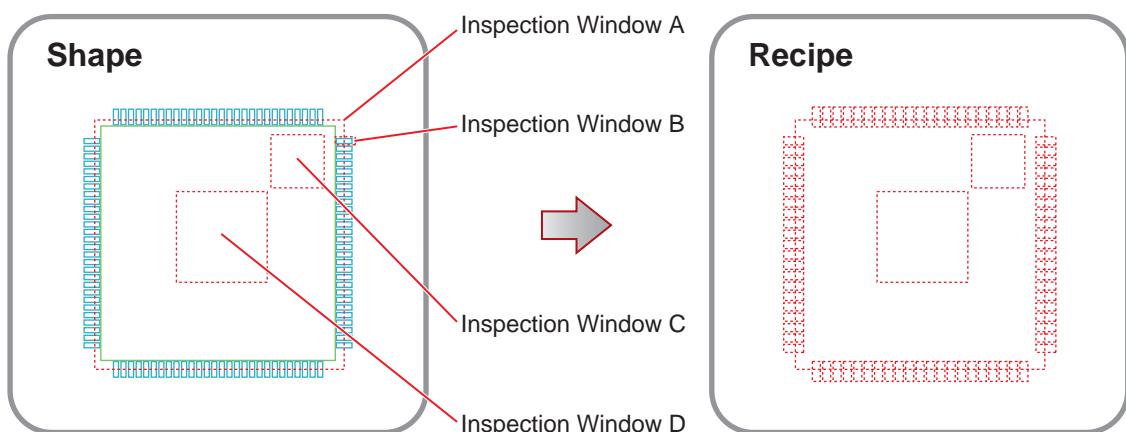


Figure 1-168 Overview of Recipe

A **Recipe** can be assigned to only one **Shape** but multiple **Recipes** can be assigned to one **Shape**. For example, if there are two components which have same shapes, sizes and different colors, the same **Shape** and different **Recipes** can be assigned to these two components.

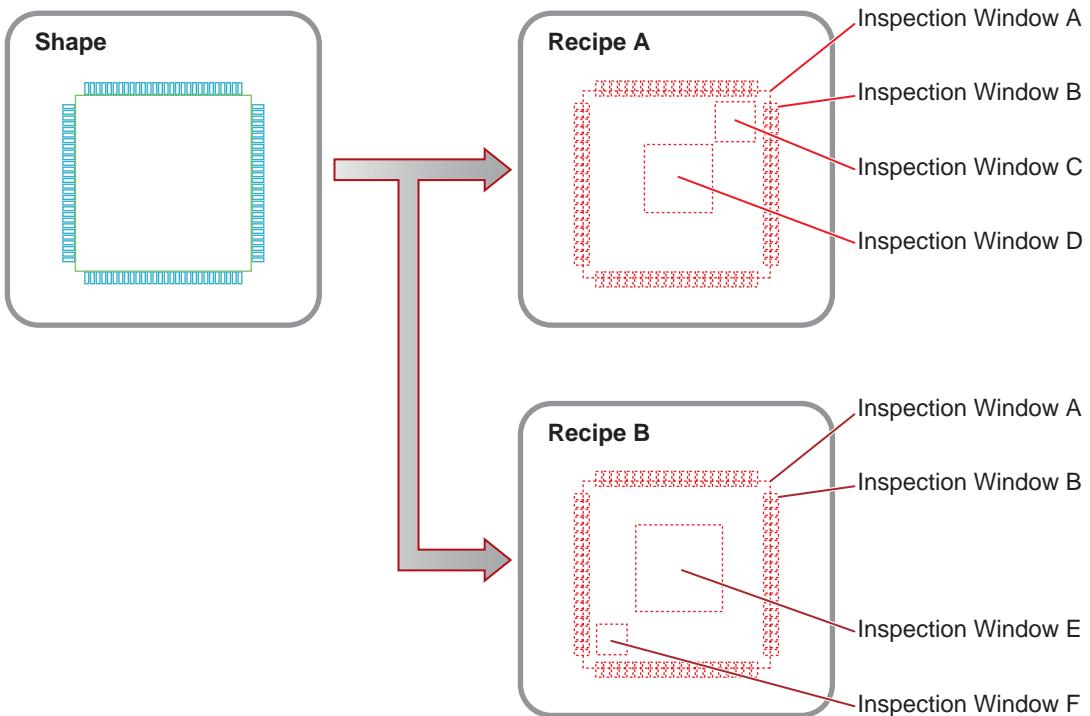


Figure 1-169 Relationship between Shape and Recipe

1.9.2 Window Details

Here describes and illustrates the Edit recipe screen.

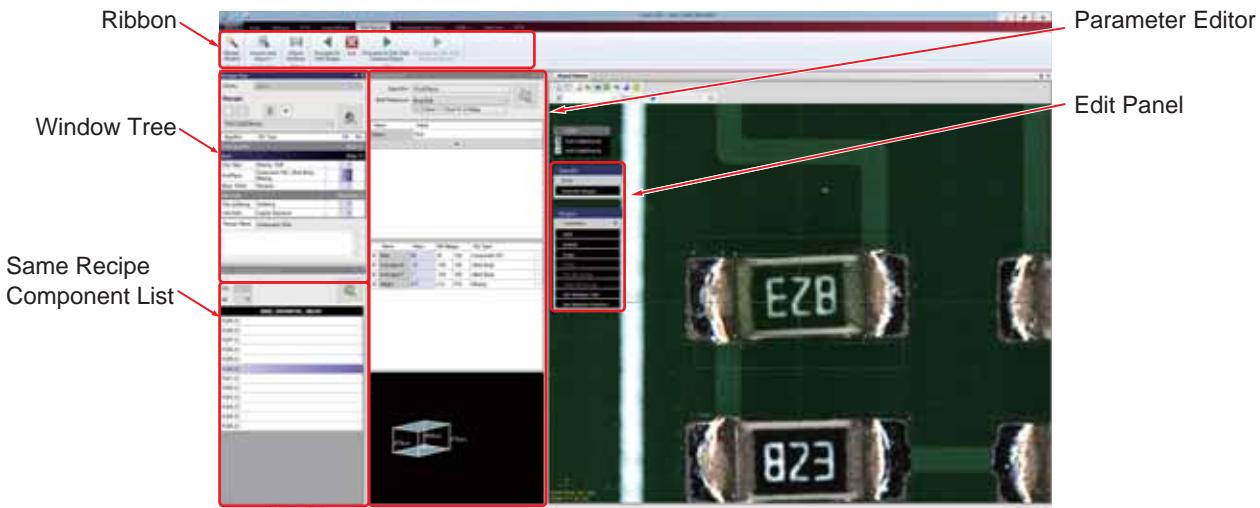


Figure 1-170 Window Details

| Item | | | Description |
|--------|-----------|-------------------|--|
| Ribbon | Wizard | Recipe Wizard | Make inspection settings by the wizard. For details, refer to 1.9.5 Setting an Inspection Window by the Element Wizard . |
| | Expansion | Import and Export | Import an inspection window from another recipe or export the currently selected inspection windows to another recipe. For details, refer to 1.9.7 Importing and Exporting the Inspection Window . |
| | Organize | Adjust Position | Adjusts inspection window positions which Shift Reference is applied. For details, refer to 1.10 Adjusting a Recipe . |
| | Exit | Exit | Finishes editing a Shape and return to the Inspect Data tab. For details, refer to 1.11 Exit Adjusting a Recipe . |
| | | | Creates a new Recipe. |
| | | | Copies the Recipe currently assigned. |
| | | | Delete a Recipe. The Recipe currently assigned cannot be deleted. |
| | | | Click Save as local library to save the changes to the opened inspection data and not the library when exiting and is displayed on upper side of Window Tree . If opened inspection data and library information are different, is displayed on upper side of Window Tree . If meet the both conditions, is displayed on upper side of Window Tree and click this ICON, the dialog shown below appears. |
| | | | |
| | | | Click Update from Library to overwrite the changes in the currently opened inspection data with the contents of the library. Click Update to Library to enter the change in the library. |
| | | | Inspects all inspection windows included in the Recipe. |

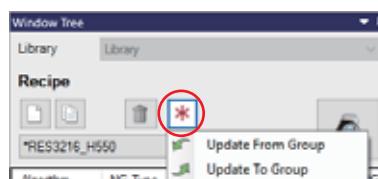


Figure 1-171 Exit Editing

Click **Update from Library** to overwrite the changes in the currently opened inspection data with the contents of the library.
Click **Update to Library** to enter the change in the library.

| Item | | Description |
|----------------------------|---|---|
| Ribbon | Recipe | Selects a Recipe from the drop-down list. This menu item is available only when multiple Recipes are assigned. |
| | Inspection Window List | Displays an algorithm, NG type, and inspection result of each inspection window. When an inspection is finished, each cell is highlighted in a color that corresponds to its inspection result. If an inspection result is OK, the cell is highlighted in blue. If a result is NG, it is highlighted in red. If an inspection has not been performed, it is highlighted in gray. |
| Same Recipe Component List | NG | Indicates the numbers of NG component data which share the same Recipe with the current component data. |
| | All | Indicates the numbers of component data which share the same Recipe with the current component data. |
| | Inspection Result List | Displays inspection results of component data which share the same Recipe with the current component data. If an inspection result is OK, the cell is highlighted in blue. If a result is NG, it is highlighted in red. |
| |  | Inspects all components which the same Recipe is assigned. Inspection results are displayed in Inspection Result List . |
| Parameter Editor | | Makes the setting for the selected inspection window. For details, refer to 1.10 Adjusting a Recipe . |
| Edit Panel | Element | Make inspection settings by the wizard. For details, refer to 1.9.5 Setting an Inspection Window by the Element Wizard . |
| | Window | Used for adjusting an inspection window. For details, refer to 1.10 Adjusting a Recipe . |

Table 1-28 Descriptions

1.9.3 Opening the Edit Recipe Screen

Here describes how to open the Edit recipe screen.

NOTE When moved directly from the Edit shape screen, this step is not necessary.

Step1: Select the **InspectData** tab.



Figure 1-172 InspectData

Step2: Select a component data which a Shape has been assigned from **Board Viewer**.

Step3: The edit panel appears on the **Board Viewer**.

Select **Recipe**. The Edit recipe screen appears.

NOTE The screen also appears when double-clicking a component data which a Shape has been assigned.

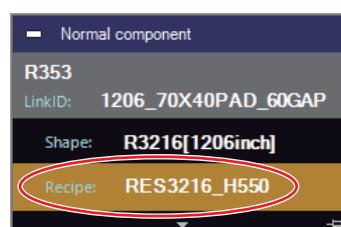


Figure 1-173 Edit Panel

1.9.4 Making a Recipe

Here describes how to make a new Recipe.

Step1: Open the Edit recipe screen by reference to **1.9.3 Opening the Edit Recipe Screen**.

Step2: Click  on the upper side of **Window Tree** and select **Add new**.

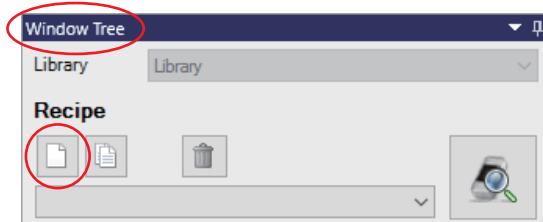


Figure 1-174 Making a Recipe 1

Step3: Enter a recipe name and click **OK**.

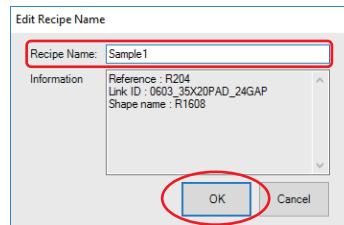


Figure 1-175 Making a Recipe 2

Step4: From **Window Tree > Recipe selection preview**, click **Assign**.

The Recipe is assigned to all component data sharing the same Link ID.

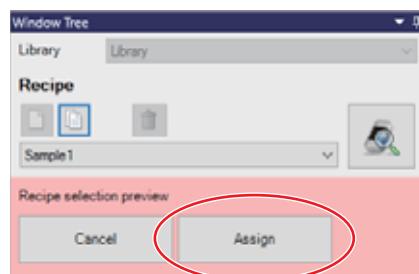


Figure 1-176 Making a Recipe 3

1.9.5 Setting an Inspection Window by the Element Wizard

Here describes how to set an inspection window by the element wizard.

Step1: Open the Edit recipe screen by reference to **1.9.3 Opening the Edit Recipe Screen**.

Step2: Select an element and click **Element Wizard** from the edit panel or from **Edit Recipe** tab, select **Wizard group > Recipe Wizard**.



Figure 1-177 Element Wizard 1

Step3: Select component type from **Recipe wizard name** and click **Start**.

NOTE When there is no applicable component type, set inspection items manually.
For details, refer to **1.9.6 Setting Inspection Items Manually**.

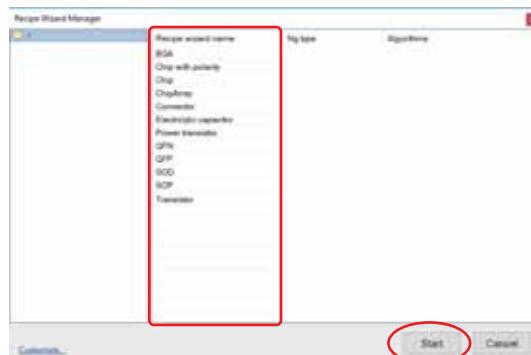


Figure 1-178 Element Wizard 2

Step4: The dialog to set parameters for inspections appears in accordance with the selected component type. Adjust the parameters and click **Next**.

Repeat the same operation for the number of NG Types set for the selected element.



Figure 1-179 Element Wizard 3

Step5: All the setting is completed, the recipe is automatically expanded.

Repeat Step2 to Step5 and set inspection items in all elements.

NOTE

When the Element Wizard is started from the ribbon, this step is not necessary.

NOTE

If an element shares the same **element ID** with another element, the same inspection items are set to both elements automatically.

Step6: Click  on **Window Tree** and check if inspections are completed properly in all inspection windows. If one of inspections is failed, adjust the parameters and sizes of the inspection window.

NOTE

If an inspection result is OK, the cell is highlighted in blue. If a result is NG, it is highlighted in red. If an inspection has not been performed, it is highlighted in gray.

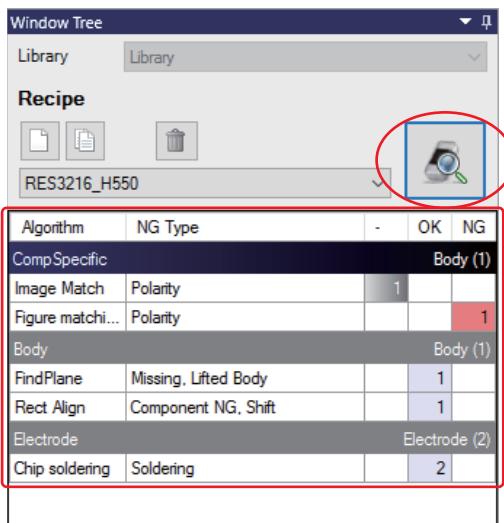


Figure 1-180 Checking the Component Data

Step7: Click  on **Same Recipe Component List** and check if inspections are completed properly in all component data. If one of inspections is failed, adjust the parameters and sizes of the corresponding component data.

NOTE

If an inspection result is NG, the cell is highlighted in red.



Figure 1-181 Checking the Same Recipe Components

Step8: Exit the Edit recipe screen by reference to **1.11 Exit Adjusting a Recipe**.

1.9.6 Setting Inspection Items Manually

If the inspection target is not supported by **Element Wizard** or when using an algorithm which is not included in the element wizard, set inspection items manually.

Step1: Assign the Recipe to a Shape by reference to **1.9.4 Making a Recipe**.

Step2: Select an element and select **Add** from the edit panel.

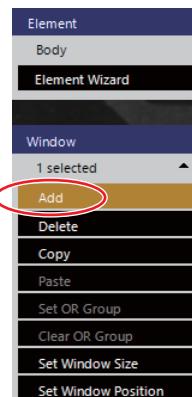


Figure 1-182 Adding an Inspection Window

Step3: From the dock window select **Parameter Editor > Algorithm** and select an algorithm used for the inspection.

NOTE For details of algorithms, refer to **Part III Inspection Algorithm**.

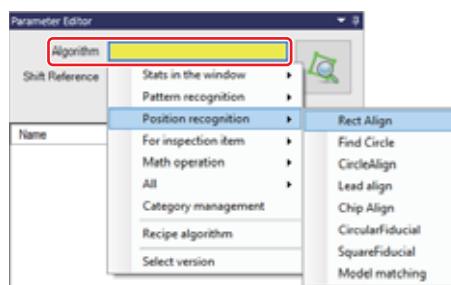


Figure 1-183 Selecting an Algorithm

Step4: Click on **Parameter Editor** and check if the inspection is completed properly.

If the inspection is failed, adjust the parameters and inspection window sizes.



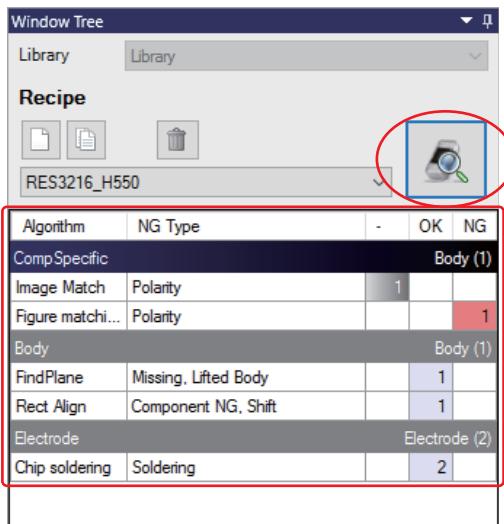
Figure 1-184 Checking the Inspection Window Settings

Step5: Repeat Step2 to Step4 and set inspection items to all elements.

NOTE If an element shares the same **Element ID** with another element, the same inspection items are set to both elements automatically.

Step6: Click  on **Window Tree** and check if inspections are completed properly in all inspection windows. If one of inspections is failed, adjust the parameters and sizes of the inspection window.

NOTE If an inspection result is OK, the cell is highlighted in blue. If a result is NG, it is highlighted in red. If an inspection has not been performed, it is highlighted in gray.

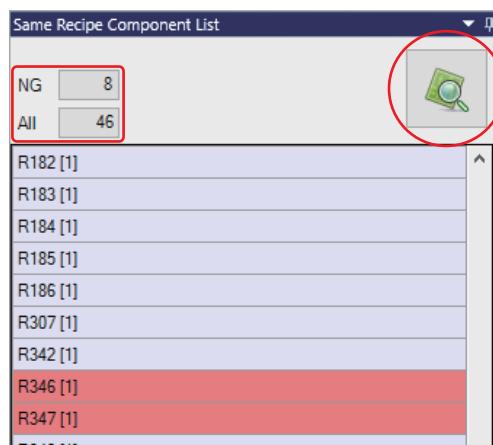


| Algorithm | NG Type | OK | NG |
|----------------------|----------------------|----|----|
| Comp Specific | | | |
| Image Match | Polarity | 1 | |
| Figure matchi... | Polarity | | 1 |
| Body | | | |
| FindPlane | Missing, Lifted Body | 1 | |
| Rect Align | Component NG, Shift | 1 | |
| Electrode | | | |
| Chip soldering | Soldering | 2 | |

Figure 1-185 Checking the Component Data

Step7: Click  on **Same Recipe Component List** and check if inspections are completed properly in all component data. If one of inspections is failed, adjust the parameters and inspection window sizes of the corresponding element.

NOTE If an inspection result is NG, the cell is highlighted in red.



| | |
|-----------------|----|
| NG | 8 |
| All | 46 |
| R182 [1] | |
| R183 [1] | |
| R184 [1] | |
| R185 [1] | |
| R186 [1] | |
| R307 [1] | |
| R342 [1] | |
| R346 [1] | |
| R347 [1] | |

Figure 1-186 Checking the Same Recipe Components

Step8: Exit the Edit recipe screen by reference to **1.11 Exit Adjusting a Recipe**.

1.9.7 Importing and Exporting the Inspection Window

The created recipe inspection window can be copied to another recipe.

NOTE Inspection windows are copied but Recipes are not copied. To avoid duplication of work/effort, it is recommended to copy an inspection window after adjusting its parameters by reference to **1.10 Adjusting a Recipe**.

NOTE When copying an inspection window in the same Recipe, use **Copy** and **Paste** of Edit Panel.

Import the Inspection Window from Another Recipe

From **Edit Recipe** tab, select the **Expansion** group > **Import and export** > **Import windows from another recipe**.

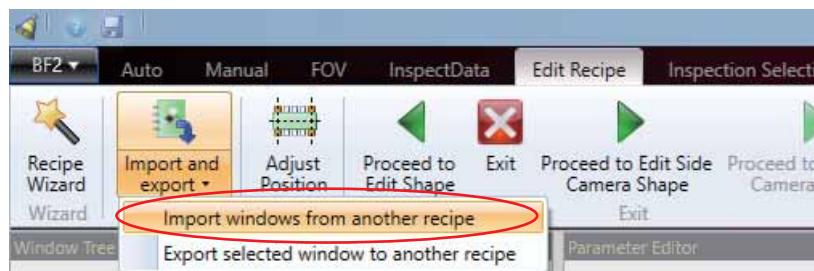


Figure 1-187 Importing and Exporting the Inspection Window

Select a Shape and Recipe from the list-box of **Shape** and **Recipe**.

Set **Copy to** and check an inspection window (algorithm) to copy.

After all the settings are completed, click **OK**.

The selected inspection window is copied to the current Recipe.

NOTE Contents in the dialog may differ according to the Recipe to be copied.

NOTE Click **Select All** or **Clear All** to turn all of the check boxes on or off.

NOTE Click on the **Recipe** list-box while a recipe is being selected to switch the bookmark of the inspection window ON and OFF. Click **Show BookMark** to display only the bookmarked inspection windows.

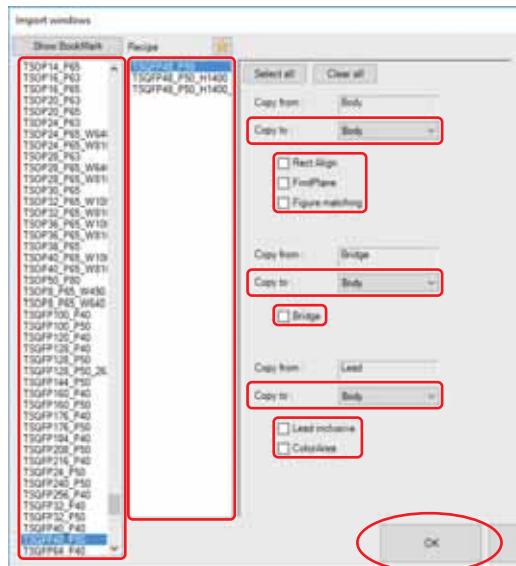


Figure 1-188 Import windows

Export the inspection window to another recipe

From **Edit Recipe** tab, select the **Expansion group > Import and export > Export selected window to another recipe.**



Figure 1-189 Importing and Exporting the Inspection Window

The algorithm displayed highlighted in blue in **Window** field on the right side is the currently selected inspection window.

Select a Shape and Recipe from the list-box of **Shape** and **Recipe**.

Check **Add** to add a new inspection window or **Replace** to overwrite the inspection window in the output destination.

After all the settings are completed, click **OK**. The selected inspection window is copied to the current Recipe.

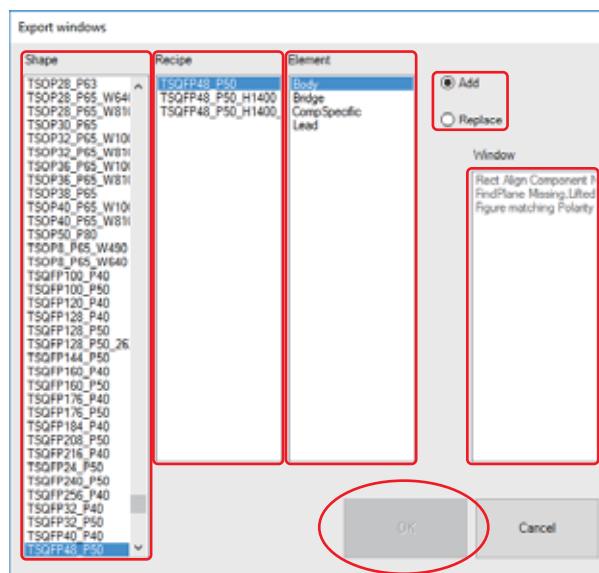


Figure 1-190 Exporting the Inspection Window

1.10 Adjusting a Recipe

This section describes how to edit and adjust a Recipe.

For editing a Recipe, **Window Tree**, **Edit panel**, and **Parameter Editor** are mainly used.

1.10.1 Window Details

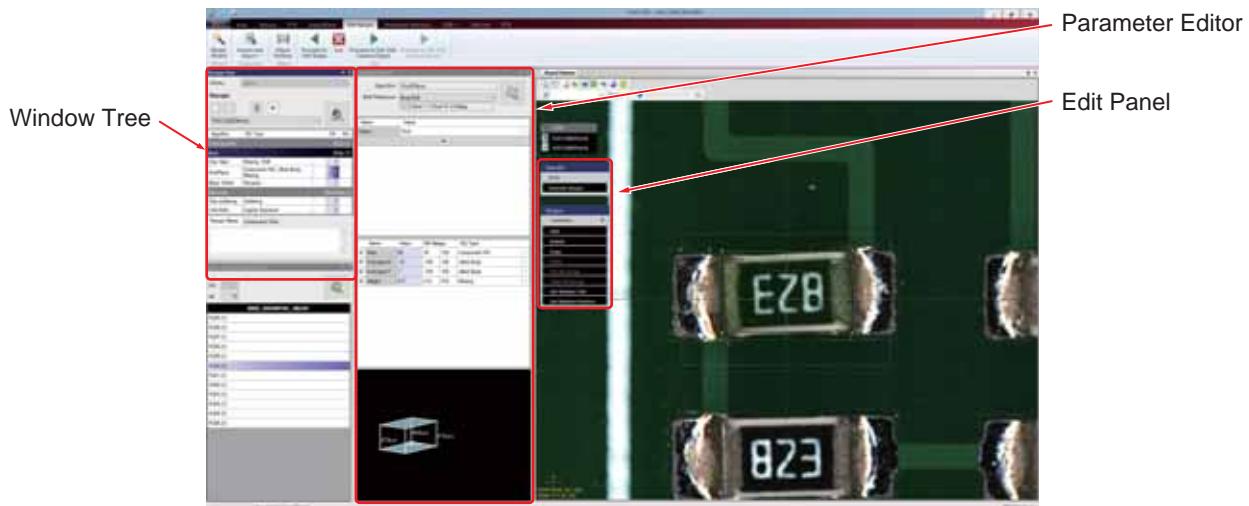


Figure 1-191 Window Details

| Item | Description | |
|------------------|---|--|
| Window Tree | Used for operations such as adding a Recipe and selecting an inspection window. For details, refer to 1.9 Assigning a Recipe . | |
| Parameter Editor | Algorithm | The drop-down list opens when clicked. Select an algorithm. |
| | Shift Reference | Applies the shift information detected by another inspection window to the selected inspection window. For details, refer to 1.10.6 Sharing a Shift Information . |
| | | Inspects the selected inspection window. |
| | (Upper table) Name | Displays parameters for an algorithm. |
| | Value | Used for setting thresholds and settings to each parameter. If a component is not recognized or false call happens, adjust these values. |
| | (Lower table) Name | Displays inspection items. When checked, the item is judged in an inspection. When unchecked, the item is not judged in an inspection. |
| | Value | Displays values detected by an inspection. If an inspection has not been performed, - is displayed. |
| | OK Range | Specifies the range which is judged as OK (good). |
| | NG Type | Specifies an NG type for when an inspection result is NG (defect, bad). |

| Item | | Description |
|------------|--------|----------------------|
| Edit Panel | Window | Add |
| | | Delete |
| | | Copy |
| | | Paste |
| | | Set OR Group |
| | | Clear OR Group |
| | | Set Window Size |
| | | Set Window Positions |

Table 1-29 Descriptions

1.10.2 Parameter Adjustment

If inspection accuracy is low or too many false calls happen, adjust parameters of a Recipe.

Here describes how to adjust parameters of a Recipe.

CAUTION

The procedure described here is just one of the examples. According to an algorithm, the procedure may differ slightly. For details, refer to **Part III Inspection Algorithm**.

NOTE

The procedure for adding inspection items is the same as the manual setting of inspection items. For details, refer to **1.9.6 Setting Inspection Items Manually**.

Step1: Select an inspection data which Recipes are already assigned by reference to **Part I 1.3 Selecting an Inspection Data File**.

Step2: Scan a good PCB by reference to **4.2 Scanning a PCB**.

Step3: From **InspectData** tab, select the **Inspect** group > **Inspect All** to start the inspection.



Figure 1-192 Inspect All

Step4: Inspection results are displayed on **Board Viewer** and **Component List**.

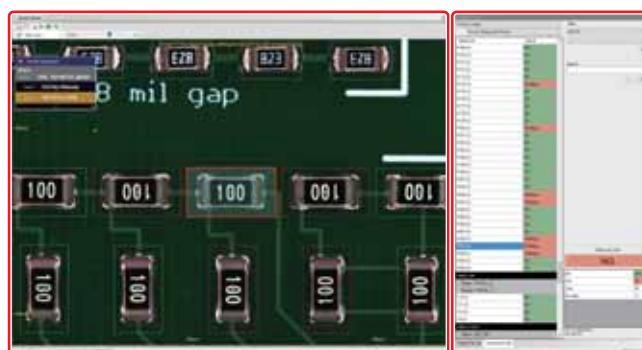


Figure 1-193 Inspection Results

Step5: Select an NG component from **Board Viewer** and select **Recipe** from the edit panel.

NOTE The same operation can also be performed by double-clicking a reference name on **Component List**.



Figure 1-194 Edit Panel

Step6: Click the value of **NG** in **Window Tree**.

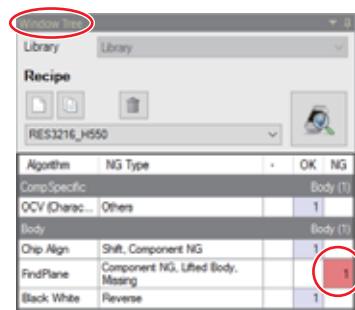


Figure 1-195 Window Tree

Step7: Adjust the parameters of the algorithm set to the inspection window by reference to **Part III Inspection Algorithm**.

Step8: Adjust the sample value settings of the algorithm set to the inspection window by reference to the followings.

For Algorithms which Judge Threshold such as Shift

On the lower table of **Parameter Editor**, click a cell which is highlighted in red. Proceed to Step9.

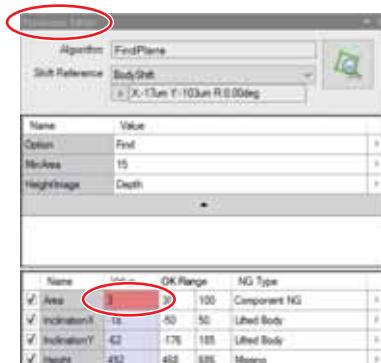


Figure 1-196 Parameter Editor

For Algorithms which Judge Detection Result such as Result type

On the lower table of **Parameter Editor**, click the **OK range** cell neighboring the cell which is highlighted in red. Select a desirable result. When the setting is completed, proceed to Step10.

CAUTION

According to an algorithm, the inspection items may differ slightly.
For details, refer to **Part III Inspection Algorithm**.

| Name | Value | OK Range | NG Type |
|-------------------|-------|----------------------|-----------|
| Detected Type | Flat | Fillet Reflection | Soldering |
| Pad Flat Area [%] | 100 | | |
| Spot Height [um] | 0 | | |
| Spot Size [um] | 0 | | |

Flat
 Fillet
 Excess Solder
 Dry Joint
 Reflection

Figure 1-197 OK Range

Step9: The dialog shown below appears.

CAUTION

According to an algorithm, the dialog displayed may differ slightly.

When Adjusting the Parameter Manually

Slide the slider on the left side of the histogram or enter a value to the text-box to adjust the threshold. After all adjustments are completed, click **OK**.

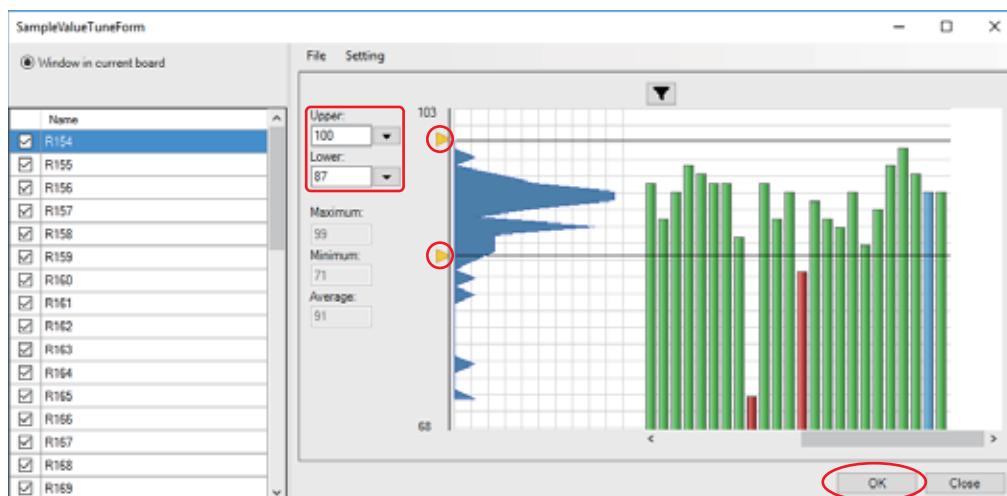


Figure 1-198 Adjusting the Sample Value 1

| | OK | NG |
|--|----|----|
| Sample value of the selected inspection window | : | |
| Sample values of inspection windows sharing the same Recipe. | : | |

When Adjusting the Parameter with the Advanced Function

Click ▾ on the right side of **Upper** or **Lower**.

The drop-down list appears for selecting a calculation method of a threshold.

Make the setting by reference to Table 1-30. After all the settings are completed, click **OK**.

NOTE

A sigma ratio and percent ratio can be changed from **Setting** located on the top of the dialog.

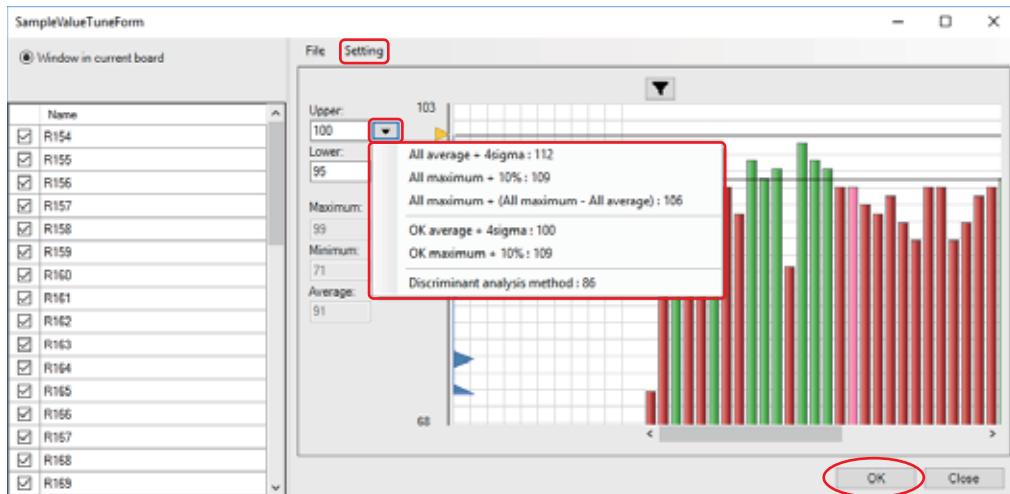


Figure 1-199 Adjusting the Sample Value 2

| Item | | Calculation Target | Description |
|-------------|---|---------------------------------|--|
| Upper limit | All average + 4sigma | All sample value | Calculates the upper limit of the sample value based on a sigma ratio and the average of the current sample values. |
| | All maximum + 10% | | Calculates 110% of the greatest value in the current sample values. The result is set as the upper limit of the sample value. |
| | All maximum + (All maximum - All average) | | In this option, it calculates the difference between the greatest and average of the current sample values first. Then, it adds the calculated value to the greatest of the sample values. The result is set as the upper limit of the sample value. |
| | OK average + 4sigma | Sample values of the OK windows | Calculates the upper limit of the sample value based on a sigma ratio and the average of the sample values of the inspection windows whose inspection results are OK. |
| | OK maximum + 10% | | Calculates 110% of the greatest value in the sample values of the inspection windows whose inspection results are OK. The result is set as the upper limit of the sample value. |
| | Discriminant analysis method | All sample value | Calculates the upper limit of the sample value based on Otsu's method (histogram shape-based image thresholding). |

| Item | | Calculation Target | Description |
|-------------|-----------------------------------|---------------------------------|---|
| Lower limit | All average - 4sigma | All sample value | Calculates the lower limit of the sample value based on a sigma ratio and the average of the current sample values. |
| | All minimum - 10% | | Calculates 90% of the smallest value in the current sample values. The result is set as the lower limit of the sample value. |
| | All minimum - (average - minimum) | | In this option, it calculates the difference between the average and smallest of the current sample values first. Then, it subtracts the calculated value from the smallest of the sample values. The result is set as the lower limit of the sample value. |
| | OK average - 4sigma | Sample values of the OK windows | Calculates the lower limit of the sample value based on a sigma ratio and the average of the sample values of the inspection windows whose inspection results are OK. |
| | OK minimum - 10% | | Calculates 90% of the smallest value in the sample values of the inspection windows whose inspection results are OK. The result is set as the lower limit of the sample value. |
| | Discriminant analysis method | All sample value | Calculates the lower limit of the sample value based on Otsu's method (histogram shape-based image thresholding). |

Table 1-30 Descriptions

Step10: Click  on **Parameter Editor** and check if the inspection is completed properly.
If the inspection is failed, adjust the parameters again.

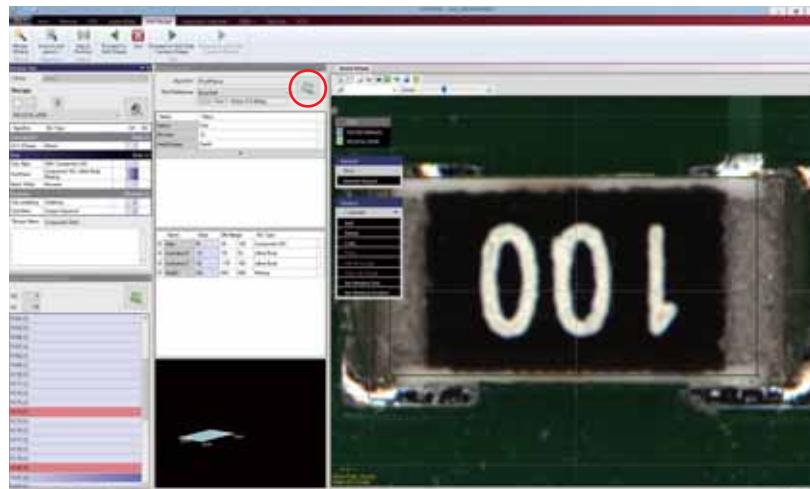
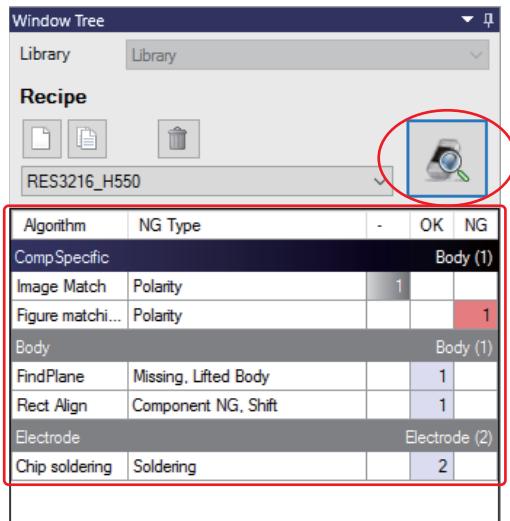


Figure 1-200 Checking the Inspection Window Settings

Step11: Click  on **Window Tree** and check if all inspection windows are judged as OK. If NG is detected, adjust the parameters again.

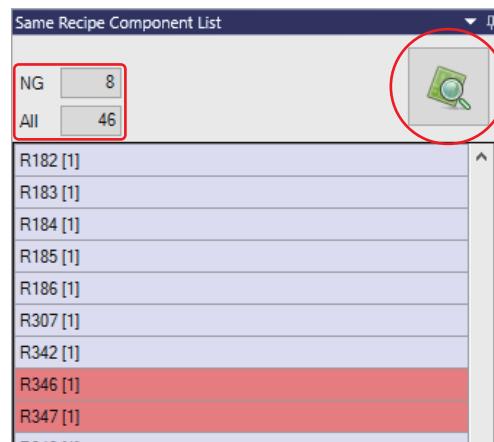
NOTE If an inspection result is OK, the cell is highlighted in blue. If a result is NG, it is highlighted in red. If an inspection has not been performed, it is highlighted in gray.



| Algorithm | NG Type | - | OK | NG |
|---------------------|----------------------|---|----|----|
| CompSpecific | | | | |
| Image Match | Polarity | 1 | | |
| Figure matchi... | Polarity | | | 1 |
| Body | | | | |
| FindPlane | Missing, Lifted Body | | 1 | |
| Rect Align | Component NG, Shift | | 1 | |
| Electrode | | | | |
| Chip soldering | Soldering | | 2 | |

Figure 1-201 Checking the Component Data

Step12: Click  on **Same Recipe Component List** and check if all component data are judged as OK. If NG is detected, adjust the parameters again.



| | |
|-----------------|----|
| NG | 8 |
| All | 46 |
| R182 [1] | |
| R183 [1] | |
| R184 [1] | |
| R185 [1] | |
| R186 [1] | |
| R307 [1] | |
| R342 [1] | |
| R346 [1] | |
| R347 [1] | |
| R348 [1] | |

Figure 1-202 Checking the Same Recipe Components

Step13: Adjust Recipes of other NG components by repeating Step5 to Step13.

1.10.3 Adjusting an Inspection Window Size

Here describes how to adjust an inspection window size.

Step1: Select the **InspectData** tab.



Figure 1-203 InspectData

Step2: Select a component data from **Board Viewer**.

Step3: The edit panel appears on **Board Viewer**.

Select **Recipe**.

NOTE The same operation can also be performed by double-clicking a reference name on **Component List**.



Figure 1-204 Edit Panel

Step4: Select an inspection window.

Step5: From the edit panel, select Window > Set Window Size.

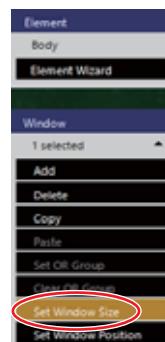


Figure 1-205 Adjusting an Inspection Window Size 1

Step6: Enter values to **X [μm]** and **Y [μm]**. Click Element size to match the inspection window size to the element size. After all the settings are completed, click OK.



Figure 1-206 Adjusting an Inspection Window Size 2

1.10.4 Adjusting an Inspection Window Position

Here describes how to adjust an inspection window position.

Step1: Select the **InspectData** tab.



Figure 1-207 InspectData

Step2: Select a component data from **Board Viewer**.

Step3: The edit panel appears on **Board Viewer**.

Select **Recipe**.

NOTE The same operation can also be performed by double-clicking a reference name on **Component List**.



Figure 1-208 Edit Panel

Step4: Select an inspection window.

Step5: From the edit panel, select **Window > Set Window Position**.

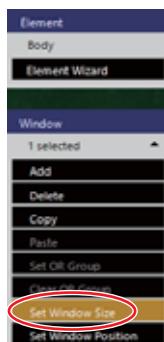


Figure 1-209 Adjusting an Inspection Window Position 1

Step6: Make the settings by reference to Table 1-31 and click **Close**.

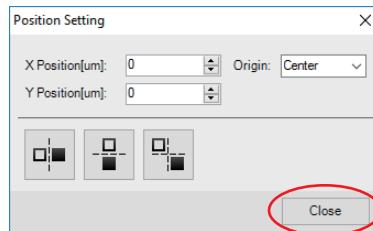


Figure 1-210 Adjusting an Inspection Window Position 2

| Item | Description | |
|-----------------|---|--|
| X Position [μm] | Specifies the X-axis distance between the center of the screen and the inspection window. Separately set the origin point of the inspection window in Origin . | |
| Y Position [μm] | Specifies the Y-axis distance between the center of the screen and the inspection window. Separately set the origin point of the inspection window in Origin . | |
| Origin | Center | Sets the origin point of the inspection window to the center of the inspection window. |
| | Left Top | Sets the origin point of the inspection window to the upper left corner of the inspection window. |
| | Left Bottom | Sets the origin point of the inspection window to the lower left corner of the inspection window. |
| | Right Top | Sets the origin point of the inspection window to the upper right corner of the inspection window. |
| | Right Bottom | Sets the origin point of the inspection window to the lower right corner of the inspection window. |
| | Moves the selected inspection window to the opposite X-axis point. | |
| | Moves the selected inspection window to the opposite Y-axis point. | |
| | Moves the selected inspection window to the origin-symmetric point. | |

Table 1-31 Descriptions

1.10.5 Setting an OR Group

Here describes how to set an OR group.

If multiple inspection windows are set to an OR group and one of the inspection window is judged as OK, the inspection result of the OR group becomes OK.

Step1: Select the **InspectData** tab.



Figure 1-211 InspectData

Step2: Select a component data from **Board Viewer**.

Step3: The edit panel appears on **Board Viewer**.

Select **Recipe**.

NOTE The same operation can also be performed by double-clicking a reference name on **Component List**.



Figure 1-212 Edit Panel

Step4: Select multiple inspection windows with pressing **Ctrl** on **Board Viewer**.

The cross line appears on the selected window.

Select **Set OR Group** from the edit panel.

NOTE To cancel the OR group, select **Clear OR Group** from the edit panel.

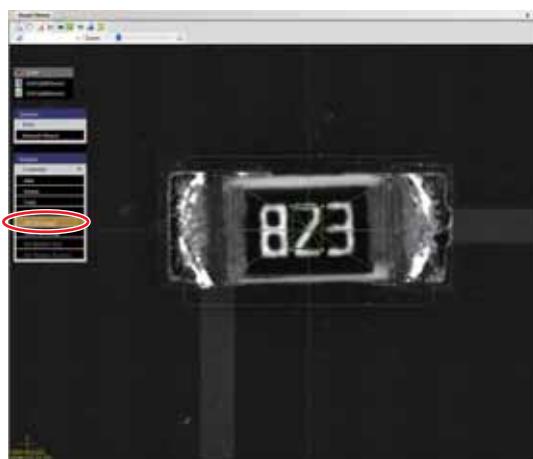


Figure 1-213 Set OR Group

1.10.6 Sharing a Shift Information

Some of the algorithms which can be used in this product can detect component misalignment amount. A detected value can be shared among algorithms.

Step1: Select the **InspectData** tab.



Figure 1-214 InspectData

Step2: Select a component data from **Board Viewer**.

Step3: The edit panel appears on **Board Viewer**.

Select **Recipe**.

NOTE The same operation can also be performed by double-clicking a reference name on **Component List**.



Figure 1-215 Edit Panel

Step4: Select an inspection window.

Step5: Select **Parameter Editor > Algorithm** to open the drop-down list. Select an algorithm which can detect a **Shift** value (e.g., **Rect Align**, **Circle Align**, **Model matching**).

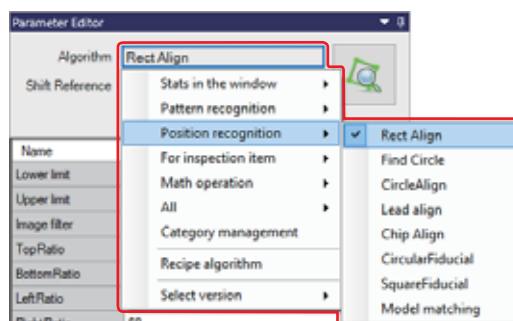


Figure 1-216 Selecting an Algorithm

Step6: Check Shift. Click the Shift cell and select Body Shift.

| | Name | Value | OK Range | | NG Type | |
|-------------------------------------|-------------|------------|----------|-----|--------------|--|
| <input checked="" type="checkbox"/> | Result type | Found | Found | | Component NG | |
| | Shift | X:-57um | -300 | 300 | | |
| | | Y:-47um | -300 | 300 | Shift | |
| | | R:0.073... | -5 | 5 | | |
| <input type="checkbox"/> | Y-Length | 3681u | - | - | | |
| <input type="checkbox"/> | X-Length | 4670u | - | - | | |

Figure 1-217 Body Shift

Step7: Click on **Parameter Editor** and check if the inspection is completed properly.

Step8: Select another inspection window.

Step9: Select **Body Shift** from the **Shift Reference** drop-down list.

Inspection window positions are adjusted according to the **Shift** value.

NOTE

If **None** is selected, the shift information is not applied to the inspection window.

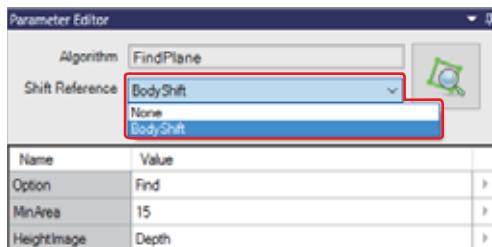


Figure 1-218 Shift Reference

1.10.7 Adjusting Inspection Windows which Shift Information is Applied

With applying Shift information, some inspection window positions are automatically adjusted. Those windows can be re-adjusted by the following procedure.

Step1: Select the **InspectData** tab.



Figure 1-219 InspectData

Step2: Select a component data from **Board Viewer**.

Step3: The edit panel appears on **Board Viewer**.

Select **Recipe**.

NOTE

The same operation can also be performed by double-clicking a reference name on **Component List**.



Figure 1-220 Edit Panel

Step4: From **Edit Recipe** tab, Select the **Adjust** group > **Adjust Position**.



Figure 1-221 Adjust Position

- Step5: A zoom-out image of a component and zoom-in images of leads and electrodes appear.
Adjust the inspection windows so it matches to the component image.
After all adjustments are completed, click **OK**.

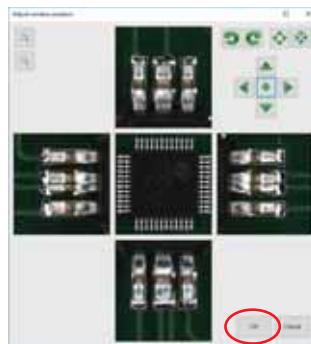


Figure 1-222 Adjusting the Inspection Window Position

| Item | Description |
|------|--|
| | Moves all inspection windows to the specified direction. |
| | Returns all inspection windows to the default position. |
| | Rotates all inspection windows to the specified direction. |
| | Moves all inspection windows to the outer side. |
| | Moves all inspection windows to the inner side. |
| | Zooms in/out the lead/electrode images. |

Table 1-32 Descriptions

1.11 Exit Adjusting a Recipe

This section describes how to close the Edit shape screen.

Return to the main screen after exiting the recipe adjustment.

Step1: From **Edit Recipe** tab, select the **Exit** group > **Exit**.

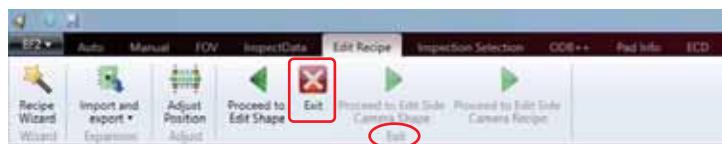


Figure 1-223 Opening the Edit shape screen 1

Step2: The dialog shown below appears. Select Item.

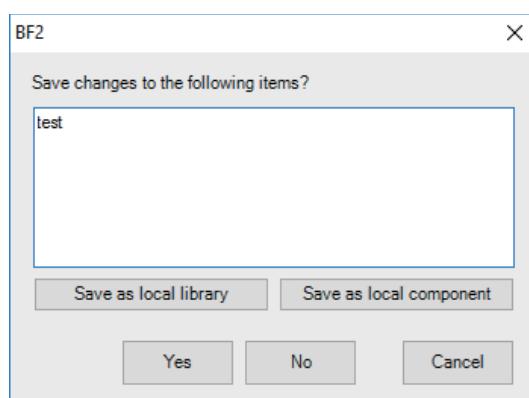


Figure 1-224 Opening the Edit shape screen 2

Save as local library

Save the Changes only to the opened inspection data and not to the library.
In this case, changes are not applied to other inspection data within the same group.
Save as local library targets inspection data currently opened, and the changes are applied to other inspection windows using the same shapes and recipes.

Save as local component

Save the Changes only to the opened inspection data and not to the library.
In this case, changes are not applied to other inspection data within the same group.
Save as local component applies changes only to the inspection window currently being saved.

Yes

Enters the changes into the library. The changes are applied to other inspection data in the same group when the changes are entered to the library.

No

Discards all the changes.

Cancel

Returns to recipe editing.

Step3: If multiple Recipes are assigned to one Shape, the dialog shown below appears.
Make the setting by reference to Table 1-33.

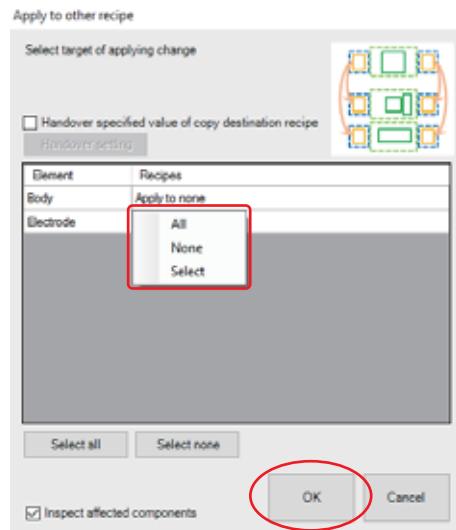


Figure 1-225 Applying the Changes to Other Recipes

| Item | Description | |
|---|--|--|
| Handover specified value of copy destination recipe | For details, refer to 1.11.1 Handover Setting of Specific Parameter . | |
| Element | Indicates the element name. | |
| Recipe | All | Applies the changes to all Recipes which assigned to the same Shape. |
| | None | Cancels the selection. |
| | Select | Applies the changes to the selected Recipes. |
| Select all | Sets Apply to all to all Recipes. | |
| Select none | Sets Apply to none to all Recipes. | |
| Inspect affected components | After click OK , start inspecting components which applied a changes. | |

Table 1-33 Descriptions

1.11.1 Handover Setting of Specific Parameter

If the change is applied to other recipe in Step3 of **1.11 Exit Adjusting a Recipe**, all parameter of copy destination recipe is overwritten with copy source recipe.

This function is used to exclude the parameter of copy destination recipe from overwrite target.

Step1: The dialog shown below appears when **Handover specified value of copy destination recipe** is checked in Step3 of **1.11 Exit Adjusting a Recipe**.

Click **Handover setting**.

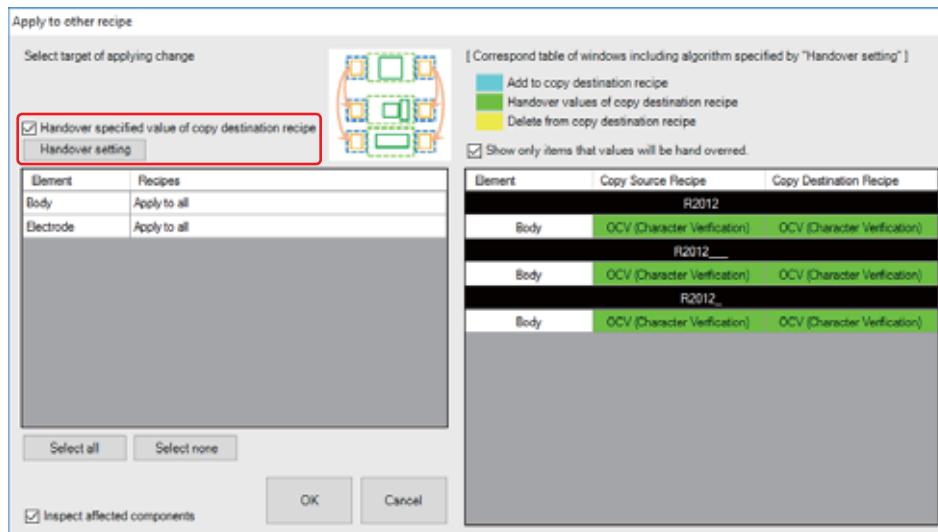


Figure 1-226 Handover Setting of Specific Parameter 1

Step2: Set the parameter of copy destination recipe to be excluded from overwrite target.

After selecting algorithm by **Add**, check the parameter to be excluded from **Items of algorithm**.

After all the settings are completed, click **OK**.

NOTE Click **Delete** to delete selected algorithm from the list.

NOTE The specific parameters of OCV algorithm (**Text** and **Font**) are checked as default.

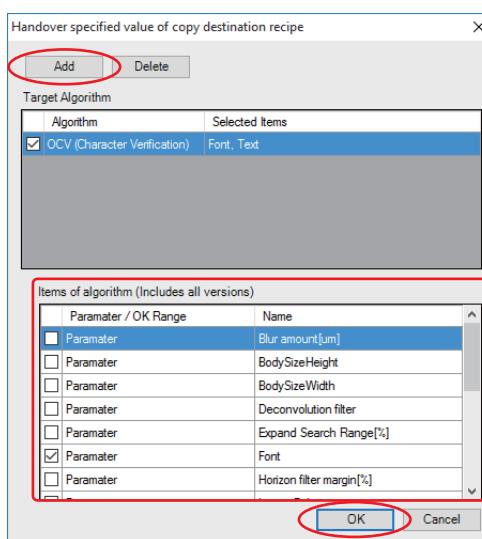


Figure 1-227 Handover Setting of Specific Parameter 2

- Step3: When the parameter set in **Handover setting** is existing, correspondence table of copy source recipe and copy destination recipe is displayed.
Check if the correspondence table is OK and click **OK**.

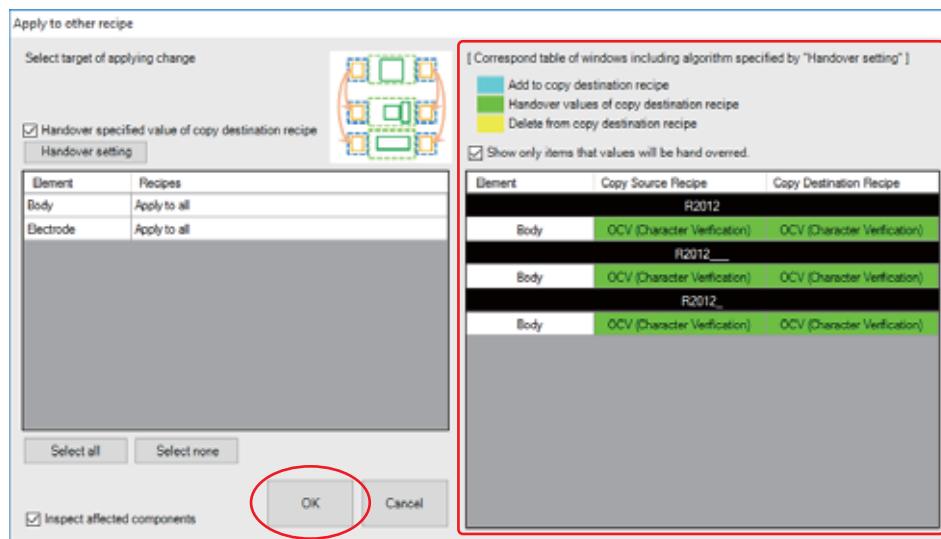


Figure 1-228 Handover Setting of Specific Parameter 3

1.12 Auto Programming

Auto Programming is an auxiliary function to create inspection data that uses a standard library provided by the Saki Corporation.

Auto Programming reduces the number of processes required in making inspection data, such as the time-consuming work of **Making Shape** and **Making Recipe**, by using the standard library to automatically assign and create shapes and recipes.

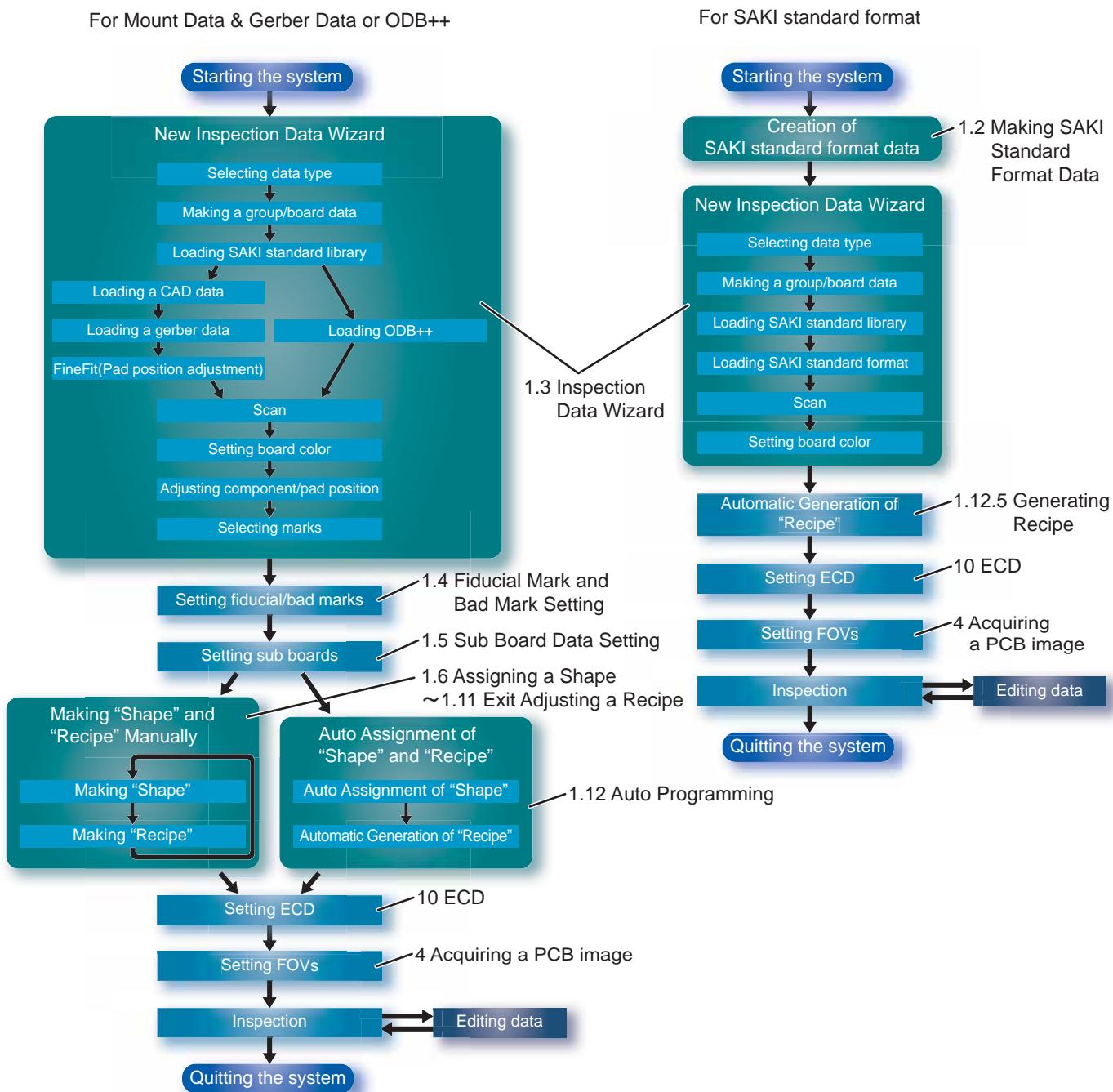


Figure 1-229 Flow Chart for Data Making

1.12.1 Importing Standard Library

Auto Programming requires Standard Library.

Import the Standard Library by reference to Step3 of **1.3 Inspection Data Wizard**.

1.12.2 Assigning a Shape Automatically

After performing all the procedures until **Setting sub boards** in the left side of Figure 1-229 **Flow Chart for Data Making**, assign shapes and recipes. Here describes how to assign library management.

NOTE

When inspection data is made by using SAKI standard format, the shape assignment is almost completed. For the some component which shape is not assigned, assign shapes by reference to **1.12.3 Assigning a Shape Manually**.

Step1: From **InspectData** tab, select **Library** group> **Library Expansion > Assign Library Management**.

The dialog shown in Figure 1-231 appears.

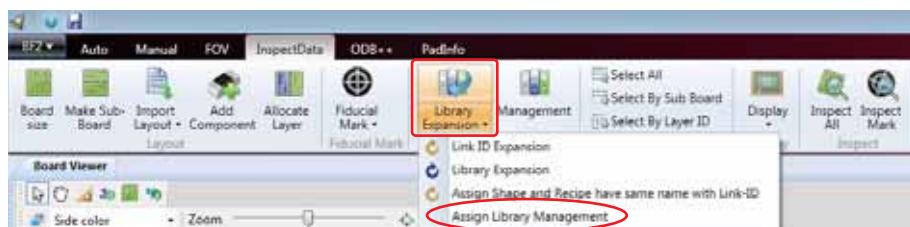


Figure 1-230 Assign Library Management 1

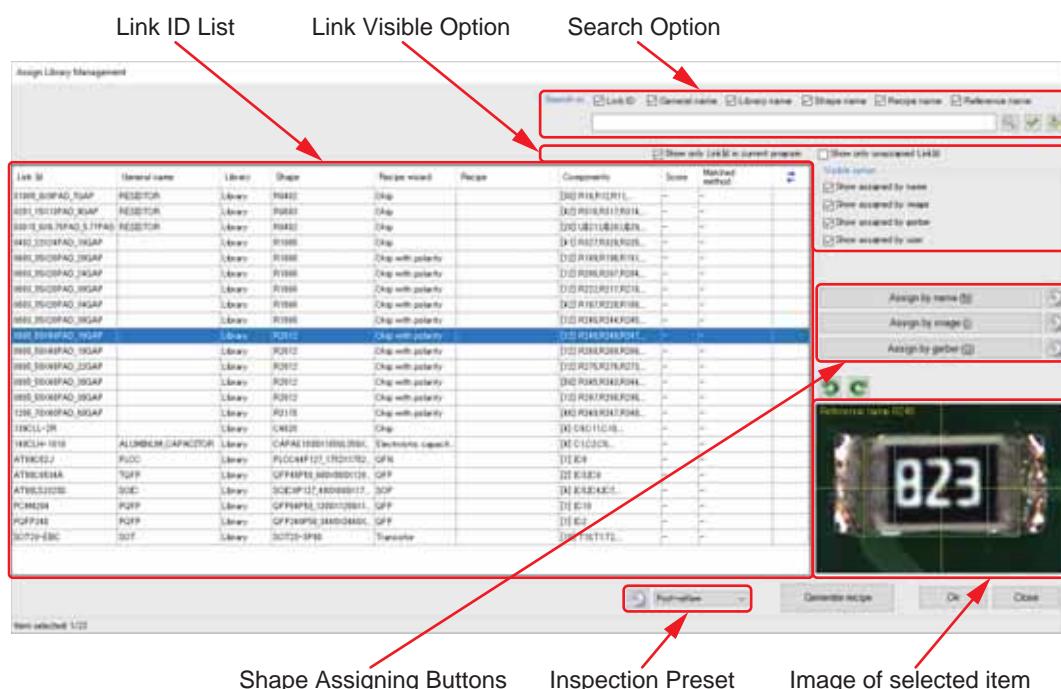


Figure 1-231 Assign Library Management 2

| | Item | Description |
|---------------------|---|--|
| Link ID List | Link ID | Displays the Link IDs of the current inspection data. |
| | General name | Displays the general name of the Link ID. Displays only if the Link ID is associated with a general name. |
| | Library name | Displays the character string Library if the Link ID exists in the library. |
| | Shape name | Displays the shape name of the Link ID. Displays only if the Link ID is associated with a shape name. |
| | Recipe wizard | Displays the Recipe wizard name of the Link ID. The Recipe wizard is a function to expand recipes according to the shape type. The Recipe wizard name is provided according to the shape type. Displays only if the Link ID is associated with a shape name. |
| | Recipe | Displays the recipe name of the Link ID. Displays only if the Link ID is associated with a shape name. |
| | Reference name | Displays the reference name of the Link ID. |
| | Score | Displays the match rate if a shape has been assigned with the Shape Assigning buttons . |
| | Matched method | Displays the Shape Assigning buttons used for assignment. |
| |  | Displays  icon during Auto Mode with the Shape Assigning Buttons . |
| Search Option | Check box | Each check box corresponds to the heading of a Link ID list. Searches for the checked items. |
| | Text box | Enter texts into the text box to search from the checked items. |
| |  | Click this during the search to move the cursor to the next search target. |
| |  | Click this during the search to select all search targets. |
| |  | Click this during the search to clear the search results. |
| Link Visible Option | Show only Link Id in current program | Check to display only the Link IDs included in the inspection data currently opened. |
| | Show only unassigned LinkId | Check to display only the unassigned Link IDs. |
| | Show assigned by name | Check to display only the items of which Matched method items in the Link ID list is Name. |
| | Show assigned by image | Check to display only the items of which Matched method items in the Link ID list is Image. |
| | Show assigned by gerber | Check to display only the items of which Matched method items in the Link ID list is Gerber. |
| | Show assigned by user | Check to display only the items of which Matched method items in the Link ID list is User. |

| Item | | Description |
|-------------------------------|--------------------|--|
| Shape Assigning Buttons | Assigned by name | Searches by a name to assign the shape having the highest match rate. Displays the assigned items in yellow. |
| | Assigned by image | Searches the image data of components and images of all shapes in the library by a template matching, and assigns shapes having the highest match rate. Displays the assigned items in green. |
| | Assigned by gerber | Searches the gerber data of components and images of all shapes in the library by template matching, and assigns shapes having the highest match rate. Displays the assigned items in red. |
| | | Performs detailed setting of automatic shape assignment. Sets the detailed settings of each tab (Assigned by name, Assigned by image, and Assigned by gerber). Change the Minimum match rate value to avoid assigning a shape having a low match rate in automatic shape assignment. If the match rate is equal to or less than the specified value, a shape is not automatically assigned. |
| Image of Selected Item | | Displays images in the selected list. |
| Inspection Preset | | Specifies the setting for inspection pre-set |
| | Drop-down list | Sets inspection preset setting for automatic recipe generation. The default value is Post-reflow . |
| Generate recipe | | Generates default recipe (recipe wizard name) for the link ID which the recipe is not assigned. |
| Close | | Exit the Assign Library Management . |

Table 1-34 Descriptions

Step2: Select an item to assign the shape.

NOTE Press **Ctrl** + **A** while the Link ID list is being selected to select all of the items.
 Select items while pressing **Shift** to select all items within the specified range.
 Select items while pressing **Ctrl** to select all the specified items.

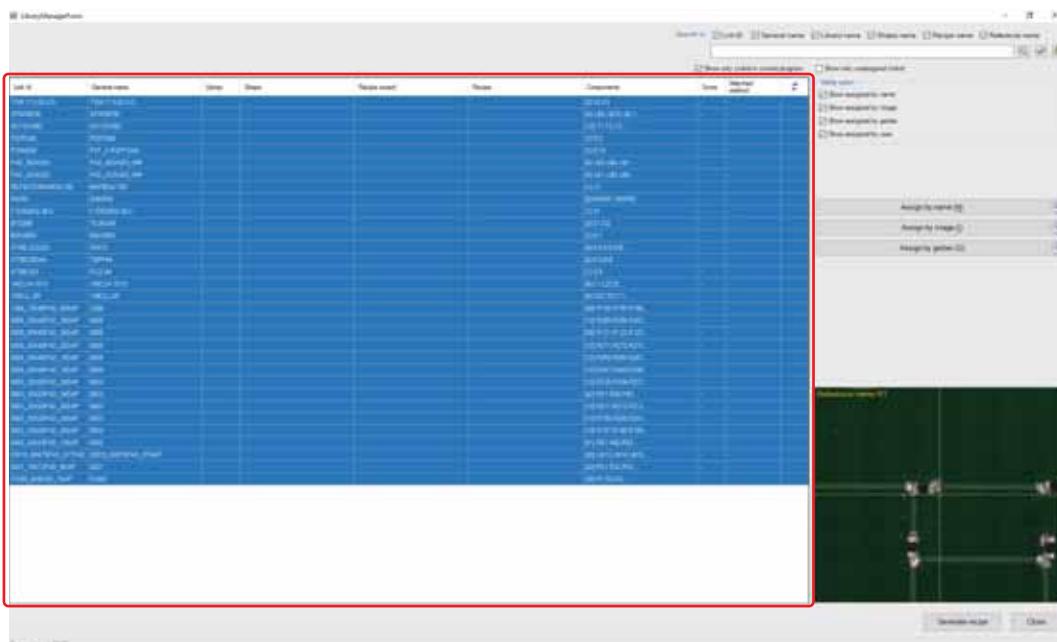


Figure 1-232 Assign Library Management 3

Step3: Click **Assigned by gerber** to assign Library Management.

NOTE If the gerber data is not loaded, click **Assigned by name**.

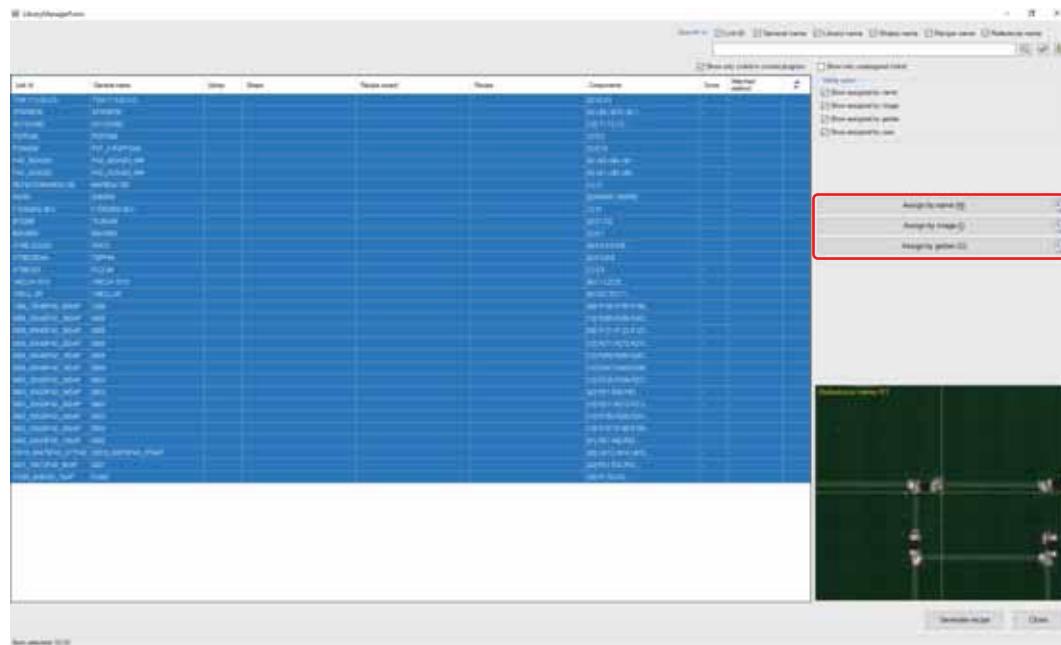


Figure 1-233 Assign Library Management 4

Step4: Refer to the **Image of Selected Item** to check whether or not automatic shape assignment has been performed appropriately. If shape assignment is not appropriate, select the target Shape name item to check other matching shape candidates.

NOTE If there are unassigned Link IDs, check **Show only unassigned Link ID** to show only the unassigned Link IDs.

In this state, select **Assigned by name** or **Assigned by image** to perform automatic shape assignment.

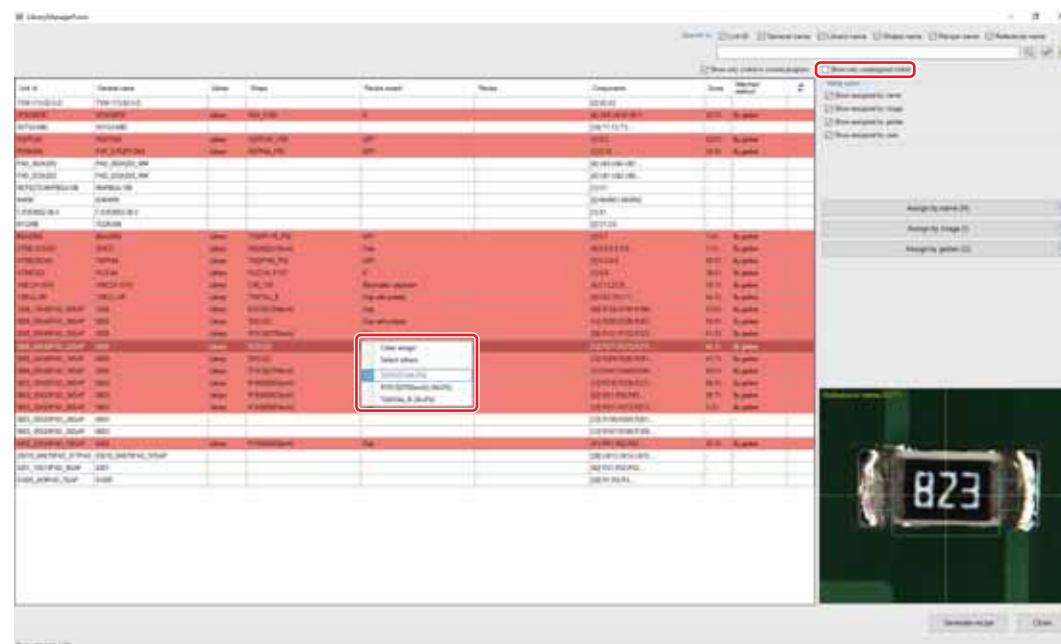


Figure 1-234 Assign Library Management 5

Step5: When an appropriate shape cannot be detected with the **Shape Assigning Buttons**, use **Select shape manually** in right-click menu on the target item to manually select a shape.

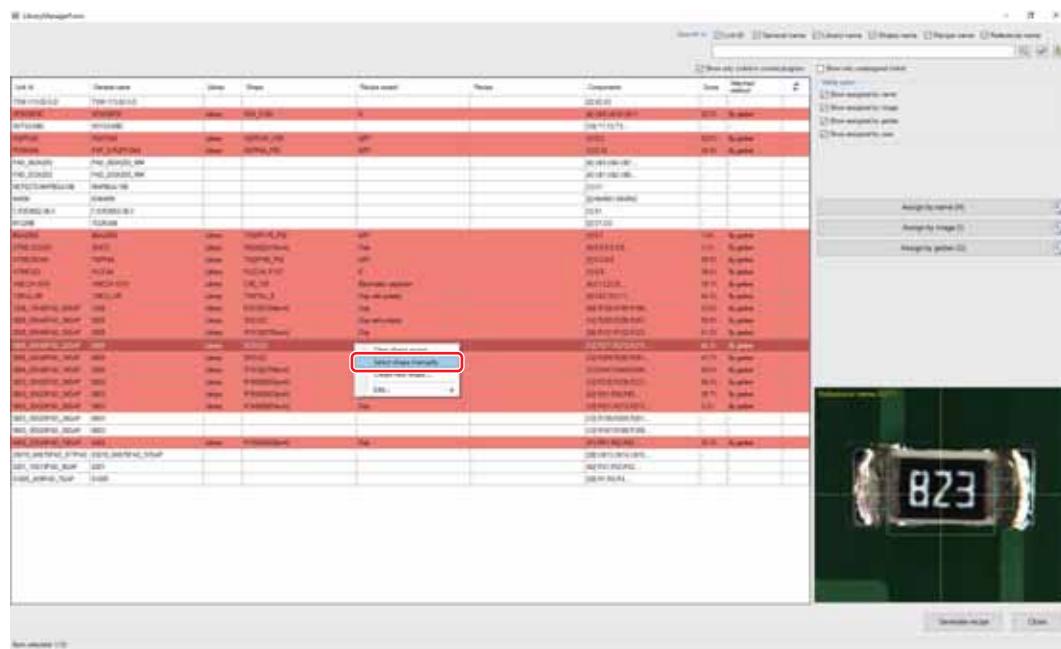


Figure 1-235 Assign Library Management 6

Step6: If an appropriate shape does not exist, use **Create new shape...** in right-click menu on the target item to create a new shape.

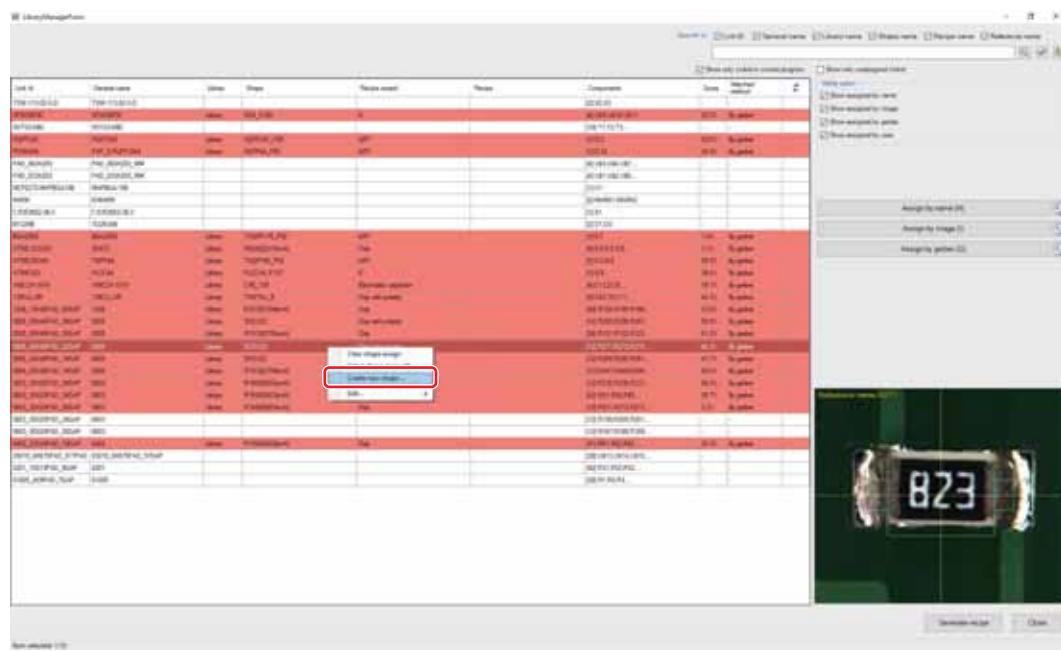


Figure 1-236 Assign Library Management 7

1.12.3 Assigning a Shape Manually

Here describes how to assign library management manually.

Step1: Right-click an item and select **Select others**.

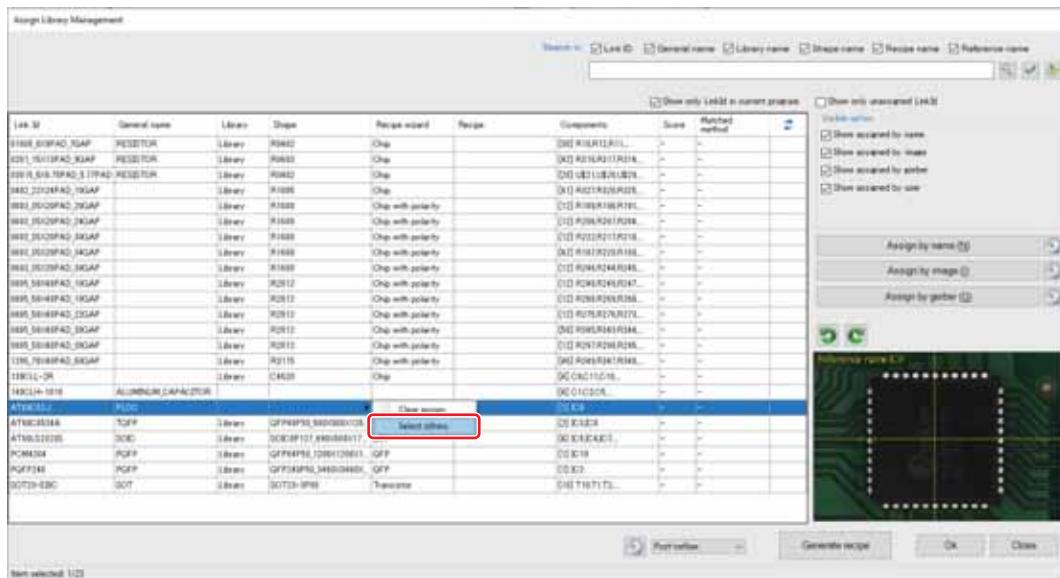


Figure 1-237 Assigning a Shape Manually 1

Step2: The dialog shown below appears.

Search the shape to be assigned by reference to Table 1-35.

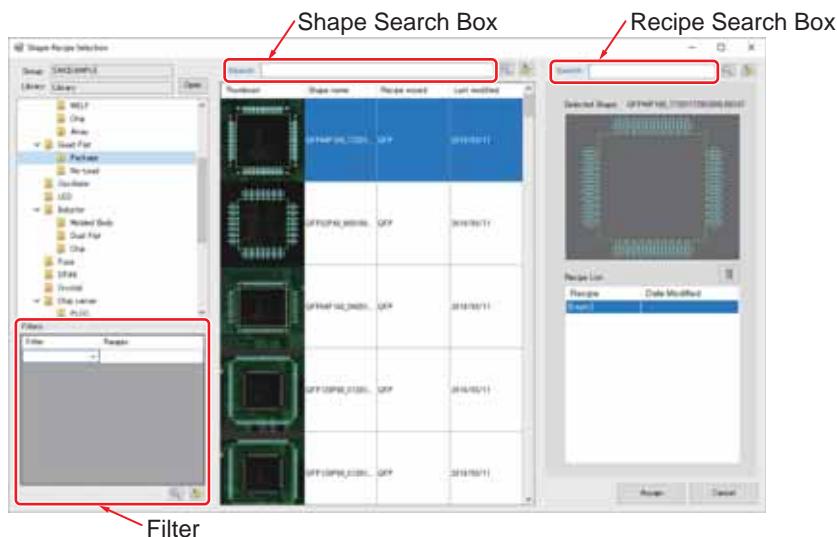


Figure 1-238 Assigning a Shape Manually 2

| Item | Description | |
|-------------------|--|---|
| Shape Search Box | Search shape by the name. | |
| Recipe Search Box | Search shape by the recipe name which belongs the shape. | |
| Filter | Body Width(X) | Search shape by width of component. |
| | Body Length(Y) | Search shape by length of component. |
| | Lead Count | Search shape by lead number of component. |
| | Electrode Count | Search shape by the number of electrodes. |
| | Lead Pitch | Search shape by the pitch of lead. |
| | Recipe Wizard Name | Search shape by the name of recipe wizard (Default recipe) which is defined in shape. |

Table 1-35 Descriptions

Step3: Select the shape to assign and click **Assign**.

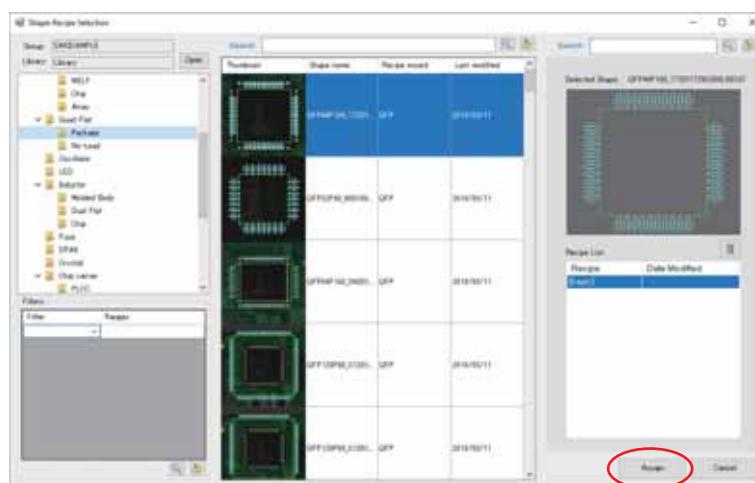


Figure 1-239 Assigning a Shape Manually 3

Step4: The component which the shape is assigned manually is highlighted in blue.

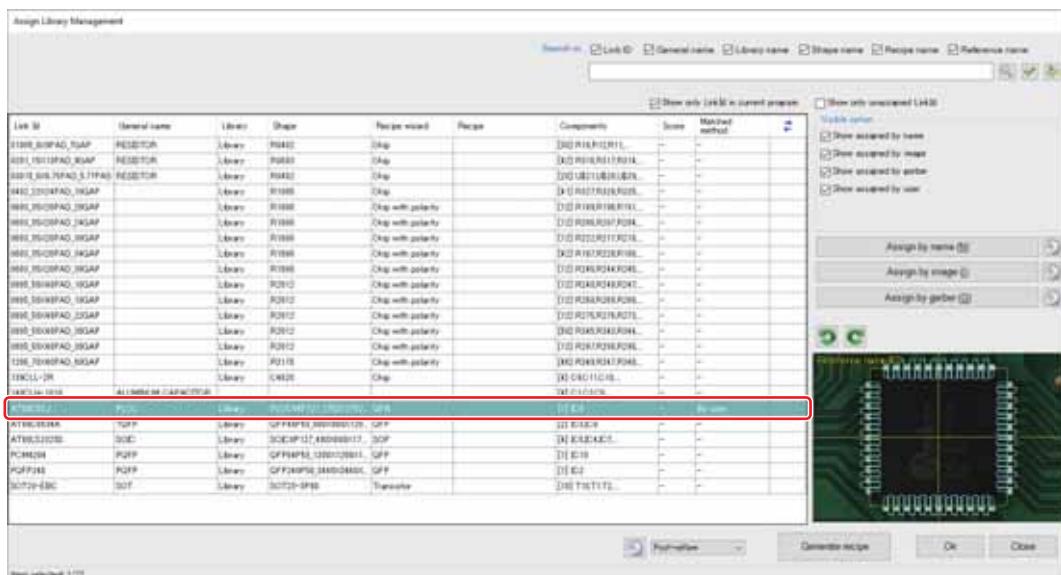


Figure 1-240 Assigning a Shape Manually 4

1.12.4 Clearing the Assigned Shape

Here describes how to clear the assigned shape.

Step1: Select an item and right-click to **Clear shape assign**.

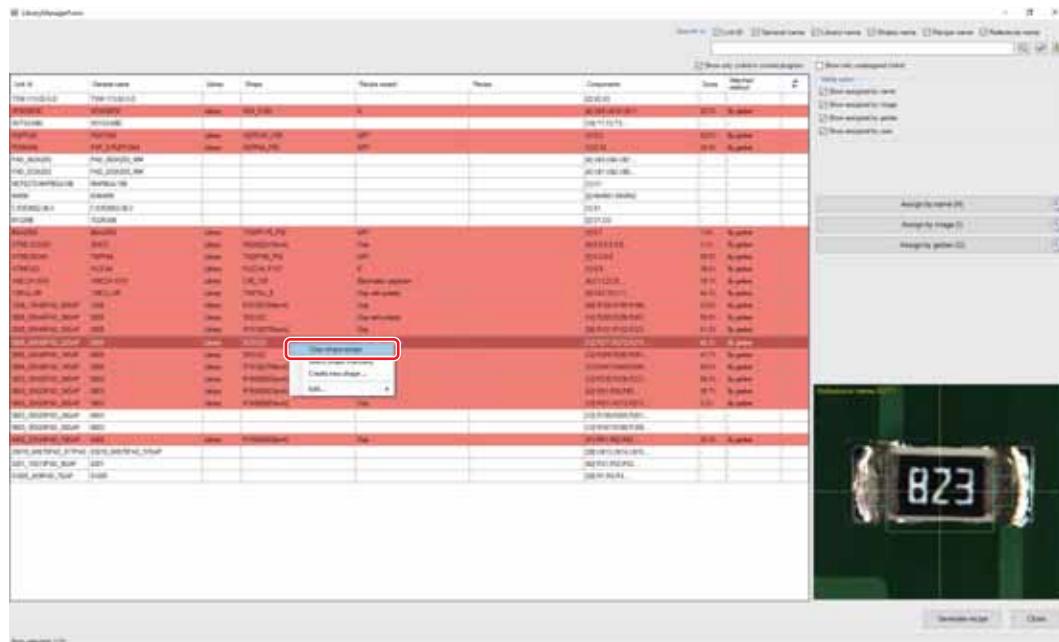


Figure 1-241 Clearing the Assigned Shape 1

Step2: The dialog shown below appears.

- | | |
|---------------|---------------------------------------|
| OK | Clearing the Assigned Shape |
| Cancel | Canceling the Clearing Assigned Shape |

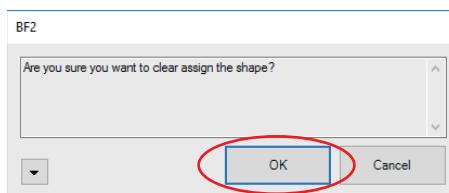


Figure 1-242 Clearing the Assigned Shape 2

1.12.5 Generating Recipe

Here describes how to generate recipe.

A recipe is automatically created from the Recipe wizard name assigned by a Link ID.

Recipes, as described in **1.9.5 Setting an Inspection Window by the Element Wizard**, are expanded by using the Element Wizard. However, Auto Programming makes it possible to automatically create a recipe by tieing a Recipe wizard name with a Link ID during automatic shape assignment.

Step1: After all shapes have been assigned, click **Generate recipe**.

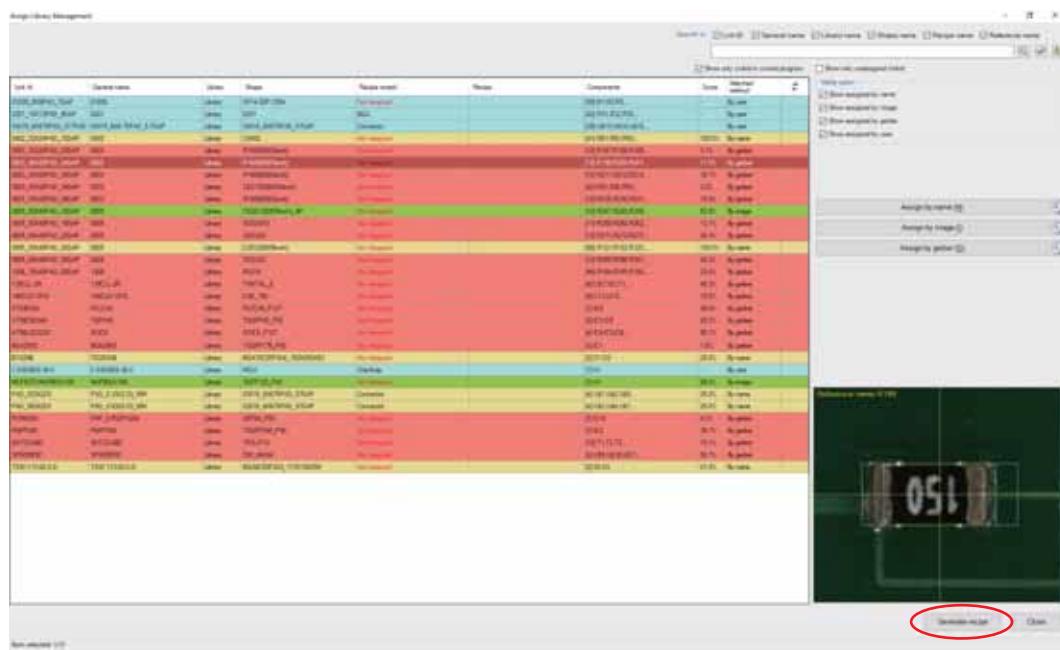


Figure 1-243 Generating Recipe 1

Step2: The dialog shown below appears.

- | | |
|------------|--------------------------|
| Yes | Generate Recipe |
| No | Does not generate Recipe |

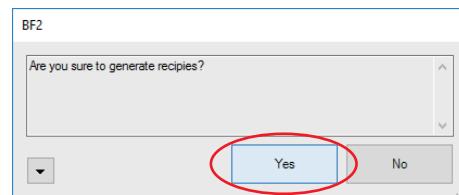


Figure 1-244 Generating Recipe 2

Step3: If a polarity inspection is included in the automatically generated recipe, proceed to Step4.

If a polarity inspection is not included in the automatically generated recipe, proceed to Step7.

Step4: The dialog shown below appears.

At the bottom left of the screen, multiple thumbnails of components having the same Link ID are displayed.

Click **Switch Link ID** button, switches the screen to a different component having the same Link ID.

If necessary, adjust the parameters of polarity inspection.

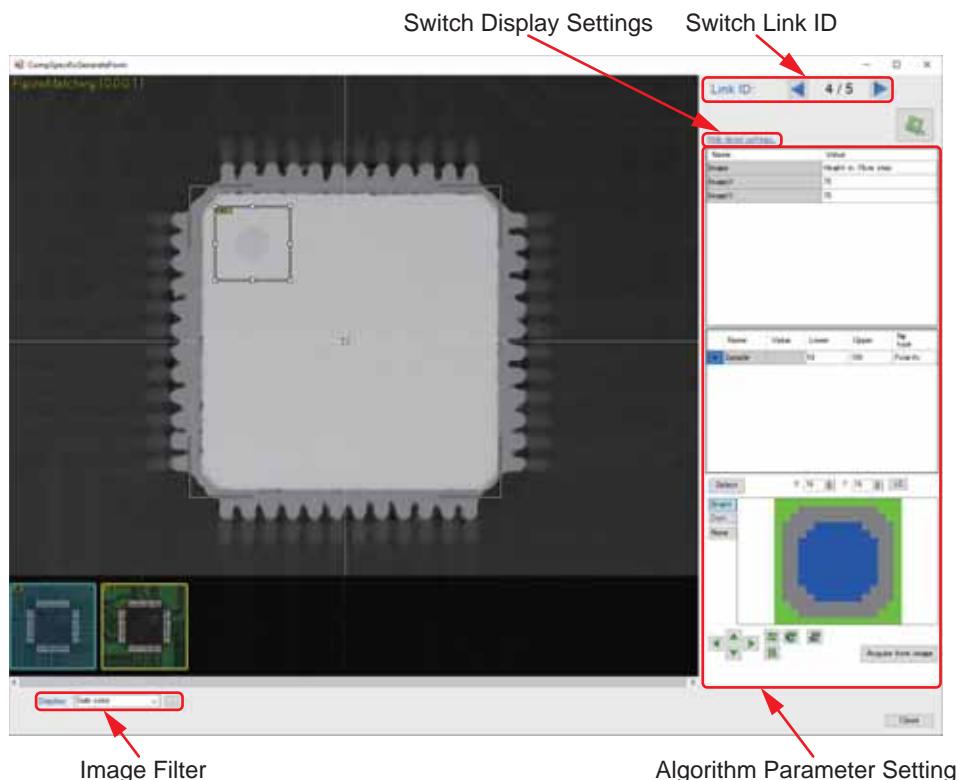


Figure 1-245 Generating Recipe 3

| Item | Description |
|-----------------------------|---|
| Switch Display Settings | Switch between showing and hiding the polarity inspection setting. |
| Switch Link ID | Switches the Link ID for setting. |
| Image Filter | Select a lighting. |
| Algorithm Parameter Setting | Parameter setting for the polarity inspect algorithm is displayed. Displayed algorithm depends on the recipe wizard setting. |

Table 1-36 Descriptions

Step5: Click  again and check if the inspection is completed properly.

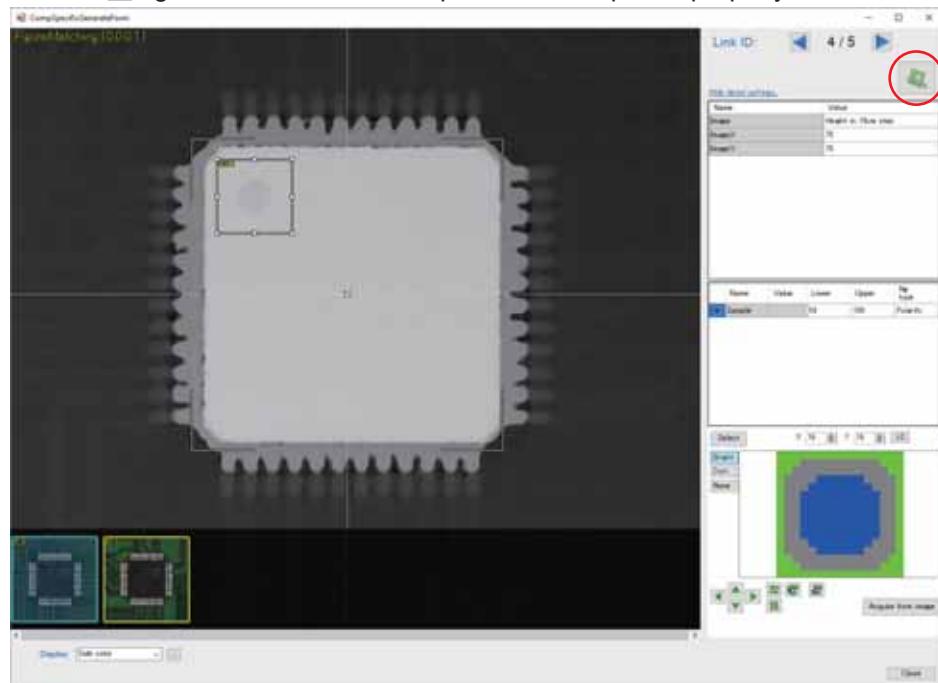


Figure 1-246 Generating Recipe 4

Step6: Click **Close**.

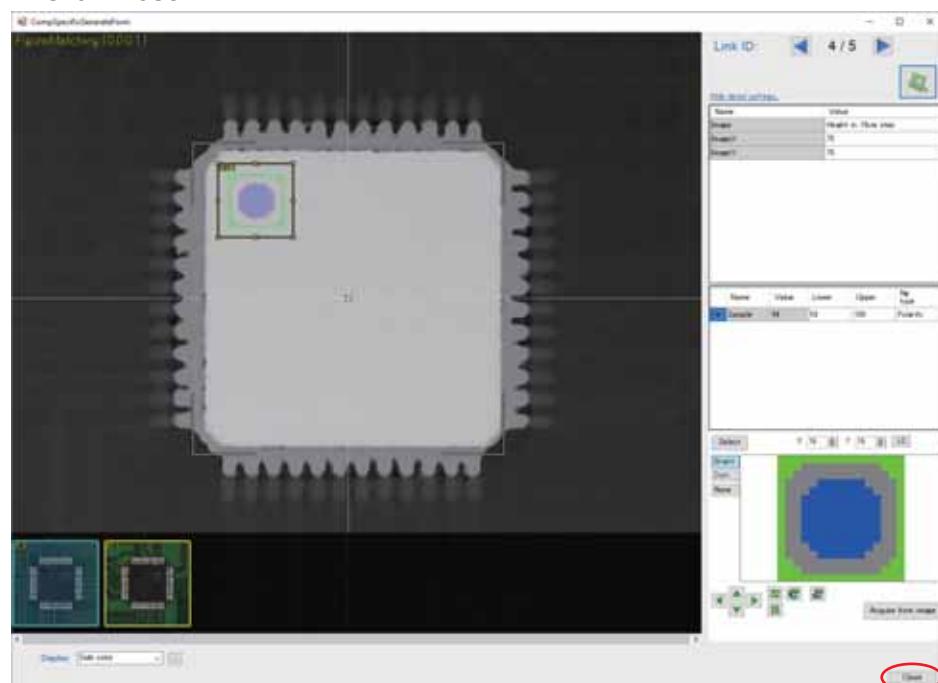


Figure 1-247 Generating Recipe 5

Step7: The dialog shown below appears.

- Yes** Close dialog and exit Assign Library Management.
- No** Return to previous screen.

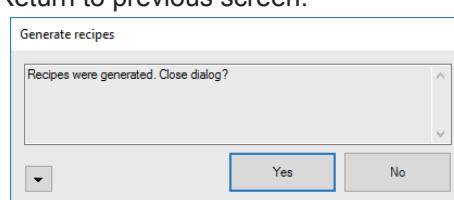


Figure 1-248 Generating Recipe 6

2 Manual Inspection

2.1 Mark Inspection

This section describes the procedures for the mark inspection. By creating fiducial marks and perform **Inspect Mark**, component data positions will be adjusted.

When two fiducial marks are set, the position and the angle of component data will be adjusted. When three marks are set, it will be also adjusted the warpage of PCB in addition to the position and the angle at the time of inspection.

NOTE

Inspect **Mark** is included in the process of **Inspect All**.

If **Inspect All** is going to be performed, it is not necessary to perform **Inspect Mark**.

2.1.1 Mark Inspection Procedure

Step1: Select the **InspectData** tab.



Figure 2-1 InspectData

Step2: From the ribbon, select the **Inspect** group > **Inspect Mark** to start the inspection.



Figure 2-2 Inspect Mark

2.1.2 Disable the Mark adjustment

Step1: Select the **InspectData** tab.

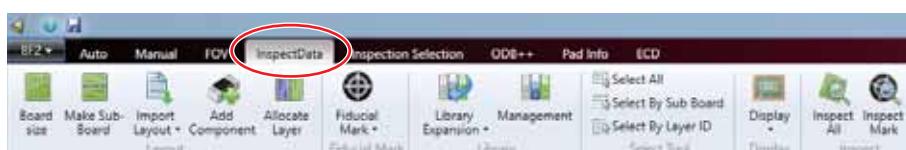


Figure 2-3 InspectData

Step2: From the ribbon, select the **Fiducial Mark** group > **Fiducial Mark** > **Disable Mark Adjustment** to disable the fiducial mark adjustment.

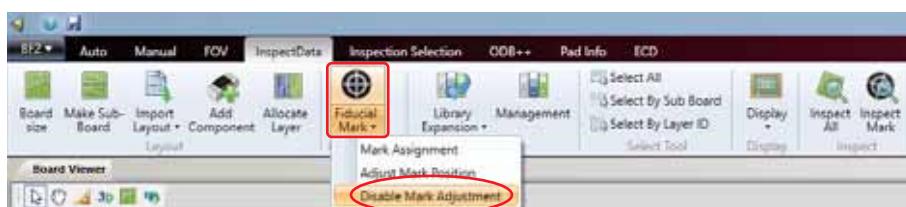


Figure 2-4 Disable Mark Adjustment

2.2 PCB Inspection

This section describes the procedure for the manual inspection and about the display of the inspection result. A PCB inspection can be performed after creating an inspection data.

2.2.1 Starting an Inspection

Step1: Select the **InspectData** tab.



Figure 2-5 InspectData

Step2: From the ribbon, select the **Inspect** group > **Inspect All** to start the inspection.



Figure 2-6 Inspect All

Step3: The inspection results are displayed on **Board Viewer** and on the right side of the dialog (the area framed box in red on Figure 2-7).

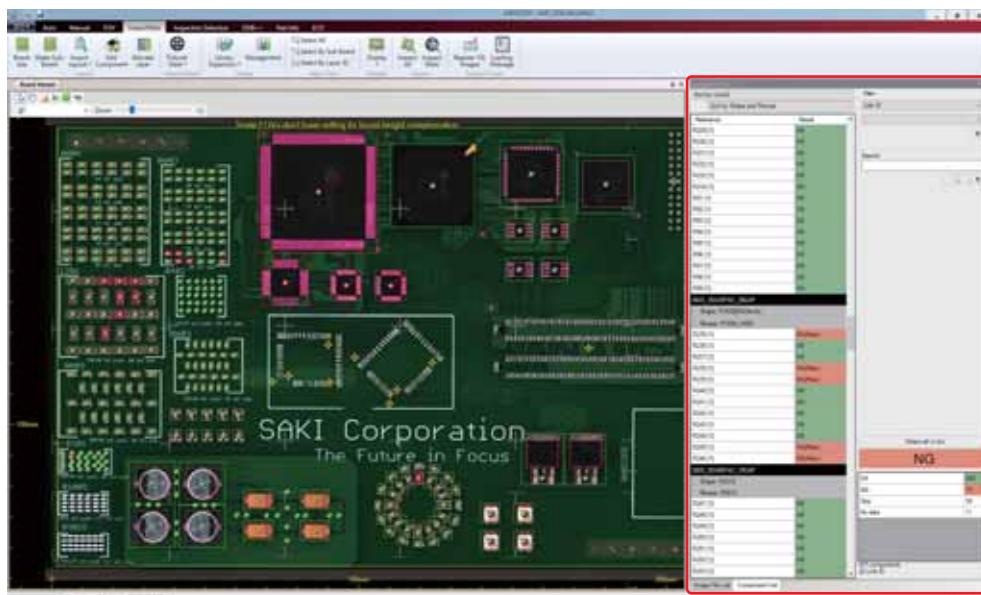


Figure 2-7 Inspection Results

2.2.2 Inspection Result Display

After an inspection, inspection results are shown as below.

Board Viewer

OK components will be framed in green (with ✓ mark on the center of a component).

NG components will be framed in red (with ✗ mark on the center of a component).

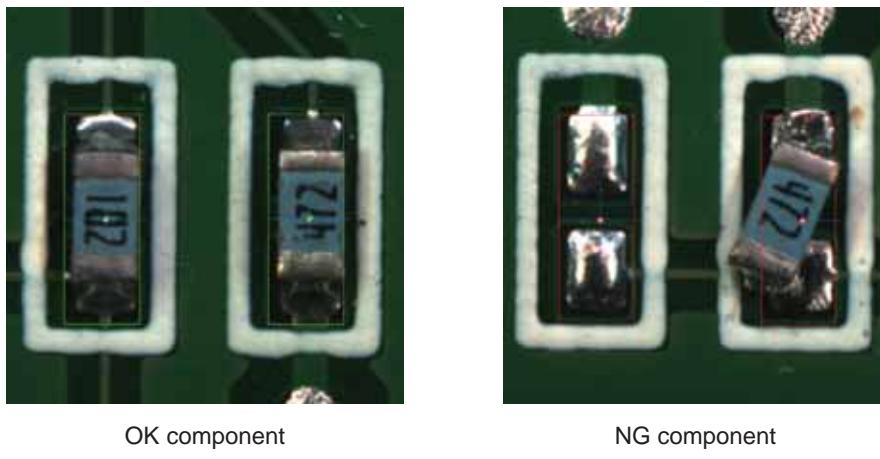


Figure 2-8 Board Viewer

Component List

If an inspection result is OK (good), **OK** is displayed in green.

If an inspection result is NG (detect, bad), **NG** is displayed in red.

Inspection Result of each Component

| Reference | Result |
|--------------------------|---------|
| R229 [1] | OK |
| R230 [1] | OK |
| R231 [1] | OK |
| R232 [1] | OK |
| R233 [1] | OK |
| R234 [1] | OK |
| R91 [1] | OK |
| R82 [1] | OK |
| R83 [1] | OK |
| R84 [1] | OK |
| R85 [1] | OK |
| R86 [1] | OK |
| R87 [1] | OK |
| R88 [1] | OK |
| 060_25COPAD_2BGAP | |
| Shape: R103000Cinch | |
| Recipe: R1030_4550 | |
| R235 [1] | NG(Res) |
| R236 [1] | OK |
| R237 [1] | OK |
| R238 [1] | NG(Res) |
| R239 [1] | NG(Res) |
| R240 [1] | OK |
| R241 [1] | OK |
| R242 [1] | OK |
| R243 [1] | OK |
| R244 [1] | OK |
| R245 [1] | NG(Res) |
| R246 [1] | NG(Res) |
| 080_5044PAC_1BGAP | |
| Shape: R2012 | |
| Recipe: K2012 | |
| R247 [1] | OK |
| R248 [1] | OK |
| R249 [1] | OK |
| R250 [1] | OK |
| R251 [1] | OK |
| R252 [1] | OK |
| R253 [1] | OK |

Inspection Result of the PCB

| Select all in list | |
|--------------------|-----|
| OK | 347 |
| NG | 13 |
| Skip | 56 |
| No-data | 11 |

Inspection Summary

401 components
32 Unit ID

Figure 2-9 Component List

3 Editing an Inspection Data

3.1 List Display of Component Data

To display the **Component List** window, select the **InspectData** tab > dock window > **Component List**.

Component names and inspection results are displayed on **Component List**.

A specific component can also be searched from this window.

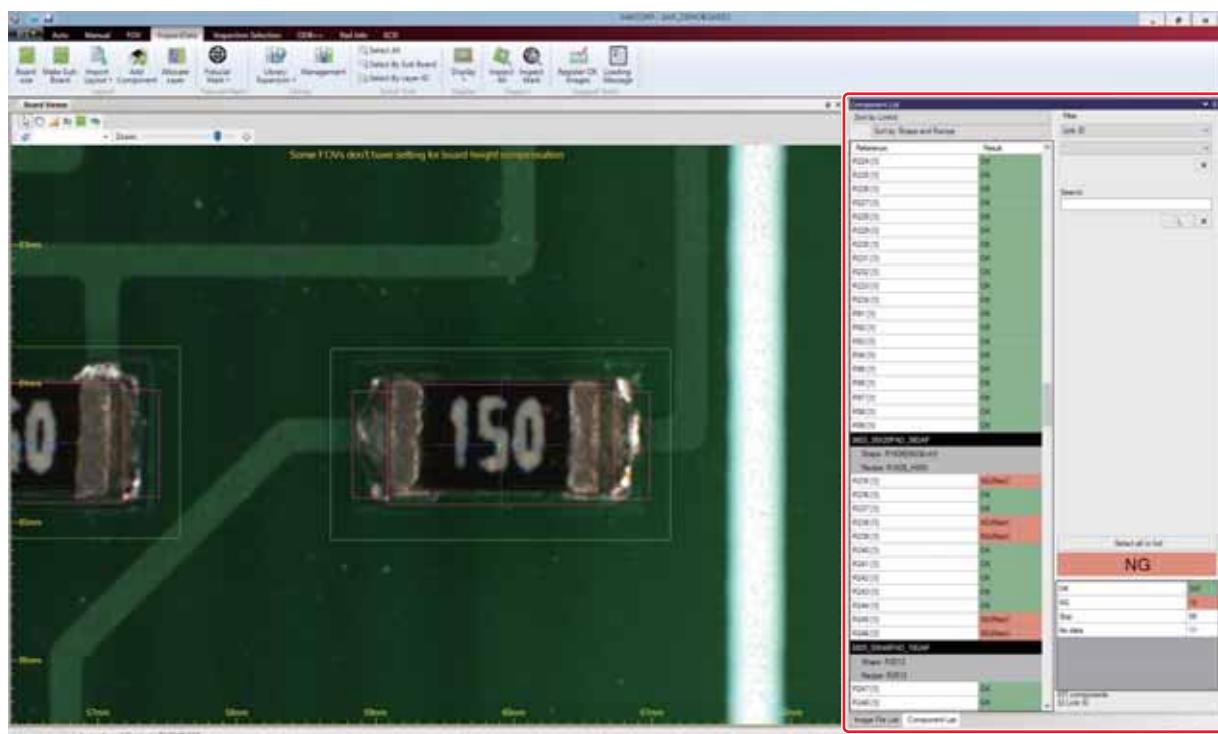


Figure 3-1 Component List

3.1.1 Selecting a Component Data (Component List)

When a reference name is clicked on Component List, the corresponding component data is selected.

When another line is clicked, all component data sharing the clicked Link ID are selected.

Also, when a line of inspection results are clicked, each inspection results (OK/NG/None) will be sequentially selected.

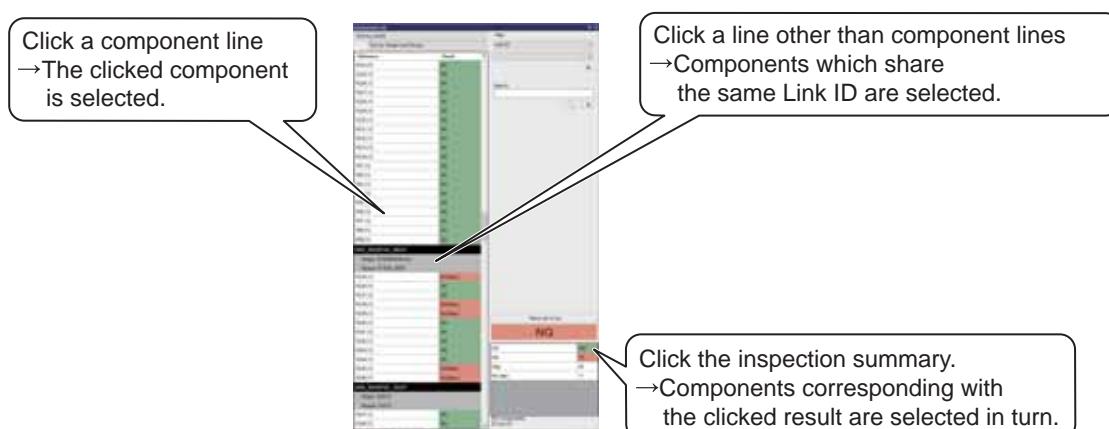


Figure 3-2 Selecting a Component Data (Component List)

3.1.2 Sorting Component Data

Sorts component data in accordance with the specified conditions.

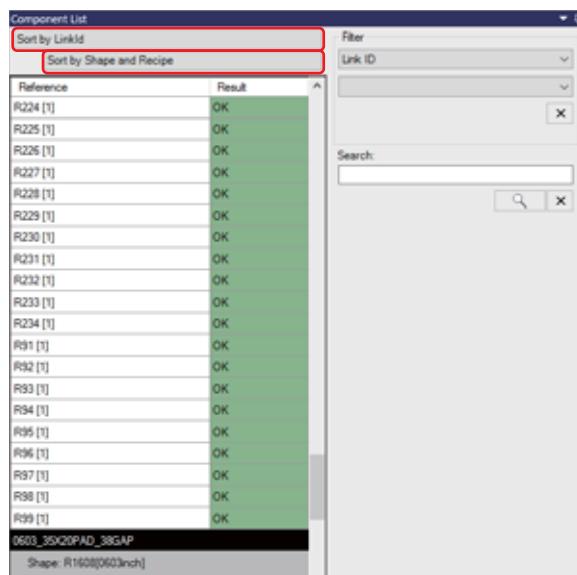


Figure 3-3 Sorting Component Data

| Item | Description |
|--------------------------|---|
| Sort by Link ID | Sorts component data in ascending order based on Link ID. |
| Sort by Shape and Recipe | Sorts component data in ascending order based on Shape names. If Shape names are the same, sorts by Recipe names. If Shape names are not set, component data are not sorted and displayed on the top of the list. |

Table 3-1 Descriptions

3.1.3 Filtering Component Data

The filtering function displays only the components corresponding to the specified conditions.

Step1: Select an item from the upper drop-down list of **Filter**.

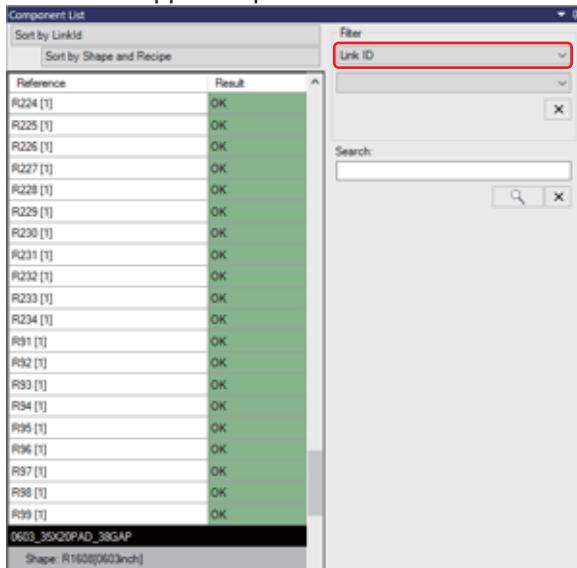


Figure 3-4 Filtering Component Data 1

Step2: Select an item from the lower drop-down list of **Filter**.

Only the components corresponding to the specified condition are displayed on **Component List**.

NOTE To reset the filtering, click the  button.

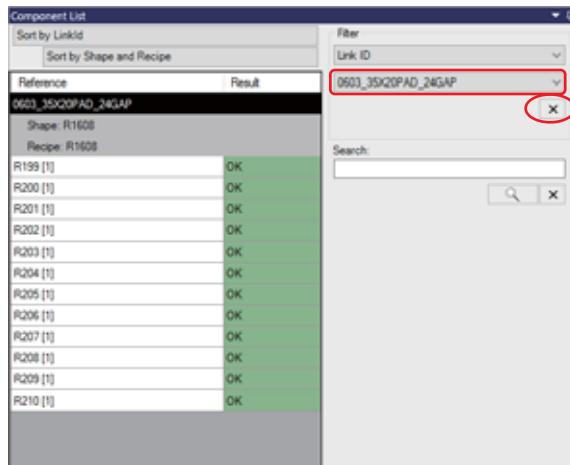


Figure 3-5 Filtering Component Data 2

3.1.4 Searching a Component Data

Enter any strings to the text-box under **Search** and click .

Component data which include the entered string will be searched and highlighted in yellow.

CAUTION The string in the text box will be case-sensitive.

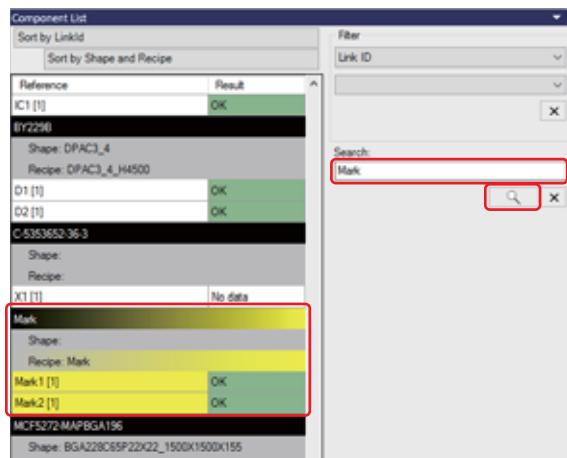


Figure 3-6 Searching a Component Data

3.2 Editing a Component Data

3.2.1 Selecting a Component Data (Board Viewer)

Here describes how to select a component data from **Board Viewer**.

Step1: Select the **InspectData** tab.



Figure 3-7 InspectData

Step2: **To Select a Specific Component Data**

On **Board Viewer**, click a component data or drag the mouse pointer to surround a component. The selected component data is framed in thick green.

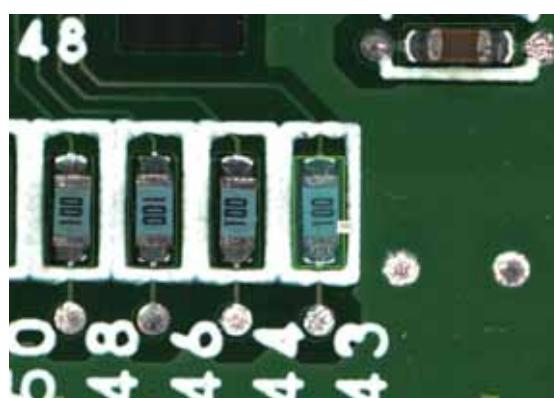


Figure 3-8 Selecting a Specific Component Data

To Select All Component Data

From **InspectData** tab, select the **Select Tool** group > **Select Tool** > **Select All**.

NOTE The same operation can also be performed by pressing **Ctrl** + **A**.

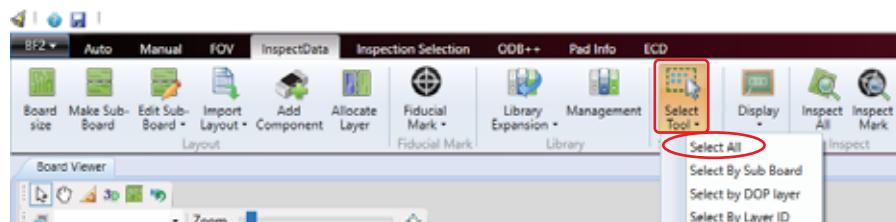


Figure 3-9 Selecting All Component Data

To Select All Component Data in the Selected Sub Board

From **InspectData** tab, select the **Select Tool** group > **Select Tool** > **Select By Sub Board**. Enter a number into **Sub Board ID** and click **OK**.

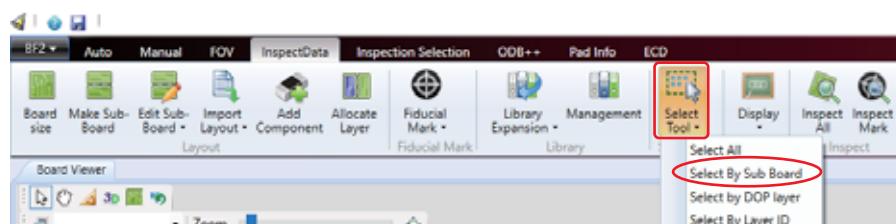


Figure 3-10 Selecting All Component Data in the Selected Sub Board 1

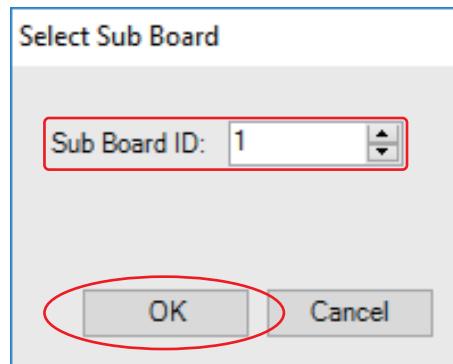


Figure 3-11 Selecting All Component Data in the Selected Sub Board 2

3.2.2 Adding a Component Data

Here describes how to add component data manually.

Step1: From **InspectData** tab, select the **Layout** group > **Add Component**.

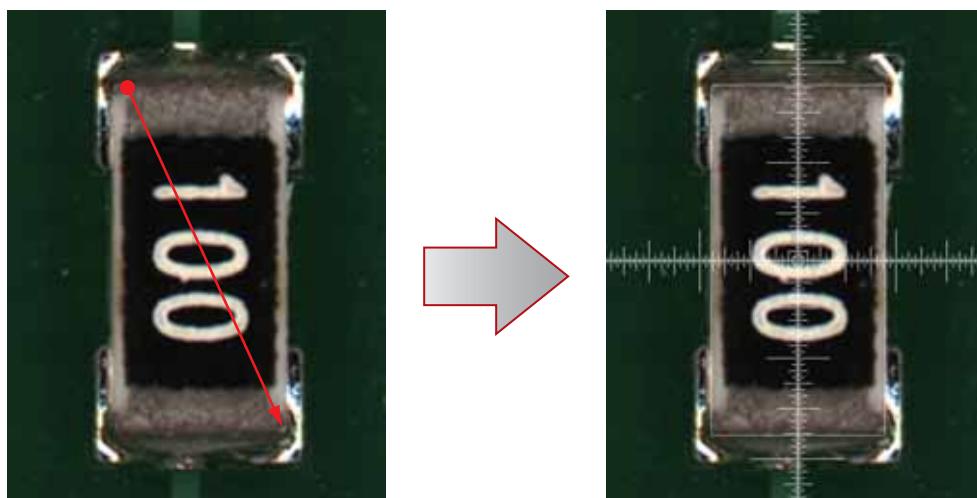


Figure 3-12 Adding a Component Data 1

Step2: Drag the mouse on where a component data to be added.

A component data is added to the center of the white cross line.

NOTE If there is a pad around a component, drag the mouse from a corner to the opposite corner of the pad diagonally. A component data will be added to the center of the mounting position.



Drag the mouse from a corner to the opposite corner of the pattern.

A component data is added to the center of the component mounting position.

Figure 3-13 Adding a Component Data 2

3.2.3 Skip Setting for Component Data

Here describes how to make the skip setting for the specified component data.

Step1: Select a component data by reference to **3.1.1 Selecting a Component Data (Component List)** or **3.2.1 Selecting a Component Data (Board Viewer)**.

Step2: **For a Single Component Data**

Click  on the upper left side of the edit panel.

For Multiple Component Data

Select **Skip** on the edit panel.

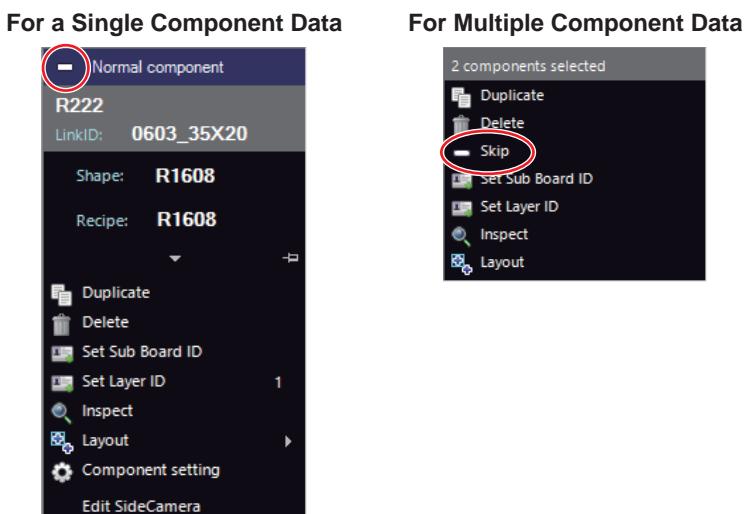


Figure 3-14 Skip Setting for Component Data

3.2.4 Deleting a Component Data

Here describes how to delete a component data.

Step1: Select a component data by reference to **3.1.1 Selecting a Component Data (Component List)** or **3.2.1 Selecting a Component Data (Board Viewer)**.

Step2: Select **Delete** on the edit panel.

CAUTION This panel display is different between the case for a single component and the case for multiple components.

NOTE The same operation can be also performed by pressing **Del**.

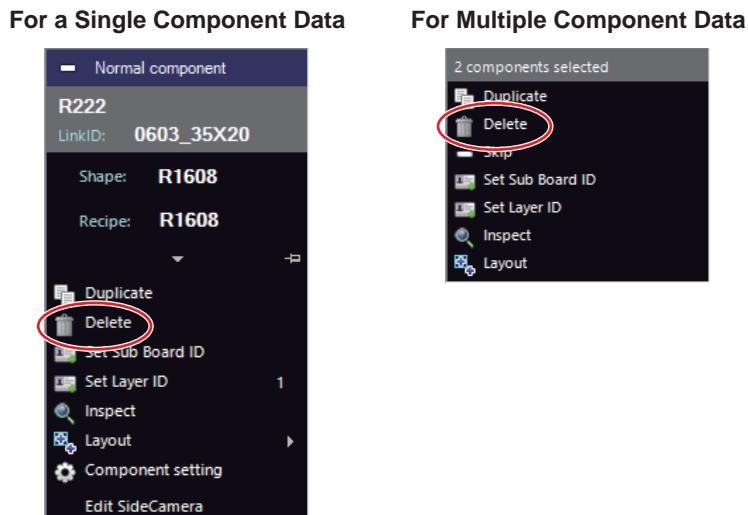


Figure 3-15 Deleting a Component Data 1

Step3: Click **Yes**.

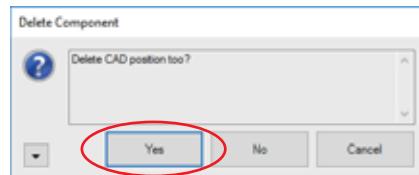


Figure 3-16 Deleting a Component Data 2

3.2.5 Moving a Component Data

Step1: Select a component data to be moved by reference to **3.1.1 Selecting a Component Data (Component List)** or **3.2.1 Selecting a Component Data (Board Viewer)**.

Step2: **To Move a Component Data Manually**

Drag the selected component data with the mouse to move it to the desired point. The dialog shown below appears. Click .

NOTE To return the component data to the original position, click **Cancel**.

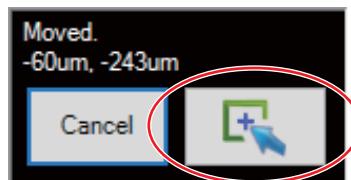


Figure 3-17 Moving a Component Data Manually

To Move a Component Data to the Specific Coordinates

Select Layout on the edit panel and enter numbers into the text-boxes under Coordinate.

CAUTION

This function is not available when selecting multiple component data.

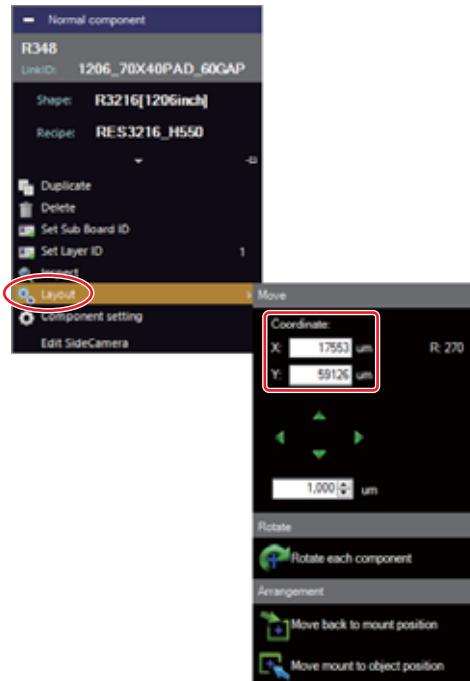


Figure 3-18 Moving a Component Data to the Specific Coordinates

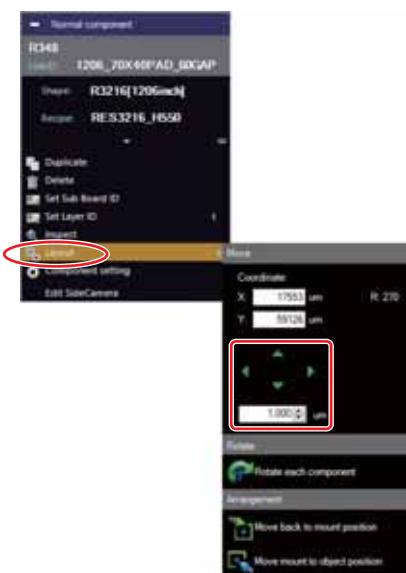
To Move a Component Data to the Specific Direction by the Specific Value

Select **Layout** on the edit panel and enter numbers to the text-boxes under ///.
Click /// to move the component data.

CAUTION

The window to be displayed is different between when a single component is selected and when multiple components are selected.

For a Single Component Data



For Multiple Component Data

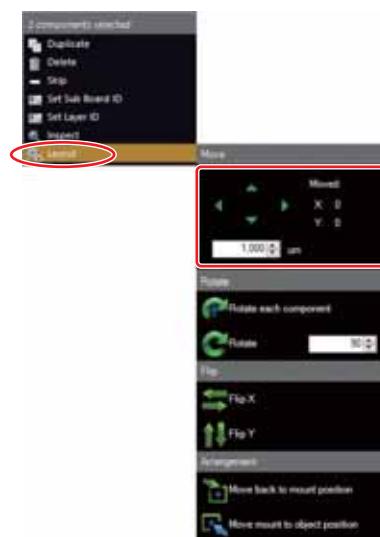


Figure 3-19 Moving a Component Data to the Specific Direction by the Specific Value

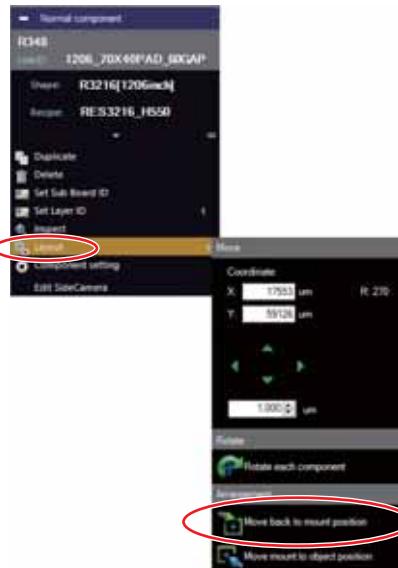
To Move a Component Data to the CAD Data Position

Select **Layout** on the edit panel and click **Move back to mount position**.

CAUTION The window to be displayed is different between when a single component is selected and when multiple components are selected.

NOTE To move the CAD data to the component data position, click **Move mount to object position**.

For a Single Component Data



For Multiple Component Data



Figure 3-20 Moving a Component Data to the CAD Data Position

3.2.6 Rotating Component Data

Step1: Select a component data to be rotated by reference to **3.1.1 Selecting a Component Data (Component List)** or **3.2.1 Selecting a Component Data (Board Viewer)**.

Step2: To Rotate a Single Component Data

Select **Layout > Rotate each component** on the edit panel and proceed to Step3.

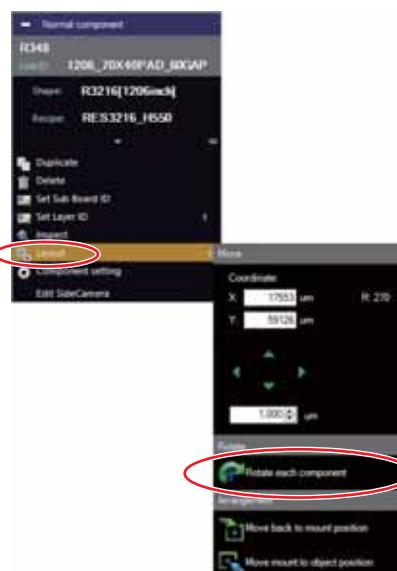


Figure 3-21 Rotating a Single Component Data

To Rotate Multiple Component Data 90 Degrees

Select **Layout > Rotate**. Each time the button is clicked, the component data is rotated 90 degrees.

CAUTION

This function is not available when selecting a single component data.

NOTE

If **Rotate** is clicked when any angle is entered in the text-box on right side of **Rotate**, the component data is rotated clockwise by entered angle.



Figure 3-22 Rotating Multiple Component Data 1

To Rotate Multiple Component Data by the Specific Degree

Select **Layout > Rotate each component** on the edit panel and proceed to Step3.

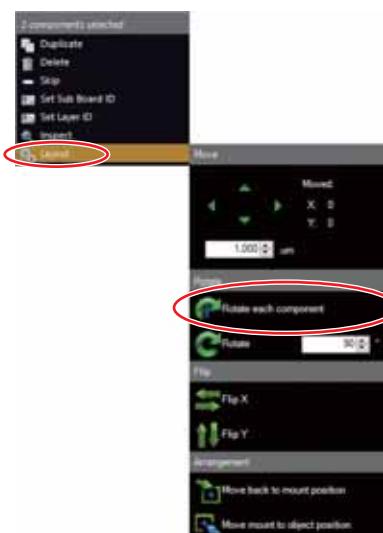


Figure 3-23 Rotating Multiple Component Data 2

Step3: Configure the settings by reference to Table 3-2 and click **Execute**.

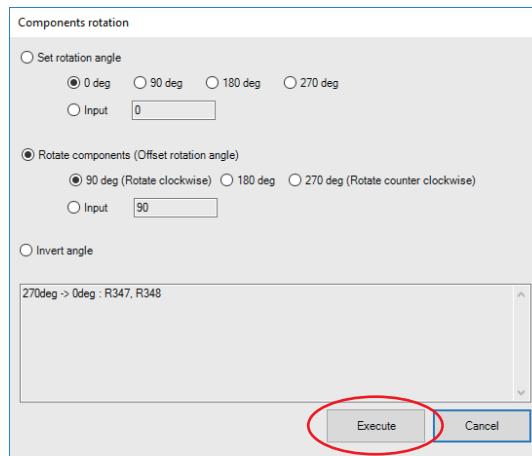


Figure 3-24 Rotation Angle Setting

| Item | Description |
|---|---|
| Set rotation angle | Changes the component angle to the specified value. |
| Rotate components (Offset rotation angle) | Rotates the components by the specified angle. |
| Invert angle | Reverses the rotation direction. |

Table 3-2 Descriptions

3.2.7 Inverting Component Data Positions

CAUTION This function is not available when selecting a single component data.

Step1: Select two or more component data by reference to **3.1.1 Selecting a Component Data (Component List)** or **3.2.1 Selecting a Component Data (Board Viewer)**.

Step2: **To Invert the X-axis of the Component Data Position**

From the edit panel, select **Layout > Flip X**.



Figure 3-25 Inverting the X-axis of the Component Data Position

To Invert the Y-axis of the Component Data Position

From the edit panel, select Layout > Flip Y.



Figure 3-26 Inverting the Y-axis of the Component Data Position

3.3 Changing Library, Reference Name, Link ID, Shape, and Recipe

3.3.1 Changing the Assignment on Board Viewer

Here describes how to change the assignments for reference name, Link ID, Shape, and Recipe by the edit panel of Board Viewer.

CAUTION Libraries cannot be changed in **Board Viewer**.

Step1: Select the InspectData tab.



Figure 3-27 InspectData

Step2: Select a component data from the **Board Viewer**.

Step3: The edit panel appears on the **Board Viewer**.

Click the upper side of the panel in which the reference name and Link ID is displayed.

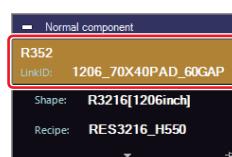


Figure 3-28 Edit Panel

Step4: Make the settings by reference to Table 3-3 and click **OK**.

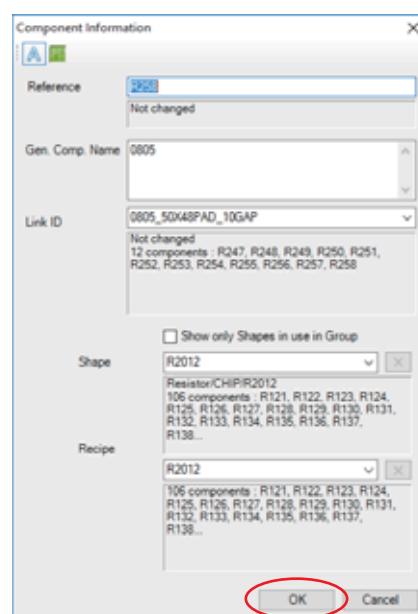
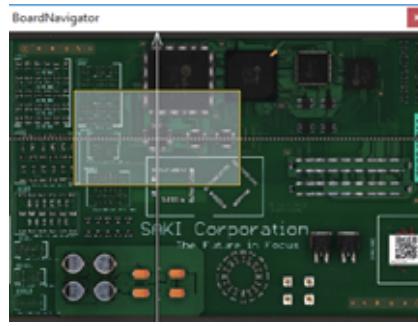


Figure 3-29 Component Information 1

| Item | Description |
|---|--|
|  | <p>When this icon is clicked, link ID, shape name and recipe name are displayed on the upper of component. (L: Link ID, S: Shape name, R: Recipe name)</p>  |
|  | <p>When this icon is clicked, board navigator appears and the component position on board is displayed.</p>  |
| Reference | <p>Specifies the reference for selected component data. The reference name can be edited on text box.</p> |
| Gen. Comp. Name | <p>Specifies the general component name for selected component data. The general component name can be edited on text box.</p> |
| Link ID | <p>Specifies the link ID for selected component data. The existing other link ID can be assigned from combo box. In this case, Shape and Recipe will be changed automatically in conjunction selected link ID. New link ID also can be assigned by editing on combo box.</p> |
| Show only Shapes in use in Group | <p>When Shape drop-down list is clicked, displays only the shape name which is used in the group of opened inspect data.</p> |

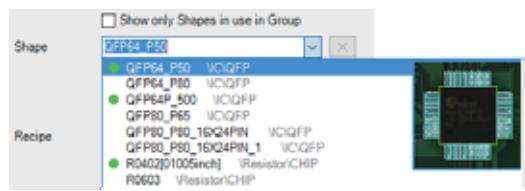
| Item | Description |
|--------|--|
| Shape | <p>Specifies the shape name for selected component data. The list of shape which are registered to library are displayed on drop-down list. There is green mark on left side of the shape used in group of opened inspect data. The library class which the shape is belonging to is displayed on right side of shape. The image when the shape is assigned to component is shown on the right side of dialog. Assign shape by refer to the right side image. Click  to release assignment of shape.</p>  |
| Recipe | <p>Specifies the recipe name for selected component data. The recipes related to specified shape are listed on drop-down list. Select the recipe from drop-down list. Click  to release assignment of recipe.</p> |

Table 3-3 Descriptions

NOTE

Change the Link ID in order to change the shape and recipe of a specific component among those which have the same Link ID.

3.3.2 Displaying the Link ID Table

The Link ID table which includes the list of library, reference name, Link ID, Shape, and Recipe is displayed by selecting **Management** from the ribbon.

Step1: From the **InspectData** tab, select the **Library** group > **Management**.

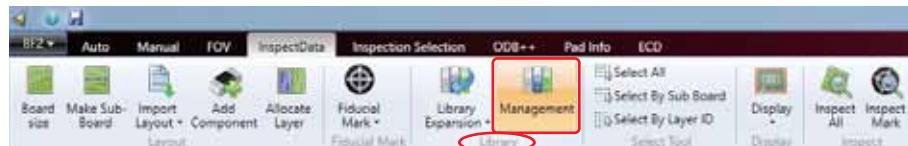


Figure 3-33 Management

Step2: Click **OK**.

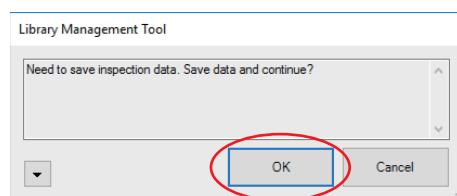


Figure 3-34 Displaying the Link ID Table 1

Step3: Click **Link ID Table**.

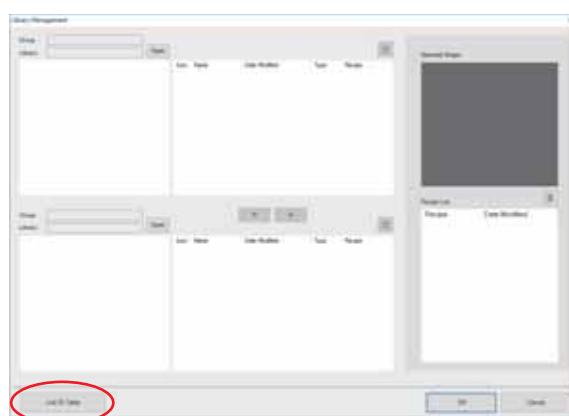


Figure 3-35 Displaying the Link ID Table 2

Step4: Click **OK**.

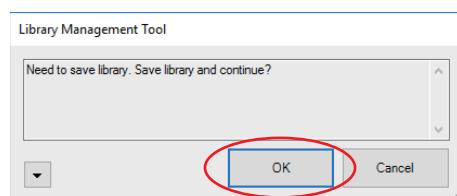


Figure 3-36 Displaying the Link ID Table 3

Step5: The Link ID table appears. The table displays the list of reference name, Link ID, Shape, and Recipe. To close the dialog, click **Close**.

| Link ID | General Name | Link ID | Shape | Assignment |
|-------------|--------------|-------------|-------|------------|
| LinkID_0001 | Component A | LinkID_0001 | None | None |
| LinkID_0002 | Component B | LinkID_0002 | None | None |
| LinkID_0003 | Component C | LinkID_0003 | None | None |
| LinkID_0004 | Component D | LinkID_0004 | None | None |
| LinkID_0005 | Component E | LinkID_0005 | None | None |
| LinkID_0006 | Component F | LinkID_0006 | None | None |
| LinkID_0007 | Component G | LinkID_0007 | None | None |
| LinkID_0008 | Component H | LinkID_0008 | None | None |
| LinkID_0009 | Component I | LinkID_0009 | None | None |
| LinkID_0010 | Component J | LinkID_0010 | None | None |
| LinkID_0011 | Component K | LinkID_0011 | None | None |
| LinkID_0012 | Component L | LinkID_0012 | None | None |
| LinkID_0013 | Component M | LinkID_0013 | None | None |
| LinkID_0014 | Component N | LinkID_0014 | None | None |
| LinkID_0015 | Component O | LinkID_0015 | None | None |
| LinkID_0016 | Component P | LinkID_0016 | None | None |
| LinkID_0017 | Component Q | LinkID_0017 | None | None |
| LinkID_0018 | Component R | LinkID_0018 | None | None |
| LinkID_0019 | Component S | LinkID_0019 | None | None |
| LinkID_0020 | Component T | LinkID_0020 | None | None |
| LinkID_0021 | Component U | LinkID_0021 | None | None |
| LinkID_0022 | Component V | LinkID_0022 | None | None |
| LinkID_0023 | Component W | LinkID_0023 | None | None |
| LinkID_0024 | Component X | LinkID_0024 | None | None |
| LinkID_0025 | Component Y | LinkID_0025 | None | None |
| LinkID_0026 | Component Z | LinkID_0026 | None | None |
| LinkID_0027 | Component AA | LinkID_0027 | None | None |
| LinkID_0028 | Component BB | LinkID_0028 | None | None |
| LinkID_0029 | Component CC | LinkID_0029 | None | None |
| LinkID_0030 | Component DD | LinkID_0030 | None | None |
| LinkID_0031 | Component EE | LinkID_0031 | None | None |
| LinkID_0032 | Component FF | LinkID_0032 | None | None |
| LinkID_0033 | Component GG | LinkID_0033 | None | None |
| LinkID_0034 | Component HH | LinkID_0034 | None | None |
| LinkID_0035 | Component II | LinkID_0035 | None | None |
| LinkID_0036 | Component JJ | LinkID_0036 | None | None |
| LinkID_0037 | Component KK | LinkID_0037 | None | None |
| LinkID_0038 | Component LL | LinkID_0038 | None | None |
| LinkID_0039 | Component MM | LinkID_0039 | None | None |
| LinkID_0040 | Component NN | LinkID_0040 | None | None |
| LinkID_0041 | Component OO | LinkID_0041 | None | None |
| LinkID_0042 | Component PP | LinkID_0042 | None | None |
| LinkID_0043 | Component QQ | LinkID_0043 | None | None |
| LinkID_0044 | Component RR | LinkID_0044 | None | None |
| LinkID_0045 | Component SS | LinkID_0045 | None | None |
| LinkID_0046 | Component TT | LinkID_0046 | None | None |
| LinkID_0047 | Component UU | LinkID_0047 | None | None |
| LinkID_0048 | Component VV | LinkID_0048 | None | None |
| LinkID_0049 | Component WW | LinkID_0049 | None | None |
| LinkID_0050 | Component XX | LinkID_0050 | None | None |
| LinkID_0051 | Component YY | LinkID_0051 | None | None |
| LinkID_0052 | Component ZZ | LinkID_0052 | None | None |
| LinkID_0053 | Component AA | LinkID_0053 | None | None |
| LinkID_0054 | Component BB | LinkID_0054 | None | None |
| LinkID_0055 | Component CC | LinkID_0055 | None | None |
| LinkID_0056 | Component DD | LinkID_0056 | None | None |
| LinkID_0057 | Component EE | LinkID_0057 | None | None |
| LinkID_0058 | Component FF | LinkID_0058 | None | None |
| LinkID_0059 | Component GG | LinkID_0059 | None | None |
| LinkID_0060 | Component HH | LinkID_0060 | None | None |
| LinkID_0061 | Component II | LinkID_0061 | None | None |
| LinkID_0062 | Component JJ | LinkID_0062 | None | None |
| LinkID_0063 | Component KK | LinkID_0063 | None | None |
| LinkID_0064 | Component LL | LinkID_0064 | None | None |
| LinkID_0065 | Component MM | LinkID_0065 | None | None |
| LinkID_0066 | Component NN | LinkID_0066 | None | None |
| LinkID_0067 | Component OO | LinkID_0067 | None | None |
| LinkID_0068 | Component PP | LinkID_0068 | None | None |
| LinkID_0069 | Component QQ | LinkID_0069 | None | None |
| LinkID_0070 | Component RR | LinkID_0070 | None | None |
| LinkID_0071 | Component SS | LinkID_0071 | None | None |
| LinkID_0072 | Component TT | LinkID_0072 | None | None |
| LinkID_0073 | Component UU | LinkID_0073 | None | None |
| LinkID_0074 | Component VV | LinkID_0074 | None | None |
| LinkID_0075 | Component WW | LinkID_0075 | None | None |
| LinkID_0076 | Component XX | LinkID_0076 | None | None |
| LinkID_0077 | Component YY | LinkID_0077 | None | None |
| LinkID_0078 | Component ZZ | LinkID_0078 | None | None |
| LinkID_0079 | Component AA | LinkID_0079 | None | None |
| LinkID_0080 | Component BB | LinkID_0080 | None | None |
| LinkID_0081 | Component CC | LinkID_0081 | None | None |
| LinkID_0082 | Component DD | LinkID_0082 | None | None |
| LinkID_0083 | Component EE | LinkID_0083 | None | None |
| LinkID_0084 | Component FF | LinkID_0084 | None | None |
| LinkID_0085 | Component GG | LinkID_0085 | None | None |
| LinkID_0086 | Component HH | LinkID_0086 | None | None |
| LinkID_0087 | Component II | LinkID_0087 | None | None |
| LinkID_0088 | Component JJ | LinkID_0088 | None | None |
| LinkID_0089 | Component KK | LinkID_0089 | None | None |
| LinkID_0090 | Component LL | LinkID_0090 | None | None |
| LinkID_0091 | Component MM | LinkID_0091 | None | None |
| LinkID_0092 | Component NN | LinkID_0092 | None | None |
| LinkID_0093 | Component OO | LinkID_0093 | None | None |
| LinkID_0094 | Component PP | LinkID_0094 | None | None |
| LinkID_0095 | Component QQ | LinkID_0095 | None | None |
| LinkID_0096 | Component RR | LinkID_0096 | None | None |
| LinkID_0097 | Component SS | LinkID_0097 | None | None |
| LinkID_0098 | Component TT | LinkID_0098 | None | None |
| LinkID_0099 | Component UU | LinkID_0099 | None | None |
| LinkID_0100 | Component VV | LinkID_0100 | None | None |
| LinkID_0101 | Component WW | LinkID_0101 | None | None |
| LinkID_0102 | Component XX | LinkID_0102 | None | None |
| LinkID_0103 | Component YY | LinkID_0103 | None | None |
| LinkID_0104 | Component ZZ | LinkID_0104 | None | None |

Figure 3-37 Link ID Table

| Item | Description |
|--------------------------------------|--|
| | Adds Link ID. |
| | Deletes Link ID. If the Link ID is currently assigned to a component, it cannot be deleted. |
| Import | Imports Link IDs from another inspection data. For details, refer to 3.3.8 Importing Link IDs . |
| Search in | Specifies the search target from drop-down list and searches a word entered in the right text-box . |
| Show only Link ID in current program | Check to show only the Link IDs included in the inspection data currently opened. |
| Link ID | Displays all Link IDs included in the current inspection data in the list. To sort data in ascending/descending order, click a header cell. Link IDs can also be changed by clicking cells. For details, refer to 3.3.3 Changing a Link ID on the Link ID Table . |
| General Component Name | Displays the General Component Name, Library, Shapes, and Recipes assigned to the Link ID. To sort data in ascending/descending order, click a header cell. |
| Library | The setting can be changed by clicking a cell. |
| Shape | For details, refer to 3.3.4 Changing Library, Shape, and Recipe on the Link ID Table . |
| Recipe | For details, refer to 3.3.5 Changing Assignment of a Link ID on the Link ID Table . |
| Components using this Link ID | Displays a component data to which a Link ID is assigned by a reference name. To sort data in ascending/descending order, click a header cell. An assigned component can be changed by clicking a cell. For details, refer to 3.3.5 Changing Assignment of a Link ID on the Link ID Table . |

Table 3-4 Descriptions

3.3.3 Changing a Link ID on the Link ID Table

Step1: Open the Link ID table by reference to **3.3.2 Displaying the Link ID Table**.

Step2: Click one of the **Link ID** cells and click **Edit**.

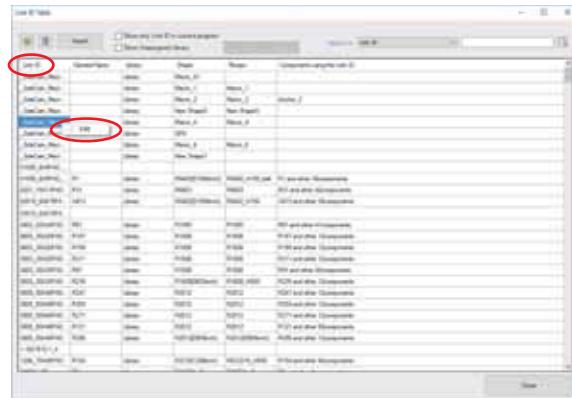


Figure 3-38 Changing a Link ID 1

Step3: Enter a Link ID into the text-box and click **OK**.

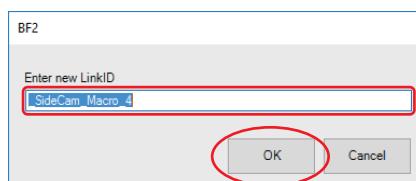


Figure 3-39 Changing a Link ID 2

3.3.4 Changing Library, Shape, and Recipe on the Link ID Table

Step1: Open the Link ID table by reference to **3.3.2 Displaying the Link ID Table**.

Step2: Click one of the **Library** cells and click **Edit**.

NOTE The same operation can also be performed by clicking one of the **Shape** or **Recipe** cells.

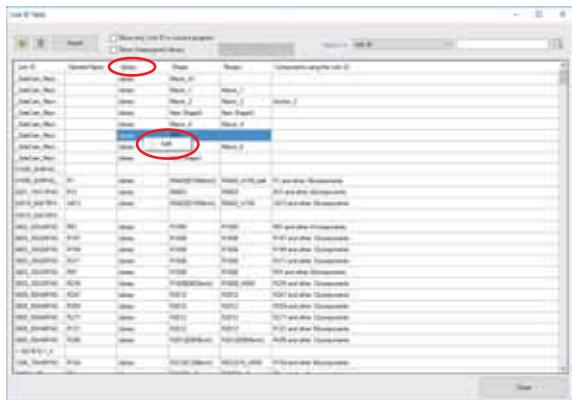


Figure 3-40 Changing Assignments (Library/Shape/Recipe) 1

Step3: Select a library in **Library**. Select a Shape in the left side and center list-box. Select a Recipe in the right side list-box. The selected library, Shape, and Recipe are displayed on the lower side of the dialog. After all the settings are completed, click **OK**.

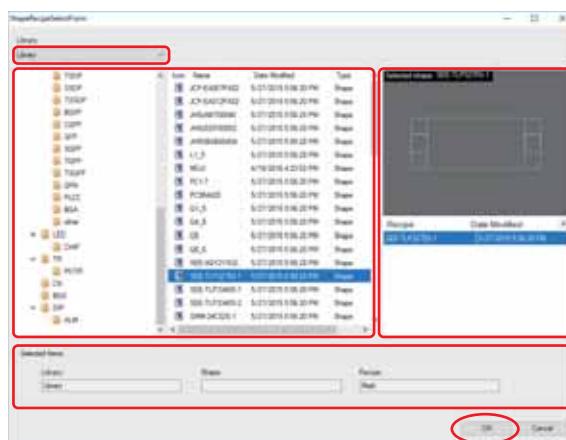


Figure 3-41 Changing Assignments (Library/Shape/Recipe) 2

3.3.5 Changing Assignment of a Link ID on the Link ID Table

Step1: Open the Link ID table by reference to **3.3.2 Displaying the Link ID Table**.

Step2: Click one of the **Components using this Link ID** cells and click **Edit**.

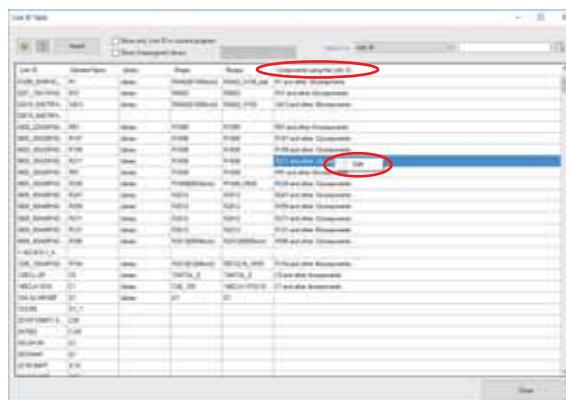


Figure 3-42 Changing Assignment (Link ID) 1

- Step3: The left side list-box displays components to which the selected Link ID is assigned. The right side list-box displays all component data included in the inspection data. Move Link IDs by clicking / and click **OK**.

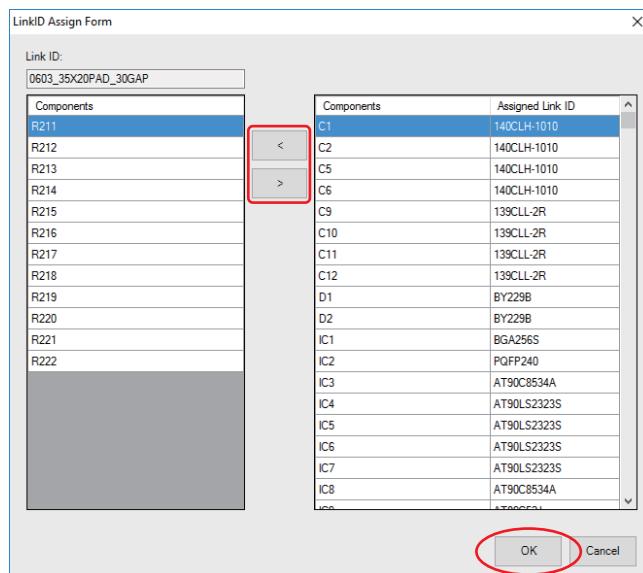


Figure 3-43 Changing Assignment (Link ID) 2

3.3.6 Importing/Exporting a Library

- Step1: From the **InspectData** tab, select the **Library** group > **Management**.

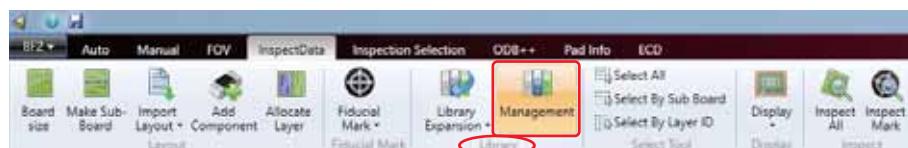


Figure 3-44 Management

- Step2: Click **OK**.

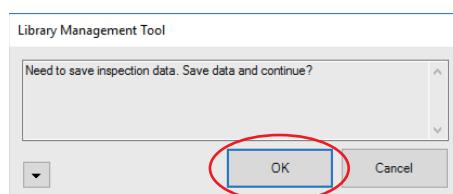


Figure 3-45 Importing/Exporting a Library 1

Step3: Click **Open** on the upper side of the dialog.

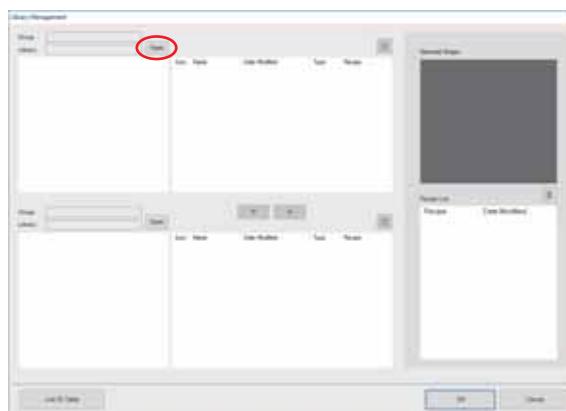


Figure 3-46 Importing/Exporting a Library 2

Step4: The current inspection group is displayed on **Opened Groups**.

To Import Libraries from or Export it to the Current Inspection Data
Click **OK**.

For Other Cases

Click **Add** and select an inspection group file (bfs file) whose library to be imported/exported.
Click **OK**.

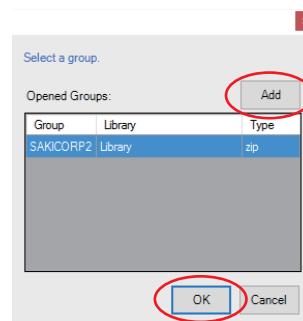


Figure 3-47 Importing/Exporting a Library 3

Step5: The library of the selected group file appears on the upper side of the dialog.
Click **Open** on the lower side of the dialog.

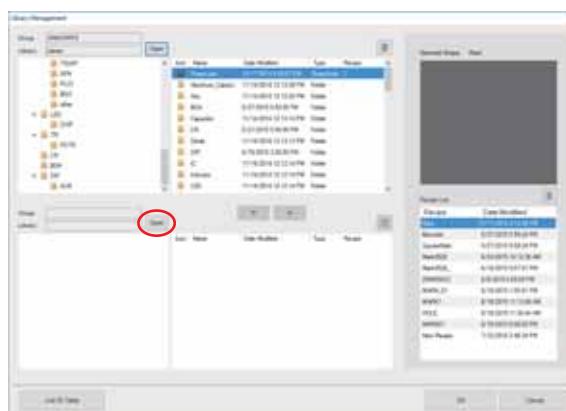


Figure 3-48 Importing/Exporting a Library 4

- Step6: The current inspection group is displayed on **Opened Groups**. Click **Add** and select an inspection group file (bfs file) whose library to be imported/exported. Click **OK**.

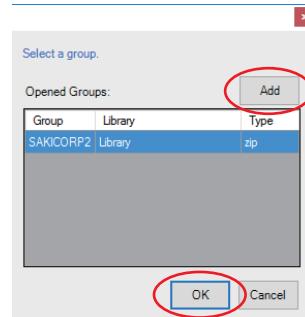


Figure 3-49 Importing/Exporting a Library 5

- Step7: The library of the selected group file appears on the lower side of the dialog.

Select a library and click or . When is clicked, a library on the upper side table is copied to the lower side table. When is clicked, a library on the lower side table is copied to the upper side table. After the copies are completed, click **OK**.

CAUTION Changes are not applied until **OK** is clicked.

CAUTION Link IDs are not assigned to component data until the Link IDs are imported from the other inspection group. For details, refer to **3.3.8 Importing Link IDs**.

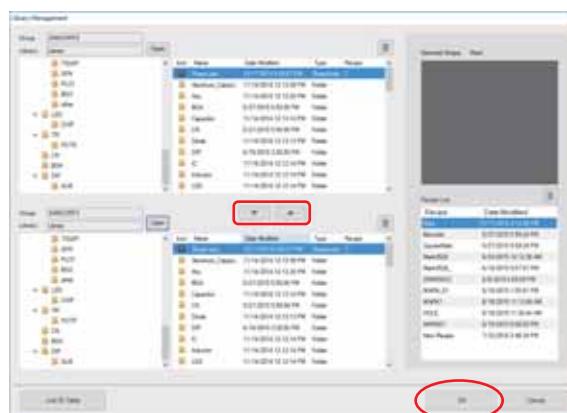


Figure 3-50 Importing/Exporting a Library 6

3.3.7 Delete Library

- Step1: From the **InspectData** tab, select the **Library** group > **Management**.

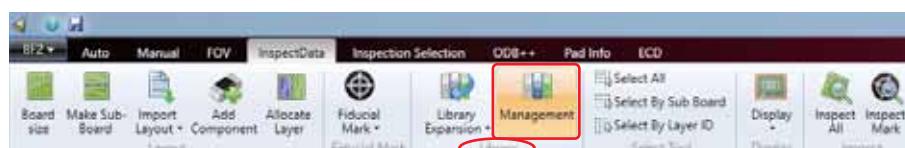


Figure 3-51 Delete Library 1

Step2: The dialog shown below appears.

Click **OK**.

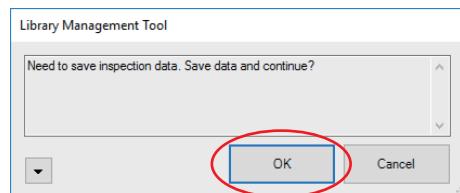


Figure 3-52 Delete Library 2

Step3: Click **Open** on the upper side of the dialog.

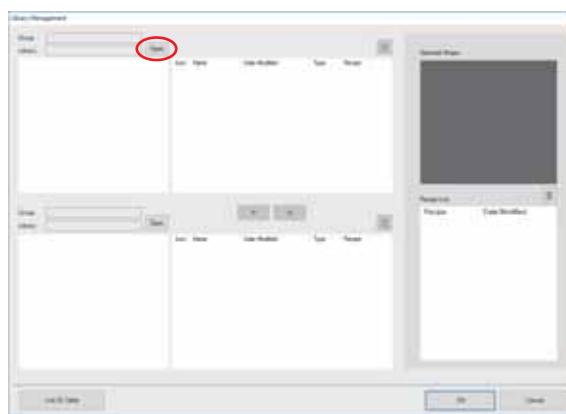


Figure 3-53 Delete Library 3

Step4: The current inspection group is displayed on Opened Groups.

To Delete Libraries from the Current Inspection Data

Click **OK**.

For Other Cases

Click **Add** and select an inspection group file (bfs file) whose library to be imported/exported.

Click **OK**.

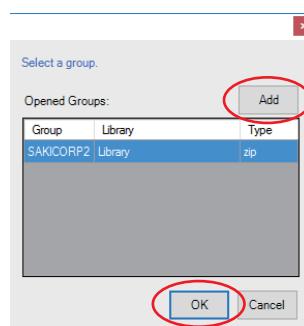


Figure 3-54 Delete Library 4

Step5: The shape whose recipe column is 0 is not used.

Select the library which is judged as unnecessary from the list.

Click  (Delete).

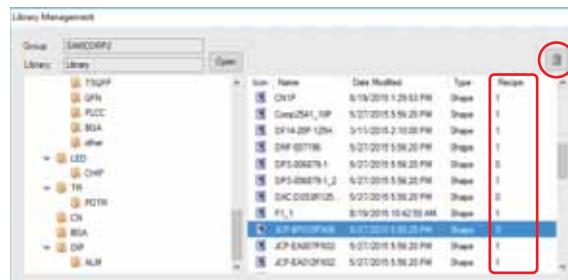


Figure 3-55 Delete Library 5

Step6: Click **Link ID Table**.

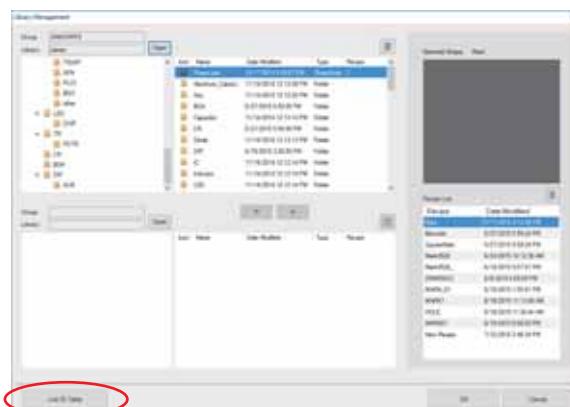


Figure 3-56 Delete Library 6

Step7: The dialog shown below appears.

Click **OK**.

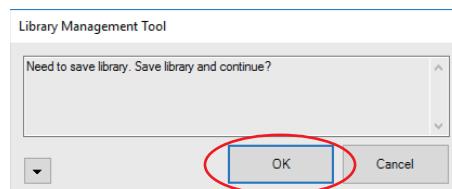


Figure 3-57 Delete Library 7

Step8: The dialog shown below appears.

Check **Show Unassigned Library**.

The unassigned libraries are displayed in list and **Delete Unassigned Library** button becomes active.



Figure 3-58 Delete Library 8

Step9: Click **Delete Unassigned Library**.

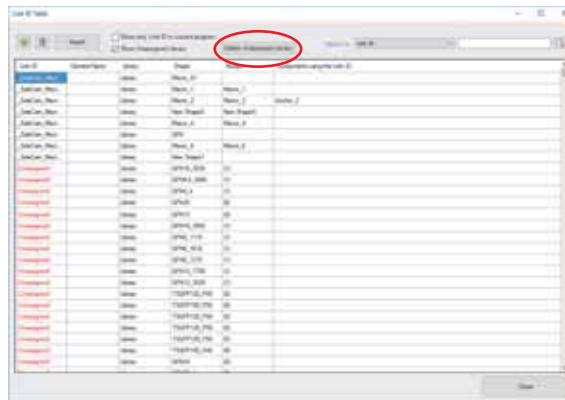


Figure 3-59 Delete Library 9

Step10: The dialog shown below appears.

Click **Yes** to delete all unassigned libraries.

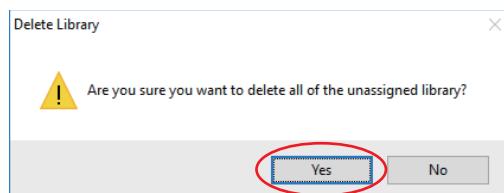


Figure 3-60 Delete Library 10

3.3.8 Importing Link IDs

Step1: Open the Library Management dialog by reference to **3.3.6 Importing/Exporting a Library**.

Step2: Click **Link ID Table**.

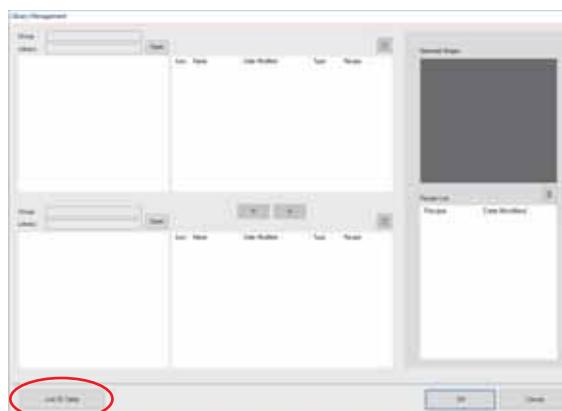


Figure 3-61 Importing Link IDs 1

Step3: The dialog shown below appears.

Click **OK**.

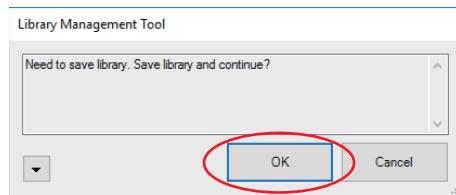


Figure 3-62 Importing Link IDs 2

Step4: Click **Import** and select an inspection group file (bfs file) to load Link IDs.

The data of the selected group file appears.

Click **Close** to close the dialog.

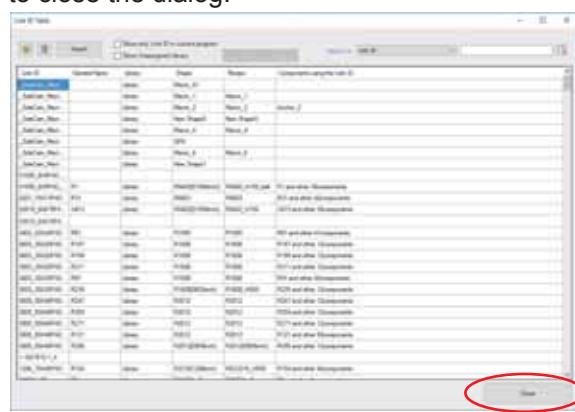


Figure 3-63 Importing Link IDs 3

3.3.9 Link Library

Changes to the recipes and shapes in the inspection data can be saved in the library.

The library exists per group, and one library is shared and used within the same group.

When using a library, changes in the recipes and shapes within the inspection data can be easily expanded to other inspection data in the same group.

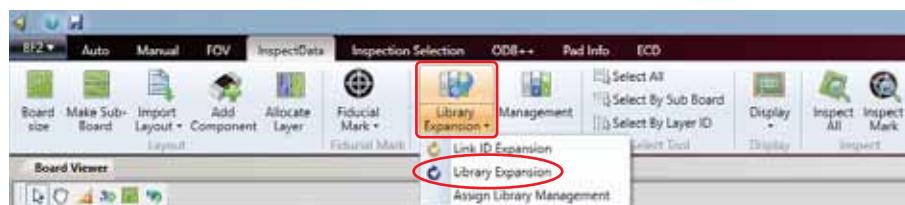


Figure 3-64 Link Library

Library Expansion

For components which use the same shapes and recipes within the group, use **Library Expansion** to apply the changes (e.g. algorithm sample value setting) entered in the library.

Link ID Expansion

For components which use the same Link ID within the group, use **Link ID Expansion** to import and assign a Link ID from the library. The shapes and recipes tied to the Link ID are also assigned when the Link ID is assigned.

3.4 Import Layout

This section describes how to import layout to the current inspection data.

3.4.1 Import Mount Data

Step1: From **InspectData** tab, select the **Layout** group > **Import Layout** > **Mount data**.



Figure 3-65 Import Layout

Step2: Select the appropriate encode setting from the **Encoding** drop-down list.
Click **Select** and select a CAD data.

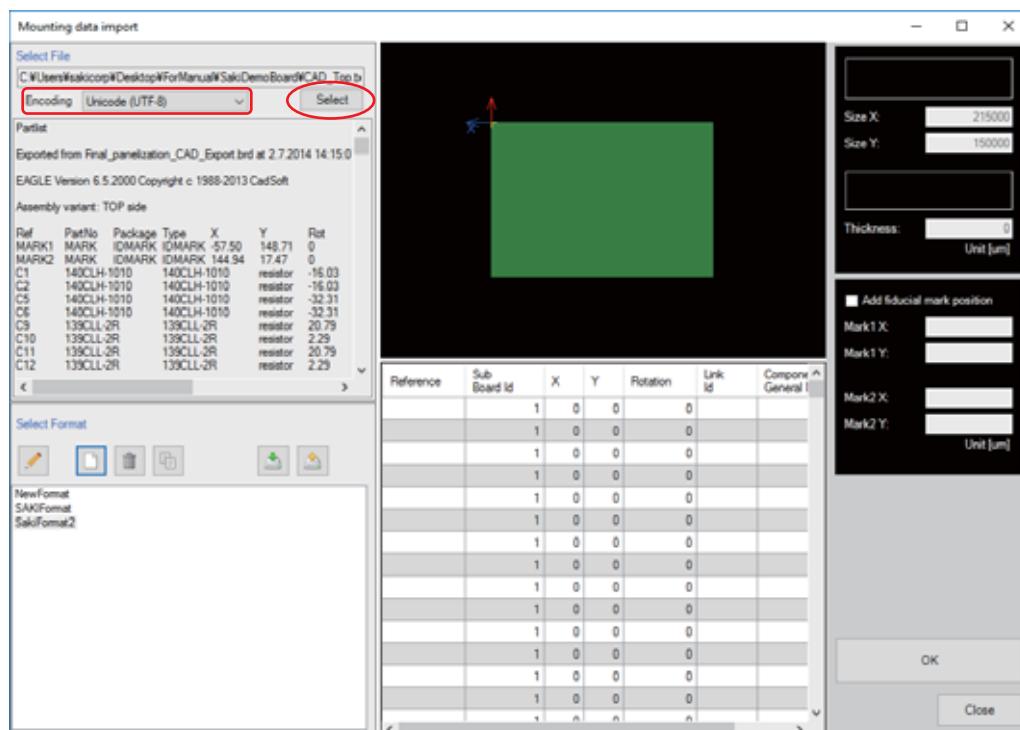


Figure 3-66 Import Mount Data

Step3: Make the setting by reference to **1.3 Inspection Data Wizard**.

3.4.2 Import SAKI Standard Format Data

Step1: From **InspectData** tab, select the **Layout** group > **Import Layout** > **SAKI standard format data**.



Figure 3-67 Import Layout

Step2: The dialog shown below appears.

Select SAKI standard format data and click **Open**.

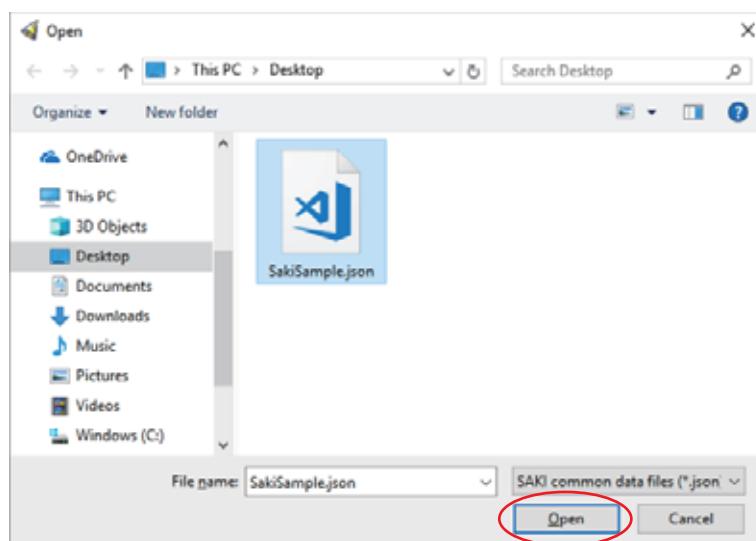


Figure 3-68 Import SAKI Standard Format Data 1

Step3: From **InspectData** tab, select the **Library** group > **Library Expansion** > **Assign Library Management**.

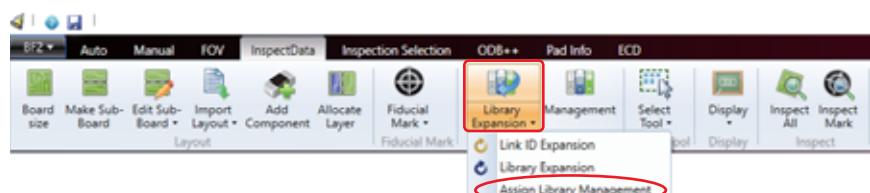


Figure 3-69 Import SAKI Standard Format Data 2

Step4: Make the setting by reference to **1.12.4 Clearing the Assigned Shape** and **1.12.5 Generating Recipe**.

3.5 Inspection Parameters (Algorithm Expansion)

Algorithm Expansion is the function to update **OK Range** of sample value and parameter for the algorithm in opened inspection data. The default value for the **OK range** of **Rect Align**, **Chip Align** and **Lead Tip Black White** is prepared as **IPC Class1**, **IPC Class2** and **IPC Class3**.

| Algorithm | Sample Value | IPC Class1 | IPC Class2 | IPC Class3 |
|----------------------|--------------------|------------|------------|------------|
| Rect Align | Side Overhang | 0 to 50% | 0 to 50% | 0 to 25% |
| | End Overhang | 0µm | 0µm | 0µm |
| Chip Align | Side Overhang | 0 to 50% | 0 to 50% | 0 to 25% |
| | End Overhang | 0µm | 0µm | 0µm |
| Lead Tip Black White | Lead Side Overhang | 0 to 50% | 0 to 50% | 0 to 25% |
| | Lead Toe Overhang | 0µm | 0µm | 0µm |

Table 3-5 Descriptions

3.5.1 Algorithm Expansion Procedure

Step1: From **InspectData** tab, select the **Inspection parameters** group > **Algorithm expansion** and check the item to update setting. The inspection parameter which is used in algorithm of opened inspection data is updated.



Figure 3-70 Algorithm Expansion Procedure

3.5.2 User Setting of Algorithm Expansion

Step1: From **InspectData** tab, select the **Inspection parameters** group > **Algorithm expansion** > **Settings management**.



Figure 3-71 User Setting 1

Step2: The dialog shown below appears. Click  (New).

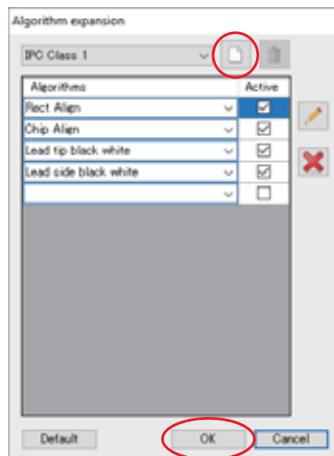


Figure 3-72 User Setting 2

Step3: The dialog shown below appears.

Enter the setting name of algorithm expansion and click **OK**.

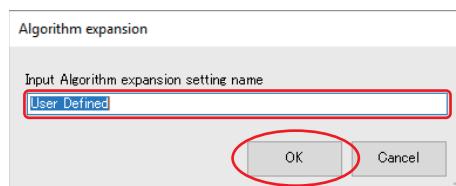


Figure 3-73 User Setting 3

Step4: Select the setting newly created from drop-down list.

NOTE To delete setting, click  (Delete).

NOTE **IPC Class1**, **IPC Class2** and **IPC Class3** can not be deleted.

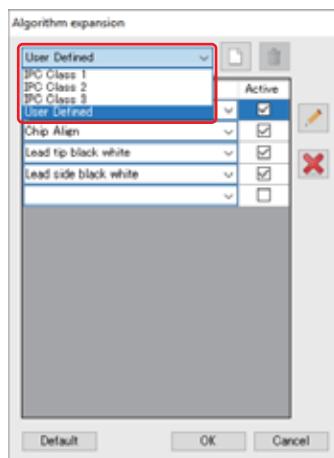


Figure 3-74 User Setting 4

Step5: Select the algorithm to set parameter from **Algorithms** drop-down list.

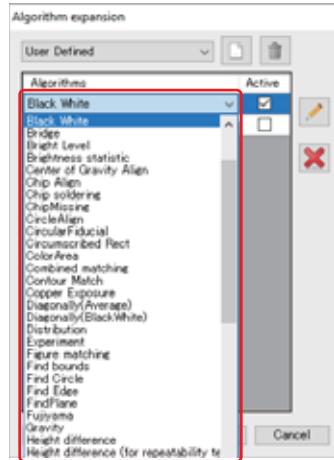


Figure 3-75 User Setting 5

Step6: Select the algorithm to edit and click (Edit).

NOTE To delete algorithm, click (Delete)

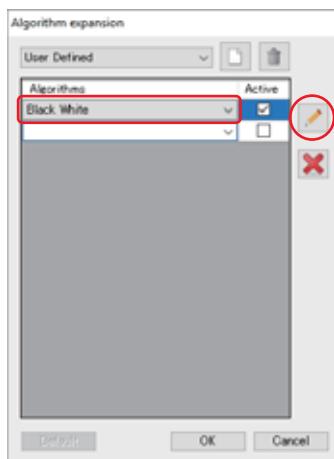


Figure 3-76 User Setting 6

- Step7: The dialog shown below appears. Set **Parameters** and **Sample and Tolerance**.
 The items checked in **Use** are expanded.
 The items checked in **Inspect of Sample and Tolerance** are inspected, and inspection of unchecked items are skipped.
 After all the setting is completed, click **Apply**.

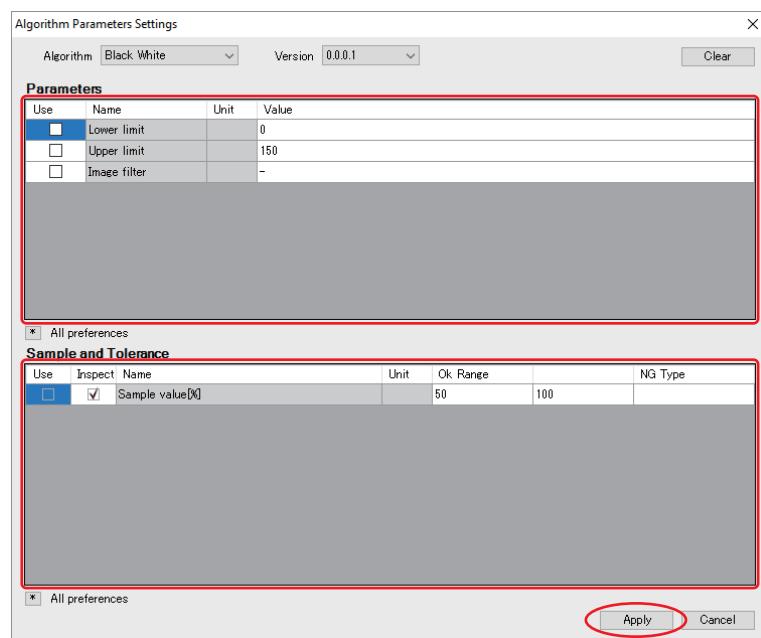


Figure 3-77 User Setting 7

- Step8: Click **OK** to close dialog.

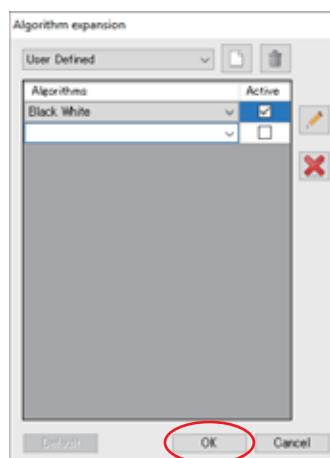


Figure 3-78 User Setting 8

- Step9: From **InspectData** tab, select the **Inspection parameters** group > **Algorithm expansion** and check the setting newly created. The setting is expanded.



Figure 3-79 User Setting 9

3.6 Inspection Parameters (Inspection Preset)

In **Inspection Preset** setting, inspection skip setting for each NG type of opened inspection data can be set.

Pre-Reflow and **Post-Reflow** are prepared as default value.

Regarding inspection skip setting on default value, refer to the following table.

(✓ : The item to be inspected. - : Inspection is skipped.)

| NG Type | Pre-Reflow | Post-Reflow |
|-----------------|------------|-------------|
| Bridge | ✓ | ✓ |
| Component NG | ✓ | ✓ |
| Lifted Body | ✓ | ✓ |
| Lifted Lead | ✓ | ✓ |
| Missing | ✓ | ✓ |
| No Solder | - | ✓ |
| Not Wet | - | ✓ |
| Polarity | ✓ | ✓ |
| Reverse | ✓ | ✓ |
| Shift | ✓ | ✓ |
| Soldering | - | ✓ |
| Copper Exposure | ✓ | ✓ |
| Others | ✓ | ✓ |

Table 3-6 Descriptions

3.6.1 Inspection Preset Procedure

Step1: From **InspectData** tab, select the **Inspection parameters** group > **Inspection preset**.



Figure 3-80 Inspection Preset Procedure 1

Step2: The dialog shown below appears.

Select the inspection preset to set from drop-down list and click **OK**.

The inspection skip setting is expanded to opened inspection data.



Figure 3-81 Inspection Preset Procedure 2

3.6.2 User Setting of Inspection Preset

Step1: From **InspectData** tab, select the **Inspection parameters** group > **Inspection preset**.



Figure 3-82 User Setting of Inspection Preset 1

Step2: The dialog shown below appears. Click (New).

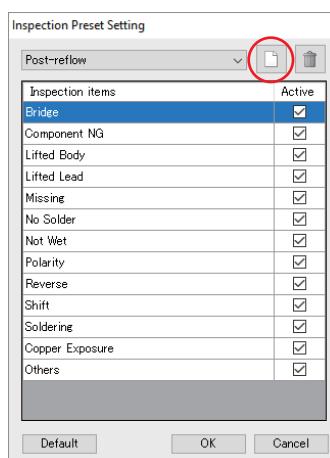


Figure 3-83 User Setting of Inspection Preset 2

Step3: The dialog shown below appears.

Enter the setting name of inspection preset to create, and click **OK**.

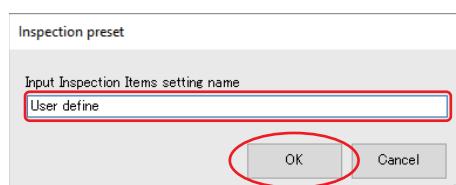


Figure 3-84 User Setting of Inspection Preset 3

- Step4: The entered inspection preset setting name is displayed on drop-down list.
Check **Active** of NG type to skip inspection.
After all the setting is completed, click **OK**.

NOTE To delete setting, click  (Delete).

NOTE **Post-reflow** and **Pre-reflow** can not be deleted.

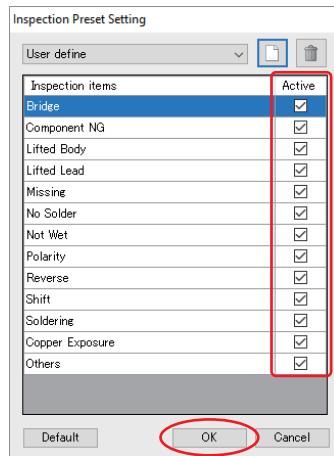


Figure 3-85 User Setting of Inspection Preset 4

3.7 Inspection Parameters (OCV Collective Setting)

ocv Collective Setting function can set the parameters of OCV algorithm in opened inspection data on one dialog at the same time.

3.7.1 OCV Collective Setting Procedure

Step1: From **InspectData** tab, select the **Inspection parameters** group > **OCV**.



Figure 3-86 OCV Collective Setting Procedure 1

Step2: The dialog shown below appears.

All OCV algorithm of opened inspection data is displayed for each link ID.

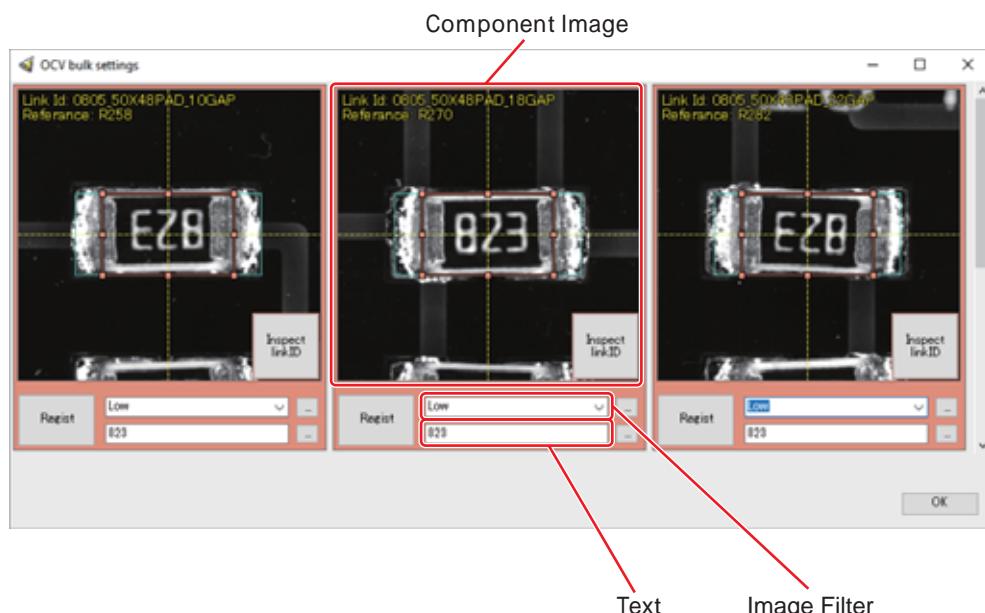


Figure 3-87 OCV Collective Setting Procedure 2

Step3: Adjust the size and position of inspection window to the character.

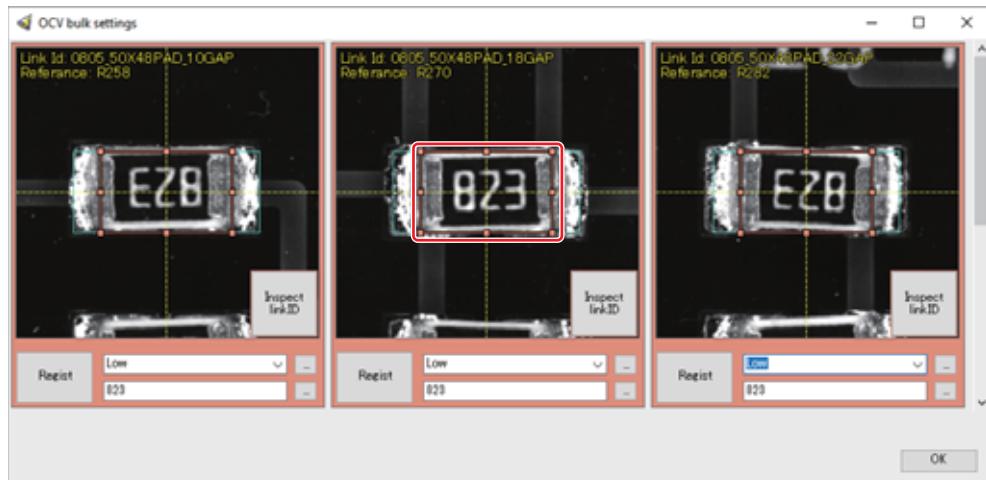


Figure 3-88 OCV Collective Setting Procedure 3

Step4: Select a lighting that displays the character clearly from the **Image Filter** drop-down list.

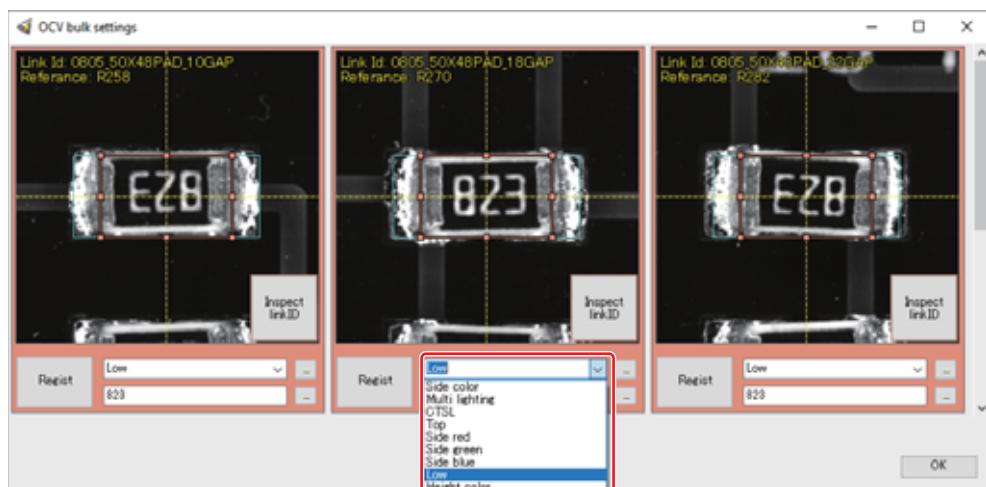


Figure 3-89 OCV Collective Setting Procedure 4

Step5: Enter the characters to inspect in **Text**.



Figure 3-90 OCV Collective Setting Procedure 5

Step6: Click **Regist**.

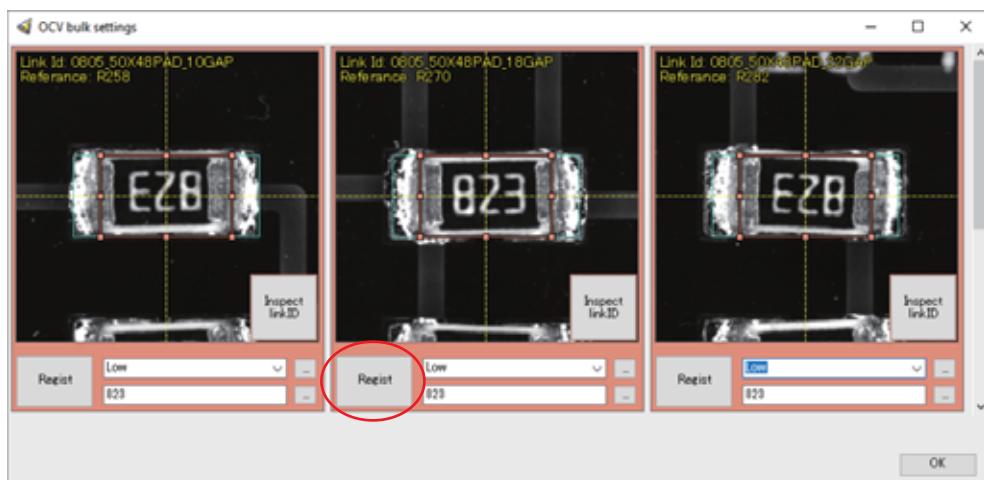


Figure 3-91 OCV Collective Setting Procedure 6

Step7: The dialog shown below appears.

Move the white point on the side of the inspection window to the side of the last character by mouse-dragging.

NOTE

For the details of character registration, refer to **Part III 3.4 OCV**.

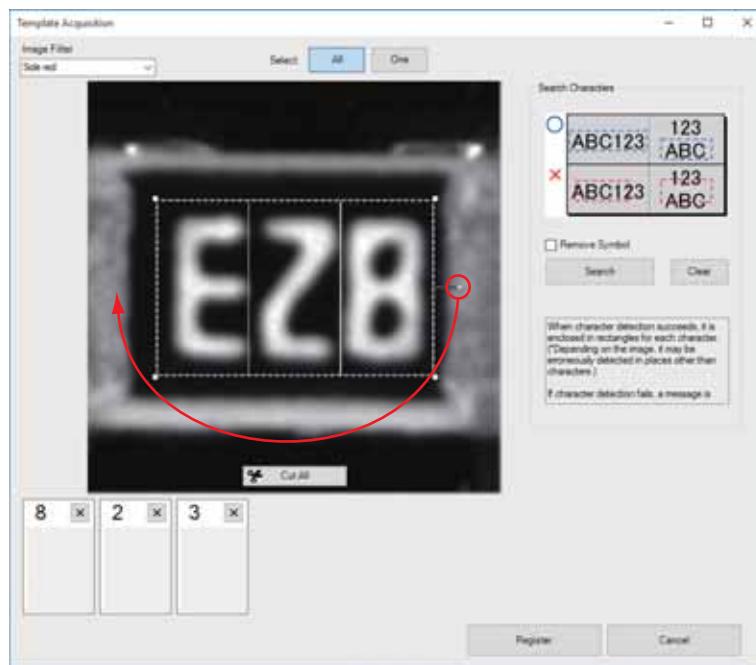


Figure 3-92 OCV Collective Setting Procedure 7

Move to the last character side

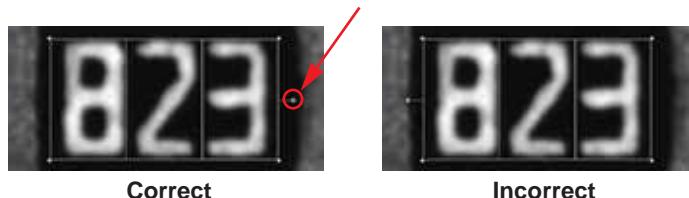


Figure 3-93 OCV Collective Setting Procedure 8

Step8: Adjust the inspection window to surround the characters and separates each character by the white lines.

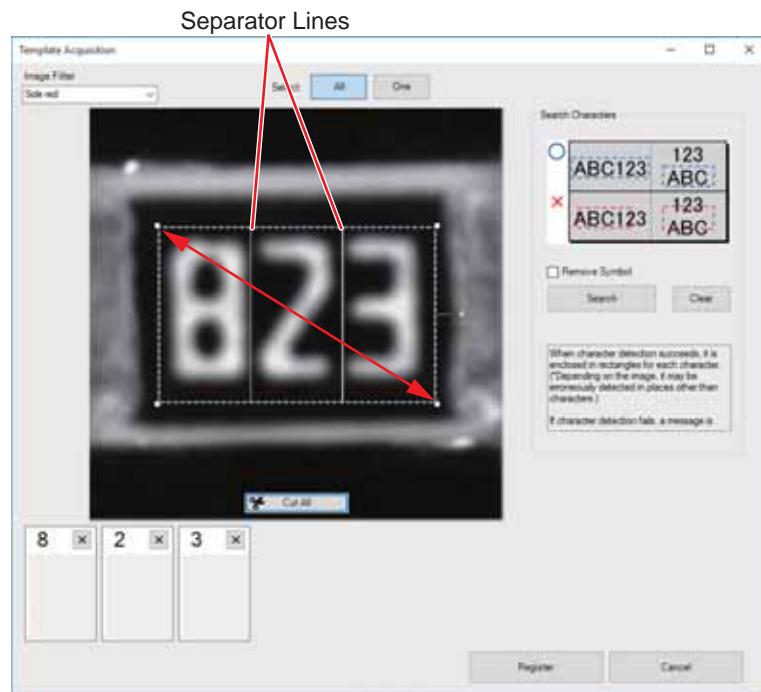


Figure 3-94 OCV Collective Setting Procedure 9

Step9: After all adjustments is completed, click **Cut All**. The template image is displayed in the lower left side of the window If the template image is OK, click **Register**. The template image is registered to the specified font.

NOTE To check the added characters, click **...** on the right side of **Text** in Step2 dialog. For details, refer to **Part III 3.4.4 How to Check the Registered Characters**.

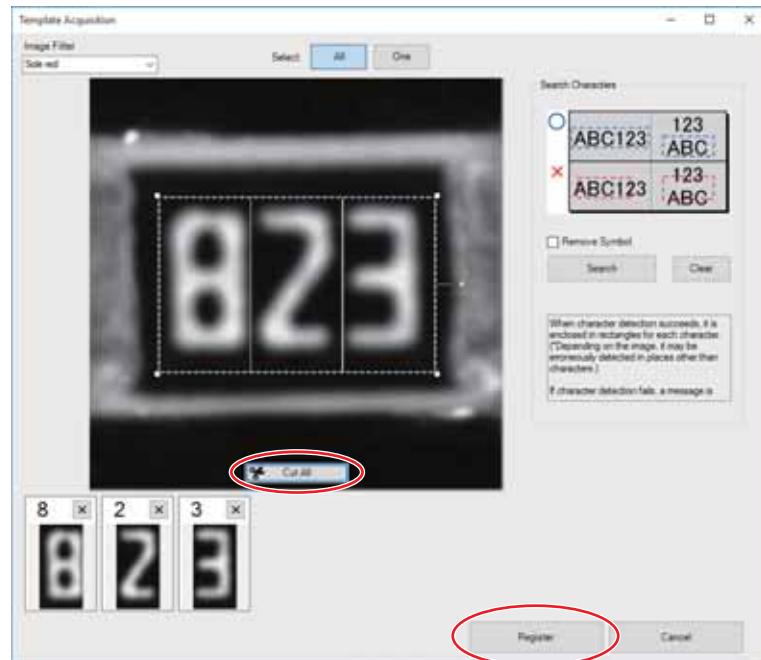


Figure 3-95 OCV Collective Setting Procedure 10

Step10: Edit recipe screen is displayed by double-clicking on Component Image area.
If necessary edit detail settings of OCV algorithm.

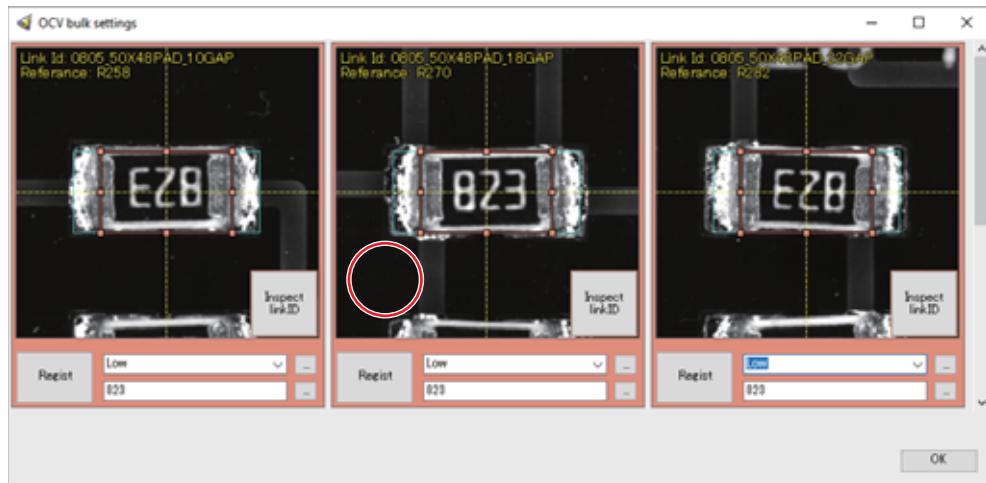


Figure 3-96 OCV Collective Setting Procedure 11

Step11: Click **Inspect linkID** and check if the inspection is completed properly.
The frame color is changed depending on the inspection result.
If all judgment results of components with the same link ID are OK, the frame is colored green.
If there is at least one NG component, the frame is colored red and the component image that result is NG is displayed on the **Component Image** area. If necessary, adjust the parameter.

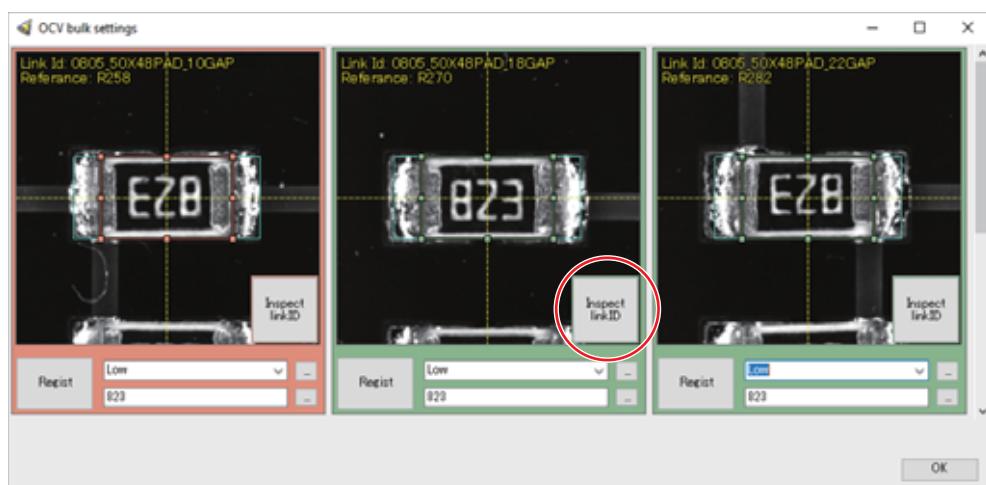


Figure 3-97 OCV Collective Setting Procedure 12

Step12: After all the setting is completed, click **OK** to close the dialog.

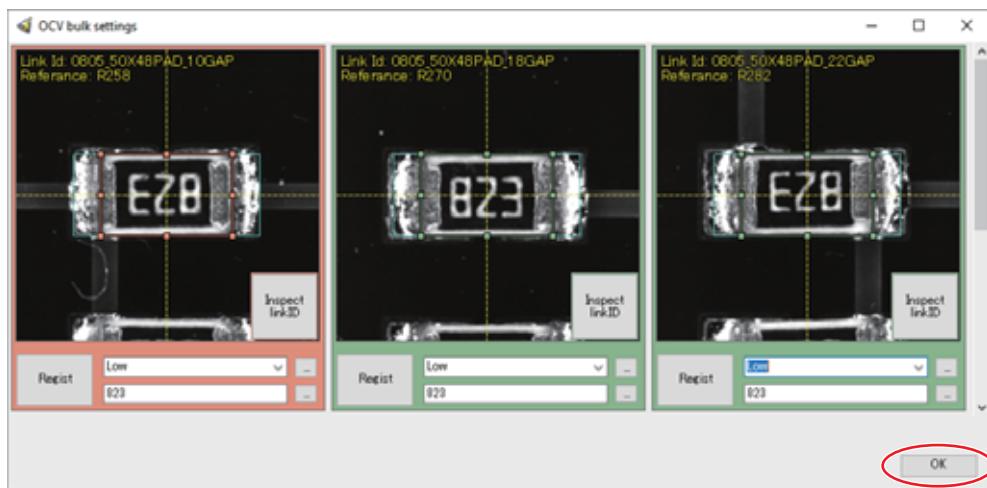


Figure 3-98 OCV Collective Setting Procedure 13

4 Acquiring a PCB image

4.1 Making an FOV File

FOV stands for **Field Of View** and indicates an image area which a camera can capture at once.

On the inspection machine, the FOV size is fixed so the machine uses multiple FOVs to take an image. Therefore, an FOV file, which defines the FOV allocation, is necessary before scanning.

CAUTION

When an inspection data is made by New Inspection Data Wizard (refer to **1.3 Inspection Data Wizard**), an FOV file is automatically made and FOVs are automatically set so the procedure in this section is not necessary except when making multiple FOV files.

4.1.1 Making an FOV File

Here describes how to make an FOV file.

Step1: Select the **FOV** tab.

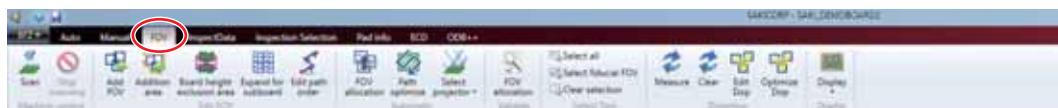


Figure 4-1 FOV

Step2: Click **New** on **FOV File List**.

| FOV File List | |
|------------------|------------------------|
| Load | New |
| FOV File name | Last update |
| FOV | 7/12/2016 1:53:53 PM |
| SIDE CAMERA | 1/7/2016 5:07:48 PM |
| * test [default] | 11/16/2016 11:46:13 AM |
| DOP | 8/29/2016 6:33:06 PM |

Figure 4-2 Making an FOV File 1

Step3: Enter a file name and click **OK**.

An FOV file is added to **FOV File List**.

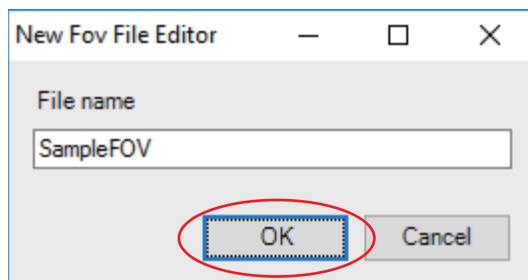


Figure 4-3 Making an FOV File 2

4.1.2 Easy FOV Allocation

Here describes how to use the easy FOV allocation function. When it is necessary to take a PCB image before setting Shapes and Recipes, allocate FOVs on the inspection data by the following procedure.

CAUTION

In the easy FOV allocation function, FOVs are also allocated to points where no inspections are performed. To reduce the scanning time, make sure to optimize the FOV allocations by **FOV allocation (refer to 4.3.3 Optimizing FOV Allocation (Auto Allocation))** and **Path optimize** (refer to **4.3.7 FOV Path Optimize**) after setting Recipes.

NOTE

In the default setting, the projector setting is **NSEW** (North-South-East-West projection). To reduce tact time, change the projector setting by reference to **4.3.10 Projector Setting**.

Step1: Select the **FOV** tab.



Figure 4-4 Easy FOV Allocation 1

Step2: Drag the mouse and surround the area to set FOVs on **Board Viewer**.

When the mouse button is released, the icons shown in Figure 4-5 appears on the lower right side of the window. Refer to Table 4-1 and select an icon.

FOVs are allocated in accordance with the selected icon.

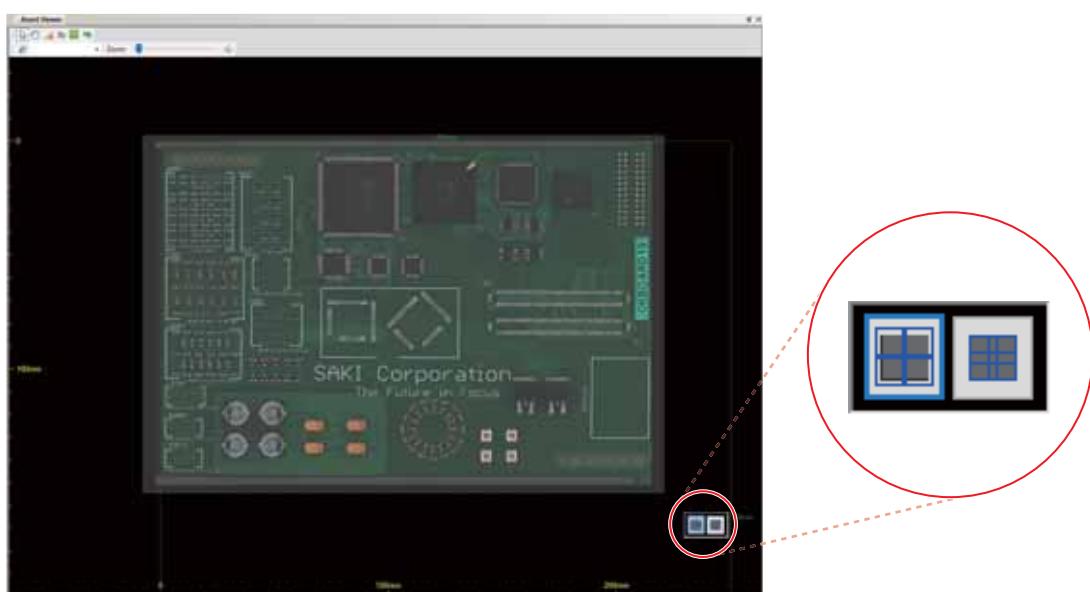


Figure 4-5 Easy FOV Allocation 2

| Item | Description |
|------|--|
| | Allocates FOVs to include the selected area and not to overlap each other. |
| | Allocates FOVs to fill in the selected area (FOVs may overlap each other). |

Table 4-1 Descriptions

4.2 Scanning a PCB

This section describes how to scan a PCB manually.

NOTE For scanning by the auto mode, refer to Operation Manual.

Step1: Select an inspection data by reference to **Part I 1.3 Selecting an Inspection Data File**.

Step2: From **Manual** tab, select the **Machine control** group > **Load/Unload** to load a PCB to the machine. Check that the PCB is set to the right position and firmly fixed.

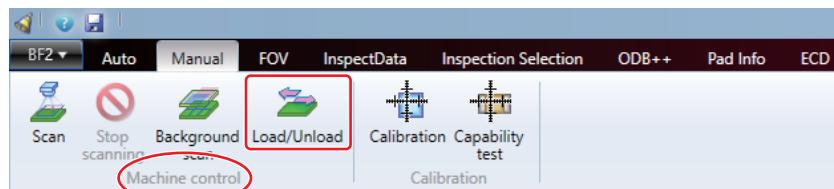


Figure 4-6 Load PCB

Step3: Select the **Machine control** group > **Scan** from the ribbon. The loaded PCB is scanned.

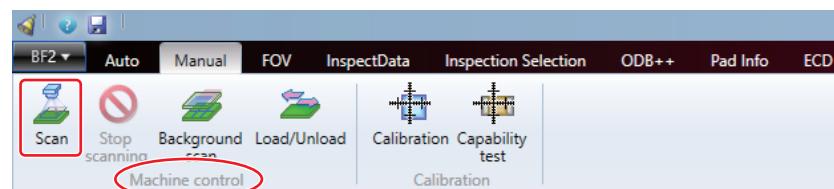


Figure 4-7 Scan

Step4: Select the **Machine control** group > **Load/Unload** to unload the PCB from the machine.

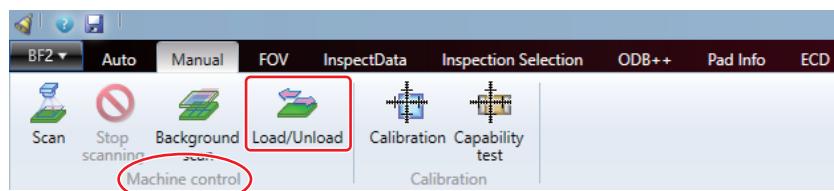


Figure 4-8 Unload PCB

4.3 Editing FOVs

4.3.1 Selecting an FOV

Here describes how to select an FOV from **Board Viewer**.

Step1: Select the **FOV** tab.



Figure 4-9 FOV

Step2: To Select All FOV

From the ribbon, select the **Select Tool** group > **Select All**.

NOTE All the FOVs can be also selected by pressing **Ctrl** + **A**.



Figure 4-10 Selecting All Component Data

To Select All FOV with Fiducial Mark

From the ribbon, select the **Select Tool** group > **Select fiducial FOV**.

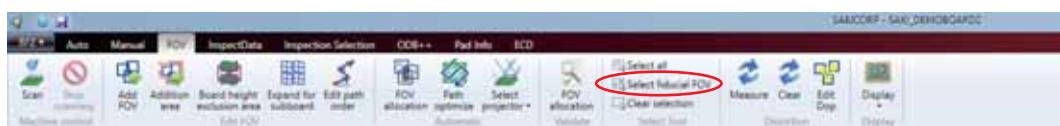


Figure 4-11 To Select All FOV with Fiducial Mark

To Clear the Selection of FOV

From the ribbon, select the **Select Tool** group > **Clear selection**.



Figure 4-12 Clear Selection

4.3.2 Locking the FOV

Here describes how to use the FOV lock function.

Lock the FOV to disable movement and deletion of the FOV.

Step1: Select the **FOV** tab.

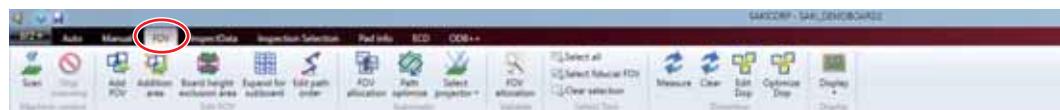


Figure 4-13 FOV

Step2: Select an FOV to lock from **Board Viewer**.

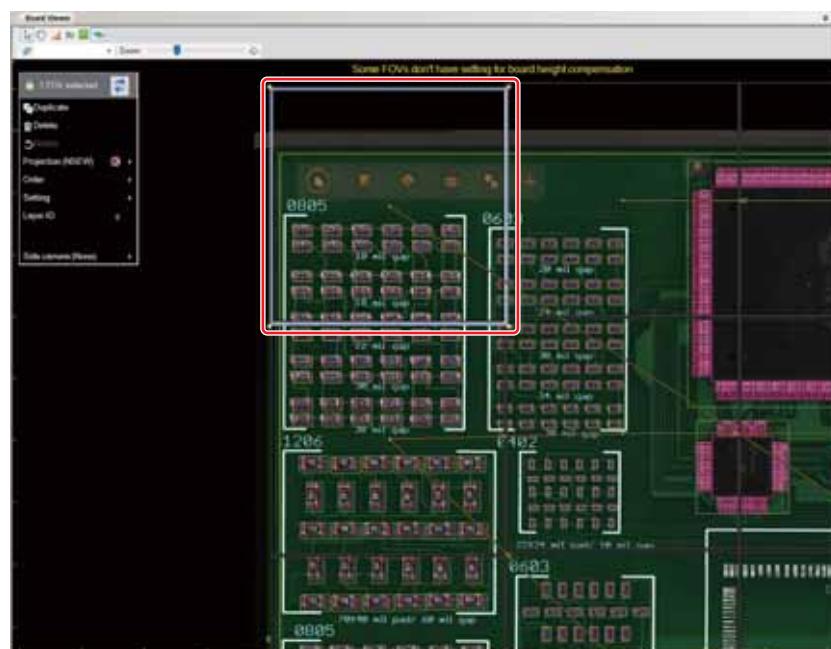


Figure 4-14 Select FOV

Step3: Click (FOV lock icon) on the **Edit Panel**. FOV is locked.

The FOV lock icon is displayed at the center of the locked FOV.

NOTE To release the FOV lock, click (FOV lock icon) again.

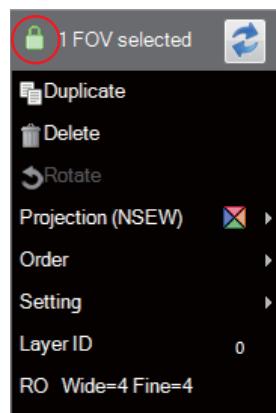


Figure 4-15 FOV Lock

4.3.3 Optimizing FOV Allocation (Auto Allocation)

Here describes how to optimize the FOV allocation by the auto allocation function.

By the auto allocation function, FOVs are automatically allocated to component data on which a Recipe is set. As FOVs are not allocated to points where no Recipe is set (= no inspections are performed), the scanning time is reduced.

CAUTION FOV allocation does not work correctly if the Recipe setting is not completed.
Make sure to complete the Recipe setting in advance.

CAUTION If there is a locked FOV, it is not affected by FOV allocation.

CAUTION To create inspection data of a large board 510 mm or longer, you must assign the layers of the component before FOV allocation. For details of assigning the layer of component, refer to **6.1 Assigning the Layer of Component**.

NOTE In the default setting, the projector setting is NSEW (North-South-East-West projection).

To reduce tact time, change the projector setting by reference to **4.3.10 Projector Setting**.

Step1: Select an inspection data on which Recipes are already assigned by reference to **Part I 1.3 Selecting an Inspection Data File**.

Step2: From **FOV** tab, select the **Automatic** group > **FOV allocation**.
FOVs are allocated automatically.

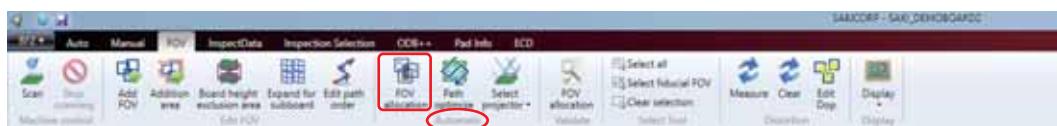


Figure 4-16 Auto FOV Allocation

4.3.4 Add FOV

Step1: From **FOV** tab, select the **Edit FOV** group > **Add FOV**.



Figure 4-17 Add FOV

Step2: Specify an area to add an FOV from the **Board Viewer**.

4.3.5 Adding an FOV for a Specified Area

Step1: From **FOV** tab, select the **Edit FOV** group > **Addition area**.



Figure 4-18 Additional Area 1

Step2: Specify the area to add an FOV.

Click in the **Board Viewer** window to draw an orange-colored straight line from the clicking point.

Click once again to draw a 90-degree right angled line.

Move the mouse to draw a orange line. Then specify the area so that all the windows of Recipes are included.

Click the origin point to finish specifying the area and automatically add FOVs to the specified area.

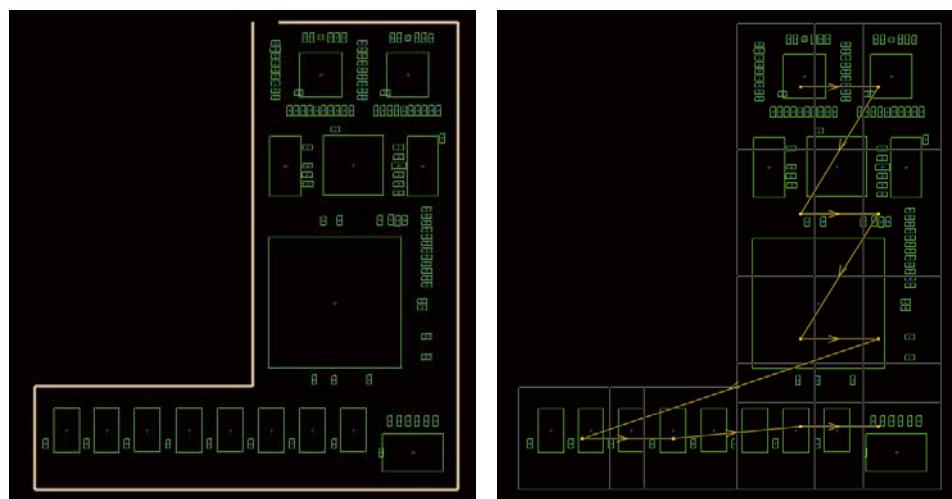


Figure 4-19 Additional Area 2

4.3.6 Checking the FOV Allocation

After changing the FOV allocation, make sure to check the FOV allocation.

Step1: From **FOV** tab, select the **Validate** group > **FOV allocation**.

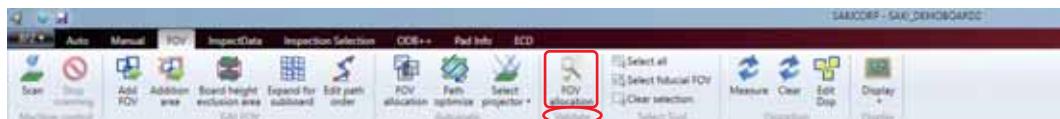


Figure 4-20 Checking the FOV Allocation 1

Step2: **When All Components are Included in FOVs**

The dialog shown below appears. Click **OK**. The FOV allocation is completed.

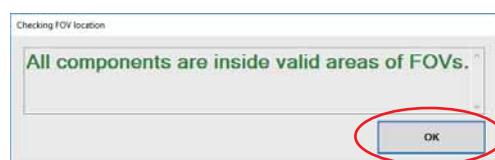


Figure 4-21 Checking the FOV Allocation 2

When there is a Component Data which is not Included in FOVs or there is a Component Data which layer is not corresponding to FOV layer

The dialog shown below appears. Click **OK** and proceed to Step3.

NOTE

The layer of component data and layer of FOV should be same.

For the layer change setting, refer to **6 Making Inspection Data of a Large Board**.

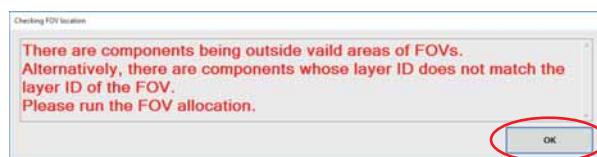


Figure 4-22 Checking the FOV Allocation 3

Step3: Components not included in FOVs or on the boundary are displayed in red on **Board Viewer**. Adjust the FOV positions or add FOVs to eliminate the error (reddened component data).

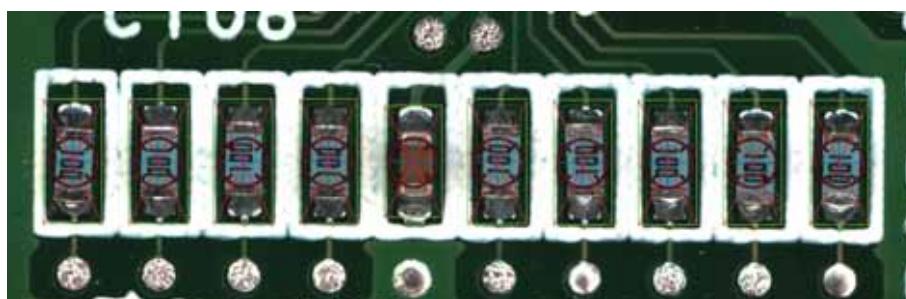


Figure 4-23 Checking the FOV Allocation 4

4.3.7 FOV Path Optimize

Path Optimize is the function for optimizing the camera moving path.

By optimizing the FOV path, scanning time may be shortened.

Step1: Select the **FOV** tab.



Figure 4-24 FOV

Step2: From the ribbon, select the **Automatic** group > **Path optimize**.

The FOV path is optimized in accordance with the FOV position.



Figure 4-25 Path Optimize

4.3.8 Board Height Exclusion Area

When there is a slit or transparent area on a PCB, a PCB height may not be measured correctly. By setting the **Board Height Exclusion Area** on an FOV, the height can be measured more accurately.

Step1: From **FOV** tab, select the **Edit FOV** group > **Board height exclusion area**.



Figure 4-26 Board Height Exclusion Area

Step2: The edit panel shown below appears.

Refer to Table 4-2 to configure the settings.

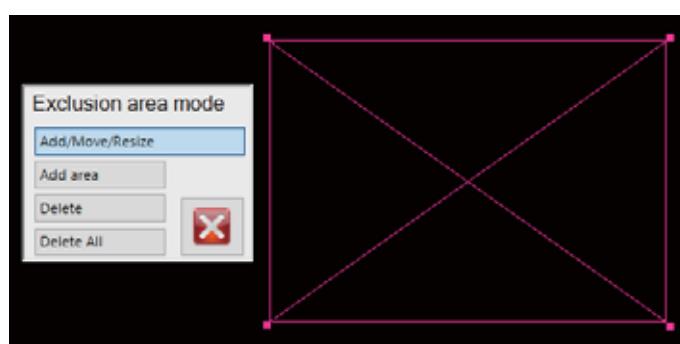


Figure 4-27 Adding the Board Height Exclusion Area

| Item | Description |
|-----------------|---|
| Add/Move/Resize | Click on any point on the board with Add/Move/Resize selected and drag to display a thick pink frame. Drag the created frame to a specified location. Drag the four corner points to change the size. |
| Add area | Click on any point on the board with Add area selected to draw a straight, white line from the origin point. Click once again to draw a 90-degree right angled line. Move the mouse to draw a white line and specify the exclusion area so that it is surrounded by the white line. Click the origin point once again to finish specifying the area and automatically add a Board Height Exclusion Area to the specified area. |
| Delete | Click the existing Board Height Exclusion Area with Delete selected to delete the selected Board Height Exclusion Area. |
| Delete All | Deletes all the existing Board Height Exclusion Areas. |

Table 4-2 Descriptions

4.3.9 Individual FOV Setting

Select an FOV to appear the edit panel as below.

Use this edit panel to set the individual FOVs.

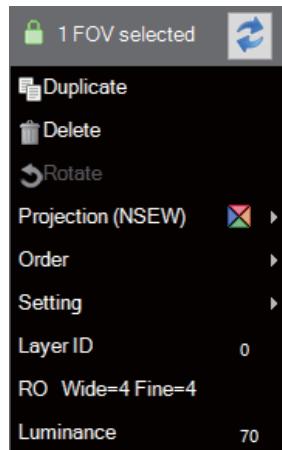


Figure 4-28 Edit Panel

| Item | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|---|------|-----------|--------------------|-----------|----------|---|---|------|------|--|---|---|-----|------|--|---|---|---|------|--------------------|---|---|------|------|--|---|---|----|------|--|---|---|-----|------|--------------------|---|---|------|------|--|---|---|------|------|--|---|---|------|------|--|----|----|------|------|--|
| <i>n</i> FOV selected | Displays the number of currently selected FOVs. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Captures an image of the selected FOV only. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Duplicate | Duplicates selected FOVs. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Delete | Deletes selected FOVs. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rotate | Rotates the selected FOV 90 degrees. This menu item is available only when multiple FOVs are assigned. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Projection | Sets the projector unit to use for image capture. For details, refer to 4.3.10 Projector Setting . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order | <table border="1"> <thead> <tr> <th>FOV</th> <th>#</th> <th>Mode</th> <th>Side mode</th> <th>Settings</th> </tr> </thead> <tbody> <tr><td>1</td><td>1</td><td>NSEW</td><td>None</td><td></td></tr> <tr><td>2</td><td>2</td><td>NSE</td><td>None</td><td></td></tr> <tr><td>3</td><td>3</td><td>E</td><td>None</td><td>Height offset: 500</td></tr> <tr><td>4</td><td>4</td><td>NSEW</td><td>None</td><td></td></tr> <tr><td>5</td><td>5</td><td>SE</td><td>None</td><td></td></tr> <tr><td>6</td><td>6</td><td>SEW</td><td>None</td><td>Height offset: 500</td></tr> <tr><td>7</td><td>7</td><td>NSEW</td><td>None</td><td></td></tr> <tr><td>8</td><td>8</td><td>NSEW</td><td>None</td><td></td></tr> <tr><td>9</td><td>9</td><td>NSEW</td><td>None</td><td></td></tr> <tr><td>10</td><td>10</td><td>NSEW</td><td>None</td><td></td></tr> </tbody> </table> <p>To first To last Reverse Optimize</p> | FOV | # | Mode | Side mode | Settings | 1 | 1 | NSEW | None | | 2 | 2 | NSE | None | | 3 | 3 | E | None | Height offset: 500 | 4 | 4 | NSEW | None | | 5 | 5 | SE | None | | 6 | 6 | SEW | None | Height offset: 500 | 7 | 7 | NSEW | None | | 8 | 8 | NSEW | None | | 9 | 9 | NSEW | None | | 10 | 10 | NSEW | None | |
| FOV | # | Mode | Side mode | Settings | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | NSEW | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 2 | NSE | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 3 | E | None | Height offset: 500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4 | NSEW | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 5 | SE | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 6 | SEW | None | Height offset: 500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 7 | NSEW | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 8 | NSEW | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 9 | NSEW | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 10 | NSEW | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Figure 4-29 FOV Path Order

Selects the FOV to display it highlighted in blue in the FOV ordered list on the right side.

Image capture of the FOVs is performed in order starting from the top.

Click **To first** to place the selected FOV at the top of the list.

Click **To last** to place the selected FOV at the bottom of the list.

Click **Reverse** to reverse the order of the selected FOV.

Click **Optimize** to optimize the order of the selected FOV.

Reverse and **Optimize** are only valid when multiple FOVs are selected.

| Item | | Description |
|-----------|-----------------------------------|---|
| Setting | Height offset(0) | The item is for Saki engineers only. Do not change the setting. |
| | Board area setting | Set the FOV board height compensation. For details, refer to 4.3.12 Board Height Compensation Setting . |
| | Board color setting | Extracts the board color from the specified area during each scan. This function is used when it is necessary to inspect boards whose colors are different because of different board manufacturers in a same line. For details, refer to 5.4.2 Board Color Extraction Setting . |
| | Board color setting (Adaptive) | The item is for Saki engineers only. Do not change the setting. |
| | FOV type | |
| | Distortion Measurement Setting | |
| Layer ID | | Sets the layer number. For details of layer, refer to 6 Making Inspection Data of a Large Board . |
| RO | | Sets the number of ROs. Wide is the number of images with wide stripes, and Fine is the number of images with fine stripes. Reducing the number of striped images increases the scan speed, but images are easily affected by noise. |
| Luminance | | Sets the luminance value for image capturing. For details, refer to 4.3.11 Luminance Value Selection . |

Table 4-3 Descriptions

4.3.10 Projector Setting

For measuring height, 4 projectors are installed to this machine.

The machine measures height accurately by projecting the stripe pattern from the specified direction. However, the measurement may fail when there is a high component next to the measured component or when there are lots of components in a small space.

In such cases, change the projector setting. Measurements become more accurate by projecting the stripe pattern from the direction which is not affected by shadows.

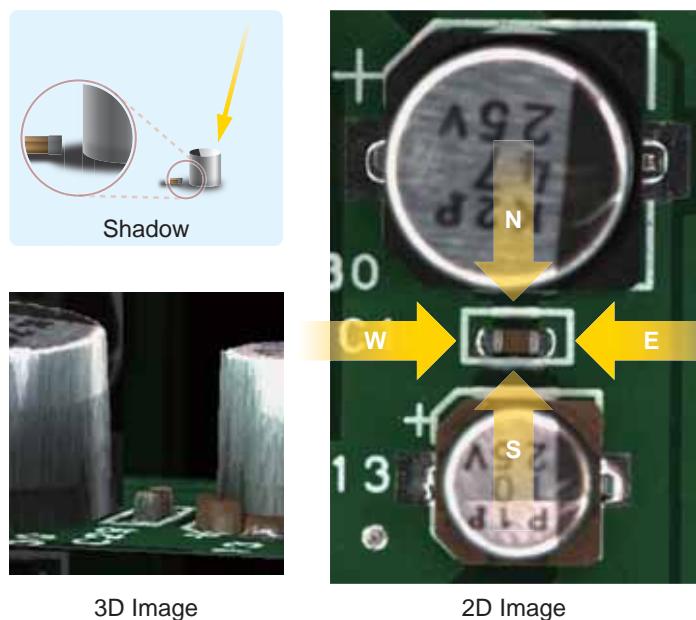


Figure 4-30 Overview of Projector Setting

Step1: Select an FOV to change the setting. The edit panel appears.

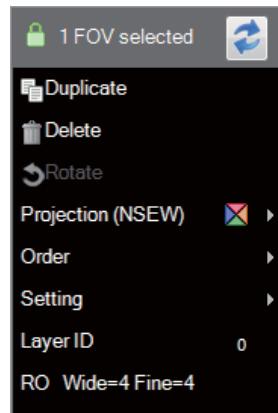


Figure 4-31 Selecting FOV

Step2: Point the cursor to the panel and the panel expands.

Select the appropriate setting from the drop-down list on the lower side of the panel.

NOTE

Using many projectors requires more time for scanning.

Configure the projector setting so that an image can be taken with as few number of the projectors as possible.

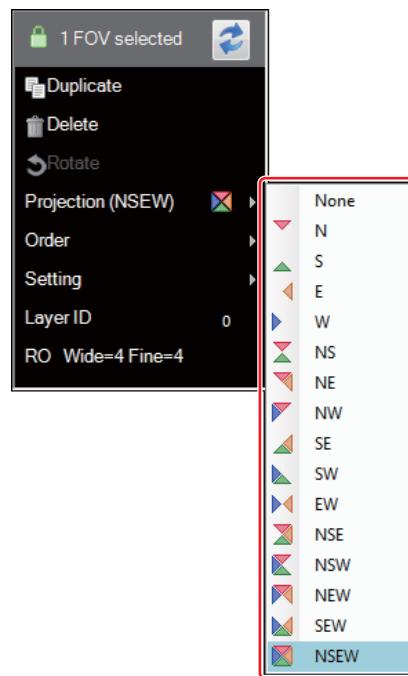


Figure 4-32 Settings of Projector

| Item | Description |
|------|---|
| None | Only uses 2D lightings. |
| N | Uses the north side (machine rear side) projector with 2D lightings. |
| S | Uses the south side (machine front side) projector with 2D lightings. |
| E | Uses the east side (machine right side) projector with 2D lightings. |
| W | Uses the west side (machine left side) projector with 2D lightings. |
| NS | Uses the north and south side projectors with 2D lightings. |
| NE | Uses the north and east side projectors with 2D lightings. |
| NW | Uses the north and west side projectors with 2D lightings. |
| SE | Uses the south and east side projectors with 2D lightings. |
| SW | Uses the south and west side projectors with 2D lightings. |
| EW | Uses the east and west side projectors with 2D lightings. |
| NSE | Uses the north, south, and east side projectors with 2D lightings. |
| NSW | Uses the north, south, and west side projectors with 2D lightings. |
| NEW | Uses the north, east, and west side projectors with 2D lightings. |
| SEW | Uses the south, east, and west side projectors with 2D lightings. |
| NSEW | Uses the all projectors with 2D lightings. |

Table 4-4 Descriptions

Step3: Scan a PCB by reference to **4.2 Scanning a PCB** and confirm there are no shadows taken in the selected FOV. If there is a shadow, return to Step2 and change the setting.

NOTE For checking shadows, **Height color** is useful for many cases. For the procedure for switching the lighting, refer to **Part I 2.2.1 Switching the Lighting**.

4.3.11 Luminance Value Selection

Depending on the color of board to be inspected, the adjustment of luminance value for stripe image is necessary.

By registering some luminance value in advance and select the setting in each board, stable height measurement is enabled.

Step1: From **Manual** tab, select the **Calibration** group > **Calibration**.

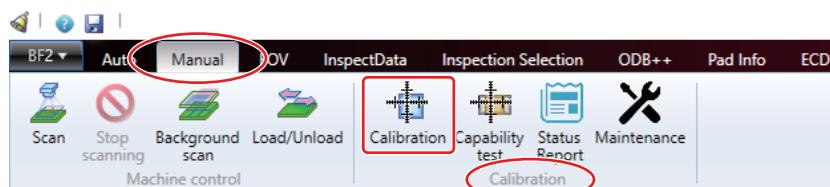


Figure 4-33 Luminance Value Selection 1

Step2: The dialog shown below appears. Click **Illumination Balance**.



Figure 4-34 Luminance Value Selection 2

Step3: The dialog shown below appears. Click **OK**.

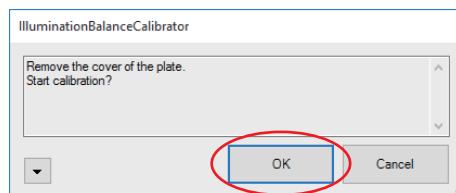


Figure 4-35 Luminance Value Selection 3

Step4: The dialog shown below appears. Click **OK**.

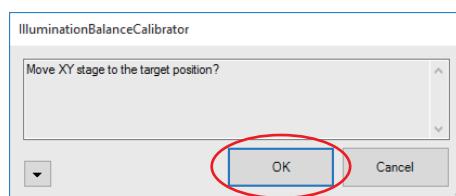


Figure 4-36 Luminance Value Selection 4

Step5: The dialog shown below appears. Click **Calibrate**.

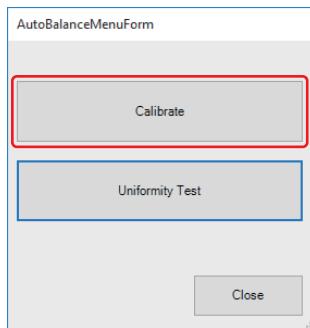


Figure 4-37 Luminance Value Selection 5

Step6: The dialog shown below appears.

Check the check box of luminance value to register, and click **Auto calibrate**.

After calibration is completed, click **OK**.

NOTE Only **70** is checked as factory default.

NOTE After calibration is completed, the registered value for each luminance value can be checked by clicking the luminance value of check box.

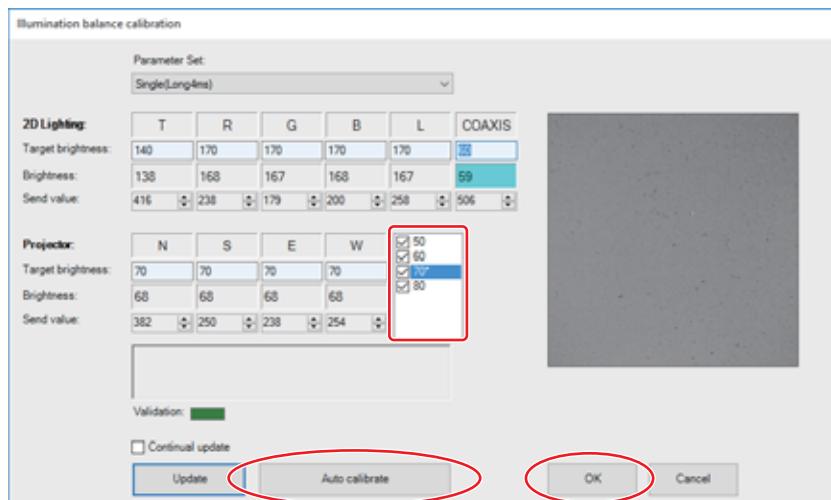


Figure 4-38 Luminance Value Selection 6

Step7: Select the FOV to change luminance value. The edit panel appears.

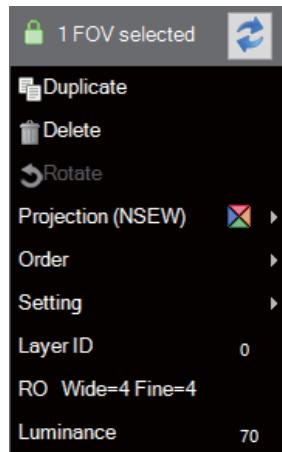


Figure 4-39 Luminance Value Selection 7

Step8: Select proper setting from **Luminance** drop-down list.

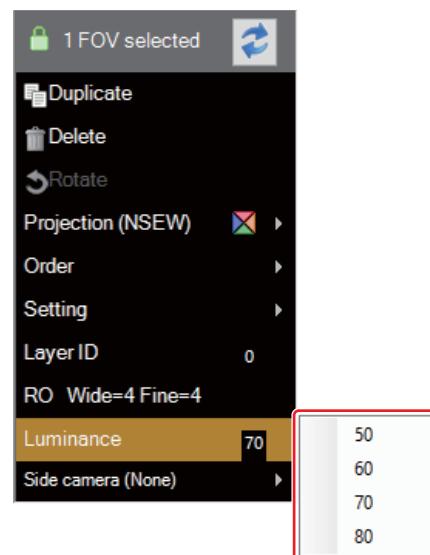


Figure 4-40 Luminance Value Selection 8

Step9: Selected luminance value is set in each FOV.

The luminance value has been set can be checked on edit panel or **FOV** window.

The screenshot shows the 'FOV' window with a table of three entries. Each entry includes columns for '#', 'Mode', 'Side mode', 'Luminance', and 'Settings'. All three entries have a 'Luminance' value of 70.

| # | Mode | Side mode | Luminance | Settings |
|---|------|-----------|-----------|----------|
| 1 | NSEW | None | 70 | |
| 2 | NSEW | None | 70 | |
| 3 | NSEW | None | 70 | |

Figure 4-41 Luminance Value Selection 9

4.3.12 Board Height Compensation Setting

Set the board surface (zero height point) to make accurate height measurements.

Here describes how to use the board color to set the zero height point and the procedure for performing board height compensation.

Step1: Select the FOV for board height compensation and display the **edit panel**.

Select **Settings > Board Color Settings**.

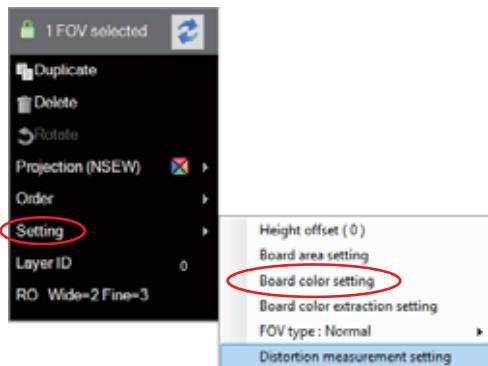


Figure 4-42 Board Height Compensation Settings 1

Step2: The dialog shown below appears. Here, specify the color of the board and other colors.

Check **Use board color setting** and click the board color section.

Select **Apply average as board color**.

A list of board colors is added on the right side of **Board color** field.

Click an area which has a color that is different from the board color and select **Apply average as anti board color**.

A list of anti board colors is added on the right side of **Anti Board color** field.

NOTE Select the wiring patterns for the board color. Select the largest range possible around an area in which there are few nearby components. For colors other than the board color, select components, silk, holes, insulation material areas, etc.

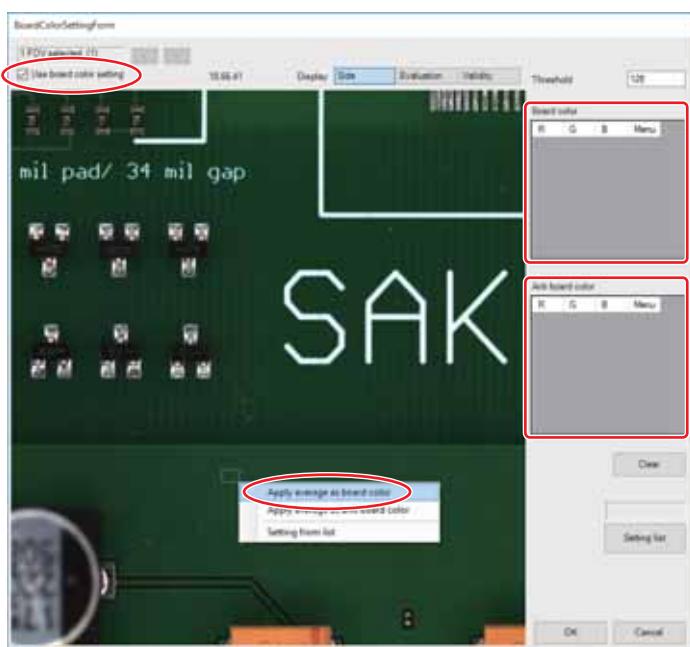


Figure 4-43 Board Height Compensation Settings 2

Step3: Fine tune the color specification set in Step2.

Select **Evaluation** on the right side of **Display**.

The area registered as the board color is shown in white depending on the **Board color** and **Anti Board color** settings.

Select **Validity** on the right side of **Display** to display areas with a brightness greater than the **Threshold** in white and all other areas in black on the **Evaluation** image.

Areas displayed in white when using **Validity** are recognized as the board surface.

Set the **Board color**, **Anti Board color**, and **Threshold** to display only the board color area in white.

For detail settings, refer to Table 4-5.

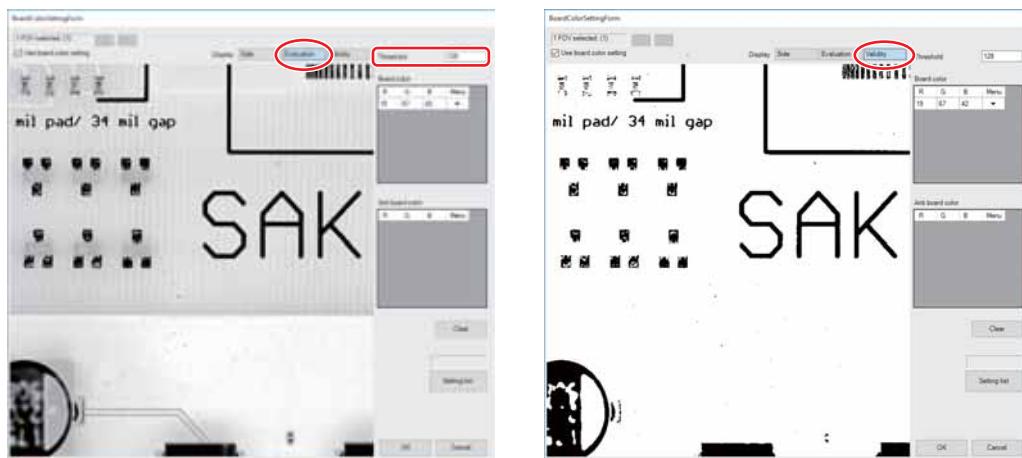


Figure 4-44 Board Height Compensation Settings 3

| Item | | Description |
|--|------------|---|
| <input type="button" value="< / >"/> | | Switches an FOV. |
| Display | Side | Displays the images of SideLight. |
| | Evaluation | Displays the board color area in white based on the Board color and Anti Board color settings. |
| | Validity | Areas with a brightness greater than the Threshold are displayed in white and all other areas in black on the Evaluation image. |
| Threshold | | Sets the threshold value when converting the Evaluation image to the Validity image. White areas in the Validity image are recognized as the board surface. |
| Board color | | A list of board colors set with Apply average as board color . |
| Anti board color | | A list of board colors set with Apply average as anti board color . |
| Clear | | Deletes all Board color and Anti Board color settings. |
| Setting list | Load | Loads all saved settings for Board color and Anti board color . |
| | Save | Saves all Board color and Anti Board color settings. |
| | Save as | Overwrites all Board color and Anti Board color settings. |
| | Delete | Deletes all saved settings for Board color and Anti board color . |

Table 4-5 Descriptions

Step4: After all the settings are completed, click **OK**.

If the multiple FOVs are selected, the dialog shown below appears.

Select the check boxes of the FOV images for applying board height compensation and click **OK**.

NOTE

Click **Select all** to select all FOVs.

Click **Clear Selection** to deselect all FOVs.

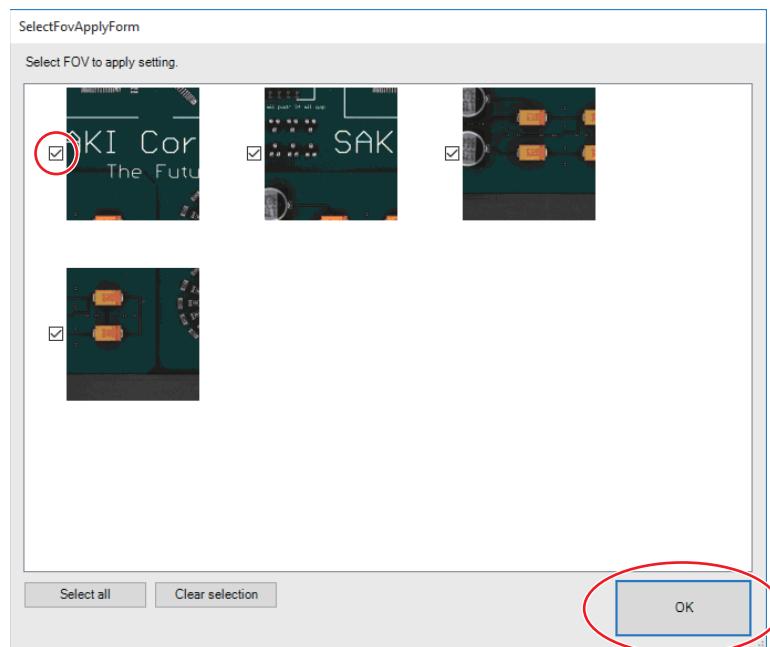


Figure 4-45 Board Height Compensation Settings 4

4.3.13 Sub Board Data Setting of FOV

Here describes how to make FOV data of sub boards.

This function is only valid for inspection data which includes a sub boards.

Step1: Set the base sub board FOV by reference to **4.3 Editing FOVs**.

Step2: From **FOV** tab, select the **Edit FOV** group > **Expand for subboard**.



Figure 4-46 Sub Board Data Setting of FOV 1

Step3: The dialog shown below appears.

Select a base sub board number from the drop-down list. Click **OK**.

The FOV settings are expanded to other sub boards.

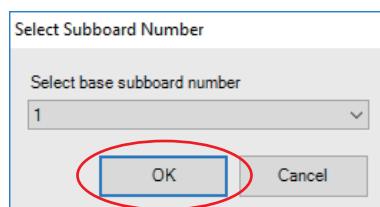


Figure 4-47 Sub Board Data Setting of FOV 2

4.3.14 Saving an FOV File by another names

Here describes how to save an FOV file by another name.

By saving FOV files in different names, multiple FOV settings can be used in one inspection data.

NOTE FOV files are overwritten when the inspection data is saved.

Step1: Select the **FOV** tab.

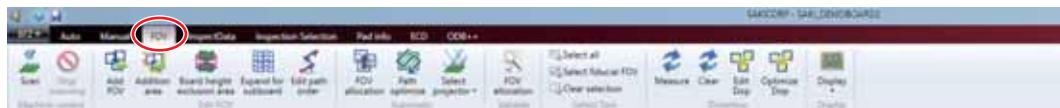


Figure 4-48 FOV

Step2: Click ▾ on the right side of the **Load** button.

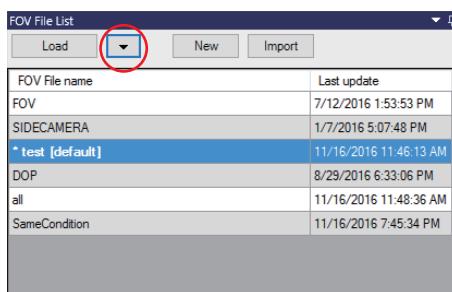


Figure 4-49 Saving an FOV File 1

Step3: The pop-up menu appears. Select **Save As**.

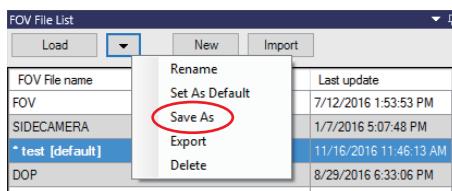


Figure 4-50 Saving an FOV File 2

Step4: Enter a file name and click **OK**.

An FOV file is added to **FOV File List**.

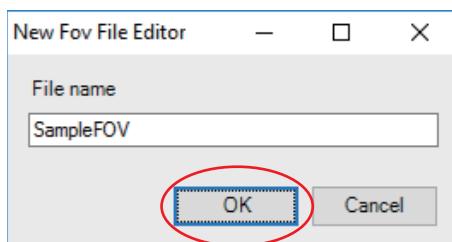


Figure 4-51 Saving an FOV File 3

4.3.15 Selecting an FOV File

Here describes how to temporarily apply the saved FOV setting to inspection data.

CAUTION The selected FOV setting is enabled until the inspection data is closed. To use the selected FOV setting when the inspection data is reopened, refer to **4.3.16 FOV File Auto Loading Setting** and configure the setting.

Step1: Select the **FOV** tab.



Figure 4-52 FOV

Step2: Select an FOV file from **FOV File List** and click **Load**.

The selected FOV setting is applied to the inspection data.

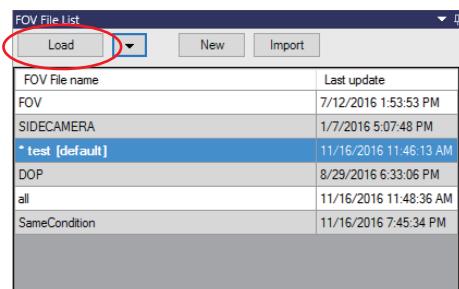


Figure 4-53 FOV File List

4.3.16 FOV File Auto Loading Setting

In this machine, an FOV file is automatically loaded when an inspection data is opened.

Here describes how to change the file to be loaded. To use a new FOV file in the future inspections, change the setting by following the procedure below.

Step1: Select the **FOV** tab.



Figure 4-54 FOV

Step2: Select an FOV file from **FOV File List** and click **▼** on the right side of **Load**.

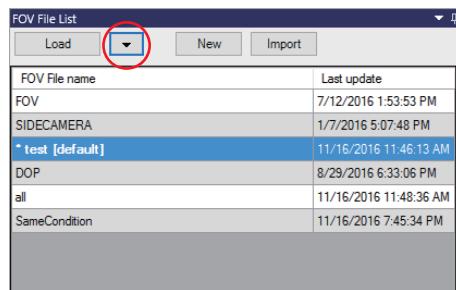


Figure 4-55 FOV File Auto Loading Setting 1

Step3: The pop-up menu appears. Select **Set As Default**.

The selected file is set as the file automatically loaded when opening the data.

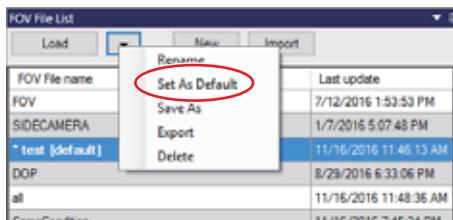


Figure 4-56 FOV File Auto Loading Setting 2

4.3.17 Changing an FOV File Name

Step1: Select the **FOV** tab.



Figure 4-57 FOV

Step2: Select an FOV file from **FOV File List** and click ▾ on the right side of **Load**.

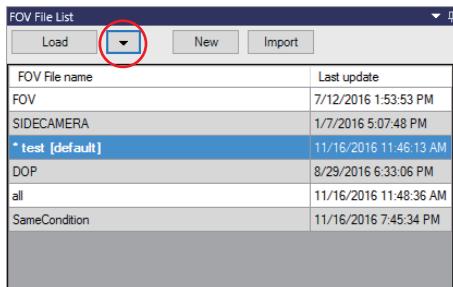


Figure 4-58 Changing an FOV File Name 1

Step3: The pop-up menu appears. Select **Rename**.

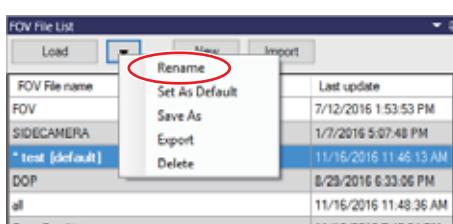


Figure 4-59 Changing an FOV File Name 2

Step4: Enter a file name and click **OK**. The selected FOV file name is changed.

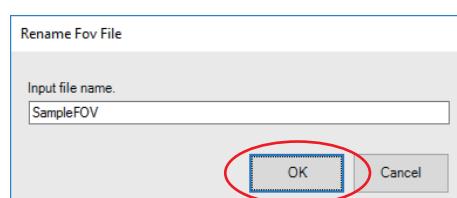


Figure 4-60 Changing an FOV File Name 3

4.3.18 Deleting an FOV File

Step1: Select the **FOV** tab.

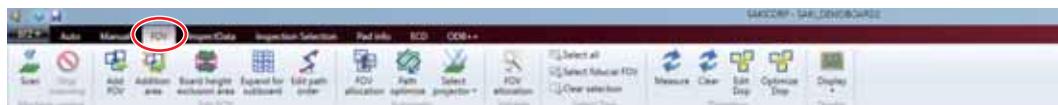


Figure 4-61 FOV

Step2: Select an FOV file from **FOV File List** and click on the right side of **Load**.

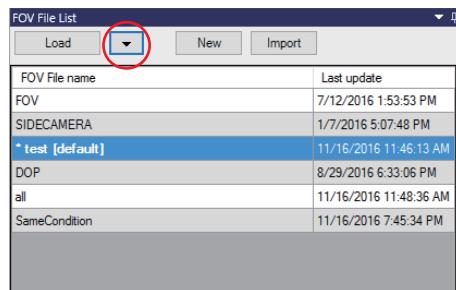


Figure 4-62 Deleting an FOV File 1

Step3: The pop-up menu appears. Select **Delete**.

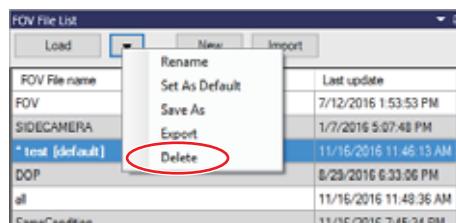


Figure 4-63 Deleting an FOV File 2

Step4: Click **OK**. The selected FOV file is deleted from **FOV File List**.

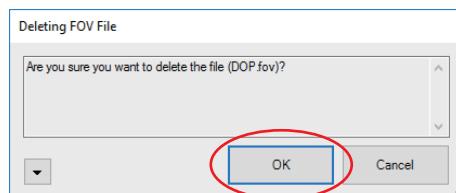


Figure 4-64 Deleting an FOV File 3

4.3.19 Importing an FOV File

Here describes how to import an FOV file from another inspection data.

To import an FOV file made on another inspection machine or BF2-Editor, follow the procedure below.

Step1: Select the **FOV** tab.



Figure 4-65 FOV

Step2: Click **Import** on **FOV File List**.

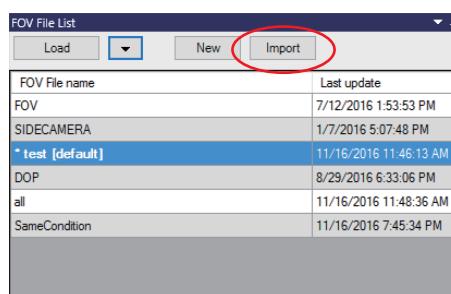


Figure 4-66 Importing an FOV File 1

Step3: Select an FOV file and click **OK**.

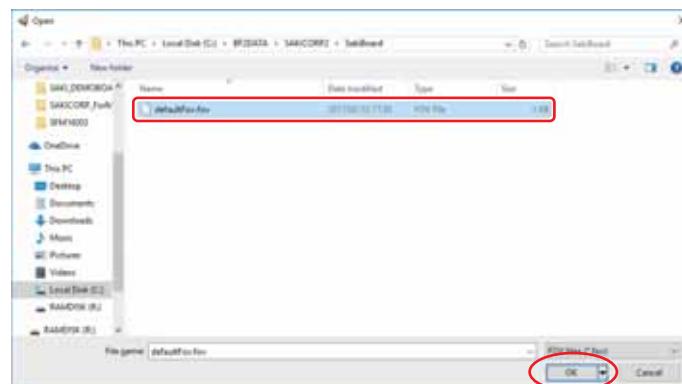


Figure 4-67 Importing an FOV File 2

4.3.20 Exporting an FOV File

Here describes how to export an FOV file to another inspection data.

To export an FOV file to another inspection machine or BF2-Editor, follow the procedure below.

Step1: Select the **FOV** tab.



Figure 4-68 FOV

Step2: Click ▾ on the right side of **Load**.

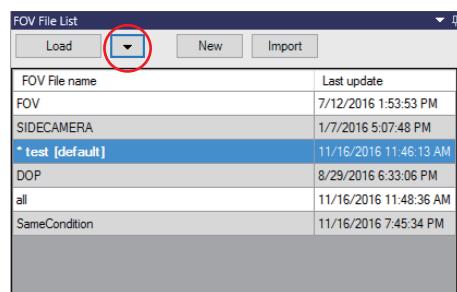


Figure 4-69 Exporting an FOV File 1

Step3: The pop-up menu appears. Select **Export**.

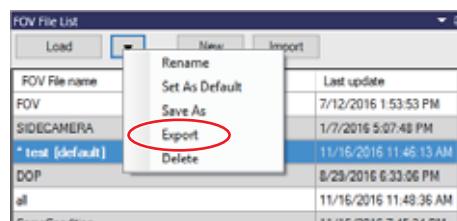


Figure 4-70 Exporting an FOV File 2

Step4: Select a destination to save the FOV file and click **OK**.

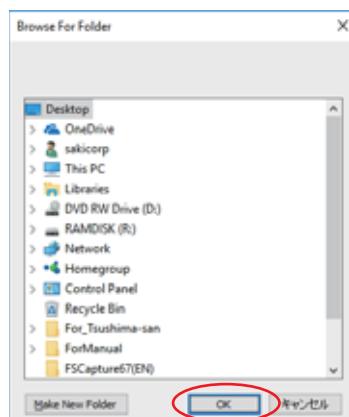


Figure 4-71 Exporting an FOV File 3

4.4 Image File Management

4.4.1 Adding a PCB Image

Multiple image files can be saved in an inspection data.

Here describes how to add a PCB image to an inspection data.

Step1: Scan a PCB by reference to **4.2 Scanning a PCB**.

Step2: Select the **InspectData** tab.



Figure 4-72 InspectData

Step3: Click **Add current image** on **Image File List**.

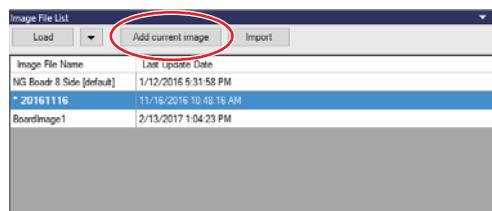


Figure 4-73 Add Current Image

Step4: Enter a file name and click **OK**.

The image file is added to **Image File List**.

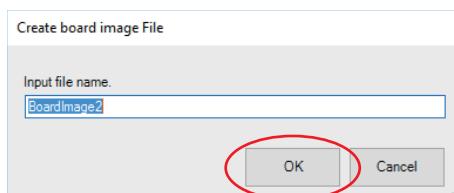


Figure 4-74 Entering the Image File Name

4.4.2 Changing the Displayed PCB Image

Here describes how to change the image file to be displayed.

CAUTION The image file set as the automatically loaded file is displayed when the inspection data is restarted. To display the selected image in the future inspections, change the auto loading setting by reference to **4.4.3 Image File Auto Loading Setting**.

Step1: Select the **InspectData** tab.



Figure 4-75 InspectData

Step2: Select an image file on **Image File List** and click **Load**.

The selected image file is loaded and displayed on the screen.

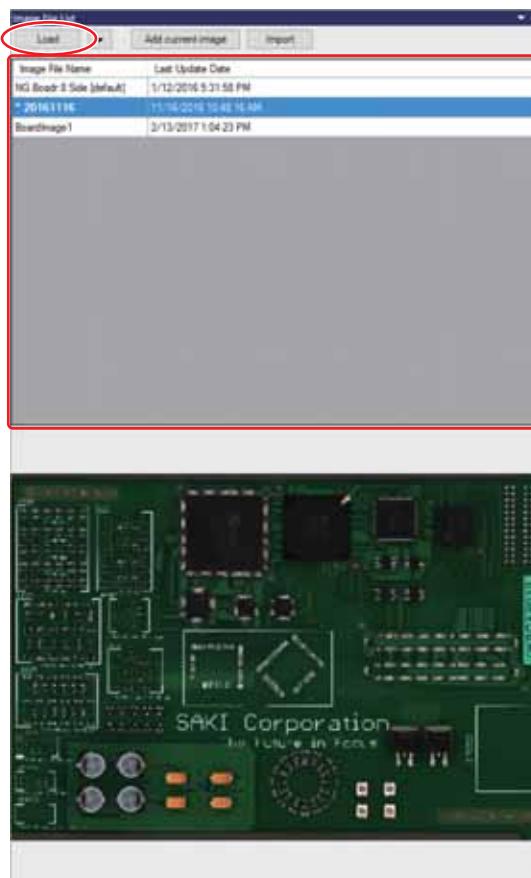


Figure 4-76 Image File Name List

4.4.3 Image File Auto Loading Setting

In this machine, the image file which is set as the automatically loaded file is displayed when an inspection data is opened.

To use a new image file in the future inspections, change the setting by following the procedure below.

Step1: Select the **InspectData** tab.



Figure 4-77 InspectData

Step2: Select an image file on **Image File List** and click ▾ on the right side of **Load**.

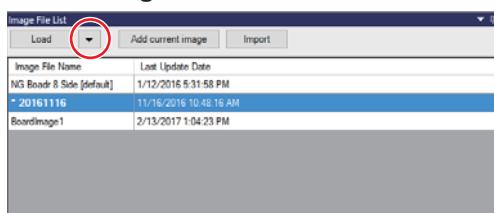


Figure 4-78 Image File Auto Loading Setting 1

Step3: Select **Set As Default > Set as default** from the pop-up menu.

The selected image file is set as the automatically loaded file.

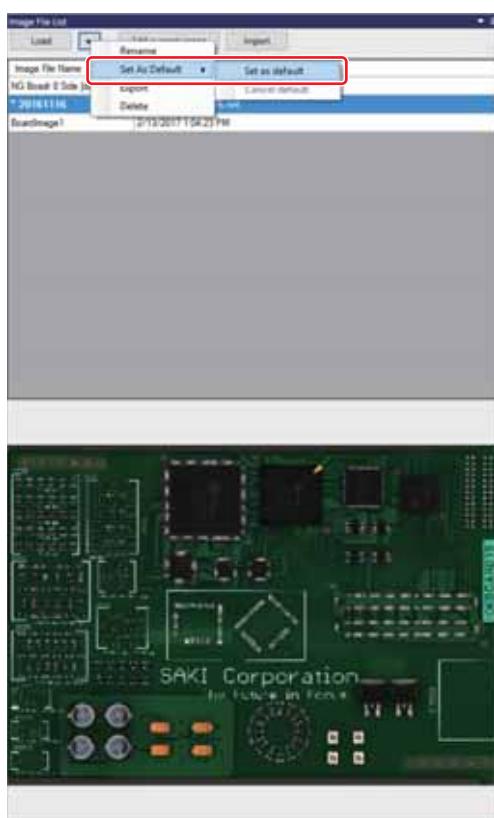


Figure 4-79 Image File Auto Loading Setting 2

4.4.4 Changing an Image File Name

Step1: Select the **InspectData** tab.

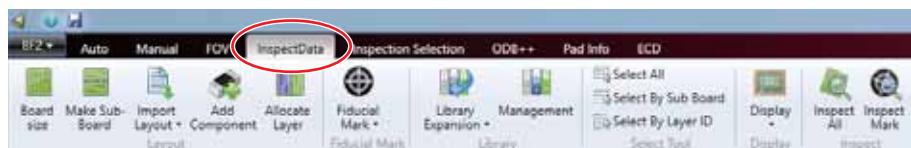


Figure 4-80 InspectData

Step2: Select an image file on **Image File List** and click on the right side of **Load**.

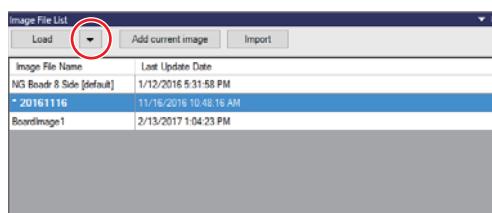


Figure 4-81 Changing an Image File Name 1

Step3: The pop-up menu appears. Select **Rename**.

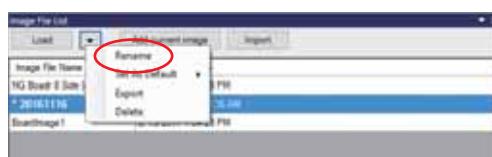


Figure 4-82 Changing an Image File Name 2

Step4: Enter a file name and click **OK**.

The selected image file name is changed.

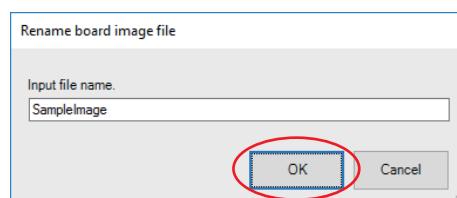


Figure 4-83 Changing an Image File Name 3

4.4.5 Deleting an Image File

Here describes how to delete an image file.

Step1: Select the **InspectData** tab.



Figure 4-84 InspectData

Step2: Select an image file on **Image File List** and click on the right side of **Load**.

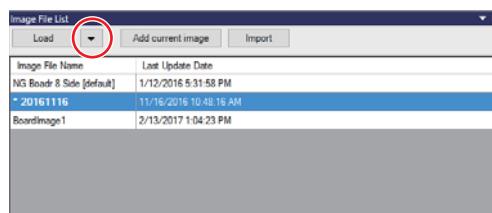


Figure 4-85 Deleting an Image File 1

Step3: The pop-up menu appears. Select **Delete**.

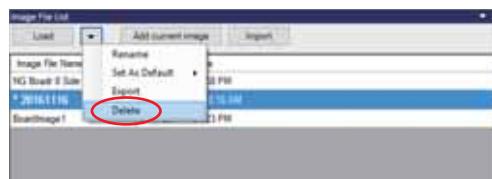


Figure 4-86 Deleting an Image File 2

Step4: Click **OK**. The selected image file is deleted from **Image File List**.

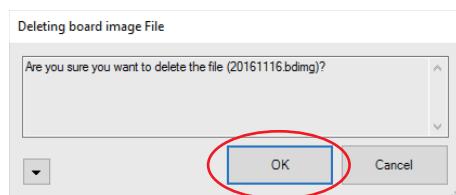


Figure 4-87 Deleting an Image File 3

4.4.6 Importing an Image File

Here describes how to import an image file from another inspection data.

To use an image file scanned by another inspection machine, follow the procedure below.

Step1: Select the **InspectData** tab.



Figure 4-88 InspectData

Step2: Click **Import** on **Image File List**.

NOTE The same operation can be performed by selecting **Import > Import Board Image** from the **BF2** menu on the upper left side of the window

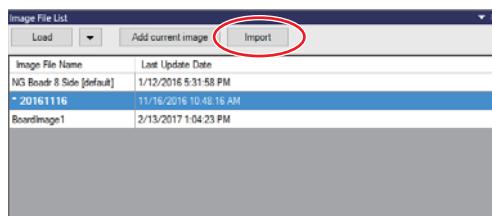


Figure 4-89 Importing an Image File 1

Step3: Select an image file and click **OK**.

NOTE The extension for an image file is ".bdimg".

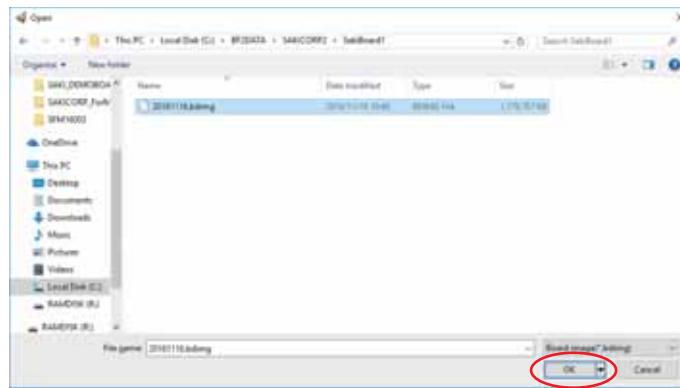


Figure 4-90 Importing an Image File 2

4.4.7 Exporting an Image File

Here describes how to export an image file to another inspection data.

To use an image file in another inspection machine or BF2-Editor, follow the procedure below.

Step1: Select the **InspectData** tab.



Figure 4-91 InspectData

Step2: On **Image File List**, click on the right side of **Load**.

Select **Export** from the pop-up menu.

NOTE The same operation can be performed by selecting **Export > Export Board Image** from the **BF2** menu on the upper left side of the window

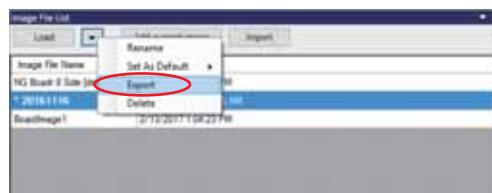


Figure 4-92 Exporting an Image File 1

Step3: Select a destination to save the image file and click **OK**.

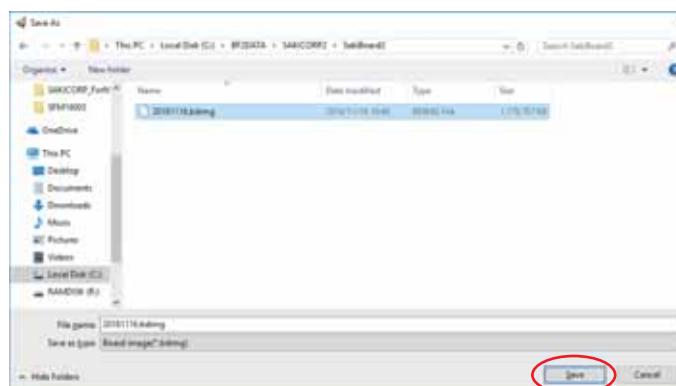


Figure 4-93 Exporting an Image File 2

5 DOP Compensation

DOP (Distortion Observation Point) compensation is a function to compensate the board height. Shifts in height, board tilt and warpage of the board because of board clamp conditions are corrected, in order to set the height of the board to 0µm and level the board. This avoids height differences between FOVs, and applies more accurate compensation to boards that is easily bent.

5.1 Conventional Board Height Compensation Method

Due to various factors such as warpage of the board or allocation of components or cut-out, the board is captured with its warpage.

In order to accurately calculate the height of the component, the height datum to the board needs to be treated as zero reference by compensating the warpage of the board. Conventionally, the board height compensation was performed by defining the reference plane per FOV and adjusting the height of the board to zero reference.

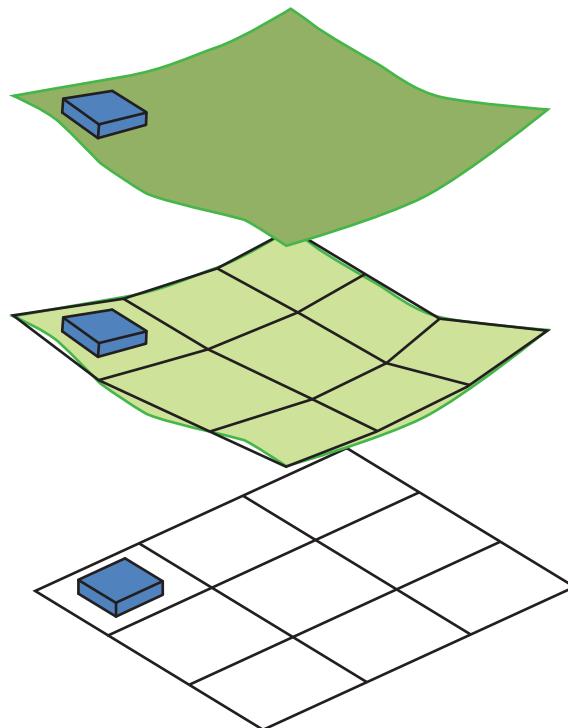


Figure 5-1 Conventional Board Height Compensation Method

However, defining the reference plane per FOV follows the warpage of the board and tilts each FOV, resulting in the occurrences of differences in contours between adjacent FOVs. When a bigger footprint component spans multiple FOVs, it is impossible to accurately measure the height of the component. The solution to this problem is by implementing DOP compensation methods.

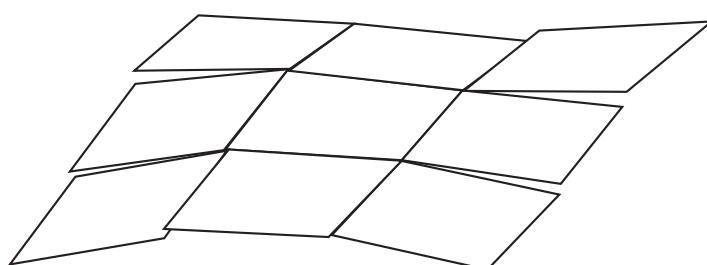


Figure 5-2 Steps Between FOVs

5.2 DOP Compensation Type

There are two methods of DOP compensation, **Find Plane** and **On Edge**.

Default is **Find Plane**.

5.2.1 Find Plane

In **Find Plane**, board surfaces are detected per FOV.

So far, this is the same as the convention board height compensation.

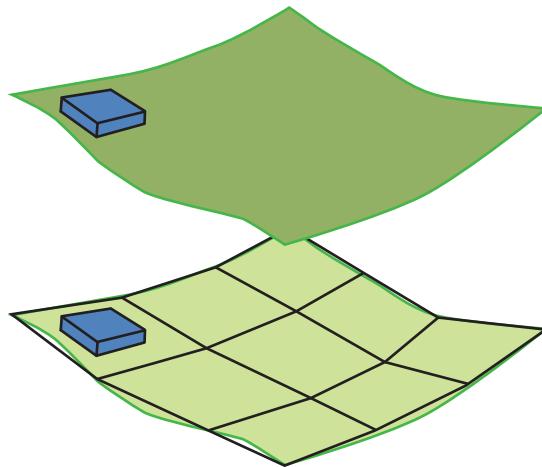


Figure 5-3 Find Plane 1

In **Find Plane**, when a board is scanned, regular triangles are automatically allocated.

These triangles are called DOPs (Distortion Observation Points), and each DOP contains board height information.

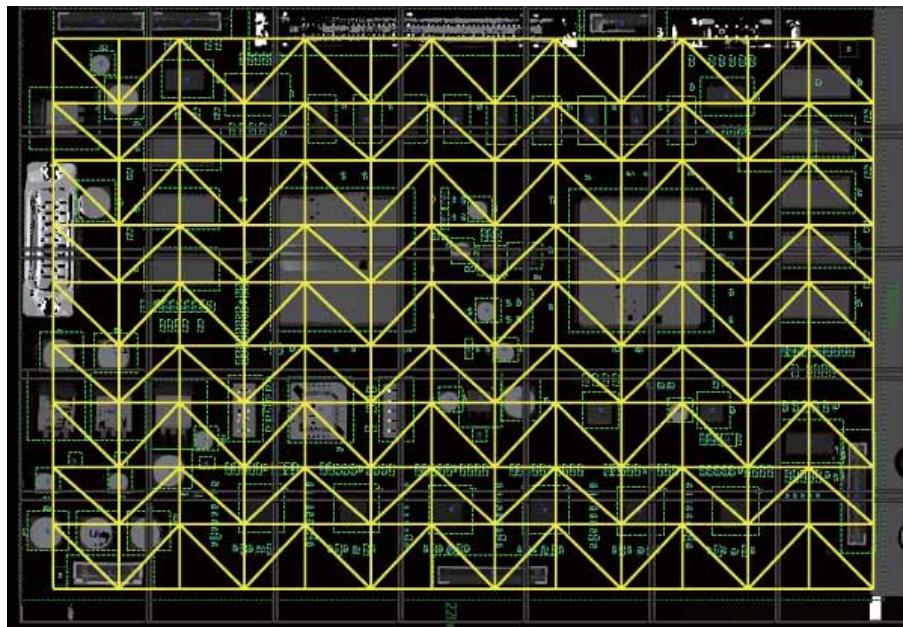


Figure 5-4 Find Plane 2

Heights are measured at DOP, not for each FOV, and warpage of the board is compensated for each triangle surrounded by DOPs. Because compensation is not performed per FOV, no differences in the contours between FOVs are generated.

In **Find Plane**, each DOP acquires height information of a boards which is compensated with the conventional method. DOPs for **Find Plane** cannot be added or deleted, since they are automatically allocated.

5.2.2 On Edge

In **On Edge** method, DOPs are allocated at slightly outside the four corners of the component. Warpage of the board is compensated by treatment slightly outside the components surrounding as the board height datum zero reference. Because compensation is not performed per FOV, no differences in the contours between FOVs are generated.

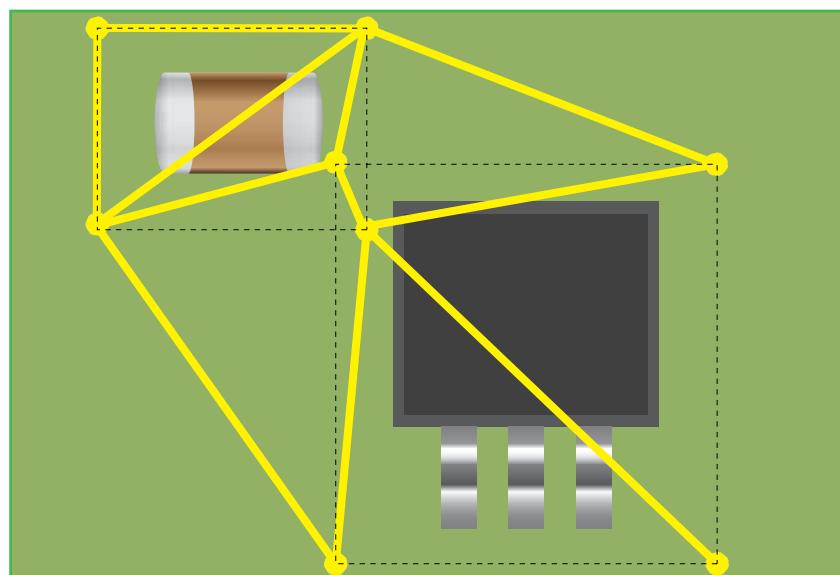


Figure 5-5 On Edge

DOPs for **On Edge** cannot be added or deleted, since they are automatically allocated.

And DOPs for **On Edge** are allocated based on component allocation. So DOPs are not allocated when the component does not have recipe.

5.2.3 Uses of DOP Compensation

Normally use **Find Plane**.

When DOPs are not allocated by **On Edge**, DOPs are automatically allocated with **Find Plane**. In the most cases, compensation is accurately performed with **Find Plane**. However, **On Edge** is suitable the following circumstances.

| Item | Description |
|---|--|
| Easily warped boards | Boards that will be greatly warped within the field of a single FOV cannot be accurately compensated with Find Plane . |
| Some boards with sub boards | Each sub board may be inclined in different ways depending on the designs of the cut-out. If multiple sub boards are inclined in different ways and coexist in the same single FOV, it is not possible to accurately perform compensation with Find Plane . |
| Boards upon which boards are installed | Because of the same reason as the above case of sub boards, compensation cannot be accurately performed with plane detection. |
| FOVs containing many semitransparent fields | Compensation cannot be accurately performed with Find Plane in some cases. |

Table 5-1 Descriptions

5.3 DOP Compensation Setting

5.3.1 Switching DOP Compensation

Step1: Click **BF2** button on the upper left side of the window to open the menu and Click **BF2 Option**.

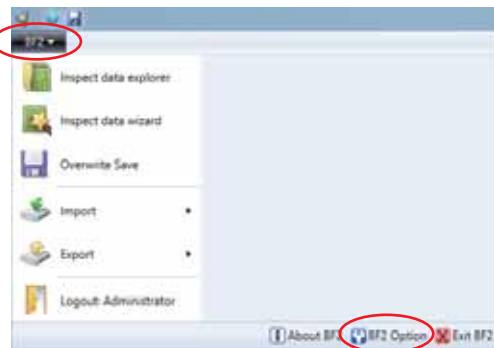


Figure 5-6 Switching DOP Compensation 1

Step2: The dialog shown below appears.

Select **Inspection Data**.



Figure 5-7 Switching DOP Compensation 2

Step3: The dialog shown below appears.

Select **DOP** and check **Distortion Measurement**.

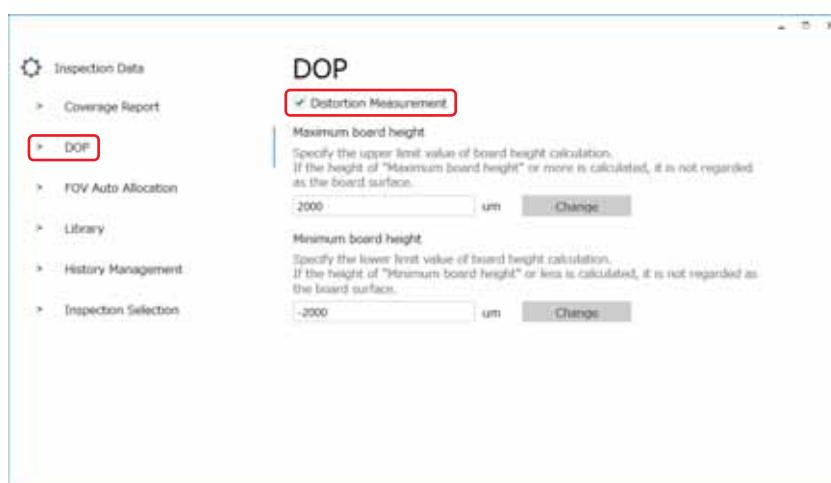


Figure 5-8 Switching DOP Compensation 3

5.3.2 Editing DOP of On Edge

Here describes how to edit the DOP of **On Edge**.

CAUTION DOPs of **Find Plane** cannot be edited because they are allocated automatically.

CAUTION DOPs of **On Edge** are allocated based on component allocation. So DOPs are not allocated when the component does not have recipe.

Step1: Select **FOV** tab.



Figure 5-9 Editing DOP of On Edge 1

Step2: Edit panel appears.

Select **Setting > Distortion measurement setting**.

NOTE When **Distortion measurement setting** is changed, the changes are applied to all other FOVs too.

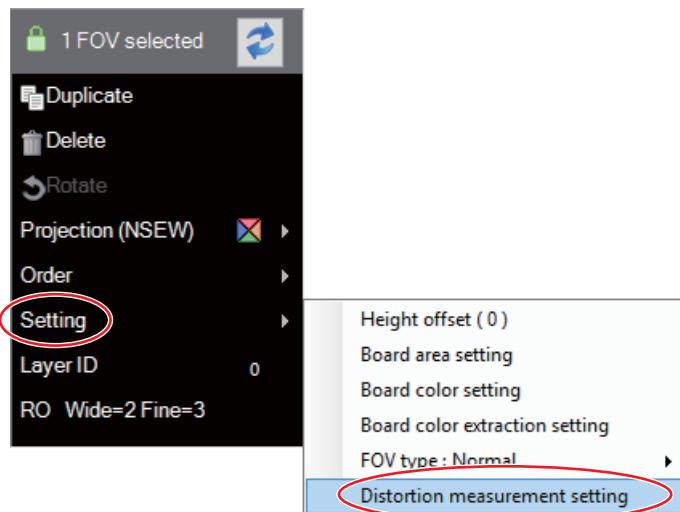


Figure 5-10 Editing DOP of On Edge 2

Step3: The dialog shown below appears. For details, refer to Table 5-2.

Select **On Edges** from **Component DOP type** drop-down list, and click **OK**.

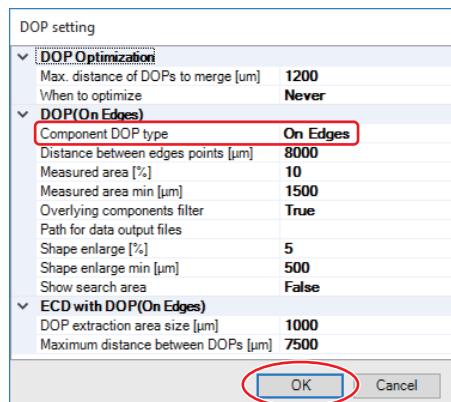


Figure 5-11 Editing DOP of On Edge 3

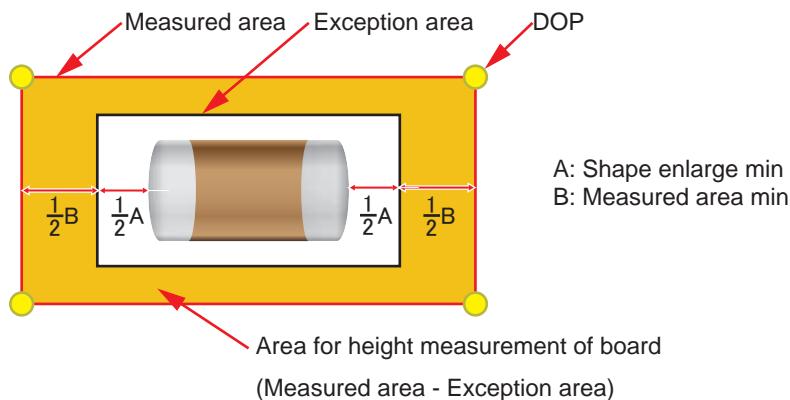


Figure 5-12 Editing DOP of On Edge 4

| Item | Description |
|-----------------------------------|--|
| Distance between edges points[μm] | <p>When distance between DOPs is long, difficult to properly correction. DOP is added automatically when the original distance between DOPs is longer than Distance between edges points.</p> <p>Minimum distance between edge point</p> |
| Component DOP type | <p>Set On Edge to use On Edge correction. The default value is On FOV(Find Plane).</p> |
| Path for data output files | <p>Specifies output path for log file.</p> |
| Shape enlarge min [μm] | <p>Specifies the minimum size of the exception area of board height calculation. In case the component size is small and only Shape enlarge[%] setting is used, the exception area may be too small to properly correct. When the area specified by Shape enlarge min[μm] is bigger than the area specified by Shape enlarge[%], the Shape enlarge min[μm] area is used as the exception area In that case, the outside of component shape by half of Shape enlarge min[μm] is used as the exception area. For details, refer to Figure 5-12.</p> |
| Measured area min [μm] | <p>Specifies the minimum size for board height calculation. In case the component size is small and only Measured area[%] setting is used, the measurement area may be too small to properly correct. When the area specified by Measured area min[μm] is bigger than the area specified by Measured area[%], Measured area min[μm] area is used as the measurement area. In that case, the outside of the exception area by half of Measured area min[μm] is used as the measurement area. For details, refer to Figure 5-12.</p> |

| Item | Description |
|-------------------------------------|--|
| Shape enlarge[%] | <p>Specifies the area to exclude from calculation of board height. There may be any noises near component. So it is necessary to exclude that area from calculation of board height. The area enlarged from the shape of component with specified percentage is exclude. Recommended setting is 5%.</p> |
| Measured area[%] | <p>Specifies the area to calculate board height. The expanded component shape with specified percentage is the area to calculate board height. Recommended setting is 10%.</p> |
| Overlying components filter | <p>If an exclusion area of another part is included in the measurement area, exclude that area from the height calculation of the board surface. Default is True.</p> <p>Measured area for component A Exception area for component A Area for board height measurement of component A (Measured area - Exception area) Measured area for component B Exception area for component B When measured area for component A and exception area for component B are overlapped, that area is not used for board height measurement of component A.</p> |
| Show search area | Show measurement area as red frame. |
| Max. distance of DOPs to merge [μm] | The set value is used for the optimization of number of DOP. DOPs are merged when the distance between DOPs which can be merged is shorter than Max. distance of DOPs to merge [μm] . Default value is 1200[μm] . |
| When to optimize | The set value is used for the DOP optimization. Default value is Never . |
| DOP extraction area size [μm] | If On Edge is used when ECD area is existing, DOP is placed on the area where is no component. This influences the position of DOP which is placed where no components exist. |
| Maximum distance between DOPs [μm] | Specifies the maximum distance between DOPs which is placed where no components in the case when ECD area is existing and On Edge is used. Default value is 7500[μm] . |

Table 5-2 Descriptions

Step4: From the **FOV** tab, select **Distortion group > Optimize DOP**.

CAUTION DOPs of **On Edge** are not allocated when the component does not have recipe.

NOTE **Optimize DOP** appears only when **Component DOP type** is set to **On Edges**.



Figure 5-15 Editing DOP of On Edge 7

Step5: From the **FOV** tab, select **Display group > Display > Distortion compensation**.

Allocated DOPs of **On Edge** is displayed.

Check DOPs are allocated.

CAUTION When DOPs are not allocated, the component may not have any recipe, or layer for component and FOV may be different.

Regarding how to change layer setting, refer to **6 Making Inspection Data of a Large Board**.



Figure 5-16 Editing DOP of On Edge 8

Step6: After scanning the board, set image filter as **Board height**.

And check the board part is colored green or yellow.

When board part is colored black, blue, orange, or red, adjust parameters by reference to Table 5-2.

If the area which height is different from board height is included in **Area for height measurement of board** of Figure 5-12, compensation does not work well.

NOTE When the component is small, adjust the parameters of **Shape enlarge min[μm]** and **Measured area min[μm]**.

Step7: From the **FOV** tab, select **Distortion group > Measure**.

If board part is colored black, blue, orange, or red, return to Step6 and adjust parameters again.



Figure 5-17 Editing DOP of On Edge 9

5.4 Settings When Using Find Plane

When using **Find Plane**, the following settings may be necessary.

NOTE These settings are not necessary when using **On Edge**.

5.4.1 Board Height Exclusion Area

When there is a slit or transparent part on a PCB, a PCB height may not be measured correctly.

By setting the Board Height Exclusion Area on an FOV, the height measurement becomes more accurate.

For details of board height exclusion area settings, refer to **4.3.8 Board Height Exclusion Area**.

5.4.2 Board Color Extraction Setting

This is a function to extract the board color from the specified area during each scan.

This function is used when it is necessary to inspect boards having different board colors because of different board manufacturers on the same line.

Step1: Select the FOV for board height compensation and display the edit panel.

Select **Settings > Board Color Extraction Setting**.

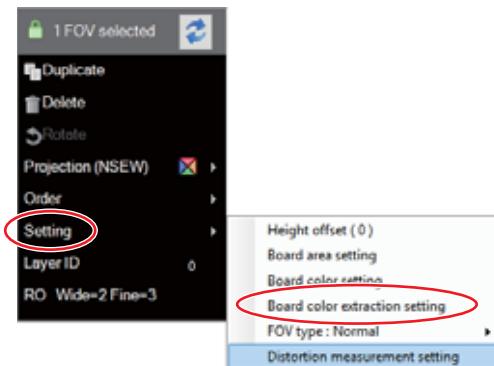


Figure 5-18 Board Color Extraction Setting 1

Step2: The dialog shown below appears.

Select an FOV to extract board color by clicking and .

After FOV is selected, check **Enable Board Color Rects**.

NOTE One FOV only from which a board color can be extracted.

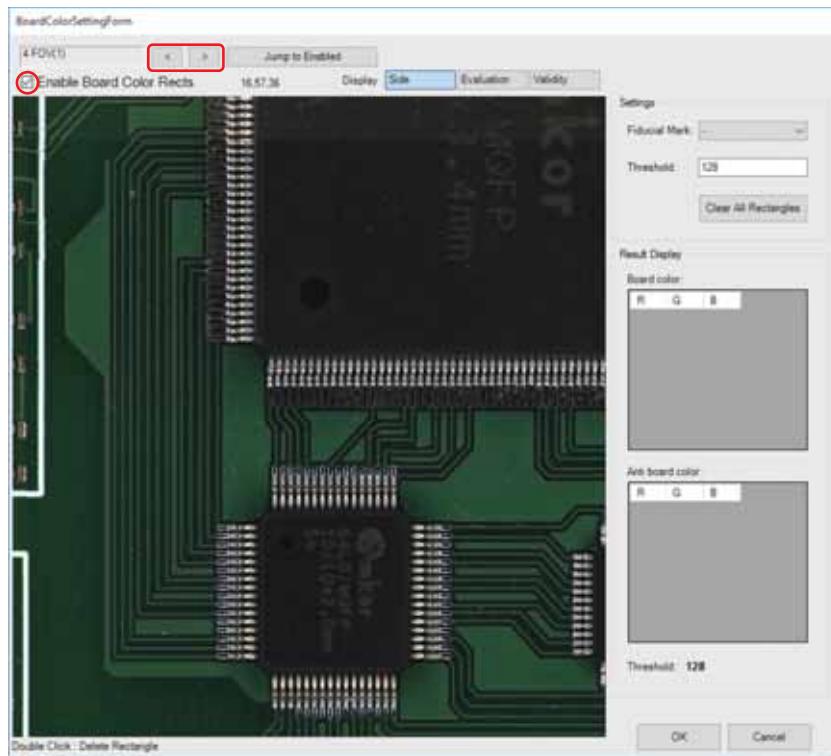


Figure 5-19 Board Color Extraction Setting 2

Step3: Specify the color of the board and other colors.

Check **Enable Board Color Rects** and click the board color section. Select **Apply average as board color** and a list of board colors is added to the **Board color** on the right side.

Click an area which has a color that is different from the board color and select **Apply average as anti board color**.

A list of anti board colors is added on the right side of **Anti Board color** field.

NOTE

Select the wiring patterns for the board color.

Select an area that there are few component around. The area should be as large as possible.

As colors other than the board color, select colors of components, silk, holes, insulation material areas, etc.

NOTE

The areas specified as board colors are shown in blue squares, and the areas specified as colors other than board colors are shown in white squares.

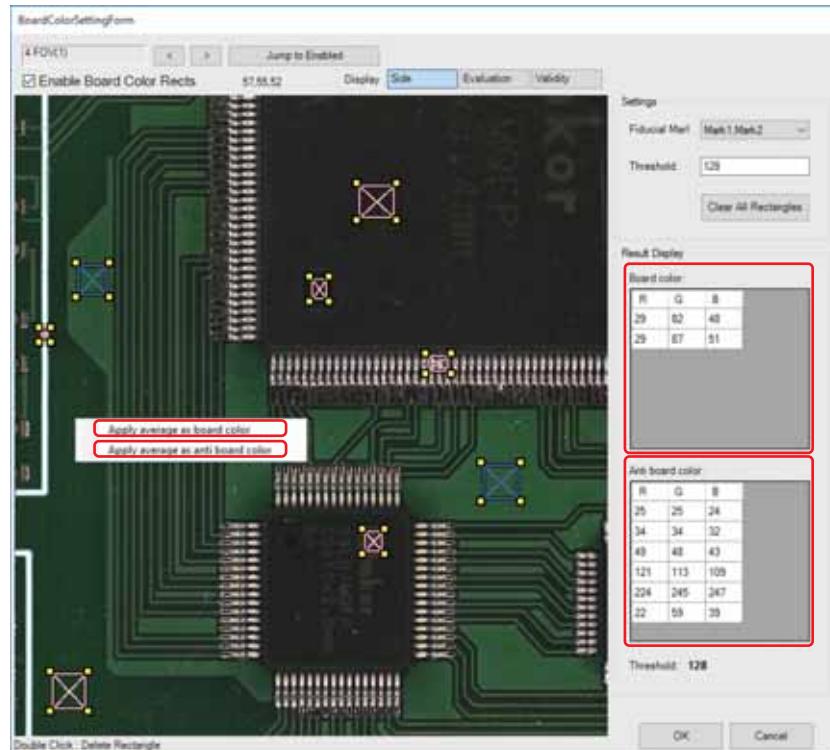


Figure 5-20 Board Color Extraction Setting 3

Step4: Fine tune the color specification set in Step3.

Select **Evaluation** on the right side of **Display**.

The area registered as the board color is shown in white depending on the Board color and Anti Board color settings.

Select **Validity** on the right side of **Display** to display areas with a brightness greater than the **Threshold** in white and all other areas in black on the **Evaluation** image.

Areas displayed in white when using **Validity** are recognized as the board surface.

Set the **Board color**, **Anti Board color**, and **Threshold** to display only the board color area in white.

For details settings, refer to Table 5-3.

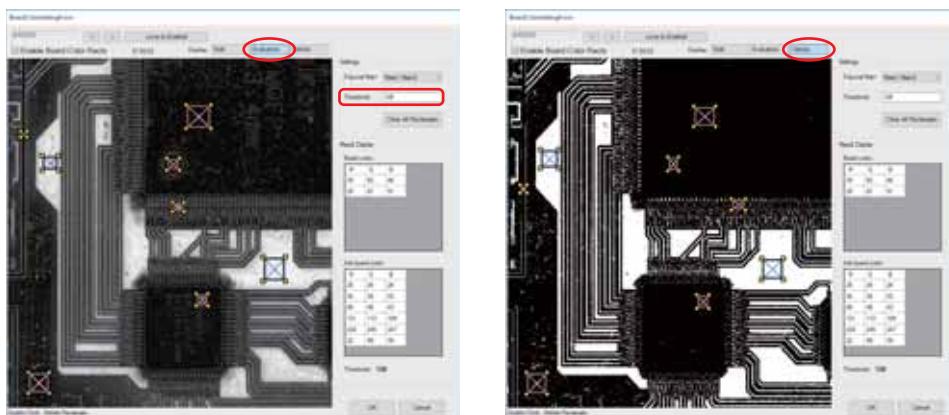


Figure 5-21 Board Color Extraction Setting 4

| Item | | Description |
|--------------------------|------------|--|
| | / | Switches an FOV. |
| Jump to Enabled | | Switches to an FOV for which Enable Board Color Rects is selected. |
| Enable Board Color Rects | | Select after switching to an FOV from which the board color is to be extracted. A board color can be extracted from one FOV only. |
| Display | Side | Displays the images of SideLight. |
| | Evaluation | Displays the board color area in white based on the Board color and Anti Board color settings. |
| | Validity | Areas in the Evaluation image with a brightness greater than the Threshold are displayed in white and all other areas in black. |
| Fiducial Mark | | Assigns the fiducial mark to use for misalignment adjustment. Fiducial marks not used for adjusting a misalignment of the component position are not displayed. |
| Threshold | | Sets the threshold value when converting the Evaluation image to the Validity image. White areas in the Validity image are recognized as the board surface. |
| Clear All Rectangles | | Deletes all Board color and Anti Board color settings. |
| Board color | | A list of board colors set with Apply average as board color. |
| Anti board color | | A list of board colors set with Apply average as anti board color. |

Table 5-3 Board Color Extraction Setting

Step5: After assigning a fiducial mark to use for misalignment adjustment, click **OK**.

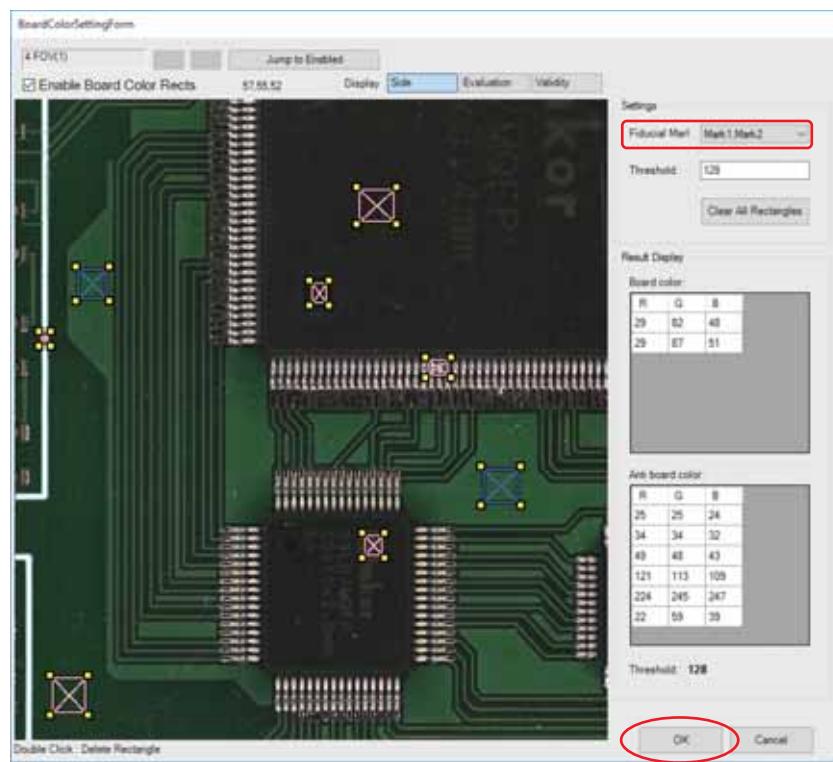


Figure 5-22 Board Color Extraction Setting 5

5.5 Board Height Compensation Tuning

Here describes tuning of board height compensation.

Step1: After allocation of FOVs has completed, capture the board before setting DOP compensation.

From **FOV** tab, select **Machine control** group > **Scan**.

At this point in time, DOP compensation is performed with **Find Plane**.

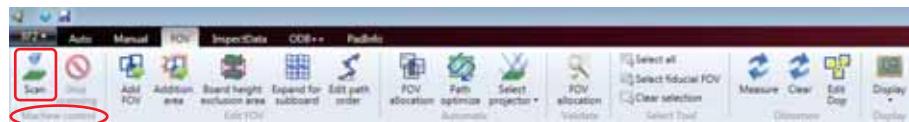


Figure 5-23 Board Height Compensation Tuning 1

Step2: Change the Image Filter to **Board height** and confirm that the board surfaces are green or yellow.

If the board surfaces are black, blue, orange, and/or red, proceed to Step 3.

NOTE The color changes from blue to black as the height becomes lower than Board surface.
Also, the color changes from orange to red as the height becomes higher than Board surface.

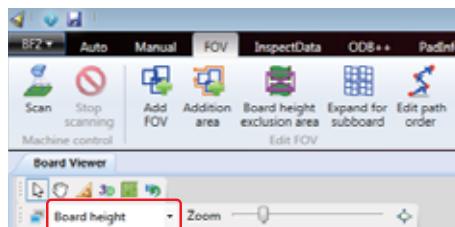


Figure 5-24 Board Height Compensation Tuning 2

Step3: Set the board color.

For details, refer to **4.3.12 Board Height Compensation Settings**.

After all the setting of the board colors is completed, select **Distortion** group > **Measure** from the ribbon to perform the DOP compensation processing. If the board surfaces are black, blue, orange, and/or red, make the settings by reference to Table 5-4.

NOTE From the ribbon, select **Distortion** group > **Clear** to cancel the DOP compensation.



Figure 5-25 Board Height Compensation Tuning 3

| Item | Description |
|--|---|
| The height of an FOV having many wiring patterns and the height of an FOV having few wiring patterns are different | Set the board color extraction setting. For details, refer to 5.4.1 Board Height Exclusion Area . |
| A lot of semitransparent parts are included in an FOV, and compensation cannot be performed correctly. | Set the board color extraction setting. For details, refer to 5.4.1 Board Height Exclusion Area . |
| The warpage at the edge of the board is large and the height of the nearby components is low or high | Sets the On Edge setting. For details, refer to 5.3.2 Editing DOP of On Edge . |
| The inclination between sub boards is different because of the slit design, and the heights of the nearby components are low or high | Sets the On Edge setting. For details, refer to 5.3.2 Editing DOP of On Edge . |

Table 5-4 Descriptions

6 Making Inspection Data of a Large Board

Inspection machine for large boards can inspect boards having a length of 510 mm or longer.

If a board has a length of 510 mm or longer, shift the board clamp position after scanning the board and scan the remaining area.



Figure 6-1 Scan Method of Large Board

6.1 Assigning the Layer of Component

This section describes how to assign the layer of component.

The FOV scanned with the first scan and the FOV scanned with the second scan are separated by layer numbers.

The FOV scanned with the first scan is Layer 1, and the FOV scanned with the second scan is Layer 2.

Components also have the concept of layers, so Layer 1 of a component is inspected with an image scanned at Layer 1 of the FOV and Layer 2 of the component is inspected with an image scanned at Layer 2 of the FOV.

NOTE The initial layer of an FOV exceeding 510 mm is Layer 2.

Step1: From **InspectData** tab, select **Layout** group > **Allocate Layer** to assign layers to each component automatically.

Layer1 components are highlighted in green and Layer2 components are highlighted in purple.



Figure 6-2 Assigning the Layer of Component 1

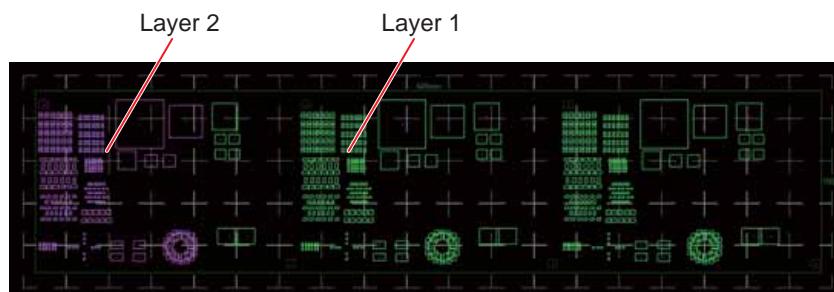


Figure 6-3 Assigning the Layer of Component 2

Step2: To change layer ID manually, click **Set Layer ID** from edit panel.
Layer ID setting dialog appears. Enter layer ID to set and click **OK**.

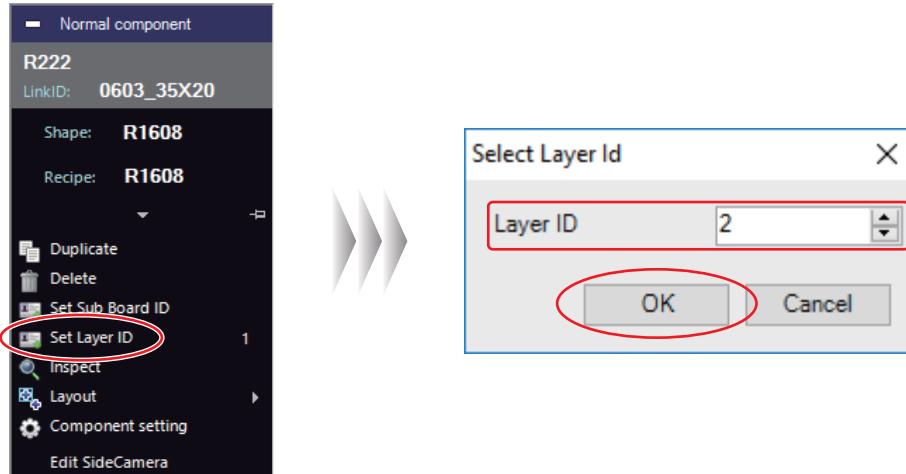


Figure 6-4 Assigning the Layer of Component 3

6.2 Assigning the Layer of FOV

Perform automatic allocation of the FOVs by reference to **4.3.3 Optimizing FOV Allocation (Auto Allocation)**.

The FOV settings in consideration of the layers are automatically set.

Layer1 FOVs are highlighted in green and Layer2 FOVs are highlighted in purple.

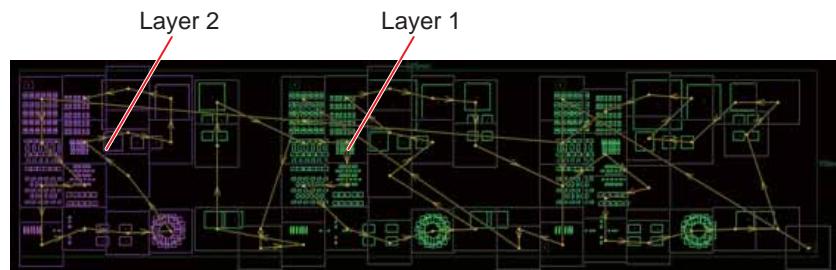


Figure 6-5 Assigning the Layer of FOV 1

To change layer ID of FOV, select any FOV on **Board Viewer**.

Click **Layer ID** and layer ID setting dialog appears. Enter layer ID and click **OK**.

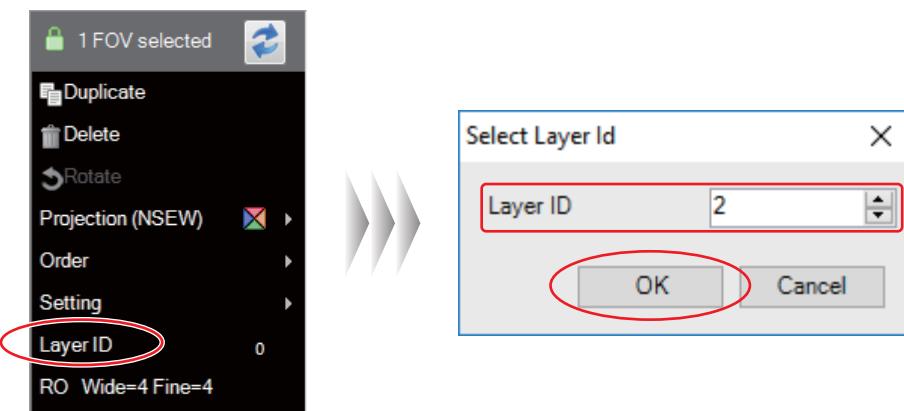


Figure 6-6 Assigning the Layer of FOV 2

6.3 Adding the Fiducial Mark

Regarding large board 510 mm or longer, two or more fiducial marks are necessary for each layer. Depends on the board, It is necessary to add fiducial mark to the boundary of layers by manual.

Step1: Add a fiducial mark to the boundary between Layer 1 and Layer 2 by manual.

Create new fiducial marks at the positions to be treated as the fiducial marks by reference to **1.4.1 Set the Marks.**

NOTE

When it is difficult to create mark in Layer2, add a fiducial mark on the range of 410 mm to 510 mm from board edge.

Add a fiducial mark to the boundary between Layer 1 and Layer 2

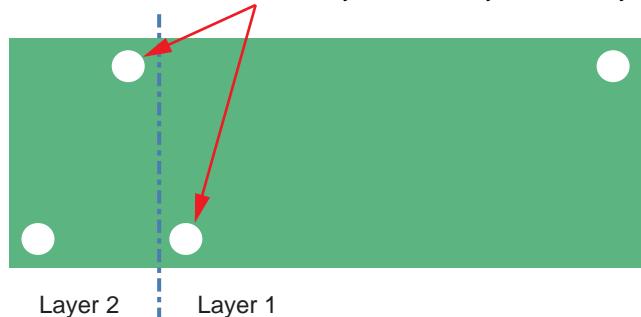


Figure 6-7 Adding the Fiducial mark 1

Step2: Select added fiducial mark and click **Set layer ID** on edit panel.

Select Layer ID dialog appears. Enter layer ID to set and click **OK**.

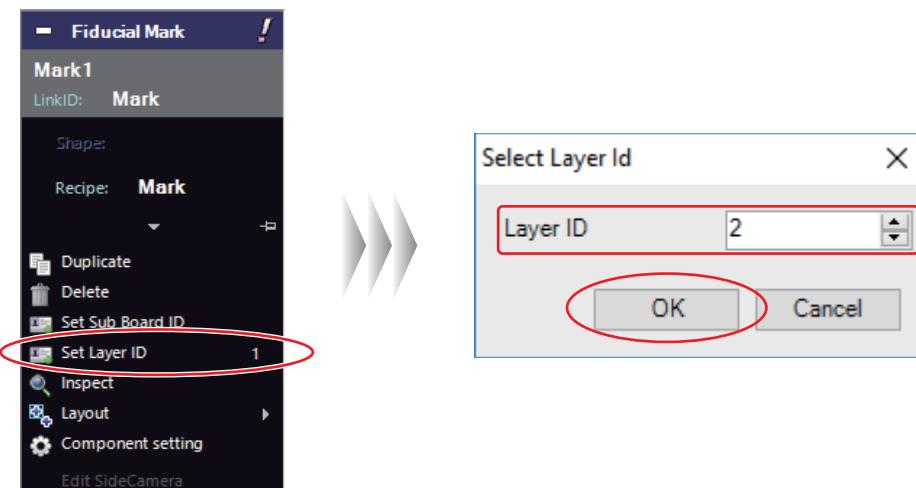


Figure 6-8 Adding the Fiducial mark 2

Step3: Confirm sub board ID and layer ID are correct, and assign fiducial mark by reference to **1.4.3 Automatic Assignment of Mark.**

Step4: Adjust the positions of the added fiducial marks.

Adjust the positions of fiducial marks by reference to **1.4.5 Makes Fiducial Mark Compensation.**

6.4 Registering the Template Image for Detection of the Board Edge

When scanning a large board, the amount of shift of the board stop position is sought by scanning the edge of the board while the board is clamped before scanning and then matching this image with the template image registered in advance.

The scan position is compensated based on the results of the calculation.

If the template image has not been registered, the following template image registration screen is displayed when the board is clamped before scanning.

Move the cursor over the edge of the board to register the template image and click **Template Registration**.

NOTE

Right-click at the **Board Viewer** of the **FOV** tab and select **Clear template for detecting board edge** to clear the template image and it will be unregistered state.

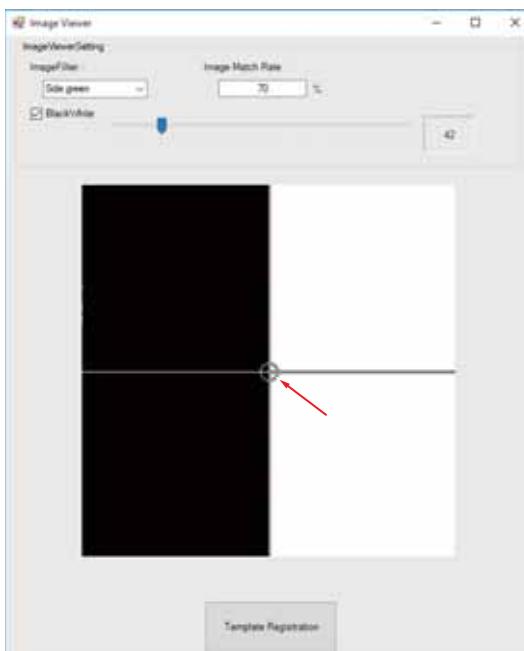


Figure 6-9 Adding Template Image

| Item | Description |
|-----------------------|--|
| Image Filter | Select a lighting that displays the board clearly. |
| Image Match Rate | Sets an image match rate to use when detecting the edge of a board. |
| Scan Retry Count | If the image match rate is equal to or less than the specified rate, only during detection of the board edge of the rear end, the camera moves 10 mm to the right and the detection of the edge of the board is performed again. Retries while moving to the right for the set number of times. |
| BlackWhite | Check to display BlackWhite. Threshold is changed by using sliderbar. |
| Template Registration | Adds the template image. |

Table 6-1 Adding Template Image

6.5 Display by layer

Scan data is displayed by each layer.

Step1: Select **InspectData** tab and right-click on **Board viewer**.

Select **Image layers** from the pop-up menu. The list of layer ID appears.

Check layer to display image.



Figure 6-10 Display by layer 1

When Layer1 and Layer2 overlap, FOV image of Layer2 is displayed.

Because of the differences of board clamped state between Layer1 and Layer2, the joint of window may be shift.

But it is no problem since only the FOV image of the same layer as the component layer is used in inspection.

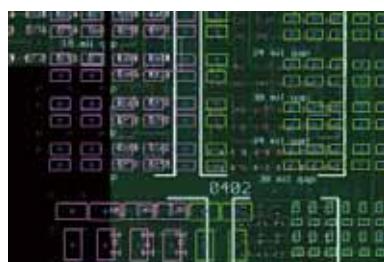


Image of layer 1

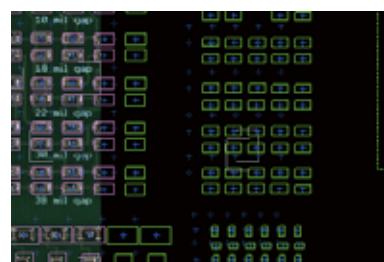


Image of layer 2

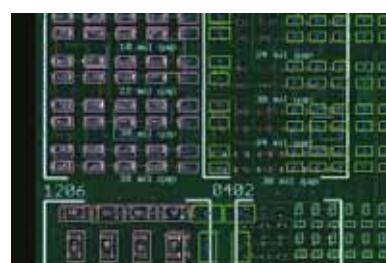


Image of all layers

Figure 6-11 Display by layer 2

7 Offline Debug

Offline Debug is a function to outputs component images during automatic operation and uses those component images to conduct parameter tuning of the inspection window.

7.1 Specifying the Output Destination

Step1: Click the **BF2** button on the upper left side of the window to open the menu and Click **BF2 Option**.

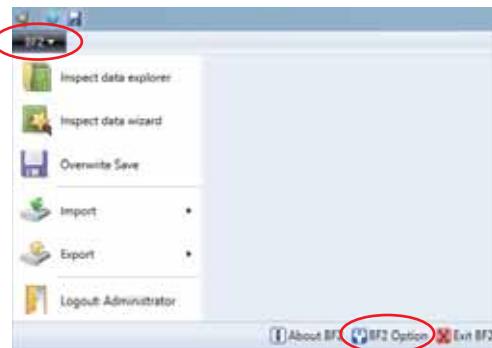


Figure 7-1 Specifying the Output Destination 1

Step2: The dialog shown below appears.

Click **Auto Mode**.



Figure 7-2 Specifying the Output Destination 2

Step3: The dialog shown below appears.

Select **Output Inspection Result** and set toggle switch of **Offline Debug** to **ON**.

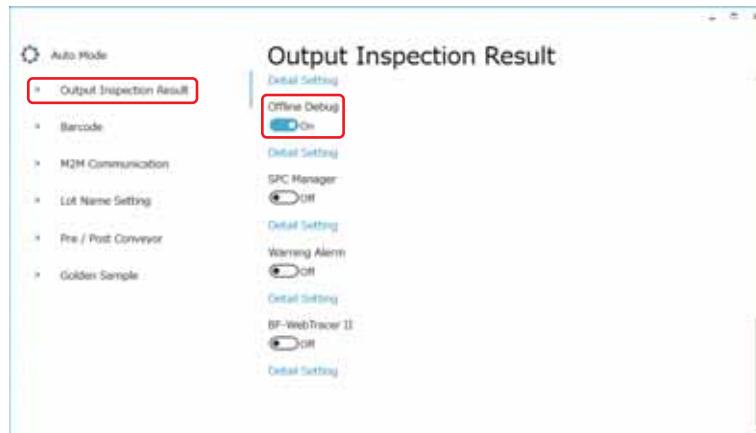


Figure 7-3 Specifying the Output Destination 3

Step4: Click **Detail Setting** under the toggle switch of **Offline Debug** to set detailed items.
Specifies **Offline debug data destination path**.

NOTE Default setting is **C:\Bf2OfflineDebugData**.

7.2 Component Image Output Setting

Step1: From **Auto** tab, select **Offline Debug** group > **Setting**.

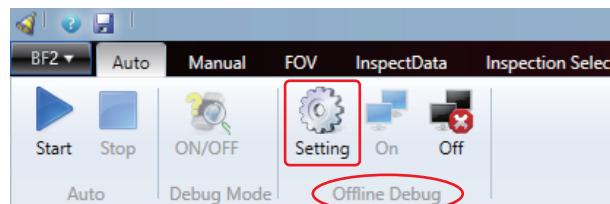


Figure 7-4 Component Image Output Settings 1

Step2: The dialog shown below appears.

Select each folder in the Library directory to display the list of shapes included in the selected folders in the Shape list under the **Shape/recipe list**.

Click **▶** and **◀** arrows to move the **shapes/recipes** to the **Selected shape/recipe list** and edit the **Output option**. For details, refer to Table 7-1.

NOTE Check **Use all shapes/recipes automatically** to target all shapes and recipes.

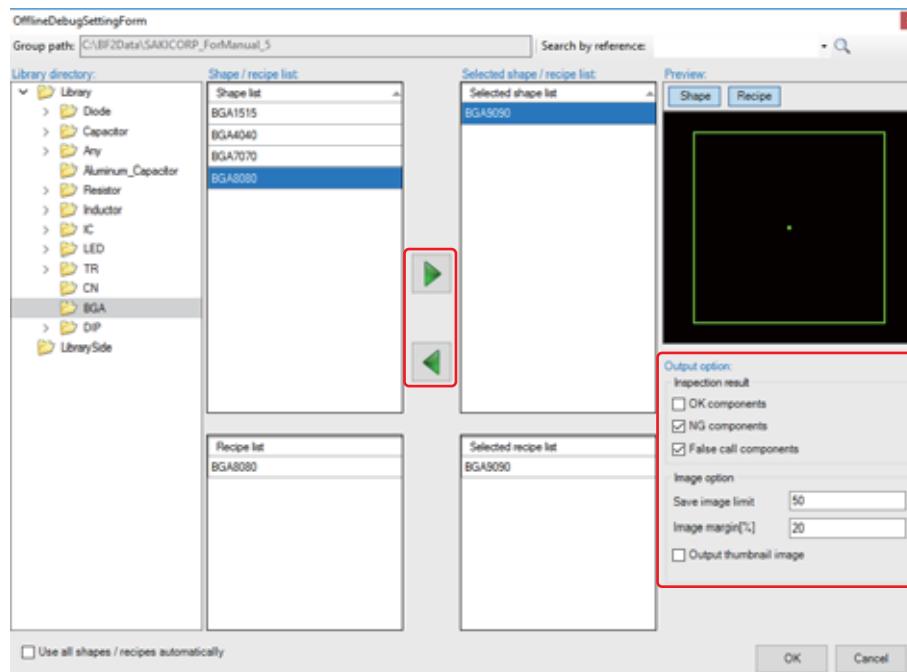


Figure 7-5 Component Image Output Settings 2

| Item | Description | |
|----------------------------|--|---|
| Group path | The path for the inspection data which is currently open. | |
| Search by reference | Click the ▼ arrow next to Search by reference to display the reference list for the currently opened inspection data. Select a reference from the list to search the shapes/recipes or check the settings in the specified reference. | |
| Library directory | This is the same list as the Library Tree described in 1.6.2 Window Details . Select each folder to display the list of shapes included in the selected folders in the Shape list under the Shape/recipe list . | |
| Shape/recipe list | The list of shapes included in the folder selected from the Library directory is displayed in the Shape list. Select a shape from the Shape list to display a list of the included recipes in the Recipe list. | |
| |  Click  to move the shape/recipe selected from the Shape/recipe list to the Selected shape/recipe list . Click  to move the shape/recipe selected from the Selected shape/recipe list to the Shape/recipe list . | |
| Selected shape/recipe list | The shapes and recipes in the Selected Shape/Recipe list are modified by the Output option settings. To exclude a particular shape and recipe from being output, select the shape and recipe and click  . | |
| Preview | Shape | Displays the shape selected in the Selected shape/recipe list with a solid line. |
| | Recipe | Displays the shape of the recipe selected in the Selected shape/recipe list with a dotted line. |
| Output option | OK components | Check this option to save component images for shapes and recipes in the Selected shape/recipe list when the inspection result is OK. |
| | NG components | Check this option to save component images for shapes/recipes in the Selected shape/recipe list when the inspection result is NG. |
| | False call components | Check this option to save component images for shapes/recipes in the Selected shape/recipe list when the inspection result is False call. |
| | Save image limit | Specifies the upper limit on the number of component images output for one recipe. Older images are deleted and new images are output when the upper limit is reached. |
| | Image margin[%] | Specifies the image margin when outputting component images. |
| | Output thumbnail image | Saves the thumbnail images to the folder specified in 7.1 Specifying the Output Destination . |

Table 7-1 Component Image Output Settings

Step3: After all the settings are completed, click **OK**.

Check that **On** is selected in the **Offline Debug** group.

Starting automatic operation under these conditions saves the component images based on the Output options.

NOTE The **On** and **Off** settings may be changed during automatic operation.

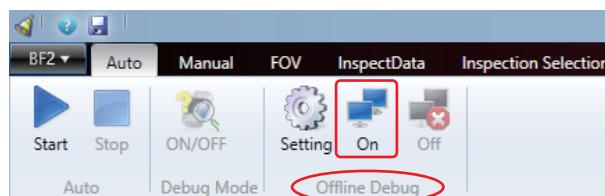


Figure 7-6 Component Image Output Settings 3

7.3 Listing the Component Image Output

Starting automatic operation after settings the **7.2 Component Image Output Setting**, saves the component images based on the Output settings.

The output component images can be confirmed after stopping automatic operation.

Step1: Select the **InspectData** tab.



Figure 7-7 InspectData

Step2: Select the **Offline Debug** tab on bottom part of dock window.

Click to display a list of output component images.

Select a reference from the list and double-click it to display the recipe edit screen for that reference.

For details, refer to Table 7-2.

| Name | Image | Last modified |
|---------------------|-------|----------------------|
| Shape_C003 | | 2017/02/21/ 17:02:50 |
| Recipe_C003 | 5 | 2017/02/21/ 17:02:50 |
| Link_id_0201_05A13 | 5 | 2017/02/21/ 17:02:50 |
| R48 | 1 | 2017/02/21/ 16:56:57 |
| R53 | 2 | 2017/02/21/ 17:02:50 |
| R54 | 1 | 2017/02/21/ 16:56:57 |
| R56 | 1 | 2017/02/21/ 16:56:58 |
| Shape_R0112 | | 2017/02/21/ 17:02:50 |
| Recipe_R0112 | 2 | 2017/02/21/ 17:02:50 |
| Link_id_00005_50440 | 2 | 2017/02/21/ 17:02:50 |
| R139 | 2 | 2017/02/21/ 17:02:50 |
| Shape_R321H1209Hx4 | | 2017/02/21/ 17:02:51 |
| Recipe_R321H1209Hx4 | 5 | 2017/02/21/ 17:02:51 |
| Link_id_1208_TO43 | 5 | 2017/02/21/ 17:02:51 |
| R173 | 2 | 2017/02/21/ 17:02:50 |
| R174 | 1 | 2017/02/21/ 17:02:50 |
| R176 | 2 | 2017/02/21/ 17:02:51 |
| Shape_TANTAL_E | | 2017/02/21/ 17:02:50 |
| Recipe_TANTAL_E | 3 | 2017/02/21/ 17:02:50 |
| Link_id_1380L12R | 3 | 2017/02/21/ 17:02:50 |
| C11 | 1 | 2017/02/21/ 16:49:42 |
| C3 | 2 | 2017/02/21/ 17:02:50 |

Figure 7-8 Listing the Component Image Output

| Item | Description | |
|---|--|---|
|  | Updates the list. | |
|  | Delete the selected reference image | Deletes the reference image selected in the list. |
| | Delete all of the board reference images | Deletes all the reference images in the currently opened board. References which are listed as Others belong to other boards within the same group and are excluded from deletion. |
| | Delete all of the group reference images | Deletes all of the reference images in the group. References listed as Others are also deleted. |
| Select all | Selects all of the list items. | |
| View | Hide references with no output images | References which have shapes/recipes set in 7.2 Component Image Output Setting are displayed in the list. Check this item to hide references with 0 output images. |
| | Display references with output images at full size | Displays references with output images with a dotted yellow line at the full image size. |
| Sort by | Sorts the list according to the selected item from the drop-down list. | |
| Filter by | Filters the list according to the selected item from the drop-down list. Select Advanced Settings to enable more detailed filtering. | |
| Search | Enter the shape/recipe/link ID/reference name in the text box and click  to highlight the search items in the list. | |

Table 7-2 Listing the Component Image Output

7.4 Parameter Tuning Using the Offline Debug Function

7.4.1 Image List

Double-click the desired reference from the list described in **7.3 Listing the Component Image Output** to display the recipe edit screen for that reference.

A list of component images output via the Offline Debug function within identical recipes is displayed in the **Image List** on the right side of the recipe edit screen.

Select the reference from the list to switch to full-size image display and show the selected reference image.

The **Offline Debug Mode** panel is also displayed to the upper right of the full-size image.

Click on the right side of the **Offline Debug Mode** panel to return to the original image.

For details, refer to Table 7-3.

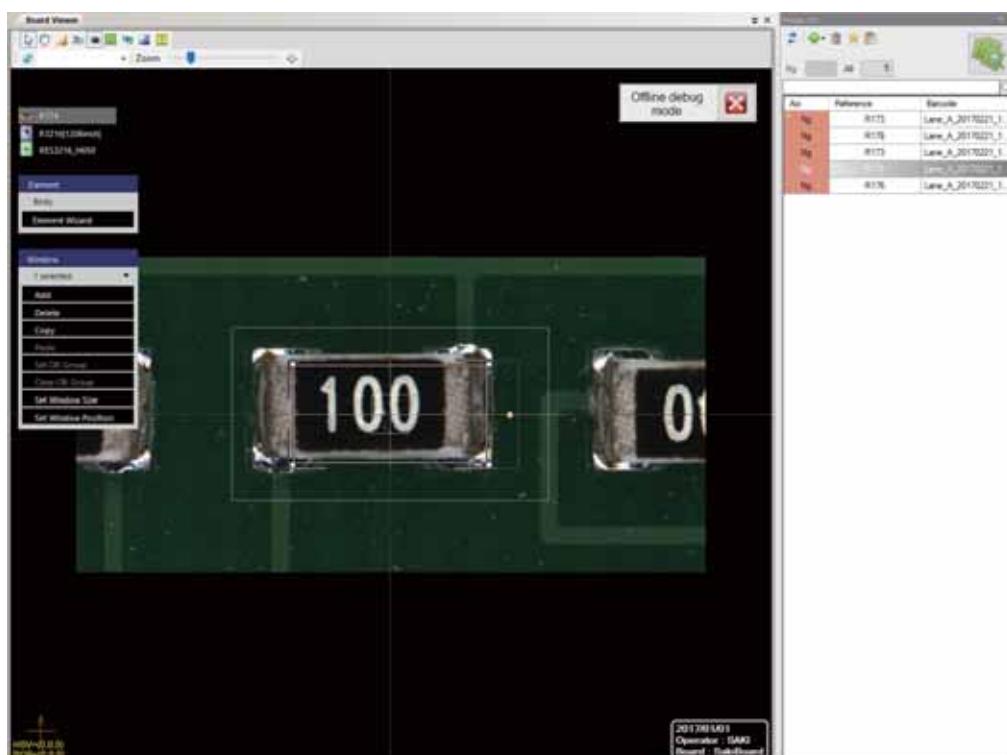


Figure 7-9 Image List

| Item | | Description |
|--------------------|--|--|
| Offline debug mode | | Select the reference from the list to display it. Click on the right side to return to the original image. |
| | | Updates the list. |
| | Add the current component image to the list | Adds the reference images in the currently opened recipe edit screen to the list. |
| | Add the component image from the identical recipe component list to the list | Adds the images for each component in the Identical Recipe Component List in the lower left of the recipe edit screen to the list. |
| | | Deletes the reference image selected in the list. |

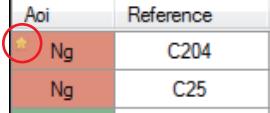
| Item | Description |
|--|--|
|  | <p>Bookmarks the reference image selected in the list. Bookmarked images are displayed with a yellow, star-shaped icon. The upper limit of the number of images displayed in the list depends on the Save image limit set in 7.2 Component Image Output Setting. Older images are deleted and new images are output when the upper limit is reached, except bookmarked images. Click it once again to clear the bookmark.</p> <div style="text-align: center;">  Figure 7-10 Bookmark </div> |
|  | <p>Adds a comment to the reference image selected in the list. The added comment is displayed in the lower right of the full-screen display.</p> <div style="text-align: center;">  Figure 7-11 Comment </div> |
|  | <p>Inspects the images output by the Offline Debug function using the parameters of the currently opened recipe. For details. Refer to 7.4.2 Inspecting Images Output with the Offline Debug Function.</p> |
| Search | <p>Enter the reference name in the text box and click  to highlight the search items in the list.</p> |
| Image List | <p>The Recognition Result is the inspection result when the image is output during automatic operation. The inspection result is displayed in green if it is OK or red if it is NG. Click  to inspect the images output by the Offline Debug function using the parameters of the currently opened recipe. The color of the Reference Name and Bar Code changes based on the inspection result. The inspection result is displayed in light-blue if it is OK or red if it is NG.</p> |

Table 7-3 Image List

7.4.2 Inspecting Images Output with the Offline Debug Function

Click  to inspect the images output by the Offline Debug function using the parameters of the currently opened recipe.

The color of the Reference Name and Bar Code changes based on the inspection result.

The inspection result is displayed in light-blue if it is OK or red if it is NG.

Step1: Click  to start inspection.

Step2: Perform the parameter tuning following the directions in **1.10.2 Parameter Adjustment**.

The appropriate parameter threshold value can be set by storing component images for NG inspection results.

8 Debug Mode

Debug Mode is a function to pause Auto Mode to perform tuning of inspection data by component and manual judgement of inspection results when an NG result has been detected in Auto Mode.

8.1 Window Details

This section describes and illustrates the debug mode screen.

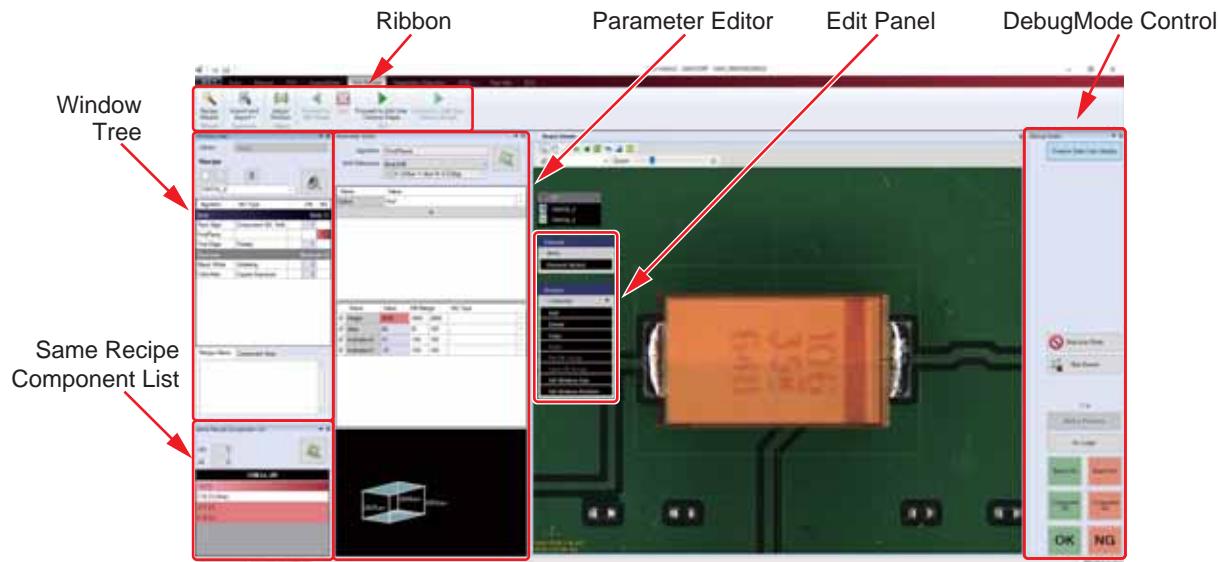


Figure 8-1 Window Details

| Item | Description | |
|----------------------------|--|---|
| Ribbon | | |
| Window Tree | | |
| Parameter Editor | | |
| Same Recipe Component List | Used when tuning inspection data. For details, refer to 1.10 Adjusting a Recipe . | |
| Edit Panel | | |
| DebugMode Control | Fixed in Side Color display Stop Auto Mode Stop Buzzer Back to Previous No Judge Board OK Board NG Component OK Component NG OK NG | Fix the display image in side color on Debug Mode. The comparison with actual board can be easily. Move to Auto Mode tab and stop Auto Mode. Stop the buzzer. Back to previous judgement window to retry judgement. Use the manual judgment. For details, refer to 8.4 Manual Judgement of Inspection Result . |

Table 8-1 Descriptions

8.2 Settings of Debug Mode

Step1: Click **BF2** button on the upper left side of the window to open the menu and Click **BF2 Option**.

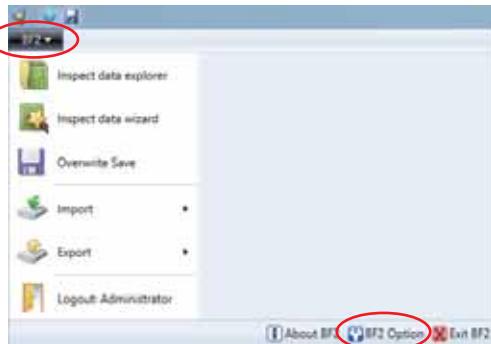


Figure 8-2 Setting of Debug Mode 1

Step2: The dialog shown below appears.

Click **Auto Mode**.

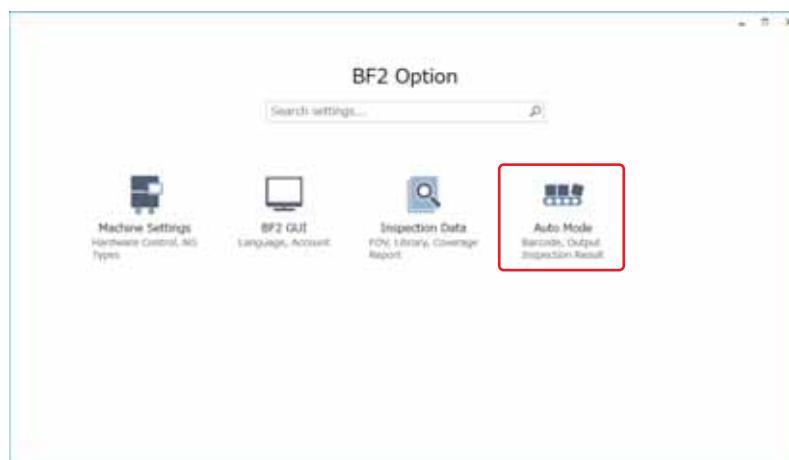


Figure 8-3 Setting of Debug Mode 2

Step3: The dialog shown below appears.

Select **Output Inspection Result** and set toggle switch of **Debug Mode** to **ON**.

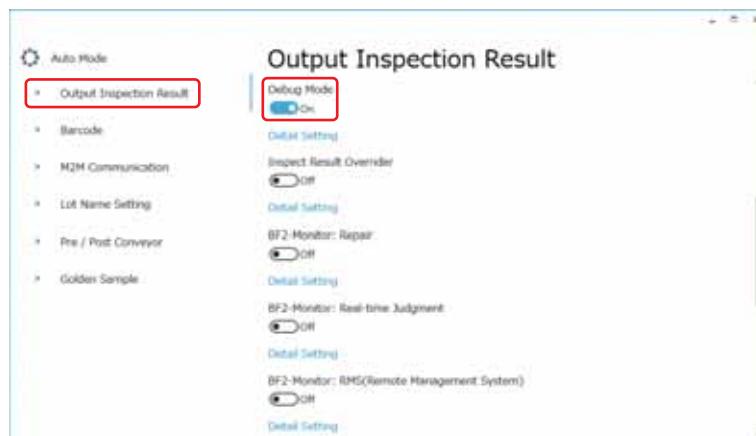


Figure 8-4 Setting of Debug Mode 3

- Step4: Click **Detail Setting** under the toggle switch of **Debug Mode** to set detailed items.
 Proceed the setup procedures, if necessary. Refer to the table below for detail settings.

| Item | Description |
|---|--|
| Set machine judgment to OK when False Call selected | When the inspection result is judged as False Call in debug mode, set machine judgment to OK. In this case, the component is treated as OK. |

Table 8-2 Setting of Debug Mode

- Step5: If an NG result is detected in Auto Mode, the Auto Mode is paused and the Debug Mode screen is displayed.

8.3 Debugging Inspection Data

Inspection data can be debugged in the DebugMode screen.

Tune the inspection data if necessary by reference to **1.10 Adjusting a Recipe**.

8.4 Manual Judgement of Inspection Result

Inspection result can be judged in the DebugMode screen.

In the Debug Mode operation screen, click an arbitrary judgement button.

For details, refer to Table 8-3.

Judge all the NG windows of a board or click **No Judge** to terminate the Debug Mode and resume Auto Mode.



Figure 8-5 Manual Judgement of Inspection Result 1

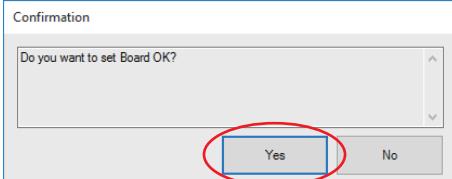
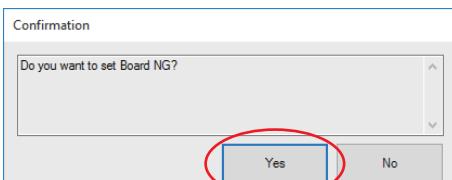
| Item | Description |
|--------------|---|
| No Judge | Manual judgement is not necessary if you would only like to perform tuning of the inspection data. When manual judgement is not to be made, click No Judge. |
| Board OK | Judges all current boards as false calls at once. Click Board OK . The dialog shown below appears. Click Yes to exit debug mode and restart Auto Mode. |
| |  |
| | Figure 8-6 Manual Judgement of Inspection Result 2 |
| Board NG | Judges all current boards as NG at once. Click Board NG . The dialog shown below appears. Click Yes to exit debug mode and restart Auto Mode. |
| |  |
| | Figure 8-7 Manual Judgement of Inspection Result 3 |
| Component OK | Judges all current boards as false calls at once. If there is another NG component, the screen switches to the Debug Mode screen of the next component. |
| Component NG | Judges all current components as false calls at once. If there is another NG component, the screen switches to the Debug Mode screen of the next component. |
| OK | Click if the inspection result of the window is NG but the board is indeed good. If there is another NG window, the window switches to the next NG window. |
| NG | Click if the inspection result is NG and the board is indeed defective. If there is another NG window, the screen switches to the Debug Mode screen of the next component. |

Table 8-3 Descriptions

9 Inspection Selection

Inspection Selection is the function to manage the case the product board has some variations.

Depending on the board version, there is the case that any component is not placed or component appearance is changed even if same board.

In that case, each variations can be set as **Inspection Selection** based on one inspection data.

By switching **Inspection Selection** setting, it is possible to shorten the inspection data creation time and improve the efficiency of data management.

9.1 Inspection Selection Type

9.1.1 Inspection Skip Component

Setting to skip inspection of any component.

This is used to skip inspection of the component that is not placed depending on board version.

9.1.2 Not-Placed Component

Setting to inspect only missing of any component.

In this inspection, when the component is not placed, judged as OK.

This is used to check the component is not mounted on the specific board version which does not need the component.

9.1.3 Link ID Re-assigning component

Set any Link ID to a component.

Some various library can be assigned to one component.

9.2 Inspection Selection Setting Procedure

Step1: Select **Inspection Selection** tab.

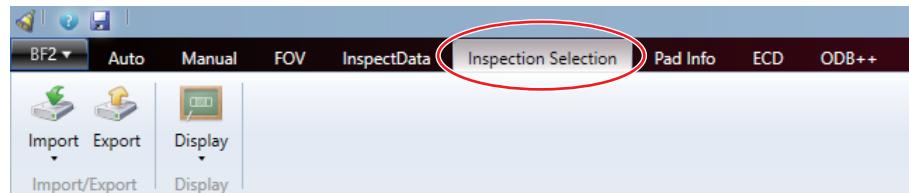


Figure 9-1 Inspection Selection 1

Step2: Click on the right side of **Load** in **Inspection Selection File List**, and click **New**.

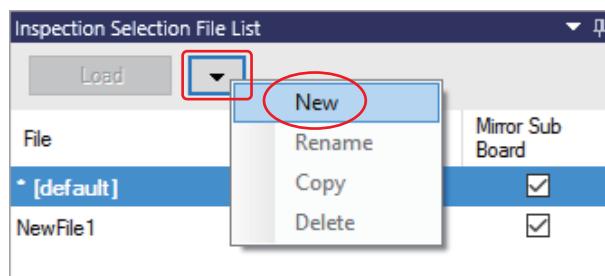


Figure 9-2 Inspection Selection 2

Step3: Select newly created inspection selection setting and click **Load**.

Dock window of **Inspect/Skip List**, **Inspection for Not Placed**, and **Exchange LinkID List** are added on the right side of window.

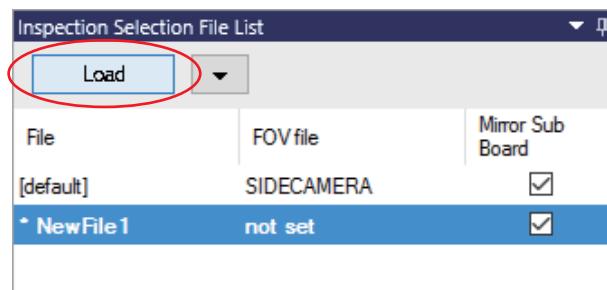


Figure 9-3 Inspection Selection 3

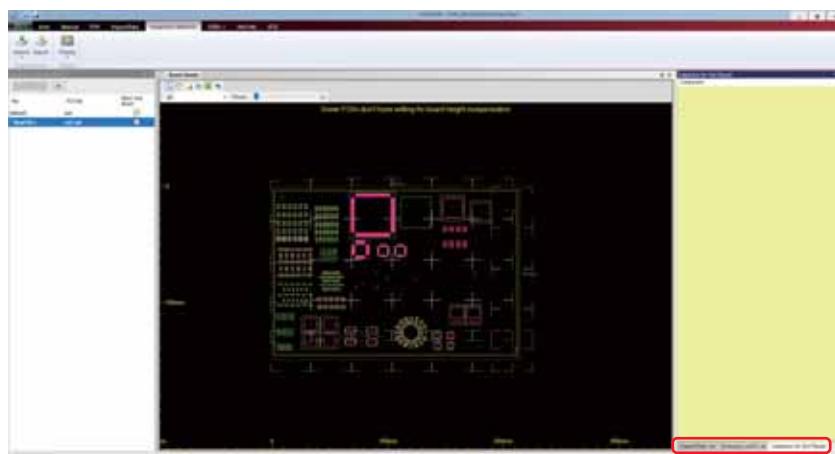


Figure 9-4 Inspection Selection 4

9.2.1 Setting for Inspection Skip Component

This is the setting to skip inspection of any component.

This is used to skip inspection for the component which is not placed depending on the board version.

The component which inspection is skipped is displayed in green on **Inspect/Skip List** tab and **Board Viewer**.

The component which inspection is skipped is displayed in orange on **Inspect/Skip List** tab and **Board Viewer**.

Step1: Load Inspection Selection setting and select **Inspect/Skip List** tab.

The list of all components on board is displayed.

In the default setting, all components are inspected

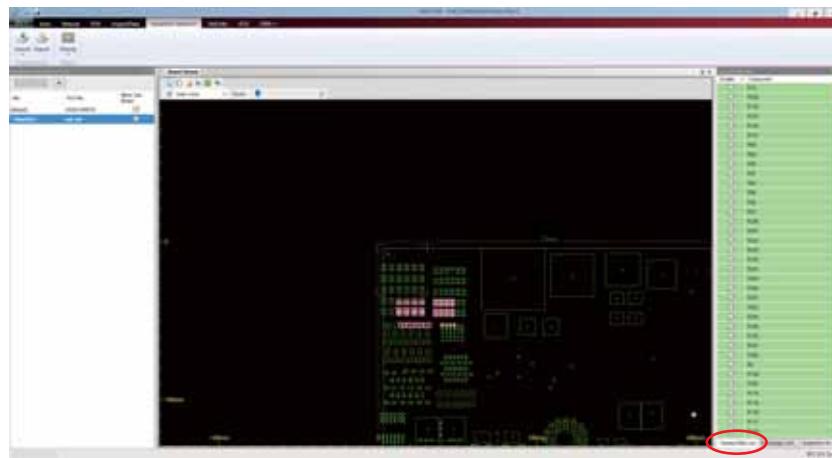


Figure 9-5 Inspection Skip Component Setting 1

Step2: Select the component to skip inspection on **Board Viewer**.

Pop-up menu appears and select **Set as Skip**.

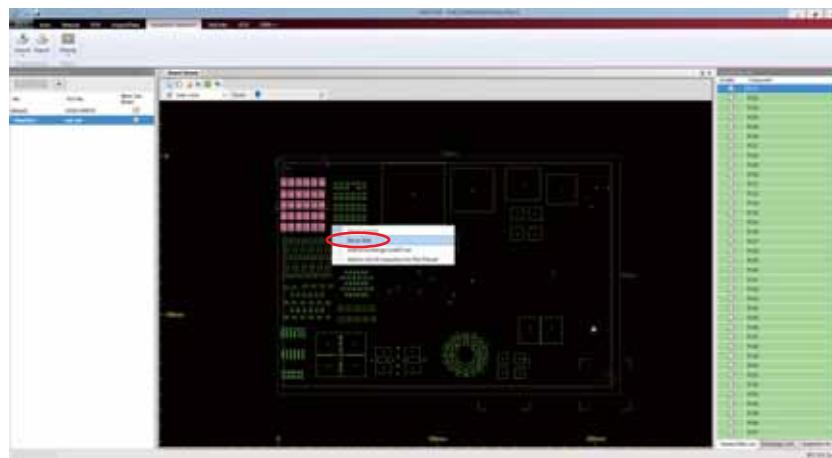


Figure 9-6 Inspection Skip Component Setting 2

- Step3: On **Inspect/Skip List** tab, **Enable** of the selected component is unchecked and displayed in orange.

NOTE

It is able to uncheck **Enable** on **Inspect/Skip List** manually.

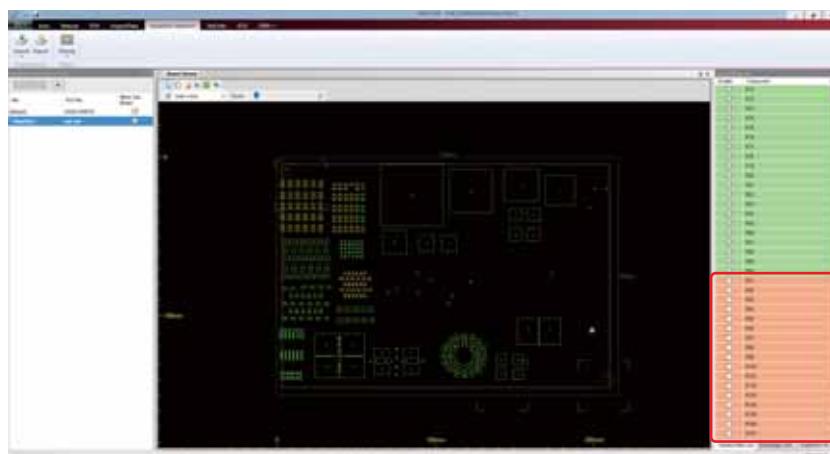


Figure 9-7 Inspection Skip Component Setting 3

9.2.2 Setting for Not-Placed Component

This is the setting to inspect only missing components.

In this inspection, when the component is not placed, judged as **OK**.

This is used to check the component is not mounted on the specific board version which does not need the component.

The mis-mounting component is displayed in yellow on **Inspection for Not Placed** tab and **Board Viewer**.

NOTE

The recipe for inspection of missing component is assigned to Not-Placed component temporarily.

The parameter of this recipe can be edited but editing results are reflected only in the currently open inspection data.

It is not reflected on other Not-Placed component which is set in other inspection data of the same group.

- Step1: Load inspection selection setting and select **Inspection for Not Placed** tab.

The list of all components to check mis-mounting is displayed.

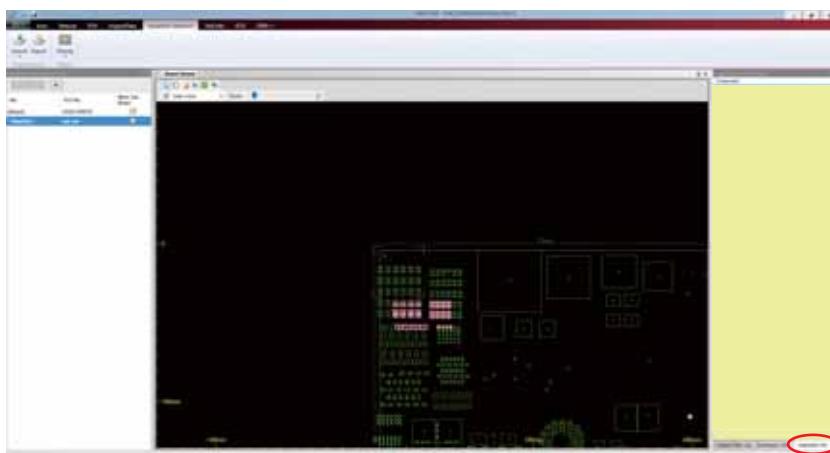


Figure 9-8 Setting for Not-Placed Component 1

- Step2: Select the component to set as Not Placed component on **Board Viewer**.
Pop-up menu appears and select **Add to List of Inspection for Not Placed**.

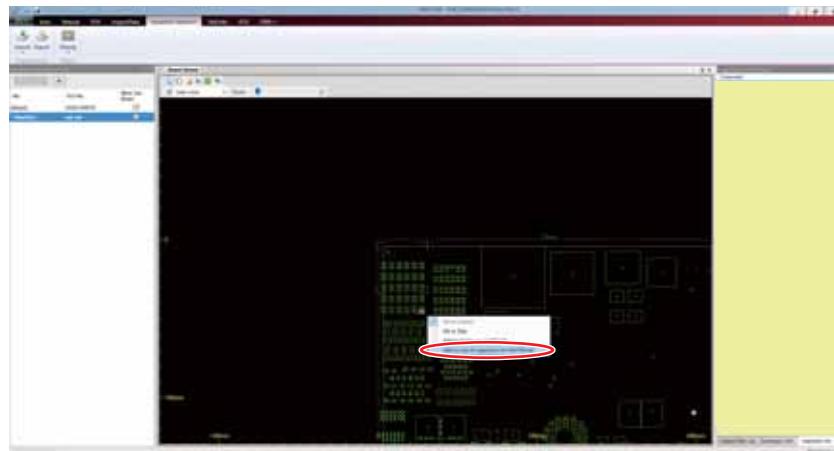


Figure 9-9 Setting for Not-Placed Component 2

- Step3: Check the component is added on **Inspection for Not Placed** tab.

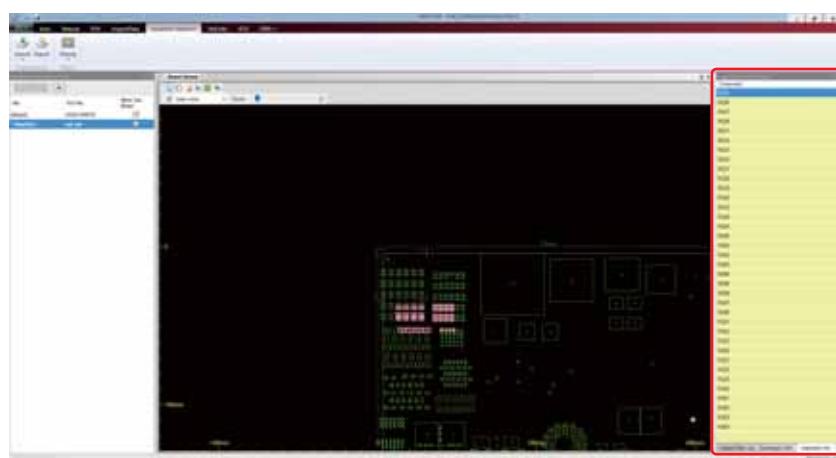


Figure 9-10 Setting for Not-Placed Component 3

9.2.3 Setting for Link ID Re-assigning Component

This is the setting to set any link ID to the component.

By this setting, multiple libraries can be applied to one component.

Link ID re-assigning components are displayed in blue on **Exchange LinkID List** tab and **Board Viewer**.

Step1: Load inspection selection setting and select **Exchange LinkID List** tab.

The list of all components to re-assign link ID are displayed.



Figure 9-11 Link ID Re-assigning Setting 1

Step2: Select the component to re-assign link id on **Board Viewer**.

Pop-up menu appears and select **Add to Exchange LinkID List**.

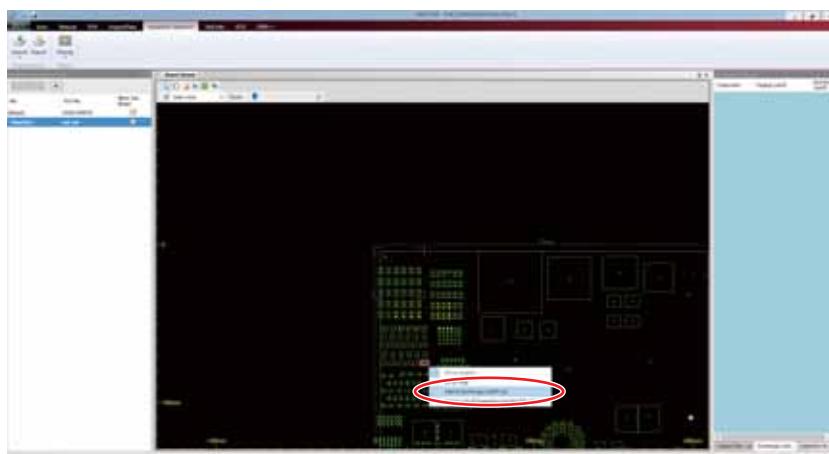


Figure 9-12 Link ID Re-assigning Setting 2

Step3: The dialog shown below appears.

Select link id to re-assign from drop-down list and click **OK**.

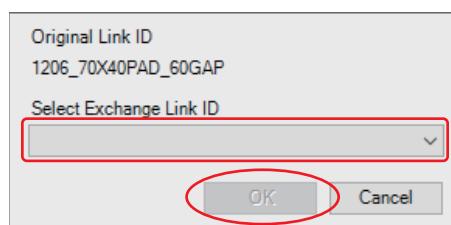


Figure 9-13 Link ID Re-assigning Setting 3

Step4: Check the components are added to **Exchange LinkID List** tab.

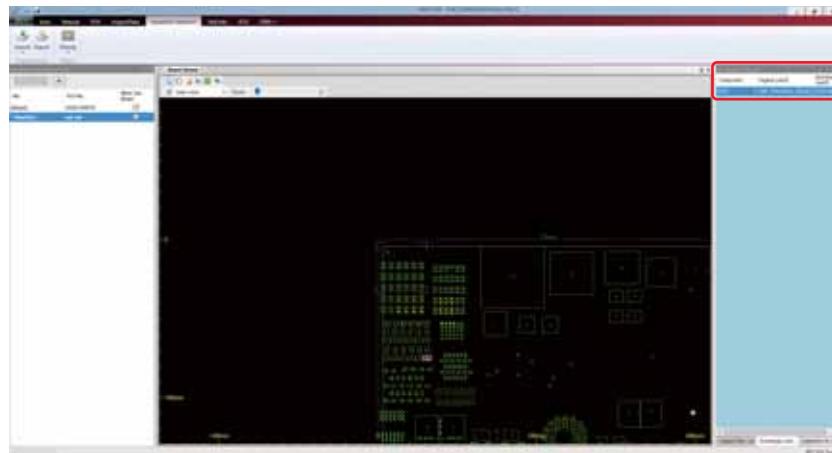


Figure 9-14 Link ID Re-assigning Setting 4

9.2.4 Assignment of FOV File

The proper FOV for each inspection selection setting can be selected from existing FOV file list. When inspection selection setting file is loaded, the assigned FOV file is loaded too.

Step1: Load inspection selection file and click **FOV file** column on **Inspection Selection File List**.

NOTE Default FOV is used when **not set** is set on FOV file column.

| Inspection Selection File List | | | |
|--------------------------------|-------------|---|-------------------------------------|
| | File | FOV file | Mirror Sub Board |
| [default] | SIDE CAMERA | <input checked="" type="checkbox"/> | |
| * NewFile1 | not set | <input type="button" value="FOV"/> <input type="button" value="SIDE CAMERA"/> <input type="button" value="fovInfo_20160518"/> | <input checked="" type="checkbox"/> |

Figure 9-15 Assignment of FOV File

9.2.5 Mirroring of Sub Board

This is the function to mirror inspection selection setting of one sub board to other sub board.

This is enabled as default.

Uncheck **Mirror Sub Board** when this function is not used.

| Inspection Selection File List | | | |
|--------------------------------|-------------|-------------------------------------|------------------|
| | File | FOV file | Mirror Sub Board |
| [default] | SIDE CAMERA | <input checked="" type="checkbox"/> | |
| * NewFile1 | not set | <input checked="" type="checkbox"/> | |

Figure 9-16 Mirroring of Sub Board

9.3 Select Inspection Selection

9.3.1 Manual Select

Step1: Open inspection data to set inspection selection, and select **Inspection Selection** tab.

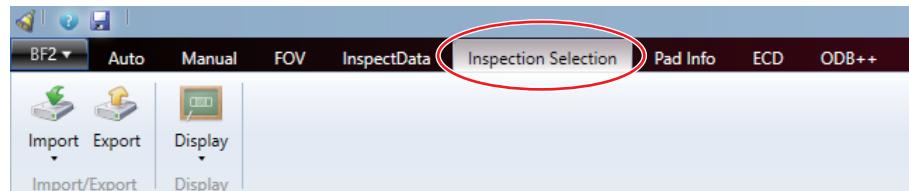


Figure 9-17 Manual Select 1

Step2: Select any inspection selection setting and click **Load**.

The selected setting is loaded.

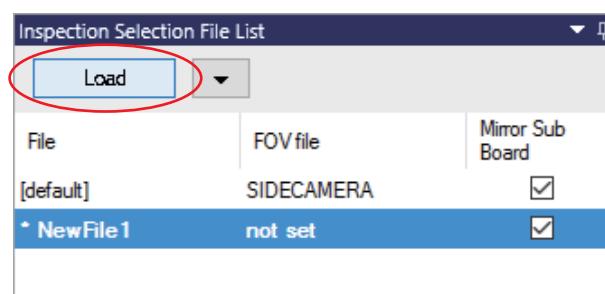


Figure 9-18 Manual Select 2

9.3.2 Auto Select

Step1: Click **BF2** button on the upper left side of the window to open the menu and click **BF2 Option**.

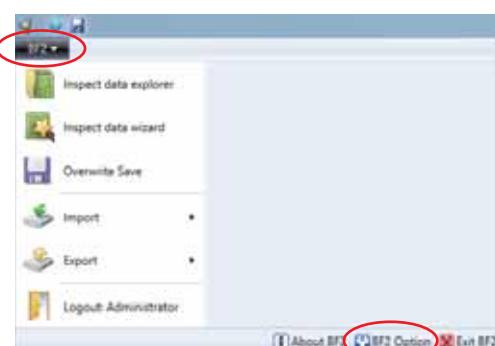


Figure 9-19 Auto Select 1

Step2: The dialog shown below appears.

Select **Inspection Data**.

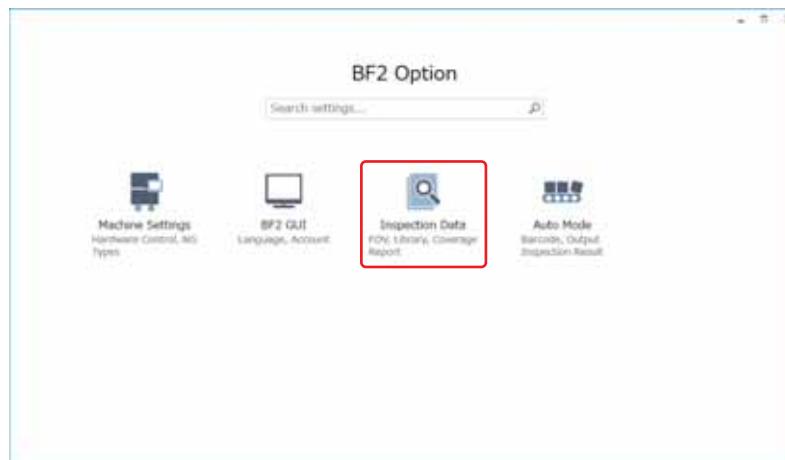


Figure 9-20 Auto Select 2

Step3: The dialog shown below appears.

Select **Inspection Selection** and select **Manual select** from **Selection of inspection selection when loading inspection program** drop-down list.



Figure 9-21 Auto Select 3

Step4: After Step1 to Step3 is completed, the dialog shown below appears when inspection data is loaded.

Select any inspection selection setting from drop-down list and click **OK**.
The selected setting is loaded.

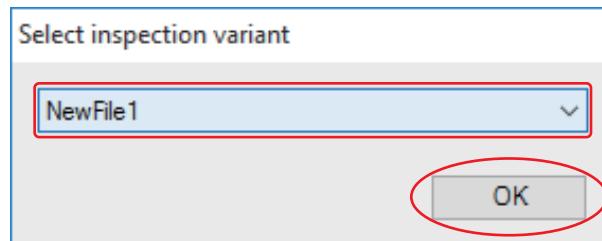


Figure 9-22 Auto Select 4

9.4 The Export and Import of Inspection Selection Setting

The inspection selection setting can be export as files for each inspection data.

The exported inspection selection setting can be used in other machine when same board is inspected.

9.4.1 Export of Inspection Selection Setting

Step1: Open inspection data to export inspection selection setting.

Step2: From **Inspection Selection** tab, select **Import/Export** group > **Export**.

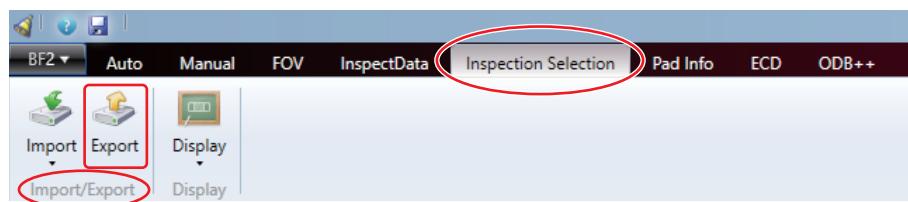


Figure 9-23 Export of Inspection Selection Setting 1

Step3: The dialog shown below appears.

Enter file name and specify the path to save data.

Click **Save**.

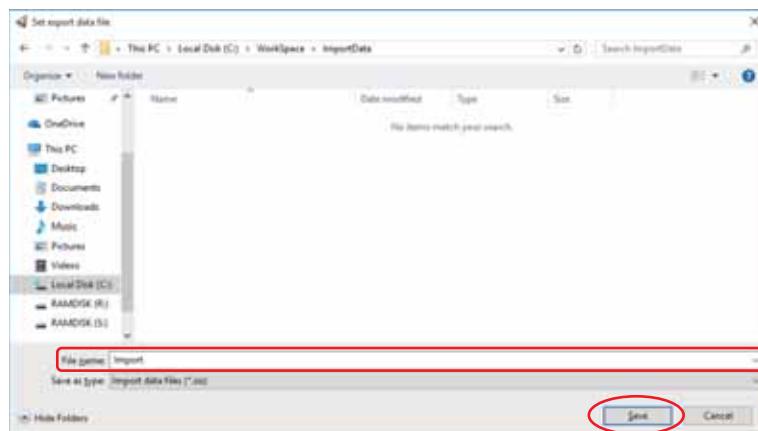


Figure 9-24 Export of Inspection Selection Setting 2

9.4.2 Import of Inspection Selection Setting

Step1: From **Inspection Selection** tab, select **Import/Export** group > **Import** > **Import SIS**.

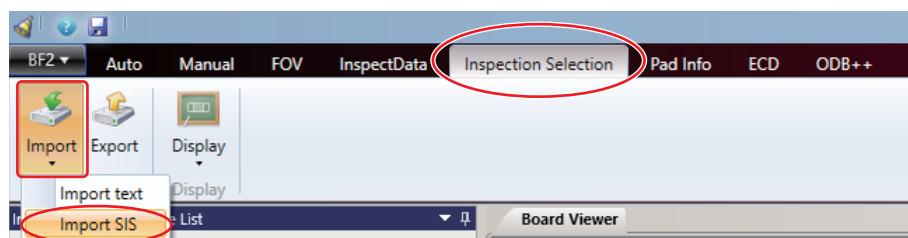


Figure 9-25 Import of Inspection Selection Setting 1

Step2: The dialog shown blow appears.

Select the file exported in **9.4.1 Export of Inspection Selection Setting** and click **OK**.

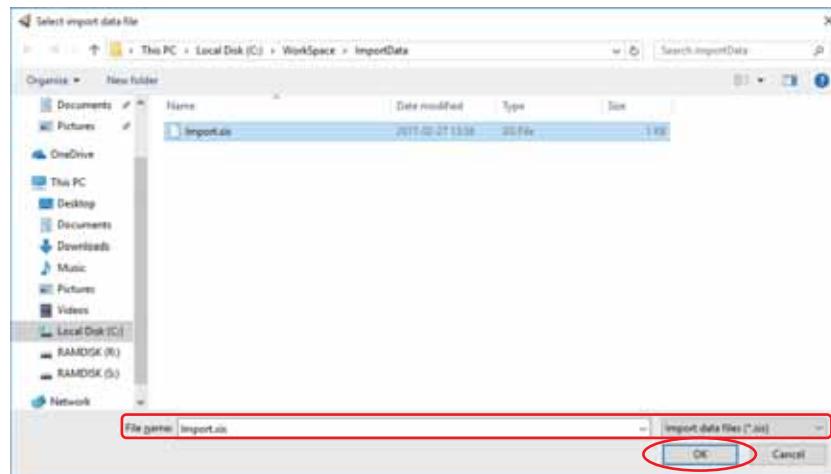


Figure 9-26 Import of Inspection Selection Setting 2

9.5 Search of the inspection selection setting component

Not-Placed component and link ID re-assigning component can be search from Component List in Inspection Data tab.

Once select **Inspection selection** from **Filter** drop-down list, it is able to select **Not placed** or **Exchange link ID** from the lower drop-down list.

Only the component that match the selected conditions are displayed in **Component List**.

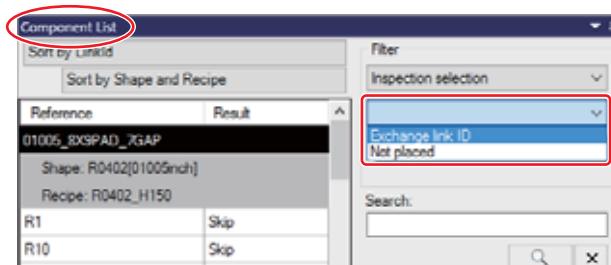


Figure 9-27 Search of the component

10 ECD

ECD (Extra Component Detection) is a function to detect drop-off component or other debris due to some reason from area that is not assigned or included in the tasked inspection windows.

For Mount Data & Gerber Data or ODB++

For SAKI standard format

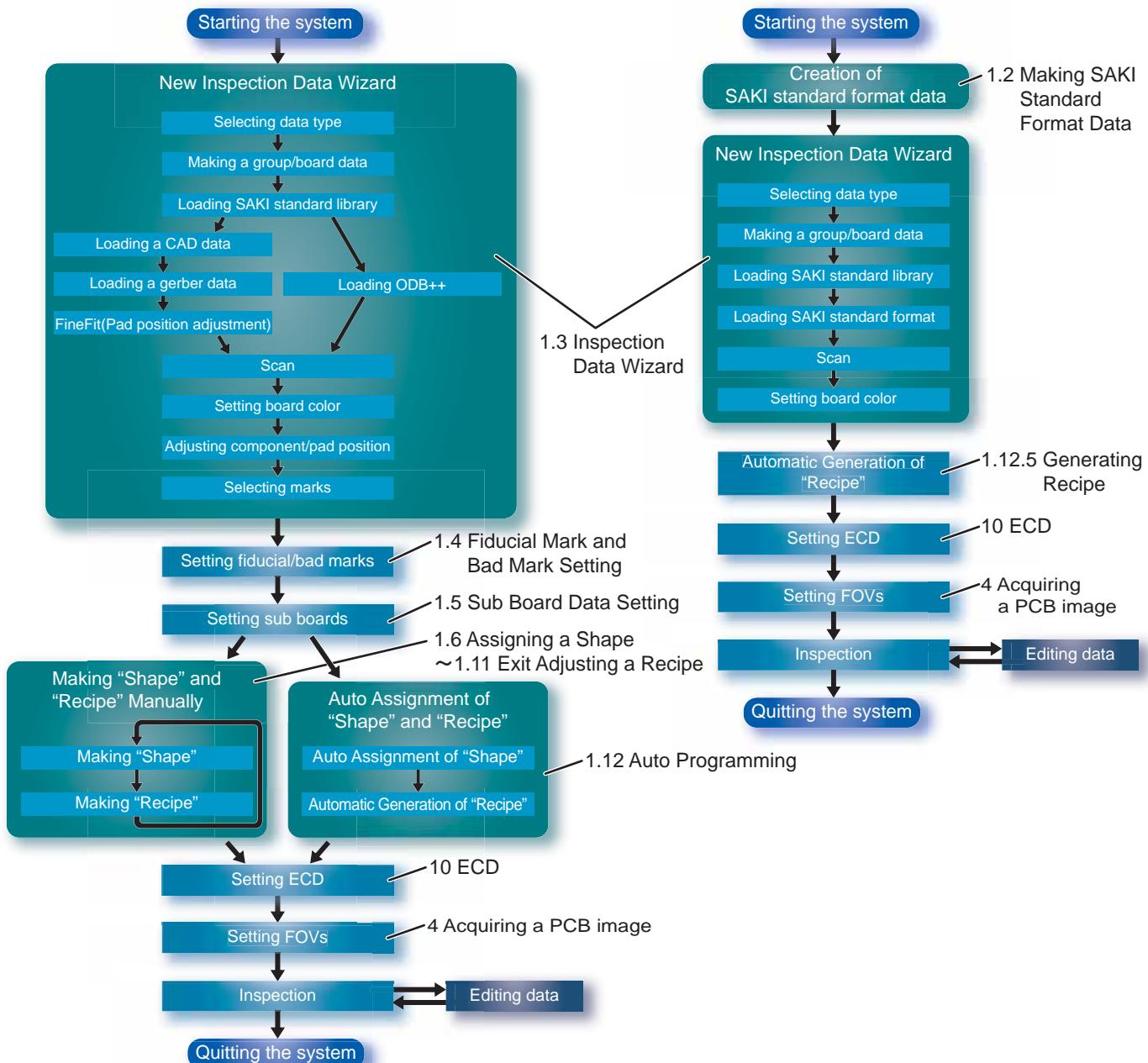


Figure 10-1 Flow chart of data creation

10.1 ECD Setting Procedure Overview

The figure shown below is the procedure of ECD creation.

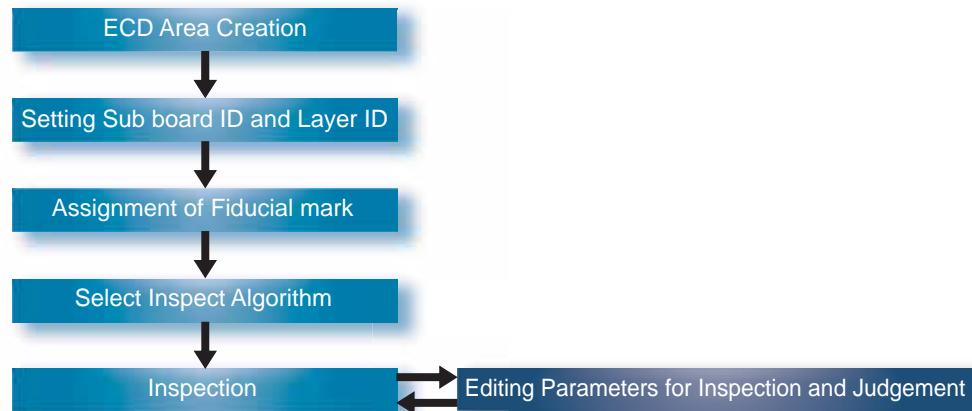


Figure 10-2 ECD Creation Procedure

10.2 ECD Inspection Overview

In ECD inspection, perform detection and judgement of misplaced component.

The ECD inspection procedure is shown below.



Figure 10-3 ECD Inspection Procedure

| Item | Description |
|-----------------------------------|--|
| Detection | Detect the candidate area of misplaced component. |
| Judgement for Misplaced component | Judge if the candidate area is the misplaced component or not. |

Table 10-1 Descriptions

10.3 ECD Setting Procedure

After completing the setting till **Making "Shape" and "Recipe"** or **Automatic Generation of "Recipe"** in Figure 10-1, proceed ECD setting.

Step1: Select **ECD** tab.

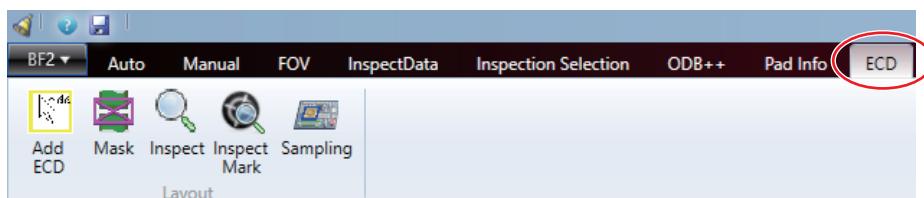


Figure 10-4 ECD Setting 1

Step2: From the ribbon, select **Layout** group > **Add ECD**.

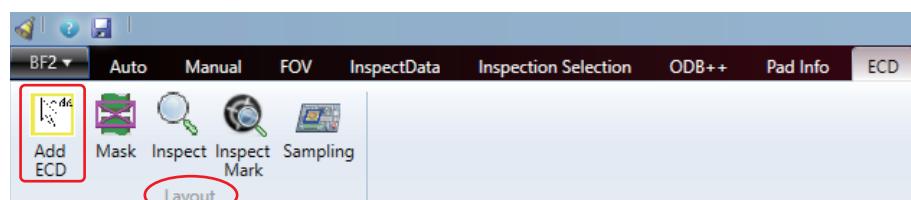


Figure 10-5 ECD Setting 2

Step3: **Add area mode dialog** appears on **Board Viewer**.

Select **Add/Move/Resize**.

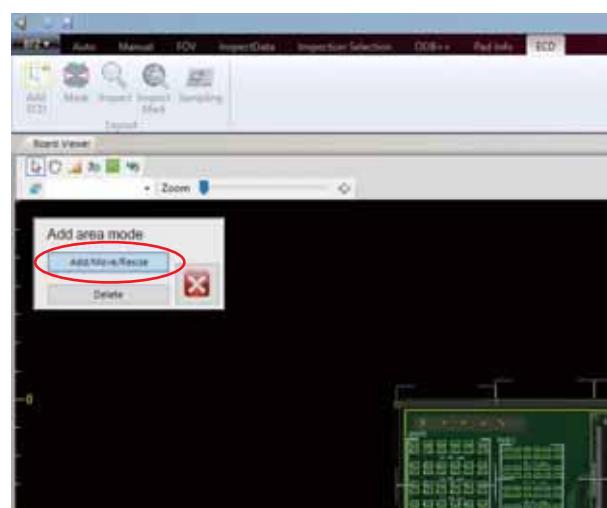


Figure 10-6 ECD Setting 3

- Step4: Surround the area to inspect by mouse-dragging.
 ECD area is set.
 After all the setting is completed, click .

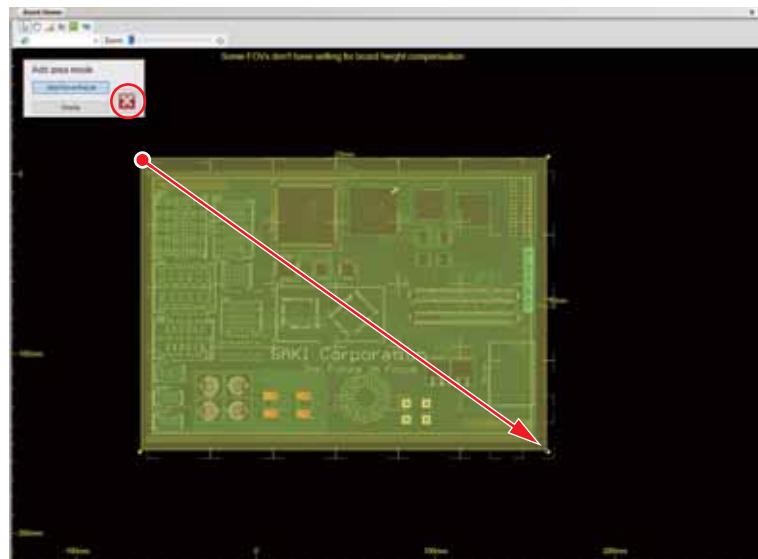


Figure 10-7 ECD Setting 4

- Step5: Added ECD area is displayed on **ECD Area List**.
 Select ECD area which is created in Step4.

| ECD Area List | | | | |
|---------------|-----------------|-----------------|------------|----------------|
| ECD Area Name | Required Number | Sampling Number | Status | Result |
| ECD Area 1 | 0 | 0 | Inspection | NG |
| ECD Area 2 | - | 0 | Skip | Not Inspection |
| ECD Area 3 | 0 | 0 | Inspection | OK |
| ECD Area 4 | 0 | 0 | Inspection | No Image |
| ECD Area 5 | 0 | 0 | Not Ready | Not Inspection |

Figure 10-8 ECD Setting 5

| Item | Description |
|-----------------|---|
| ECD Area Name | Display name of created ECD area |
| Required Number | The item is for Saki engineers only. Do not change the setting. |
| Sampling Number | The item is for Saki engineers only. Do not change the setting. |
| Status | Displays status of ECD inspection. For details of status, refer to Table 10-3. |
| Result | Displays result of ECD inspection. For details of result, refer to Table 10-4. |

Table 10-2 Descriptions

| Item | Description |
|------------|---|
| Inspection | Shows the status that inspect is available. |
| Not Ready | Shows the algorithm is not yet set for ECD inspection. ECD area is existing but inspection is not performed. |
| Skip | Shows that ECD area is set as skip. |

Table 10-3 Descriptions of Status

| Item | Description |
|----------------|--|
| OK | Shows there is no misplaced component. |
| NG | Shows misplaced component is found. |
| Not Inspection | Shows inspection is not performed. This is set when Status is Not Ready or Skip . |
| No Image | Shows there is no images in ECD area. Inspection is not performed. |

Table 10-4 Descriptions of Result

Step6: When select ECD area, the edit panel appears.

Set **ECD area name**, **Sub Board ID**, and **Layer ID** if necessary.

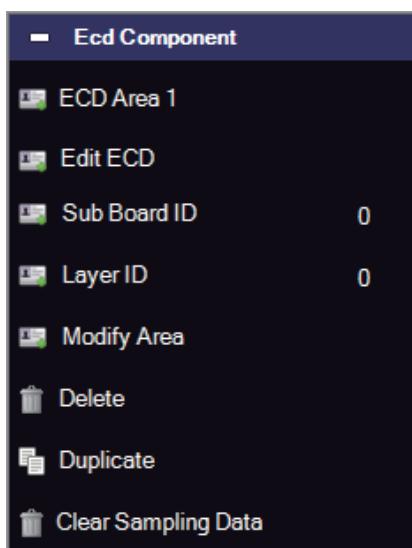


Figure 10-9 ECD Setting 6

| Item | Description |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Click to toggle between Skip or Inspect. |
| ECD area name | ECD area name is displayed. This can be edited by selecting. |
| Edit ECD | By selecting this, enter to ECD edit display. |
| Sub Board ID | Displays sub board ID of ECD layer. Sub board ID is changed by clicking. |
| Layer ID | Displays layer ID of ECD area. Layer ID is changed by clicking. |
| Modify Area | ECD area size is changed. |
| Delete | ECD area is deleted. |
| Duplicate | ECD area is duplicated. Algorithm setting is not copied. |
| Clear Sampling Data | The item is for Saki engineers only. Do not change the setting. |

Table 10-5 Descriptions

Step7: To correct ECD area position of each board, assign fiducial mark by reference to **1.4 Fiducial Mark and Bad Mark Setting**.

Step8: Set mask to avoid false call.

From ECD tab, select Layout group > Mask.



Figure 10-10 ECD Setting 7

Step9: The dialog shown below appears.

Click Add Mask for All Component.

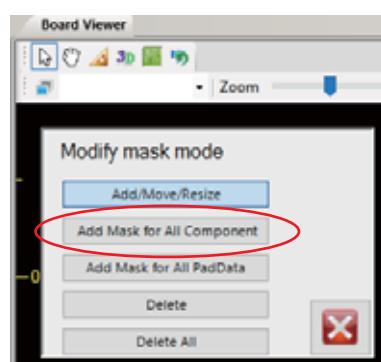


Figure 10-11 ECD Setting 8

| Item | Description |
|----------------------------|--|
| Add/Move/Resize | By clicking this, the mask can be added ,moved, resized. |
| Add Mask for All Component | Make mask for all component based on all inspect data information. The shape of component size becomes base of mask making. This is suitable when correctly mounted components are judged as misplaced component. For details, refer to Step10. |
| Add Mask for All PadData | Make mask based on pad data. This is suitable when false call happened on pad. |
| Delete | Switch to mask delete mode. Delete mask by click. |
| Delete All | Delete all mask. |

Table 10-6 Descriptions

Step10: The dialog shown below appears.

Set the mask area (Detection exception area) by reference to Table 10-7.

The created mask is shown as pink line as Figure 10-13.

The internal area indicated in pink is excluded from ECD inspection.

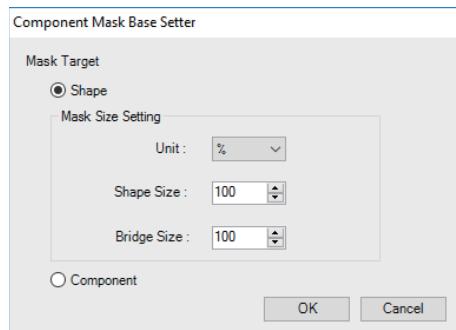


Figure 10-12 ECD Setting 9

| Item | Description | | |
|-----------|---|-------------|---|
| Shape | Make mask according to shape. | | |
| | Mask Size Setting | Unit | Specifies of unit for Shape Size and Bridge Size . % or μm can be set. |
| | | Shape Size | Set percentage of mask based on shape size except bridge. |
| | | Bridge Size | Set percentage of mask for bridge. |
| Component | Make mask to fit inspection data outline. | | |

Table 10-7 Descriptions

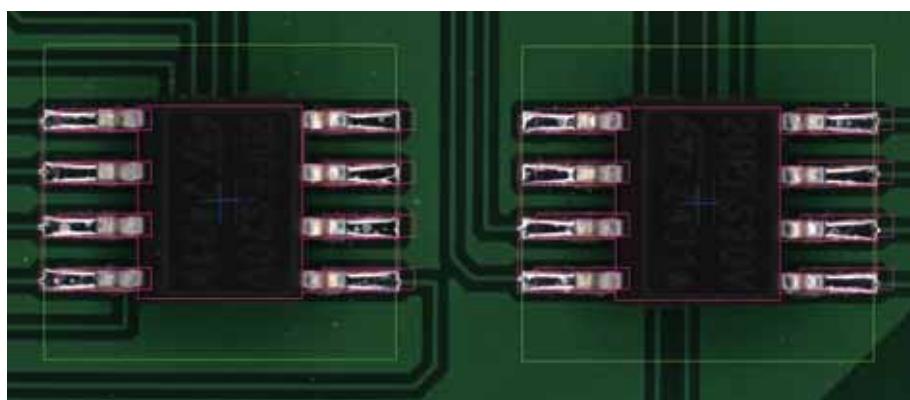


Figure 10-13 Component Mask

Step11: Select **ECD** tab, and select ECD area to edit from **ECD Area List**.

The edit panel appears, and click **Edit ECD** from the panel.

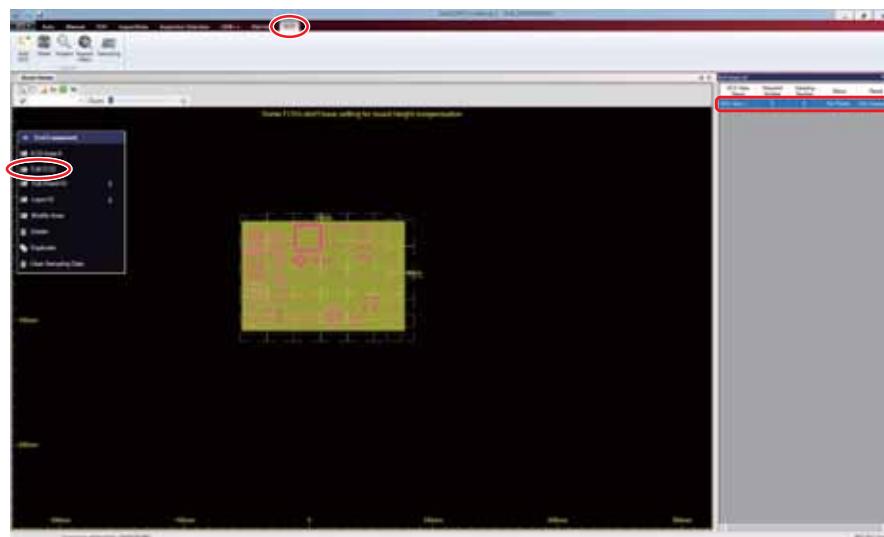


Figure 10-14 ECD Setting 10

Step12: The ECD editing screen is displayed.

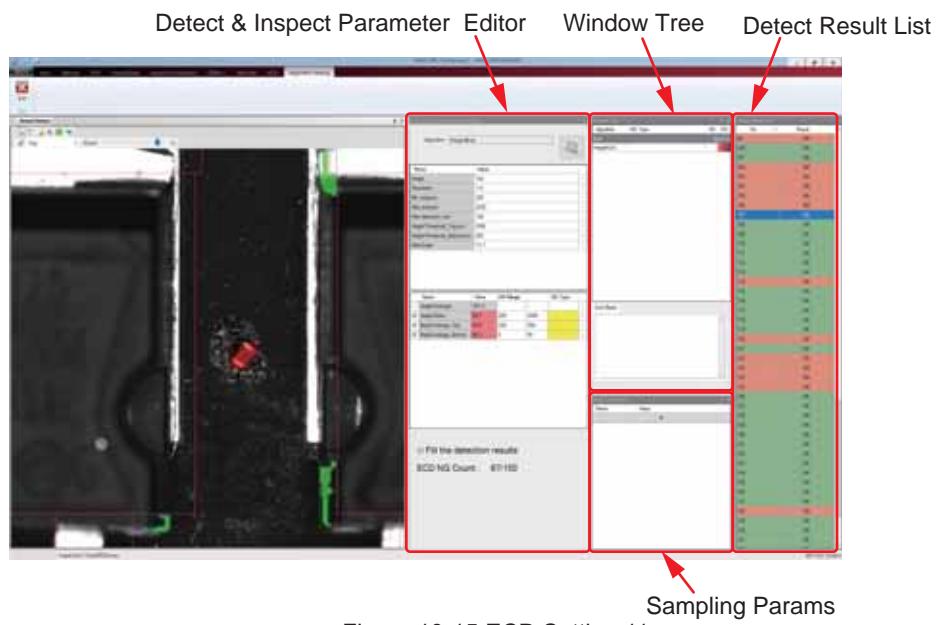


Figure 10-15 ECD Setting 11

| Item | Description |
|-----------------------------------|---|
| Detect & Inspect Parameter Editor | Select algorithm for ECD inspection. Once a algorithm is selected, the detect parameter is displayed on upper list and the inspect parameter is displayed on lower list. |
| Sampling Params | The item is for Saki engineers only. Do not change the setting. |
| Detect Result List | Shows ECD inspection result. OK : The area which is detected but judged as not misplaced component. NG :The area judged as misplace component by inspection |
| Window Tree | Displays ECD inspection window |

Table 10-8 Descriptions

Step13: Select **Algorithm** on **Detect & Inspect Parameter Editor**, and set parameters if needed.

After parameter setting is completed, Click **Exit** from the ribbon to close editing screen.

NOTE

For details, refer to **10.6 ECD Algorithm Setting (HeightEcd)**.

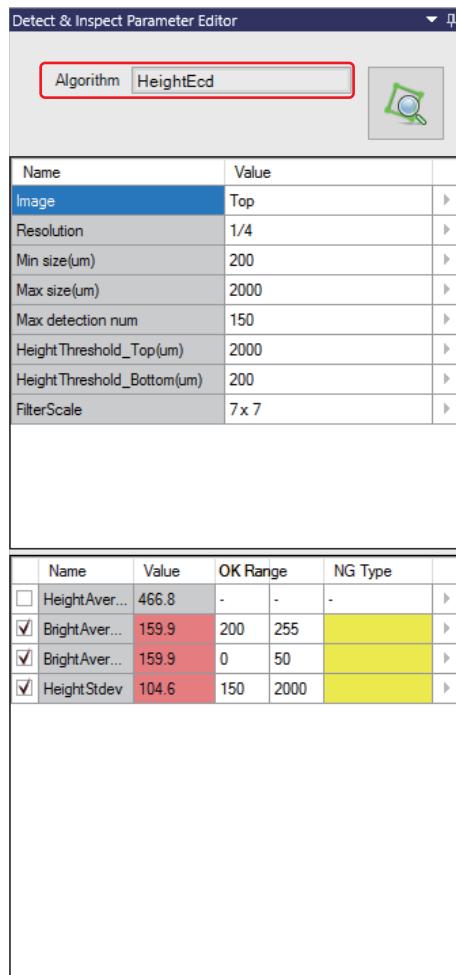


Figure 10-16 ECD Setting 12



Figure 10-17 ECD Setting 13

10.4 Auto Mode

Description of ECD inspection on Auto mode screen.

On auto mode screen, **ECD Inspection Result** and **ECD Area list** to show status of each ECD area are displayed.

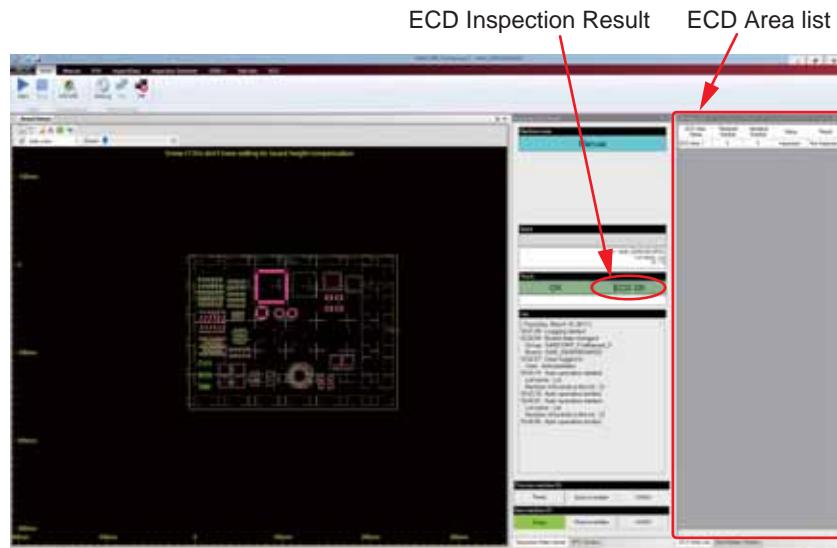


Figure 10-18 Auto Mode Screen

When ECD inspection result is NG, The number of detected misplaced component is shown as below.

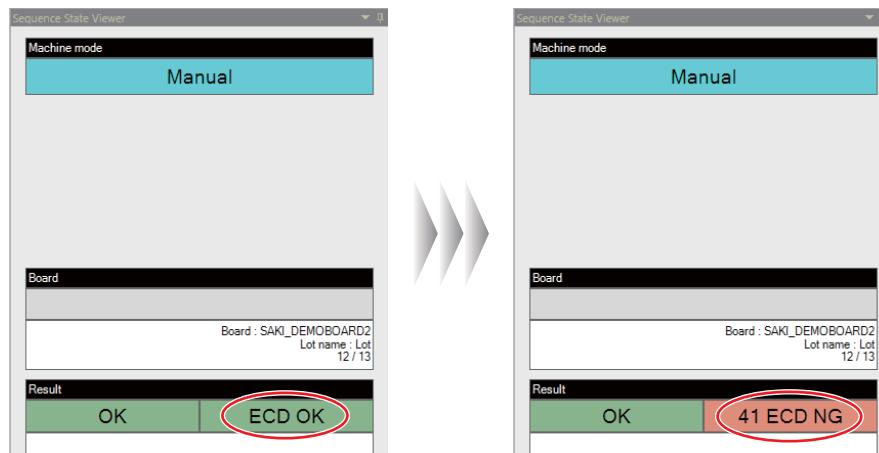


Figure 10-19 ECD Inspection Result

10.5 FOV Skip Setting

ECD inspection is different from normal component, even if the ECD area is not filled with FOV, inspection works.

Here describes the setting not to consider ECD area during FOV allocation.

Step1: Click **BF2** button on the upper left side of the window to open the menu and click **BF2 Option**.

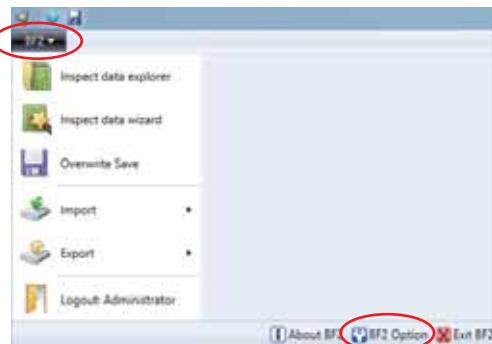


Figure 10-20 BF2 Option

Step2: The dialog shown below appears. Select **Inspection Data**.

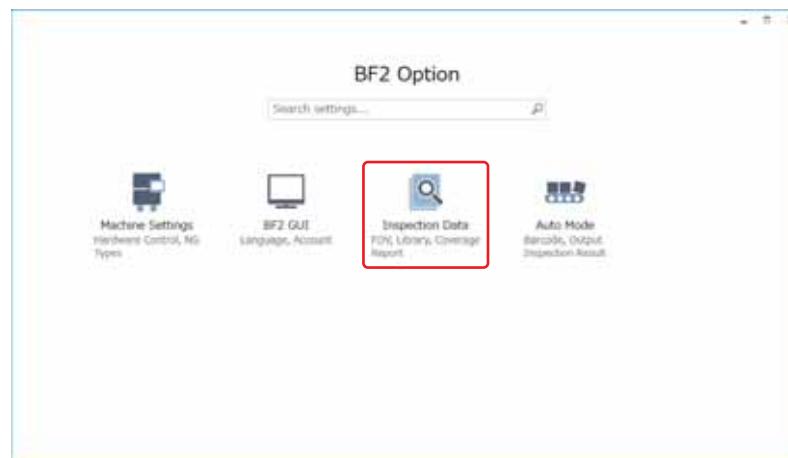


Figure 10-21 BF2 Option Setting 1

Step3: The dialog shown below appears.

Select **FOV Auto Allocation** and check **Ignore EcdArea for FOV allocation**.

FOV auto allocation and validation of FOV allocation work without considering ECD areas.



Figure 10-22 BF2 Option Setting 2

10.6 ECD Algorithm Setting (HeightEcd)

HeightEcd is the algorithm for ECD to detect the area which is higher than certain height in ECD area. This algorithm is suitable for the board in low volume, high mix environment. And this is suitable for the component which color is similar to board color too. Since this algorithm uses height information to detect misplaced component.

10.6.1 Parameter Setting

Sampling Params

| Sampling Params | |
|-----------------|-------|
| Name | Value |
| ImageOutput | false |

Figure 10-23 Sampling Params

| Item | Description |
|-------------|--|
| ImageOutput | The item is for Saki engineers only. Do not change the setting. Default setting is False . |

Table 10-9 Descriptions

Detect & Inspect Parameter

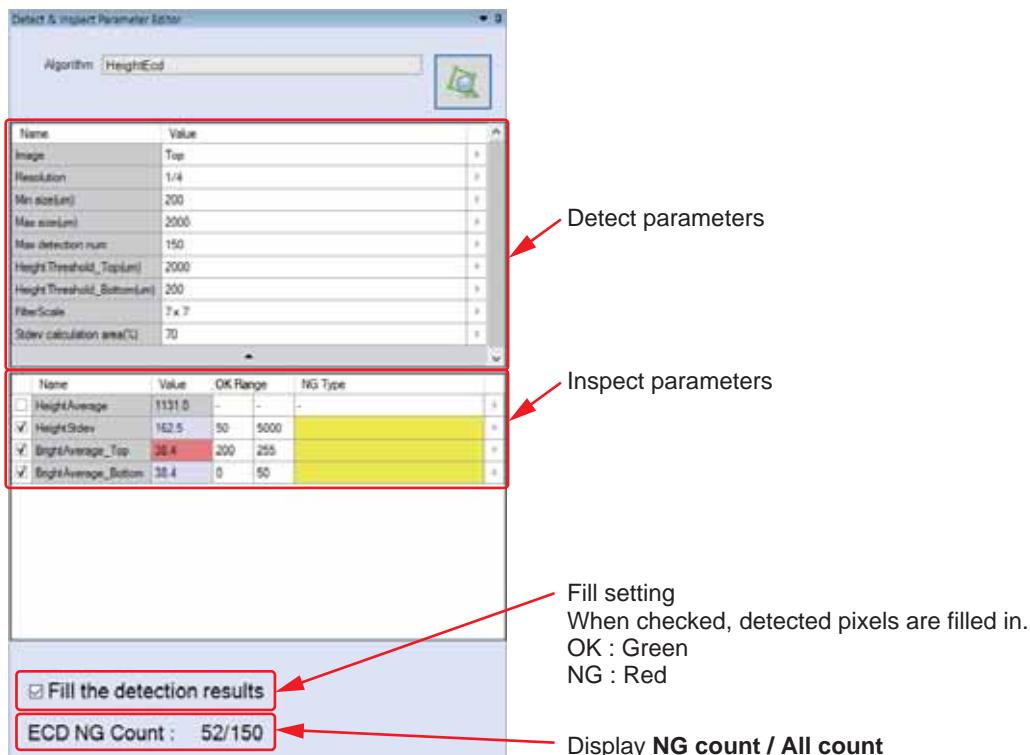


Figure 10-24 Detect and Inspect Parameter (Version 1.0.0.0)

| Item | Description |
|-----------------------------|--|
| Image | Select 2D image which is used in Height Threshold_Top[μm] and Height Threshold_Bottom[μm] as described below. Select the image that through hole and soldering have larger brightness value than detection target. The default is Top . |
| Resolution | Specifies resolution for inspection. When 1/4 is selected, inspection is performed with 1/4 resolution. 1/4, 1/8, and 1/16 can be selected. If smaller value is selected, resolution becomes low, but inspection time is reduced. Default value is 1/4 . |
| Min size[um] | Specifies minimum detect size. The smaller component than this value is not detected. Adjust the value depending on inspect target. For details, refer to Figure 10-26. |
| Max size[um] | Specifies maximum detect size. The bigger component than this value is not detected. Adjust the value depending on inspect target. For details, refer to Figure 10-26. |
| Max detection num | Specifies maximum detection number. Detection is stopped when the detection number overs this setting value. Default value is 150 , and maximum value is 300 . |
| Height Threshold_Top[μm] | Specifies the upper limit value for height detection. This is the parameter to avoid false call because of height noise and so on. The maximum setting value is 20000μm . For details, refer to Figure 10-27. |
| Height Threshold_Bottom[μm] | Specifies the lower limit value for height detection. This is the parameter to avoid false call because of silk and so on. The maximum setting value is 0μm . For details, refer to Figure 10-27. |
| FilterScale | Specifies noise filter range. Set the strength of noise filter to avoid false call because of small noise, slight position misalignment and so on. No Use, 3x3, 5x5, 7x7, and 9x9 can be selected. The bigger the number, the stronger filter works and remove noise. The default value is 7x7 . |
| Stdev calculation area(%) | Specifies the calculation method of Height Stdev . By rearranging the height of each pixel in the detected area in ascending order and using only the top height for calculation of Height Stdev , the separation of excessive component and noise becomes easily. Default value is 70% and the height of 70% or higher after sorting in ascending order is used for calculation of Height Stdev . |

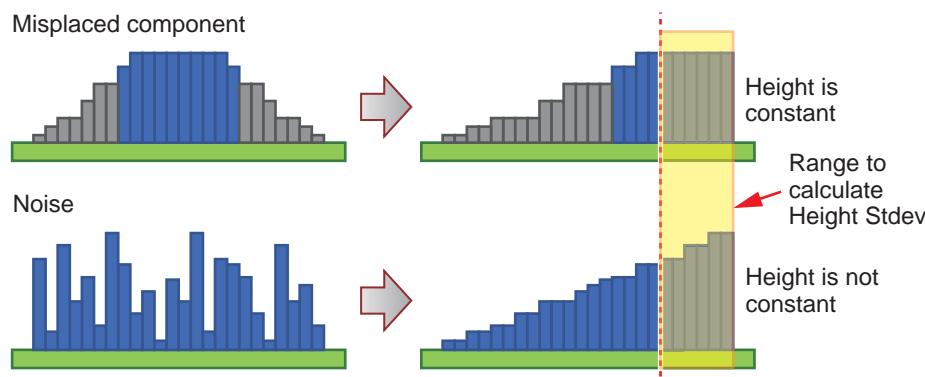


Figure 10-25 Height Stdev Calculation Area

Table 10-10 Descriptions for Detect Parameter.



Regarding the circumscribed quadrangle of the detect area, a component are not detected in the following cases.

- If the longer side is larger than the **Max size[μm]**.
- If the shorter side is smaller than the **Min size[μm]**.

Figure 10-26 Min size and Max size

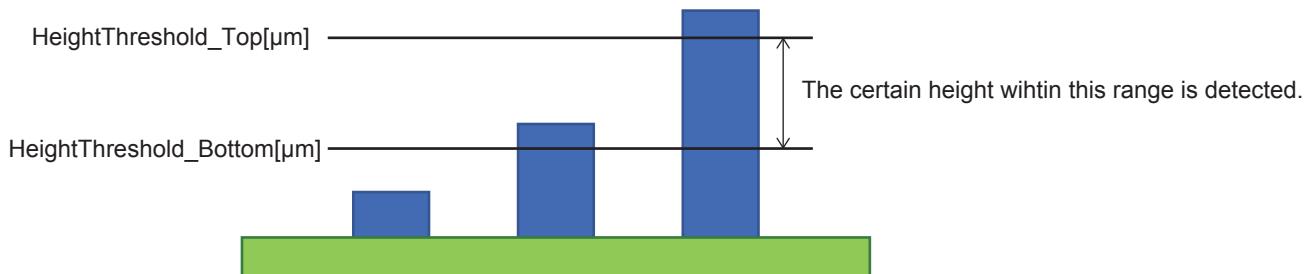


Figure 10-27 Height Threshold

| Item | Description |
|----------------------|--|
| HeightAverage | Displays height average of detected area. This parameter is not used as default. Use this value as guide to set Height Threshold_Top(μm) and Height Threshold_Bottom(μm) in detect parameter. |
| HeightStdev | Specifies the scattering of height for each pixel in detected area. Set as the detected misplaced component is judged as NG. As shown in Figure 10-28, the height of misplaced component such as chip does not scatter so much. But the height noise tend to scatter. |
| BrightAverage_Top | Specifies the average of brightness in detected area based on the image which is selected by [Image] in detect parameter. Set the value of BrightAverage_Top so that false call on soldering and silk area is judge as OK. |
| BrightAverage_Bottom | Set the value of BrightAverage_Bottom so that false call on through hole area is judged as OK. The height noise tend to have quite higher brightness than the brightness of misplaced component like soldering and through hole. |

Table 10-11 Descriptions for Inspect Parameter

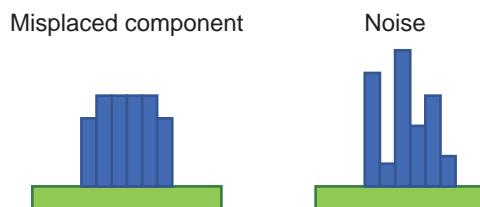


Figure 10-28 HeightStdev

NOTE

In HeightEcd, when there is at least one inspect parameter which judges as OK, the detected area is judged as NOT misplaced component.

10.6.2 Setting Procedure

Step1: From the **ECD** tab, select **Layout** group > **Mask**.

Click **Add Mask for All Component** on **Modify mask mode** dialog to add mask.

NOTE

Create mask by reference to Step8 to Step10 of **10.3 ECD Setting Procedure**.

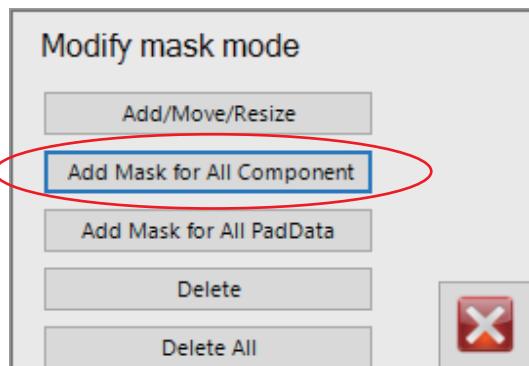


Figure 10-29 Add Mask for All Component

Step2: After mask making is completed, enter to **ECD area edit mode**.

Select **HeightEcd** from **Algorithm** drop-down list.

Step3: Select a lighting shows through hole and soldering clearly that from **Image** drop-down list.
Default value is Top.

Step4: Check the value of **Resolution**, **Min size(um)**, **Max size(um)**, **Max detection num**, **Height Threshold_Top(um)**, **Height Threshold_Bottom(um)**, and **FilterScale**.

Step5: Click , and check the misplaced component is detected.

The area judged as misplaced component is highlighted in red.

And the area which is detected but judged as proper mounting is highlighted in green.

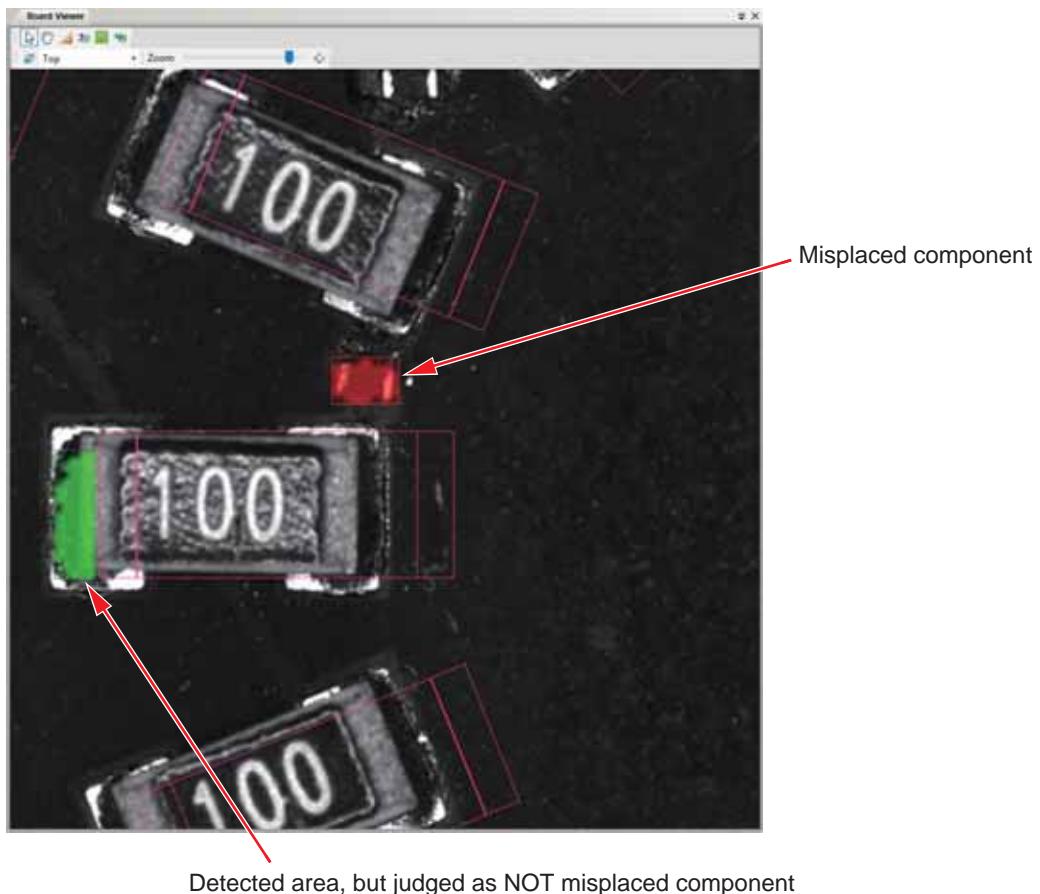


Figure 10-30 Detection of misplaced component

Step6: When the area can not be detected or too many areas are detected, adjust the detect parameters by reference to Table 10-12.

| Item | Cause | Correspondence |
|---------------------------------------|---|---|
| When any area is not detected | The setting value of Min size[um] is larger than the detection target. | Set the value of Min size[um] smaller |
| | The setting value of Max size[um] is smaller than the detection target. | Set the value of Max size[um] larger |
| | The setting value of Height Threshold_Bottom[um] is larger than the detection target. | Set the value of Height Threshold_Bottom[um] smaller |
| | The setting value of Height Threshold_Top[um] is smaller than the detection target. | Set the value of Height Threshold_Top[um] larger |
| | The detection target is removed since the setting value of FilterScale is large. | Set the value of FilterScale smaller |
| | The number of detection overs Max detection num before the target is detected. | Set the value of Max detection num larger |
| When the number of detection is large | The setting value of Min size[um] is smaller than the detection target. | Set the value of Min size[um] larger |
| | The setting value of Max size[um] is larger than the detection target. | Set the value of Max size[um] smaller |
| | The setting value of Height Threshold_Bottom[um] is smaller than the detection target. | Set the value of Height Threshold_Bottom[um] larger |
| | The setting value of Height Threshold_Top[um] is larger than the detection target. | Set the value of Height Threshold_Top[um] smaller |
| | The noise is not removed properly since the setting value of FilterScale is small. | Set the value of FilterScale larger |

Table 10-12 Adjustment of Detect Parameter

Step7: When false call happens, adjust inspect parameters by reference to Table10-13.

| False Call Items | Correspondence |
|--|---|
| The noise on the board is judged as a misplaced component | Adjust parameters so that HeightStdev becomes OK. And when the height of noise is large, adjust Height Threshold_Top[um] value not to detect noise. |
| The noise on through-hole is judged as a misplaced component | Adjust setting value of BrightAverage_Bottom so that the through hole area becomes OK. When that adjustment influences to other detection area, select the image which has clear differences in brightness from Image in inspect parameters. |
| The soldering or silk is judged as a misplaced component. | Adjust setting value of BrightAverage_Top so that the area of soldering and silk becomes OK. When that adjustment influences to other detection area, select the image which has clear differences in brightness from Image in inspect parameters. |

Table 10-13 Adjustment of Inspect Parameter

Inspection Algorithm

1 Position Recognition

1.1 Square Fiducial

1.1.1 Inspection Overview

Square Fiducial is the algorithm to detect a square fiducial mark in an inspection window and calculate the distance (X and Y coordinates) between the detected mark and the center of the inspection window.

Square Fiducial is suitable for detecting a square fiducial mark.

1.1.2 Parameter Setting

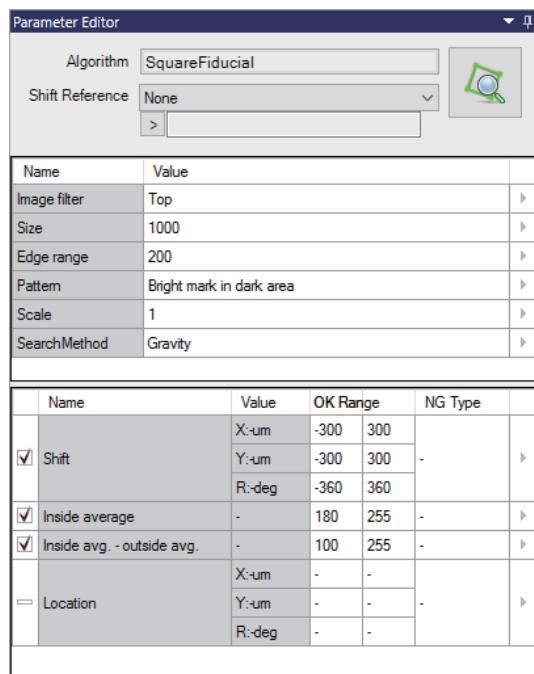


Figure 1-1 Dialog (Version 1.2.0.0)

| Parameter | Description |
|---------------|---|
| Image filter | Select a lighting that displays the fiducial mark clearly. |
| Size | Referring to Part I 2.1.3 Measuring Dimensions of the Selected Area , accurately measure the size of the fiducial mark and set the measured value. |
| Edge range | Specifies the distance between the inner and outer square window used for detecting a fiducial mark. Adjust the value so every side of the square fiducial mark is included in between the inner and outer window. If fiducial mark sides are uneven, increase the value. |
| Pattern | Select Bright mark in dark area if the brightness of the fiducial mark is brighter than its surroundings or Dark mark in bright area if it is darker in comparison. |
| Scale | Increasing this value, increases the precision because the position is acquired by finely partitioning the pixels. However, this increases the inspection time. Default value is 5 . |
| Search Method | Specifies the calculation method of the center position of the fiducial mark. Gravity calculates the center position of the fiducial mark from the gravity center of the detected area. FindRect calculates the center position of the fiducial mark from the circumscription of the detected area. |

Table 1-1 Parameter

| Parameter | Description | | |
|----------------------------|--|--|--|
| Shift | X: -μm | Specifies the acceptable range of the X-axis distance between the center of the detected fiducial mark and the center of the inspection window. | |
| | Y: -μm | Specifies the acceptable range of the Y-axis distance between the center of the detected fiducial mark and the center of the inspection window. | |
| | R: -deg | Not available. This algorithm is always set to 0 , because it does not detect the amount of rotation. Use OK Range with the default value. | |
| Inside average | Specifies the acceptable range of the average brightness level in the detected fiducial mark. Judges that the whether fiducial mark is correctly detected. | | |
| Inside avg. - outside avg. | Specifies the acceptable range of a difference in the average brightness level between the detected fiducial mark and its surroundings. Judges that the whether fiducial mark is correctly detected. | | |
| Location | Shows the coordinates of the center position. | | |

Table 1-2 OK Range Setting

1.1.3 Setting Procedure

Step1: Select the **Square Fiducial** from the **Algorithm** drop-down list.

Step2: Select a lighting that displays the fiducial mark clearly from the **Image filter** drop-down list.

Step3: Adjust the inspection window to surround the fiducial mark.

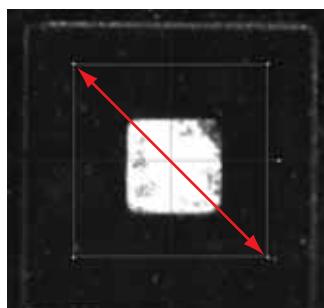


Figure 1-2 Adjusting the Inspection Window

Step4: To detect the fiducial mark, every side of the mark needs to be included in between the inner and outer square windows.

Adjust the value of **Size** and click  to check if the fiducial mark is detected.

NOTE For the value of Size, refer to **Part I 2.1.3 Measuring Dimensions of the Selected Area**, accurately measure the value of Diameter.

NOTE If fiducial mark sides are uneven, increase the **Edge range** value.

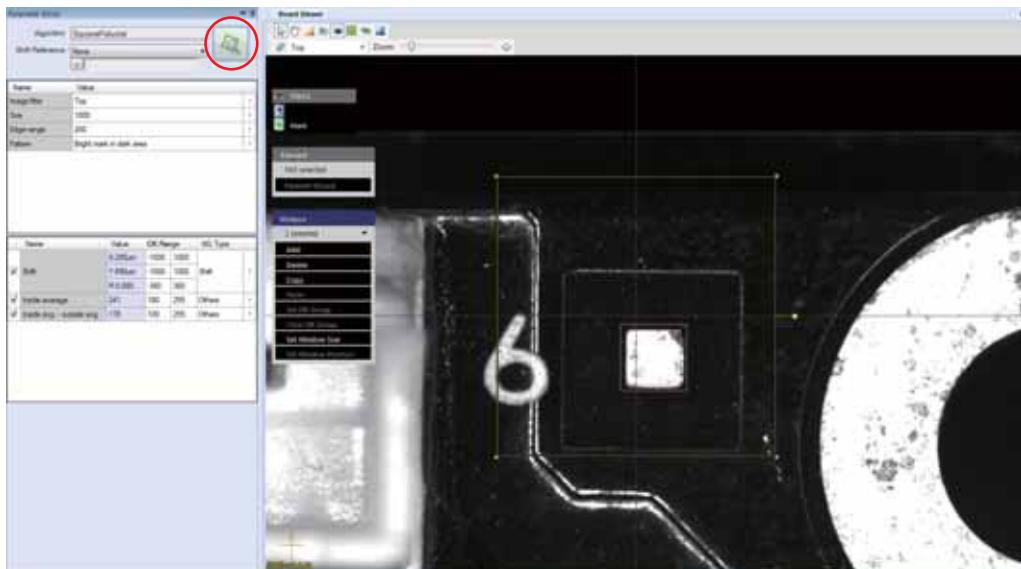


Figure 1-3 Detecting the Fiducial mark

Step5: To share the Shift information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.

Step6: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

Step7: Click  and check if the inspection is completed properly.

1.2 Circular Fiducial

1.2.1 Inspection Overview

Circular Fiducial is the algorithm to detect a round fiducial mark in an inspection window and calculate the distance (X and Y coordinates) between the detected mark and the center of the inspection window.

Circular Fiducial is suitable for detecting a round fiducial mark.

1.2.2 Parameter Setting

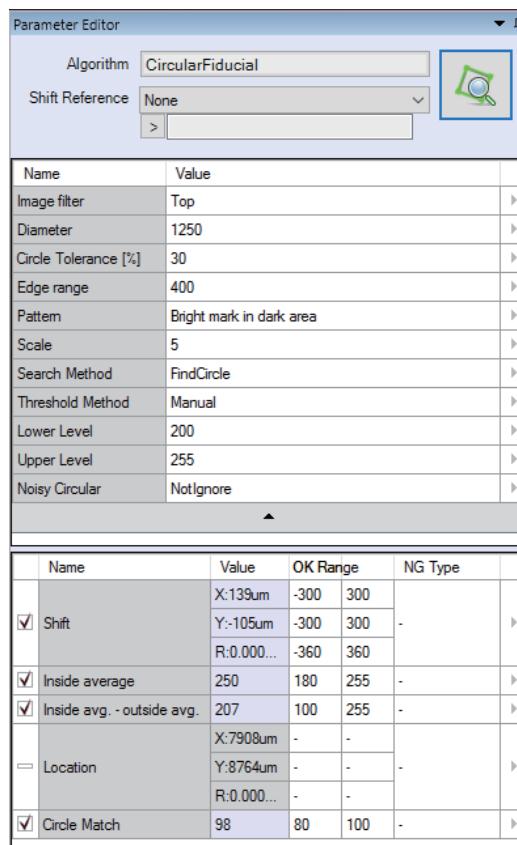


Figure 1-4 Dialog (Version 1.5.0.0)

| Parameter | Description |
|---------------------|---|
| Image filter | Select a lighting that displays the fiducial mark clearly. |
| Diameter | Referring to Part I 2.1.3 Measuring Dimensions of the Selected Area, accurately measure the diameter of the circle of the fiducial mark and set the measured values. |
| Circle Tolerance[%] | This parameter is valid only if FindCircle has been set for Search Method . This parameter specifies the tolerance of circularity as percent. When the noise is contiguous with the fiducial mark which brightness is as same as the brightness of noise, please set this value higher to increase detection rate. However false call may be increased when this value is too much higher. |
| Edge range | This parameter is valid only if Gravity has been set for Search Method . When a fiducial mark is detected, two pink dashed circles are displayed around the fiducial mark. The inner circle shows the size of circle set in Diameter . The outer circle diameter is adding Diameter to Edge range . If there is unevenness around the fiducial mark, set higher value in this parameter to adjust so that the fiducial mark is included in the outer circle. |
| Pattern | Select Bright mark in dark area if the brightness of the fiducial mark is brighter than its surroundings or Dark mark in bright area if it is darker in comparison. |
| Scale | Increasing this value, increases the precision because the position is acquired by finely partitioning the pixels. However, this increases the inspection time. Default value is 5 . |
| Search Method | Specifies the calculation method of the center position of the fiducial mark. Gravity calculates the center position of the fiducial mark from the gravity center of the detected area. FindCircle calculates the center position of the fiducial mark from the circumscription of the detected area. |
| Threshold Method | This parameter is valid only if FindCircle has been specified with Search method . Set Adaptive to automatically set the threshold values of the brightness level. Set Manual to manually set the threshold values. By setting the appropriate setting in Manual , the detection rate will be improved more than Adaptive . |
| Lower Level | This parameter is valid only if Find Circle has been set for Search Method and Manual has been set for Threshold Method . Set Upper Level to 255 . And set Lower Level to the value which shows the fiducial mark clearly visible. |
| Upper Level | |
| Noisy Circular | This parameter is valid only if Find Circle has been set for Search Method . When the circle that is similar size to the fiducial mark is existing near fiducial mark, and noise is existing inside/outside of the circle, the circle is set as out of detection target by setting Ignore for this parameter. Recommended value is NotIgnore . |

Table 1-3 Parameter

| Parameter | Description | |
|----------------------------|--|---|
| Shift | X: - μm | Specifies the acceptable range of the X-axis distance between the center of the detected fiducial mark and the center of the inspection window. |
| | Y: - μm | Specifies the acceptable range of the Y-axis distance between the center of the detected fiducial mark and the center of the inspection window. |
| | R: -deg | Not available. This algorithm is always set to 0 , because it does not detect the amount of rotation. Use OK Range with the default value. |
| Inside average | Specifies the acceptable range of the average brightness level in the detected fiducial mark. Judges that the whether fiducial mark is correctly detected. | |
| Inside avg. - outside avg. | Specifies the acceptable range of a difference in the average brightness level between the detected fiducial mark and its surroundings. Judges that the whether fiducial mark is correctly detected. | |
| Location | Shows the coordinates of the center position. | |
| Circule Match | Shows the matching rate when FindCircle has been specified with Search Method . | |

Table 1-4 OK Range Setting

1.2.3 Setting Procedure

- Step1: Select the **CircularFiducial** from the **Algorithm** drop-down list.
- Step2: Select a lighting that displays the fiducial mark clearly from the **Image filter** drop-down list.
- Step3: Adjust the inspection window to surround the fiducial mark.

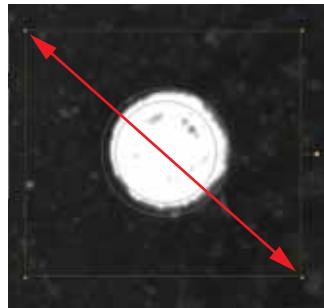


Figure 1-5 Adjusting the Inspection Window

- Step4: Select **Bright mark in dark area** if the brightness of the fiducial mark is brighter than its surroundings or **Dark mark in bright area** if it is darker in comparison from **Pattern** drop-down list.
- Step5: By reference to **Part I 2.1.3 Measuring Dimensions of the Selected Area**, accurately measure the diameter of the circle of the fiducial mark and set the measured values to **Diameter**.
- Step6: When **Gravity** is set for **Search Method**, adjust parameters by reference to **1.2.4 Search Method: Gravity**.
When **FindCircle** is set for **Search Method**, adjust parameters by reference to **1.2.5 Search Method: FindCircle**.
- Step7: To share the Shift information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.
- Step8: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.
- Step9: Click and check if the inspection is completed properly.

1.2.4 Search Method: Gravity

- Step1: Select **Gravity** from the **Search Method** drop-down list.
- Step2: If there is unevenness around the fiducial mark, set **Edge range** to higher value to adjust so that the fiducial mark is included in the outer circle.
- Step3: Click  to check if the fiducial mark is detected.
Two pink dashed circles are displayed around the fiducial mark.
The inner circle shows the size of circle set in **Diameter**. The outer circle **diameter** is adding Diameter to **Edge range**.

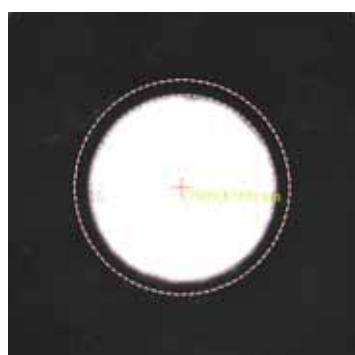


Figure 1-6 Search Method: Gravity

1.2.5 Search Method: FindCircle

- Step1: Select **FindCircle** from the **Search Method** drop-down list.
- Step2: When the noise is contiguous with the fiducial mark which brightness is as same as the brightness of noise, please set **Circle Tolerance[%]** higher. However false call may be increased when this value is too much higher.

NOTE

Circle Tolerance[%] judges if the target is circle or not based on the aspect ratio of circumscribed quadrangle.

When the following condition is met, the target is judged as NOT circle.

- Height < Width × (1 – (Circle Tolerance / 100))
- Height > Width × (1 + (Circle Tolerance / 100))

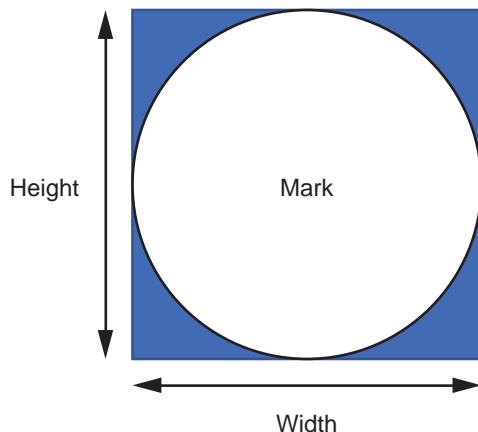


Figure 1-7 Circle Tolerance

When **Circle Tolerance[%]** value is higher, the target is judged as circle even if the aspect ratio of circumscribed quadrangle is higher. But when the value is too much higher, other circle than fiducial mark may be misrecognized.

When **Circle Tolerance[%]** value is smaller, only the circle closer to a complete round is recognized. But when the value is too much smaller, even slight noise add effect and target may not be judged as circle.

Please adjust the value of **Circle Tolerance[%]** depending on the image condition of fiducial mark and around of it.

Step3: Select **Manual** in **Threshold Method**.

Set **Upper Level** to **255**. And set **Lower Level** to the value which shows the fiducial mark clearly visible.

Step4: When the circle that is similar size to the fiducial mark is existing near fiducial mark, and noise is existing inside/outside of the circle, set **Noisy Circular** to **Ignore**.

NOTE

Noisy Circular judges if the target is circle with noise or not by using binarization or labeling. Treats the circle with noise as out of detection target. To increase the accuracy of binarization, parameter adjustment in Step3 is necessary.

Step5: Click  to check if the fiducial mark is detected.

When **Bright mark in dark area** is selected in **Pattern** drop-down list, white area in binarization is colored green.

When **Dark mark in bright area** is selected in **Pattern** drop-down list, black area in binarization is colored green.

And blue dashed circle which size is set in **Diameter** is displayed around the detected fiducial mark.

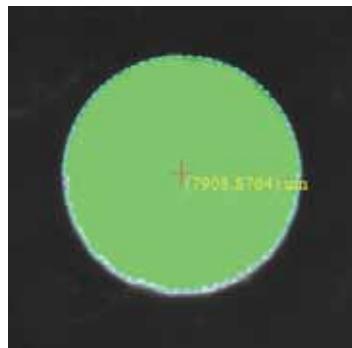


Figure 1-8 Detected Circle by FindCircle

NOTE

When the noise which is as same brightness as fiducial mark is contiguous with the fiducial mark, separate of fiducial mark and noise may be failed. In that case, set **Diameter** to the maximum length includes noise, or set **Circle Tolerance[%]** to higher.

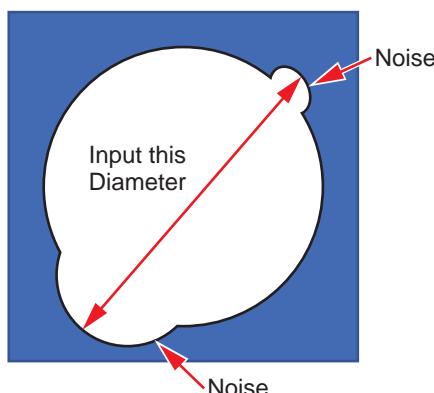


Figure 1-9 When The Noise Is Adjacent to The Fiducial Mark

NOTE

Please try the following steps when the fiducial mark is not detected correctly even if it is in the center of inspection window.

1. Check green area in Step5 and confirm the fiducial mark is colored green in a circle. And check the maximum length of fiducial mark is not changed by the noise.
2. When the fiducial mark is not colored green in a circle, adjust **Lower Limit** value. And re-measure the diameter of the circle and enter **Diameter** to it.
3. When the maximum length is changed in 1, adjust **Diameter** or **Circle Tolerance[%]** with considering maximum length.
4. When a circle with the same size as the fiducial mark exists in the inspection window, misdetection may occur. Select the lighting that clearly displays the difference between fiducial mark and misdetected circle in **Image filter**, and retry Step2 to Step5 in **1.2.5 Search Method: FindCircle**.

1.3 Gravity

1.3.1 Inspection Overview

Gravity is the algorithm to detect a center of the specified brightness pixels in an inspection window and calculate the distance (X and Y coordinates) between the detected mark and the center of the inspection window.

Gravity is suitable for detecting a fiducial mark.

1.3.2 Parameter Setting

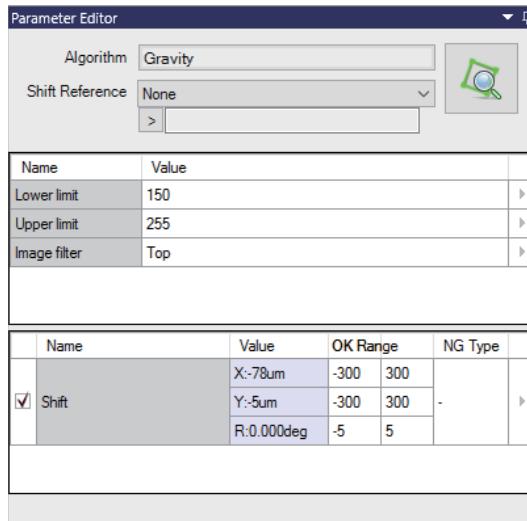


Figure 1-10 Dialog (Version 0.0.0.1)

| Parameter | Description |
|--------------|---|
| Lower limit | Upper limit is the upper limit of the brightness level. Lower limit is the lower limit of the brightness level. |
| Upper limit | Set the value that the fiducial mark is visually clear. |
| Image filter | Select a lighting that displays the fiducial mark clearly. |

Table 1-5 Parameter

| Parameter | Description | |
|-----------|-------------|---|
| Shift | X: -μm | Specifies the acceptable range of the X-axis distance between the center of the detected component and the center of the inspection window. |
| | Y: -μm | Specifies the acceptable range of the Y-axis distance between the center of the detected component and the center of the inspection window. |
| | R: -deg | Not available. This algorithm is always set to 0, because it does not detect the amount of rotation. Use OK Range with the default value. |

Table 1-6 OK Range Setting

1.3.3 Setting Procedure

Step1: Select **Gravity** from the **Algorithm** drop-down list.

Step2: Select a lighting that displays the fiducial mark clearly from the **Image filter** drop-down list.

Step3: Adjust the inspection window to surround the fiducial mark.

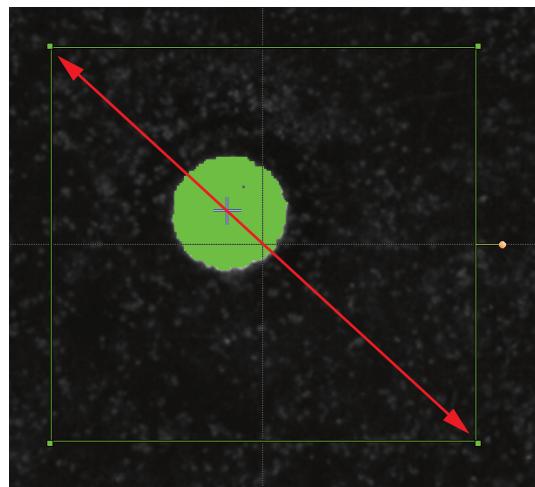


Figure 1-11 Adjusting the Inspection Window

Step4: To detect the fiducial mark, outer perimeter of the mark needs to be included in between the inner and outer round windows. Adjust the value of **Diameter** and click to check if the fiducial mark is detected.

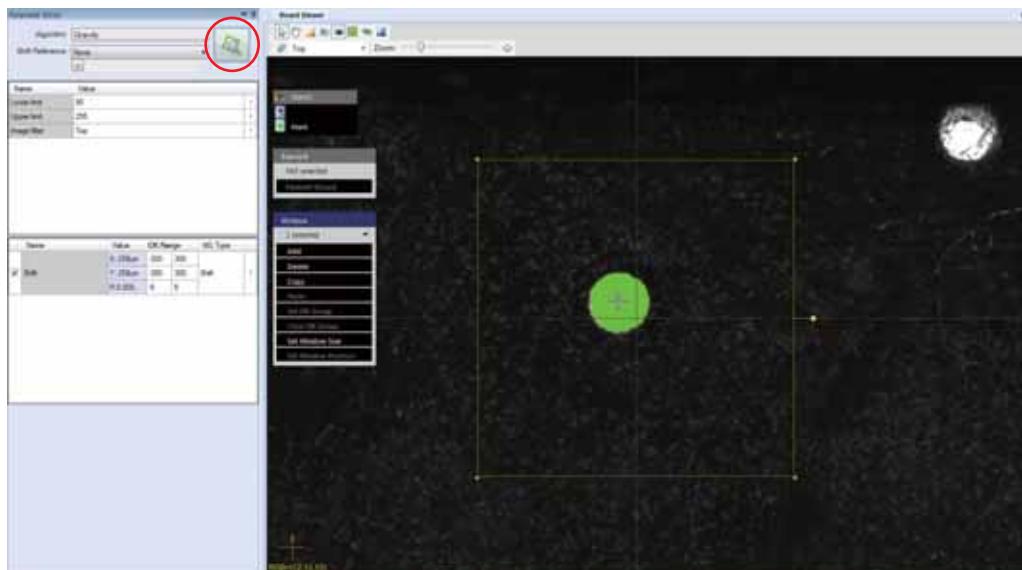


Figure 1-12 Detecting the Fiducial mark

Step5: To share the Shift information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.

Step6: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

Step7: Click and check if the inspection is completed properly.

1.4 Model Matching

1.4.1 Inspection Overview

Model matching is the algorithm to perform inspections with the same process as Image matching using height information.

The algorithm makes a template image including height information from a good PCB, compares the image with scanned image, and outputs the position which minimizes the component's height offset and the matching rate at that position.

Model matching is suitable for adjusting a misalignment.

1.4.2 Parameter Setting

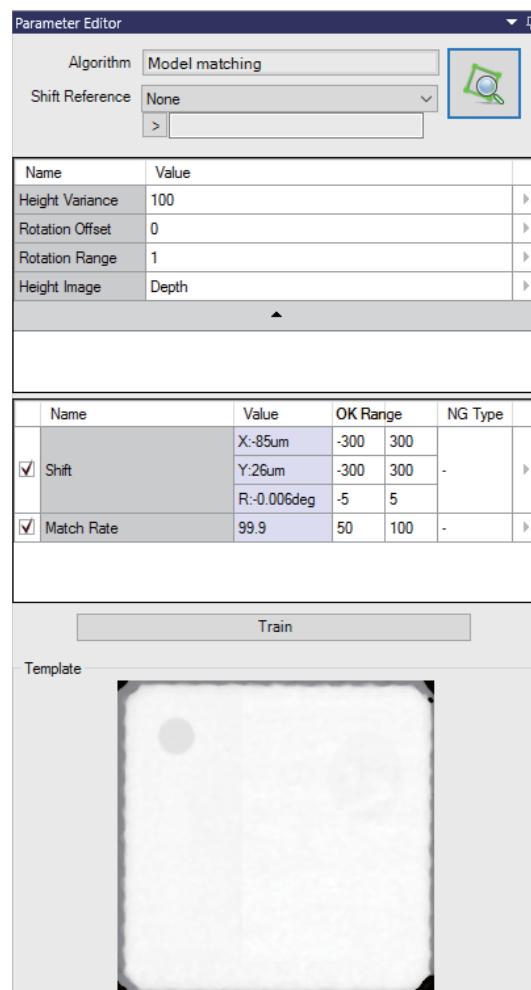


Figure 1-13 Dialog (Version 0.0.0.1)

| Parameter | Description |
|-----------------|---|
| Height Variance | Specifies the acceptable range of misalignments in height. If it exceeds the value, the area is displayed in red on Board Viewer . The red area is minimized when  is clicked. If the large area on the component is displayed in red, increase the value. |
| Rotation Offset | The item is for Saki engineers only. Do not change the setting. |
| Rotation Range | Specifies the acceptable range of the misalignments in angles. If 1 is set, only images inclined 1 degree or less are detected. |
| Height Image | The item is for Saki engineers only. Do not change the setting. |
| Train | Takes an image inside the inspection window as a template image. |
| Template | Displays the template image. |

Table 1-7 Parameter

| Parameter | Description | | |
|------------|--|---|--|
| Shift | X: -μm | Specifies the acceptable range of the X-axis distance between the center of the detected component and the center of the inspection window. | |
| | Y: -μm | Specifies the acceptable range of the Y-axis distance between the center of the detected component and the center of the inspection window. | |
| | R: -deg | Specifies the acceptable range of the mounting angle of the detected component. Angular value increases clockwise and decreases counter-clockwise. | |
| Match Rate | Specifies the acceptable range of the matching rate (percentage of the area which is not displayed in red) of the image. | | |

Table 1-8 OK Range Setting

1.4.3 Setting Procedure

Step1: Select **Model matching** from the **Algorithm** drop-down list.

Step2: Adjust the inspection window to surround the component.

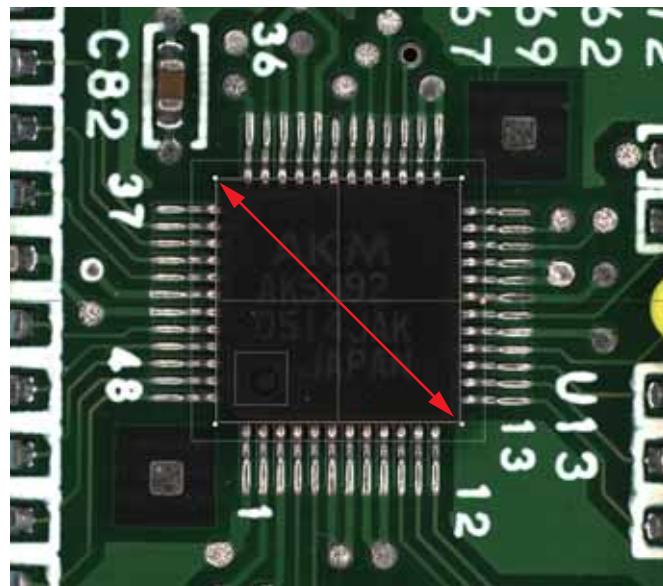


Figure 1-14 Adjusting the Inspection Window

Step3: Click **Train** on the lower side of **Parameter Editor**.

Step4: Specify the area to take the image and click **OK**.

NOTE Window angles can be changed by dragging the circular mark on the right side of the window.

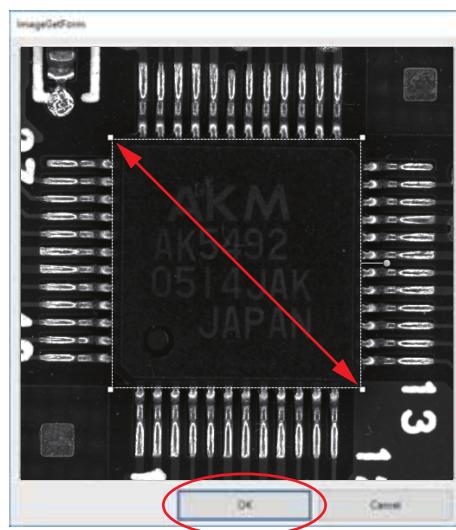


Figure 1-15 Taking the Template Image 1

Step5: The taken image is displayed on **Template** on the lower side of **Parameter Editor**.

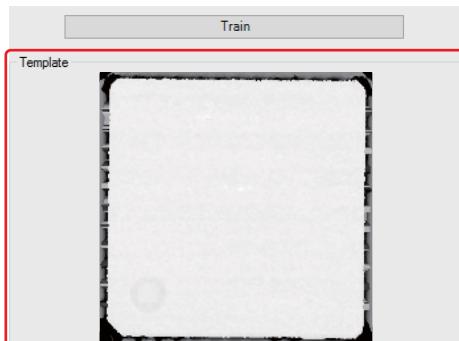


Figure 1-16 Taking the Template Image 2

Step6: To share the Shift information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.

Step7: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step8: Click and check if the inspection is completed properly.

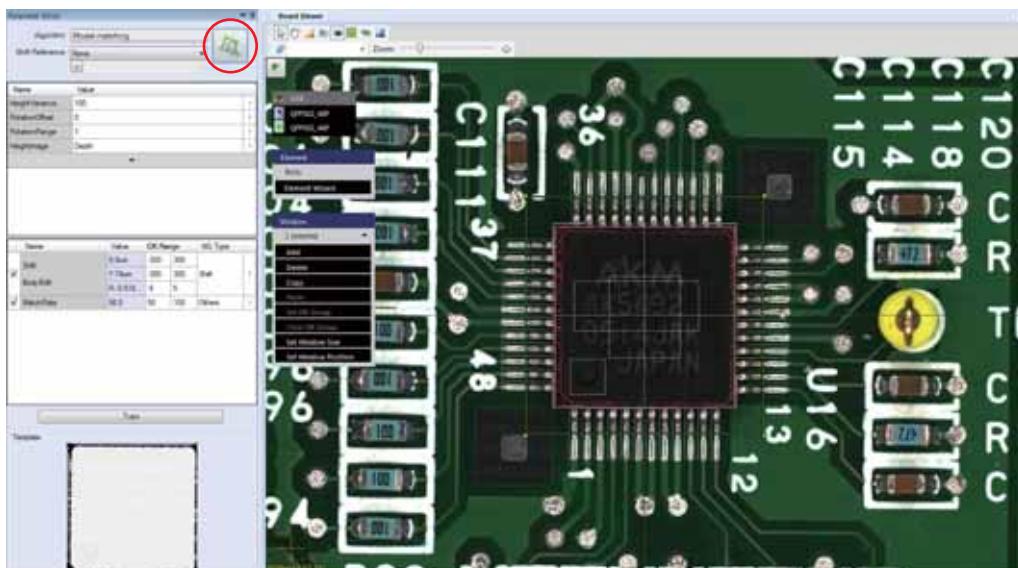


Figure 1-17 Confirming the Result

1.5 Combined Matching

1.5.1 Inspection Overview

Combined matching is the algorithm to perform image matching using height information and image. The algorithm uses the component's height information and image to create a template image, compares it with the captured image of the board and outputs the position which minimizes the component's height offset and the matching rate at that position.

Combined matching is suitable for adjusting a misalignment.

1.5.2 Parameter Setting

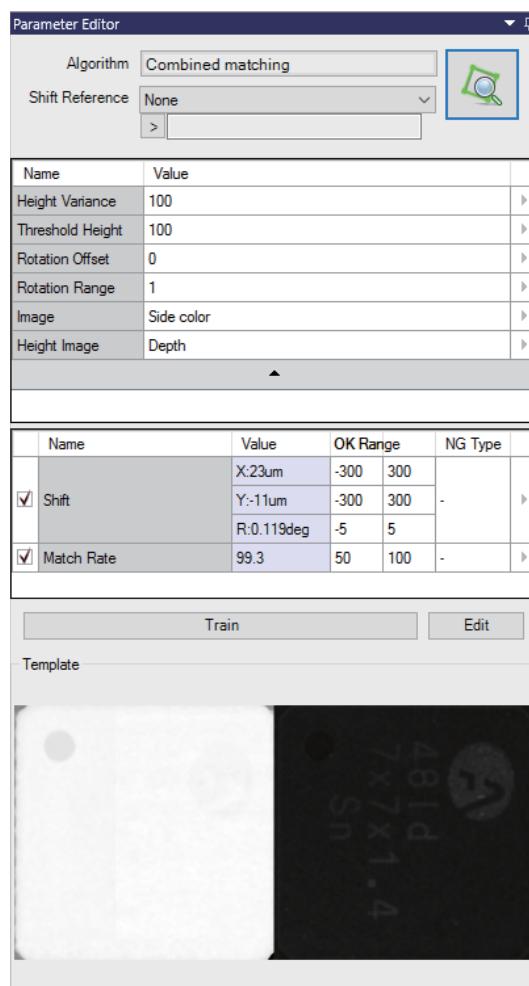


Figure 1-18 Dialog (Version 1.0.0.0)

| Parameter | Description |
|------------------|---|
| Height Variance | Specifies the acceptable range of misalignments in height. If it exceeds the value, the area is displayed in red on Board Viewer. The red area is minimized when  is clicked. If the large area on the component is displayed in red, increase the value. |
| Threshold Height | Specifies the threshold value of the height information used for inspection. Areas with a height less than the specified value are not used for inspection. |
| Rotation Offset | The item is for Saki engineers only. Do not change the setting. |
| Rotation Range | Specifies the acceptable range of the misalignments in angles. If 1 is set, only images inclined 1 degree or less are detected. |
| Image | Select a lighting that displays the component clearly. |
| Height Image | The item is for Saki engineers only. Do not change the setting. |
| Train | Takes an image inside the inspection window as a template image. |
| Template | Displays the template image. |

Table 1-9 Parameter

| Parameter | Description | | |
|------------|--|---|--|
| Shift | X: -μm | Specifies the acceptable range of the X-axis distance between the center of the detected component and the center of the inspection window. | |
| | Y: -μm | Specifies the acceptable range of the Y-axis distance between the center of the detected component and the center of the inspection window. | |
| | R: -deg | Specifies the acceptable range of the mounting angle of the detected component. Angular value increases clockwise and decreases counter-clockwise. | |
| Match Rate | Specifies the acceptable range of the matching rate (percentage of the area which is not displayed in red) of the image. | | |

Table 1-10 OK Range Setting

1.5.3 Setting Procedure

- Step1: Select **Combined matching** from the **Algorithm** drop-down list.
- Step2: Select a lighting that the target component is visually clear from the **Image** drop-down list.
- Step3: Adjust the inspection window to surround the component.

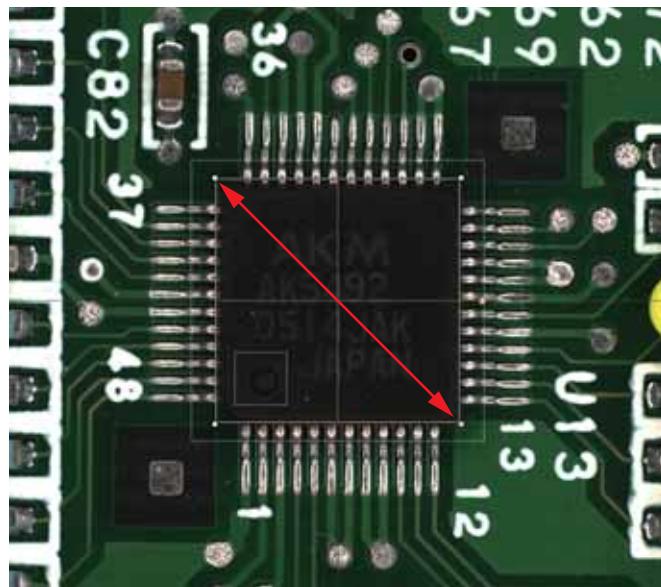


Figure 1-19 Adjusting the Inspection Window

Step4: Click **Train** on the lower side of **Parameter Editor**.

Step5: Specify the area to take the image and click **OK**.

NOTE Window angles can be changed by dragging the circular mark on the right side of the window.

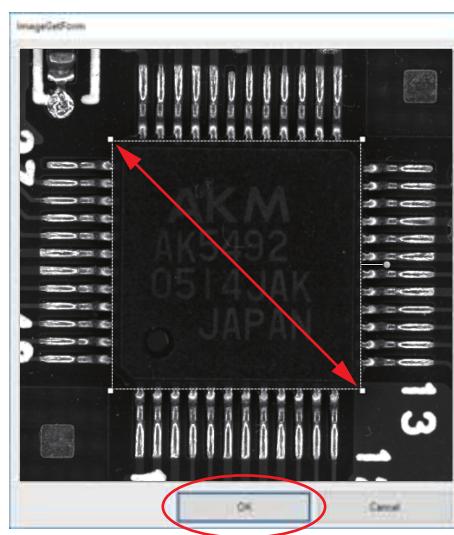


Figure 1-20 Taking the Template Image 1

Step6: The taken image is displayed on **Template** on the lower side of **Parameter Editor**.



Figure 1-21 Taking the Template Image 2

Step7: To share the **Shift** information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.

Step8: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step9: Click and check if the inspection is completed properly.

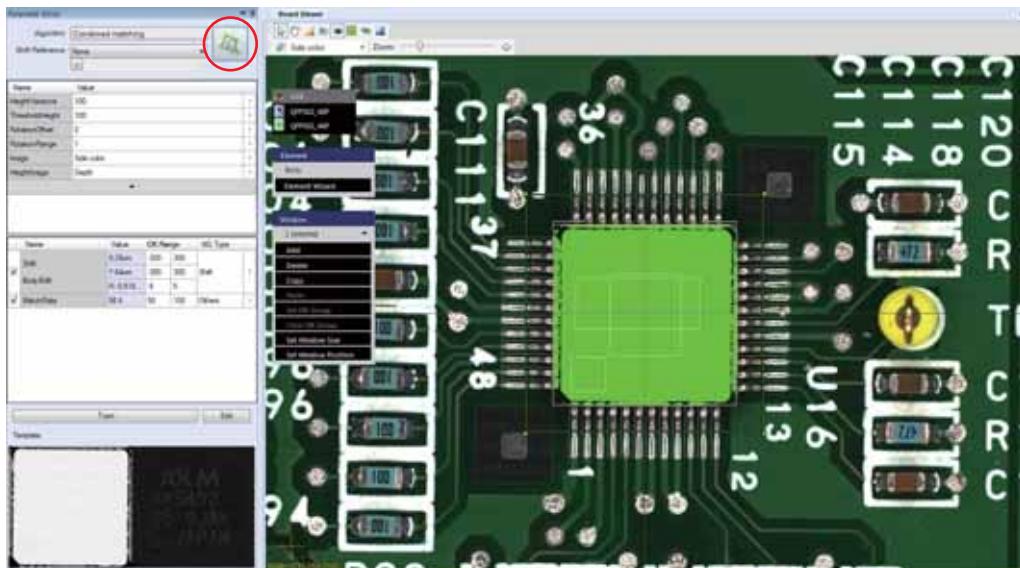


Figure 1-22 Confirming the Result

1.6 Rect Align

1.6.1 Inspection Overview

Rect Align is the algorithm to detect a rectangular component in an inspection window.

The algorithm also calculates the mounting angle, size, and the distance (X and Y coordinates) between the detected component and the center of the inspection window.

Rect Align is suitable for correcting a misalignment.

1.6.2 Parameter Setting

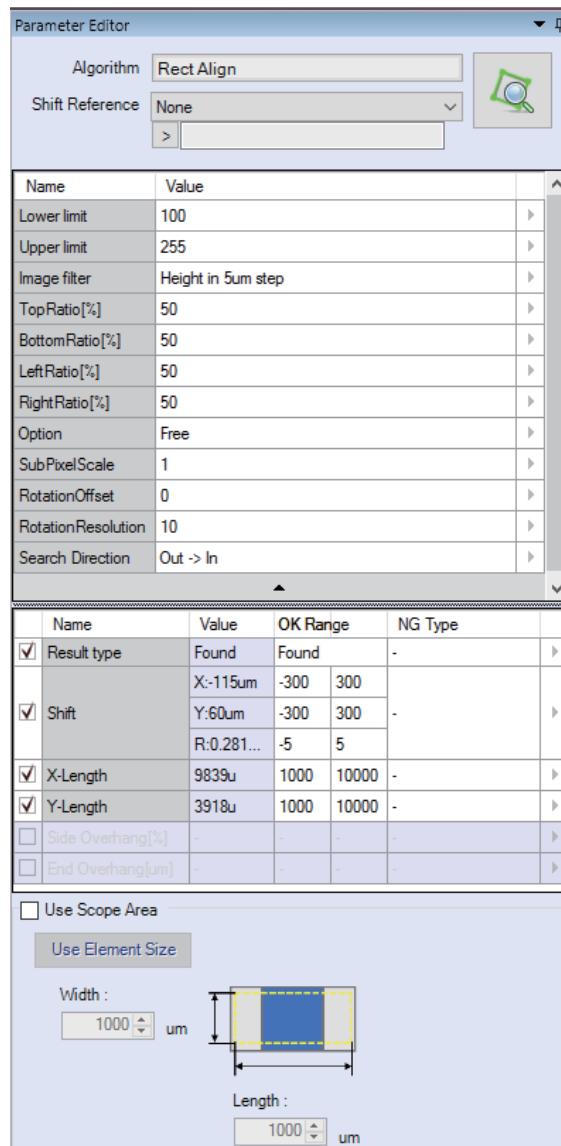


Figure 1-23 Dialog (Version 1.4.0.0)

| Parameter | Description | |
|--------------------|--|---|
| Lower limit | Upper limit is the upper limit of the brightness level. Lower limit is the lower limit of the brightness level. | |
| Upper limit | Set 255 to Upper limit . Set the value which displays the rectangle component clearly to Lower limit . | |
| Image filter | Select a lighting that displays the component clearly. | |
| Top Ratio | Used for specifying the body of a component which has leads (e.g., IC chips). Each parameter indicates the contact area percentage between the detected component and each side of the pink rectangle window. When the component sides are uneven, increase the value. Protruding parts are ignored and inner area is recognized as the component body. To recognize a wider area as the body, decrease the value. | |
| Bottom Ratio | | |
| Left Ratio | | |
| Right Ratio | | |
| Option | Free | Recognizes the mounting angle of the rectangular component. |
| | No | Does not recognize the mounting angle of the rectangular component. |
| | Rotate | Select this item when the component cannot be detected by Free . |
| SubPixelScale | Specifies the scale of sub pixel. The larger the setting value, the longer the inspection time. But inspection with detailed pixel is enabled. Please set larger value for small component. | |
| | | |
| RotationOffset | Specifies the rotation angle when the component has specific rotation. | |
| RotationResolution | Specifies the resolution for calculation of rotation. More detailed calculation of angle is possible by setting larger value. | |
| Search Direction | Out->In searches for the edge of the component in the central direction from the outside of the inspection window. In->Out searches for the edge of the component in the outward direction from the center of the inspection window. Usually, Out->In is specified. If an adjacent component is mistakenly searched, specify In->Out . When specifying In->Out , a component body must be included in the center of the inspection window. | |

Table 1-11 Parameter

| Parameter | Description | |
|------------------|------------------|--|
| Result type | Found | The inspection result becomes OK when the component is detected. |
| | Not Found | The inspection result becomes OK when the component is not detected. |
| | Too Near To Edge | The inspection result becomes OK when the component is close to the inspection window corners more than the specified value. |
| Shift | X: -µm | Specifies the acceptable range of the X-axis distance between the center of the detected component and the center of the inspection window. |
| | Y: -µm | Specifies the acceptable range of the Y-axis distance between the center of the detected component and the center of the inspection window. |
| | R: -deg | Specifies the acceptable range of the mounting angle of the detected component. Angular value increases clockwise and decreases counter-clockwise. |
| X-Length | | Specifies the acceptable range of the X-axis length of the detected component. |
| Y-Length | | Specifies the acceptable range of the Y-axis length of the detected component. |
| Side Overhang[%] | | If pad information exists, algorithm automatically assign pad standard inspection by IPC standard. |
| End Overhang[µm] | | |

Table 1-12 OK Range Setting

NOTE If multiple items are selected on **OK Range of Result type**, the inspection result becomes OK when one of the selected result types is detected.

| Parameter | Description |
|----------------|---|
| Use Scope Area | When the noise except adjacent or target component affects inspection result, check this. For details of scope area, refer to 1.6.4 Scope Area . |
| Width | Specifies scope area size. |
| Length | By clicking Use Element Size , the element size of body is set for Width and Length . |

Table 1-13 Scope Area Setting

1.6.3 Setting Procedure

Step1: Select **Rect Align** from the **Algorithm** drop-down list.

NOTE

To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that the target component is visually clear from the **Image filter** drop-down list.

Step3: Adjust the inspection window to surround the component.

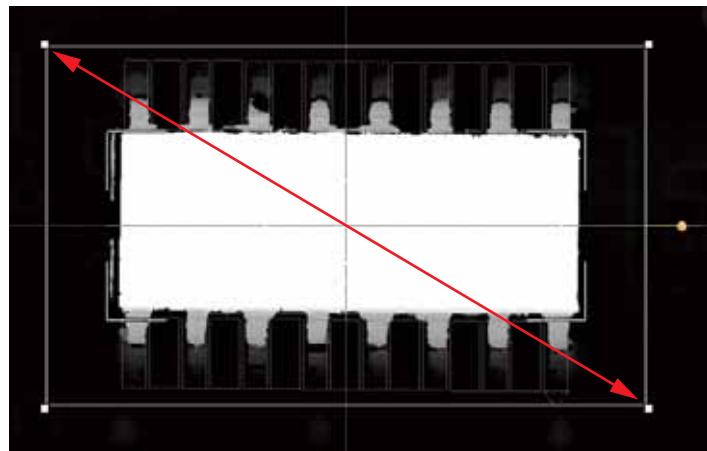


Figure 1-24 Adjusting the Inspection Window

Step4: Adjust the values of **Lower limit** and **Upper limit**.

Set **255** to **Upper limit**. Set the value which displays the component clearly to **Lower limit**.

Step5: Check the values on **Top Ratio**, **Bottom Ratio**, **Left Ratio**, and **Right Ratio**.

Increase the values for components which have leads such as IC chips.

Step6: Click  and check if the component is detected.

The detected component is displayed with the pink rectangle.

NOTE If an adjacent component is mistakenly searched, set the **Search Direction** to **In->Out**. In this case, there must be a component body in the center of the inspection window.

NOTE If an adjacent component is mistakenly searched, check **Use Scope Area**, and click **Use Element Size** to set scope area. In this case, body of component need to be included in scope area.

NOTE Please set **SubPixelScale** to larger value for small component. The larger the setting value, the longer the inspection time. But inspection with detailed pixel is enabled.

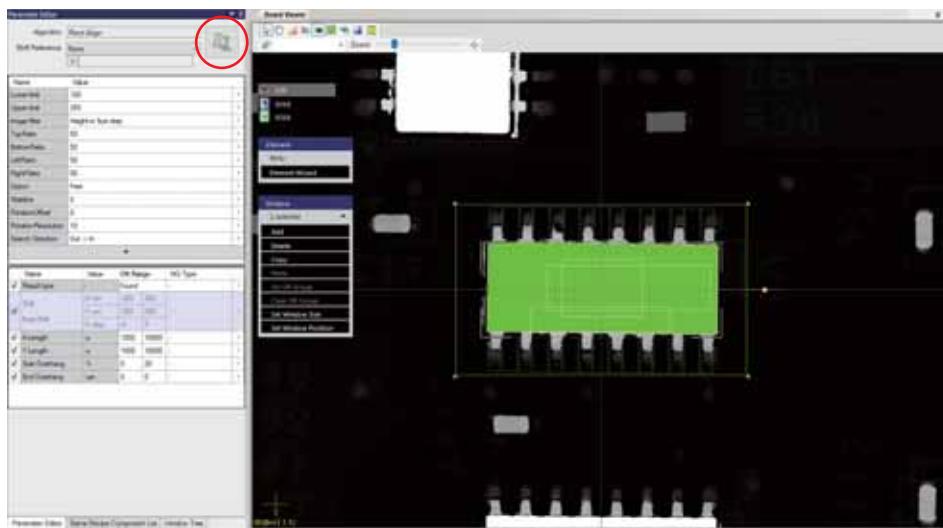


Figure 1-25 Detecting the Component

Step7: To share the Shift information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.

Step8: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step9: Click  and check if the inspection is completed properly.

1.6.4 Scope Area

When scope area is used, the pixels that are not in contact with scope area are masked and treated as out of detection target.

By this function, body of component can be searched with reducing the effect of noise from adjacent component or board.

Scope area is displayed in dotted yellow line.

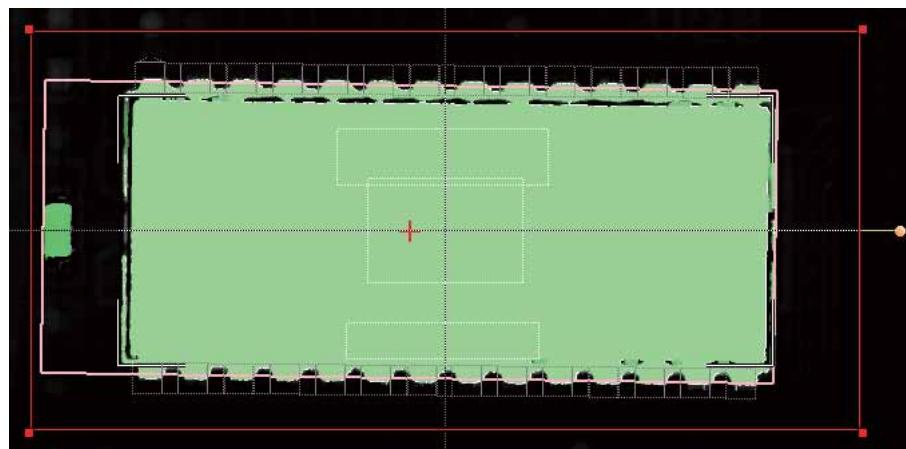


Figure 1-26 Without Scope Area Setting

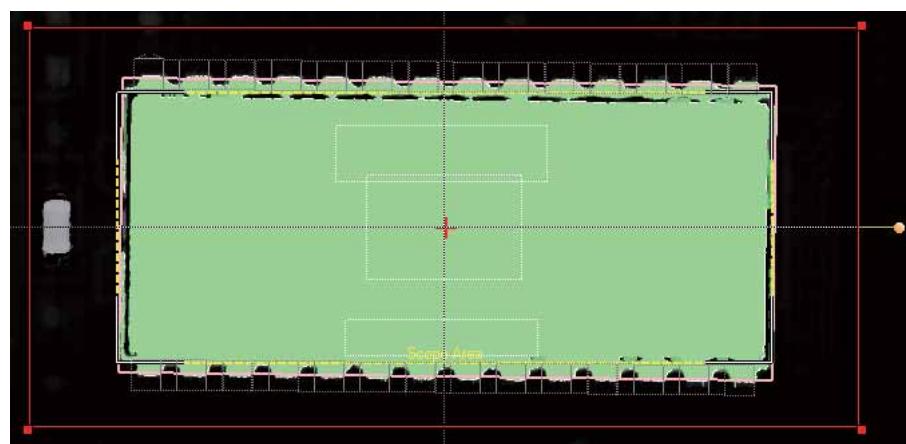


Figure 1-27 With Scope Area Setting

1.7 Rect Align Simple

1.7.1 Inspection Overview

Rect Align Simple is the algorithm to detect a rectangular component in an inspection window. The algorithm also calculates the mounting angle, size, and the distance (X and Y coordinates) between the detected component and the center of the inspection window.

Rect Align Simple is the algorithm which applies the **BrightLevel** algorithm. For more information about the **BrightLevel** algorithm, refer to **2.6 Bright Level**.

Rect Align Simple is suitable for correcting a misalignment.

1.7.2 Parameter Setting

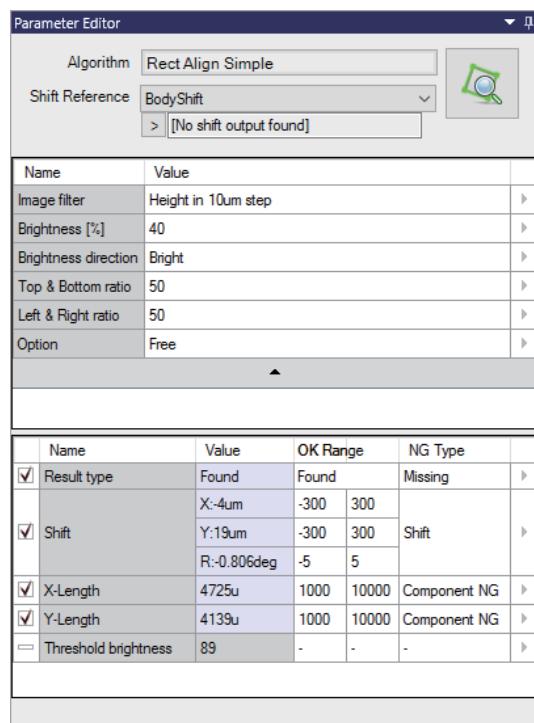


Figure 1-28 Dialog (Version 0.0.0.1)

| Parameter | Description | | | | |
|----------------------|--|------|---|-----------|--|
| Image filter | Select a lighting that displays the component clearly. | | | | |
| Brightness [%] | <p>Rect Align Simple outputs the threshold value which is the area ratio specified under Brightness and detects pixels which exceed the threshold value. Brightness specifies the area ratio as a percentage.</p> | | | | |
| Brightness Direction | Select Bright to specify the area ratio of a section in the inspection window with a high degree of brightness (bright) or select Dark to specify the area ratio of a section in the inspection window with a low degree of brightness (dark). | | | | |
| Top & Bottom ratio | Used for specifying the body of a component which has leads (e.g., IC chips). Each parameter indicates the contact area percentage between the detected component and each side of the pink rectangle window. When the component sides are uneven, increase the value. Protruding parts are ignored and inner area is recognized as the component body. To recognize a wider area as the body, decrease the value. | | | | |
| Left & Right ratio | | | | | |
| Option | <table border="1"> <tr> <td>Free</td> <td>Recognizes the mounting angle of the rectangular component.</td> </tr> <tr> <td>No Rotate</td> <td>Does not recognize the mounting angle of the rectangular component. Select this item when the component cannot be detected by Free.</td> </tr> </table> | Free | Recognizes the mounting angle of the rectangular component. | No Rotate | Does not recognize the mounting angle of the rectangular component. Select this item when the component cannot be detected by Free . |
| Free | Recognizes the mounting angle of the rectangular component. | | | | |
| No Rotate | Does not recognize the mounting angle of the rectangular component. Select this item when the component cannot be detected by Free . | | | | |

Table 1-14 Parameter

| Parameter | Description |
|----------------------|--|
| Result type | Found |
| | Not Found |
| | Too Near To Edge |
| Shift | X: -µm |
| | Y: -µm |
| | R: -deg |
| X-Length | Specifies the acceptable range of the X-axis length of the detected component. |
| Y-Length | Specifies the acceptable range of the Y-axis length of the detected component. |
| Threshold brightness | Specifies the upper and lower limit of the threshold value which is the area ratio specified under Brightness . |

Table 1-15 OK Range Setting

NOTE

If multiple items are selected on OK Range of Result type, the inspection result becomes OK when one of the selected result types is detected.

1.7.3 Setting Procedure

Step1: Select **Rect Align Simple** from the **Algorithm** drop-down list.

Step2: Select a lighting that displays the component clearly from the **Image filter** drop-down list.

Step3: Adjust the inspection window to surround the component.

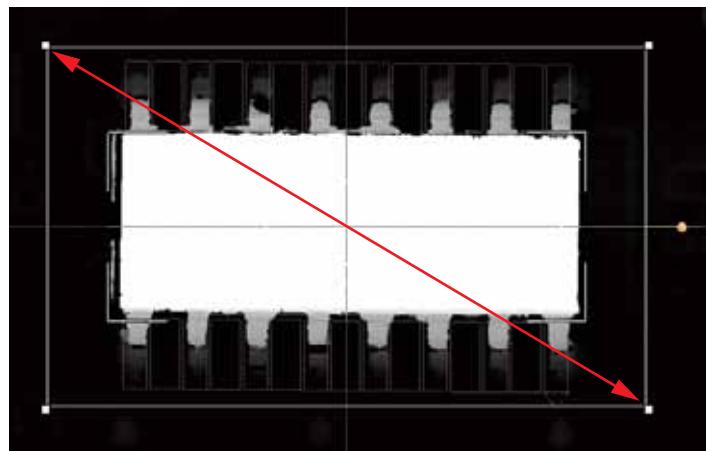


Figure 1-30 Adjusting the Inspection Window

Step4: Adjust the values of **Brightness** and **Brightness direction**.

Step5: Click and check if the component is detected.

The detected component is displayed with the pink rectangle.

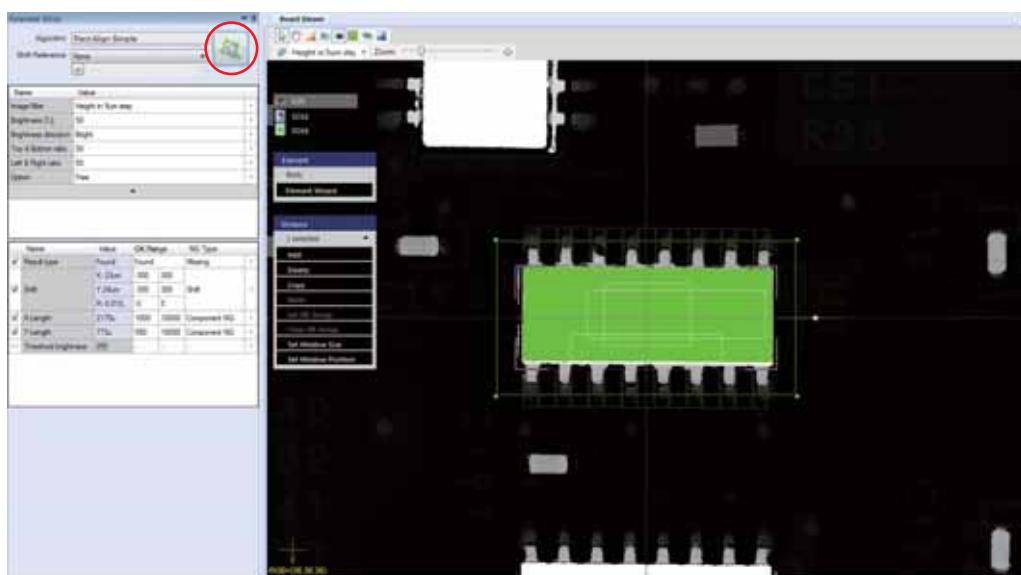


Figure 1-31 Detecting the Component

- Step6: To share the Shift information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.
- Step7: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.
- NOTE If not performing the inspection, uncheck the item.
- Step8: Click  and check if the inspection is completed properly.

1.8 Circle Align

1.8.1 Inspection Overview

Circle Align is the algorithm to detect a round component in an inspection window. The algorithm also calculates the radius and the distance (X and Y coordinates) between the detected component and the center of the inspection window.

Circle Align is suitable for correcting a misalignment.

1.8.2 Parameter Setting

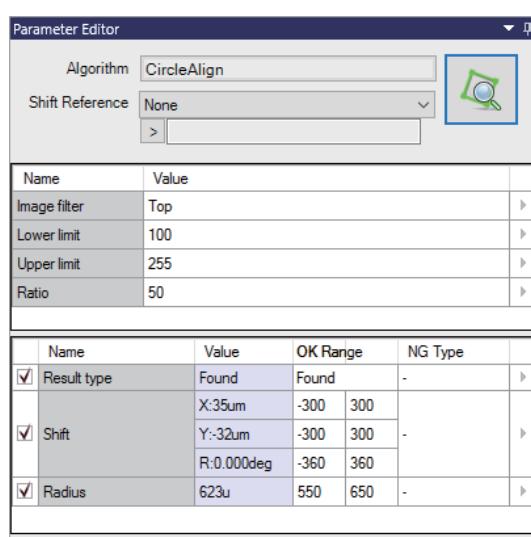


Figure 1-32 Dialog (Version 1.0.0.0)

| Parameter | Description |
|--------------|---|
| Image filter | Select a lighting that displays the component clearly. |
| Lower limit | Upper limit is the upper limit of the brightness level. Lower limit is the lower limit of the brightness level. |
| Upper limit | Set 255 to Upper limit . Set the value which displays the round component clearly to Lower limit . |
| Ratio | Indicates the contact area percentage between the detected component and the pink circle window. When the component outer perimeter are uneven, increase the value. Protruding parts are ignored and inner area is recognized as the component body. To recognize a wider area as the body, decrease the value. |

Table 1-16 Parameter

| Parameter | Description | |
|-------------|---|---|
| Result type | Found | The inspection result becomes OK when the component is detected. |
| | Not Found | The inspection result becomes OK when the component is not detected. |
| | Too Near To Edge | The inspection result becomes OK when the component is close to the inspection window corners more than the specified value. |
| Shift | X: -μm | Specifies the acceptable range of the X-axis distance between the center of the detected component and the center of the inspection window. |
| | Y: -μm | Specifies the acceptable range of the Y-axis distance between the center of the detected component and the center of the inspection window. |
| | R: -deg | Not available. This algorithm is always set to 0 , because it does not detect the amount of rotation. Use OK Range with the default value. |
| Radius | Specifies the acceptable range of the radius of the detected component. | |

Table 1-17 OK Range Setting

NOTE If multiple items are selected on OK Range of **Result type**, the inspection result becomes OK when one of the selected result types is detected.

1.8.3 Setting Procedure

- Step1: Select **Circle Align** from the **Algorithm** drop-down list.
- Step2: Select a lighting that displays the component clearly from the **Image filter** drop-down list.
- Step3: Adjust the inspection window to surround the component.

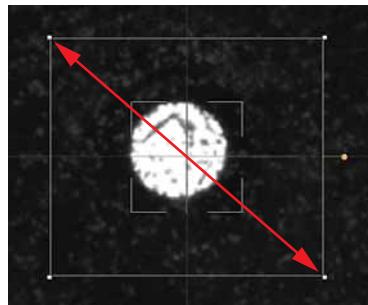


Figure 1-33 Adjusting the Inspection Window

- Step4: Check the values of **Lower limit** and **Upper limit**. Set **255** to **Upper limit**. Set the value which displays the round component clearly to **Lower limit**.
- Step5: Click and check if the component is detected. The detected component is displayed with the pink circle.

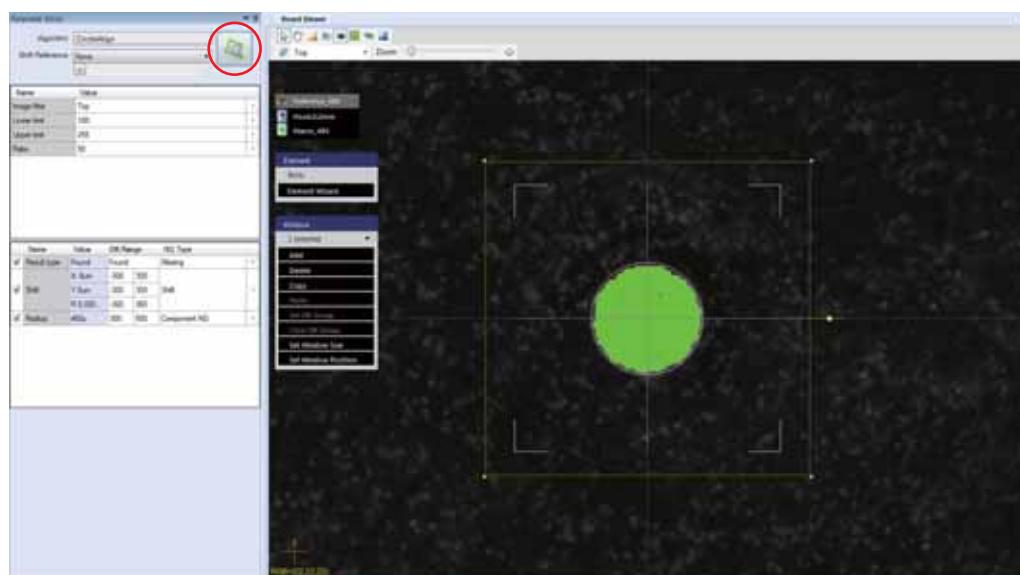


Figure 1-34 Detecting the Component

- Step6: To share the Shift information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.
- Step7: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.
- NOTE** If not performing the inspection, uncheck the item.
- Step8: Click and check if the inspection is completed properly.

1.9 Chip Align

1.9.1 Inspection Overview

Chip Align is the algorithm to detect a chip component in an inspection window.

The algorithm also calculates the mounting angle and the distance (X and Y coordinates) between the detected component and the center of the inspection window.

The algorithm uses height information to detect the edge of the chip component in the length direction and the specified image filter to detect the edge in the width direction (electrode).

Chip Align is suitable for correcting a misalignment of chip component.

In **Chip Align** Version 1.1.0.0 or higher, it is possible to perform pad based shift inspection.

For detail information regarding **Pad Based Shift Inspection**, refer to **Part IV 2 Pad Based Shift Inspection**.

1.9.2 Parameter Setting

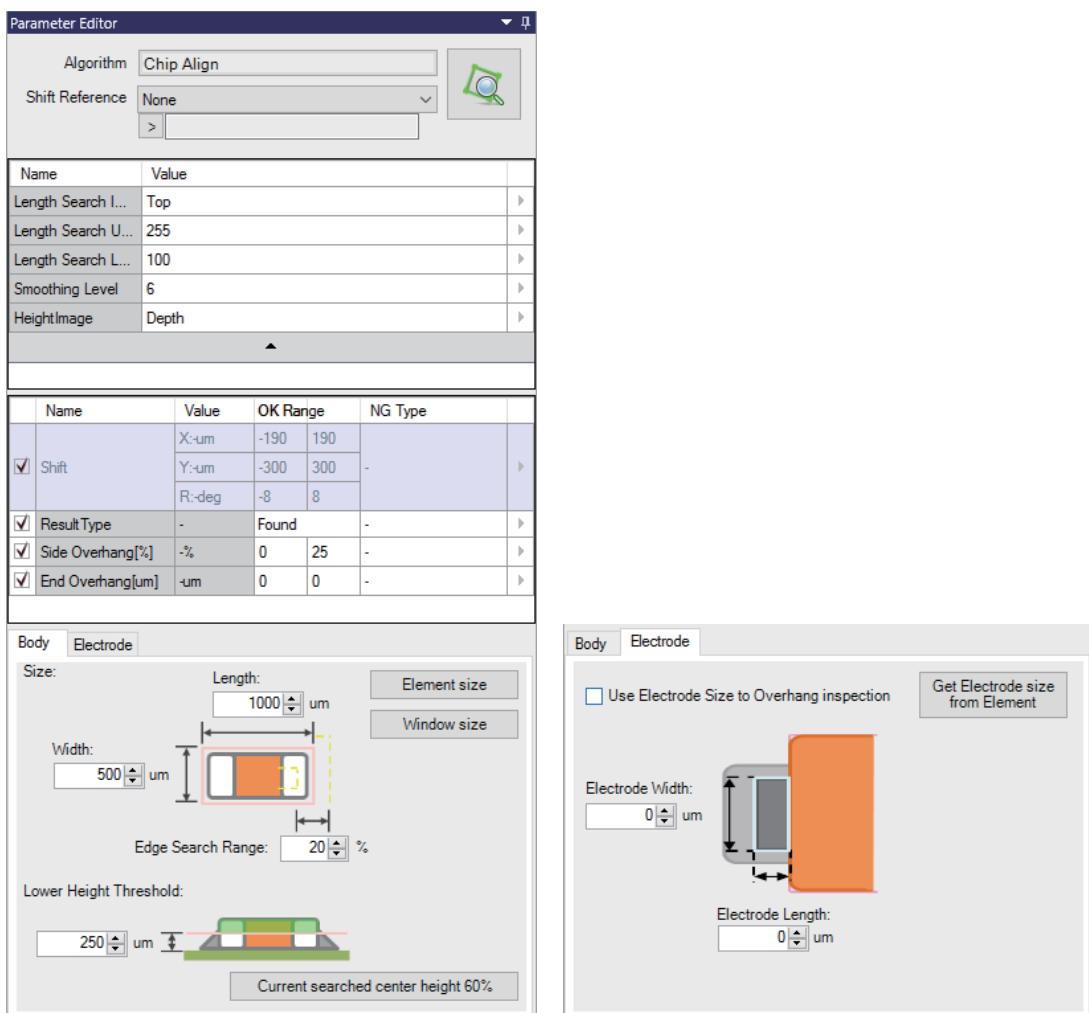


Figure 1-35 Dialog (Version 1.1.0.0)

| Parameter | Description |
|---------------------|---|
| Length Search Image | Selects a lighting that displays the electrode clearly. |
| Length Search Upper | This is the setting for detecting the edge of the chip component in the width direction (electrode). Length Search Upper is the upper limit value of the electrode brightness. Length Search Lower is the lower limit value. When thresholding have been done for the brightness of electrode of the component and of its periphery, set the values to detect the electrode. Pixels confirmed to be the electrode with the Length Search Upper and Length Search Lower are shown in blue. |
| Length Search Lower | |
| Smoothing Level | Sets the bigger value to reduce noise. Default value is 6 . |
| Height Image | The item is for Saki engineers only. Do not change the setting. |

Table 1-18 Parameter

| Parameter | Description |
|------------------------|---|
| Length | Specifies the chip size. Click Element size to set the element size of the body to Length and Width . Click Window size to set the size of the current window to Length and Width . |
| Width | |
| Edge Search Range | Specifies the area to search the edge of chip component. Sets the percentage of the setting values of Length and Width . Shows the area between the two yellow lines on the screen as the search range. |
| Lower Height Threshold | This is the setting for detecting the edge of the chip component in the length direction. Recognizes a height equal to or greater than the Lower Height Threshold , then detects the edge of the chip component in the length direction. Set the Lower Height Threshold lower than the height of the component and higher than the solder height. The pixels having a height equal to or greater than the Lower Height Threshold are shown in green. In this green area, pixels recognized as the electrode with LengthSearchUpper and LengthSearchLower are shown in blue. Click Current searched center height 60% to set 60% of the value of the center part of the detected height as the Lower Height Threshold . |

Table 1-19 Discription of Body Tab

| Parameter | Description |
|---|--|
| Use Electrode Size to Overhang inspection | Check this item when the width of the body and the width of the electrode are different. |
| Electrode Length [μm] | Specifies the size of the electrode. Click Acquire size of electrode from element to set the element size of the electrode as Electrode Length [μm] and Electrode Width [μm] . |
| Electrode Width [μm] | |

Table 1-20 Discription of Electrode Tab

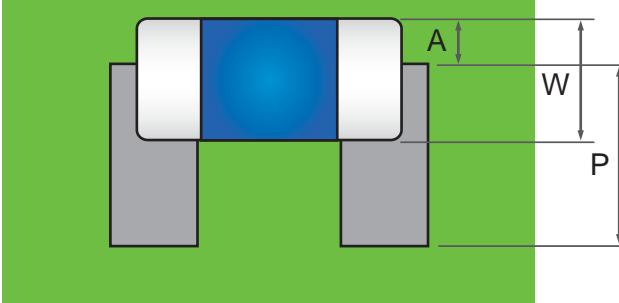
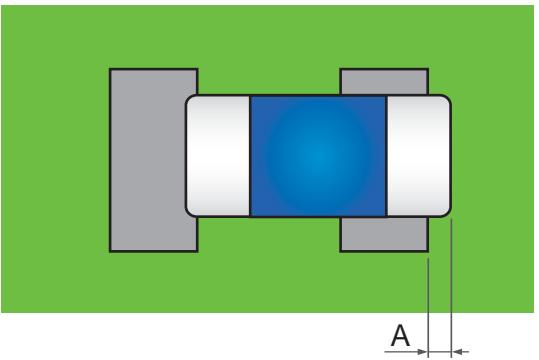
| Parameter | | Description |
|-------------------|-----------|--|
| Shift | X: -μm | Specifies the acceptable range of the X-axis distance between the center of the detected component and the center of the inspection window. This can be set only when there is no pad information. |
| | Y: -μm | Specifies the acceptable range of the Y-axis distance between the center of the detected component and the center of the inspection window. This can be set only when there is no pad information. |
| | R: -deg | Specifies the acceptable range of the mounting angle of the detected component. Angular value increases clockwise and decreases counter-clockwise. This can be set only when there is no pad information. |
| Result type | Found | The inspection result becomes OK when the component is detected. |
| | Not Found | The inspection result becomes OK when the component is not detected. |
| Side Overhang [%] | | <p>This can be set only when there is pad information. If the width of the pad is smaller than the width of the electrode, $A / P \times 100[\%]$ is calculated. If the width of the pad is larger than the width of the electrode, $A / W \times 100[\%]$ is calculated. If the result of the calculation is 25% or higher, this is recognized as NG.</p>  |
| End Overhang [μm] | | <p>This can be set only when there is pad information. Calculate the A value. If the chip tip protrudes even a little bit from the pad, this is recognized as NG.</p>  |

Table 1-21 OK Range Setting

NOTE If multiple items are selected on OK Range of **Result type**, the inspection result becomes OK when one of the selected result types is detected.

1.9.3 Setting Procedure

- Step1: Select **Chip Align** from the **Algorithm** drop-down list.
- Step2: Select a lighting that displays the electrode clearly from the **Length Search Image** drop-down list.
- Step3: Adjust the inspection window to surround the component.

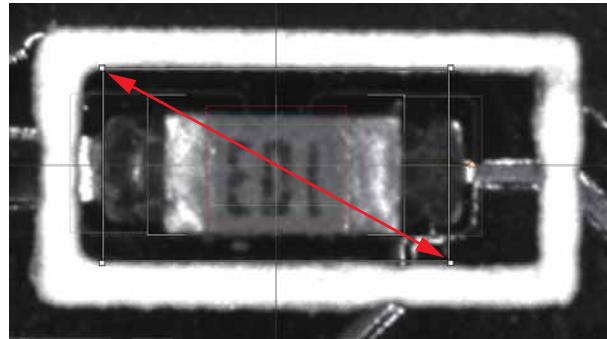


Figure 1-38 Adjusting the Inspection Window

- Step4: Check the values of **Length Search Upper** and **Length Search Lower**.
Set the value to electrode can be detected when using thresholding for the brightness of the component electrode and its surroundings.

- Step5: Click **Element size**.

NOTE When the width of the body and the width of the electrode are different, check **Use Electrode Size to Overhang inspection** in the **Electrode** tab and click **Acquire size of electrode** from element.

- Step6: Click and check if the component is detected.
The detected component is displayed with the pink circle.

NOTE If the component cannot be detected, adjust the value of **Lower Height Threshold**.
Set the **Lower Height Threshold** lower than the height of the component and higher than the height of the solder.

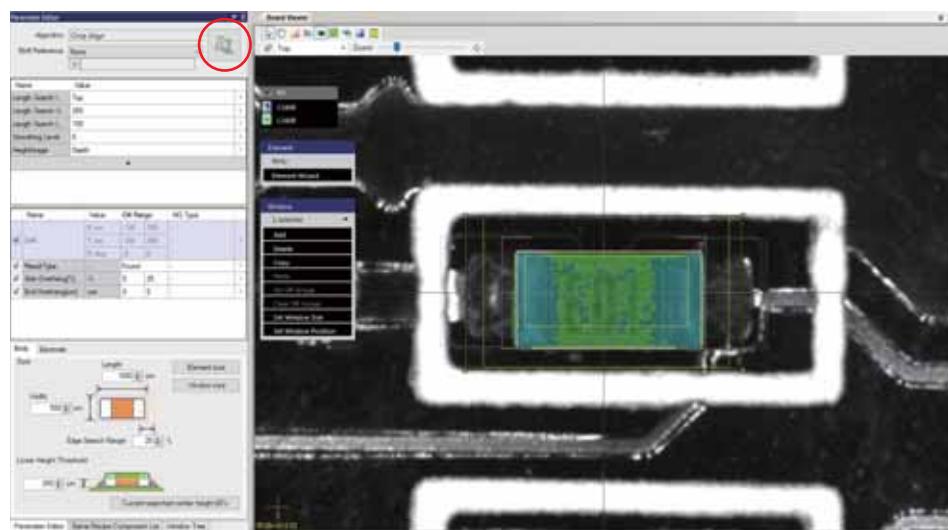


Figure 1-39 Detecting the Component

Step7: To share the Shift information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.

Step8: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step9: Click  and check if the inspection is completed properly.

1.10 LW Tracking

1.10.1 Inspection Overview

LW Tracking is an algorithm to detect the component edge automatically from the difference in brightness between the board and the component and calculates the distance (X and Y coordinates) between the detected component and the center of the inspection window.

LW Tracking is suitable for adjusting a misalignment.

1.10.2 Parameter Setting

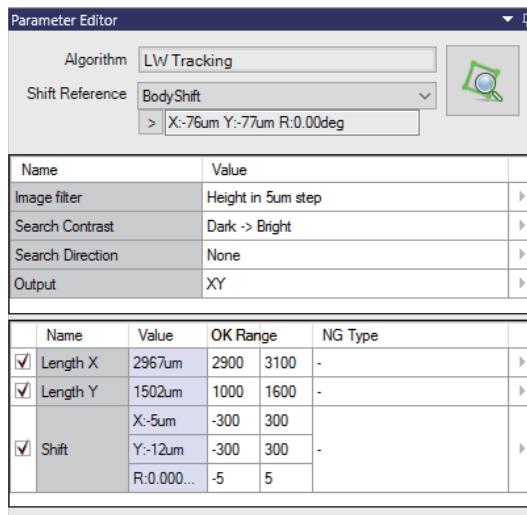


Figure 1-40 Dialog (Version 0.0.0.1)

| Parameter | Description |
|------------------|--|
| Image filter | Select a lighting that displays the component clearly. |
| Search Contrast | When searching for edges of the component, select Dark -> Bright to detect dark to bright edges or Bright -> Dark to detect bright to dark edges. |
| Search Direction | Select None to search for the edge from the left edge to the right edge or from the top edge to the bottom edge of the inspection window. Select Out -> In to search for the edge from the outside toward the center of the inspection window or In -> Out to search from the center toward the outside. |
| Output | Select XY to detect the offset amount in the XY direction or set just X or Y to detect the offset amount in only one direction. |

Table 1-22 Parameter

| Parameter | Description | |
|-----------|--|---|
| Length X | Specifies the acceptable length of the X axis. | |
| Length Y | Specifies the acceptable length of the Y axis. | |
| Shift | X: -μm | Specifies the acceptable range of the X-axis distance between the center of the detected component and the center of the inspection window. |
| | Y: -μm | Specifies the acceptable range of the Y-axis distance between the center of the detected component and the center of the inspection window. |
| | R: -deg | Not available. This algorithm is always set to 0, because it does not detect the amount of rotation. Use OK Range with the default value. |

Table 1-23 OK Range Setting

NOTE If multiple items are selected on OK Range of **Result type**, the inspection result becomes OK when one of the selected result types is detected.

1.10.3 Setting Procedure

- Step1: Select **LW Tracking** from the **Algorithm** drop-down list.
- Step2: Select a lighting that displays the component clearly from the **Image filter** drop-down list.
- Step3: Adjust the inspection window to surround the component.

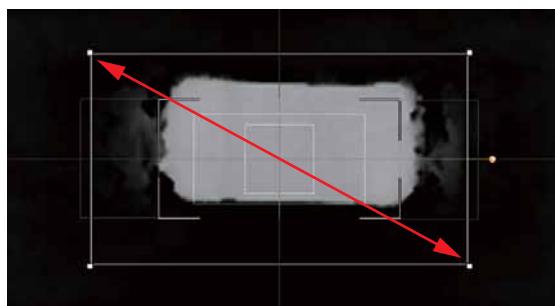


Figure 1-41 Adjusting the Inspection Window

- Step4: Check the values of **Search Contrast** and **Search Direction**.

- Step5: Click and check if the component is detected.

The detected edge is displayed with a blue line and the center position of the component with a blue cross-hair.

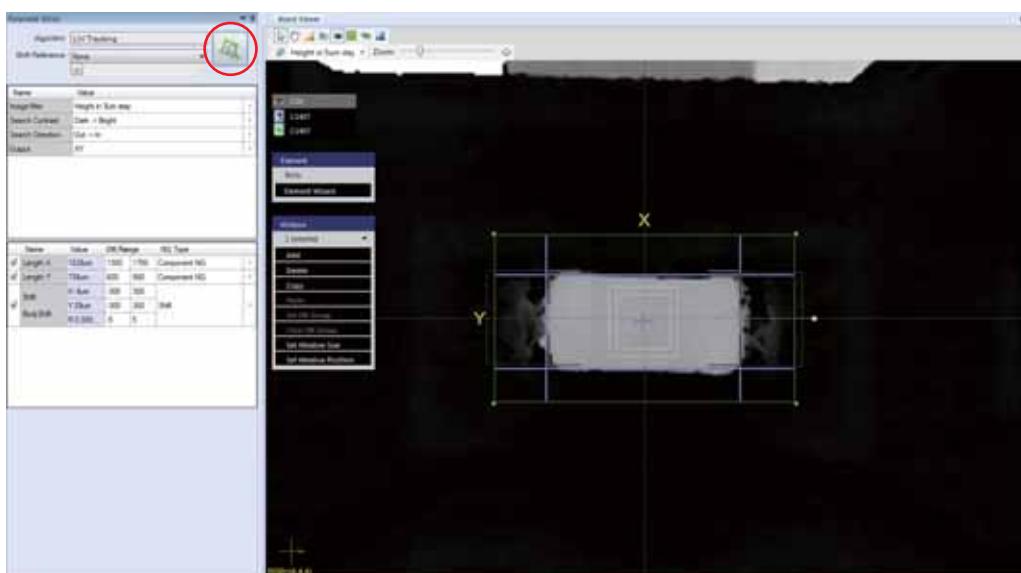


Figure 1-42 Detecting the Component

- Step6: To share the Shift information detected by this algorithm with other inspection windows, check **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.

- Step7: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

- Step8: Click and check if the inspection is completed properly.

1.11 ShiftDispatcher

1.11.1 Inspection Overview

ShiftDispatcher is an algorithm to determine a priority order of offset information to be used when multiple alignment algorithms are used.

The inspection window of the alignment algorithm set by ShiftDispatcher is automatically set to an OR group, and if more than one inspection window in the group is found to be OK then the inspection result for the entire group is set to OK.

If the inspection result of the algorithm with the highest priority order is NG and the second highest algorithm is OK, the offset information of the second highest algorithm is used for alignment in the other windows.

1.11.2 Parameter Setting

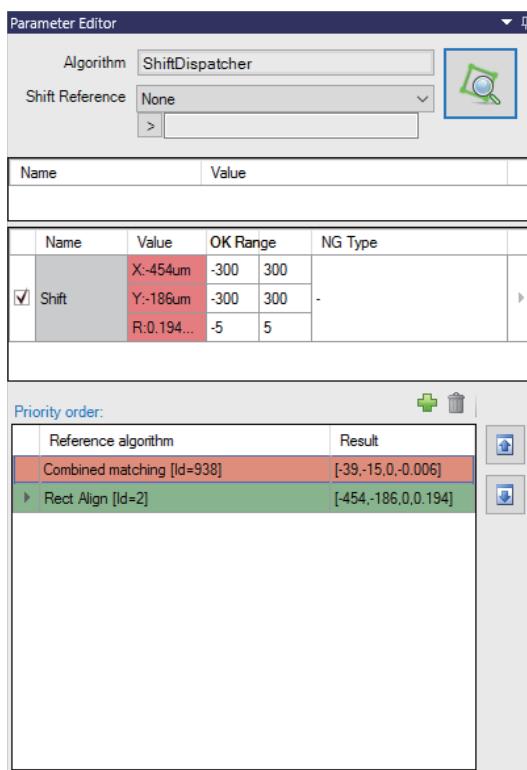


Figure 1-43 Dialog (Version 0.0.0.1)

| Parameter | | Description |
|-----------|---------|--|
| Shift | X: -μm | Specifies the acceptable range of the X-axis distance between the center of the detected component and the center of the inspection window. |
| | Y: -μm | Specifies the acceptable range of the Y-axis distance between the center of the detected component and the center of the inspection window. |
| | R: -deg | Specifies the acceptable range of the mounting angle of the detected component. Angular value increases clockwise and decreases counter-clockwise. |

Table 1-24 OK Range Setting

1.11.3 Setting Procedure

Step1: Select **ShiftDispatcher** from the **Algorithm** drop-down list.

NOTE

For ShiftDispatcher, no inspection windows need to be adjusted.
Leave it with the default setting.

Step2: Click  in the right side of Priority order.

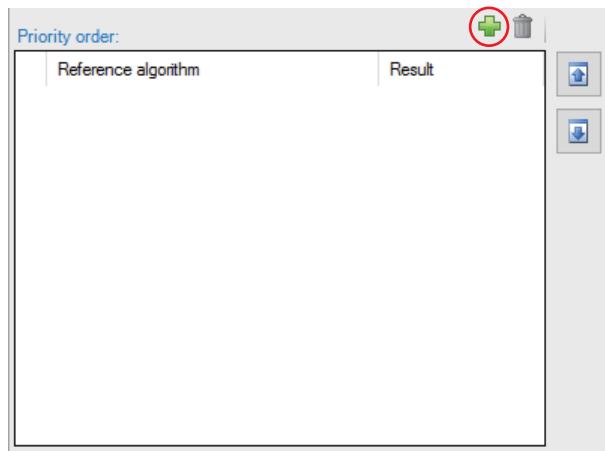


Figure 1-44 Settings of Priority Order 1

Step3: Display a list of the algorithms which are used in the current recipe and output offset information.
Select an Algorithm and click **OK**.

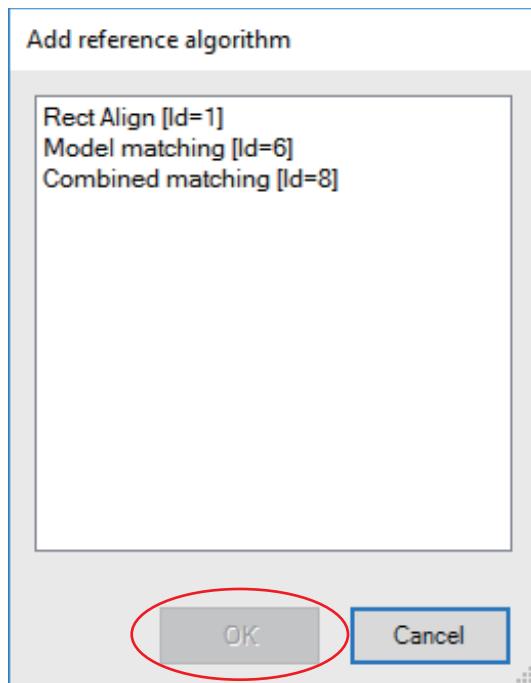


Figure 1-45 Settings of Priority Order 2

- Step4: Repeat Step2 to Step3 and register the algorithms to priority order.
 The algorithms are listed in order of priority from the top.
 Click or with the algorithm selected to change the order of priority.

NOTE Click to delete the algorithm form Priority order.

| Priority order: | |
|----------------------------|--------|
| Reference algorithm | Result |
| Combined matching [Id=938] | [] |
| Rect Align [Id=2] | [] |

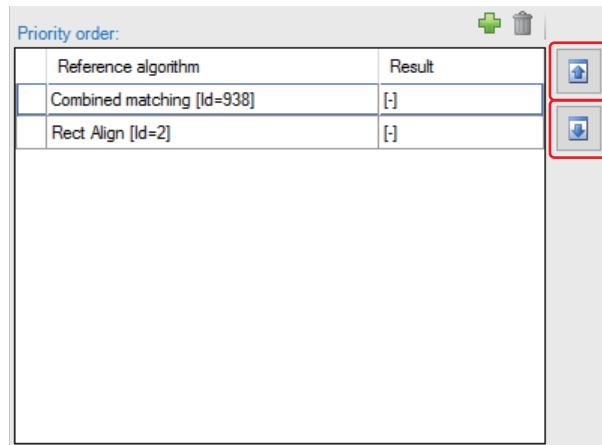


Figure 1-46 Settings of Priority Order 3

- Step5: Click .
 The background color changes to green when the inspection result of each algorithm is OK or red if the inspection result of each algorithm is NG.
 The shift information of the highest priority algorithm is used for alignment in other windows if the inspection result is OK.

NOTE The algorithm used for alignment in other windows is indicated with a mark.

| Priority order: | |
|----------------------------|---------------------|
| Reference algorithm | Result |
| Combined matching [Id=938] | [-39,-15,0,-0.006] |
| Rect Align [Id=2] | [-454,-186,0,0.194] |

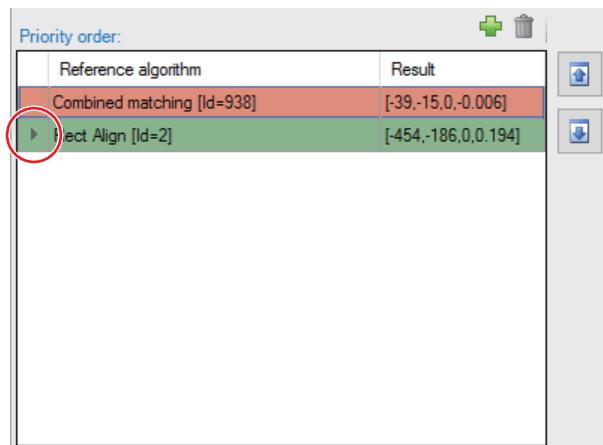


Figure 1-47 Settings of Priority Order 4

- Step6: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

- Step7: Click and check if the inspection is completed properly.

2 Window Statistics

2.1 Find Plane

2.1.1 Inspection Overview

Find Plane is the algorithm to calculate the inclination of the image and the center height of the image in the inspection window.

Find Plane is suitable for inspecting lifted leads/components and missing components.

2.1.2 Parameter Setting

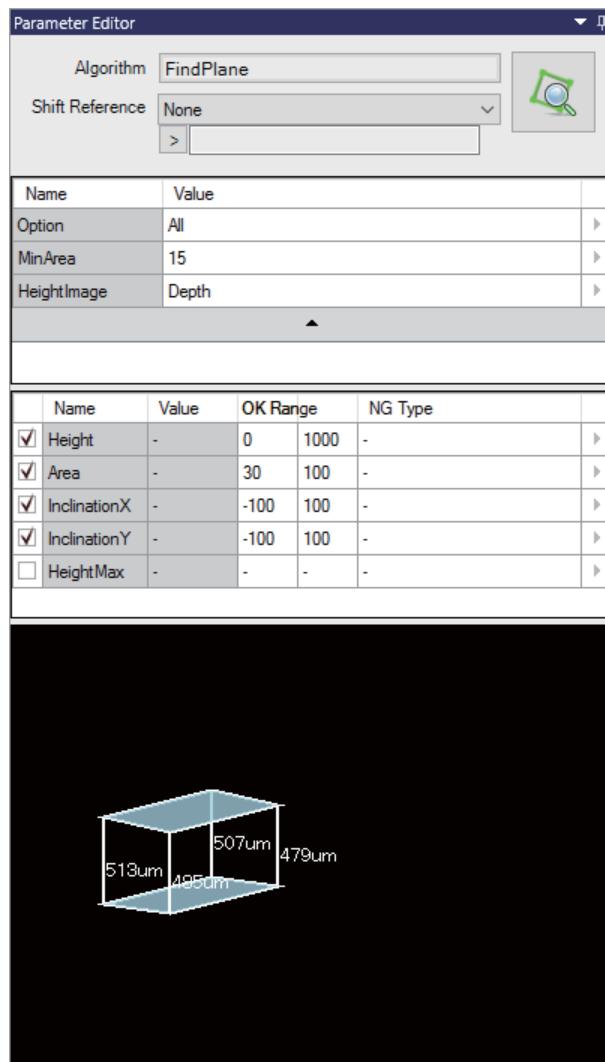


Figure 2-1 Dialog 1 (Version 1.0.0.0)

| Parameter | | Description |
|--------------|------|--|
| Option | Find | Automatically detects the plane within the inspection window and sets it to the inspection range. |
| | All | Specifies the entire inspection window as the inspection range. |
| Min Area | | This item is available only if Find is selected in Option . Specifies the minimum plane surface size to be automatically detected with a percentage of the size to the inspection window. If the percentage is smaller than the specified value, the flat surface is not detected. This item is available only when Find is selected in Option. |
| Height Image | | The item is for Saki engineers only. Do not change the setting. |

Table 2-1 Parameter

| Parameter | Description |
|---------------|--|
| Height | Specifies the acceptable range of the detected flat surface center height. If All is selected in Option , it specifies the acceptable range of the inspection window center height. |
| Area | Specifies the acceptable range of the percentage of the detected plane area to the inspection window. If Find is selected in Option , it specifies the acceptable range of the protruding area size to the inspection window. If All is selected in Option , the sample value is always set to 100 . |
| Inclination X | Specifies the acceptable range of the X-axis inclination of the detected component. |
| Inclination Y | Specifies the acceptable range of the Y-axis inclination of the detected component. |
| Height Max | If Find is selected in Option , the value of the pixel with the maximum height in the automatically detected plane is output as sample value. If All is selected in Option , the value of the pixel with the maximum height in the inspection window is output as sample value. |

Table 2-2 OK Range Setting 1

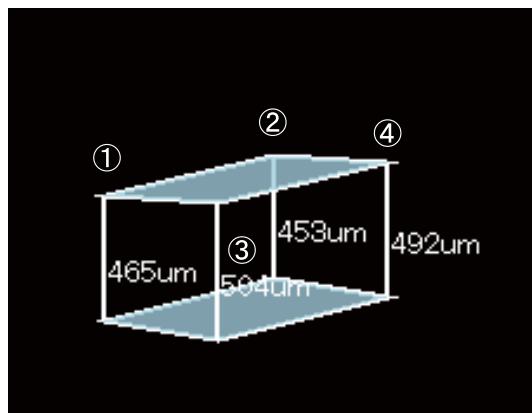


Figure 2-2 Dialog 2 (Version 1.0.0.0)

| Parameter | Description |
|-----------|---|
| 1 | [Height] sample value |
| 2 | [Height] sample value + [Inclination X] sample value |
| 3 | [Height] sample value + [Inclination Y] sample value |
| 4 | [Height] sample value + [Inclination X] sample value + [Inclination Y] sample value |

Table 2-3 OK Range Setting 2

2.1.3 Setting Procedure

Step1: Select **Find Plane** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: **When Find is Selected in Option**

Adjust the inspection window to match with the component size.

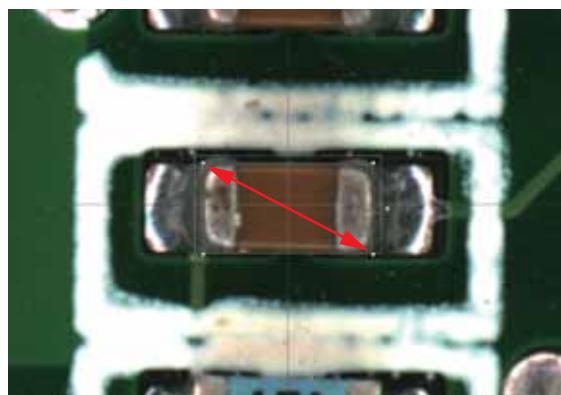


Figure 2-3 Adjusting the Inspection Window 1

When All is Selected in Option

Adjust the inspection window to match with a flat surface of the component.

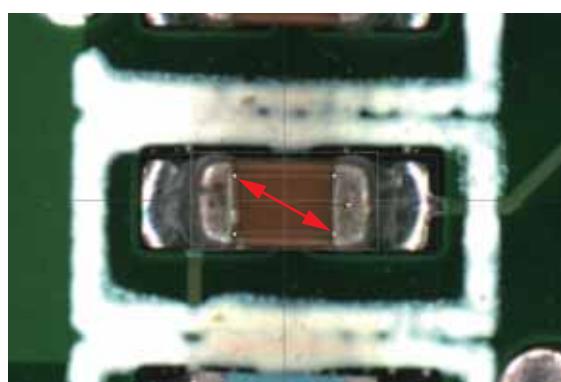


Figure 2-4 Adjusting the Inspection Window 2

Step3: Click and check if the component is detected.

The component height and inclinations to X and Y-axis are calculated.

NOTE

The inspection target area in an inspection window is displayed in green.



Figure 2-5 Detecting the Component

Step4: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE

If not performing the inspection, uncheck the item.

Step5: Click and check if the inspection is completed properly.

2.2 Height Difference

2.2.1 Inspection Overview

Height difference is the algorithm to calculate the difference in height between two points on a plane in the inspection window. **Height difference** is suitable for lifted lead of IC components.

2.2.2 Parameter Setting

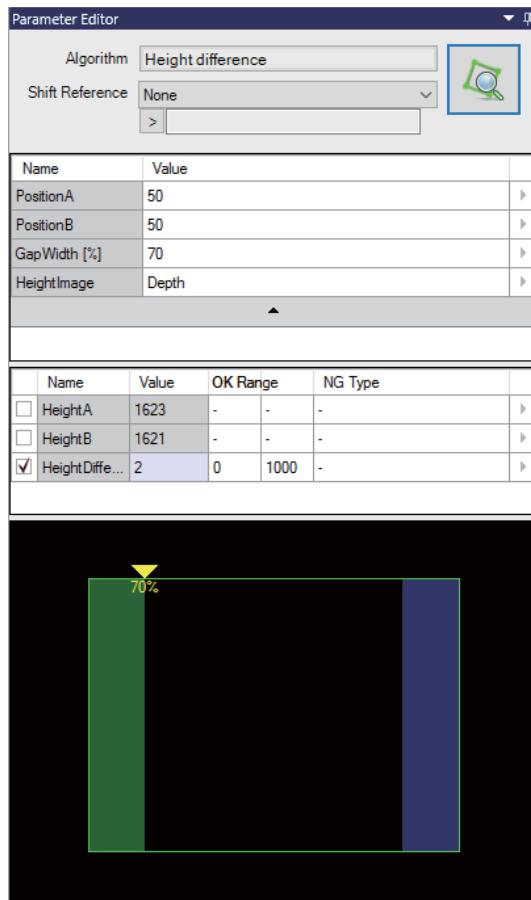


Figure 2-6 Dialog (Version 0.0.0.1)

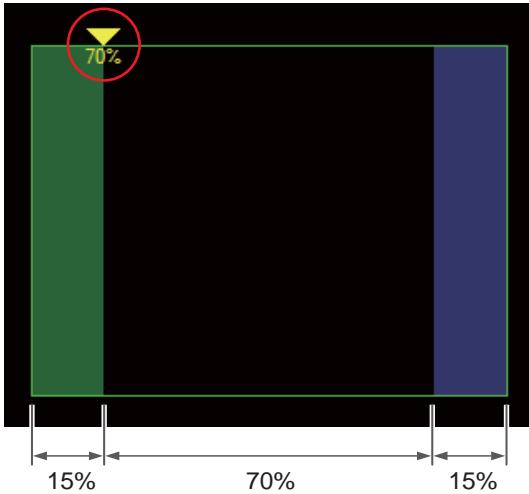
| Parameter | Description |
|---------------|---|
| PositionA | When the height measurement result is converted to a histogram, a value of the histogram is output as a sample value. Set 100 to output the maximum value of the histogram, 0 to output the minimum value and 50 to output the center value as the sample value. |
| PositionB | PositionA is the setting for the green area, and PositionB is the setting for the blue area in the inspection window. |
| Gap Width [%] | Specify what percentage of the field from the center of the inspection window should be out of the inspection range. The Gap Width[%] is linked with a graph at the lower part of the Parameter Editor . When 70[%] is specified, 70% of the field from the center of the window is not subject to inspection.  |
| Height Image | The item is for Saki engineers only. Do not change the setting. |

Table 2-4 Parameter

| Parameter | Description |
|------------------------|--|
| HeightA | HeightA is the output result of the height of the green area in the inspection window, and |
| HeightB | HeightB is the output result of the height of the blue area. |
| Height Difference [um] | Specifies the acceptable range of difference between Height A and Height B. |

Table 2-5 OK Range Setting

2.2.3 Setting Procedure

Step1: Select **Height difference** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Define the two points for which to measure the height difference and adjust the size of the inspection window and the **Gap Width [%]** value so that each area is included in the green area and blue area in the inspection window.

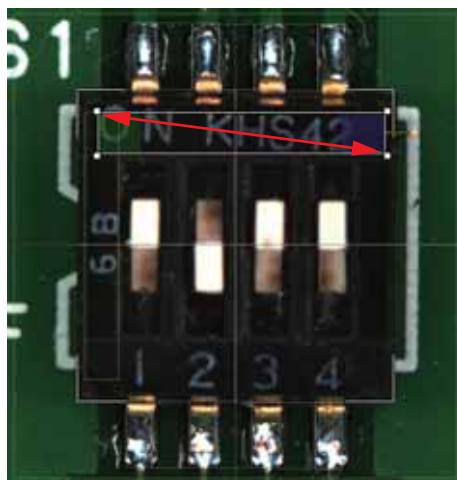


Figure 2-8 Adjusting the Inspection Window

Step3: Click and check that the height of each area and the difference are calculated.

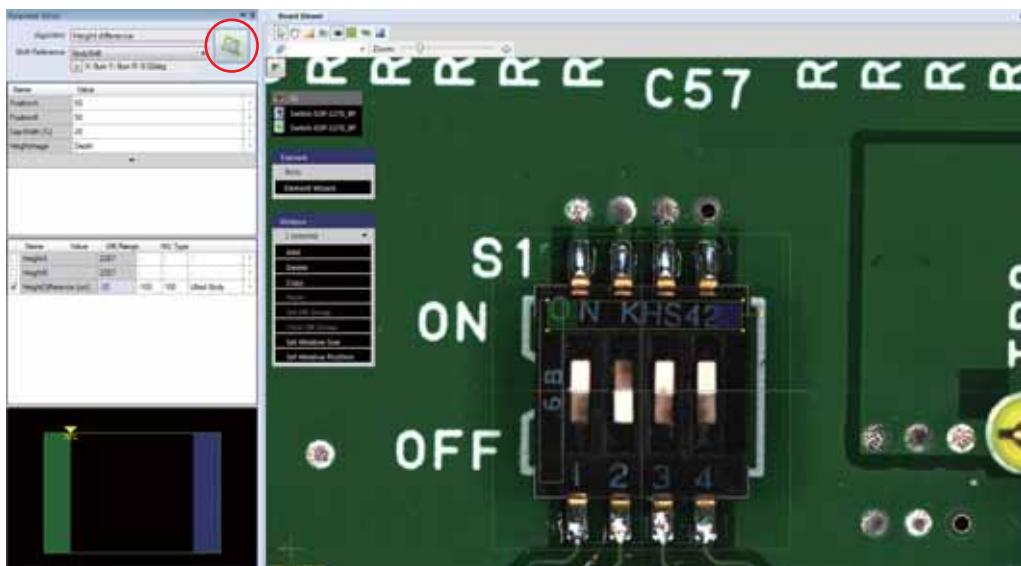


Figure 2-9 Detecting Height

Step4: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step5: Click and check if the inspection is completed properly.

2.3 Color Area

2.3.1 Inspection Overview

Color Area is the algorithm to inspect the color of the component.

The algorithm calculates the average color of the inspection window and displays the red circle marking at the graph in the lower side of **Parameter Editor**.

And displays the sample value of other component on same recipe as green circle marking.

For inspection, check the average color with the OK result and set the green area in the graph in advance.

Color Area is suitable for inspection of irregular-shape components and copper inspection.

2.3.2 Parameter Setting

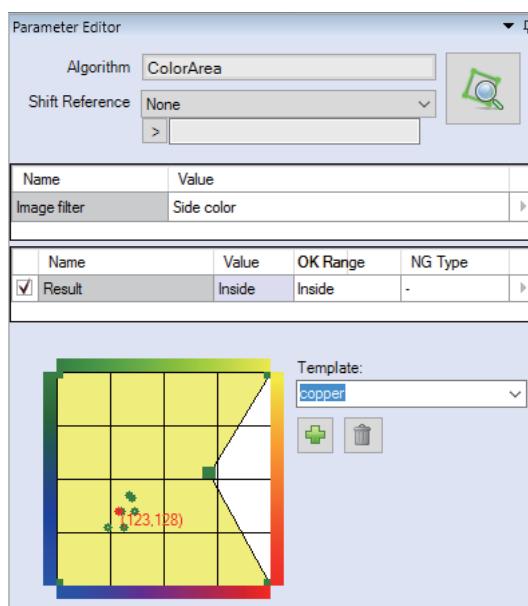


Figure 2-10 Dialog (Version 0.0.0.1)

| Parameter | Description |
|--------------|--|
| Image filter | Select a lighting which displays a color image such as Side color . |

Table 2-6 Parameter

| Parameter | Description | |
|---|---|--|
| Result | Inside | The inspection result becomes OK when the detected average color is in the OK range. |
| | Outside | The inspection result becomes OK when the detected average color is out of the OK range. |
| (The graph on the lower side of Parameter Editor) | Specifies the range of the color to be judged as OK/NG. The range can be changed by dragging each of the green rectangles. | |
| Template | Click to save the range setting of the current color. Click to delete the selected template. | |

Table 2-7 OK Range Setting

NOTE

If multiple items are selected on OK Range of **Result**, the inspection result becomes OK when one of the selected result types is detected.

2.3.3 Setting Procedure

Step1: Select **Color Area** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting which displays color images such as **Side color** from the **Image filter** drop-down list.

Step3: Adjust the inspection window to get color information.

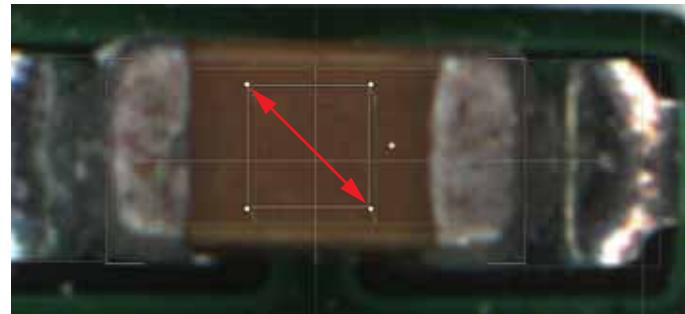


Figure 2-11 Adjusting the Inspection Window

Step4: Click and check if the average color is calculated.

The calculated value is displayed with the red circle mark in the graph on the lower side of **Parameter Editor**.

NOTE The sample value of other component on same recipe are displayed in the graph on the lower side of **Parameter Editor** as green circle marking by clicking blue circled on **Same Recipe Component List**.

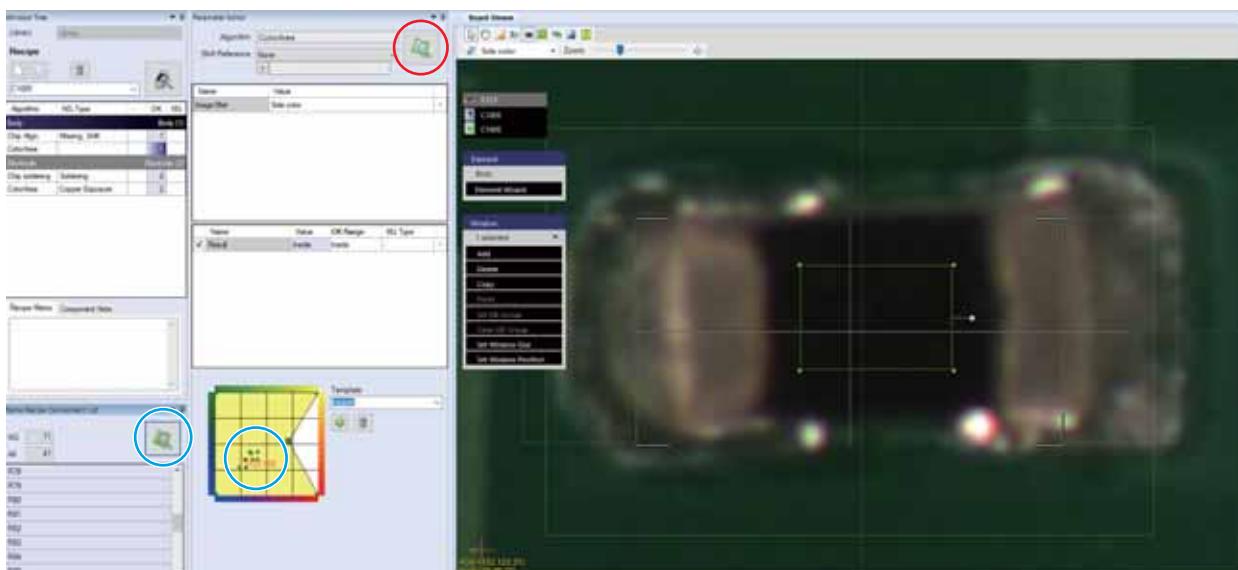


Figure 2-12 Calculating Average Color

- Step5: Set the OK/NG color range by dragging the five green rectangles displayed in the graph on the lower side of **Parameter Editor**.

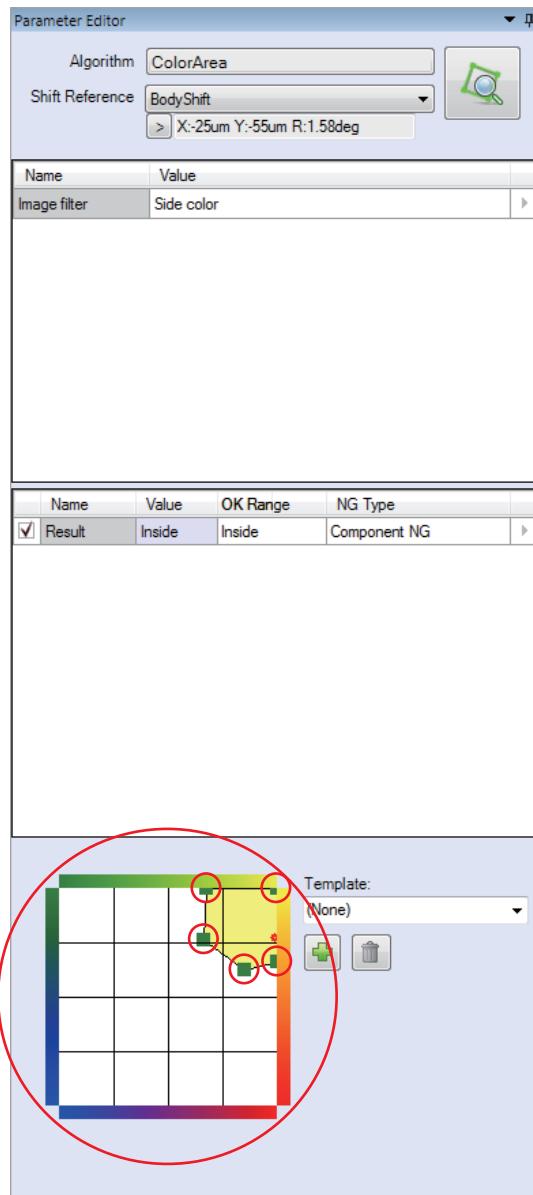


Figure 2-13 Setting the Color Area

- Step6: If the average color in the inspection window is within the specified range and it should be judged as OK
Select **Inside** in **OK Range**.

If the average color in the inspection window is out of the specified range and it should be judged as OK
Select **Outside** in **OK Range**.

- Step7: Click and check if the inspection is completed properly.

2.4 Black White

2.4.1 Inspection Overview

Black White is the algorithm to specify the acceptable range of the brightness level and to do an inspection by calculating the percentage of the area meeting the specified brightness level in the inspection window.

The algorithm judges the inspection result is OK if the percentage is higher than the specified value. **Black White** is suitable for the solder paste inspection of chip components.

2.4.2 Parameter Setting

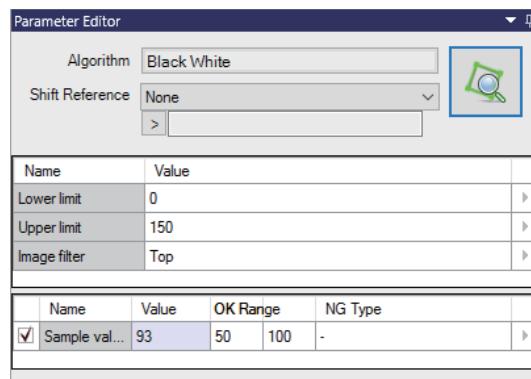


Figure 2-14 Dialog (Version 0.0.0.1)

| Parameter | Description |
|--------------|---|
| Lower limit | When the NG Brightness Level is Higher than the OK Brightness Level Enter the intermediate value of the OK and NG values to Upper limit . Enter 0 to Lower limit. |
| Upper limit | When the OK Brightness Level is Higher than the NG Brightness Level Enter 255 to Upper limit . Enter the intermediate value of the OK and NG values to Lower limit . |
| Image filter | Select a lighting that clearly displays the difference between the OK and NG brightness level. (When using this algorithm to the solder inspection, select Top .) |

Table 2-8 Parameter

| Parameter | Description |
|--------------|--|
| Sample value | Specifies the acceptable range of the percentage of the specified brightness level to the inspection window. |

Table 2-9 OK Range Setting

2.4.3 Setting Procedure

Step1: Select **Black White** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that clearly displays the difference between the OK and NG brightness level from the **Image filter** drop-down list.

NOTE When using this algorithm to the solder inspection, select **Top**.

Step3: Adjust the inspection window size and position.

NOTE

When using this algorithm to the solder inspection, adjust the inspection window size and position to surround the solder fillet.

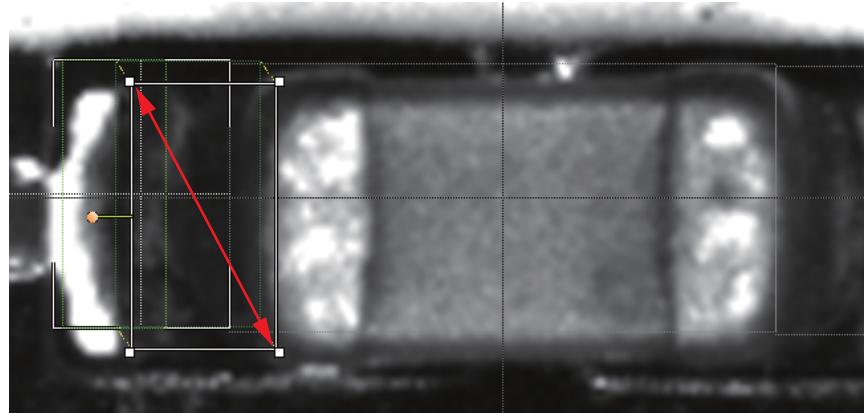


Figure 2-15 Adjusting the Inspection Window

Step4: Adjust the values of **Lower limit** and **Upper limit**.

If the NG Brightness Level is Higher than the OK Brightness Level

Enter the intermediate value of the OK and NG values to Upper limit. Enter **0** to **Lower limit**.

If the OK Brightness Level is Higher than the NG Brightness Level

Enter **255** to **Upper limit**. Enter the intermediate value of the OK and NG values to **Lower limit**.

Step5: Click and check if the component/fillet is detected.

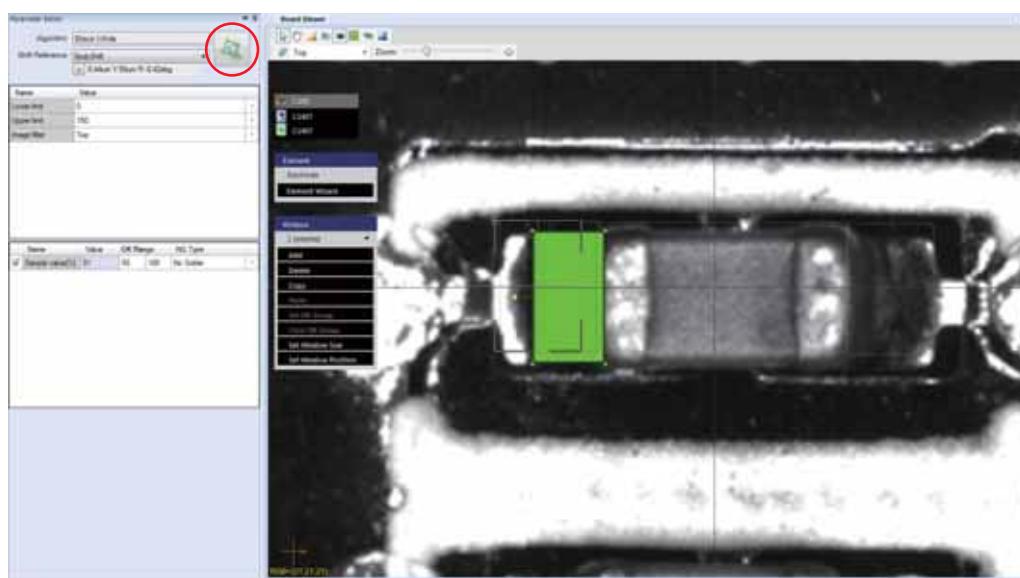


Figure 2-16 Detecting the Component

Step6: Set the acceptable range of the sample value.

NOTE

If not performing the inspection, uncheck the item.

Step7: Click and check if the inspection is completed properly.

2.5 Area Average

2.5.1 Inspection Overview

Area Average is the algorithm to specify the acceptable range of the brightness level. The algorithm outputs the percentage of the area meeting the specified brightness level and outputs an average brightness level of pixels meeting that level.

2.5.2 Parameter Setting

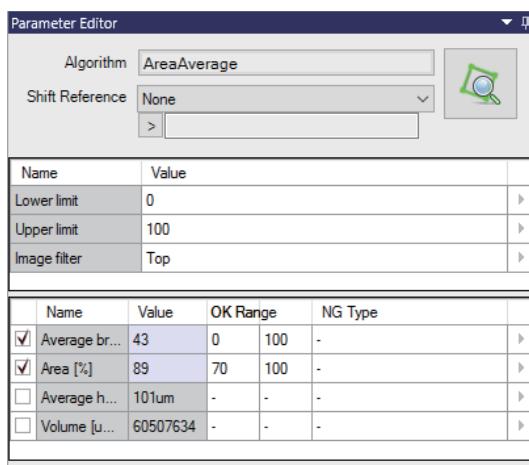


Figure 2-17 Dialog (Version 0.0.0.2)

| Parameter | Description |
|--------------|--|
| Lower limit | When the NG Brightness Level is Higher than the OK Brightness Level Enter the intermediate value of the OK and NG values to Upper limit . Enter 0 to Lower limit . |
| Upper limit | When the OK Brightness Level is Higher than the NG Brightness Level Enter 255 to Upper limit. Enter the intermediate value of the OK and NG values to Lower limit . |
| Image filter | Select a lighting that clearly displays the difference between the OK and NG brightness level. |

Table 2-10 Parameter

| Parameter | Description |
|---------------------|---|
| Average | Specifies the upper and lower limit of the average Brightness Level for the pixels which meet the specified Brightness Level. |
| Area [%] | Specifies the upper and lower limit of the percentage of the specified brightness level to the inspection window. |
| Average height [um] | Displays the average height of pixels that match the specified brightness value. |
| Volume [um3] | Displays the total volume of pixels that match the specified brightness value. |

Table 2-11 OK Range Setting

2.5.3 Setting Procedure

Step1: Select **AreaAverage** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that clearly displays the difference between the OK and NG brightness level from the **Image filter** drop-down list.

Step3: Adjust the inspection window size and position.

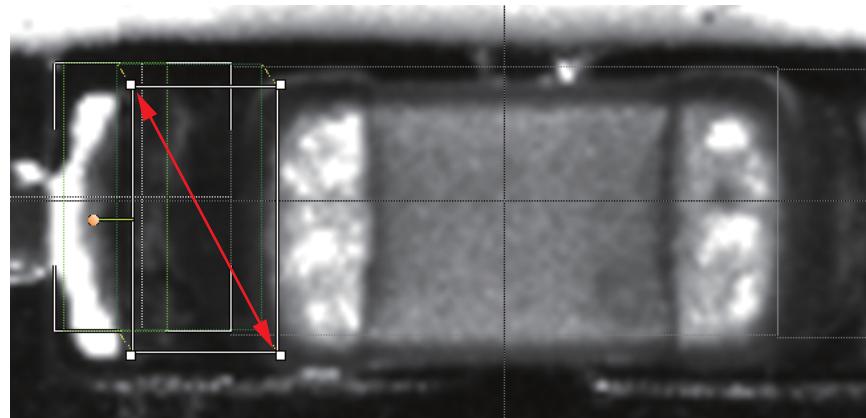


Figure 2-18 Adjusting the Inspection Window

Step4: Adjust the values of **Lower limit** and **Upper limit**.

If the NG Brightness Level is Higher than the OK Brightness Level

Enter the intermediate value of the OK and NG values to **Upper limit**. Enter 0 to **Lower limit**.

If the OK Brightness Level is Higher than the NG Brightness Level

Enter 255 to **Upper limit**. Enter the intermediate value of the OK and NG values to **Lower limit**.

Step5: Click and check if the inspection target is detected.

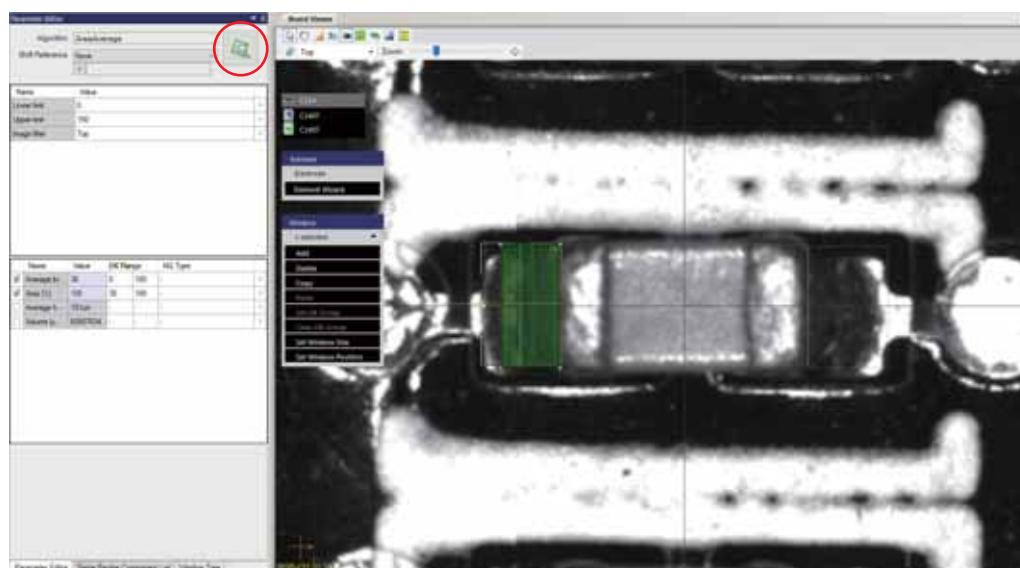


Figure 2-19 Detecting the Component

Step6: Set the acceptable range of the sample value.

NOTE If not performing the inspection, uncheck the item.

Step7: Click and check if the inspection is completed properly.

2.6 Bright Level

2.6.1 Inspection Overview

Bright Level is an algorithm to output the threshold value which is a ratio of the specified area and detect pixels which exceed the output threshold value.

Black White specifies the brightness threshold value, divides high brightness (bright) areas and low brightness (dark) areas in the inspection window, and outputs the ratio of those areas.

However, the **Bright Level** has the opposite inspection way to **Black White**, and outputs the threshold value which is the ratio of the specified area. The threshold value output by the **Bright Level** can be used with other algorithms and applied to the inspection of components with highly variable brightness.

2.6.2 Parameter Setting

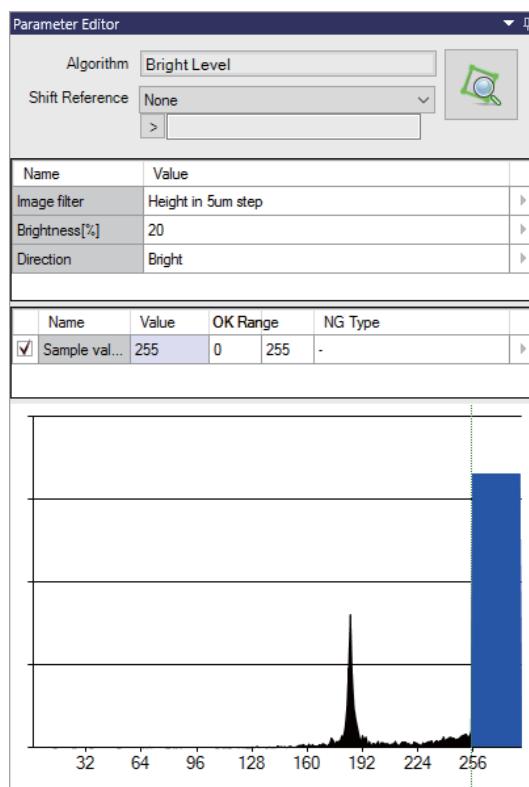


Figure 2-20 Dialog (Version 0.0.0.1)

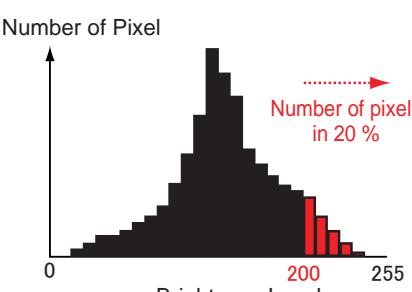
| Parameter | Description |
|--------------|---|
| Image filter | Select a lighting that clearly displays the difference between the OK and NG brightness level. (When using this algorithm to the solder inspection, select Top .) |
| Brightness | <p>Black White specifies the brightness threshold value, divides high brightness (bright) areas and low brightness (dark) areas in the inspection window, and outputs the ratio of those areas.</p> <p>However, the Bright Level has the opposite inspection way to Black White, and outputs the threshold value which is the ratio of the area specified in Brightness. Then, it detects pixels with values higher than the output threshold.</p>  <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <ul style="list-style-type: none"> • Brightness: 20% • Direction : Bright <p>↓</p> <p>Outputs a brightness threshold value where the section of high brightness (bright) is 20% of the total area in the inspection window (200 in this case)</p> </div> |
| Direction | <p>When specifying a ratio of the high brightness (bright) area in the inspection window, select Bright.</p> <p>When specifying a ratio of the low brightness (dark) area in the inspection window, select Dark.</p> |

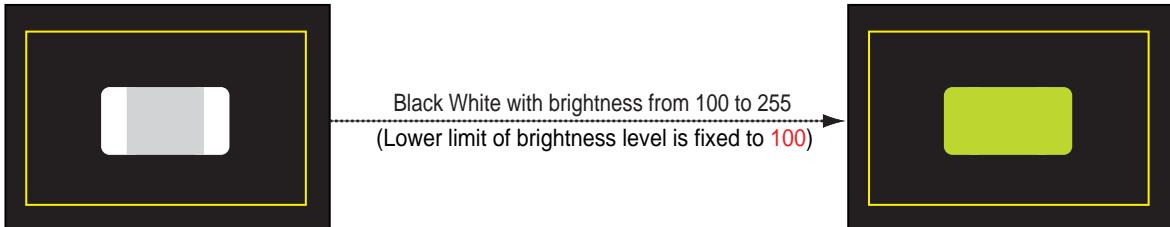
Table 2-12 Parameter

| Parameter | Description |
|--------------|--|
| Sample value | Specifies the acceptable range of the percentage of the specified brightness level to the inspection window. |

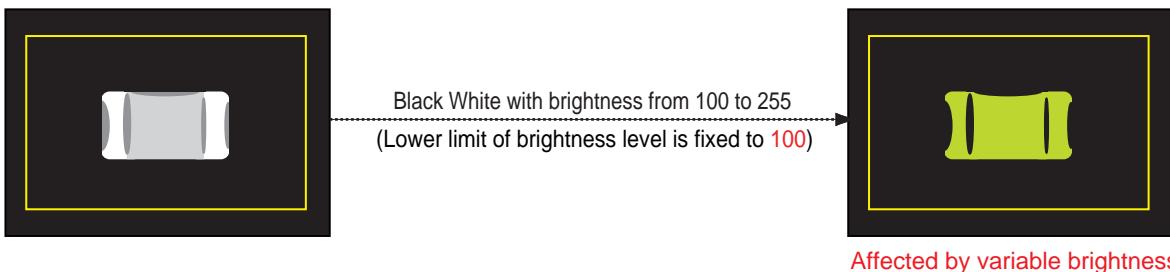
Table 2-13 OK Range Setting

Using Black White

- Components with ideal luminance

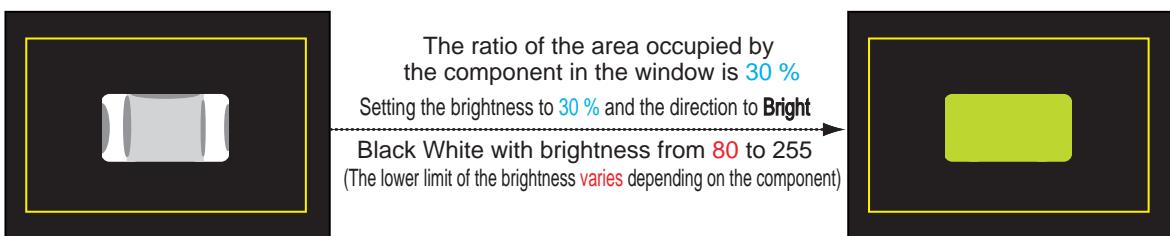


- Components with highly variable brightness and uneven luminance



Using BrightLevel

- Components with highly variable brightness and uneven luminance



Outputs a brightness threshold value where the section of high **brightness (bright)** is 30 % of the total area in the inspection window. In the case of the component above, the brightness threshold value is lower in comparison to the component with the ideal luminance (example: 80).

The lower limit can be made **variable** for each component by setting the brightness threshold value output by the BrightLevel to the lower limit of another Black White window.

Figure 2-22 Example of Brightness Level

2.6.3 Setting Procedure

- Step1: Select **Bright Level** from the **Algorithm** drop-down list.
- Step2: Select a lighting that clearly displays the difference between the OK and NG brightness level from the **Image filter** drop-down list.
- Step3: Adjust the inspection window size and position.

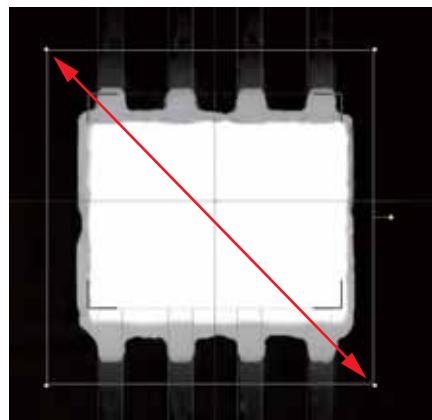


Figure 2-23 Adjusting the Inspection Window

- Step4: Adjust the values of **Brightness** and **Direction**.

- Step5: Click and check if the sample value is calculated.

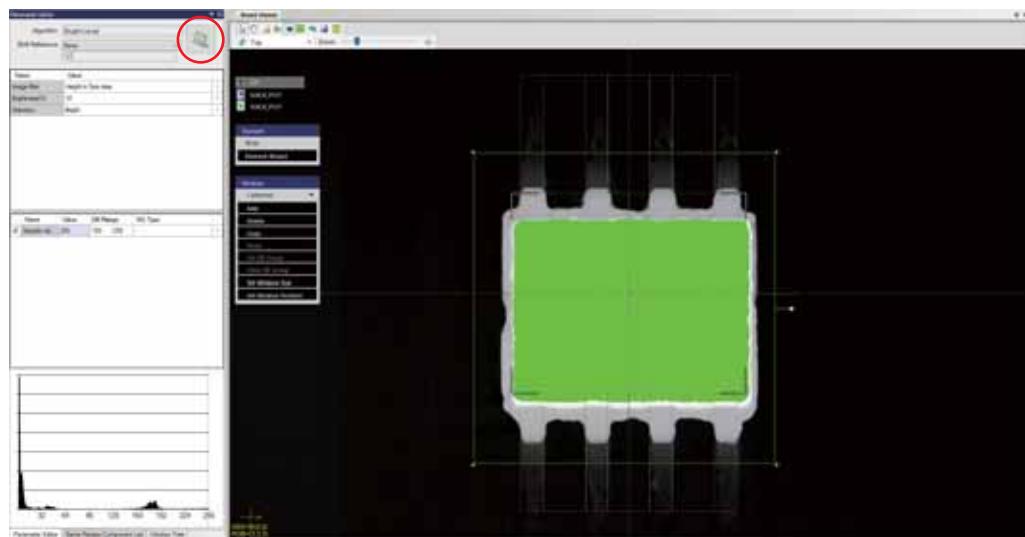


Figure 2-24 Detecting the Component

- Step6: Set the acceptable range of the sample value.

NOTE If not performing the inspection, uncheck the item.

- Step7: Click and check if the inspection is completed properly.

- Step8: Select the inspection window of an algorithm for which the threshold value output with **Bright Level** is used.
 Click ▶ to the right of the parameter to which the threshold value is applied to and select **Set reference**.

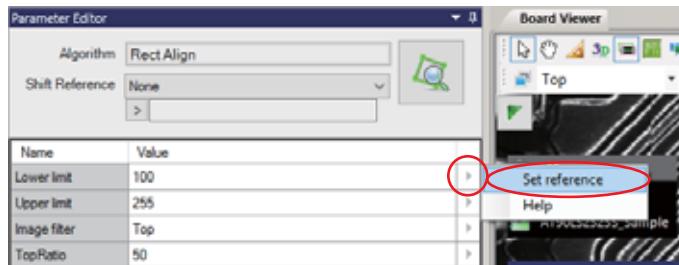


Figure 2-25 Reference Settings 1

- Step9: Check **Use reference parameter** and select **Bright Level** from Window and select [xxx]sample from Sample. Click **OK**.

NOTE The sample value output by the **Bright Level** is displayed in **xxx**.

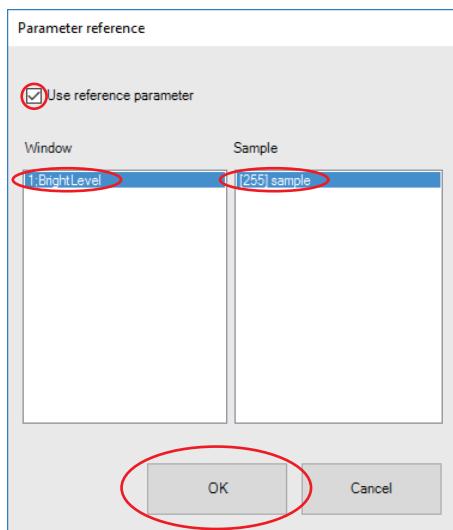


Figure 2-26 Reference Settings 2

- Step10: Check that the sample value output by the **Bright Level** is the specified parameter value.

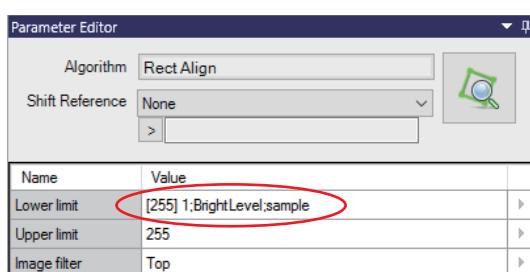


Figure 2-27 Reference Settings 3

2.7 Diagonally (Average)

2.7.1 Inspection Overview

Diagonally(Average) is an algorithm to compare the average brightness in the specified window with the average brightness within the window at the point symmetry location with reference to the center of the component. **Diagonally(Average)** is suitable for polarity inspection of IC components.

2.7.2 Parameter Setting

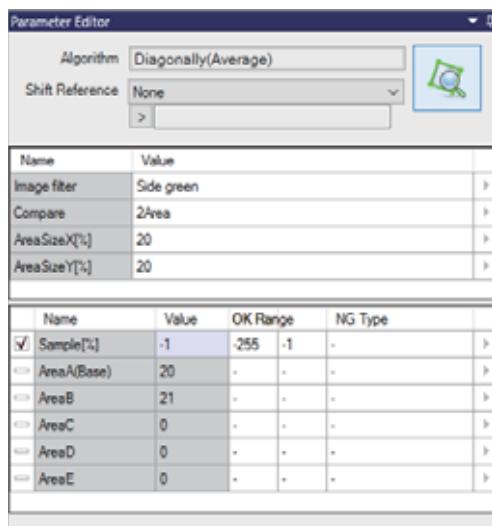


Figure 2-28 Dialog (Version 0.0.0.1)

| Parameter | Description |
|--------------|---|
| Image filter | Select a lighting that the brightness level difference between the polarity and the component body is visually clear. |
| Compare | Set the number of inspection windows to be compared. |
| AreaSizeX[%] | Set inspection area. Set what percentage of the field from the edge of the inspection window should be the inspection range. AreaSizeX[%] specifies the ratio of the length in the X direction and AreaSizeY[%] specifies the ratio of the length in the Y direction. |
| AreaSizeY[%] | |

Table 2-14 Parameter

| Parameter | Description |
|---------------|--|
| Sample | If brightness level of polarity is higher than brightness level of component body, enter 255 in Upper field and 1 in Lower field . If brightness level of polarity is lower than brightness level of component body, enter -1 in Upper field and -255 in Lower field . When Compare is set to 2Area , the difference in brightness between the AreaA window and window (AreaB) at the point symmetry location to AreaA is calculated and the result is set as the sample value. When Compare is set to 3Area , the difference in brightness between AreaA and the window (AreaC) located on the center of the component is calculated, in addition to the 2Area calculation. The largest brightness difference is set as the sample value. When Compare is set to 4Area , the differences in brightness between AreaA and the windows (AreaD, AreaE) at the line symmetry locations are calculated, in addition to the 2Area calculation. The largest brightness difference is set as the sample value. |
| AreaA ~ AreaE | AreaA is the average brightness of the polarity mark location. AreaB displays the average brightness of the point symmetry location with respect to AreaA. AreaC displays the average brightness of the component's center location. AreaD and AreaE display the average brightness of the location of line symmetry with respect to AreaA. |

Table 2-15 OK Range Setting

2.7.3 Setting Procedure

Step1: Select **Diagonally(Average)** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that a polarity is visually clear from the **Image filter** drop-down list.

Step3: Click  and adjust the inspection window size and position.

Adjust the location and size of the inspection window so that AreaA, which is enclosed by a bold yellow line, matches the location of the polarity mark.

AreaA is located in the upper left by default. If the polarity mark is not located in the upper left, rotate the inspection window so that AreaA matches the location of the polarity mark.

NOTE Adjust the location of AreaA's bold yellow line with the **AreaSizeX[%]** and **AreaSizeY[%]** settings.

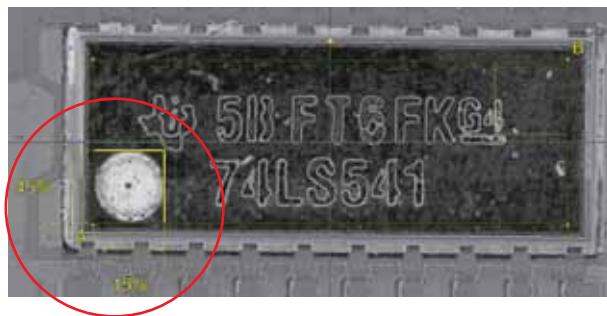


Figure 2-29 Adjusting the Inspection Window

Step4: Click  and check if the average brightness of each area is calculated.

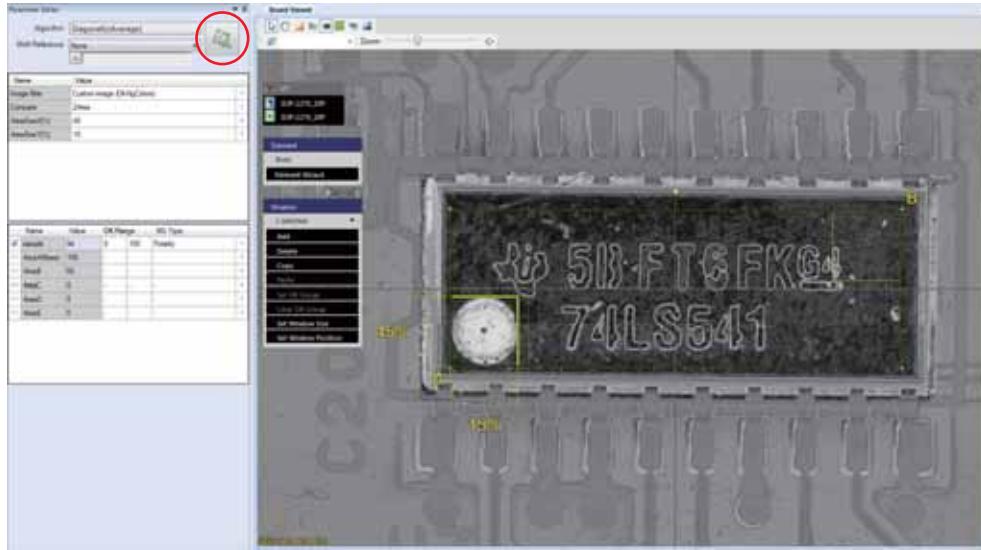


Figure 2-30 Detecting the Component

Step5: Set the acceptable range of the sample value.

NOTE If not performing the inspection, uncheck the item.

Step6: Click  and check if the inspection is completed properly.

2.8 Find Edge

2.8.1 Inspection Overview

Find Edge is the algorithm to detect a changing point of brightness in the inspection window.

Find Edge is suitable for the polarity inspection.

2.8.2 Parameter Setting

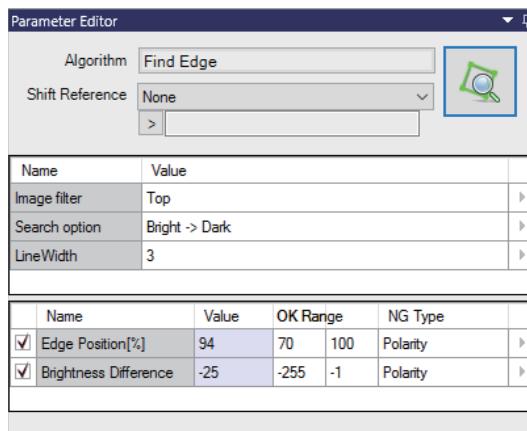


Figure 2-31 Dialog (Version 1.0.0.0)

| Parameter | Description |
|---------------|---|
| Image filter | Select a lighting that the brightness level difference between the polarity and the component body is visually clear. |
| Search option | When searching for edges of the component, set the option to Dark > Bright to detect dark to bright edges and Bright > Dark to detect bright to dark edges. |
| Line width | Set the bigger value to reduce noise. Default value is 3. |

Table 2-16 Parameter

| Parameter | Description |
|-----------------------|--|
| Edge Position [%] | Searches for edges in the direction of the yellow arrow in the inspection window and displays the location of the detected edges with a ratio of the inspection window's size. |
| Brightness Difference | Displays brightness difference of the edge. |

Table 2-17 OK Range Setting

2.8.3 Setting Procedure

Step1: Select **Find Edge** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that a polarity is visually clear from the **Image filter** drop-down list.

Step3: Adjust the inspection window size and position.

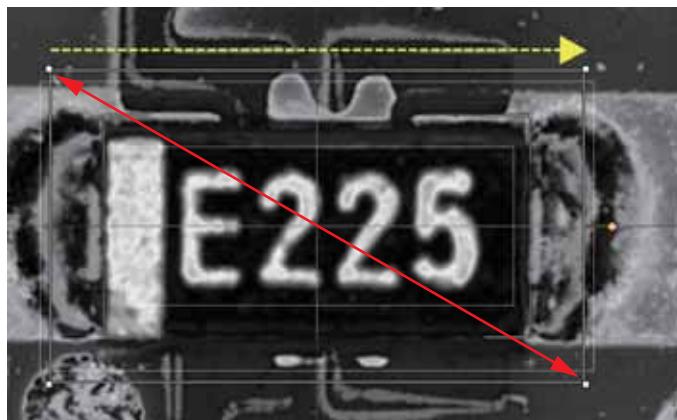


Figure 2-32 Adjusting the Inspection Window

Step4: Check the setting of **Search option**.

Step5: Click and check if the edge is detected.

The detected edge is displayed with a blue line.

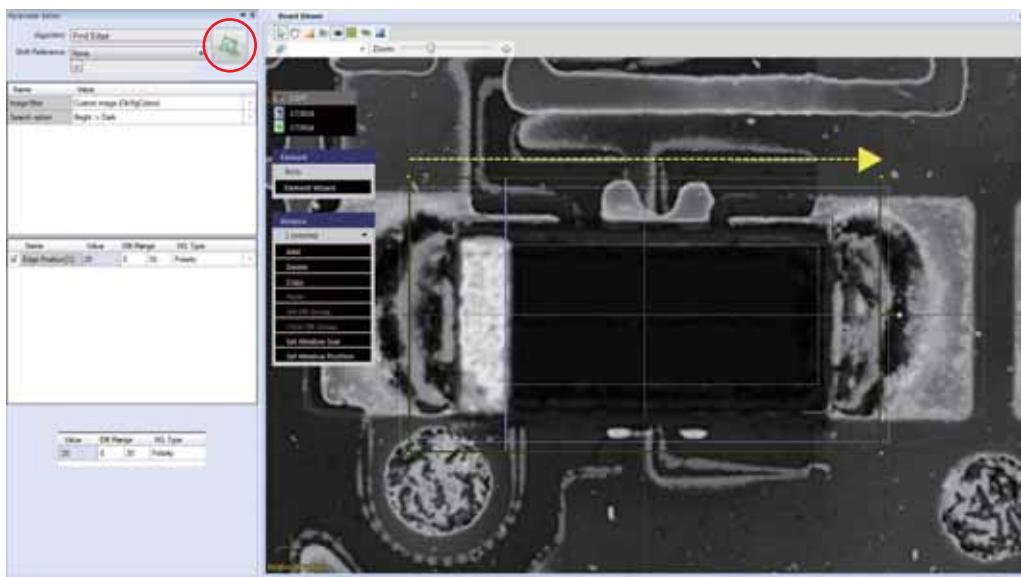


Figure 2-33 Detecting the Component

Step6: Set the acceptable OK range of the **Edge Position**.

NOTE If not performing the inspection, uncheck the item.

Step7: Click and check if the inspection is completed properly.

2.9 Brightness Statistic

2.9.1 Inspection Overview

Brightness statistic is the algorithm to calculate the average brightness level and the deference between the maximum and minimum brightness level in the inspection window.

Brightness statistic is suitable for the reverse inspection of chip components and the polarity inspection of IC components.

2.9.2 Parameter Setting

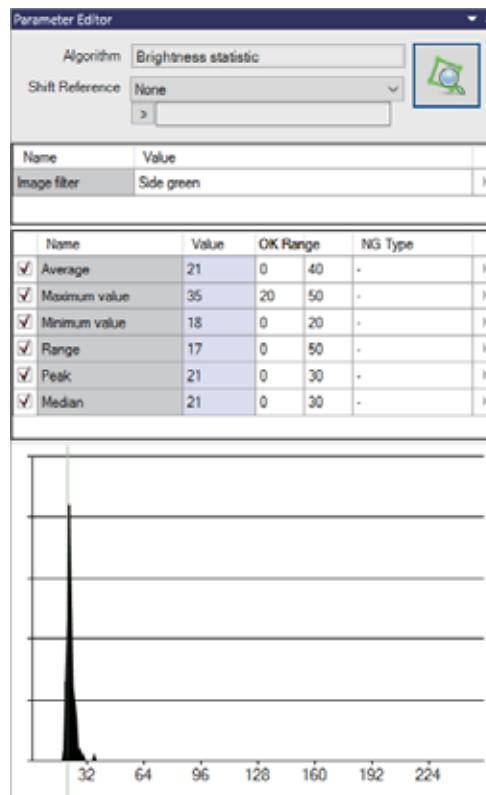


Figure 2-34 Dialog (Version 0.0.0.1)

| Parameter | Description |
|--------------|---------------------------------|
| Image filter | Selects an appropoate lighting. |

Table 2-18 Parameter

| Parameter | Description |
|---------------|---|
| Average | Specifies the acceptable range of the average brightness level in the inspection window. |
| Maximum value | Specifies the acceptable range of the maximum brightness level in the inspection window. |
| Minimum value | Specifies the acceptable range of the minimum brightness level in the inspection window. |
| Range | Specifies the acceptable range of the difference between the maximum and the minimum brightness level in the inspection window. |
| Peak | Specifies the acceptable range of the brightness level value with the largest number of pixels in the inspection window. |
| Median | Specifies the acceptable range of the median in the inspection window. The median is the center value of data when it is arranged in descending order. For example, the median of 0, 4, 7, 9, 30 is 7. The median can reduce the noise than the average. |

Table 2-19 OK Range Setting

2.9.3 Setting Procedure

Step1: Select **Brightness statistic** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select an appropriate lighting from the **Image filter** drop-down list.

Step3: Set the inspection window on the component.

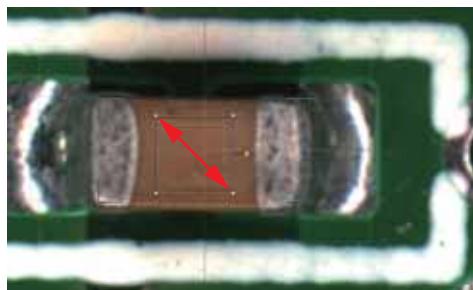


Figure 2-35 Adjusting the Inspection Window

Step4: Click and check if the brightness level value is detected.

The detected brightness level value is displayed on the lower side of **Parameter Editor** as the histogram.

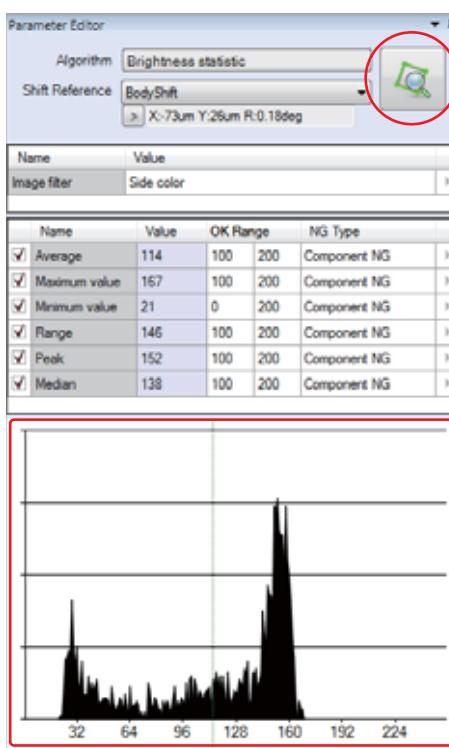


Figure 2-36 Detecting the Brightness Level

Step5: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step6: Click and check if the inspection is completed properly.

3 Pattern Recognition

3.1 Figure Matching

3.1.1 Inspection Overview

Figure Matching is the algorithm to calculate the match ratio between the specified pattern and the image in the inspection window.

Figure Matching is suitable for the polarity inspection.

3.1.2 Parameter Setting

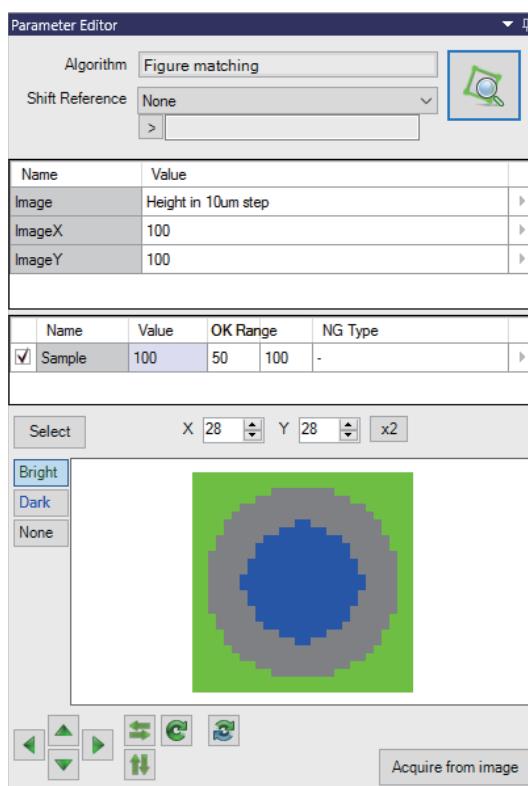


Figure 3-1 Dialog (Version 0.0.0.1)

| Parameter | Description |
|--------------|---|
| Image | Select a lighting that displays the inspection target clearly. |
| Image Size X | This detects the area that has a high match ratio with the set pattern from the inspection window. |
| Image Size Y | Setting Image Size X to 40 and Image Size Y to 70 detects the area having a high match ratio with the set pattern from the area which is 40% of the width and 70% of the height of the inspection window. |

Table 3-1 Parameter

| Parameter | Description |
|-----------|--|
| Sample | Specifies the acceptable range of the match ratio between the specified pattern and the scanned image. |

Table 3-2 OK Range Setting

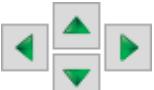
| Item | Description |
|---|--|
| Select | Selects a pattern from the template. |
| X | Specifies the number of pixels in the X-axis. |
| Y | Specifies the number of pixels in the Y-axis. |
| x2 | Doubles the number of pixels in the X and Y-axis. |
| Bright | Adds a bright pixel (green) to the pattern manually. |
| Dark | Adds dark pixel (blue) to the pattern manually. |
| None | Adds a pixel not to be inspected (gray) to the pattern manually. |
|  | Moves the pattern to the specified direction. |
|  | Inverts the X-axis of the pattern. |
|  | Inverts the Y-axis of the pattern. |
|  | Rotates the pattern 90 degrees to clockwise. |
|  | Interchanges the bright pixels (green) and dark pixels (blue). |
| Acquire from image | Extracts the pattern from the current image. |

Table 3-3 Description of Items on the Lower Side of Parameter Editor

3.1.3 Setting Procedure

Step1: Select **Figure Matching** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that displays the inspection target clearly from the **Image** drop-down list.

Step3: Adjust the inspection window to match with the inspection target such as the polarity mark.

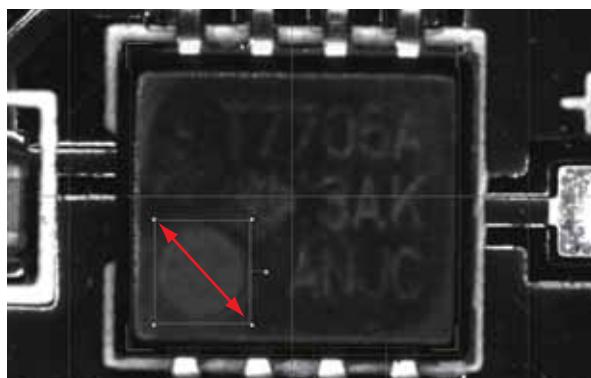


Figure 3-2 Adjusting the Inspection Window

Step4: When Selecting a Pattern from the Template

Click **Select** and select a pattern.

If necessary, modify the pattern using **Bright**, **Dark**, **None**, and other buttons.

When Making a Pattern Based on the Current Image

Click **Acquire from image**.

If necessary, modify the pattern using **Bright**, **Dark**, **None**, and other buttons.

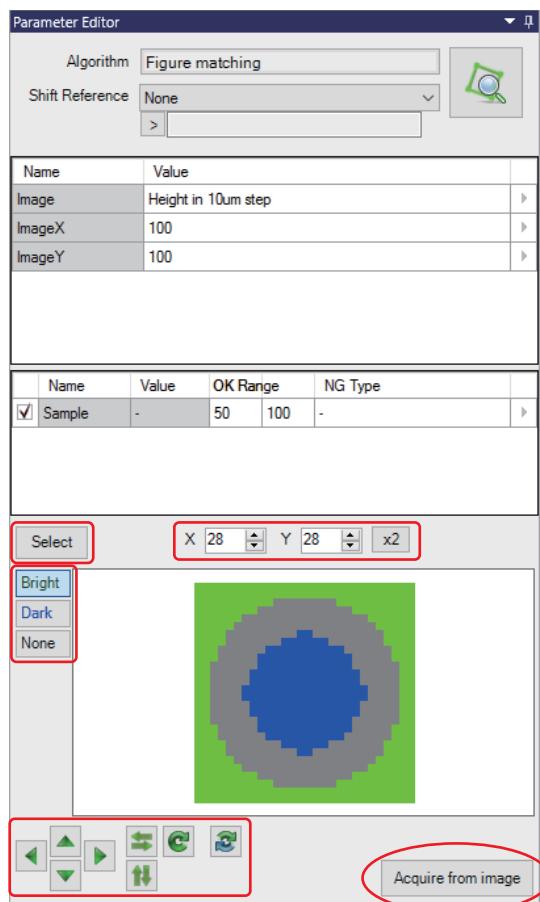


Figure 3-3 Setting the Pattern

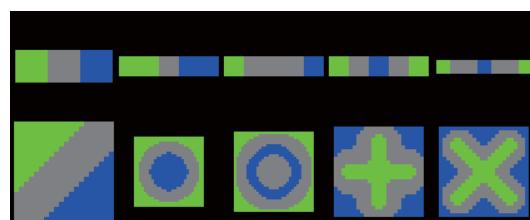


Figure 3-4 Patterns can be Selected from the Select button

- Step5: Click and check if the inspection target is recognized.
The area which does not match with the pattern is displayed in red.

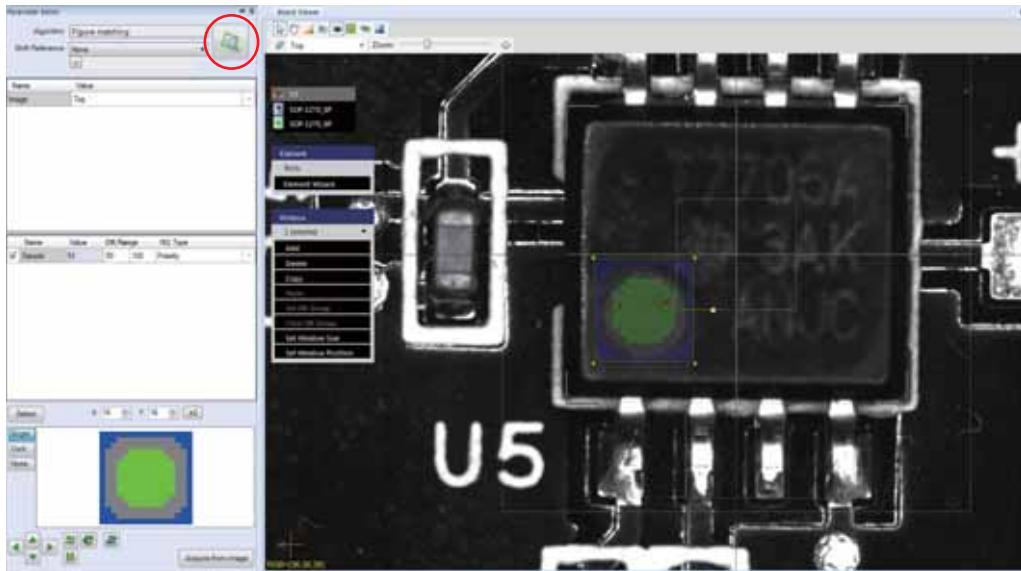


Figure 3-5 Detecting the Inspection Target

Step6: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

Step7: Click and check if the inspection is completed properly.

3.2 Image Match

3.2.1 Inspection Overview

Image Match is the algorithm to perform the image matching.

The algorithm takes the image of the good component and compares with the scanned image.

Symbols are also recognized in addition to alphanumeric characters.

Image Match is suitable for the missing inspection, miss-mounting inspection, and misalignment correction.

3.2.2 Parameter Setting

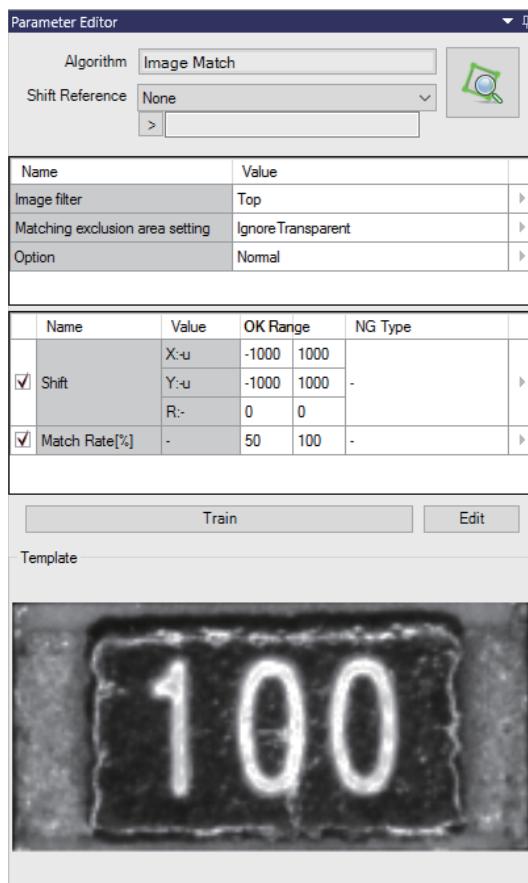


Figure 3-6 Dialog (Version 1.4.0.0)

| Parameter | | Description |
|---------------------------------|-----------------|---|
| Image Filter | | Selects a lighting that displays the target clearly. |
| Matching exclusion area setting | | Selects Ignore Transparent to use the filter function or Fast not to use the filter. |
| Option | Normal | This is set as default. Performs the inspection including the direction of the characters. |
| | Ignore Polarity | Performs the inspection while ignoring the direction of the characters. Select this item when inspecting a component with no polarity. |
| Train | | Saves the image of the specified area as the template image. |
| Edit | | Changes the Filter settings. |
| Template | | Displays the template image. |

Table 3-4 Parameter

| Parameter | | Description |
|------------|---------|---|
| Shift | X: -μm | Specifies the acceptable range of the X-axis distance between the center of the detected image and the center of the inspection window. |
| | Y: -μm | Specifies the acceptable range of the Y-axis distance between the center of the detected image and the center of the inspection window. |
| | R: -deg | Specifies the acceptable range of the detected image angle. Angular value increases clockwise and decreases counter-clockwise. |
| Match Rate | | Specifies the acceptable range of the matching rate. |

Table 3-5 OK Range Setting

3.2.3 Setting Procedure

Step1: Select **Image Match** from the **Algorithm** drop-down list.

Step2: Select a lighting that displays the inspection target clearly from the **Image Filter** drop-down list.

Step3: Adjust the inspection window to match with the component size.

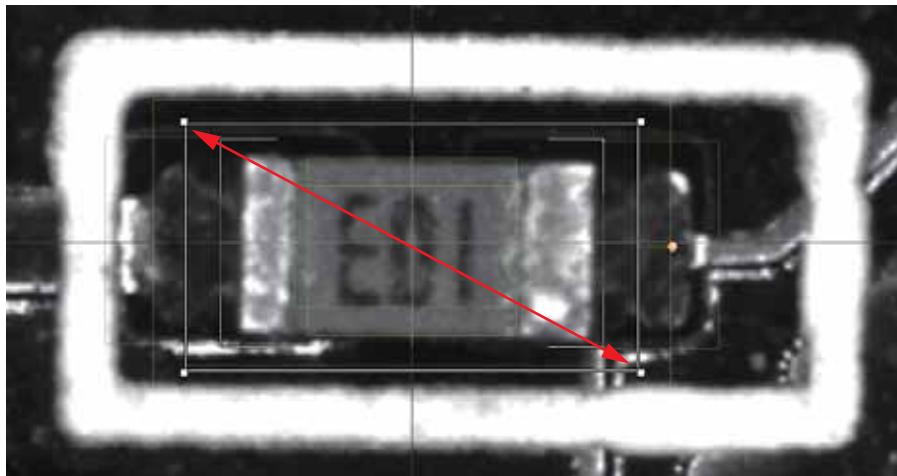


Figure 3-7 Adjusting the Inspection Window

Step4: Click **Train** on the lower side of **Parameter Editor**.

Step5: Specify the area to take the image and click **OK**.

The image taken in the specified area is displayed on **Template**.

NOTE

Window angles can be changed by dragging the circular mark on the right side of the window.

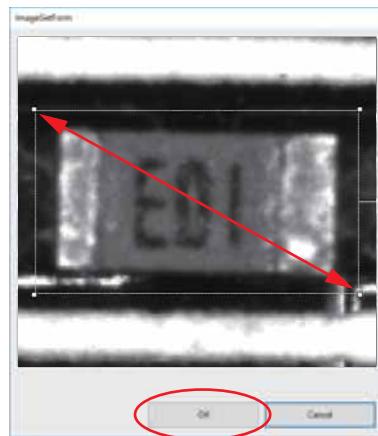


Figure 3-8 Taking the Template Image 1

Step6: Set the Option to **Ignore Transparent** to use the filter function and click **Edit** on the right of the **Train**.

With **Transparent** selected in the upper right, drag the area where the filter is to be applied. The blue and black checkered area is excluded from the inspection.

After all the settings are completed, click **OK**.

NOTE

This setting is effective for reducing noise effects.



Figure 3-9 Image Filter Function

Step7: Click and check if the inspection target is recognized.

When the target is recognized, the inspection window turns to green and the recognized area is surrounded by the yellow dot lines.

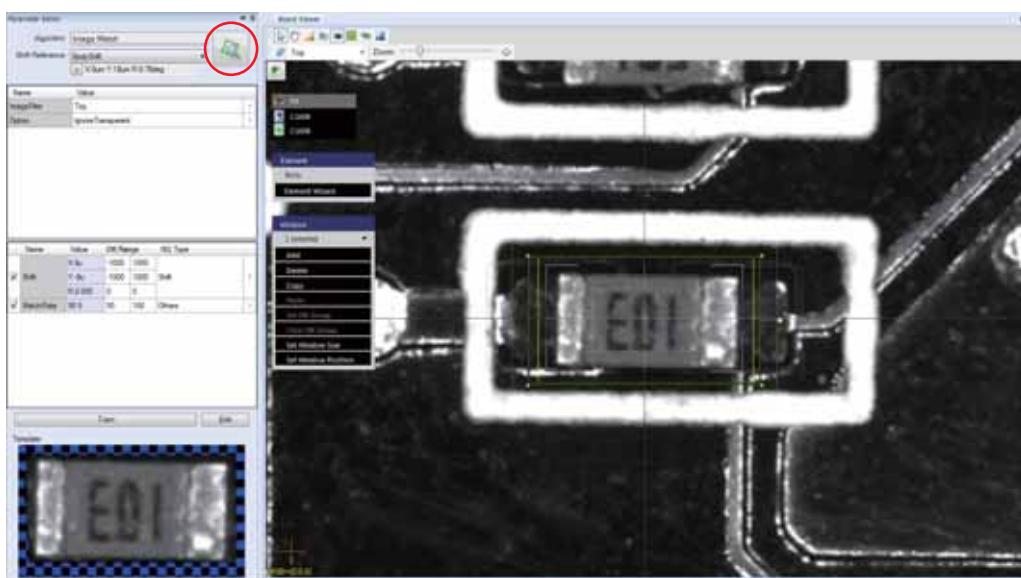


Figure 3-10 Detecting the Inspection Target

Step8: To share the Shift information calculated by this algorithm with other inspection windows, check the **Shift** on **Parameter Editor** and select **Body Shift** from the pop-up menu opened by left-clicking. After that, adjust the inspection windows by reference to **Part II 1.10.7 Adjusting Inspection Windows which Shift Information is Applied**.

Step9: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step10: Click and check if the inspection is completed properly.

3.3 Image List Match

3.3.1 Inspection Overview

Image list match is the algorithm to perform the image matching with multiple template images. This algorithm judges whether the captured image is close to the OK or the NG image group which were previously registered. **Image list match** is suitable for missing inspection which is difficult to be inspected by brightness level or inspections which false calls frequently occur.

3.3.2 Parameter Setting

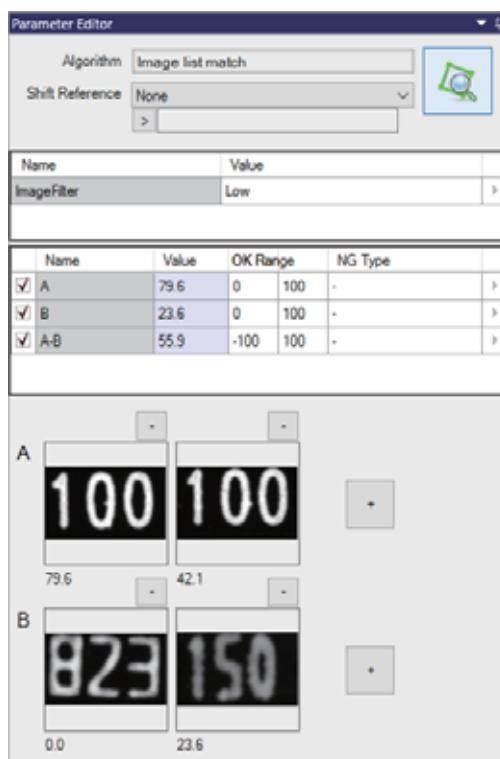


Figure 3-11 Dialog (Version 1.0.0.0)

| Parameter | Description |
|--------------|--|
| Image Filter | Selects a lighting that displays the target clearly. |
| [+] | Adds the template image. |
| [-] | Deletes the template image. |

Table 3-6 Parameter

| Parameter | Description |
|-----------|---|
| A | The match rate is displayed in the lower left of each template image. The highest matching rate among the A (OK image group) template images is displayed as the sample rate for A. |
| B | In the same manner, the highest matching rate among the B (NG image group) template images is displayed as the sample rate for B. |
| A-B | Displays the value of A-B. If the value is positive number, it can be recognized that the most similar image exists in A (OK image group). |

Table 3-7 OK Range Setting

3.3.3 Setting Procedure

- Step1: Select **Image list match** from the **Algorithm** drop-down list.
- Step2: Select a lighting that displays the inspection target clearly from the **Image Filter** drop-down list.
- Step3: Adjust the inspection window to match with the component size.

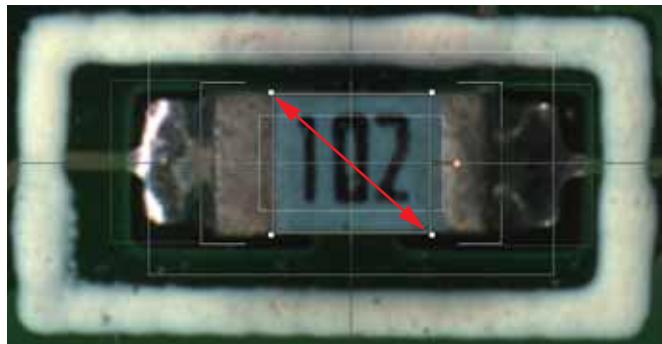


Figure 3-12 Adjusting the Inspection Window

- Step4: Add the template image. Click (+ button) to the right of A to add the image to the OK images or click (+ button) to the right of B to add it to the NG images.
- Step5: Click and check that the match rate is displayed in the lower left of each template.



Figure 3-13 Detecting the Inspection Target

- Step6: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

- Step7: Click and check if the inspection is completed properly.

3.4 OCV

3.4.1 Inspection Overview

OCV is the algorithm to perform the character image matching.

This algorithm registers character images on good components as a font and compares captured character images with them by pattern matching. Judgment (OK or NG) is performed based on its matching ratio.

OCV is suitable for missing and miss-mounting.

3.4.2 Parameter Setting

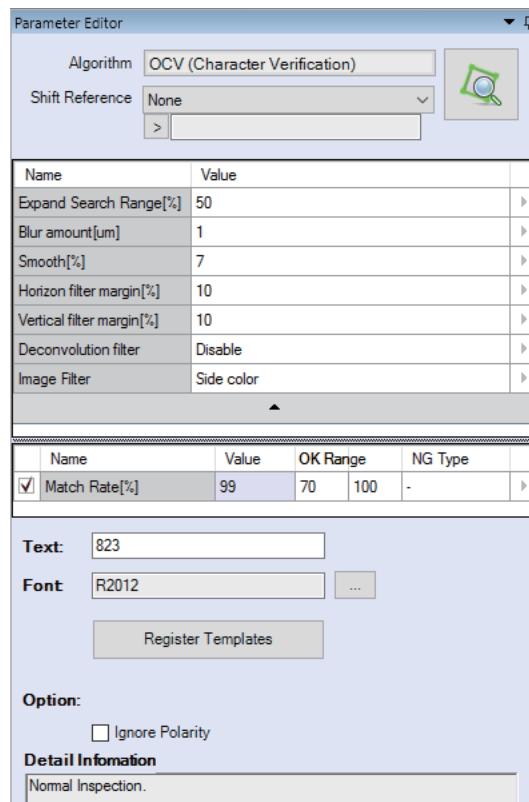


Figure 3-14 Dialog (Version 2.1.0.0)

| Parameter | | Description |
|---------------------------|-----------------|---|
| Expand Search Range [%] | | Expands the auto search area for the first character (displayed in the yellow dot lines). OCV searches the first character at first and finds the rest of characters based on the first character position. |
| Image Filter | | Selects a lighting that displays the characters clearly. |
| Deconvolution filter | | Inspects with using deconvolution filter. Inspection is performed with the image inside of pink dotted line. |
| Blur amount[μm] | | Specifies the blur amount of deconvolution filter. |
| Smooth[%] | | Specifies the parameter to remove noise occurred by deconvolution filter. |
| Horizon filter margin[%] | | Specifies the horizontal margin of inspection area when using deconvolution filter. The margin is displayed as pink dotted line. |
| Vertical filter margin[%] | | Specifies the vertical margin of inspection area when using deconvolution filter. The margin is displayed as pink dotted line. |
| Text | | Enters the characters to be registered. |
| Font | | Specifies the place to save the characters. |
| Register Templates | | Registers the template image. |
| Option | Ignore Polarity | Performs the inspection with ignoring the direction of the characters. Check this item when inspecting a component with no polarity. |
| Detail Information | | The detailed information of inspection is displayed. [No image registered] No template image is registered. [Warning] Template image is bigger than inspect area. [Ignore Polarity] Ignore Polarity inspection is performed. [Found 1st character] The inspection area for first character is shifted because some first characters are detected. |

Table 3-8 Parameter

| Parameter | Description |
|------------|--|
| Match Rate | Specifies the acceptable range of the matching rate of the images. |

Table 3-9 OK Range Setting

3.4.3 Setting Procedure

Step1: Select **OCV** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that displays the character clearly from the **Image Filter** drop-down list.

Step3: Click  on the right side of **Font**.

NOTE Shape name is assigned to **Font** automatically in version 2.1.0.0 or greater.

Step4: Select a font to register the characters and click **Close**.

NOTE

To add a new font, click **New**.

For details, refer to **3.4.4 How to Check the Registered Characters**.

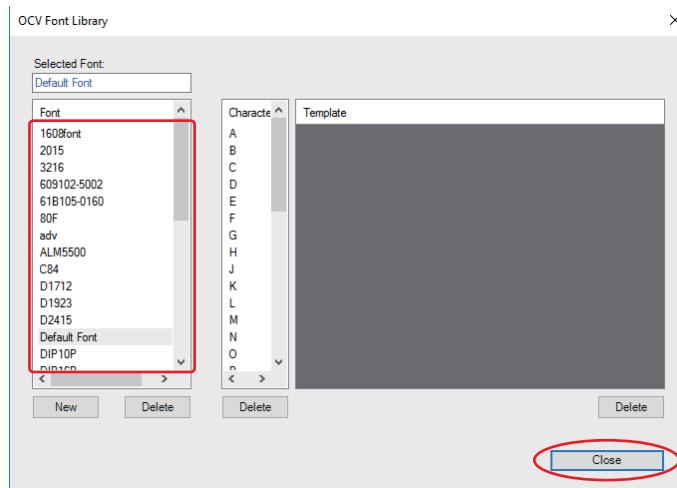


Figure 3-15 OCV Font Library

Step5: Enter the characters to register them **Text**.

Step6: Click **Register Templates**.

Step7: Select a lighting that displays the character clearly from the **Image Filter** drop-down list.

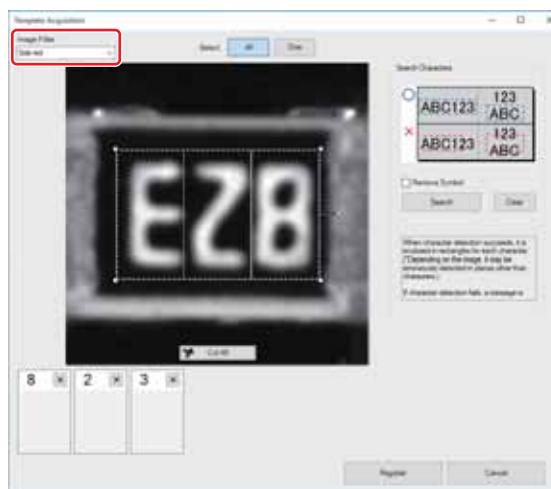


Figure 3-16 Template registration

Step8: Move the white point on the side of the inspection window to the side of the last character by mouse-dragging.

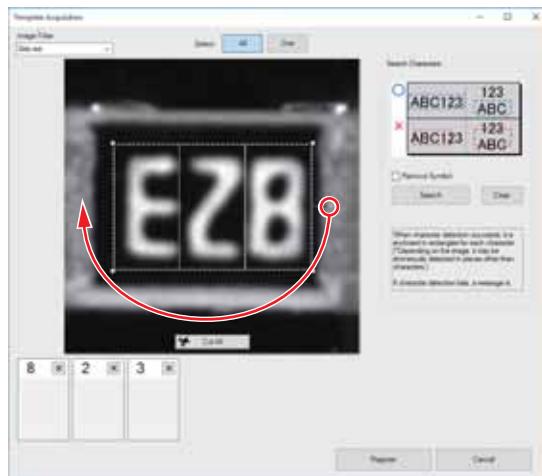


Figure 3-17 Adjusting the Inspection Window 1

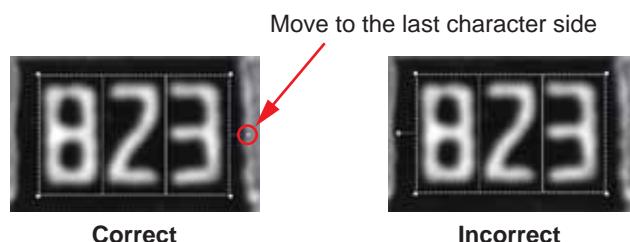


Figure 3-18 Correct Angle

Step9: Adjust the inspection window to surround the characters and separates each character by the white lines.

NOTE Zooming in/out of image is available by wheel of mouse in version 2.1.0.0 or greater.

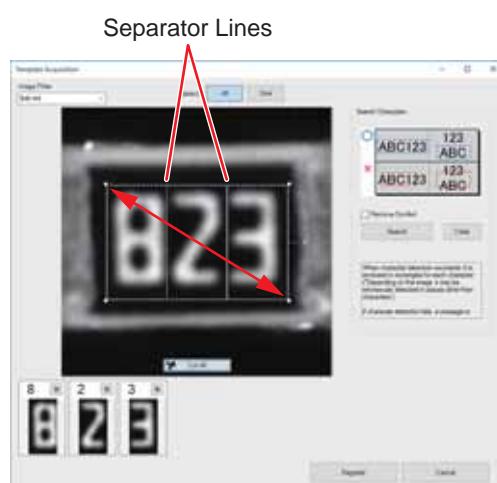


Figure 3-19 Adjusting the Inspection Window 2

For searching characters automatically

To search characters automatically, set inspection window to surround the characters for registration and click **Search**.

NOTE When auto searching is failed, click **Clear** to reset inspection result.

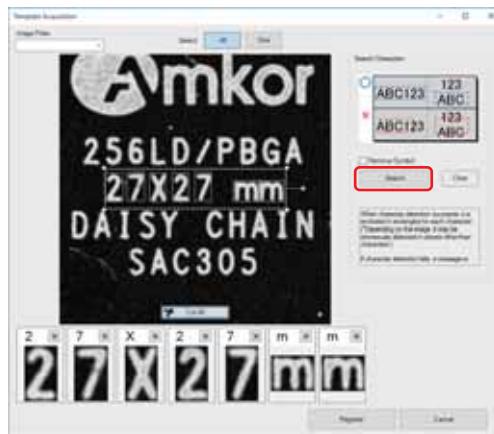


Figure 3-20 Search Characters Automatically

For searching only characters except symbols

To search characters except symbols, check **Remove Symbol** and click **Search**.

NOTE When auto searching is failed, click **Clear** to reset inspection result.

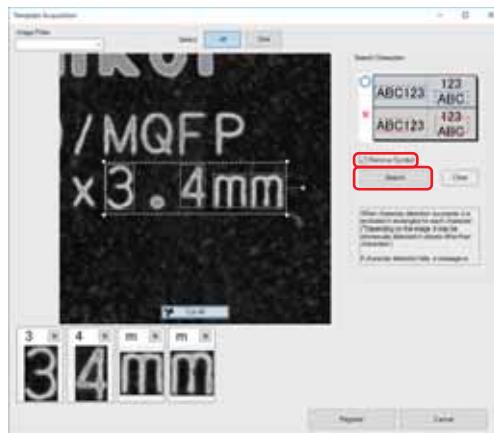


Figure 3-21 Remove Symbol Automatically

Step10: After all adjustments are completed, click **Cut All**. The template image is displayed in the lower left side of the window If the template image is OK, click **Register**. The template image is registered to the specified font.

NOTE To check the added characters, click the button on the right side of **Font**.
For details, refer to **3.4.4 How to Check the Registered Characters**.

Step11: Click  and check if the characters are searched.

The first character is displayed in the blue rectangle and the rest of the characters are displayed in the pink rectangles.



Figure 3-22 Detecting the Characters

Step12: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

Step13: Click  and check if the inspection is completed properly.

3.4.4 How to Check the Registered Characters

To check the registered characters, click **[...]** on the right side of **Font**.

After all the setting is completed, click **Close** to close the dialog.

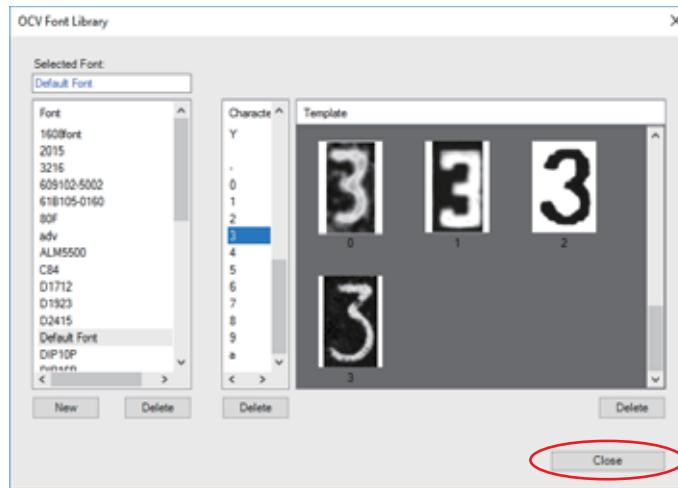


Figure 3-23 Dialog

| Item | Description |
|---------------|--|
| Selected Font | The font currently selected. |
| Font | The list of fonts can be selected. New : Makes a new font. Delete : Deletes a font. |
| Character | The list of characters registered to the selected font. Delete : Deletes the selected character. |
| Template | Shows the image registered to the character. Delete : Deletes the selected image. |
| Close | Closes the dialog. |

Table 3-10 Descriptions

3.4.5 Deconvolution Filter

By using deconvolution filter, the blur of image can be removed.

This image filter is effective for the character inspection of component which is out of focus (e.g., tall electrolytic condenser).

CAUTION

Deconvolution filter needs much calculation, so inspection time will be longer.
It is recommended to enable this only the inspection which needs deconvolution filter.

Step1: Select **Enable** from **Deconvolution filter** drop-down list.

Step2: Proceed setting by reference to Step1 to Step8 of **3.4.3 Setting Procedure**.

Step3: Set **Blur amount[μm]** and **Smooth[%]** as the image is displayed clearly.

NOTE

Set **Horizon filter margin[%]** and **Vertical filter margin[%]** and adjust inspection are if the noise is generated in the corner of image by deconvolution filter, and that effects inspection. Inspection is performed with the image inside of pink dotted line.



Figure 3-24 Original Image

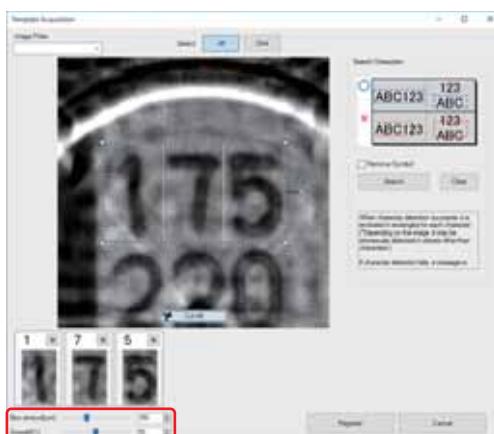


Figure 3-25 Deconvolution Filter

Step4: Proceed setting and inspection by reference to Step9 to Step12 of **3.4.3 Setting Procedure**.

3.5 OCR

3.5.1 Inspection Overview

OCR is the algorithm to recognize characters.

This algorithm registers character images of good components and compares captured character images.

OCR is suitable for the missing inspection and miss-mounting inspection.

3.5.2 Parameter Setting

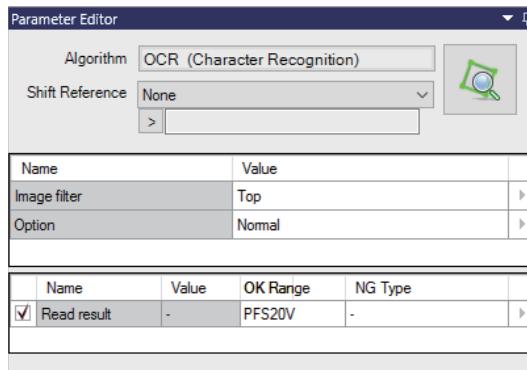


Figure 3-26 Dialog (Version 1.0.0.0)

| Parameter | | Description |
|--------------|----------|---|
| Image filter | | Selects a lighting that displays the characters clearly. |
| Option | Normal | This is set as default. Performs the inspection for the characters and its direction. |
| | Ignore | Performs the inspection with ignoring the direction of the characters. |
| | Polarity | Select this item when inspecting a component with no polarity. |

Table 3-11 Parameter

| Parameter | Description |
|-------------|--|
| Read result | Displays the result of character recognition and registration. |

Table 3-12 OK Range Setting

3.5.3 Setting Procedure

Step1: Select **OCR** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that displays the character clearly from the **Image Filter** drop-down list.

Step3: Adjust the inspection window to surround the characters.

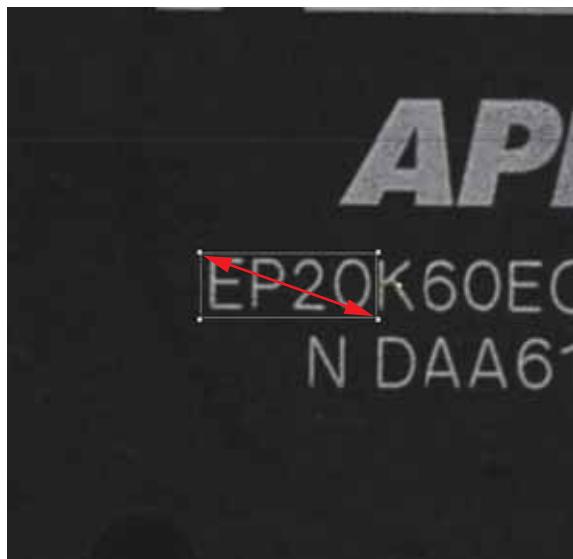


Figure 3-27 Adjusting the Inspection Window

Step4: Move the yellow point on the side of the inspection window to the end of the last character by mouse-dragging.



Figure 3-28 Adjusting the Inspection Window Angle

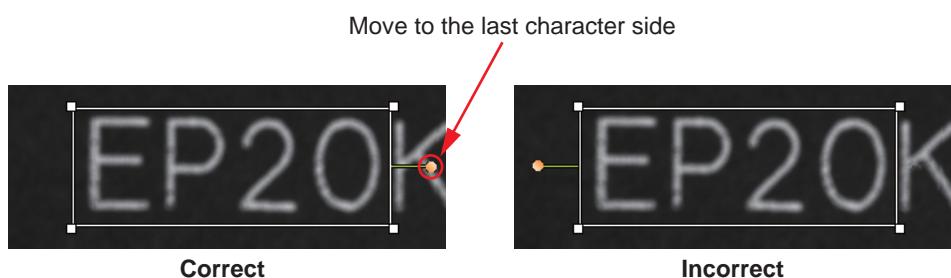


Figure 3-29 Correct Angle

Step5: Click the **OK Range** cell.

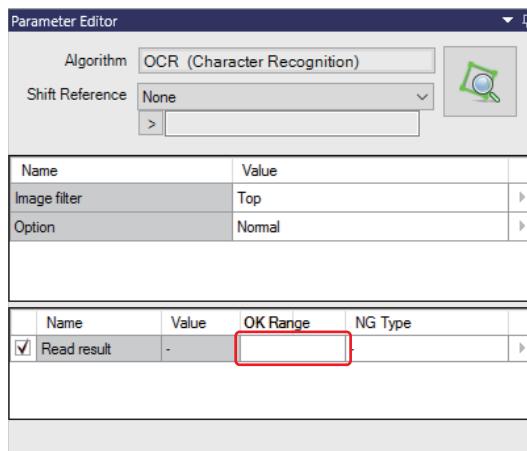


Figure 3-30 OK Range

Step6: Enter the characters to be registered into **Match what** and click **x** on the upper right side of the dialog.

NOTE

In **Match what**, two special characters, "?" and "*", can be used for recognizing when **Use regular expressions** is not checked. "?" matches any single characters. "*" matches any characters which length is more than 0.
e.g., a?c matches to aac, abc, acc, etc.
a*c matches to ac, aaac, abac, etc along with the above.

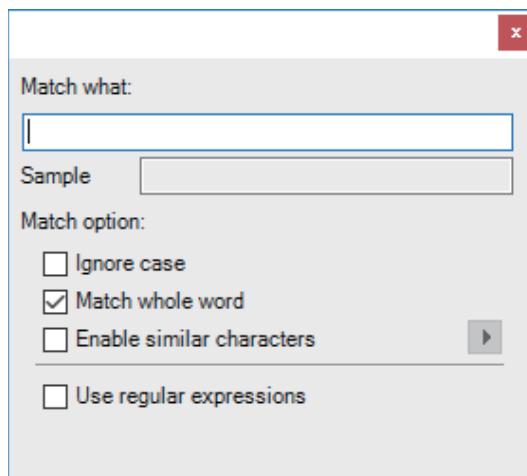


Figure 3-31 Match what

| Item | Description |
|------------------|---|
| Ignore case | Ignores upper and lower cases. |
| Match whole word | Allows the result to be OK only when the characters completely matched with the registered characters. e.g., When 23 is entered in Match what and 1234 is detected, the inspection result becomes NG if Match whole word is checked. If Match whole word is unchecked, the inspection result becomes OK. |

| Item | Description |
|---------------------------|--|
| Enable similar characters | <p>Use this item when the algorithm miss-recognizes the characters which have the similar forms such as 1 (one) and I or 0 (zero) and O. When this function is enabled, the inspection result becomes OK whichever the character is recognized.</p> <p>To set similar characters, click  to display the dialog shown below.</p>  |
| Use regular expressions | <p>When checked, regular expressions can be used for recognizing.</p> <p>e.g., When 123[0-9] is entered in Match what, the inspection result becomes OK if whichever of the numbers from 1230 to 1239 is recognized.</p> |

Table 3-13 Descriptions

Step7: Set **NG Type** for when Sample value becomes NG.

Step8: Click  and check if the inspection is completed properly.

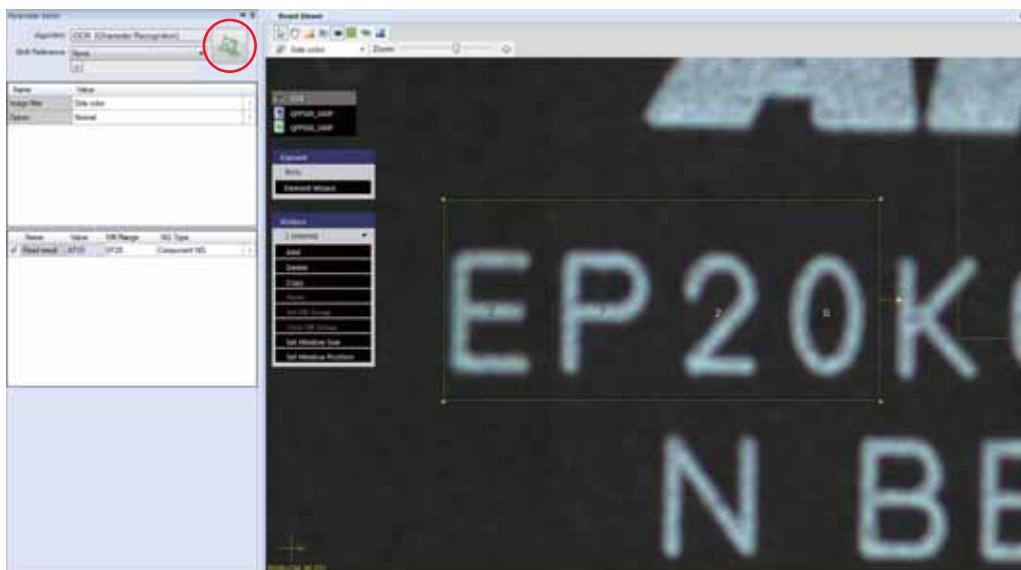


Figure 3-33 Confirming the Result

3.6 1D Code

3.6.1 Inspection Overview

1D Code is the algorithm to recognize 1D barcodes.

The algorithm registers the barcode of the good PCB to compare with the barcode of the captured PCB.

1D Code is suitable for traceability of PCBs with barcodes.

3.6.2 Parameter Setting

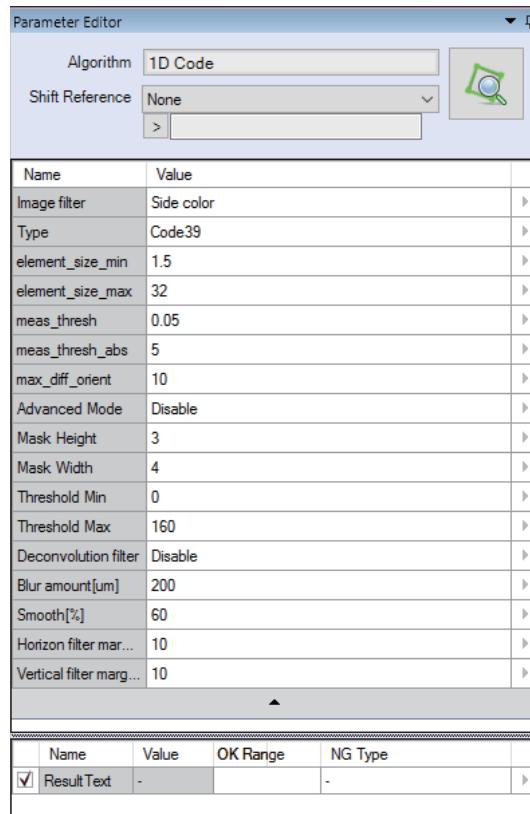


Figure 3-34 Dialog (Version 2.0.0.0)

| Parameter | Description |
|------------------|---|
| Image filter | Selects a lighting that displays the barcode clearly. |
| Type | Selects a barcode type to be recognized. |
| element_size_min | |
| element_size_max | |
| meas_thresh | |
| meas_thresh_abs | |
| max_diff_orient | |
| Advanced Mode | The item is for Saki engineers only. Do not change the setting. |
| Mask Height | |
| Mask Width | |
| Threshold Min | |
| Threshold Max | |

| Parameter | Description |
|---------------------------|---|
| Deconvolution filter | Inspects with using deconvolution filter. Inspection is performed with the image inside of pink dotted line. |
| Blur amount[um] | Specifies the blur amount of deconvolution filter. |
| Smooth[%] | Specifies the parameter to remove noise occurred by deconvolution filter. |
| Horizon filter margin[%] | Specifies the horizontal margin of inspection area when using deconvolution filter. The margin is displayed as pink dotted line. |
| Vertical filter margin[%] | Specifies the vertical margin of inspection area when using deconvolution filter. The margin is displayed as pink dotted line. |

Table 3-14 Parameter

| Parameter | Description |
|-------------|--|
| Result Text | Displays the result of character recognition and registration. |

Table 3-15 OK Range Setting

3.6.3 Setting Procedure

Step1: Select **1D Code** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that displays the barcode clearly from the **Image filter** drop-down list.

Step3: Select the barcode type to be recognized from the **Type** drop-down list.

Step4: Adjust the inspection window size to surround the barcode and move the yellow point on the side of the inspection window to the end of the barcode by mouse-dragging.

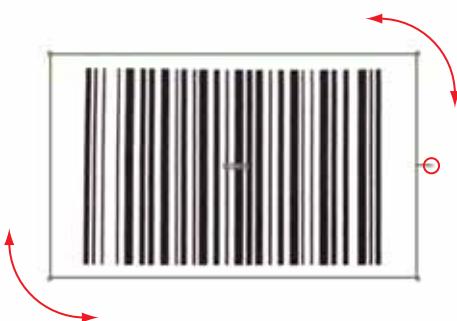


Figure 3-35 Adjusting the Inspection Window Angle

Step5: Complete the rest of settings and perform the inspection by reference to Step5 to Step8 of **3.5.3 Setting Procedure**.

3.6.4 Deconvolution Filter

By using deconvolution filter, the blur of image can be removed.

This image filter is effective when the barcode is on shield and which is out of focus.

CAUTION

Deconvolution filter needs much calculation, so inspection time will be longer.

It is recommended to enable this only the inspection which needs deconvolution filter.

Step1: Select **Enable** from **Deconvolution filter** drop-down list.

Step2: Set **Blur amount[μm]** and **Smooth[%]** as the image is displayed clearly.

NOTE

Set **Horizon filter margin[%]** and **Vertical filter margin[%]** and adjust inspection are if the noise is generated in the corner of image by deconvolution filter, and that effects inspection. Inspection is performed with the image inside of pink dotted line.

Step3: Complete the rest of settings and perform the inspection by reference to Step5 to Step8 of **3.5.3 Setting Procedure**.

3.7 2D Code

3.7.1 Inspection Overview

2D Code is the algorithm to recognize 2D barcodes.

The algorithm registers the barcode of the good PCB to compare with the barcode of the captured PCB.

2D Code is suitable for traceability of PCBs with barcodes.

3.7.2 Parameter Setting

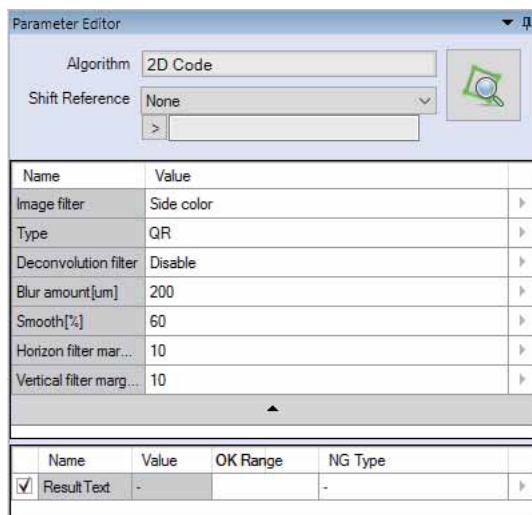


Figure 3-36 Dialog (Version 2.0.0.0)

| Parameter | Description |
|---------------------------|---|
| Image filter | Select a lighting that displays the barcode clearly. |
| Type | Select a barcode type to be recognized. |
| Deconvolution filter | Inspects with using deconvolution filter. Inspection is performed with the image inside of pink dotted line. |
| Blur amount[um] | Specifies the blur amount of deconvolution filter. |
| Smooth[%] | Specifies the parameter to remove noise occurred by deconvolution filter. |
| Horizon filter margin[%] | Specifies the horizontal margin of inspection area when using deconvolution filter. The margin is displayed as pink dotted line. |
| Vertical filter margin[%] | Specifies the vertical margin of inspection area when using deconvolution filter. The margin is displayed as pink dotted line. |

Table 3-16 Parameter

| Parameter | Description |
|-------------|--|
| Result Text | Displays the result of character recognition and registration. |

Table 3-17 OK Range Setting

3.7.3 Setting Procedure

Step1: Select **2D Code** from the **Algorithm** drop-down list.

NOTE

To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that displays the barcode clearly from the **Image filter** drop-down list.

Step3: Select the barcode type to be recognized from the **Type** drop-down list.

Step4: Adjust the inspection window size to surround the barcode and adjust the position of the yellow point on the side of the inspection window by mouse-dragging in accordance with the barcode direction.

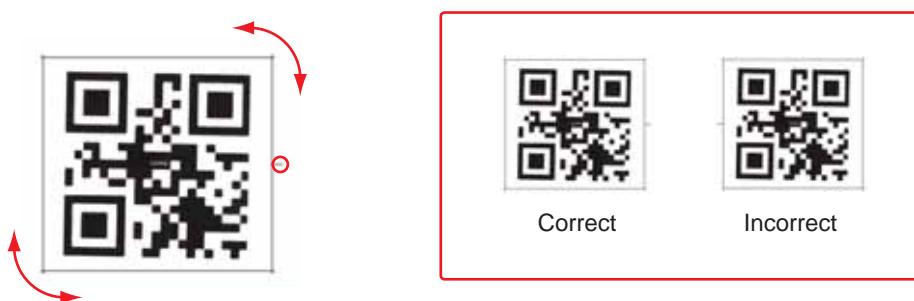


Figure 3-37 Adjusting the Inspection Window Angle

Step5: Complete the rest of settings and perform the inspection by reference to Step5 to Step8 of **3.5.3 Setting Procedure**.

3.7.4 Deconvolution Filter

By using deconvolution filter, the blur of image can be removed.

This image filter is effective when the barcode is on shield and which is out of focus.

CAUTION

Deconvolution filter needs much calculation, so inspection time will be longer.
It is recommended to enable this only the inspection which needs deconvolution filter.

Step1: Select **Enable** from **Deconvolution filter** drop-down list.

Step2: Set **Blur amount[μm]** and **Smooth[%]** as the image is displayed clearly.

NOTE

Set **Horizon filter margin[%]** and **Vertical filter margin[%]** and adjust inspection are if the noise is generated in the corner of image by deconvolution filter, and that effects inspection. Inspection is performed with the image inside of pink dotted line.

Step3: Complete the rest of settings and perform the inspection by reference to Step5 to Step8 of **3.5.3 Setting Procedure**.

4 For Inspection Item

4.1 Distribution

4.1.1 Inspection Overview

Distribution is the algorithm to detect bridges between leads of IC components.

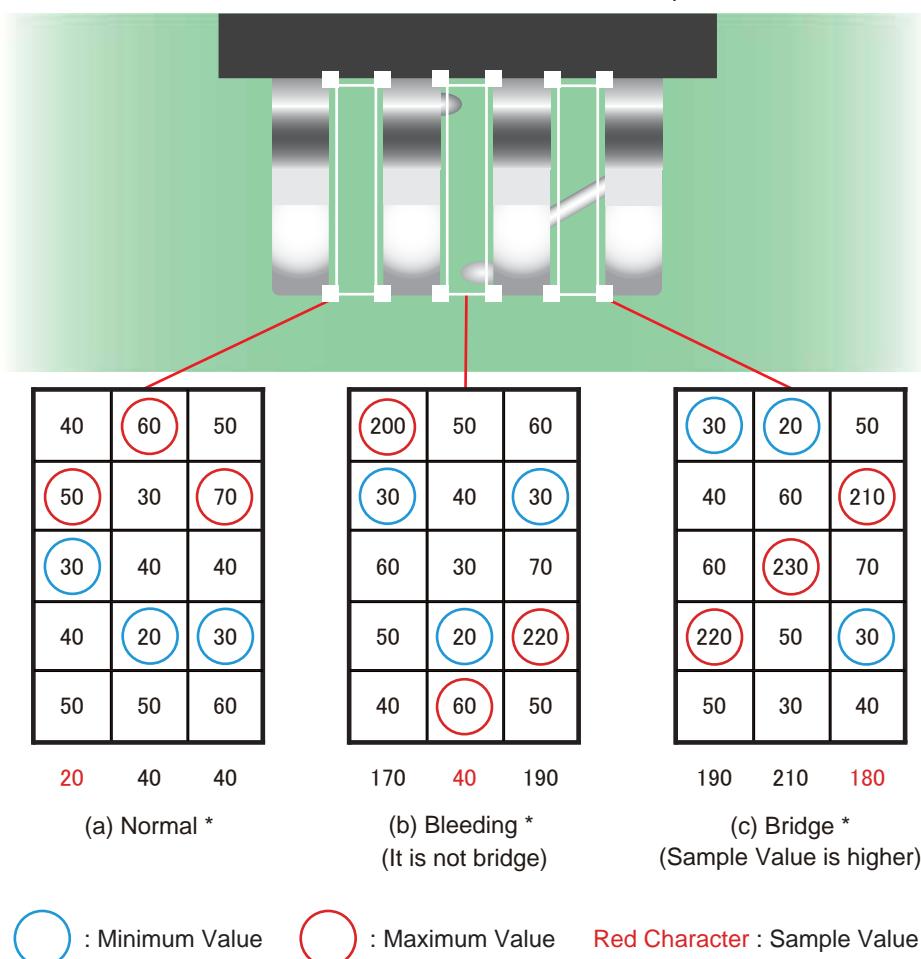
Solders are brighter than a PCB base. Therefore, bridges can be displayed as bright lines when the inspection window are set between the leads.

Distribution separates the inspection window into multiple blocks and calculates the differences between the maximum and minimum values. The calculated value becomes the sample value.

If the sample value is in the specified acceptable range, the inspection result becomes OK.

The algorithm divides inspection windows into multiple blocks and calculates the difference between maximum and minimum brightness level of each column.

The minimum difference value becomes the sample value.



* When OK range is set to 0 to 80.

Figure 4-1 Overview of Distribution

4.1.2 Parameter Setting

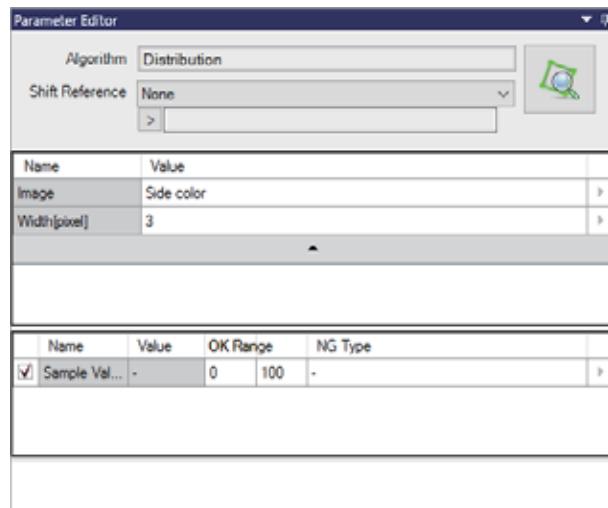


Figure 4-2 Dialog (Version 1.0.0.0)

| Parameter | Description |
|---------------|--|
| Image | Selects a lighting that displays solders clearly. For bridge inspections, select Low . |
| Width [pixel] | Sets the bigger value to reduce noise. Default value is 3 . |

Table 4-1 Parameter

| Parameter | Description |
|--------------|--|
| Distribution | Specifies the acceptable range of the sample value. For bridge inspections, set approximately 80 to the upper limit and approximately 0 to the lower limit. |

Table 4-2 OK Range Setting

4.1.3 Setting Procedure

Step1: Select **Distribution** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that displays solders clearly from the **Image** drop-down list.

For bridge inspections, select **Low**.

- Step3: Adjust the length of the inspection window to surround the lead base to pad end.
Adjust the width to match with the space between the leads.

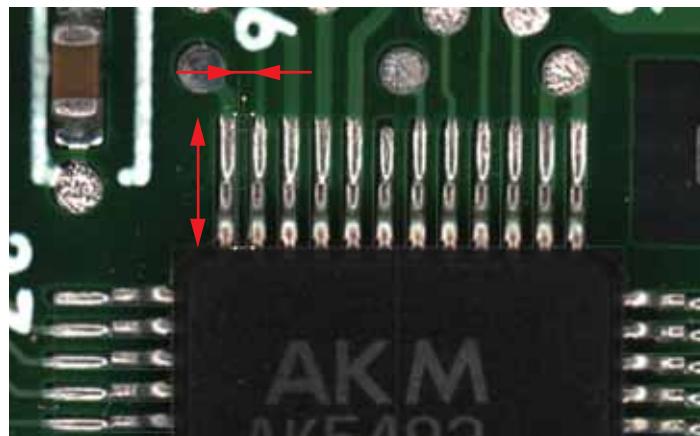


Figure 4-3 Adjusting the Inspection Window

- Step4: Click  and check if the bridge is detected.
The detected values are displayed on the lower side of **Parameter Editor** as a graph.

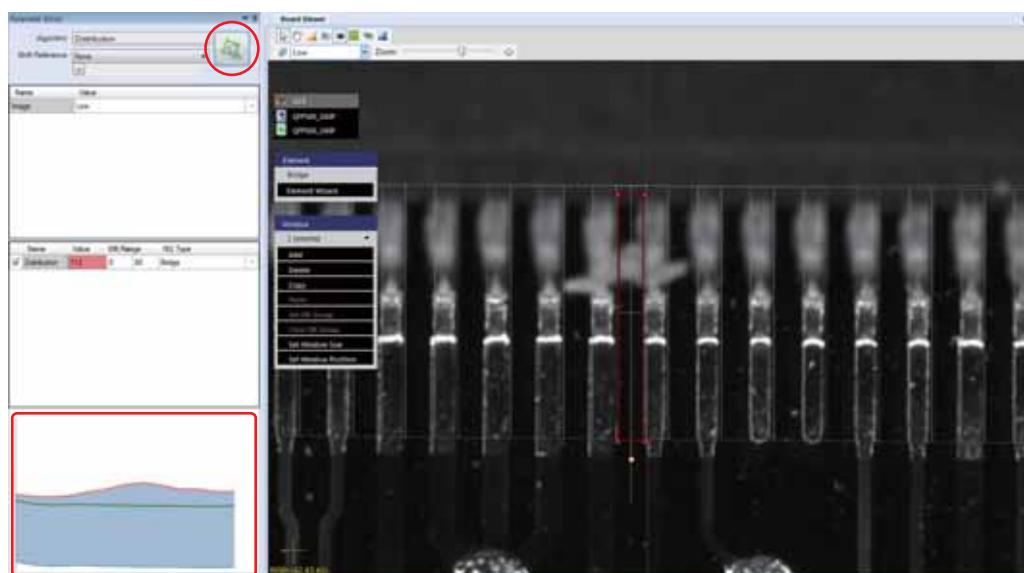


Figure 4-4 Detecting the Inspection Target

- Step5: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE For bridge inspections, set approximately **80** to the upper limit and approximately **0** to the lower limit.

- Step6: Click  again and check if the inspection is completed properly.

4.2 RingDistribution

4.2.1 Inspection Overview

RingDistribution is an algorithm to inspects the area around a component or pad and to detect solder bridges or dust.

The inspection is performed in the same manner as described in **4.1 Distribution** in each inspection window quadrant.

4.2.2 Parameter Setting

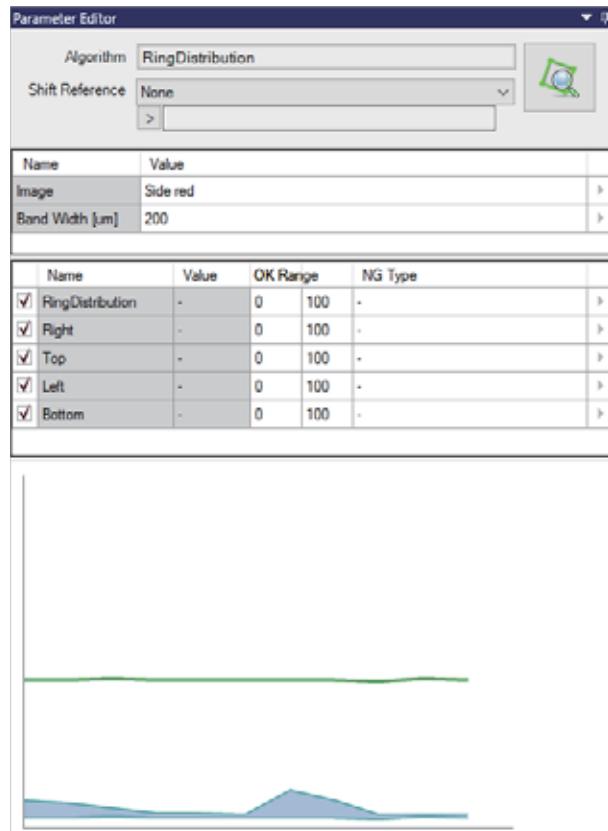


Figure 4-5 Dialog (Version 0.0.0.1)

| Parameter | Description |
|------------------------------|--|
| Image | Selects a lighting that displays target clearly. |
| Band Width [μm] | Specifies the width of the inspection area from the edge of the inspection window to the center. |

Table 4-3 Parameter

| Parameter | Description |
|------------------|--|
| RingDistribution | Specifies the acceptable range of the sample value. Displays the highest sample value for each window quadrant. |
| Right | Performs the same inspection as described in 4.1 Distribution in each window quadrant and outputs the sample value. |
| Top | For more details about the 4.1 Distribution inspection, refer to 4.1.1 Inspection Overview . |
| Left | Specifies the range of the sample value (upper limit to lower limit) for each window quadrant determined to be OK. |
| Bottom | The direction from the edge of the inspection window in which a round dot extends is set as Right . |

Table 4-4 OK Range Setting

4.2.3 Setting Procedure

Step1: Select **RingDistribution** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that displays target clearly from the **Image** drop-down list.

Step3: Adjust the inspection window to surround the target.

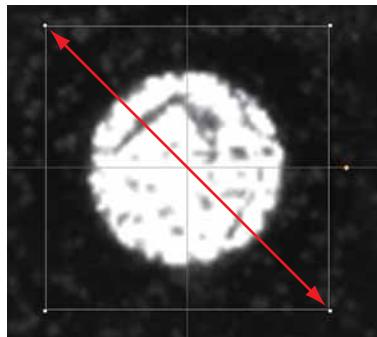


Figure 4-6 Adjusting the Inspection Window

Step4: Click and check the setting of **Band Width [μm]**.

The inspection area is the four window quadrants enclosed by a white dotted line.

NOTE If an inspection result is NG, the inspection window is highlighted in red.

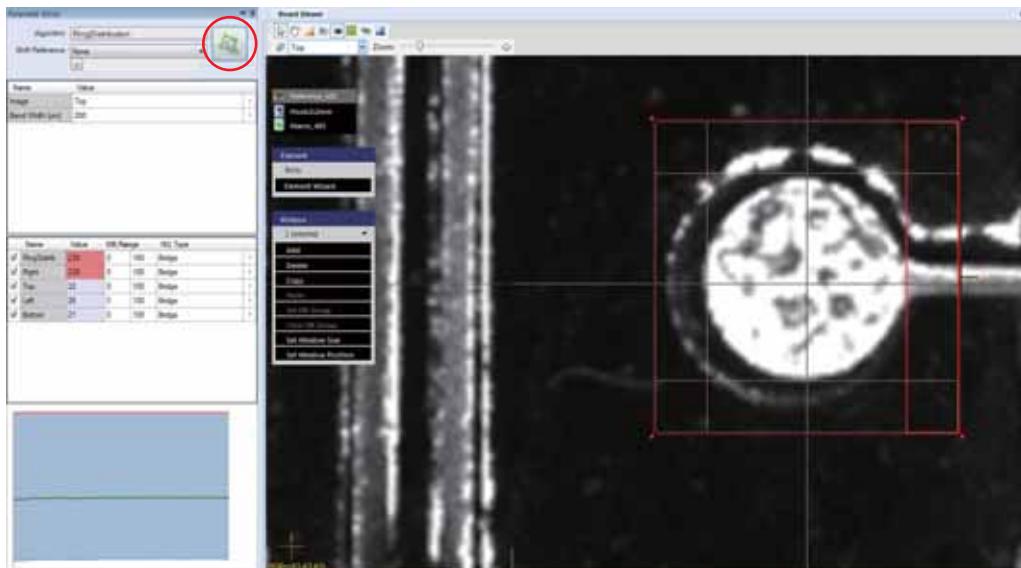


Figure 4-7 Adjusting Parameter

Step5: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

Step6: Click again and check if the inspection is completed properly.

4.3 Bridge

4.3.1 Inspection Overview

Bridge is the algorithm to detect bridges between leads of IC components.

Bridge uses the specified image filter to perform Black White on 255 gradations of brightness to check if there is no cutting-across lines in the inspection window.

If performing Black White with brightness value **1**, means that a line of low brightness will definitely cut across the inspection window.

Find an appropriate brightness value of Black White to be set as sample value.(no lines should cut across the inspection window).

If there is a solder bridge, a line of high brightness will cut across the inspection window.

4.3.2 Parameter Setting

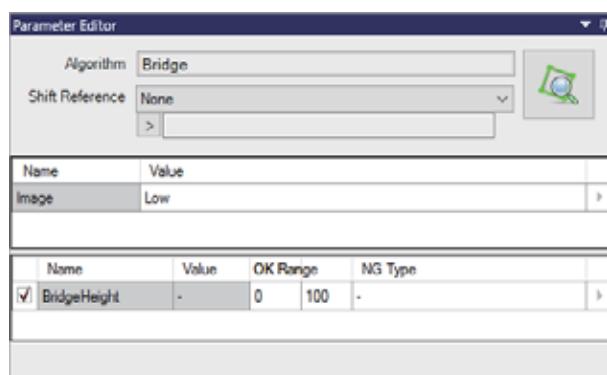


Figure 4-8 Dialog (Version 0.0.0.1)

| Parameter | Description |
|-----------|--|
| Image | Select a lighting that displays solders clearly. |

Table 4-5 Parameter

| Parameter | Description |
|--------------|---|
| BridgeHeight | Specifies the acceptable range of the sample value. For bridge inspections, set approximately 100 to the upper limit and approximately 0 to the lower limit. |

Table 4-6 OK Range Setting

4.3.3 Setting Procedure

Step1: Select **Bridge** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Select a lighting that displays solders clearly from the **Image** drop-down list.

- Step3: Adjust the length of the inspection window to surround the lead base to pad end.
Adjust the width to match with the space between the leads.

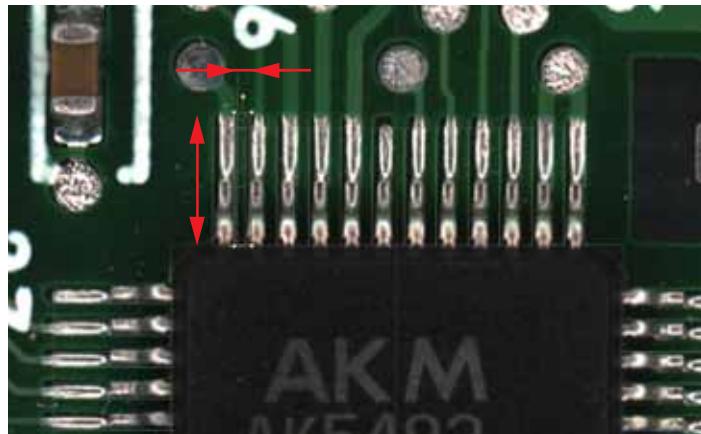


Figure 4-9 Adjusting the Inspection Window

- Step4: Click  and check if the bridge is detected.

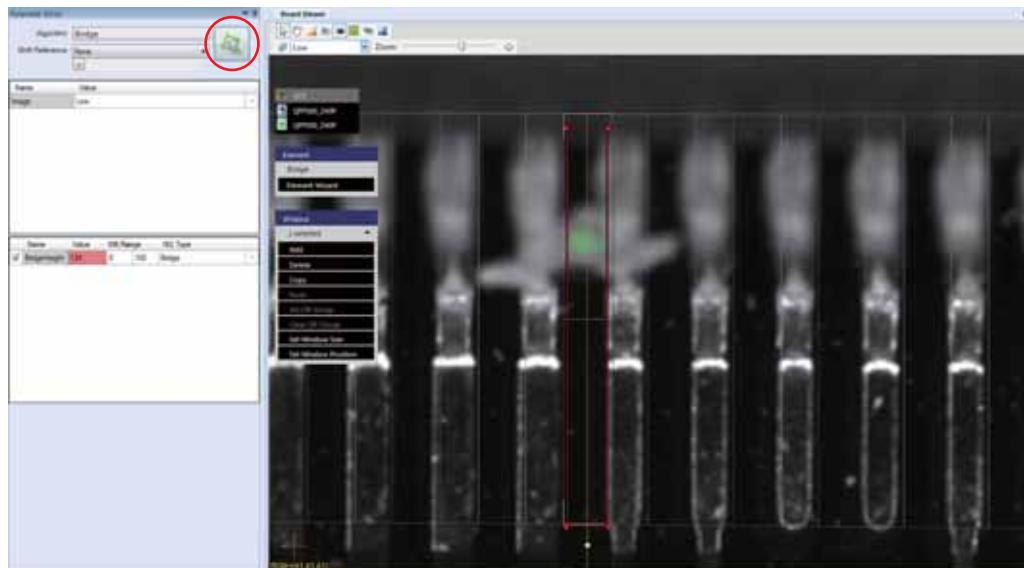


Figure 4-10 Detecting the Inspection Target

- Step5: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE For bridge inspections, set approximately **100** to the upper limit and approximately **0** to the lower limit.

NOTE Pixels in the inspection window with a brightness higher than the sample value are displayed in green.

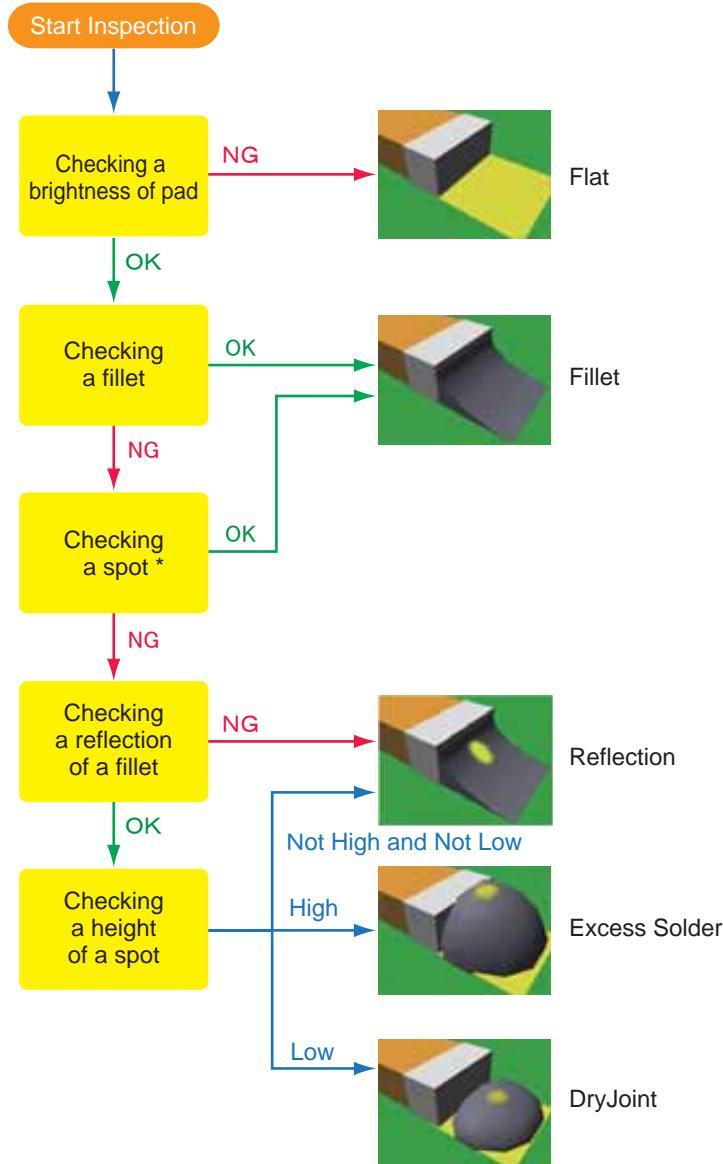
- Step6: Click  again and check if the inspection is completed properly.

4.4 Chip Soldering

4.4.1 Inspection Overview

Chip soldering is the algorithm to measure the brightness level and height of the image in the inspection window and inspect defects on chip components, such as **No Solder**, **DryJoint**, or **Excess Solder**.

The inspection flow is as follows.



* A location having high brightness, located in toe of an electrode.

Figure 4-11 Inspection Flow Chart

4.4.2 Parameter Setting

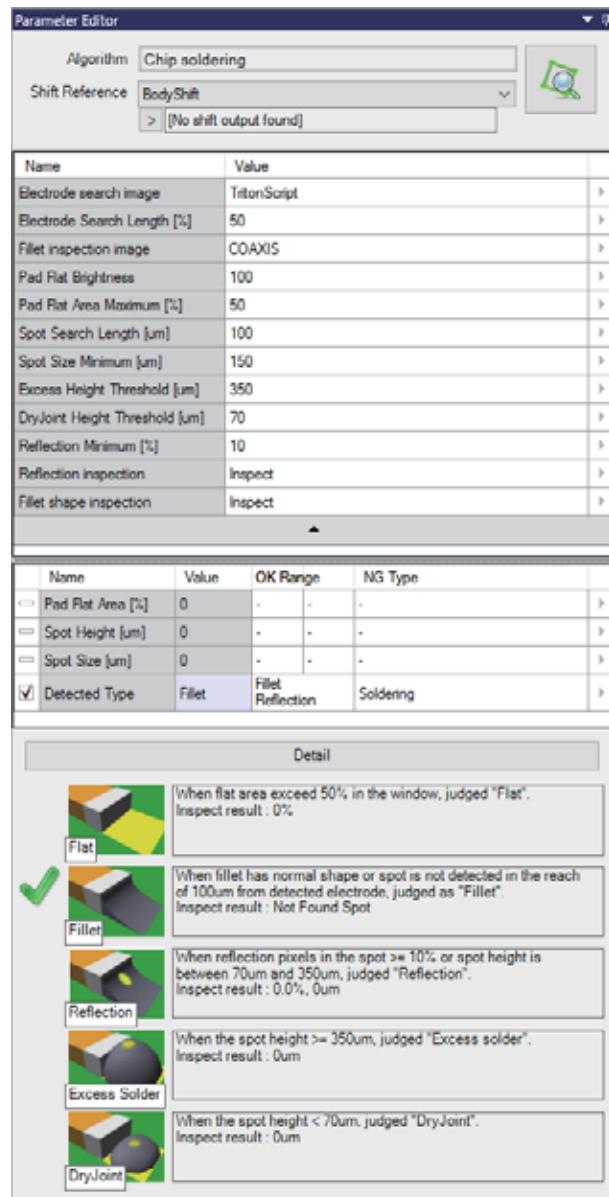
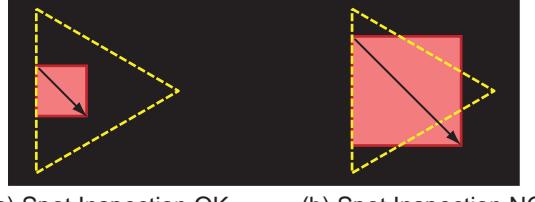


Figure 4-12 Dialog (Version 1.3.0.2)

| Parameter | Description |
|---|---|
| Electrode search image | Specifies the lighting for detecting electrodes. The default is Script Electrode (specialized electrode detection lighting). |
| Electrode Search Length [%] | Specifies the area to search the electrode in the inspection window. Specify the area by the percentage of the area in the inspection window from the electrode side. e.g., When inspecting the right electrode and 25 is entered, the left fourth part of the inspection window is set as the search area for the electrode. |
| Fillet inspection image | Specifies the lighting for detecting solders. The default is Script Solder (specialized solder inspection lighting). |
| Pad Flat Brightness | Used with Checking a brightness of pad of Figure 4-11 Inspection Flow Chart. This is the lower limit of the brightness level that is recognized to be a flat area during inspection with a solder inspection image. |
| Pad Flat Area Maximum [%] | Used with Checking a brightness of pad of Figure 4-11 Inspection Flow Chart. In an area where the electrode has been removed from the inspection window, if the specified percentage of the area of the flat area has exceeded the specified value, the flat area check is NG and is recognized as No solder. |
| Spot Search Length [μm] | Used with Checking a spot of Figure 4-11 Inspection Flow Chart. This defines the spot as a location having high brightness with Script Solder that is located in toe of the electrode. This specifies the spot detection range. This specifies the range as the distance from the detected electrode. |
| Spot Size Minimum [μm] | Used with Checking a spot of Figure 4-11 Inspection Flow Chart. This calculates the circumscribed rectangle of the detected spot. If the length of the diagonal line of the circumscribed rectangle exceeds the specified value then the spot is recognized to be NG and proceeds to check for reflections. If the circumscribed rectangle of the detected spot fits into the yellow triangle then the spot is recognized to be OK and the inspection result is recognized as a normal fillet . If the circumscribed rectangle of the detected spot protrudes from the yellow triangle then the spot is recognized to be NG and proceeds to check for reflections. |
| |  <p>(a) Spot Inspection OK (b) Spot Inspection NG</p> |
| | Figure 4-13 Spot Inspection |
| Excess Height Threshold [μm] | Used with Checking a height of a spot of Figure 4-11 Inspection Flow Chart. Specifies the threshold value of the spot height. If the height of the spot is greater than the Excess Height Threshold, it is recognized as excessive solder . If the height is less than the DryJoint Height Threshold, then it is recognized as a dry joint . If the height of the spot is less than the Excess Height Threshold and greater than the DryJoint Height Threshold, then it is recognized as a reflection . |
| DryJoint Height Threshold [μm] | Make sure to set the Excess Height Threshold to a value greater than the DryJoint Height Threshold . Result (excessive solder) > Excess Height Threshold > Result (reflection) > DryJoint Height Threshold > Result (dry joint) |

| Parameter | Description |
|-------------------------|---|
| Reflection Minimum [%] | Used with Checking a reflection of a fillet of Figure 4-11 Inspection Flow Chart. This calculates the circumscribed rectangle of the detected spot. If the ratio of the area recognized to be a reflection exceeds the specified value within the interior of the circumscribed rectangle, then the reflection result is NG and the spot is recognized as a Reflection . If the ratio of the area recognized as a reflection is less than the specified value, the reflection result is OK and a determination of the spot height is performed. |
| Reflection inspection | Used with Checking a reflection of a fillet of Figure 4-11 Inspection Flow Chart. The reflection is a phenomenon whereby light that is specularly reflected from other components shines on the solder surface. Select Inspect to recognize if it is a reflection or Skip to bypass the inspection. |
| Fillet shape inspection | Select Inspect to recognize if it is a fillet or Skip to bypass the inspection. |
| Detail | The details of the recognition result are displayed. |

Table 4-7 Parameter

| Parameter | Description |
|-------------------|---|
| NG Type | Flat When the ratio of the flat area exceeds the Flat Area Too Large [%] value in the area of the inspection window which excludes the electrodes, the flat area is judged to be Flat . Specify the Flat for OK Range and if the inspection result to be Flat , judged as OK . |
| | Fillet When the fillet inspection result to be OK or a Spot was not detected, Judges to be Fillet . Specify the Fillet for OK Range and if the inspection result to be Flat , judged as OK . |
| | Excess Solder Specifying the selected NG Type as the acceptable range sets the inspection result to OK when the result matches the specified NG Type. |
| | Dry Joint For the details of the recognition methods and parameters, refer to Table 4-7. (Please insert the number of the table above) |
| | Reflection |
| Pad Flat Area [%] | Displays the ratio of the region recognized as a flat area in the section of the inspection window which excludes the electrode. |
| Spot Height | Display measured spot height. |
| Spot Size | Calculates the circumscribed rectangle of the detected spot and displays the length of the diagonal line. |

Table 4-8 OK Range Setting

NOTE

If multiple items are selected on OK Range of NG type, the inspection result becomes OK when one of the selected result types is detected.

4.4.3 Setting Procedure

Step1: Select **Chip soldering** from the **Algorithm** drop-down list.

Step2: Used for adjusting an inspection window size.

Set the lateral direction of the inspection window, one side matches the leading edge of the pad and the other side includes part of the electrode.

Set the longitudinal direction of the inspection window, the width is slightly smaller than the electrode.

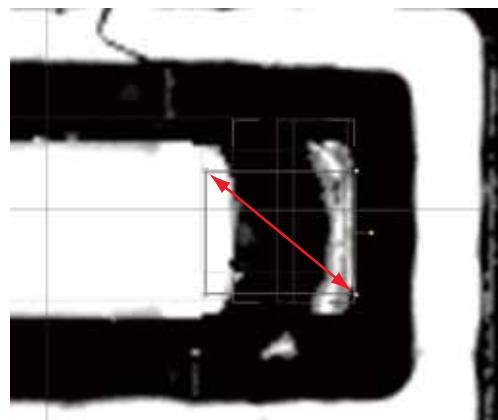


Figure 4-14 Adjusting the Inspection Window

Step3: Click . Images of the electrode and solder are displayed up and down.

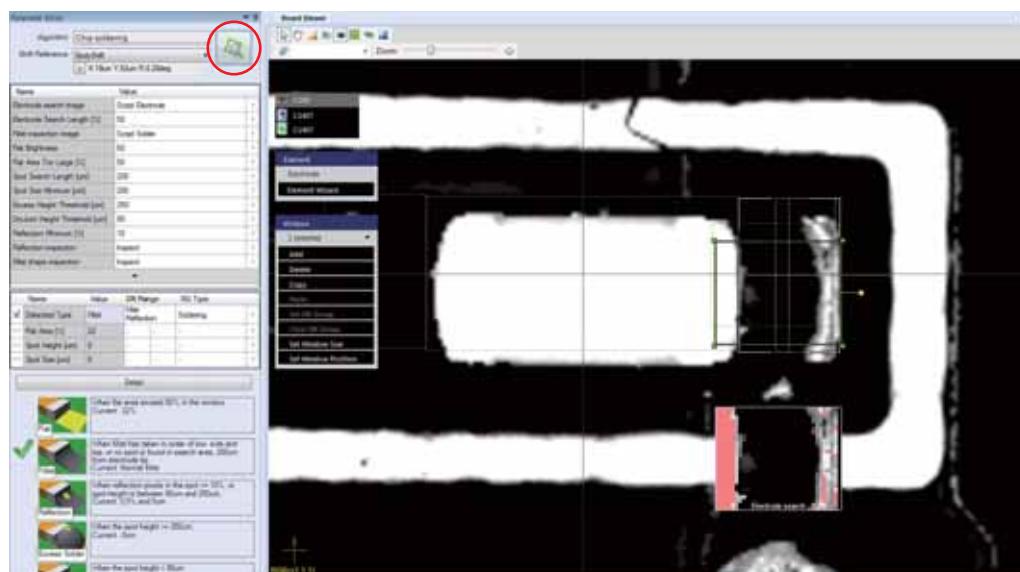


Figure 4-15 Detecting the Electrode and Solder

Step4: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

- Step5: Click  and check if the inspection is completed properly.
 Click **Detail** to display the details of the judged result.
 If necessary, adjust the parameter by reference to Table 4-7 and Table 4-8.

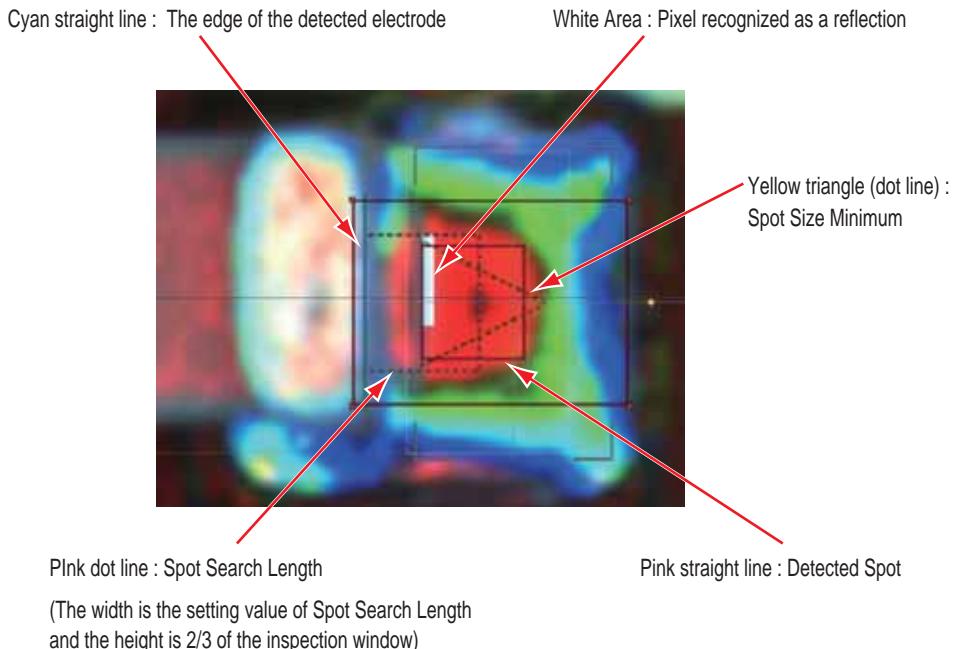


Figure 4-16 Descriptions

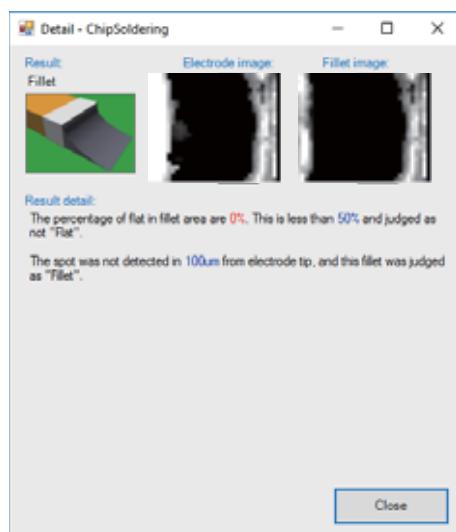


Figure 4-17 Detail

4.5 ChipMissing

4.5.1 Inspection Overview

ChipMissing is the algorithm to inspect solder at either end of the chip component with Toplight and Sidelight used.

The brightness level of solder is lower when solder fillet is formed. The brightness level of solder is higher when solder fillet is not formed or component is missing.

ChipMissing is suitable for the solder paste inspection of chip component.

4.5.2 Parameter Setting

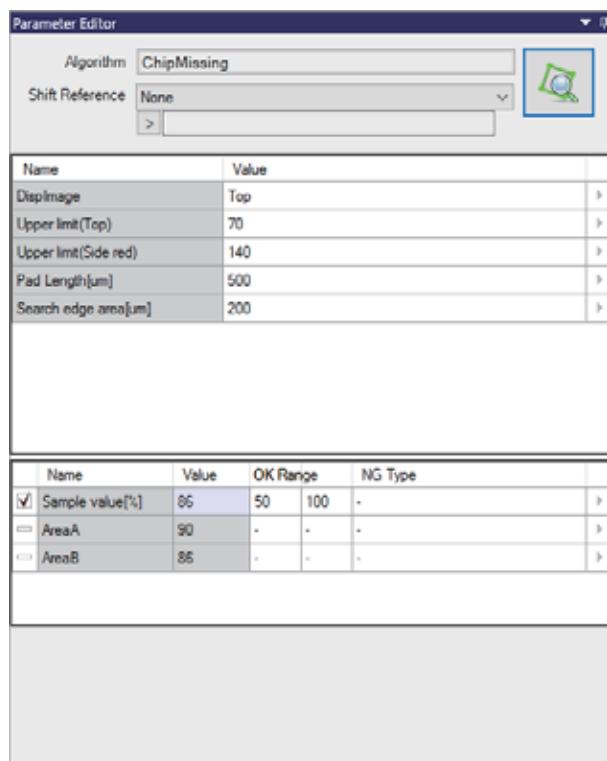


Figure 4-18 Dialog (Version 0.0.0.1)

| Parameter | Description |
|------------------------|---|
| DisplImage | Specifies the lighting used for display. |
| Upper limit(Top) | Specifies the upper limit of the brightness when the inspection result is OK. |
| Upper limit (Side red) | Specifies the upper limit of the brightness when the inspection result is OK. |
| Pad Length [μm] | Specifies the distance from the edge of the inspection window to the electrode. |
| Search edge area [μm] | Specifies the search range when searching for the edge of the pad and electrode. The search for the edge of the pad and electrode is centered on the position specified by the pad length. |

Table 4-9 Parameter

| Parameter | Description |
|-----------------|---|
| Sample value[%] | Displays the lower value of AreaA and AreaB . |
| AreaA | The percentages of the area that the result is OK in each area at either end of the chip component with TopLight and SideLight, are calculated. |
| AreaB | For details, refer to 4.5.4 Calculation of Sample Figure . |

Table 4-10 OK Range Setting

4.5.3 Setting Procedure

Step1: Select **ChipMissing** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Adjust the inspection window to surround the electrode tip and pad.

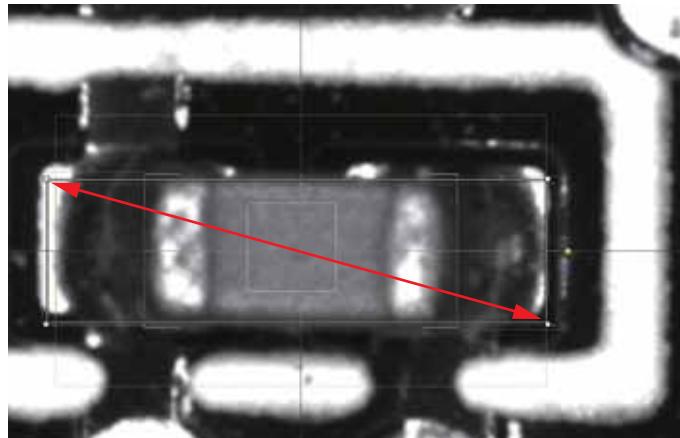


Figure 4-19 Adjusting the Inspection Window

Step3: Click and check the settings of **Pad Length** and **Search edge area**.

Check that the dotted yellow line which cuts longitudinally across the inspection window is displayed at the edge position of the pad and electrode.

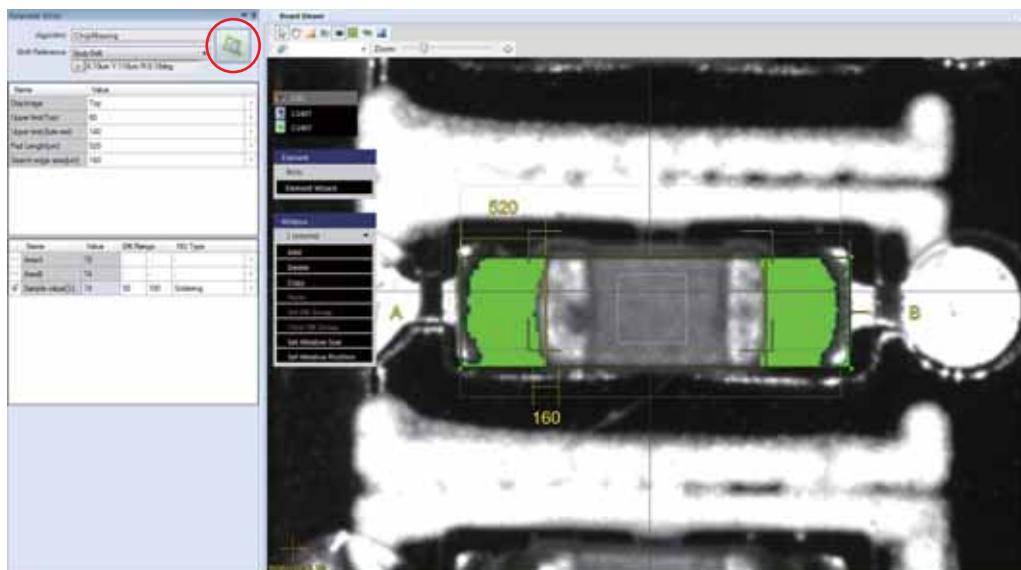


Figure 4-20 Detecting the Component

Step4: Set the acceptable range of the sample value.

NOTE If not performing the inspection, uncheck the item.

Step5: Click  again and check if the inspection is completed properly.

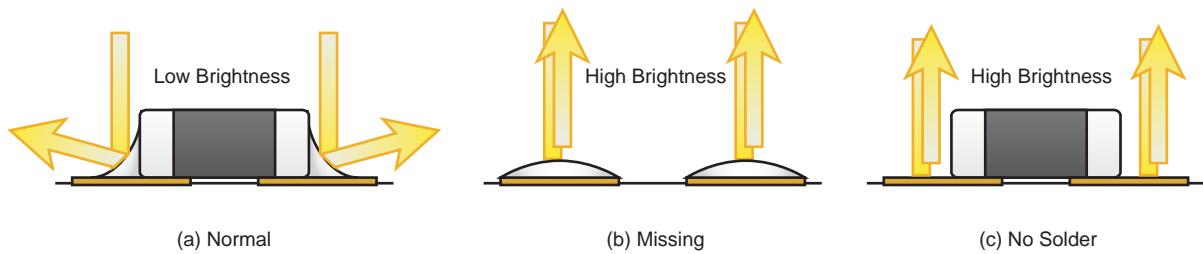
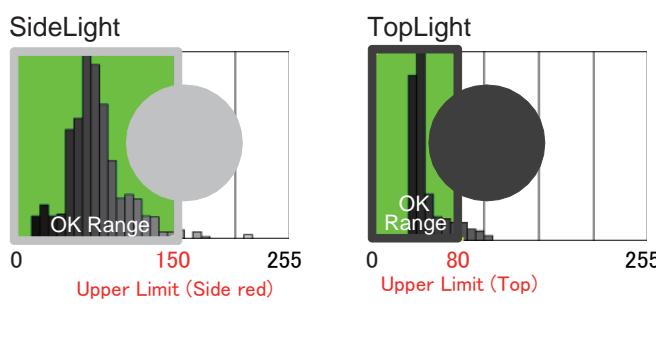


Figure 4-21 Inspection of ChipMissing

4.5.4 Calculation of Sample Figure

Specify **OK Range** of brightness for each lighting based on **Upper limit (Top)** and **Upper limit (Side red)**. The percentages of the area which is judged OK in solder inspection window at either end of the chip component with Top lighting and Side Lighting, are calculated. The lower figure is shown as sample figure.



Calculate the Rate of the Overlapping Parts

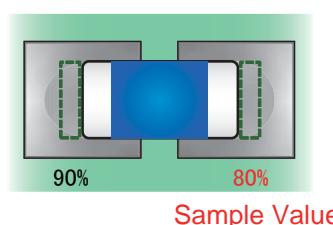


Figure 4-22 Calculation of Sample Figure

4.6 Lead Inclusive

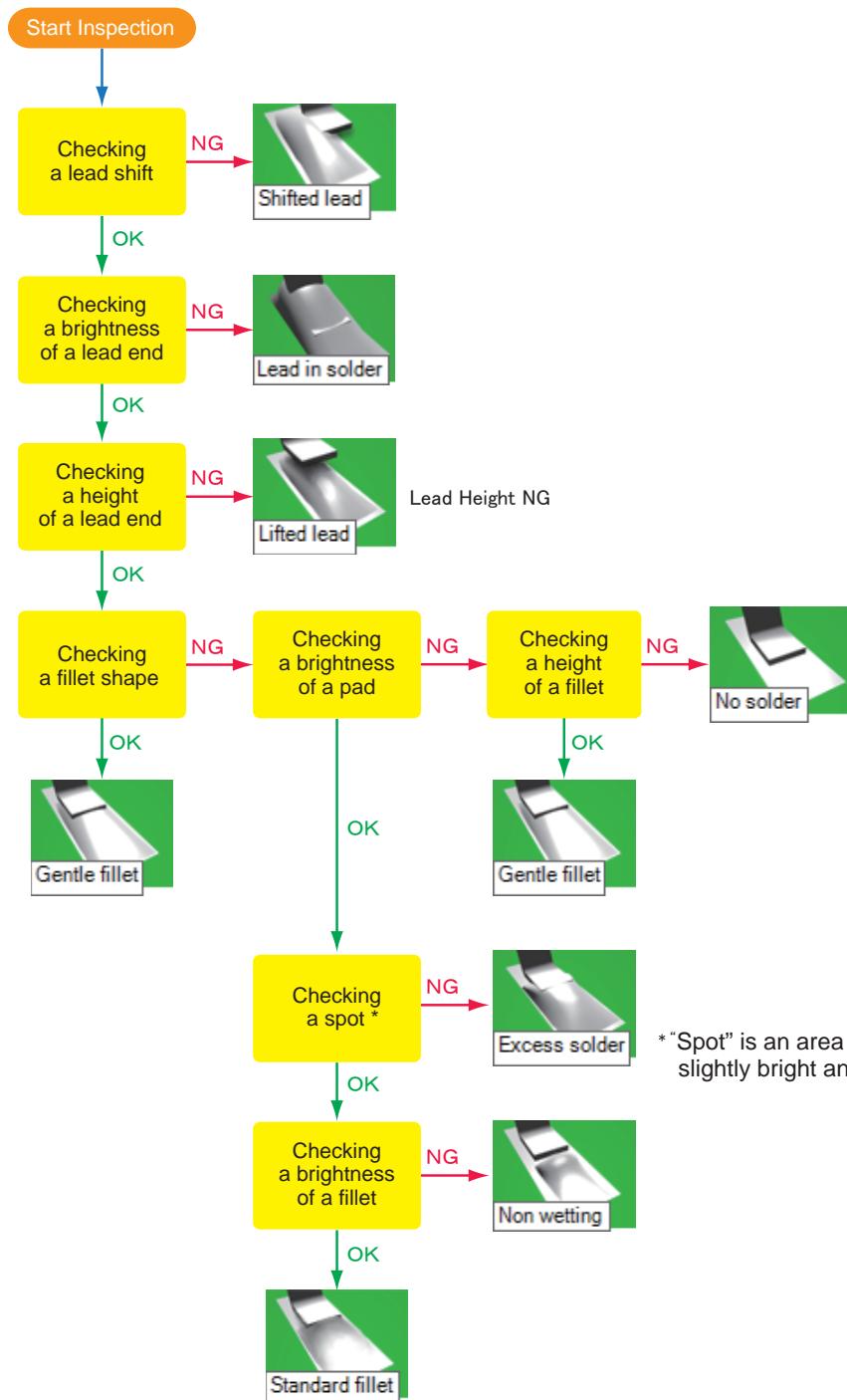
4.6.1 Inspection Overview

Lead inclusive is the algorithm to measure the brightness level and height of the image in the inspection window and inspect defects on IC components, such as **No solder**, **Non wetting**, or **Lifted lead**.

The inspection flow is as follows.

The Lead Inclusive Version 1.5.0.0 or higher can perform Pad Based Shift Inspection.

For detail information regarding Pad Based Shift Inspection, refer to **Part IV 2 Pad Based Shift Inspection**.



* "Spot" is an area which is slightly bright and separated from a lead.

Figure 4-23 Inspection Flow Chart

4.6.2 Parameter Setting

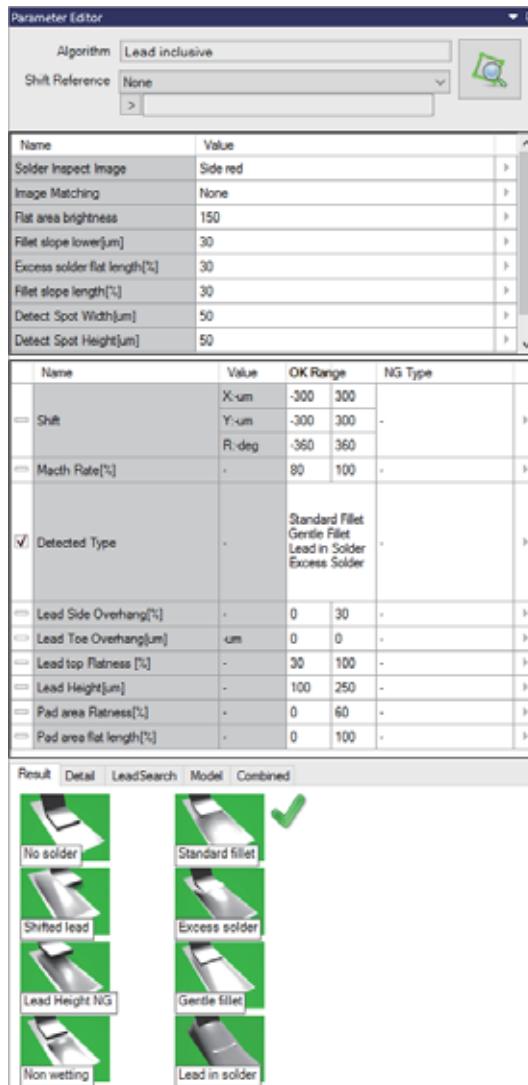


Figure 4-24 Dialog (Version 1.5.0.0)

| Parameter | Description |
|-------------------------------|--|
| Solder Inspect Image | Specifies the lighting for solder inspection. Default is TopLight . |
| Image Matching | <p>Used with Checking a fillet shape of Figure 4-23 Inspection Flow Chart.</p> <p>Select Model matching or Combined matching to perform Checking a fillet shape. If None is selected, it skips the fillet checking and proceeds to Checking a brightness of a pad. Default is None.</p> <p>Model matching uses height information to perform image matching and recognize the shape of the fillet.</p> <p>Combined matching uses height information and the image to perform image matching and recognize the shape of the fillet.</p> <p>If the matching rate is high, it is recognized as a Gentle Fillet.</p> <p>The details are set in Model matching tab and Combined Matching tab. For each detail settings, refer to Table 4-14 and Table 4-15.</p> |
| Flat area brightness | <p>Used with Checking a brightness of a lead end of Figure 4-23 Inspection Flow Chart.</p> <p>Specifies the lower limit of the brightness level which is recognized as a flat area in lead tip.</p> |
| Fillet slope lower [μm] | <p>Used with Checking a height of a fillet of Figure 4-23 Inspection Flow Chart.</p> <p>Separates the solder into three areas and measures each height. If the height difference between the upper area and the lower area is greater than this value and the height value increases to the electrode direction, the image is recognized as Gentle Fillet. In other cases, the image is recognized as No Solder.</p> <p>✓ A-C > Fillet slope lower ✓ A > B ✓ B > C</p> <p>Gentle Fillet</p> <p>Other cases</p> <p>No Solder</p> |
| Excess solder flat length [%] | <p>Used with Checking a spot of Figure 4-23 Inspection Flow Chart.</p> <p>When the spot (location having high brightness in the lead tip) approaches the lead and the percentage of the length of the spot to the width of the lead exceeds this value, the image is recognized as Excess Solder.</p> <p>B ÷ A > Excess solder flat at length</p> <p>Excess solder</p> |

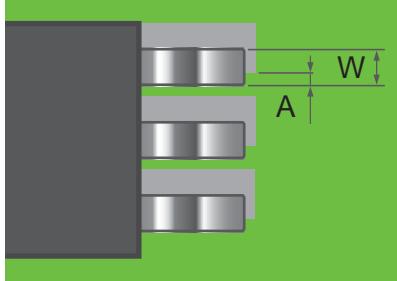
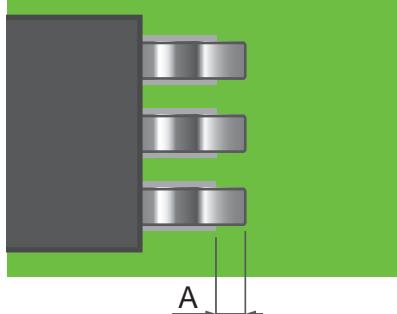
Figure 4-25 Fillet Slope Lower

Figure 4-26 Excess Solder Flat Length

| Parameter | Description |
|--------------------------------------|--|
| Fillet slope length [%] | <p>Used with Checking a brightness of a fillet of Figure 4-23 Inspection Flow Chart. Separates the solder into three areas and measures each height. If the height difference between the upper area and the lower area is greater than the setting value and the height value increases in the electrode direction, judged as a Gentle Fillet (gentle fillet shape). In other cases, the image is recognized as No Solder.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>$B \div A > \text{Fillet slope length}$</p> <p>$\downarrow$</p> <p>Standard Fillet</p> </div> <div style="text-align: center;"> <p>Height of "C" \leq Height of "D"</p> <p>\downarrow</p> <p>Non Wetting</p> </div> </div> <div style="text-align: center; margin-top: 10px;"> <p>* If the spot length above a certain length, the inspection area divided in three areas.</p> </div> |
| Detect Spot Width [μm] | <p>Used with Checking a spot of Figure 4-23 Inspection Flow Chart. Specifies the lower limit of the spot (location having high brightness that is located in front of the lead tip) size. If the size of the detected spot exceeds this value, it is recognized as a spot.</p> |
| Detect Spot Height [μm] | <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> </div> <div style="border: 1px solid black; padding: 5px; background-color: white;"> <ul style="list-style-type: none"> ▪ A > Lower Limit of Spot Width ▪ B > Lower Limit of Spot Length <p>\downarrow</p> <p>Recognize as a SPOT</p> </div> </div> |

Table 4-11 Parameter

| Parameter | Description |
|----------------|--|
| Shift | Shows the shift information. |
| Match Rate [%] | <p>Used with Checking a fillet shape of Figure 4-23 Inspection Flow Chart. Displays the matching rate that select Model matching or Combined matching in the Image Matching item. If the matching rate exceeds this value, it is recognized as a Gentle Fillet.</p> |

| Parameter | | Description |
|------------------------|-----------------|--|
| Detected Type | Shifted Lead | <p>If the recognition result by this algorithm is the selected parameter, the inspection result becomes OK.</p> <p>For the details of the recognition methods and parameters, refer to Table 4-11.</p> |
| | Lead In Solder | |
| | Lead Height NG | |
| | No Solder | |
| | Excess Solder | |
| | Non Wetting | |
| | Standard Fillet | |
| | Gentle Fillet | |
| Lead Side Overhang [%] | | <p>Used with Checking a lead shift of Figure 4-23 Inspection Flow Chart. Indicates the misalignment amount of the lead. If the shift value is out of OK range, the image is recognized as Shifted Lead. When there is pad information, shift inspection is performed according to IPC standards, and $A / W \times 100[\%]$ is calculated. If the result of this calculation is at least 25%, the image is recognized as Shifted Lead.</p>  |
| Lead Toe Overhang [μm] | | <p>A is calculated only when there is pad information. If the lead tip protrudes even a little from the pad, the image is recognized as Shifted Lead.</p>  |
| Lead top Flatness [%] | | <p>Used with Checking a brightness of a lead end of Figure 4-23 Inspection Flow Chart. Indicates the percentage of the flat area in the lead top. If the percentage is lower than this value, the image is recognized as Lead in solder.</p> |
| Lead Height [μm] | | <p>Used with Checking a height of a lead end of Figure 4-23 Inspection Flow Chart. Indicates the height of the lead. If the height of the lead is out of OK range, the image is recognized as Lead Height NG.</p> |

| Parameter | Description |
|--------------------------|---|
| Pad area Flatness [%] | Used with Checking a brightness of a pad of Figure 4-23 Inspection Flow Chart. Shows the percentage of the area recognized as being a flat area in the solder area of the lead tip. If the percentage of the flat area is equal to or higher than this value, proceed to Checking a height of a fillet of Figure 4-23 Inspection Flow Chart. If the percentage of the flat area is less than this value, proceed to Checking a spot of Figure 4-23 Inspection Flow Chart. |
| Pad area flat length [%] | Shows the length to the lead width of the flat area in the solder of the lead tip. |

Table 4-12 OK Range Setting

| Parameter | Description |
|------------------------------|---|
| Search | BlackWhite Searches for a lead tip based on height information and brightness value. Use this when there is a distinctly difference in the height of the lead tip and the solder area. |
| | LWedge Searches for the lead tip based on the brightness value. Use this when the difference in height between the lead tip and solder area is not clear. |
| | Off The tip of the window position as the lead tip. |
| Search Image | Select the lighting for searching for the lead tip. Default is ScriptLeadTip . This is the lighting for searching for the lead tip. Click Set default Image to specify ScriptLeadTip. |
| Set default Image | |
| Tip Brightness | This can be set in the case of BlackWhite . Specifies the lower limit of the brightness value considered to be the lead tip. If the brightness exceeds this value, it is recognized as a lead. |
| Tip Height [μm] | This can be set in the case of BlackWhite . Specifies the lower limit of the height considered to be the lead tip. If the height exceeds this value, it is recognized as a lead. |
| Tip Length Tolerance [%] | Defines the length of the part considered to be the lead tip. Specifies with the percentage of the width of the inspection window. |
| Tip Width Tolerance [%] | Defines the width of the part considered to be the lead tip. Specifies with the percentage of the width of the inspection window. |

Table 4-13 LeadSearch Setting

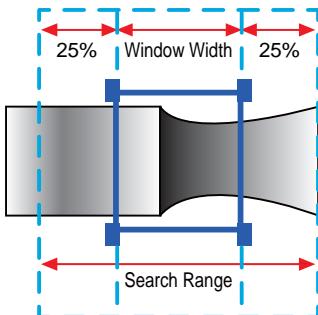
| Parameter | Description |
|-----------------|---|
| Height Variance | Specifies the acceptable range of misalignments in height. If it exceeds the value, the area is displayed in red on Board Viewer . If the large area is displayed in red, increase the value. |
| Search Range | Specifies the search range of matching. Specifies the percentage of the Window Width specified in the Train. If 50[%] is specified, the range of searching is Window Width + 25% of the Window Width on the left side + 25% of the Window Width on the right side.  <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> $\text{Search Range of Matching} = \text{Window Width} + ((\text{Window Width} \div 2) \times (\text{Search Range} \div 100))$ </div> |

Figure 4-31 Search Range

| Parameter | Description |
|----------------|--|
| Rotation Range | Specifies the acceptable range of the misalignments in angles. If 1 is set, only images inclined 1 degree or less are detected. |
| Train | Takes an image inside the inspection window as a template image. Register the fillet image. |
| Template | Displays the template image. |

Table 4-14 Model Setting

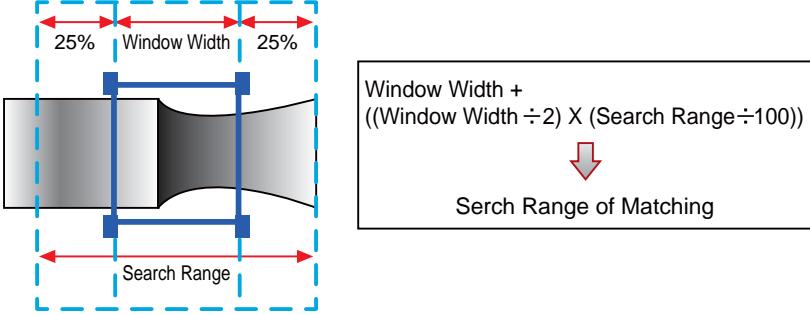
| Parameter | Description |
|------------------|---|
| Height Variance | Specifies the acceptable range of misalignments in height. If it exceeds the value, the area is displayed in red on Board Viewer . If the large area is displayed in red, increase the value. |
| Search Range | Specifies the search range of matching. Specifies the percentage of the Window Width specified in the Train. If 50[%] is specified, the range of searching is Window Width + 25% of the Window Width on the left side + 25% of the Window Width on the right side.  |
| Rotation Range | Specifies the acceptable range of the misalignments in angles. If 1 is set, only images inclined 1 degree or less are detected. |
| Threshold Height | Specifies the threshold of height information used in inspection. Lower height than the specified value area is not used for the inspection. |
| Train | Takes an image inside the inspection window as a template image. |
| Template | Displays the template image. |

Table 4-15 Combined Setting

4.6.3 Setting Procedure

Step1: Select **Lead inclusive** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Adjust the size of the inspection window to surround the lead shoulder to lead tip.

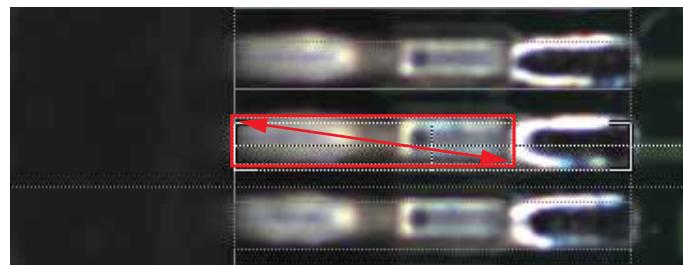


Figure 4-33 Adjusting the Inspection Window

Step3: Click and check if the lead tip is detected.

The detected lead tip and pad end are displayed with the dark pink rectangle.

NOTE If the lead tip cannot be detected, adjust in the Lead Search tab.
For detail settings, Refer to Table 4-13 LeadSearch Setting.

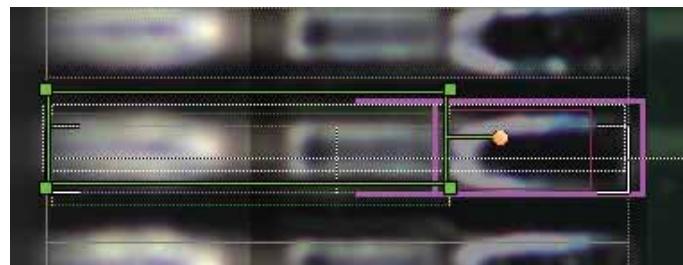


Figure 4-34 Detecting the Lead Tip

Step4: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step5: Click  and check if the inspection is completed properly.

The details of the inspection results are displayed in the **Detail** tab on the lower side of **Parameter Editor**.

If necessary, adjust the parameter by reference to Table 4-11, Table 4-12, Table 4-14, and Table 4-15.

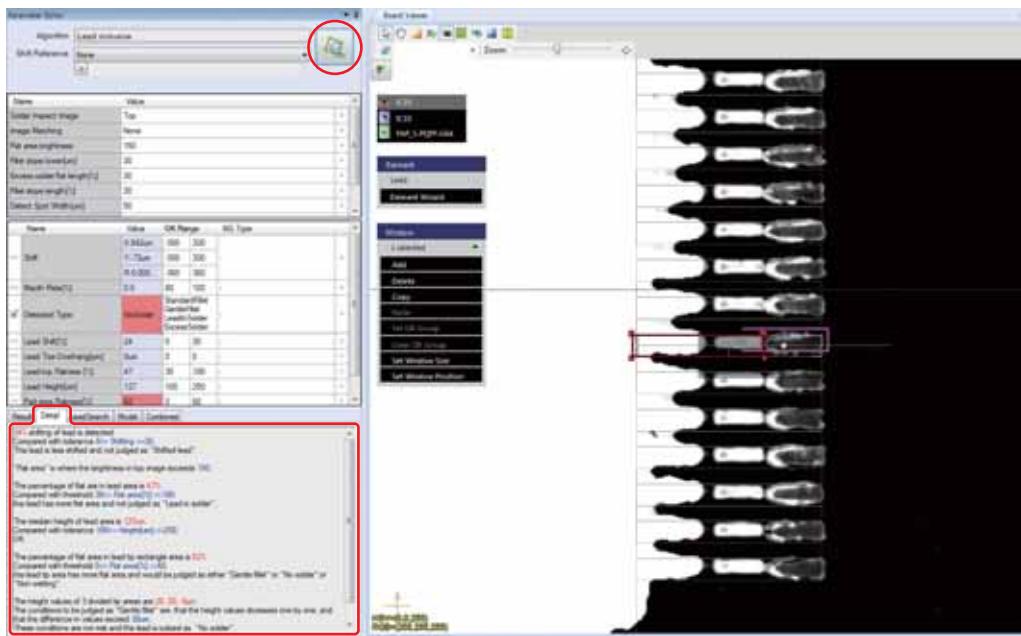


Figure 4-35 Judgement

4.7 Lead Tip Black White

4.7.1 Inspection Overview

Lead tip black white is the algorithm to perform the lead position search, lead height inspection, and fillet inspection at once on the lead tip area.

Lead tip black white is suitable for the inspection of IC leads whose fillet height calculation are difficult due to its narrow pitches.

4.7.2 Parameter Setting

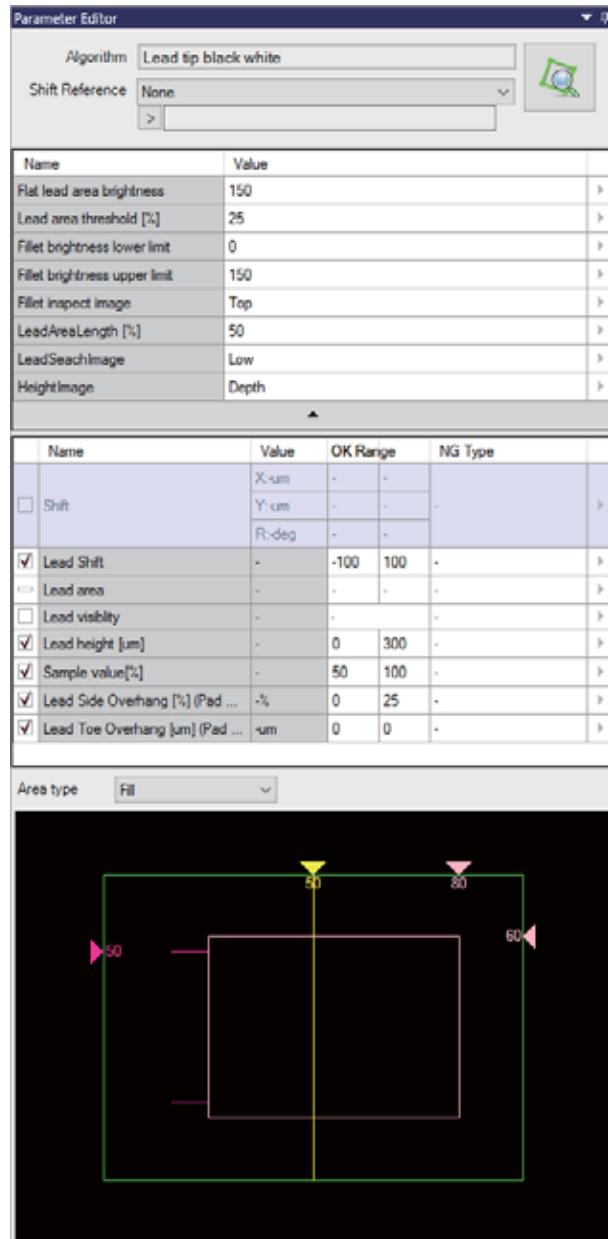


Figure 4-36 Dialog (Version 1.0.0.0)

| Parameter | Description |
|-------------------------------|--|
| Flat lead area brightness | Specifies the lower limit of the brightness level which is recognized as a flat area. |
| Lead area threshold [%] | Specifies the lower limit of the area size which is recognized as a lead. |
| Fillet brightness lower limit | The Fillet brightness lower limit is the lower limit value of the brightness recognized as the fillet, and the Fillet brightness upper limit is the upper limit value of the brightness recognized as the fillet. Within the fillet inspection field specified in Toe Fillet Area and Fillet Width of Table 4-18, the pixels of the specified brightness are recognized as the fillet. The fillet inspection field is highlighted in light pink rectangle, and the detected fillet is highlighted in green pixels. |
| Fillet inspect image | Select Top . |
| Lead Area Length [%] | The length of the lead detected is specified with the percentage of the Lead Tip Width of Table 4-18. When the Lead Tip Width is set to 50[%] and the Search Lead Area Length is set to 50[%] , 25% of the inspection window width is the length of the detected lead. |
| Lead Search Image | Select Top . |
| Height Image | The item is for Saki engineers only. Do not change the setting. |

Table 4-16 Parameter

| Parameter | Description |
|-------------------------------|---|
| Shift | Shows the shift information. This can be set only when there is no pad information. |
| Lead Shift | Specifies the acceptable range of the detected lead misalignment. When there is pad information, the sample value is always 0. |
| Lead area [%] | In the detected lead, displays the percentage of the area recognized as a flat area. This value is the reference value. The detected lead is highlighted in dark pink rectangle. |
| Lead visibility | When the Lead area [%] has exceeded the Lead area threshold [%] , it is recognized as Visible and when the value is lower, it is recognized as Invisible . If it is Invisible , the lead tip is recognized as not correctly detected, and the lead is highlighted in dotted pink rectangle. In this case, the left edge of the window is the lead tip, and the fillet inspection field is set. |
| Lead height [μm] | Specifies the acceptable range of the detected lead height. |
| Sample value [%] | Specifies the acceptable range of the percentage of the detected fillet in the fillet inspection area. |
| Lead Side Overhang [%] | This can be set when there is pad information. Calculate the $A / W \times 100 [\%]$. If the calculation result is 25% or greater, judged as NG. |

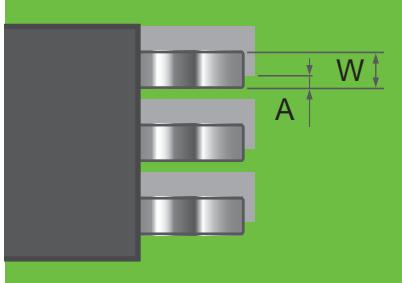


Figure 4-37 Lead Side Overhang

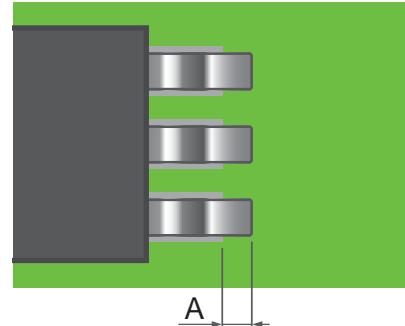
| Parameter | Description |
|---------------------------|---|
| Lead Tip Overhang [μm] | <p>This can be set if there is pad information. Calculate the A value. If the tip of the lead is protruding even a little from the pad, judged as NG.</p>  |

Figure 4-38 Lead Tip Overhang

Table 4-17 OK Range Setting

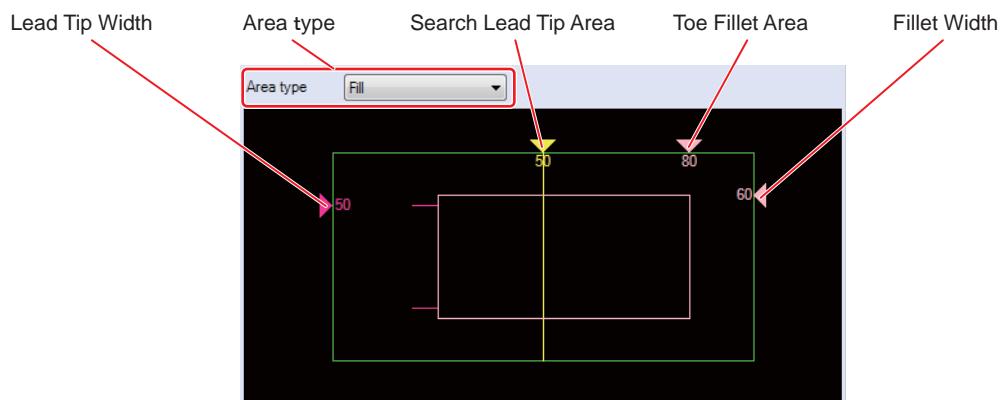


Figure 4-39 Search Lead Tip and Fillet Area Settings

| Parameter | Description |
|----------------------|---|
| Area type | Specifies the area type from the drop-down list that accordance with the shape of the fillet. |
| Lead Tip Width | Specifies the width to search a lead tip by the percentage of the area in the inspection window. If 50[%] is specified, 50% of the inspection window width as the width of the lead tip. The detected lead tip is highlighted in dark pink rectangle. |
| Search Lead Tip Area | Specifies the area to search a lead tip by the percentage of the area in the inspection window. If 50[%] is specified, the lead tip is searched for within the range of the left half of the inspection window. The search area is highlighted in yellow line. |
| Toe Fillet Area | Specifies the location of fillet tip to search by the percentage of the area in the inspection window. If 80[%] is specified, the lead tip is 80% of the position from the left edge of the inspection window. The length from lead tip to fillet tip as the length of the fillet inspection area. |
| Fillet Width | Specifies the fillet width to search by the percentage of the area in the inspection window. If 60[%] is specified, 60% of the inspection window is the width of fillet inspection area. |

Table 4-18 Search Lead Tip and Fillet Area Settings

4.7.3 Setting Procedure

Step1: Select **Lead tip black white** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: Adjust the size of the inspection window to surround the solder fillet area and the lead tip.

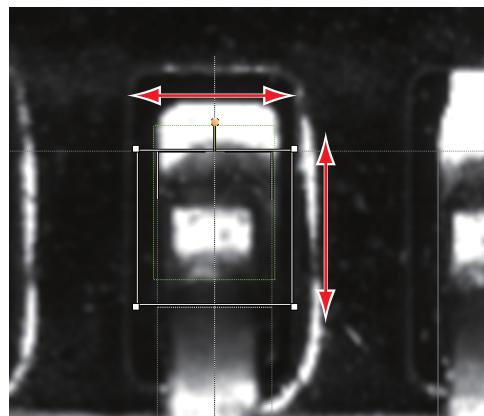


Figure 4-40 Adjusting the Inspection Window

Step3: Click and check if the lead and fillet are detected. The detected lead tip is displayed in the dark pink rectangle and the fillet is displayed in the light pink rectangle with green pixels.

NOTE If the lead tip and fillet cannot be detected, adjust the parameter by reference to Table 4-16 and Table 4-18.

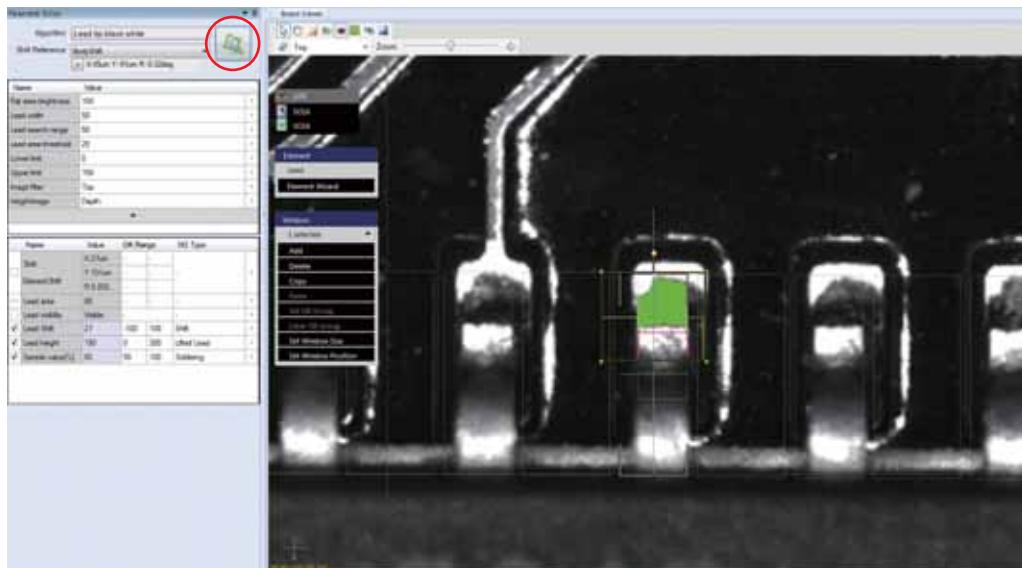


Figure 4-41 Detecting the Lead Tip and Fillet

Step4: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step5: Click again and check if the inspection is completed properly.

4.8 Two Step Lead Solder (Lefted Lead)

4.8.1 Inspection Overview

Two step lead solder(Lefted lead) is the algorithm to calculate brightness level of solder in the lead end of IC components and in the pad end.

In ideal solder joints form, the TopLight displays lower brightness level in lead end area and higher brightness level is pad end area.

The solder area at the lead edge may have a slightly higher brightness depending on the shape of the solder. In this case, it automatically detects the solder at the edge of the pad and calculates the degree of brightness, judged as OK if the brightness is high.

Two step lead solder(Lefted lead) is suitable for the solder paste inspection of IC components.



(a) The result will be OK, if the brightness level of 1(Lead end) is lower. 2(Pad end) does not inspect.

(b) The result will be NG(No Solder), if the brightness level of 1 is lower.



(c) Inspect the brightness level of 2, if the brightness level of 1 is dubious value.

The result will be OK, if the brightness level of 2 is higher.

The result will be NG(lifted lead), if the brightness level of 2 is lower.

Figure 4-42 Two step lead solder(Lefted lead)

4.8.2 Parameter Setting

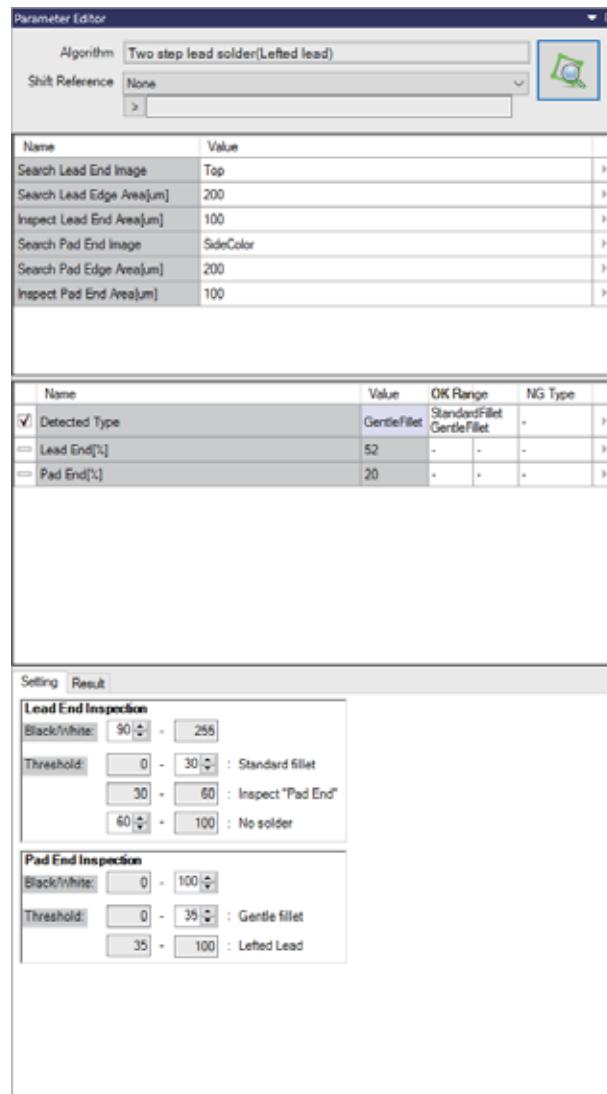


Figure 4-43 Dialog (Version 0.0.0.1)

| Parameter | Description |
|----------------------------|---|
| Search Lead End Image | Specifies the lighting for search lead end. Default is TopLight . |
| Search Lead Edge Area [μm] | Specifies the search range of the bright to the dark edge going from the edge (lead side) toward the interior of the inspection window. Define the detected edge as lead tip. (Refer to ① in figure below). |
| Inspect Lead End Area [μm] | Specifies the area for detecting lead tip. Specifies the length from the lead edge detected by Search Lead Edge Area. The space between the two dotted lines which traverse the inspection window on the screen is set as the Inspect Lead End Area. (Refer to ② in figure below). |
| Search pad end Image | Specifies the lighting for search pad end. Default is SideColor . |
| Search Pad Edge Area [μm] | Inspects the Pad Edge Area if the brightness is fuzzy in the Inspect Lead End inspection. Specifies the search range of the dark to the bright edge going from the edge (pad side) toward the interior of the inspection window. Define the detected edge as pad end. (Refer to ③ in figure below). |
| Inspect Pad End Area [μm] | Specifies the area for detecting pad end. Specifies the length from the pad edge detected by Search Pad Edge Area. The space between the two dotted lines which traverse the inspection window on the screen is set as the Inspect Pad End Area. (Refer to ④ in figure below). |

Table 4-19 Parameter

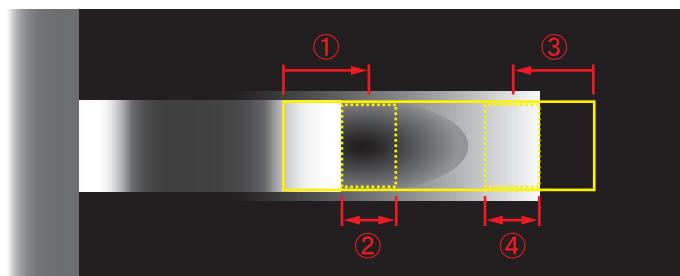


Figure 4-44 Adjusting the Inspection Window

| Parameter | Description |
|-------------|---|
| Black White | Set the brightness level of no fillet shape. Upper limit of brightness level is 255 . Lower limit of brightness level defined as NG (Default value is 90). Enter the bigger value in Lower limit field if the OK sample value is higher and the result is NG. The NG area is displayed in green on the screen. |
| Threshold | The judgement is performed based on the NG area ratio in lead tip area. If the ratio of the NG area is high, judged as No solder . If the ratio of the NG area is low, judged as Standard fillet . If the ratio of the NG area is neither high nor low, start pad end inspection. Refer to Table 4-21 Settings of Inspect Pad End Area to see detail settings of solder inspection at pad end area. Specifies the threshold of No solder and Standard fillet . |

Table 4-20 Settings of Inspect Lead End Area

| Parameter | Description |
|-------------|--|
| Black White | If the ratio of the NG area in the lead end inspection is neither high nor low, inspect the solder at the end of the pad and judge the result. In ideal solder joints form, the pad lead area is darker and pad end area is brighter (Refer to the left side of (c) Figure 4-42 Two step lead solder (Lefted lead)). Set the brightness level of Lifted Lead for the case of solder amount is excessive. Lower limit of brightness level is 0 . Upper limit of brightness level defined as NG (Default value is 100). Enter smaller value in Upper limit field, if the OK sample value is lower and result is NG. The NG area is displayed in green on the screen. |
| Threshold | The result is the percentage of specified brightness level as NG in the pad end area. If the ratio of the NG area is high, judged as Lifted lead . If the ratio of the NG area is low, judged as Gentle fillet . Specifies the threshold to judge the between a Lifted lead and a Gentle fillet . |

Table 4-21 Settings of Inspect Pad End Area

| Parameter | Description |
|--------------------|--|
| Inspection Results | Standard Fillet |
| | No Solder |
| | Gentle Fillet |
| | Lifted Lead |
| Lead End [%] | The percentage of specified brightness level as NG in the lead end area is displayed. |
| Pad End [%] | The percentage of specified brightness level as NG in the pad end area is displayed. If not to inspect pad end, set to 0 . |

Table 4-22 OK Range Setting

4.8.3 Setting Procedure

Step1: Select **Two step lead solder(Lefted lead)** from the **Algorithm** drop-down list.

NOTE To use same shift information by another algorithm, at the **Shift Reference** select **Body Shift** from the drop down list.

Step2: As shown in figure below, adjust the inspection window size and position.

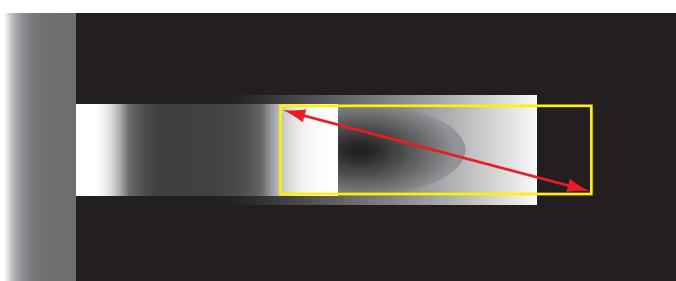


Figure 4-45 Adjusting the Inspection Window

Step3: Click and check if the lead edge is searched. If the lead tip cannot be found, adjust the **Search Lead Edge Area**.



Figure 4-46 Detecting the Lead end 1

Step4: Specify **OK Range** of the sample value and set **NG Type** for when the sample value is judged as NG.

NOTE If not performing the inspection, uncheck the item.

Step5: Click again and check if the inspection is completed properly.

The details of the inspection results are displayed in the **Result** tab on the lower side of **Parameter Editor**.

If necessary, adjust the parameter by reference to Table 4-19 to Table 4-22.



Figure 4-47 Detecting the Lead end 2

MEMO

Other Functions

1 Making an Inspection Data on BF2-Editor

The image taken by AOI machines can be transferred to BF2-Editor to create inspection data.

1.1 Transferring a Data to BF2-Editor

Step1: Scan a good PCB on an AOI machine by reference to **Part II 4 Acquiring a PCB image**.

Step2: From the dock window, select **Image File List > Add current image**.

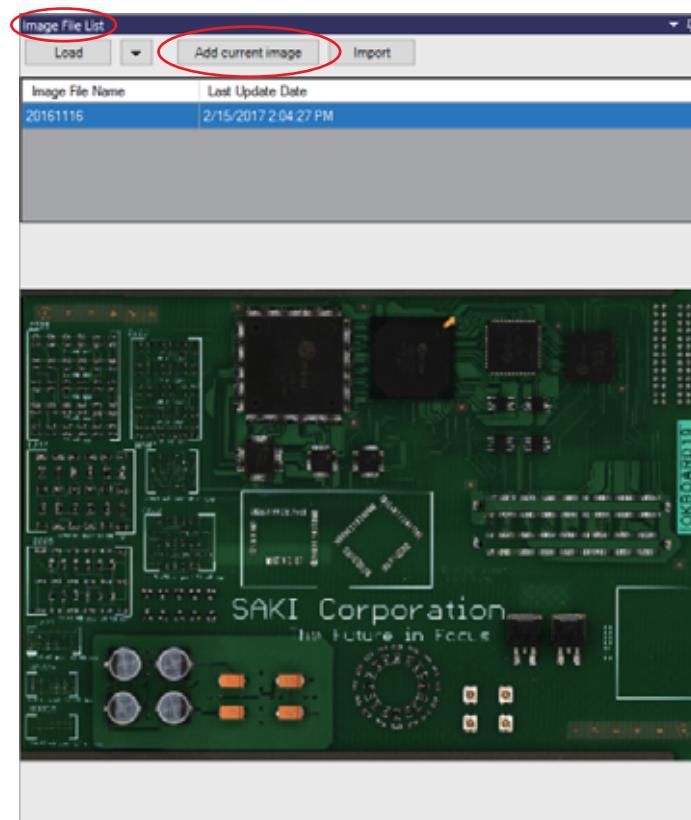


Figure 1-1 Add Current Image

Step3: Enter a desired file name and click **OK**.

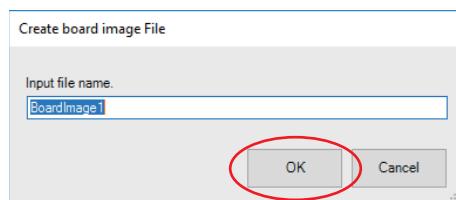


Figure 1-2 Entering the File Name

Step4: The PCB image is displayed on the lower side of the dock window.

When Transferring Only the Image File

Click on the right side of **Load** and select **Export** from the drop-down list.

The file saving dialog is displayed.

Save the data to a place where BF2-Editor can access or an external devise.

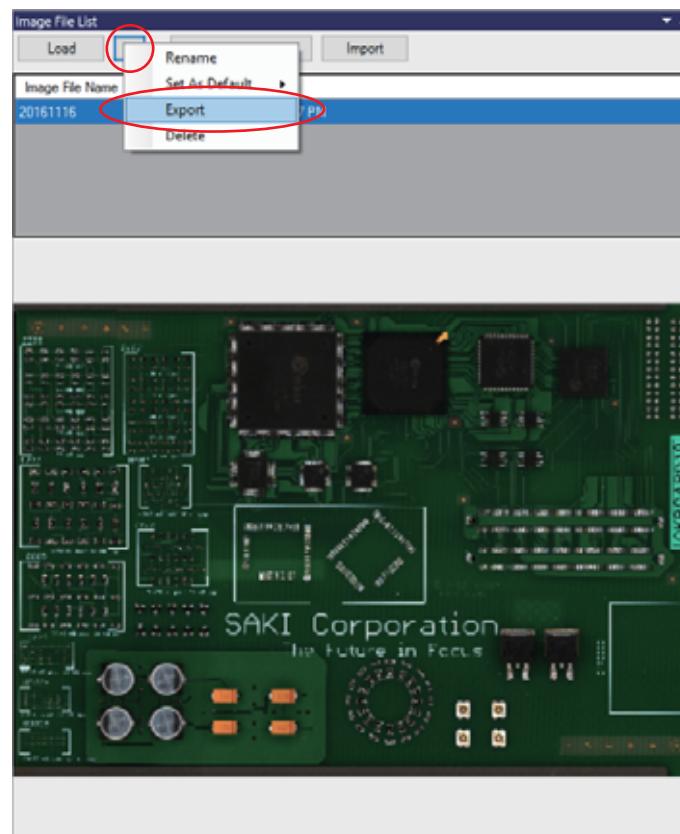


Figure 1-3 Export

When Transferring the Inspection Data

Click the **BF2** button on the upper left side of the window and select **Export > Copy Group**.

The dialog shown in Figure 1-5 appears.

In this dialog, all board data which is included in the selected group are displayed.

Select the board data to be transferred and click **Copy File**.

Save the data to a place where BF2-Editor can access or to an external devise.

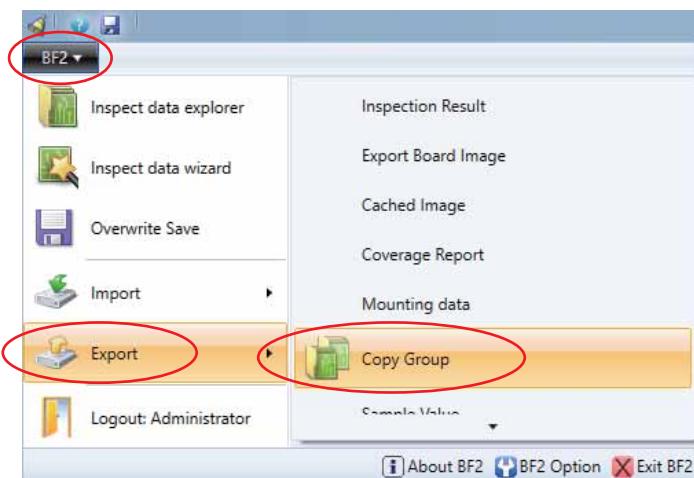


Figure 1-4 Copy Group 1

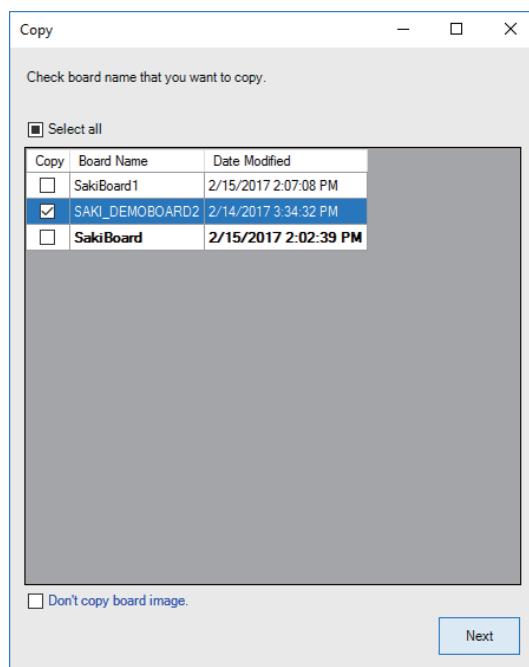


Figure 1-5 Copy Group 2

1.2 Making/Editing an Inspection Data on BF2-Editor

Procedures for making/editing an inspection data on BF2-Editor is the same as the procedure on inspection machine.

Step1: Save the inspection data or image file to the place where BF2-Editor can access or the external device by reference to **1.1 Transferring a Data to BF2-Editor**.

Step2: **When Only Editing the Inspection Data in BF2-Editor**

Select an inspection data by reference to **Part I 1.3 Selecting an Inspection Data File**.

Edit the inspection data by reference to **Part II 3 Editing an Inspection Data**.

When Making the Inspection Data in BF2-Editor

Make the inspection data by reference to **Part II 1 Making an Inspection Data**.

NOTE **Scan** is not displayed when loading a PCB image, because BF2-Editor is not capable of scan the PCB. Select **Load Board Image** and load the file saved in Step1.

Step3: To edit the inspection data which is made/edited in BF2-Editor in an Inspection machine, save the inspection data to a place where the inspection machine can access or an external device by reference to **1.1 Transferring a Data to BF2-Editor**.

2 Pad Based Shift Inspection

Pad Based Shift Inspection is an inspection that calculates the amount of shift from position information of the pad connected between components.

Inspects the shift value that comply with the IPC standard.

Inspectable components are chip parts, capacitors, and component with leads.

2.1 Available Algorithms

Pad Based Shift Inspection is supporting algorithm below.

CAUTION

In the Pad Based Shift Inspection, pad information is loaded and applied only if a pad information is tied to the component. When pad is not existing, does not perform the Pad Based Shift Inspection.

| Inspection Algorithm | Version | Inspection Categories |
|----------------------|------------------|---|
| Chip Align | 1.1.0.0 or above | Side Overhang [%] End Overhang [μm] For details of algorithm, refer to Part III 1.9 Chip Align . |
| Lead tip black white | 1.3.0.0 or above | Lead Shift [%] End Overhang [μm] For details of algorithm, refer to Part III 4.7 Lead Tip Black White . |
| Lead inclusive | 1.5.0.0 or above | Lead Shift [%] End Overhang [μm] For details of algorithm, refer to Part III 4.6 Lead Inclusive . |

Table 2-1 Inspection Algorithm

2.2 Inspection Item of Available Algorithms

Pad Based Shift Inspection is inspects shown below items.

2.2.1 Side Overhang

Calculate the $A / W \times 100 [\%]$.

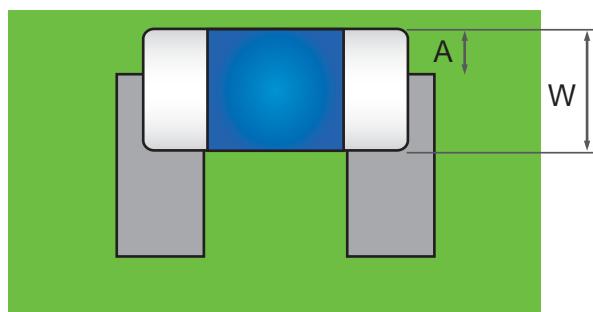


Figure 2-1 Side Overhang

2.2.2 End Overhang

Calculate the A value.

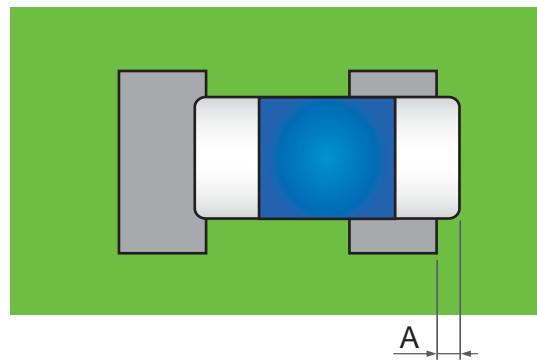


Figure 2-2 End Overhang

2.2.3 Lead Shift

Calculate the $A / W \times 100 [\%]$.

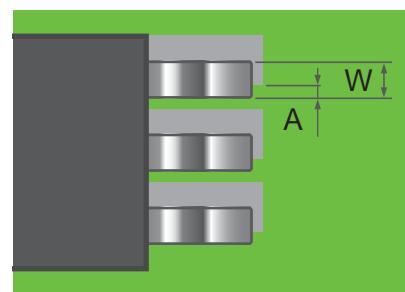


Figure 2-3 Lead Shift

2.2.4 End Overhang

Calculate the A value.

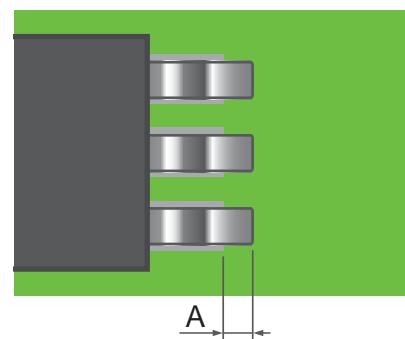


Figure 2-4 End Overhang

2.3 Loading Pad Information

This section describes how to load a pad information.

Pad Based Shift Inspection uses gerber data as pad information.

Step1: From **Pad Info** tab, select **Layout** group > **Load Gerber**.



Figure 2-5 Loading Pad Information 1

Step2: Select Gerber data and click **OK**.

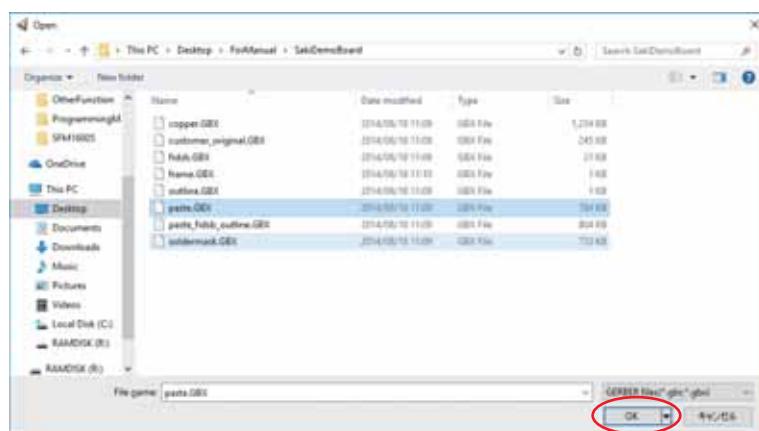


Figure 2-6 Loading Pad Information 2

Step3: Move and rotate the pad information and board image to match the position by pressing buttons and click **OK**.

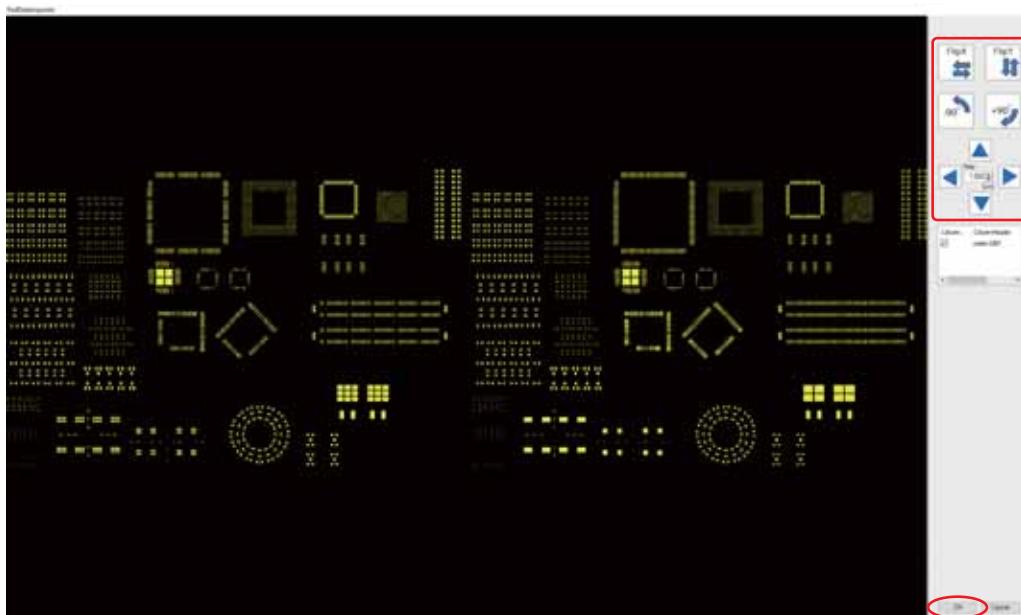


Figure 2-7 Loading Pad Information 3

Step4: From **Pad Info** tab, select **Layout** group > **Fine fit**.

The dialog shown in Figure 2-9 appears.



Figure 2-8 Loading Pad Information 4

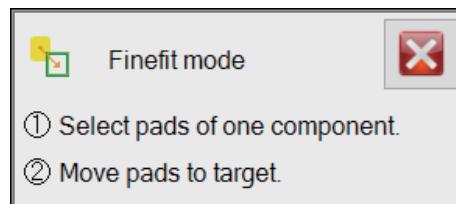


Figure 2-9 Loading Pad Information 5

Step5: Select a pad by dragging diagonally across the pad.

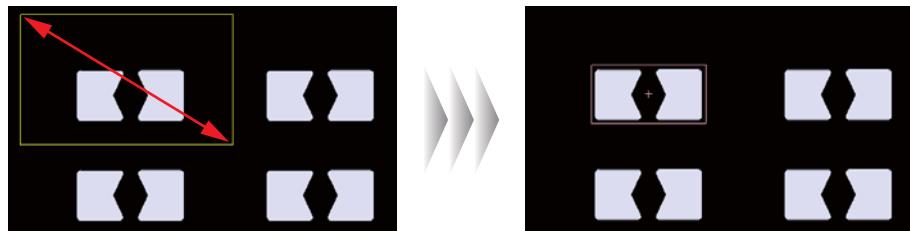


Figure 2-10 Loading Pad Information 6

Step6: Drag the selected pad to the position of the corresponding component.

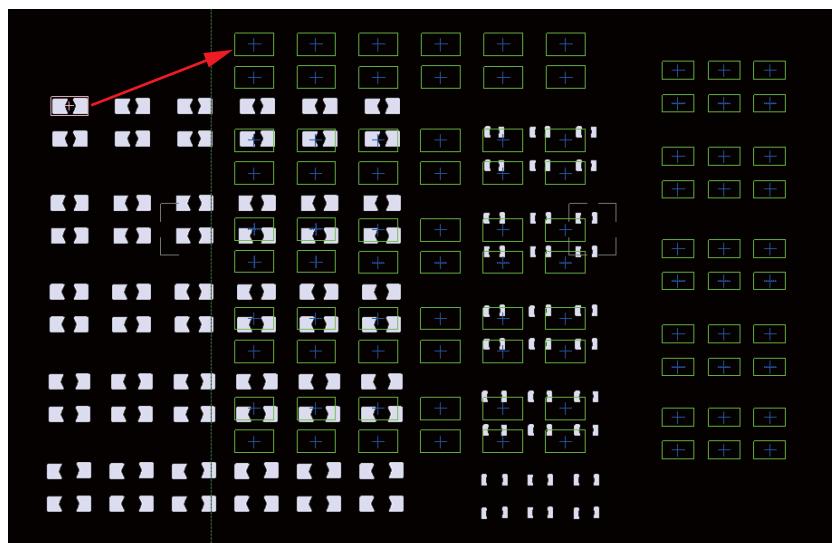


Figure 2-11 Loading Pad Information 7

Step7: When a pad is dragged close to the same shape component corresponding to the pad, a red dotted line is displayed. Drop it when the pad and the corresponding component are displayed with red dotted line.

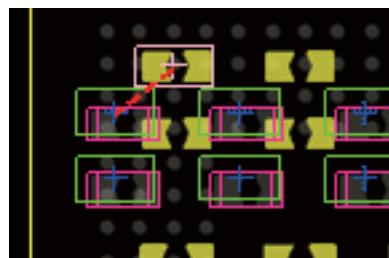


Figure 2-12 Loading Pad Information 8

Step8: The dialog shown below appears.

- Yes** All pads move to corresponding component window.
No Cancel the movement.

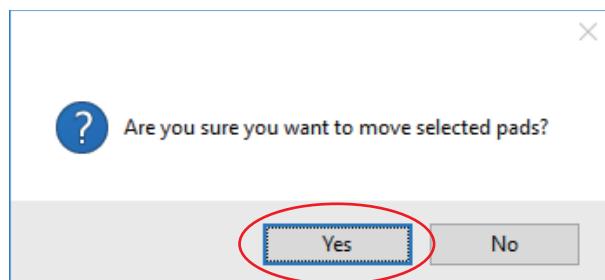


Figure 2-13 Loading Pad Information 9

Step9: Automatically adjust the pad and component position.

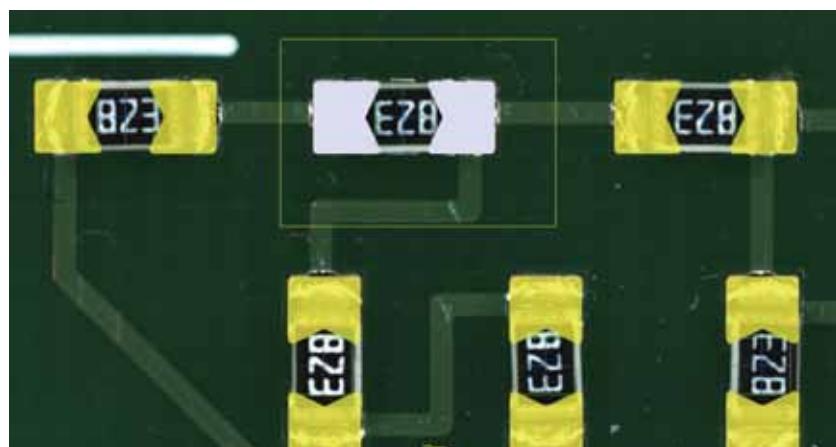


Figure 2-14 Loading Pad Information 10

2.4 Inspection Items of Pad Standard Inspection

This section describes with an example of chip align.

Pad Based Shift Inspection can inspect the Side Overhang[%] and End Overhang[μm].

The default value of the OK range is based on the IPC standards.

When using Pad Based Shift Inspection, it is not possible to set the **Shift** value, which is the conventional shift inspection.

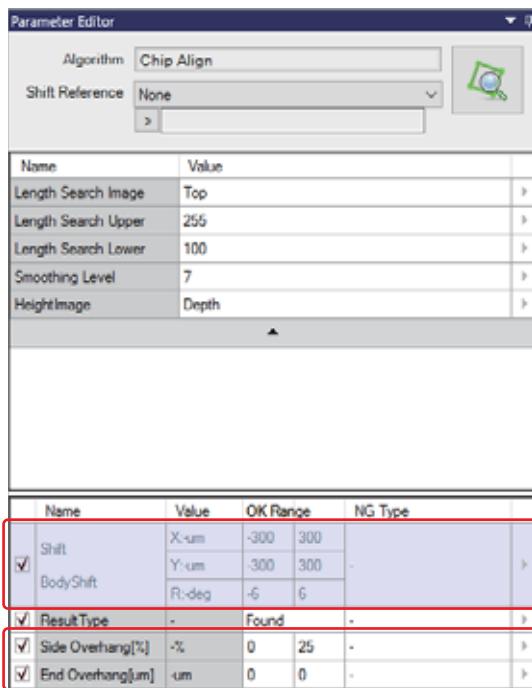


Figure 2-15 Pad Based Shift Inspection

It is not possible to set the **End Overhang[μm]** and **Side Overhang[%]** without pad information.

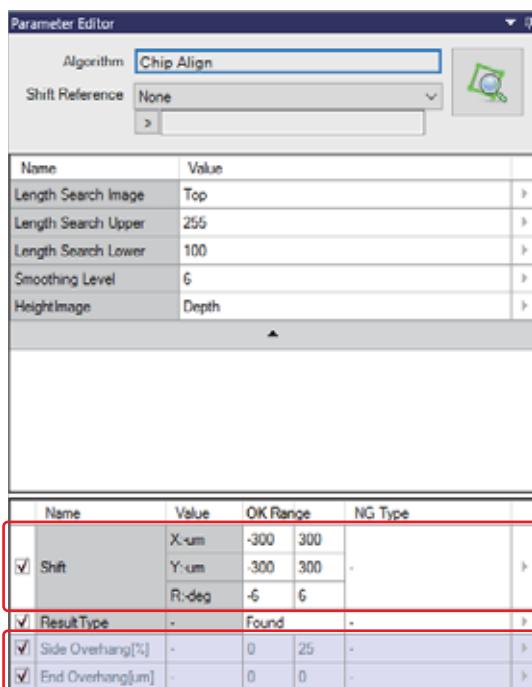


Figure 2-16 Does Not Exist Pad Information

3 SPC Function

SPC (Statistical process control) is the method that controls the manufacturing process statistically. By using SPC, the quality of products can be maintained, and the manufacturing process can be controlled and improved.

3.1 Setting of SPC Function

Step1: Click **BF2** button on the upper left side of the window to open the menu and click **BF2 Option**.

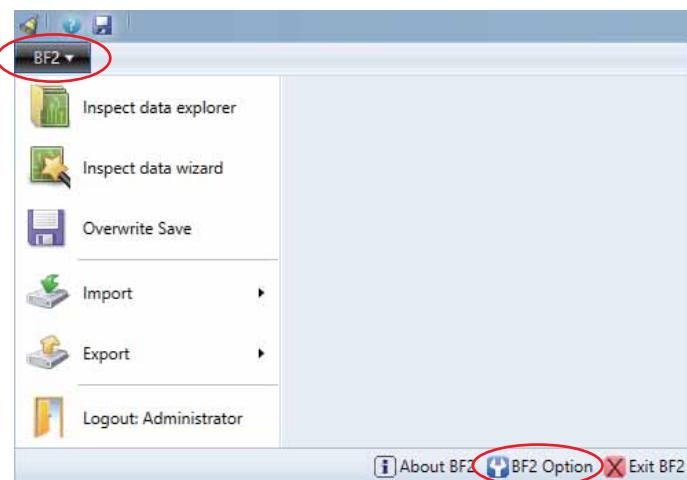


Figure 3-1 Setting of SPC Function 1

Step2: The dialog shown below appears.

Click **Auto Mode**.

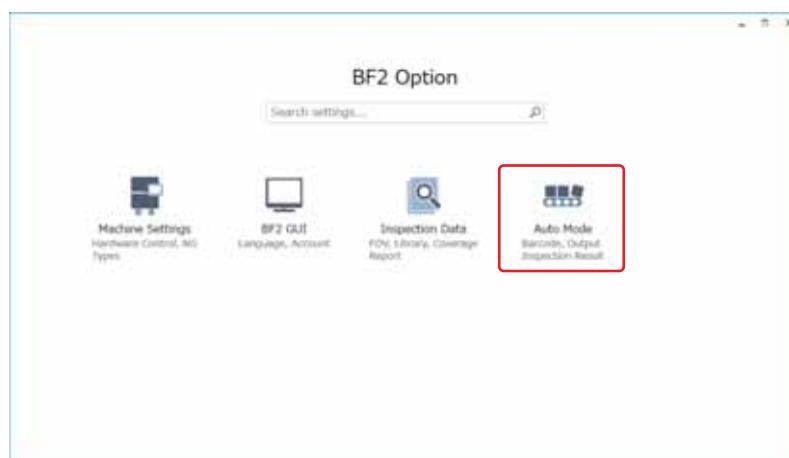


Figure 3-2 Setting of SPC Function 2

Step3: Select **Output Inspection Result** and set toggle switch of **SPC Manager** to **ON**.

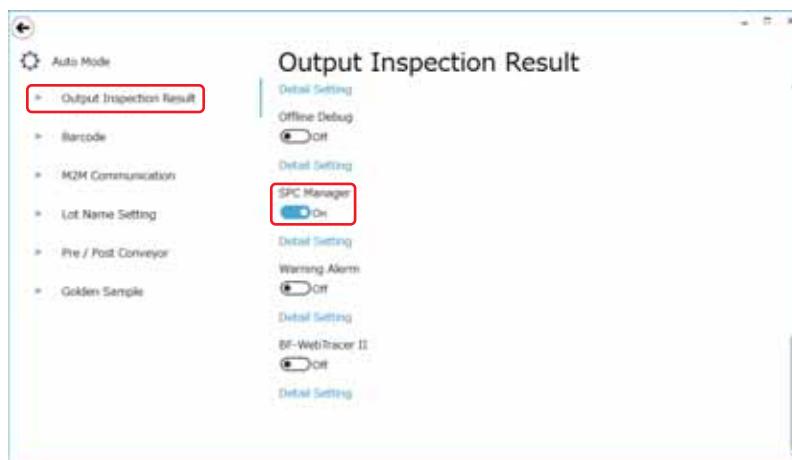


Figure 3-3 Setting of SPC Function 3

Step4: Click **Detail Setting** under the toggle switch of **SPC Manager** to set detailed items.

Enable a desired function. Refer to the table below for detail settings.

After all the settings are completed, click **X** on the upper right side of the dialog and click **Yes** to close dialog.

| Item | Description |
|---------------------------------|---|
| Inspection Sample Result Enable | The sample value is output as the csv file format to the Inspection Sample Result Folder . |
| Inspection Sample Result Folder | Sets a file location for the inspection sample result to be stored. |
| Simple Inspection Result Enable | The inspection result file is output as the xml file format to the Simple Inspection Result Folder . |
| Simple Inspection Result Folder | Sets a file location for the inspection result to be stored. |
| Enable SPC Window | The SPC Window is updated during Auto Mode. The SPC Window can be verified with the Auto tab. Displays the statistical information calculated from the inspection result of Auto Mode. For details, refer to 3.2 SPC Window . |
| Enable SPC Detail Window | The SPC Detail Window is updated during Auto Mode. The SPC Detail Window can be verified with the Auto tab. Displays the number of OK, NG, False Call and Total by unit of board, sub board unit, and component unit. For details, refer to 3.2 SPC Window . |
| SPC Window Directory | Sets a file location for the SPC item result file to be stored. |
| SPC Window List | Sets the maximum display size of components and recipes displayed in the worst ranking of the SPC window. Default value is 15 . |

Table 3-1 Setting of SPC Function

3.2 SPC Window

SPC Window and SPC Detail Window displays the statistical information calculated from the inspection results of Auto Mode.

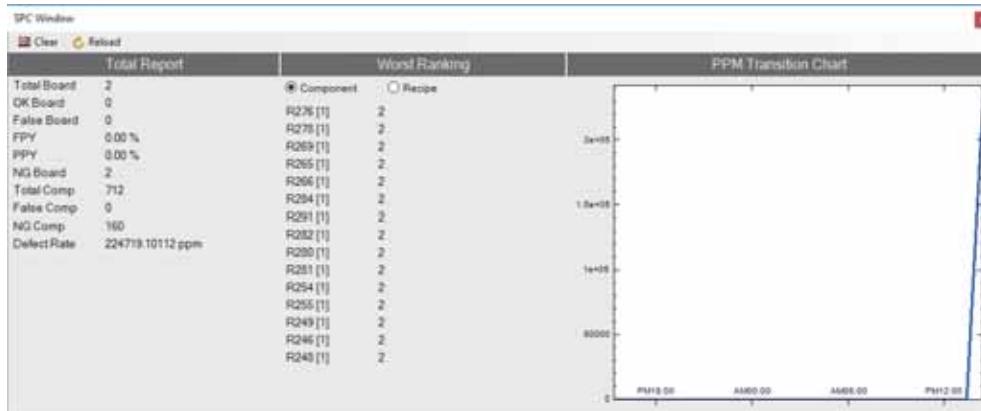


Figure 3-4 SPC Window

| Item | | Description |
|----------------------|-------------|---|
| Clear | | Clears the SPC Window Informations. |
| Reload | | Updates the SPC Window Informations. |
| Total Report | Total Board | Shows the total number of the inspected PCBs. |
| | OK Board | Shows the total number of the OK PCBs. |
| | False Board | Shows the total number of boards judged as false call in Debug Mode and in Real-time Judgement. |
| | FPY | Shows the percentage of the number of OK boards out of all the boards. This is calculated with “(number of OK boards / total number of boards) x 100”. |
| | PPY | Shows the percentage of the number of OK boards and of the number of boards judged to be excessive in the total amount of boards. This is calculated with “((number of OK boards + number of boards judged to be excessive) / total number of boards) x 100”. |
| | NG Board | Shows the total number of the NG PCBs. |
| | Total Comp | Shows the total number of components. |
| | False Comp | Shows the total number of components judged to be false call in Debug Mode and in Real-time Judgement. |
| | NG Comp | Shows the total number of NG components. |
| | Defect Rate | Shows the ratio of NG components from the total number of components. Calculated with “(number of NG components / total number of components) x 1000000”. |
| Worst Ranking | Component | Shows the components and recipes at which many NGs were judged. |
| | Recipe | |
| PPM Transition Chart | | Shows the trend of the percentage of defective boards through the course of time. |

Table 3-2 SPC Window

| Board (Sheet) | | Sub Board | | Component | |
|---------------|---|-------------|---|-------------|---|
| Total | 1 | Total | 4 | Total | 8 |
| OK | 0 | OK | 0 | OK | 4 |
| False | 0 | False | 0 | False | 0 |
| NG | 1 | 100.00 % NG | 4 | 100.00 % NG | 4 |

Figure 3-5 SPC Detail Window

| Item | | Description | |
|--------------|-------|---|--|
| Clear | | Clears the SPC Detail Window Informations. | |
| Reload | | Updates the SPC Detail Window Informations. | |
| Board(Sheet) | Total | Shows the total number of the inspected PCBs. | |
| | OK | Shows the total number of the OK PCBs. | |
| | False | Shows the total number of PCBs judged as false call in Debug Mode and in Real-time Judgement. | |
| | NG | Shows the total number of the NG PCBs. | |
| Sub Board | Total | Shows the total number of the inspected sub boards. | |
| | OK | Shows the total number of the OK sub boards. | |
| | False | Shows the total number of sub boards judged as false call in Debug Mode and in Real-time Judgement. | |
| | NG | Shows the total number of the NG sub boards. | |
| Component | Total | Shows the total number of the inspected components. | |
| | OK | Shows the total number of the OK components. | |
| | False | Shows the total number of components judged as false call in Debug Mode and in Real-time Judgement. | |
| | NG | Shows the total number of the NG components. | |

Table 3-3 SPC Detail Window

4 Output Image Function

The Output Image Function is a function to outputs images of arbitrary components in Auto Mode.

4.1 Setting a Output Image Function

Step1: Click **BF2** button on the upper left side of the window to open the menu and click **BF2 Option**.

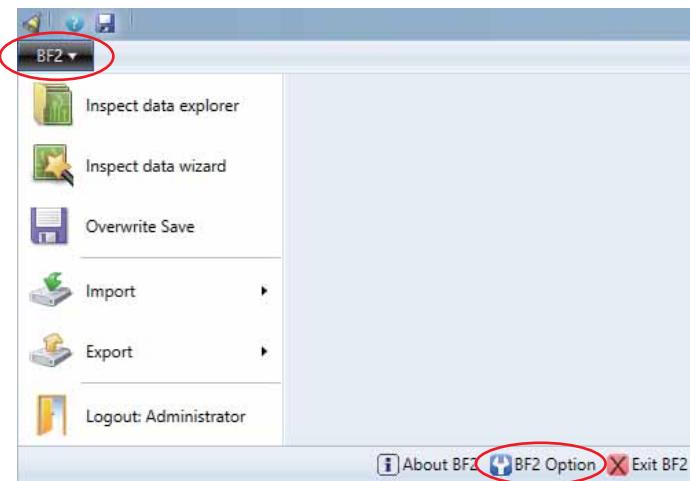


Figure 4-1 Setting a Output Image Function 1

Step2: The dialog shown below appears.

Click **Auto Mode**.

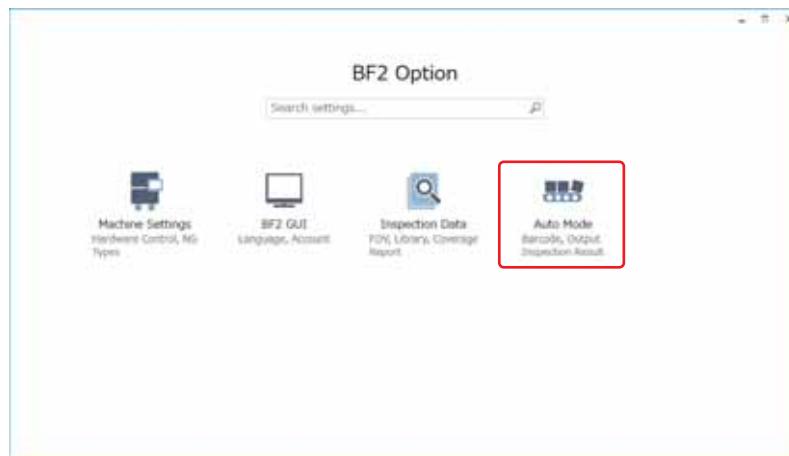


Figure 4-2 Setting a Output Image Function 2

Step3: Select **Output Inspection Result** and set toggle switch of **Component Image Output** to **ON**.

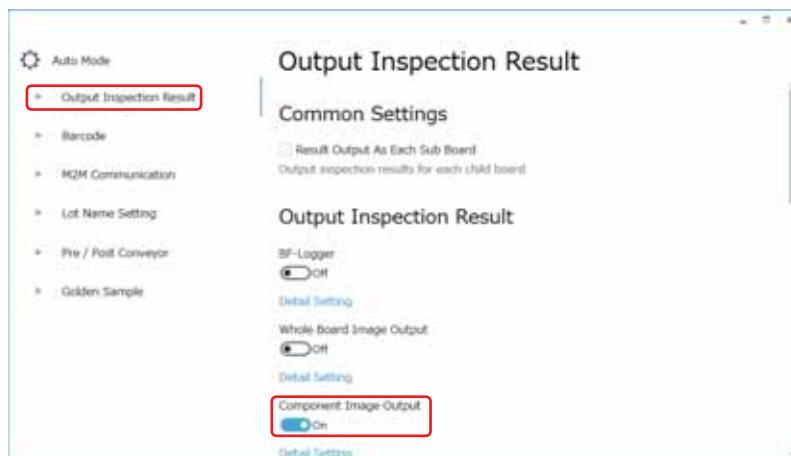


Figure 4-3 Setting a Output Image Function 3

Step4: Click **Detail Setting** under the toggle switch of **Component Image Output** to set detailed items.

Proceed the setup procedures, if necessary. Refer to the table below for detail settings.

After all the settings are completed, click **X** on the upper right side of the dialog and click **Yes** to close dialog.

| Item | Description |
|-------------------|--|
| Conf_Image Format | Sets output format of image file. Selects Jpeg or Bmp. |
| Output Condition | Specifies the inspection result of the component for which an image is to be output. Selects ALL to outputs all images targeted for image output. Selects OK to outputs the OK component images among the images targeted for image output. Selects NG to outputs the NG component images among the images targeted for image output. The targets for output are specified in 4.2 Specifying Components to Output Images . |
| Output Path | Set destination for the image file output . |

Table 4-1 Setting a Output Image Function

4.2 Specifying Components to Output Images

This section describes how to specify a component to output image.

Step1: Select the **InspectData** tab.



Figure 4-4 Specify Component to Output Image 1

Step2: Select a component data from **Board Viewer**.

Click **Component setting** on the edit panel.

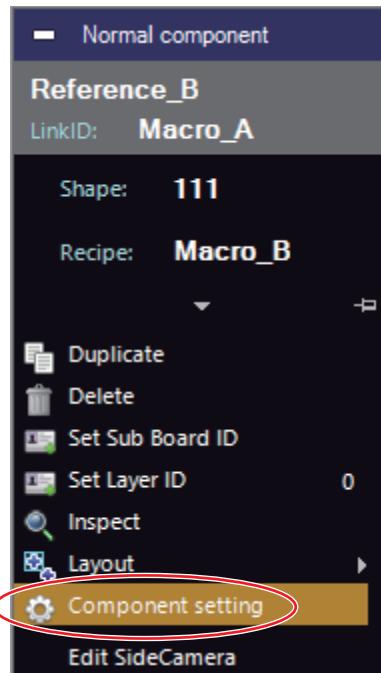


Figure 4-5 Specify Component to Output Image 2

Step3: The dialog shown below appears.

Set the **Output Image** to **True**, the component as a target for image output.

After all settings are completed, click **OK**.

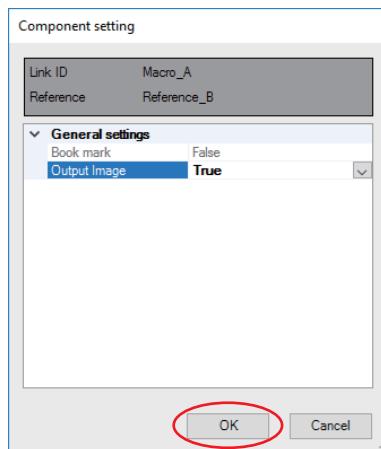


Figure 4-6 Specify Component to Output Image 3

4.3 Search Function of Components to Output Images

This section describes how to search a component to output image.

Step1: Select the **InspectData** tab.



Figure 4-7 Search Function of Components to Output Images 1

Step2: Select the **Component List** tab and set the upper part to **Component Image Output** and the lower part to **True** in Filter settings. Only the components for which images output are displayed in the **Component List** window.

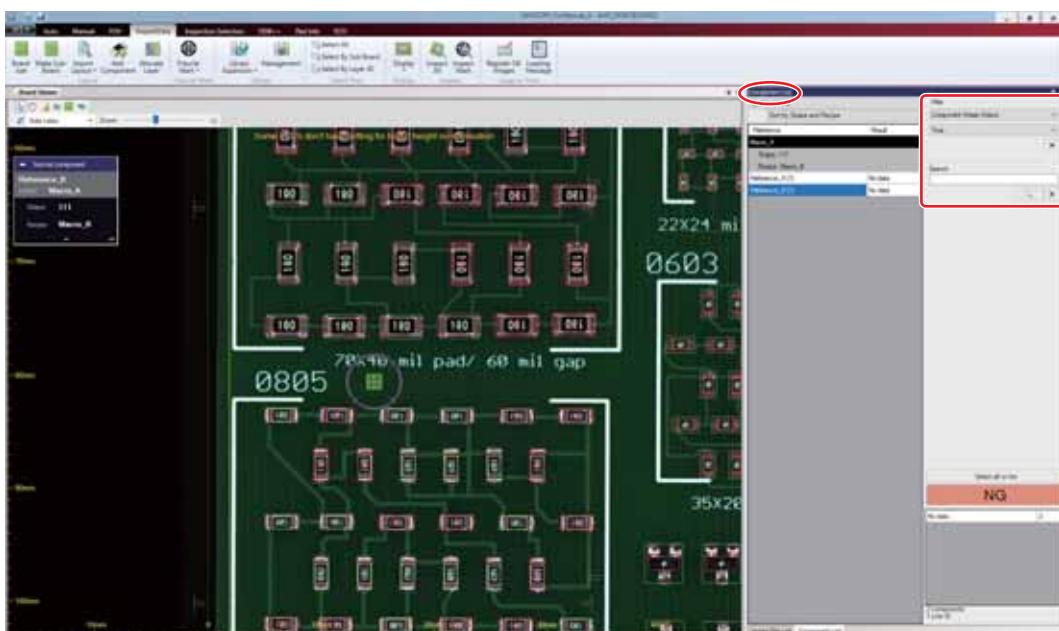


Figure 4-8 Search Function of Components to Output Images 2

5 Save Whole Board Image Function

The Save whole board image function is a function to outputs whole images of boards in Auto Mode.

5.1 Save Whole Board Image Setting

Step1: Click **BF2** button on the upper left side of the window to open the menu and click **BF2 Option**.

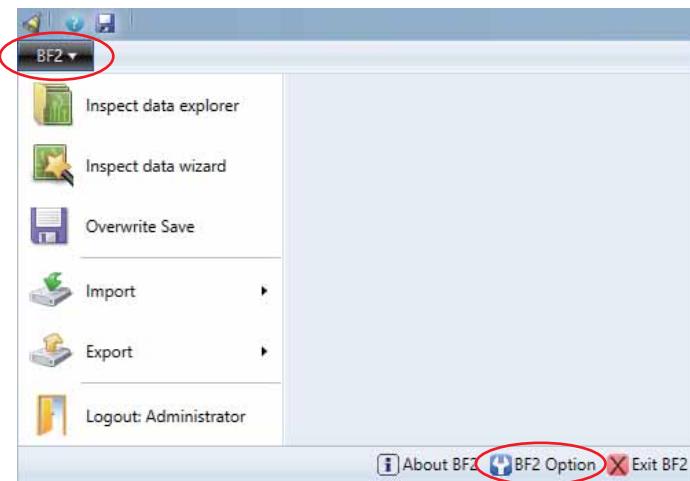


Figure 5-1 Whole Board Image Save Setting 1

Step2: The dialog shown below appears.

Click **Auto Mode**.

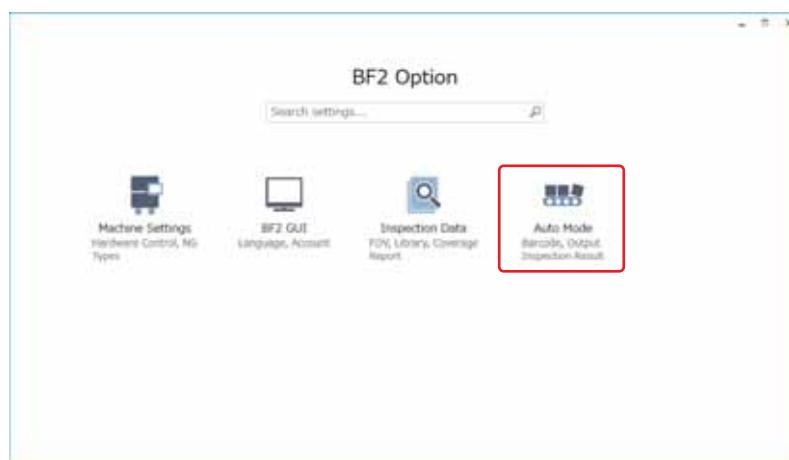


Figure 5-2 Whole Board Image Save Setting 2

Step3: Select **Output Inspection Result** and set toggle switch of **Whole Board Image Output** to **ON**.

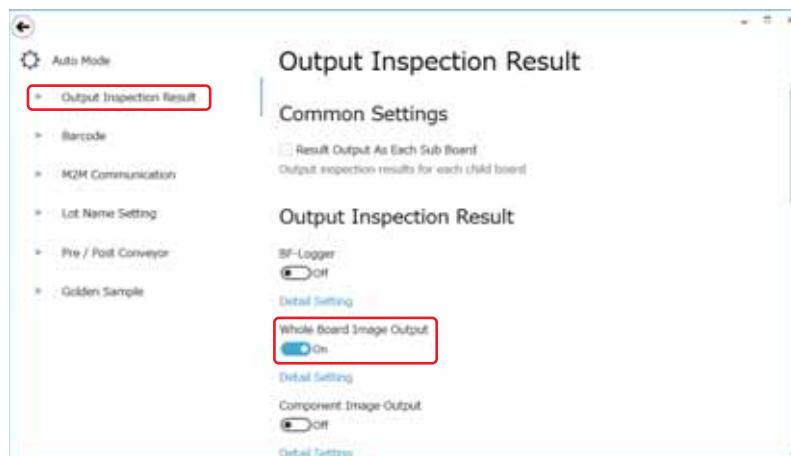


Figure 5-3 Whole Board Image Save Setting 3

Step4: Click **Detail Setting** under the toggle switch of **Whole Board Image Output** to set detailed items.

Proceed the setup procedures, if necessary. Refer to the table below for detail settings.

After all the settings are completed, click **X** on the upper right side of the dialog and click **Yes** to close dialog.

| Item | Description |
|----------------------|--|
| Output path | Set output destination of the image file. |
| File name | Set the image file output format. Select Board manage code to outputs the board manage code as the file name. Select Outputted time to outputs the outputted time as the file name. Select Group name_Board name_Board manage code_Outputted time to outputs Group name_Board name_Board manage code_Outputted time as the file name. |
| File type | Set the image file output format. Select Jpeg or bdimg(BF2 Image) . bdimg(BF2 Image) is an image used in inspection. bdimg(BF2 Image) image size is large so it takes time for output. |
| Lot name sub-folder | Create sub-folder of lot name. |
| Compression rate (%) | Set the image file compression rate. If increase this value, compression rate also increase so that the output time will be reduced. Default value is 20[%] . |
| Save timing | Sets the output setting of the Save whole board image function. Select All boards to outputs fullscreen images of each board. |
| Output once in | Select Interval time to outputs fullscreen images at the Output once in by minutes. Select Interval boards to outputs fullscreen images at the Output once in by images. |

Table 5-1 Descriptions

6 Warning Alarm

Warning Alarm function notifies when the situation during Auto Mode is satisfied with specified condition.

6.1 Function Overview

Warning Alarm function uses Warning Control Window displayed on **Auto** tab.

Warning Control Window shows the Warning Alarm Condition and notifies the detail information of warning when the alarm goes off.

NOTE To display Warning Control Window, the setting on BF2 Option is necessary.
For details, refer to **6.3 Warning Alarm Setting**.

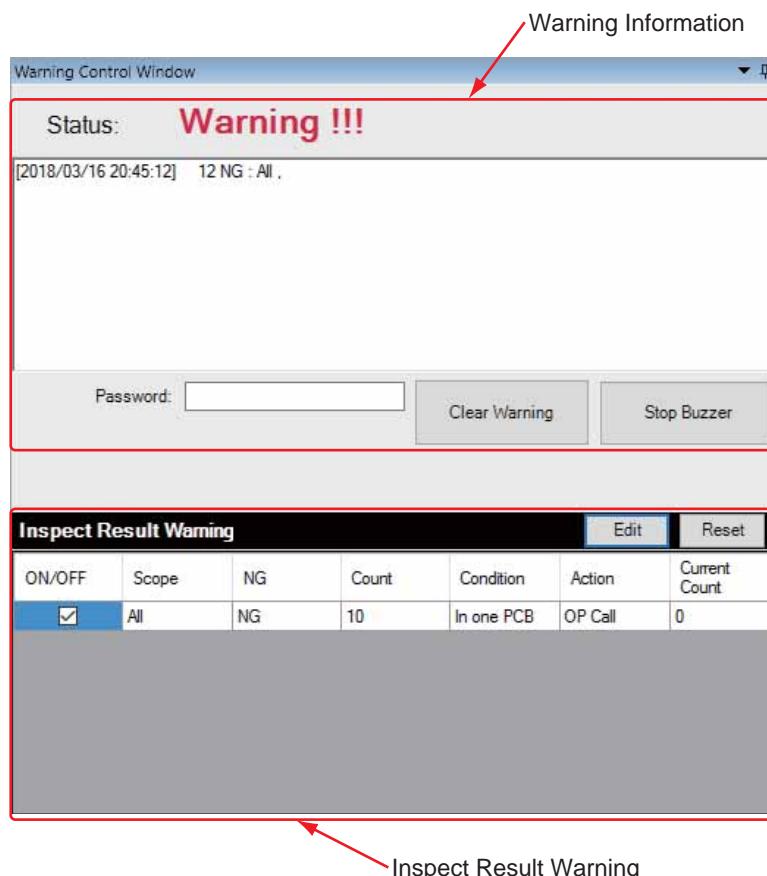


Figure 6-1 Warning Control Window

| Item | Description |
|------------------------|---|
| Warning Information | <p>When warning alarm goes off, the warning condition and the judged time are displayed.</p> <p>The warning log is reset by clicking Clear Warning. Please enter password when it is set in BF2 Option.</p> <p>For details, refer to 6.3 Warning Alarm Setting.</p> |
| Inspect Result Warning | <p>Displays the warning condition which is set for inspection result.</p> <p>The condition becomes invalid when ON/OFF is unchecked.</p> <p>Set the warning condition by clicking Edit.</p> <p>For details, refer to 6.2 Warning Alarm Condition.</p> <p>The current count number is reset by clicking Reset.</p> |

Table 6-1 Warning Control Window

6.2 Warning Alarm Condition

This section describes the warning alarm condition.

Warning alarm condition can be edited by clicking **Edit** on Warning Control Window of Figure 6-1.

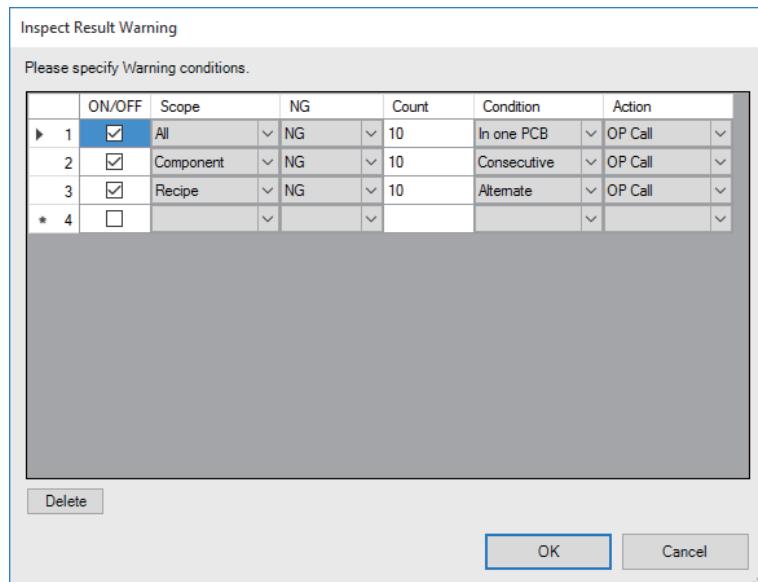


Figure 6-2 Warning Alarm Condition

| Item | Description |
|-----------|--|
| ON/OFF | Check to enable the warning condition. |
| Scope | Select the scope to be judged from All , Component , and Recipe . The judgment for warning alarm is performed in this scope. |
| NG | Sets NG. |
| Count | Input the count number until the warning alarm occurring. |
| Condition | Specifies the condition to occur warning alarm. The warning alarm goes off when NG is occurred by the number set in Count during set condition. Item : Consecutive / Alternate / In one PCB / In 15 min / In 30 min / In 60 min / In 3 hrs / In 6 hrs / In 12 hrs / In 18 hrs / In 24 hrs |
| Action | Specifies the action when the warning alarm goes off. Select OP Call . |

Table 6-2 Warning Alarm Condition

6.3 Warning Alarm Setting

Step1: Click **BF2** button on the upper left side of the window to open the menu and click **BF2 Option**.

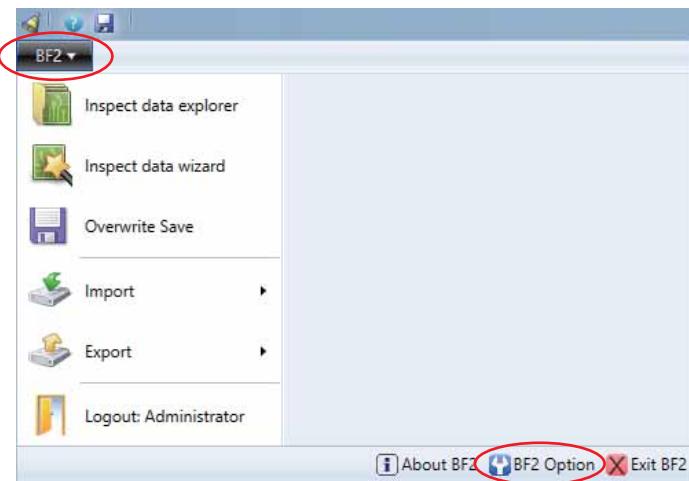


Figure 6-3 Warning Alarm Setting 1

Step2: The dialog shown below appears.

Click **Auto Mode**.

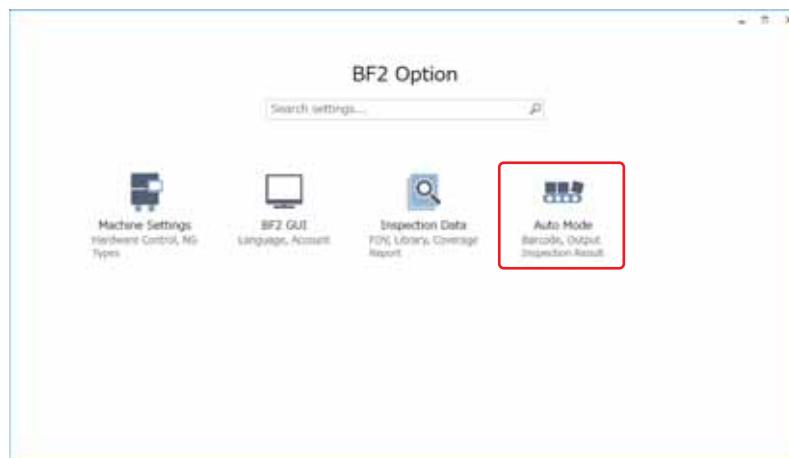


Figure 6-4 Warning Alarm Setting 2

Step3: Select **Output Inspection Result** and set toggle switch of **Warning Alarm** to **ON**.

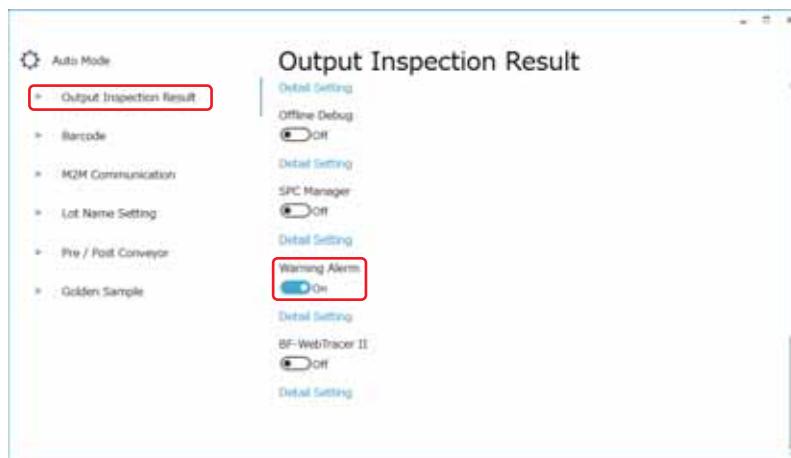


Figure 6-5 Warning Alarm Setting 3

Step4: Click **Detail Setting** under the toggle switch of **Warning Alarm** to set detailed items.

Proceed the setup procedures, if necessary. Refer to the table below for detail settings.

After all the settings are completed, click **X** on the upper right side of the dialog and click **Yes** to close dialog.

| Item | Description |
|---------------------------|--|
| Override Password | Sets the password to call off warning alarm. |
| Reset count when OK Board | The count is reset when a board is judged as OK. |
| Stop Auto Mode | Specifies the operation when the warning alarm occurs. Stop Forcibly: Stops Auto Mode when the warning alarm goes off. User Select: The dialog appears when the warning alarm goes off and the action can be selected. OFF: Auto Mode is not stopped. |

Table 6-3 Descriptions

Step5: **Warning Control Window** appears on **Auto** tab.

Step6: Click **Edit** on **Warning Control Window** to set condition.

For details, refer to **6.2 Warning Alarm Condition**.

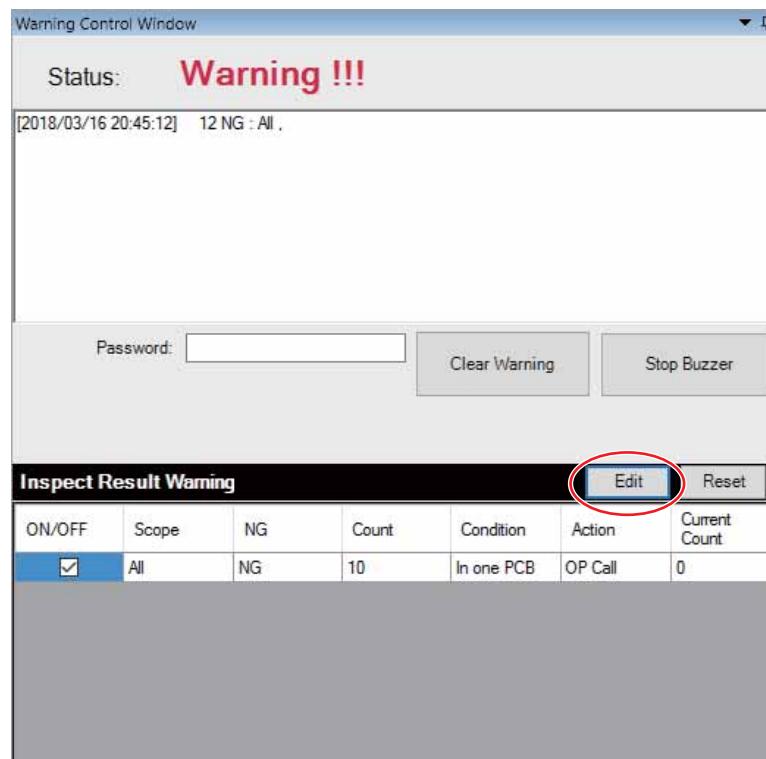


Figure 6-6 Warning Alarm Setting 4

6.4 Warning Alarm Operation

This section describes the operation of warning alarm.

Step1: Start Auto Mode.

Step2: When warning alarm occurs, detailed information is displayed on **Warning Information**.

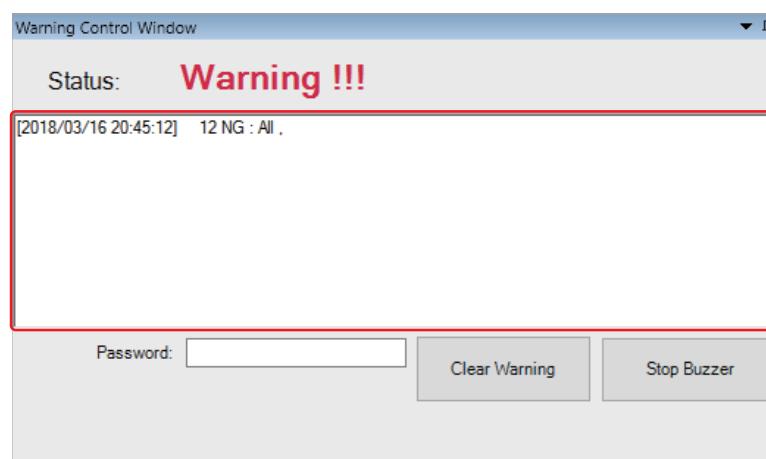


Figure 6-7 Warning Alarm Operation 1

Step3: The next step depends on the **Stop Auto Mode** setting of BF2 Option.

When **Stop Forcibly** is selected, please refer to **6.4.1 Forced Stoppage of Auto Mode**.

When **OFF** is selected, please refer to **6.4.2 Continuation of Auto Mode**.

When **User Select** is selected, please refer to **6.4.3 User Select**.

NOTE For details of **Stop Auto Mode** setting, refer to Step4 of **6.3 Warning Alarm Setting**.

6.4.1 Forced Stoppage of Auto Mode

Step1: If **Stop Forcibly** is selected in **Stop Auto Mode** setting, Auto Mode is interrupted when warning alarm goes off.

Step2: Click **Stop Buzzer** to stop operator call.

Check the details of warning alarm and resolve the problem on production.

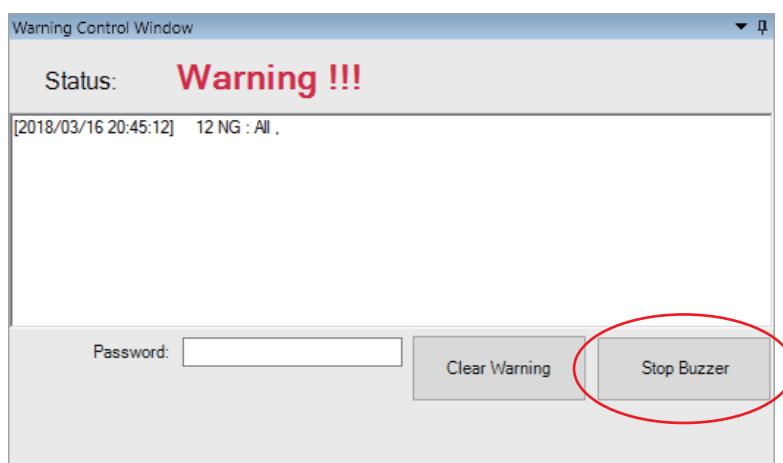


Figure 6-8 Forced Stoppage of Auto Mode 1

Step3: Enter the password which set in **Override Password** setting of BF2 Option, and click **Clear Warning** to clear Warning Alarm log.

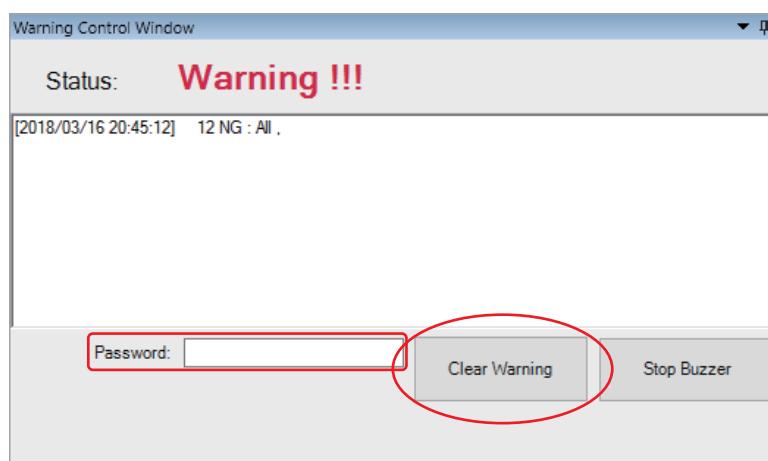


Figure 6-9 Forced Stoppage of Auto Mode 2

6.4.2 Continuation of Auto Mode

If **OFF** is selected in **Stop Auto Mode** setting, Auto Mode is continued.

Warning Log is displayed mountingly.

6.4.3 User Select

If **User Select** is selected in **Stop Auto Mode** setting, the dialog shown below appears when warning alarm goes off.

Check the details of warning alarm and select the operation.

NOTE To select **Continue**, entering of the password which set in **Override Password** setting of BF2 Option is necessary. Auto Mode is continued if **Continue** is selected.

NOTE For operation of the case when **Stop Auto Mode** is selected, please refer to **6.4.1 Forced Stoppage of Auto Mode**.

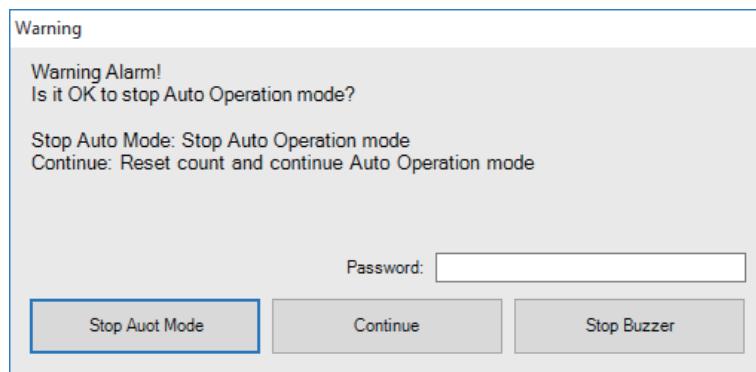


Figure 6-10 User Select

7 Golden Sample

Golden Sample Function can register the scan image and the inspection result based on the scan image together. By registering the sample image and inspection result of perfect board or the board which includes already-known issue in advance, reinspection by using registered sample image is performed at the Auto Mode is started after parameter tuning.

Overlooking because of parameter tuning or false call can be avoided by comparing the inspection result between reinspection and at the registration.

When the inspection results are not matched, it is notified to operator.

NOTE The board without NG is called **Golden Sample**. And the board with already-known NG is called **Silver Sample**.

7.1 Setting of Golden Sample Function

Step1: Click **BF2** button on the upper left side of the window to open the menu and click **BF2 Option**.

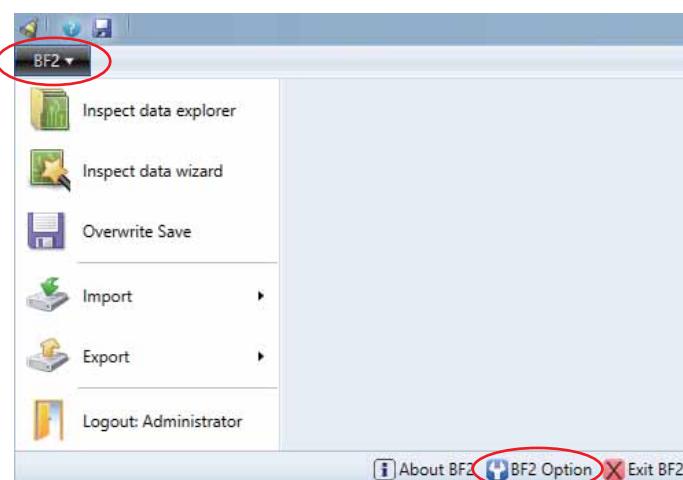


Figure 7-1 Setting of Golden Sample Function 1

Step2: The dialog shown below appears.

Click **Auto Mode**.

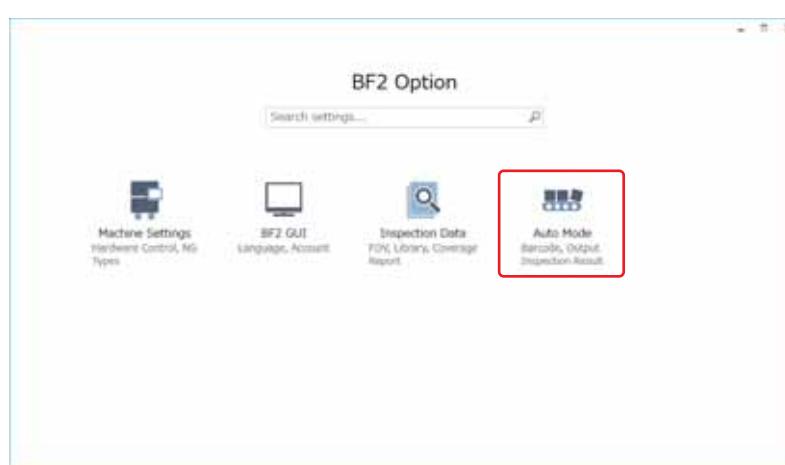


Figure 7-2 Setting of Golden Sample Function 2

Step3: The dialog shown below appears.
Select **Golden Sample** and check **Enabled**.

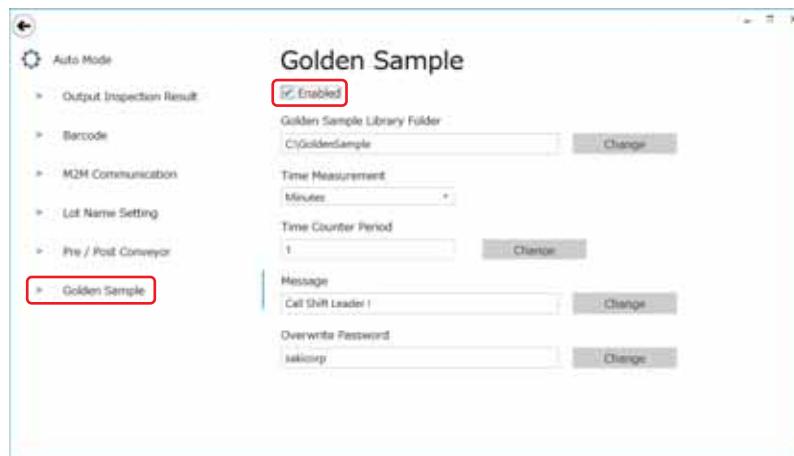


Figure 7-3 Setting of Golden Sample Function 3

Step4: Set detailed setting if necessary. For details refer to Table 7-1.

| Item | Description |
|------------------------------|--|
| Golden Sample Library Folder | Sets the path to save the sample image and inspection result of Golden Sample and Silver Sample. Sample images are saved as bdimg format, Inspection results are saved as gsr format. When the inspection data is shared with some machines, network path can be specified as saving location. |
| Time Measurement | Golden Sample function reinspect by using the sample image which is registered at the start of Auto Mode. Interval of reinspection can be specified here. |
| Time Counter Period | Reinspection will not be performed until setting time of Time Measurement and Time Counter Period is past. |
| Message | When the inspection results of reinspection and at the registration are not matched, it is notified to operator with displaying evaluation result. This setting can edit the message to notice operator. |
| Overwrite Password | When the inspection results of reinspection and at the registration are not matched, it is notified to operator with displaying evaluation result. If the account has Administrator right, Auto Mode is started by clicking Continue . If the account does not have Administrator right, password enter dialog appears by clicking Continue. Auto Mode is started by entering the password set in Overwrite Password . |

Table 7-1 Setting of Golden Sample Function

7.2 Registration of Sample Image and Inspection Result

Step1: Scan Golden Sample or Silver Sample.

Step2: From **InspectData** tab, select **Image File List > Add Golden sample**.

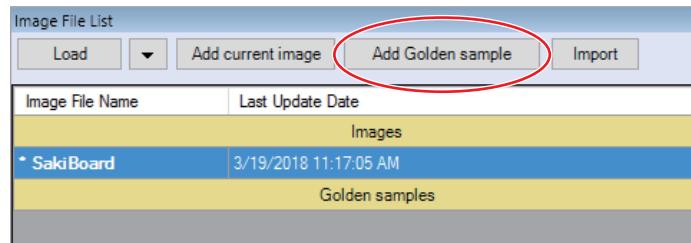


Figure 7-4 Registration of Sample Image and Inspection Result 1

Step3: The dialog shown below appears.

- | | |
|---------------|---|
| Yes | Registers images and NG inspection results. |
| No | Registers images and NG and OK inspection result. |
| Cancel | Cancels to register. |

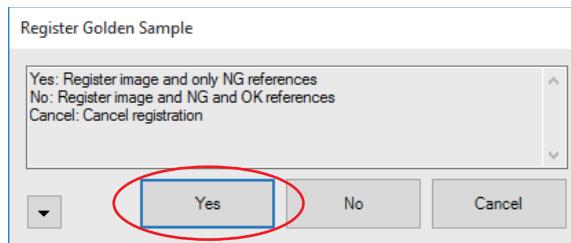


Figure 7-5 Registration of Sample Image and Inspection Result 2

Step4: The dialog shown below appears by clicking **Yes** or **No** in Step3.

Enter the file name of sample and click **OK**.

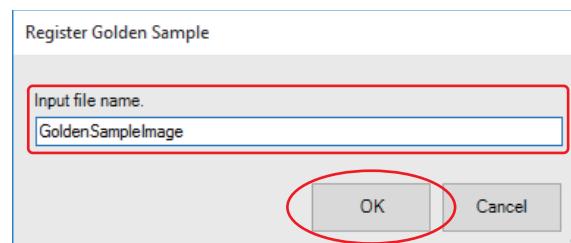


Figure 7-6 Registration of Sample Image and Inspection Result 3

Step5: The inspection is started automatically.

After inspection is completed, registered file name is displayed under **Golden samples** list.

NOTE Multiple sample can be registered.

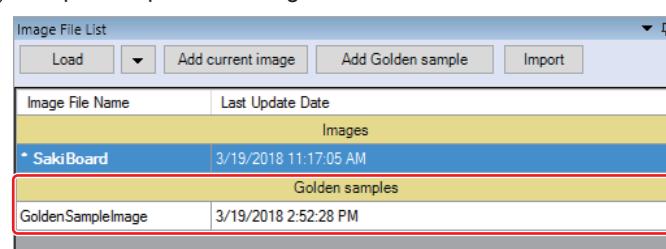


Figure 7-7 Registration of Sample Image and Inspection Result 4

7.3 Comparison of Inspection Result

At the start of Auto Mode, sample images are loaded automatically and perform inspection with current inspection data. When some samples are registered, the inspection is performed in succession.

After the inspection is completed, the image which compares registered inspection result and newly inspected one is displayed.

7.3.1 When the Validation Result Is OK

The dialog shown below appears.

When the inspection results of reinspection and at the registration are matched, **VALIDATION RESULT : PASS** is displayed.

Click **Continue** to start Auto Mode.

Click **Cancel** to cancel Auto Mode.

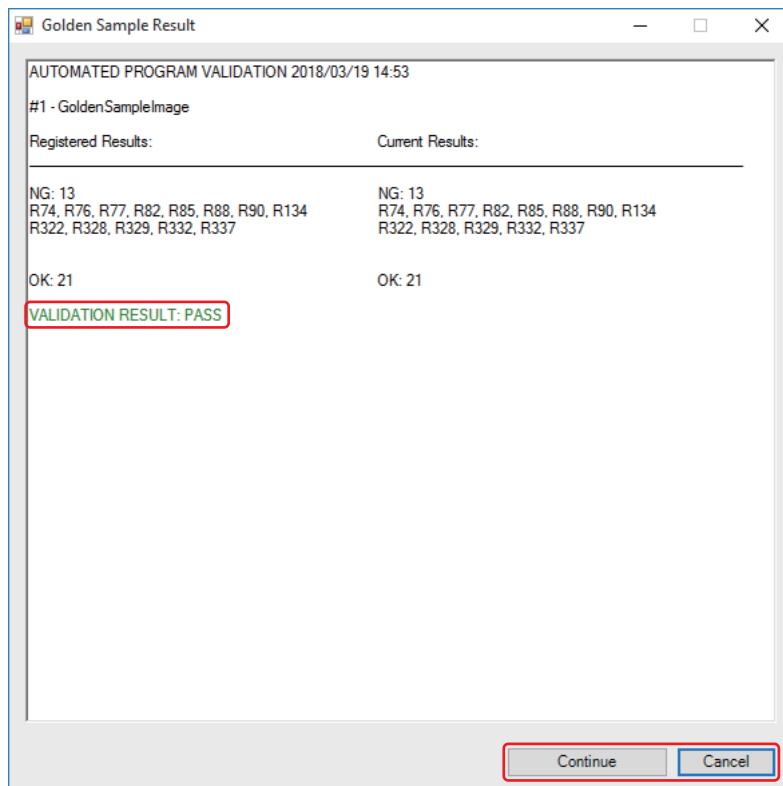


Figure 7-8 Comparison of Inspection Result 1

7.3.2 When the Validation Result Is NG

When Auto Mode is started by the account which has **Administrator** right, the dialog shown below appears.

If the inspection results of reinspection and at the registration are not matched, **VALIDATION RESULT : FAIL** is displayed.

The message set in Step4 of **7.1 Setting of Golden Sample Function** can be displayed at the last of validation result.

Click **Continue** to start Auto Mode.

Click **Cancel** to cancel Auto Mode.

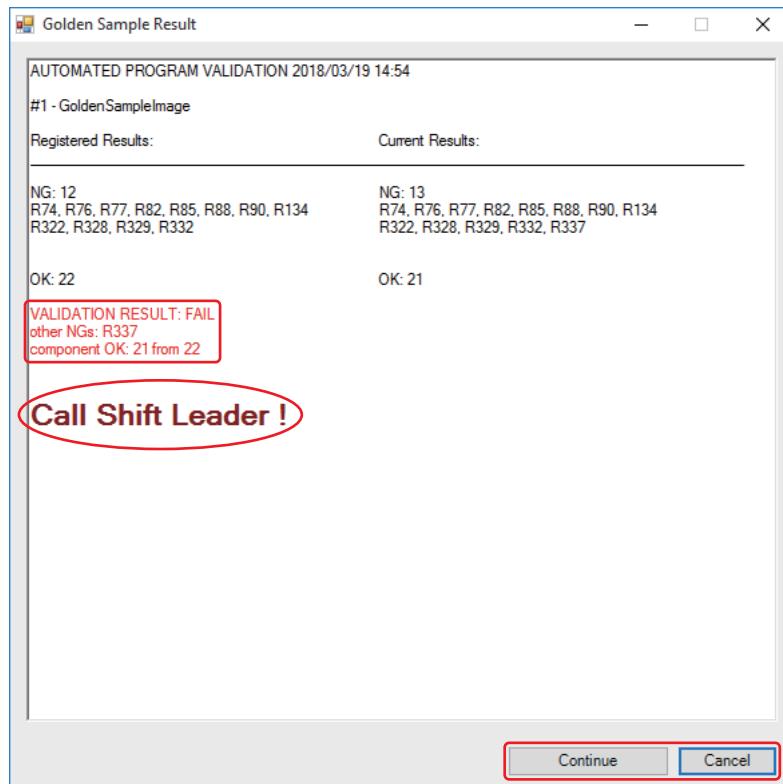


Figure 7-9 Comparison of Inspection Result 2

When Auto Mode is started by the account which does not have **Administrator** right, the dialog shown below appears.

Continue is invalid but password enter dialog appears by double-clicking **Continue**.

Enter the password set in Step4 of 7.1 Setting of Golden Sample Function and click **OK** to enable **Continue**.

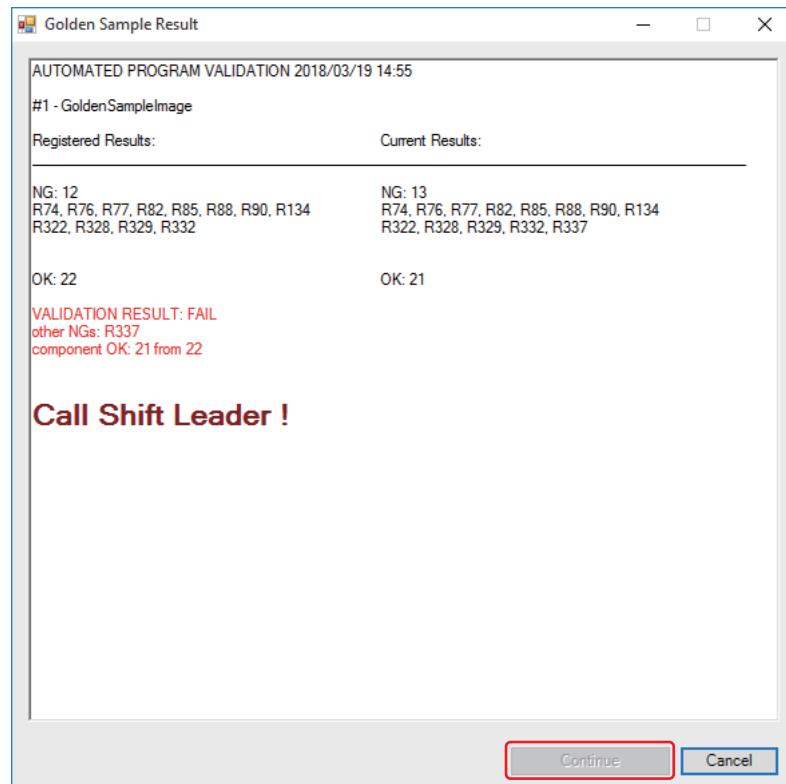


Figure 7-10 Comparison of Inspection Result 3

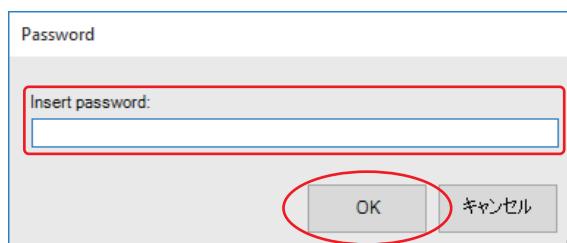


Figure 7-11 Comparison of Inspection Result 4

7.4 Golden Sample Log

When Golden Sample function is enabled, **Golden Sample Log** doc window appears on **Auto** tab.

The validation result of **7.3 Comparison of Inspection Result** is displayed. For details, refer to Table 7-2.



Figure 7-12 Golden Sample Log

| Item | Description |
|-----------|---|
| From / To | Sets the period to show log. Log is updated, by clicking  . |
| OK logs | Displays the log for 7.3.1 When the Validation Result Is OK . |
| NG logs | Displays the log for 7.3.2 When the Validation Result Is NG . |
| All logs | Displays all logs. |

Table 7-2 Golden Sample Log Setting

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Appendices and References

1 Appendices

1.1 Folder Structure of the PC

This section describes the folder structure of BF2.

CAUTION

Do not move, delete, or rename files of the inspection software from the OS.
It may result in damaging the inspection data.

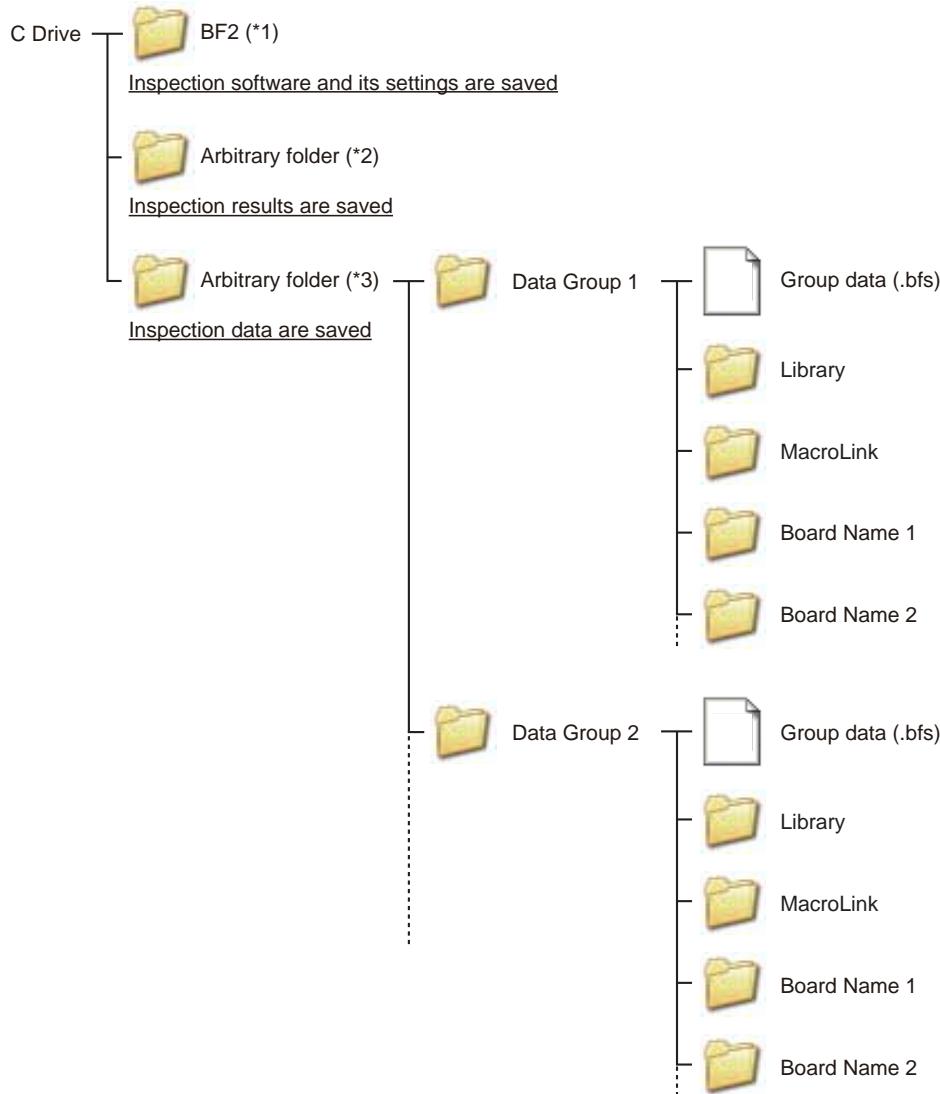


Figure 1-1 Folder Structure of the PC

NOTE

(*1) When using BF2-Editor, the folder name is **BF2-Editor**.

(*2) The data are saved in the folders which are set in **BF2 Options > Auto Mode > Output Inspection Result > BF2-Monitor : Repair > Reference data save location** and **Result data save location**.

(*3) The data location is specified in an inspection data creation process.

1.2 Precautions When Using the Machine

CAUTION If connecting an external memory device to the USB port on the machine, be sure to perform a virus-scan before connecting.

CAUTION Do not use a two-byte character, space, tab, and symbolic character (\ < > : " / | ? * . , ; & % =). They may cause unexpected errors.

1.3 Customer Support Contacts

| | | |
|--------------|--|--------------------|
| Company Name | Saki Corporation | |
| Address | DMG MORI Tokyo Digital Innovation Center, 3-1-4, Edagawa, Koto-ku, Tokyo, 135-0051, Japan | |
| URL | http://www.sakiglobal.com | |
| Phone | Inquiry about the products | +81-(0)3-6632-7901 |
| | Inquiry about the technical service | +81-(0)3-6632-7906 |

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