Programming Manual

saki

[SJ00DCM01-04.1E]

First of all, 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.

Document Disclaimer

- For easier understanding, some of the figures and photographs included in this manual may be slightly different from the actual objects depicted.
- For improvement and enhancement purposes, the physical appearance and specifications for the product are subject to change without notice.
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Saki Corporation Programming Manual (Original Instructions)

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Basic Operation

1 Basic Operation of Inspection Software

1.1 Basic Operation

This section describes basic operation of inspection software.

1.1.1 Window Details

The main window consists of the following two frames.

Image Frame Display scanned image or inspection data.

Index Frame Display operation mode, inspection data name, inspection result, and cursor position coordinate.

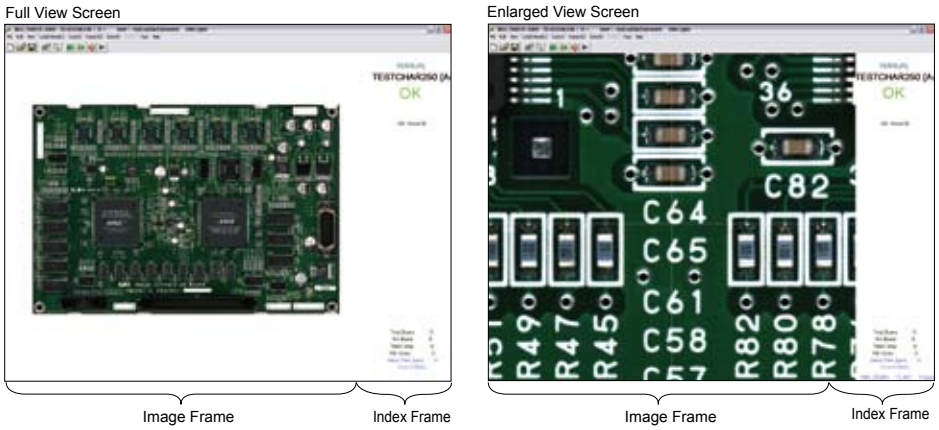


Figure 1-1 Window Names

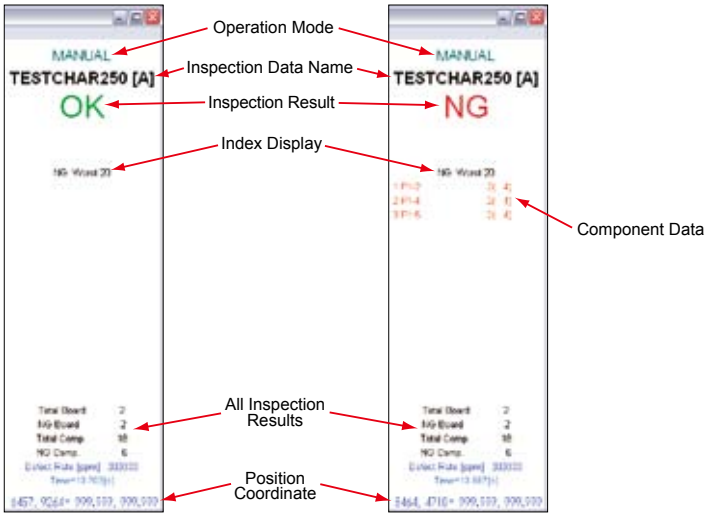


Figure 1-2 Explanation of Index Frame

NOTE **Index Display** can be selected from the following formats. Select **View** > **Results** from the menu-bar. Display the corresponding components in **Component Data**.

Worst 20 Rank the components in which defects are found by the number of occurrences, and display the worst 20 components.

False 20 Rank the components in which false defects are found by the number of false defect occurrences, and displays the worst 20 components.

NG Display the components that produced **NG** inspection results.

OK Display the components that produced **OK** inspection results.

1.1.2 Switching Between Enlarged View Screen and Full View Screen

Enlarged View Screen

Left-click on the image in **Full View Screen**. The image is enlarged by centering on the clicked point.

Full View Screen

Left-click the index frame in the **Enlarged View Screen** to go back to **Full View Screen**.

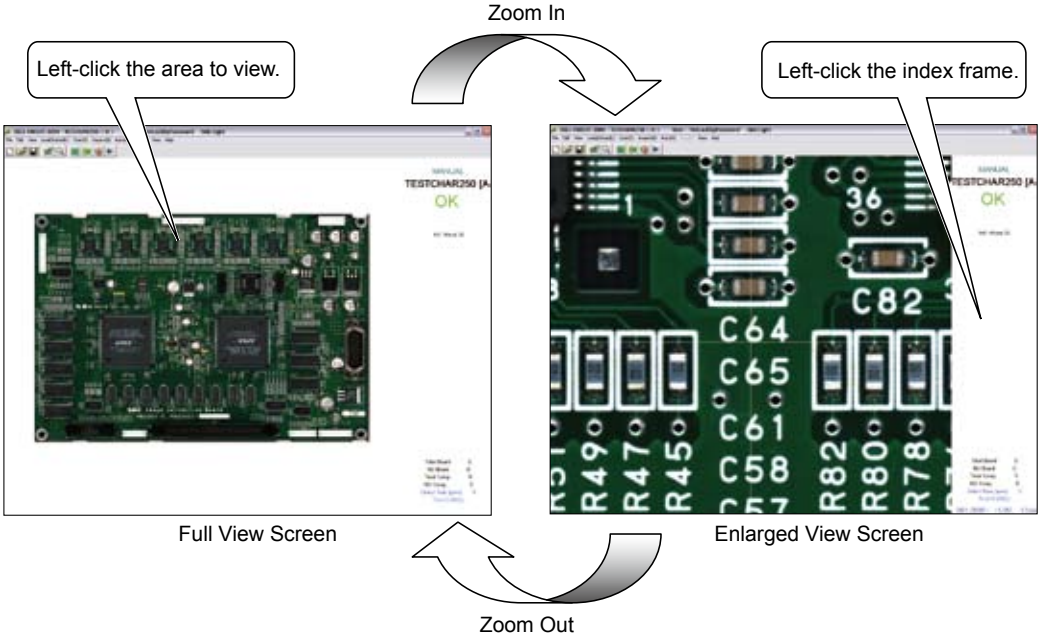


Figure 1-3 Full View Screen and Enlarged View Screen

1.1.3 Area Moving in the Enlarged View Screen

Left-click on the image to move the view area. The area centered on the clicked point is displayed. Click to edge of the image to return to **Full View Screen**.

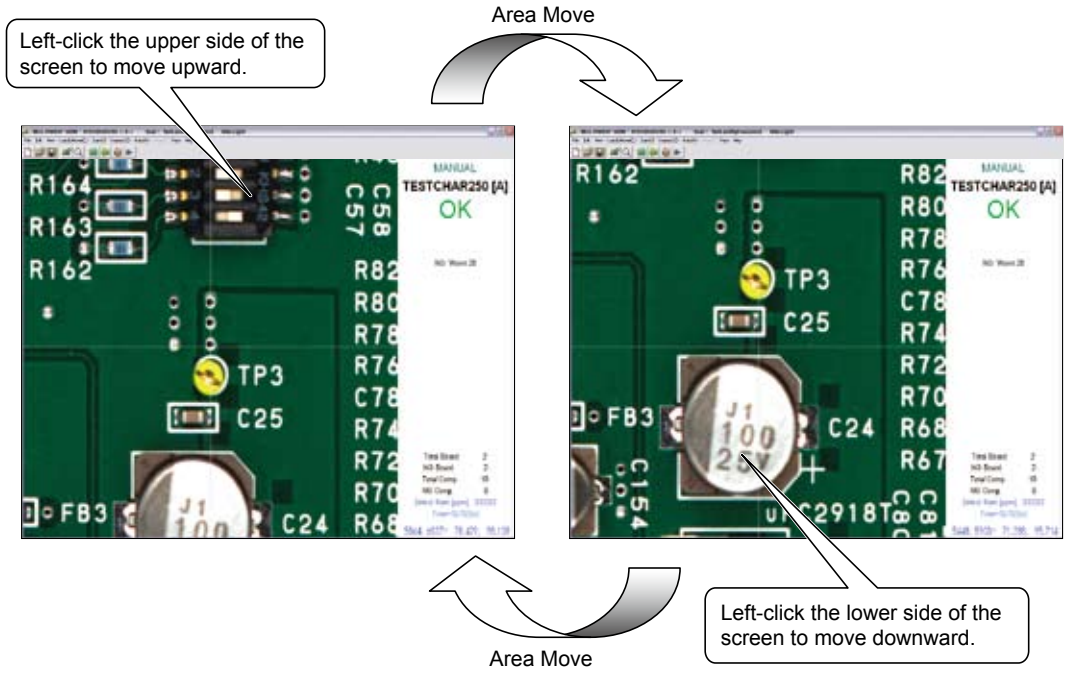


Figure 1-4 Moving in the Enlarged View Screen

1.1.4 Changing the Magnification

The magnification can be changed by pressing ↑ and ↓ in **Enlarged View Screen**.The same operation is available by scrolling wheel of mouse.

Press ↑ or scroll wheel of mouse upward to zoom in the image.

Press ↓ or scroll wheel of mouse downward to zoom out the image.

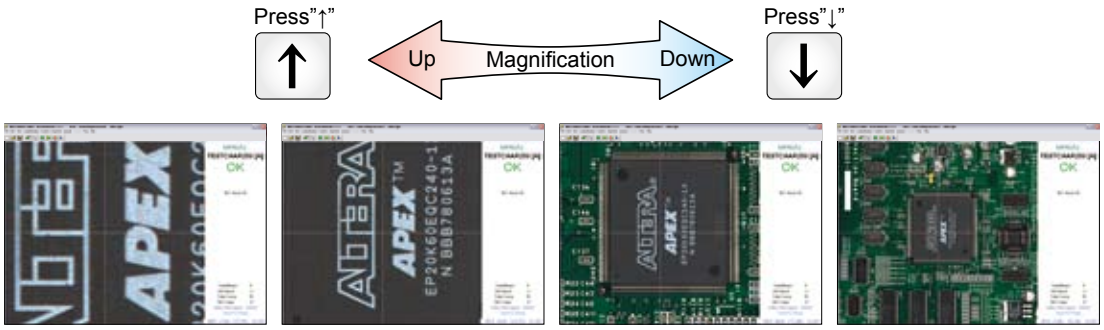


Figure 1-5 Changing the Magnification

1.1.5 Switching Between the Images

Press D to switch images among TopLight(Coaxial Overhead Light), SideLight, and LowLight.

<<Full View Screen>>

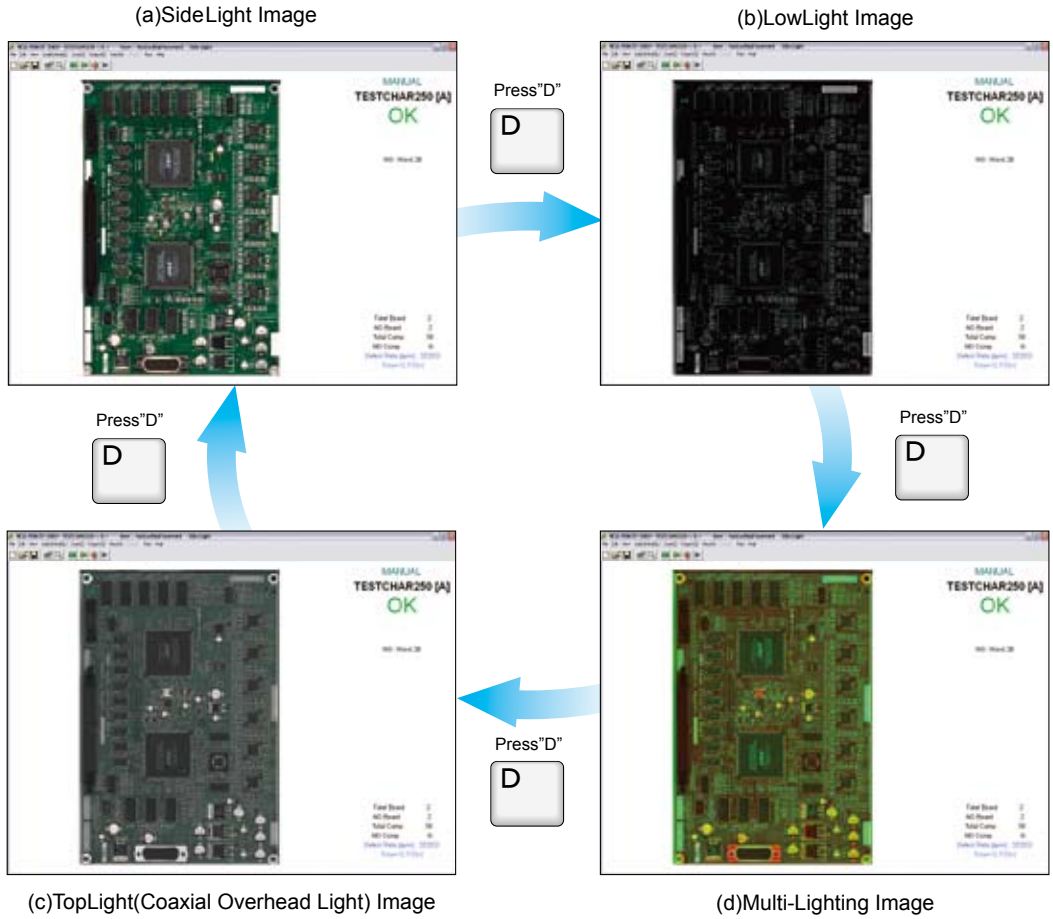


Figure 1-6 Switching Images in the Full View Screen

<<Enlarged View Screen>>

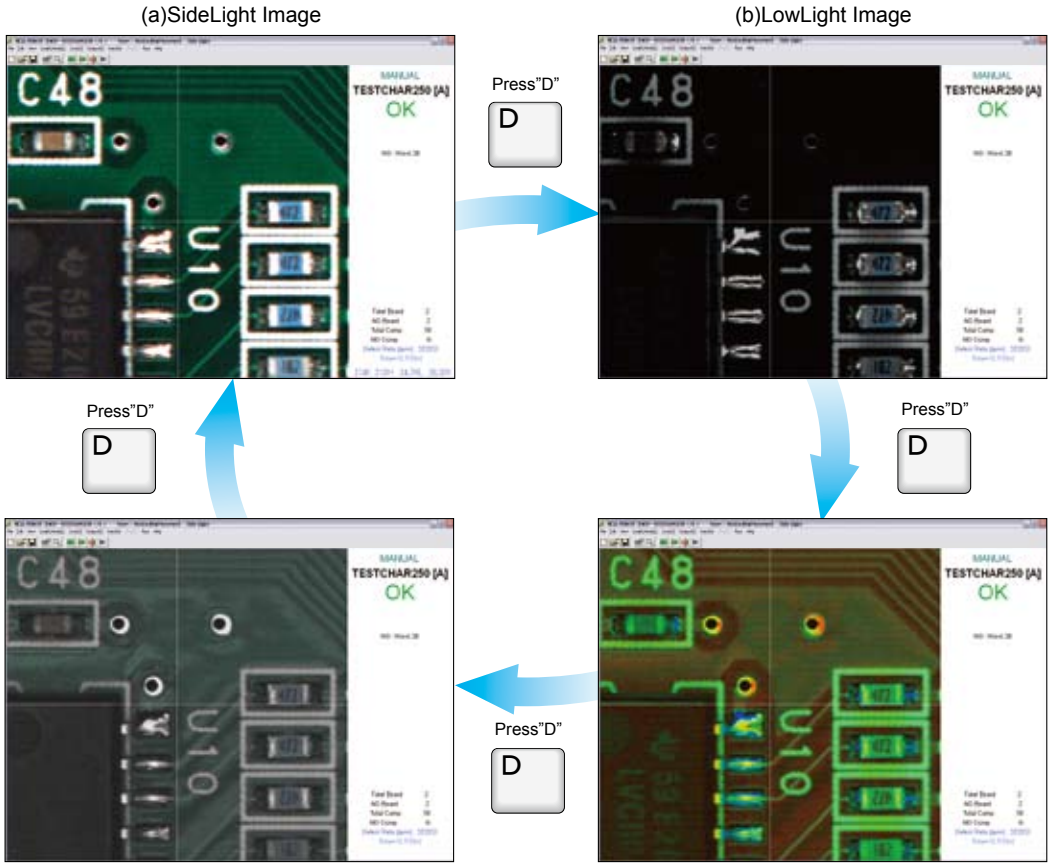


Figure 1-7 Switching Images in the Enlarged View Screen

1.1.6 Board Setting

Open **Board Data** window in Figure 1-8 to check the PCB size, set or edit the PCB data. Press **Board Setting** button on the tool-bar or right-click the index frame to open the window. After all the settings are completed, press **OK**.

NOTE The above operation is available in **Full View** and **Enlarged View Screen**.

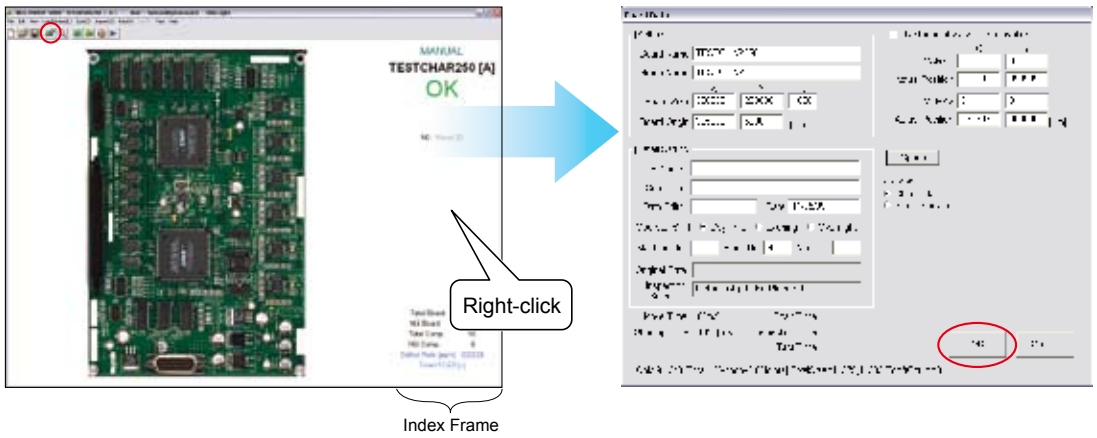


Figure 1-8 Board Data Edit

The table below describes the items in **Board Data Edit** window.

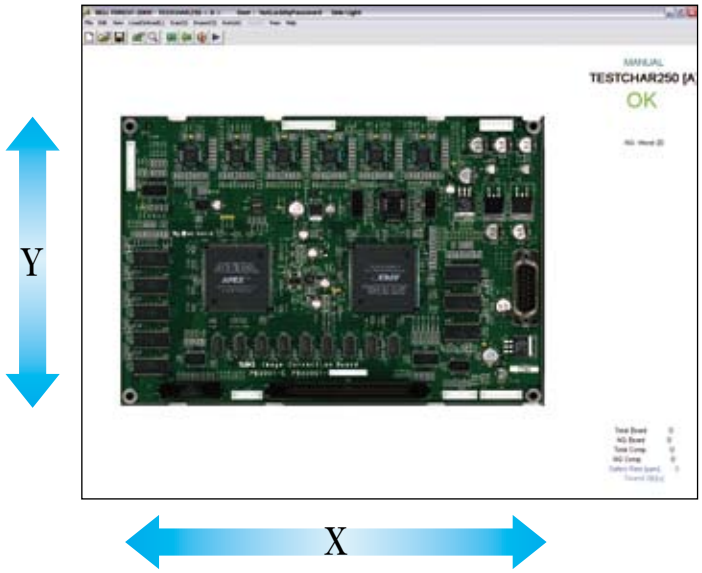
Board Name	The name of selected image.
Group Name	Group name.
Board size	Set the target PCB size. **t** is PCB thickness. (*1)  Figure 1-9 Board Size Setting
Board Origin	Set the PCB origin.
Model Name	Not available.
Comment	Enter any comments if necessary.
Data Editor	Enter data creator.
Date	Created date(Month/Day/Year).
Operator Shift	Work shift.
Machine No.	Not available.
Block No.	Enter the number of sub-PCBs, if necessary.
Number	Not available.
Use Fiducial Mark Compensation	Set the fiducial marks to correct the warpage of PCB or distortion.
MARK1	Set the position of the first fiducial mark in X and Y coordinates.
Actual Position	Set the actual position of the fiducial mark in X and Y coordinates. The gap between this value and the **MARK1** value represents the amount of deviation between the inspection data and the scanned image.
MARK2	Set the position of the second fiducial mark in X and Y coordinates.
Actual Position	Set the actual position of the fiducial mark in X and Y coordinates. The gap between this value and the **MARK2** value represents the amount of deviation between the inspection data and the scanned image.
Option	Not available.

Table 1-1 Explanation of the Respective Items of **Board Data Edit** Window

CAUTION (*1) In case of BF-Comet10, BF-Comet18, and BF-Sirius, longitudinal direction is **X** and lateral direction is **Y**.

1.1.7 Display the Edit Component Data Window

If there are many false calls, the inspection data should be readjusted. Right-click the target component, open the **Edit Component Data** window and adjust the inspection data.

NOTE Select inspection data in order of making by pressing ← or →.
The above oparation is available in **Full View Screen** and **Enlarged View Screen**.

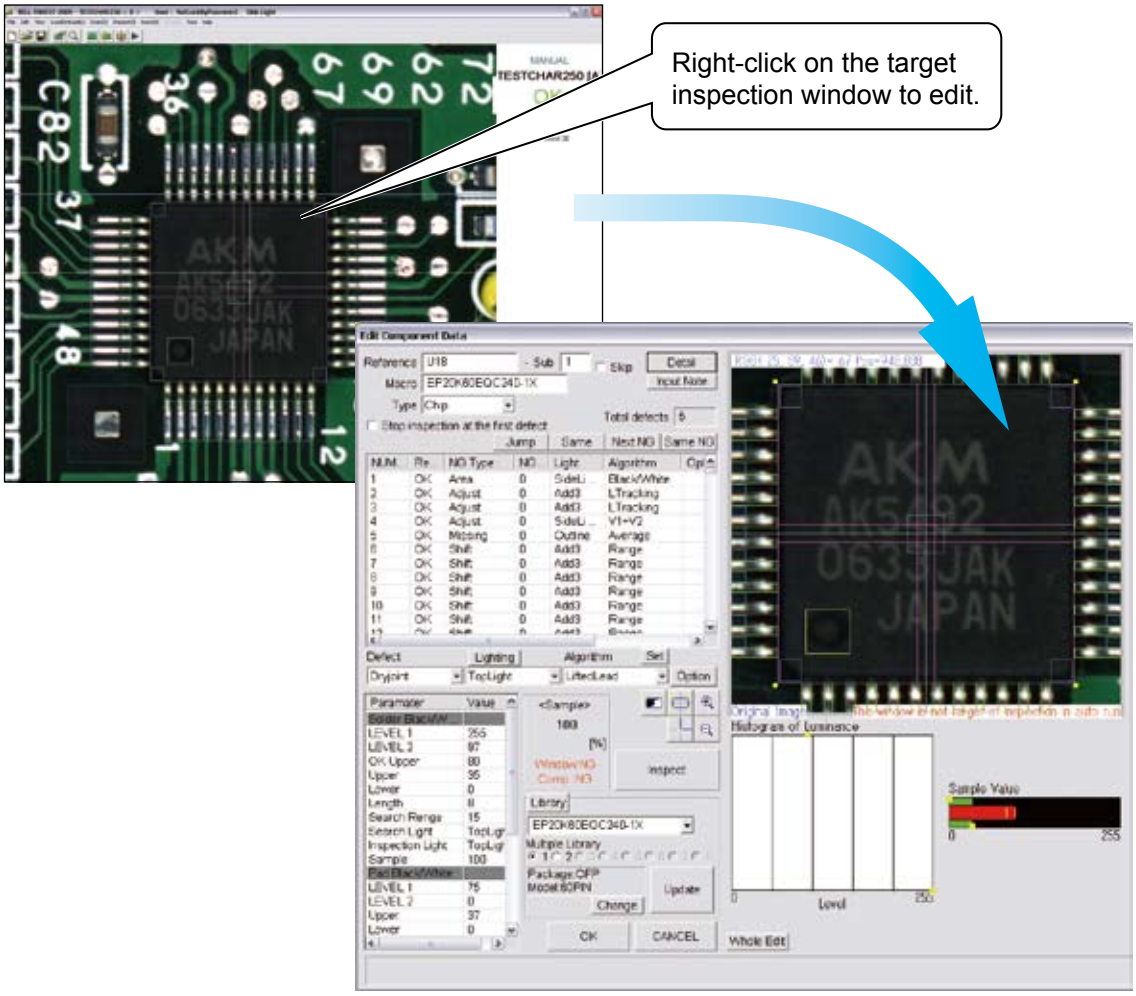


Figure 1-10 Edit Component Data

The following three ways are available to open **Edit Component Data** window.

Search the component and open Edit Component Data window

Press Ctrl + Alt + F concurrently and **Search Component** window shown in Figure 1-11 appears. Enter the component name and press **Edit**, **Edit Component Data** window for the component appears.

Figure 1-11 Search Component

In another way, select **Edit** > **Search** from the menu-bar and **Search Data** window shown in Figure 1-12 appears. Select the component and press **Edit**. **Edit Component Data** window for the component appears.

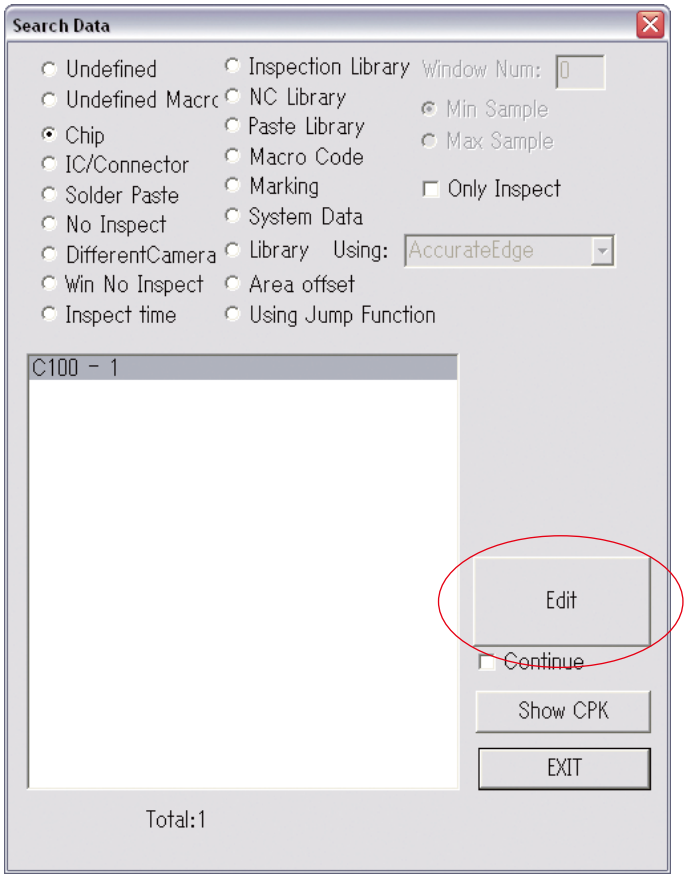


Figure 1-12 Search Data

Press Enter to open Edit Component Data window

Click arbitrary position on the image and press Enter. The NG component data that is in the closest to the clicked position is displayed.

NOTE This operation is available in **Full View Screen** and **Enlarged View Screen**.

Select Edit NG to open Edit Component Data window

Step1: Select **Edit** > **Edit NG** from the menu-bar and **Edit Components** window shown in Figure 1-13 appears.

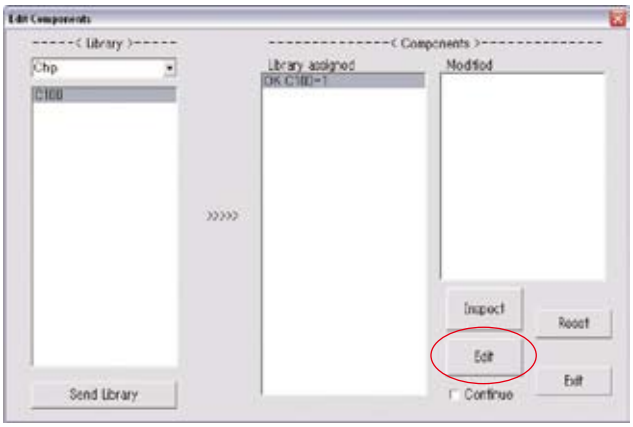


Figure 1-13 Edit Components

Step2: Select the type of the component from the library.

Step3: Select the library name of the component and select the target component from **Library assigned**.

Step4: Press **Edit** and **Edit Component Data** window shown in appears.

The display items of **Edit Components** window are described.

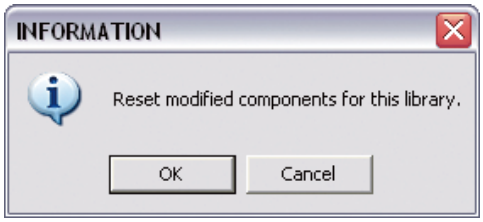
Send Library	Send the specified library data to BF-Editor(optional system).
Inspect	Re-inspect all components that the selected library is used and display the inspection result on **Edit Components** window.
Reset	Discard the separate setting. The dialog shown in Figure 1-14 appears.  Figure 1-14 Confirmation Dialog for Tuning Reset **OK** Discard the separate setting. **Cancel** Return to the Edit window.
Edit	Open **Edit Component Data** window.
Continue	After close the Edit Component Data window, the next component is automatically selected.
Exit	Return to the original inspection window.

Table 1-2 Explanation on Each Item of **Edit Components**

1.1.8 Setting the Range

Surround the arbitrary area by mouse dragging. Inspection data of several components in the area can be edit at once. This operation can be applied to both multiple and single components.

Group Edit window shown in Figure 1-15 appears.

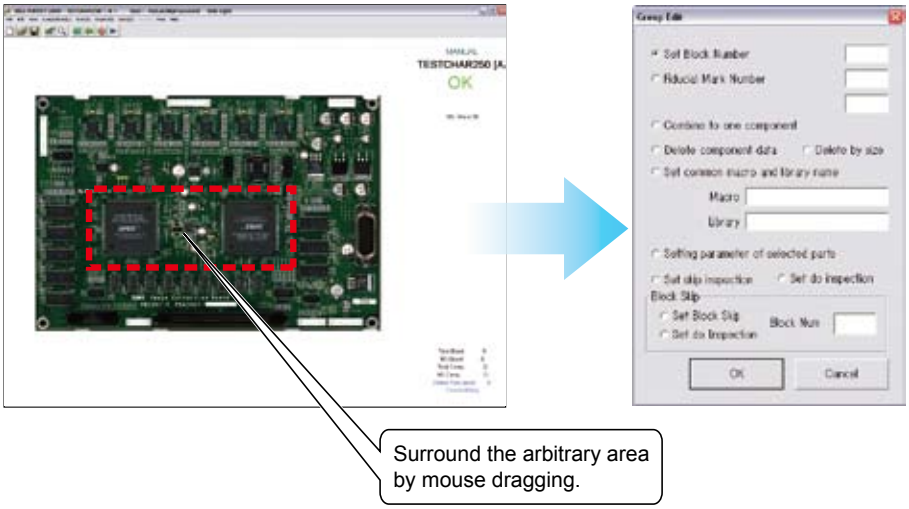


Figure 1-15 Group Edit

OK Apply the change and close the window.

Cancel Cancel the change and close the window.

NOTE The above oparation is available in **Full View Screen** and **Enlarged View Screen**.

The items on the **Group Edit** window are described.

Set Block Number		Check the **Set Block Number** and enter arbitrary value to changes **Sub** number in the upper left side of the **Edit Component Data** Window(Refer to Figure 2-10).
Fiducial Mark Number		Check the **Fiducial Mark Number** and register arbitrary fiducial mark number. All data in the specified area are corrected with the fiducial marks.
Combine to one component		Combine all data in a specified area as one data.
Delete component data		Delete all components data in the specified area.
Delete by size		Indicate all inspection results of all components data in a specified area as NG.
Set common macro and library name		Unify the macro names and the library names for all components data in a specified area.
Setting parameter of selected parts		Set the parameters of the inspection window for all components data in a specified area collectively.
Set skip inspection		Exclude all components in a specified area from the target of the inspection.
Set do inspection		Designate all components in a specified area as the target of the inspection.
Block Skip	Set Block Skip	Exclude a given sub-PCB from the target of the inspection.
	Set do inspection	Designate a given sub-PCB as inspection target.
	Block Num	Input the block number.

Table 1-3 Explanation of the Respective Items for **Group Edit** Window

1.1.9 Moving Component Data

Drag the component data to the target position. **Move Component** window shown in Figure 1-16 appears. Select appropriate items. This function is used to set the CAD data on the actual position of the component or to operate ECD function.

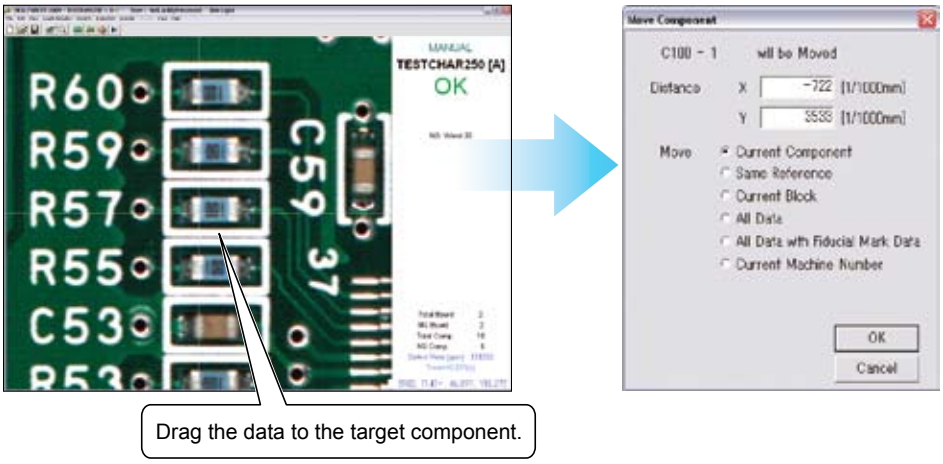


Figure 1-16 Move Component

OK Apply the change and close the window.
Cancel Cancel the change and close the window.

The items on the **Move Component** window are described.

Current Component	Move only the selected components data.
Same Reference	Move all the components with the same reference name.
Current Block	Move all components in the sub-PCB with the selected component.
All Data	Move all components data on the PCB together with the selected component.
All Data with Fiducial Mark Data	Move all components data with the fiducial marks data.
Current Machine Number	Move all components data that use the same mounter data as the selected data.

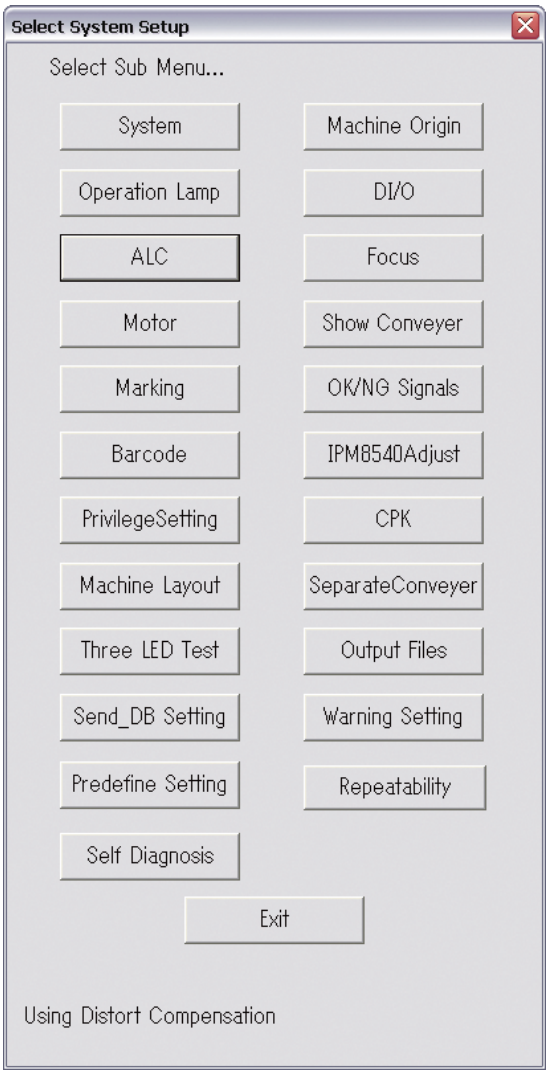
Table 1-4 Explanation of the Respective Items for **Move Data** Window

2 System Setup

This chapter describes the detail on system setup.
Select **Edit > System Setup** from the menu-bar. **Select System Setup** dialog shown in Figure 2-1 appears.
Each item of **Select System Setup** in Figure 2-1 are described as follows.

NOTE Benchtop machine is different dialog from inline machine.

Benchtop Machine



Inline Machine

Figure 2-1 Select System Setup

2.1 System

The destination of the file to save, the name of NG type or the flow direction of PCB can be set in **System**. Press **System** in Figure 2-1 **Select System Setup**. **System** window shown in Figure 2-2 appears.

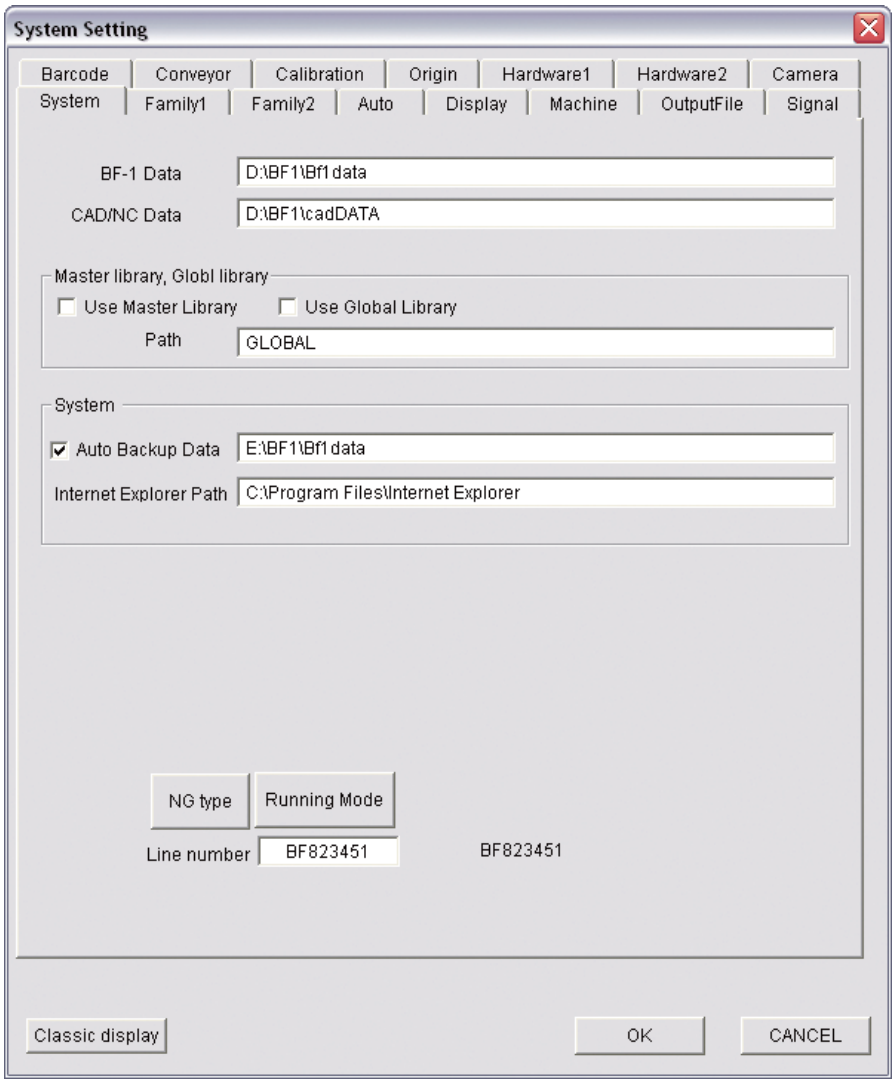


Figure 2-2 System

2.1.1 Contents of System

This table describes the contents of System.

Tab	Item		Description
System	BF-1 Data		Destination of the inspection data to save. Default Setting: D:\BF1\BF1DATA
	CAD/NC Data		Destination of the original CAD and NC data to save. Default Setting: D:\BF1\NCDATA
	Use Master Library		Check the box to use the master library.
	Use Global Library		Check the box to use the global library.
	Path		Destination of the master library to save.
	Auto Backup Data		Made the backup file automatically. Dialog of confirmaton is displayed before making backup.
	Internet Explorer		Link of total report. Default Setting: C:\Program Files\Internet Explorer
	NG Type		Set NG types. Defects name can be modified.
	Running Mode		Switch the mode(Normal Mode / Test Mode / Ignore Hardware).
Family1	BF-RP1	Connect BF-RP1	Connect with BF-RP1(optional system).
		BF-RP1	Specify the destination of the connected PC to save in BF-RP1.
		BF-RP1 Backup	Specify the master BF-RP1 PC in case of connecting with several BF-RP1.
		Export NG Files	Save inspection results in auto mode.
		NG Limit	Specifies the upper limit number of the NG component per PCB.
		Date and Time	Save the NG file name as inspection date and time.
		Inspect Number	Save the NG file name as inspection number.
		Barcode	Save the NG file name as barcode.
		Not Create OK File	Create files with NG inspection results only.
		Use Lot Number	Manage NG file by lot number.
		Create False Call Data	Create a false call data file.
		Repair A/B Side by One Barcode	Combine inspection results for both top and bottom side in case barcode is on one side.
		Enable OK Button After Click Component Images	OK button is enabled by clicking the image (Benchtop machine only).
		Save BadMark Error	Add badmark error to NLT file.
		Use Current Date to Lot Number	Create lot number folder with the current date.
		Lot Number Required	Lot number must be entered in this setting.
		Save Defect Images	Saves images of defect component.
		Save False Images	Saves the component image of false calls.
		Image Limit	Specifies the upper limit number of the NG image to save per inspection.
		jpeg	Saves the images by JPEG.
		Send Side Light Image to BF-RP1	Transfer the images by SideLight.
		BF-RP1 Enlarge Images	Transfer the enlarged image to BF-RP1.
		NG File	Specify the transferring destination of NG file.
		NG File1	Specify the transferring destination of NG file (Backup).

Tab	Item		Description
Family1	BF-Editor	Connect BF-Editor	Connect with BF-Editor(optional system).
		BF-Editor	Specify the saving inspection data destination of BF-Editor.
		Offline Debug	Specify the saving destination of data when using offline debug.
		Offline Debug : Always Active	Validate offline debug consistently.
		Offline Debug : Don't Send Library	Not to send library to BF-Editor.
Family2	BF-Monitor	Connect BF-Monitor	Connect with BF-Monitor(optional system).
		BF-NET Command	Specify the folder of RAM disk of BF-Monitor.
		BF-NET Data	Specify the saving destination of BF1DATA in BF-Monitor.
		Send Side Light Image to BF-Monitor	Display enlarged image in BF-Monitor.
		Set Mouse Position in BF-Monitor	Cursor of mouse is automatically positioned on OK button when making judgements.
		Send Enlarge Image to BF-Monitor	Send Enlarge Image to BF-Monitor.
		Output OK Image to BF-NET	Transfer NG images and criterial OK images for judgement.
		Show OK Image on BF-NET	Display NG images and criterial OK images for judgement.
		Send Image-Match and OCR Reference	In case that use character recognition algorithm, display OK image when judged NG. Check same item of BF-Monitor.
	BF-View	Output log file for NetView	Connect with BF-View(optional system).
		Image saved for NetView Limit	Specify the maximum number of the image to save per inspection.
		Only Output NG Images	Transfer NG images only.
		Only Output False Call Images	Transfer the images of false calls only.
	BF-WebTracer	Connect BF-WebTracer	Connect with BF-WebTracer(optional system).
		Host	Enter host of BF-WebTracer.
		Max Save Image Num:	Specify the maximum number of the image to transfer per inspection.
		Only Output NG Images	Transfer NG images only.
		Only Output False Call Images	Transfer the images of false calls only.
		Output whole Board images	Transfer the whole PCB image.
		Output OCR log	Transfer log information of OCR.
		Output component Information	Transfer inspection data.
Auto	Warning	Operator Call at Mark Error	Conduct operator call when mark error occurs in auto mode.
		Use Air Pressure Sensor	Conduct operator call if air pressure goes lower than the specified value.
		Operator Call at Defects are Detected	Conduct operator call when NG is detected in auto mode.
	Monitor Mode, Debug Mode	Check Board After Exchanging in Monitor Mode	Confirmation dialog is displayed after PCB is unloaded.
		Check Board Inside in Monitor Mode	At NG detection, confirmation dialog appears with PCB inside the machine.
		Monitor Mode: Buzzer Button Disable	Invalidate the function to stop alarm when NG is detected.
		Enable OK Button After Click Component Image	OK button is enabled by clicking the image(Inline machine only).
		Monitor Mode	Automatically run in monitor mode.
		Correcting OCR in Monitor Mode	Displays registered characters of OCR and current result.
		Debug Mode Timeout	Specify the time period to display the next NG image.

Tab	Item		Description
Auto	Others	Screen Saver	Screen saver is activated after five minutes standby state.
		Check Next Board	Check if PCB is loaded in doubly.
		Unload when Mark Error	Unload the PCB if mark error occurs.
		Save Detected Images	Saves NG images in inspection data folder.
		Auto Load Model	Not available.
		Continuous Drive in Pass Mode	Circulate motor consistently during pass mode.
		Must input Model Name	Enter model name.
		WinXP Super Thread	Unload the PCB after scanning(Windows XP only).
		Using Accelerating Method	Accelerate processing speed of algorithm.
Display	Display	Set Scale 1:1 in Debug Mode	Display the debug mode image at the same magnification.
		New Editor (Beginner mode)	Simplify Edit Mode.
		Legacy display (Non BF+)	Not available.
	Programming	Display History Diagram	Display sample graphs of black/white as histogram mode.
		Make Dry-joint Window	Add inspection window for dryjoint automatically at IC inspection data extracted.
		Set Binary Image on Upper / Lower Level	Reverse the luminance range, in the case of the value for black/white Level2 is zero.
		Display Statistic History Diagram	Record the history of sample value of black/white and display it by histogram.
		Link Library Automatically	As selecting inspection data, renew library to the latest version automatically.
	System	Shutdown Windows	Exit windows at BF1 termination.
		Check Servo	Not available.
Signal	Send OK/NG Signal to Next Machine		Output OK/NG singal to downstream machine.
	Reset OK/NG Signal after Unloading PCB		Reset OK/NG signal right after unloading PCB.
	OK/NG Output for Next Machine	ON at NG	Turn the signal(OK/NG Out) on if NG is detected.
		OK at OK	Turn the signal(OK/NG Out) on if NG is not detected.
	OK/NG Input from Previous Machine	ON at NG	Turn the signal(OK/NG In) on if NG is detected.
		OK at OK	Turn the signal(OK/NG In) on if NG is not detected.
	For SMEMA Standard		Use to connect to upstream/downstream machines by SMEMA.
	FUJI Mounter		Not available.
	SMEMA 2007		Check **For SMEMA Standard** and **SMEMA 2007** to use SMEMA(SMEMA standard: IPC-SMEMA-9851).
	Reset Ready Signal after Loading (No Preconveyor, Not SMEMA)		Reset the Ready Out signal after PCB carry-in. Not available with SMEMA.
	Reset Ready-Out Signal, when Entrance Senser is Touched (QA/QC)		Not available.
	Output Busy-Out Signal before Ready-In Signal from Next Machine		Output Busy Out signal before Ready-in signal is input from downstream machine.
	Send Ready Signal when there is no PCB		Output Ready signal to upstream machine if there is no PCB inside of the machine.
	Set Ready Signal during Unload if inspection is OK		If the inspection result is OK, unload the PCB and output the ready signal.
	Connected with NG Buffer		Check the box to use NG buffer.

Tab	Item		Description
Signal	Set Ready Signal when Sensor Detected		Output Ready signal while PCB inlet sensor is activated.
	Send OK/NG, Surface A/B info by Comport		Output OK/NG signal from Comport.
Barcode	Barcode	Use Barcode Reader	Check the box to use barcode-reader (either fixed or handy type).
		Reader is Set Out of BF	Check the box to use fixed barcode-reader.
		Use Handy Barcode for Hero Machine	Not available.
		Inspect Both Side by One Barcode	Not available.
		Two Dimension Barcode	Check the box to use 2D barcode-reader.
		Not Input Text Reader	Check the box to use barcode-reader without text input (e.g. TOKEN).
		Com2 (Com1 Unchecked)	Not available.
		Print Shft Data (SKP)	Not available.
		Multi Head Reader	Check the box to use barcode-reader of multi head.
	Option	Select the Board by Barcode	Check the box to select data by barcode.
		Compare Barcode	Make comparison with registered barcode information.
		Input Barcode on BF-RP1	Enter barcode information on BF-RP1.
		Don't Change Jump Value	Check the box not to change the jump setting automatically if inspection item is added or deleted to the data with jump function.
		Wait for Barcode Recognition	Keep on trying until barcode-reader reads barcode.
		Don't Popup Input Dialog while Read Barcode Error	Output NG file named current date if reading barcode is failed.
		Show Skip Message	Display (Some components are skipped to inspect) in the lower left side of the window, if any inspection window is set as skip.
		Barcode on Two Sides	Check the box to manage the number of two sides by one barcode.

Table 2-1 **System** Parameter List 1

Tab	Item		Description
Output File			*
Machine			*
Conveyor			*
Calibration			*
Origin			*
Hardware1	Conveyor	2 Speed Conveyor	Use in the case of validate board delay sensor.
	Other Items		*
Hardware2			*
Camera			*

Table 2-2 **System** Parameter List 2

CAUTION Regarding the items with *, these are for Saki engineer only.

2.1.2 NG Type

Modify the NG type name to appropriate ones. The analysis of the inspection result will be done effectively based on the proper NG type name.

Step1: Press **NG Type** in Figure 2-2 **System**. **NG Type Setup** window shown in Figure 2-3 appears.

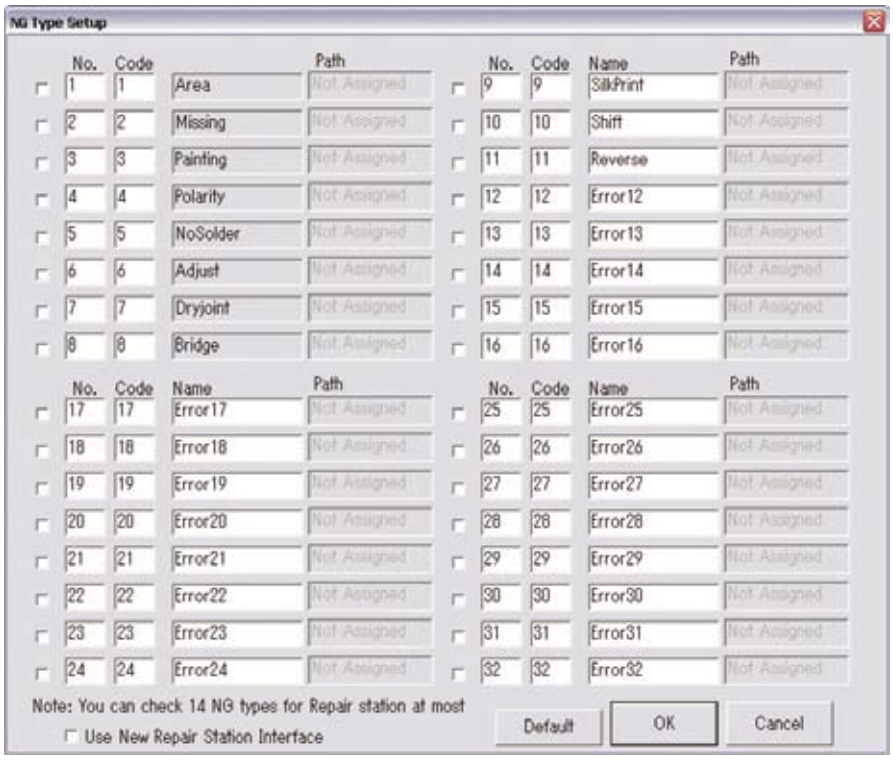


Figure 2-3 NG Type Setup

Step2: 21 NG types name(from 12 to 32) can be modified.
Enter arbitrary name in the each **Name** text-box.

Step3: Press **OK** to update.

NOTE Press **Default** and **OK** to back to the default.

2.2 Operation Lamp

This section describes the settings of signal tower and buzzer.

The operation of signal tower lighting and buzzer can be modified in **Operation Lamp** according to the operating condition of the machine.

Press **Operation Lamp** in Figure 2-1 **Select System Setup**. **Operation Lamp and Buzzer Settings** window shown in Figure 2-4 appears.

Check the arbitrary boxes based on the operating condition of the machine.

NOTE Press **Default** and **OK** to back to the default.

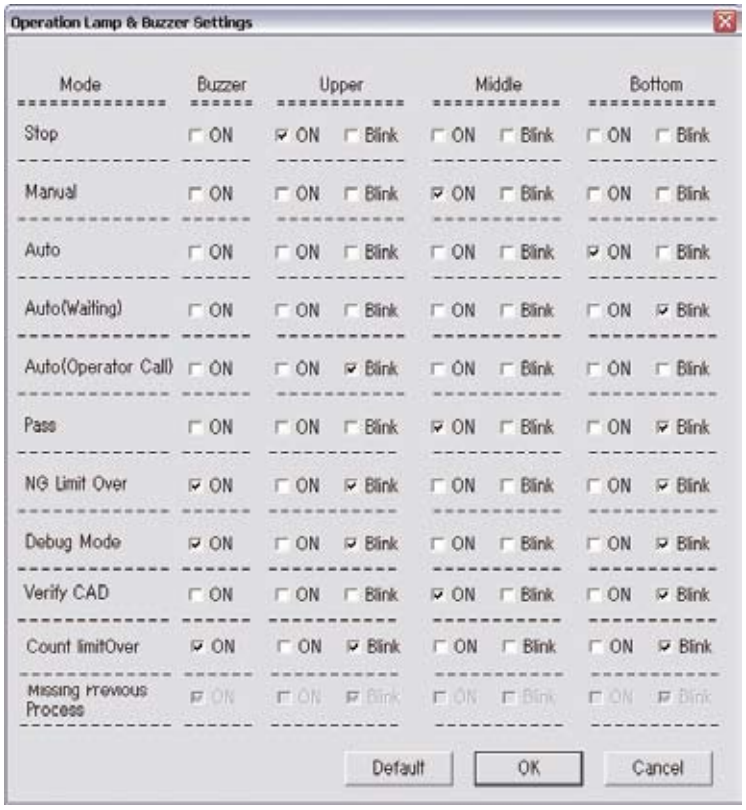


Figure 2-4 Operation Lamp and Buzzer Settings

Mode	State	Description
Stop	Emergency Stop	Emergency stop switch is pressed or the front door is opened.
Manual	Manual Mode Running	Normal operation under Manual Mode.
Auto	Auto Mode Running	Normal operation under Auto Mode.
Auto (Waiting)	Waiting for the next PCB	Stand by status for PCB carry-in under normal operation.
Auto (Operator Call)	During Auto Mode Running Defect Occurrence	Stand by status for operator check on detected NG under normal operation.
Pass	Pass Mode Running	Pass Mode.
NG Limit Over	Continuous NG Occurrence	The number of NG PCB reach the specified value.
Debug Mode	Debug Mode Running	Debug Mode is running normally.
Verify CAD		Not available.
Count Limit Over	Reached limit number of inspection	Completed the specified number of the PCB inspection.
Missing Previous Process		Not available.

Table 2-3 **Operation Lamp and Buzzer Settings** Parameter List

2.3 ALC

This section describes the setting of Automatic Luminance Control. All parameter is adjusted appropriately at the time of installation or before shipping.

CAUTION Normaly customers do not need modify the Automatic Luminance Control setting as wrong setting cause unexpected errors.

2.4 Motor

This section describes settings of Motors. All parameter is adjusted appropriately at the time of installation or before shipping.

CAUTION Normaly customers do not need modify the Automatic Luminance Control setting as wrong setting cause unexpected errors.

2.5 Marking

This section describes how to set the marking function.

Collective Setting and **Setting by Type of Marking** are available to set the marking function. If both are selected, priority is given to marking type setup.

CAUTION Enable the settings only marking unit.

2.5.1 Collective Setting

Press **Marking** in Figure 2-1 **Select System Setup**. **Mark Position Default Settings** window shown in Figure 2-5 appears.

A in Figure 2-5 specify the type of marking. **B** specify the position of marking. **C** specify the plot selection of XY marking and rotation angle of characters by PLOT NUMBER when plotting.

D specify the size of characters and contents of comments (in the case of selecting PLOT NUMBER).

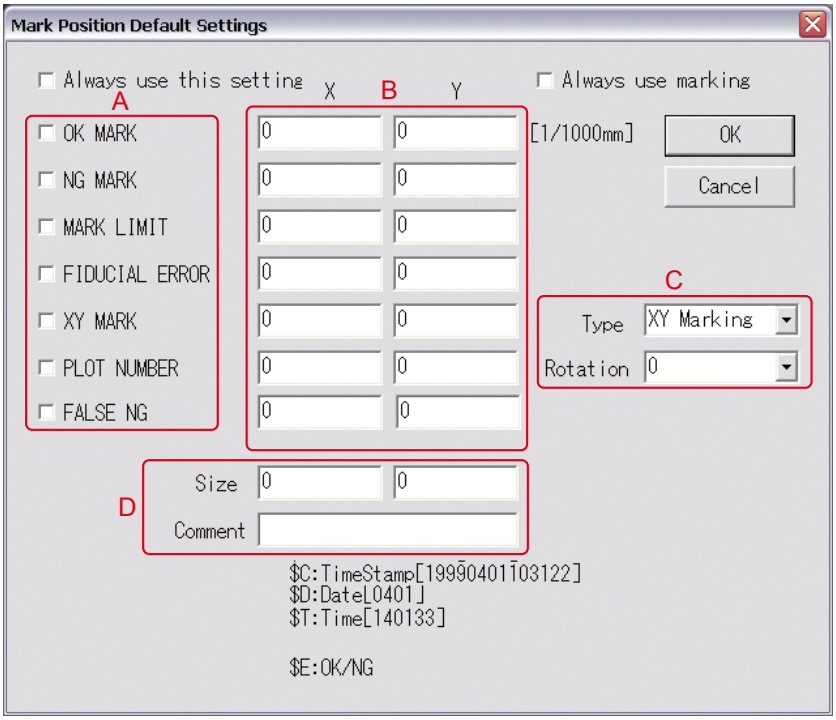


Figure 2-5 Mark Position Default Settings

2.5.2 Setting by Type of Marking

Here describes the way to setup marking respectively.

Step1: Open the inspection data which you wish to change marking setup.

Step2: Select **Edit** > **Search** from the menu-bar. **Search Data** window shown in Figure 2-6 appears.

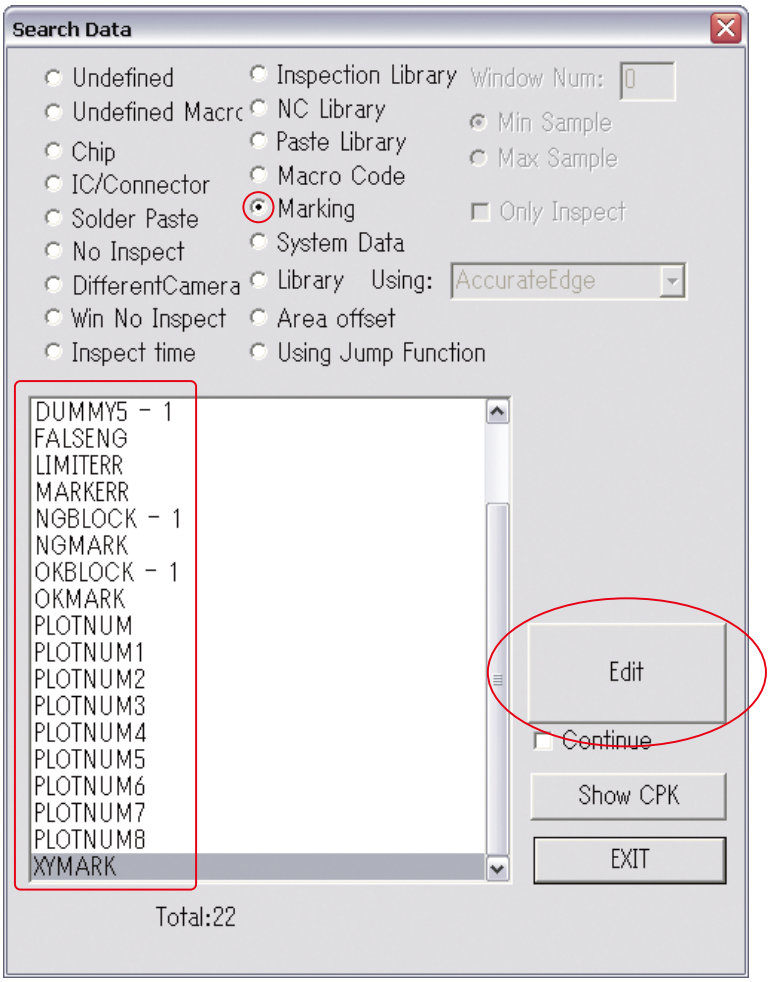


Figure 2-6 Search Data

XY Marking (Painting) Setup

Check the **Marking** in Figure 2-6 **Search Data**, select XYMARK and press **Edit**. **Painting Setup** window shown in Figure 2-7 appears. Refer to Table 2-4 **XY Painting Setup** and proceed the setup procedures. After all the settings are completed, press **OK**.

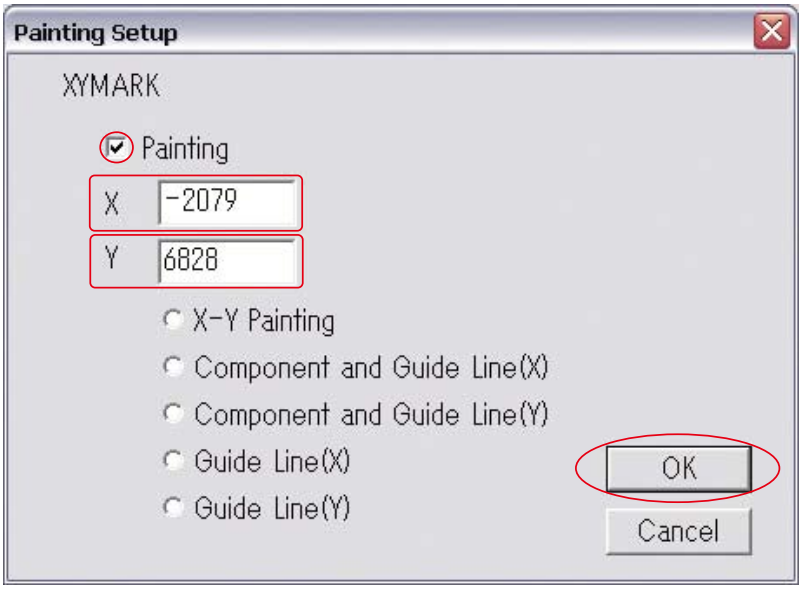


Figure 2-7 Painting Setup

Item	Description
Painting	With check mark in, XY painting function works.
XY Coordinates Setup	The marking position for NG components can be specified. (X,Y = (325000, 5000) [µm]) is marking origin (X,Y = (0, 0) [µm]). If you wish to change the position of marking, enter coordinates.  Figure 2-8 XY Coodinates Setup
X-Y Painting	Put marks on the specified coordinates point.
Component and Guide Line (X)	Put two marks, one on the NG components, and the other on the axis of X coordinates of the component.
Component and Guide Line (Y)	Put two marks, one on the NG component, and the other on the axis of Y coordinates of the component.
Guide Line (X)	Put a mark on the axis of X coordinates of the NG component.
Guide Line (Y)	Put a mark on the axis of Y coordinates of the NG component.

Table 2-4 Painting Setup

Plot Number Setup

Check the **Marking** in Figure 2-6 **Search Data**, select PLOTNUM(Plot Number) and press **Edit**. **Plot Number Settings** window shown in Figure 2-9 appears. Refer to Table 2-5 **Plot Number Settings** and proceed the setup procedures. After all the settings are completed, press **OK**.

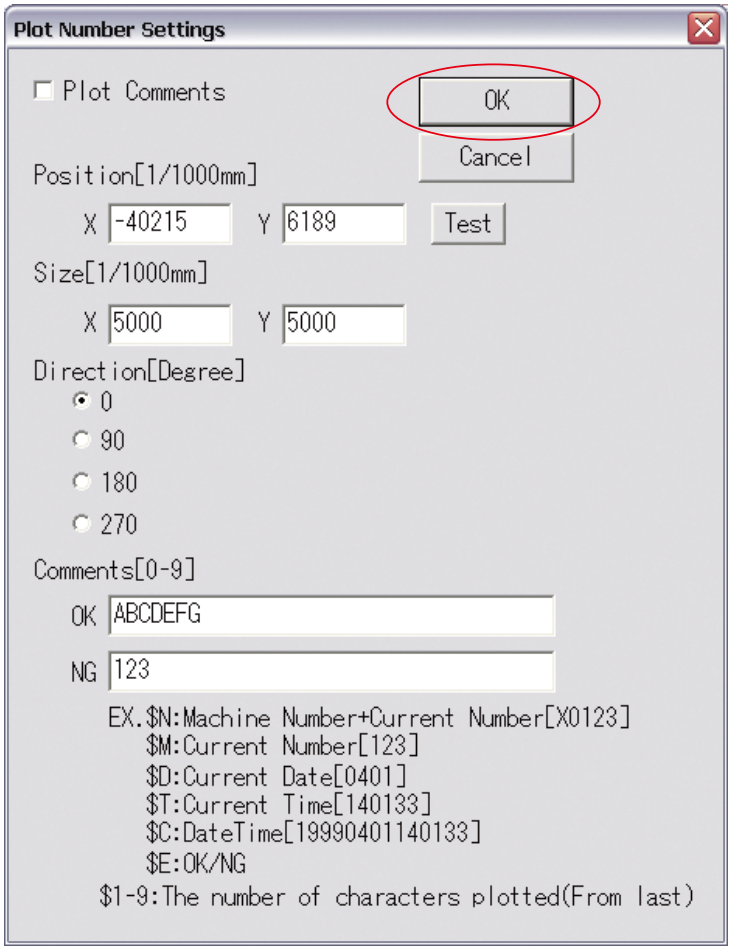


Figure 2-9 Plot Number Settings

Item	Description
Plot Comments	Check in the case of plotting comments.
Position [1/1000mm]	Specify the central position to start plotting.
Size [1/1000mm]	Specify the size of characters to plot.
Direction [Degree]	Specify the direction of characters.
Comments [0-9]	Enter comments.
Test	Test if plotting can be performed correctly on the board based on the specified setup.

Table 2-5 Plot Number Settings

Other Setup Methods

Check the **Marking** and select one from the following items in the window of Figure 2-6 **Search Data**, FALSENG, LIMITERR, MARKERR, NGBLOCK-1, NGMARK, OKBLOCK, or OKMARK. Press **Edit**. **Painting Setup 2** window shown in Figure 2-10 appears.

Check the **Painting**, enter the coodinates of marking location and press **OK**.

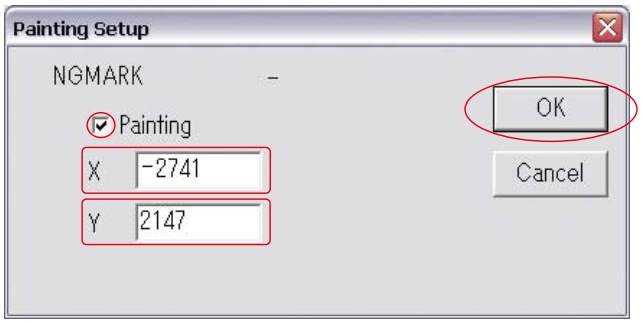


Figure 2-10 Painting Setup 2

2.6 Barcode

The reading data by barcode-reader can be checked in case of using the barcode-reader as optional. Press **Barcode** in Figure 2-1 **Select System Setup**. **Barcode** window shown in Figure 2-11 appears.

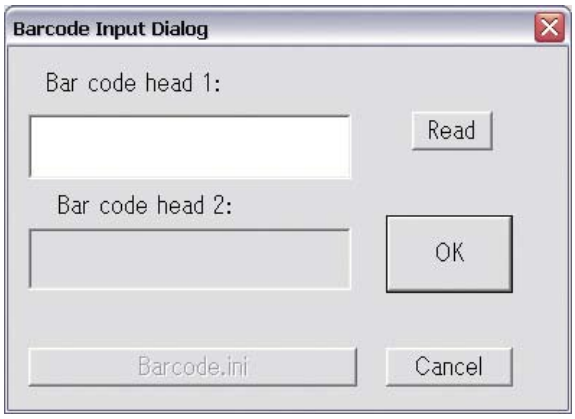


Figure 2-11 Barcode

Press **Read** in Figure 2-11 **Barcode** to check the reading barcode function.
Reading value is displayed in **Barcode head 1**.

2.7 Privilege Setting

The section describes how to register the user level. Unexpected change of system setup or inspection data can be avoided with this function.

Press **Privilege Setting** in Figure 2-1 **Select System Setup**. **Privilege Setting** window shown in Figure 2-12 appears.

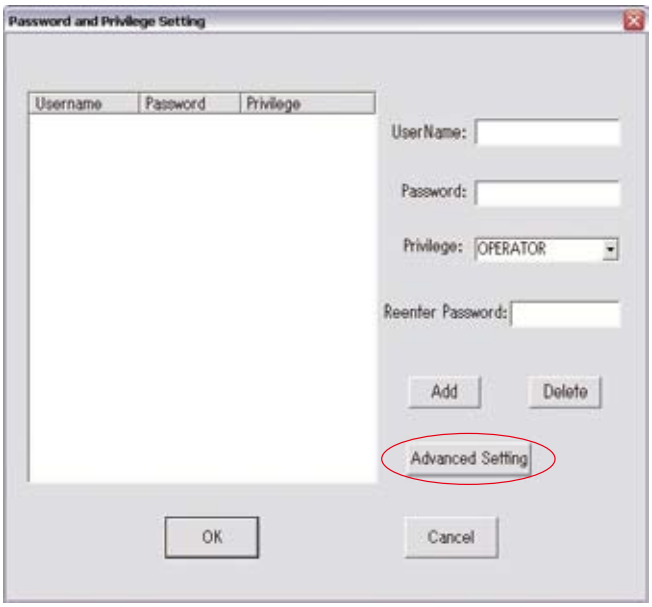


Figure 2-12 Privilege Setting

2.7.1 User Accessible Level

Accessible level of the user can be arranged into five levels.

Operable functions in each level can be changed in **Advanced Setting** window of Figure 2-13. Press **Advanced Setting** in Figure 2-12 and **Advanced Setting** window shown in Figure 2-13 appears.

Select user accessible level in **Privilege**. Operable functions are displayed in **Selected Functions**. Inoperable functions are displayed in **Optional Functions**.

Press **<<<** or **>>>** to move functions.

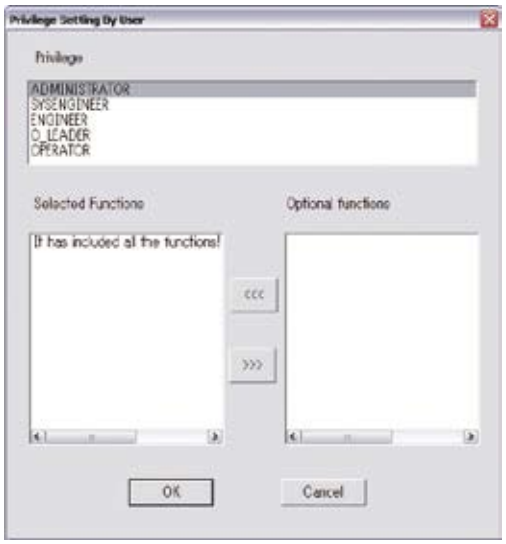


Figure 2-13 Advanced Setting

No.	User Accessible Level	Description
L1	Administrator	All functions and windows are available.
L2	System Engineer	Not allowed to change the privilege setting.
L3	Engineer	Not allowed to change the privilege setting and system setup.
L4	O_Leader	Not allowed to save inspection data.
L5	Operator	Allowed to select inspection data and run Auto Mode only.

Table 2-6 User accessible level and functions availability

Function	Item which can be changed in accessible level in advanced setting	L1	L2	L3	L4	L5
Edit Inspection Data		○	○	○	○	×
Auto Inspection		○	○	○	○	○
BF Termination		Retern to OS		OS Shutdown		
Menu-bar→File→Select Data	File->Select Data	○	○	○	○	○
Menu-bar→File→Save Data	File->Save Data	○	○	○	×	×
Menu-bar→File→Add Data	File->Add Data	○	○	×	×	×
Menu-bar→File→Append CAD Data	File->Select CAD Data	○	○	×	×	×
Menu-bar→File→Select Image	File->Select Image	○	○	○	×	×
Menu-bar→Edit→Search	Edit->Search	○	○	○	×	×
Menu-bar→Edit→Add	Edit->Add	○	○	○	×	×
Menu-bar→Edit→Input mode	Edit->Input Mode	○	○	○	×	×
Menu-bar→Edit→Delete	Edit->Delete	○	○	○	×	×
Menu-bar→Edit→Edit NG	Edit->Edit NG	○	○	○	×	×
Menu-bar→Edit→Block	Edit->Block	○	○	○	×	×
Menu-bar→Edit→Offset	Edit->Offset	○	○	○	×	×
Menu-bar→Edit→Reference List	Edit->Reference List	○	○	○	×	×
Menu-bar→Edit→SubMark	Edit->SubMark	○	○	○	×	×
Menu-bar→Edit→Edit Library	Edit->Edit Library	○	○	○	×	×
Menu-bar→Edit→Link Library	Edit->Link Library	○	○	○	×	×
Menu-bar→Edit→Unlink Library	Edit->Unlink Library	○	○	○	×	×
Menu-bar→Edit→System Setup		○	○	×	×	×
Menu-bar→Edit→System Setup →privilege setting		○	×	×	×	×
Menu-bar→View→Rename Component	View->Rename Component	○	○	○	×	×
Menu-bar→Auto→Lotnumber	Autorun->Lotnumber	○	×	×	×	×
Menu-bar→Auto→Marking	Autorun->Marking pen	○	×	×	×	×
Menu-bar→Pass		○	○	○	○	×
Not used	BFRP1->Delete OK Data	○	×	×	×	×
Not used	BFRP1->Delete This Data	○	×	×	×	×
Not used	BFRP1->Repaired	○	×	×	×	×
Not used	BFRP1->All Repaired	○	×	×	×	×
Not used	BFRP1->Show Current Offset	○	×	×	×	×
Not used	BFRP1->Make Report	○	×	×	×	×

Table 2-7 User Accessible Level and restricted function

CAUTION Diagonal items can not be changed in accessible level.
When the password wish to change, please contact Saki Corporation.

2.7.2 Registration Method of New User

Here describes how to register new user name.
Only Administrator is authorized to use this function.

Step1: Select **Edit > System Setting > Privilege Setting** from the menu-bar.

CAUTION Register **Administrator** first as only Administrator can enter **System Setting** > **Privilege Setting** and change settings.

CAUTION If the password for Administrator is lost, please contact Saki Corporation.

Step2: Enter **User name, Password**, and **Re-enter Password**. Select user accessible level in **Privilege** and press **Add**. After all the settings are completed, press **OK**.

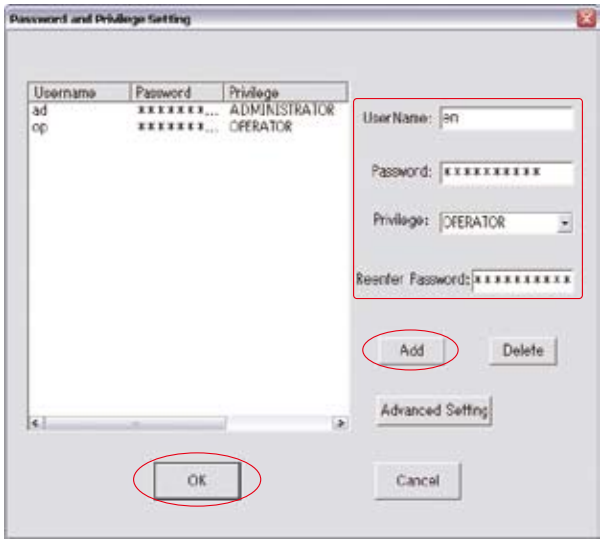


Figure 2-14 Privilege Setup Screen

Step3: **Log in** dialog appears right after system is activated. Enter user-name and password. Press **OK**. Operation starts depending on the specified user accessible level.

Figure 2-15 Log in

Step4: Select **File > Log** in to return to Figure 2-15 to change the user's accessible level.

2.8 Send_DB Setting

Disabled function.

2.9 Three LED Test

Check the lighting of LED's. This function controls the lighting-up of the LEDs.

Press **Three LED Test** in Figure 2-1 **Select System Setup**. **Light Test** window shown in Figure 2-16 appears. Press **ALL ON** and check if all lights are turned on. Press **ALL OFF** and check if all lights are turned off. All lights are turned off automatically in 15 seconds.

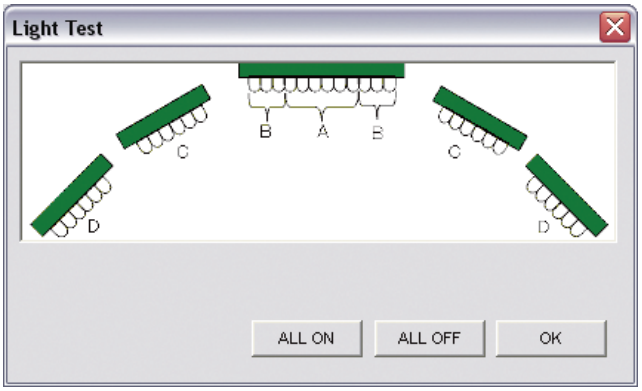


Figure 2-16 Light Test

2.10 Machine Layout

Disabled function.

2.11 Predefine Setting

This list displays the parameters, such as NG Type, Screen Selection, Judgement saved in Edit Component Data Window. Press **Predefine Setting** in Figure 2-1 **Select System Setup**. **Predefine Setting** window shown in Figure 2-17 appears.

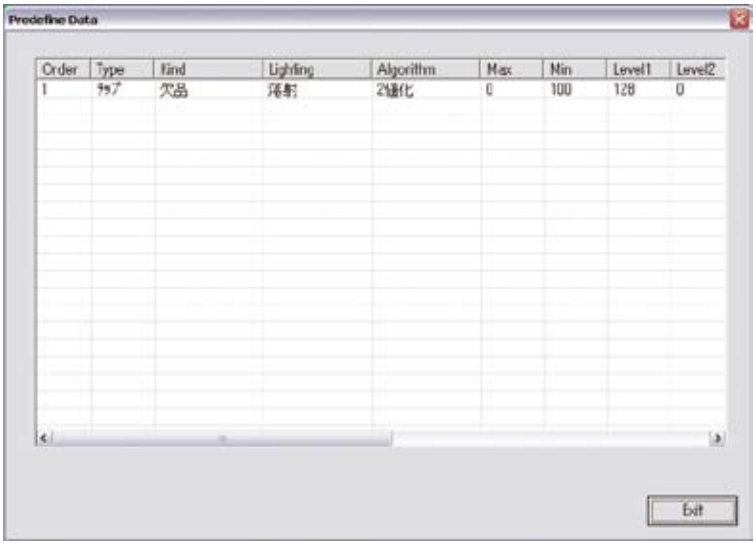


Figure 2-17 Predefine Setting

The follows explanation to save inspection data parameter.
Right-click the inspection data to open Figure 2-18 **Edit Component Data Window**.
Right-click the inspection window and select **Save Parameter** to save parameter of the inspection data in Figure 2-17 **Predefine Setting**.

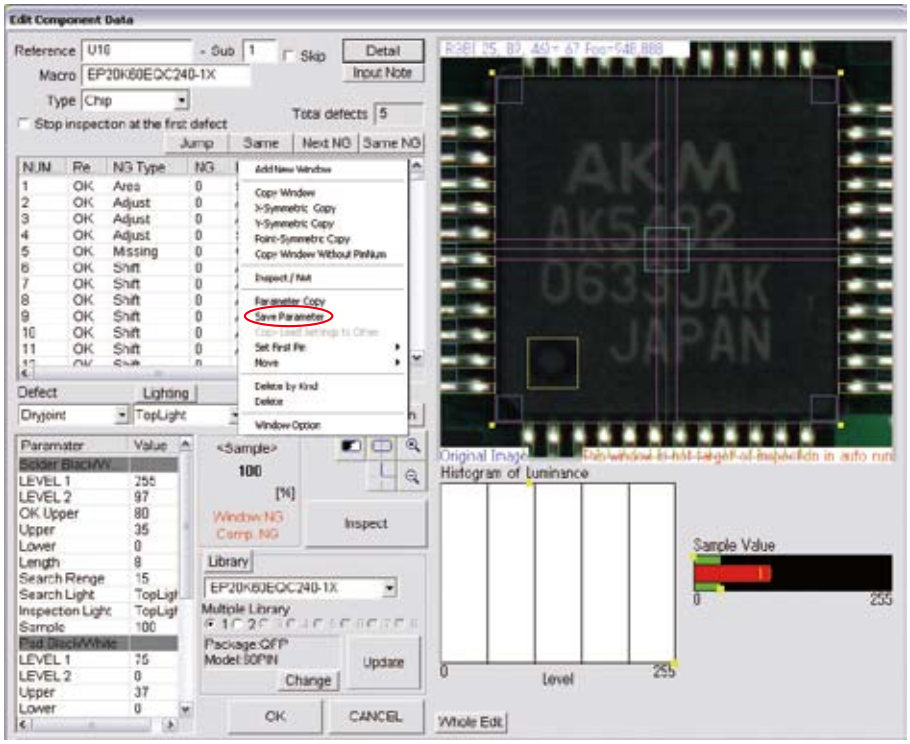


Figure 2-18 Edit Component Data Window

2.12 Self Diagnosis

Disabled function.

2.13 Machine Origin

Disabled function.

2.14 DI/O

Input or output signals can be checked in this window.

Press **DI/O** in Figure 2-1 **Select System Setup**. **Check PLC Functions** window shown in Figure 2-19 appears.

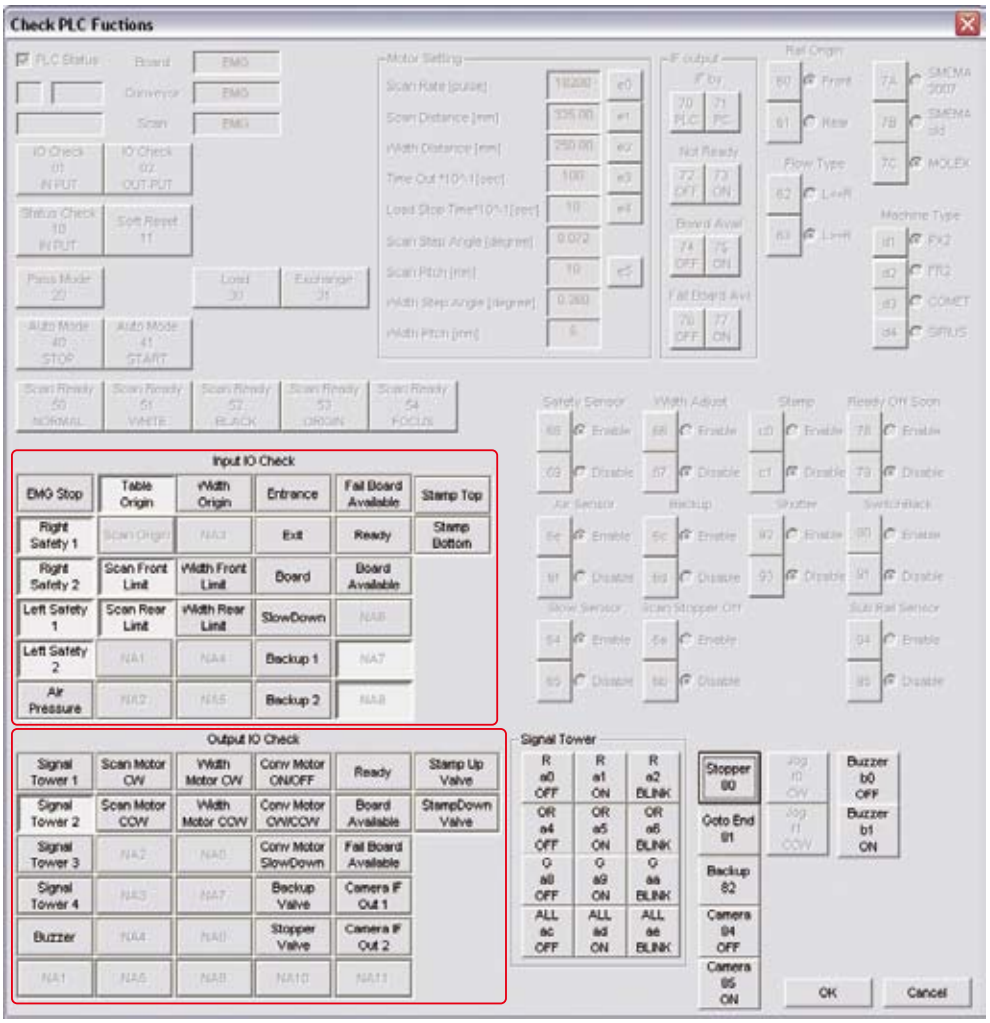


Figure 2-19 Check PLC Functions

A(Input IO Check) items in Figure 2-19 shows the state of input signals from external devices and sensors. When signal is input, corresponding item is on.

B(Output IO Check) items shows the operating status of signal tower or each motors. When unit is operating, corresponding item is on.

2.15 Focus

Disabled function.

2.16 Show Conveyer

Disabled function.

2.17 OK/NG Signals

This section describes the connection settings with upstream/downstream machines.

Press **OK/NG Signals** in Figure 2-1 **Select System Setup**. **OK/NG Signal Settings** window shown in Figure 2-20 appears.

Refer to **Signal** tab in Table 2-1.

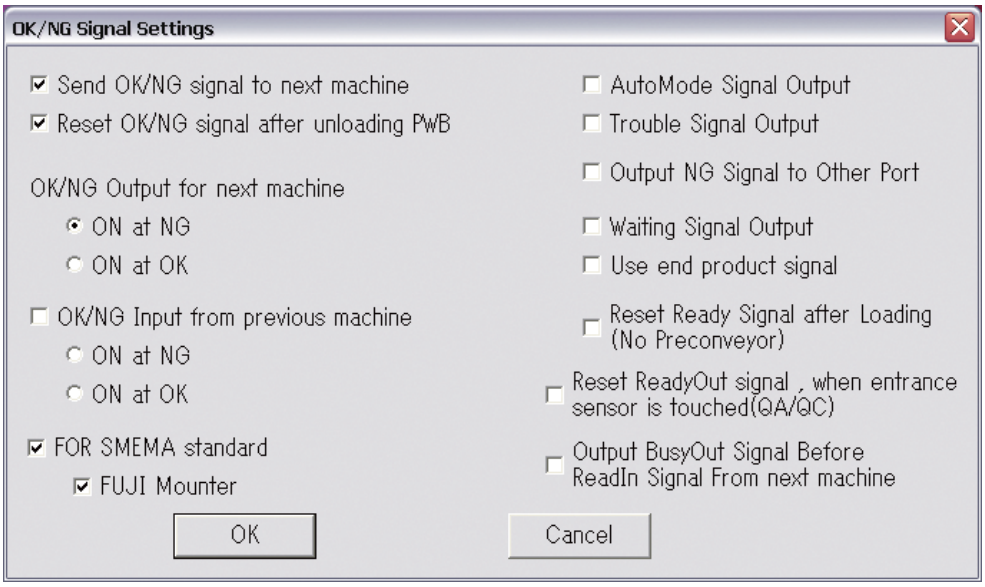


Figure 2-20 OK/NG Signal Settings

In case of receiving OK/NG signal from upstream machine, OK/NG signal is output from AOI based on the AOI inspection result as below.

		Inspection Result	
		The Case of OK	The Case of NG
OK/NG In	No Signal	OK	NG
	OK	OK	NG
	NG	NG	NG

Table 2-8 Relations between Signals from the Upstream Machine and Output Signal

2.18 IPM8540Adjust

Disabled function.

2.19 CPK

Disabled function.

2.20 Separate Conveyer

Disabled function.

2.21 Output Files

Disabled function.

2.22 Warning Setting

This is the function to issue the warning if the NG or false calls are detected more than the specified occurrence frequency. As the warning is issued based on the frequency, errors are detected and informed to operators although the operation is continued over the long term.

Press **Warning Setting** in Figure 2-1 **Select System Setup**. **Warning Setting** window shown in Figure 2-21 appears. Refer to Table 2-9 **Warning Kind Setting**.

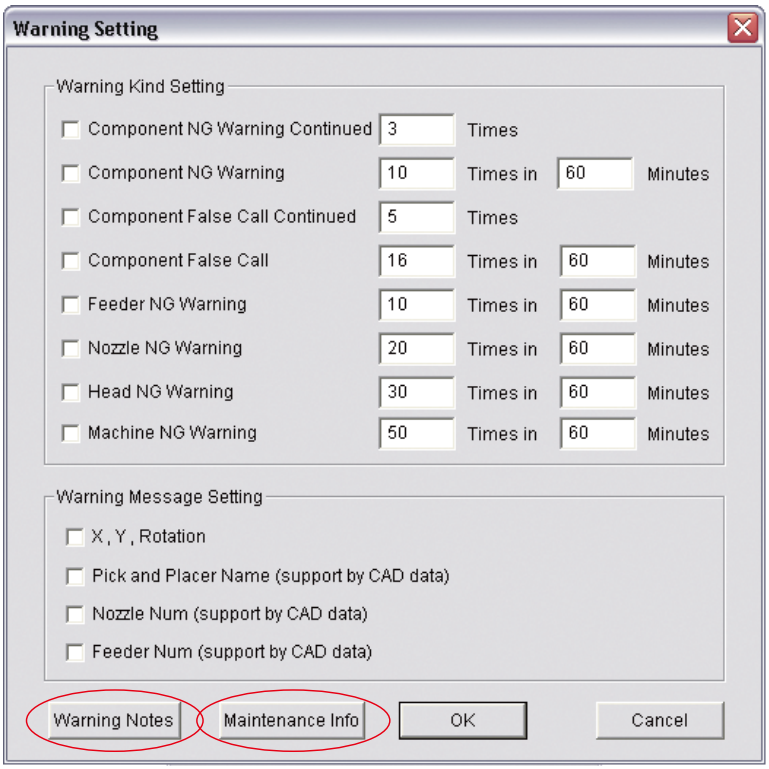


Figure 2-21 Warning Setting

Items	Description
Component NG Warning Continued	If NG of the component in a reference are detected continuously and the number of the continuous NG detection reachs the specified times, the warning message appears.
Component NG Warning	It the number of detected NG of a component in a reference during the specified time reach the specified time, the warning message appears.
Component False Call Continued	If false call of a component in a reference are detected continuously and the number of the continuous false call detection reachs the specified times, the warning message appears.
Component False Call	It the number of false call of a component in a reference during the specified time reach the specified time, the warning message appears.
Feeder NG Warning	It the number of detected NG in mounter during the specified time, the warning message appears.
Nozzle NG Warning	
Head NG Warning	
Machine NG Warning	
X, Y, Rotation	Not available.
Pick and Placer Name (support by CAD data)	
Nozzle Num (support by CAD data)	
Feeder Num (support by CAD data)	

Table 2-9 Warning Kind Setting

Press **Warning Notes** in Figure 2-21 **Warning Setting** window. **Warning Notes** window shown in Figure 2-22 appears. Modify the warning message in this window.

In **Common Advice**, advice message as to defect kind can be arranged. Select the defect type from the **Advice Kinds** drop-down list and enter advice in the text-box. Press **Save**.

In **Equipment Info**, message for each component can be set. Press **Add** to add new items. Press **Delete** to delete items. Press **Save** to apply changes.

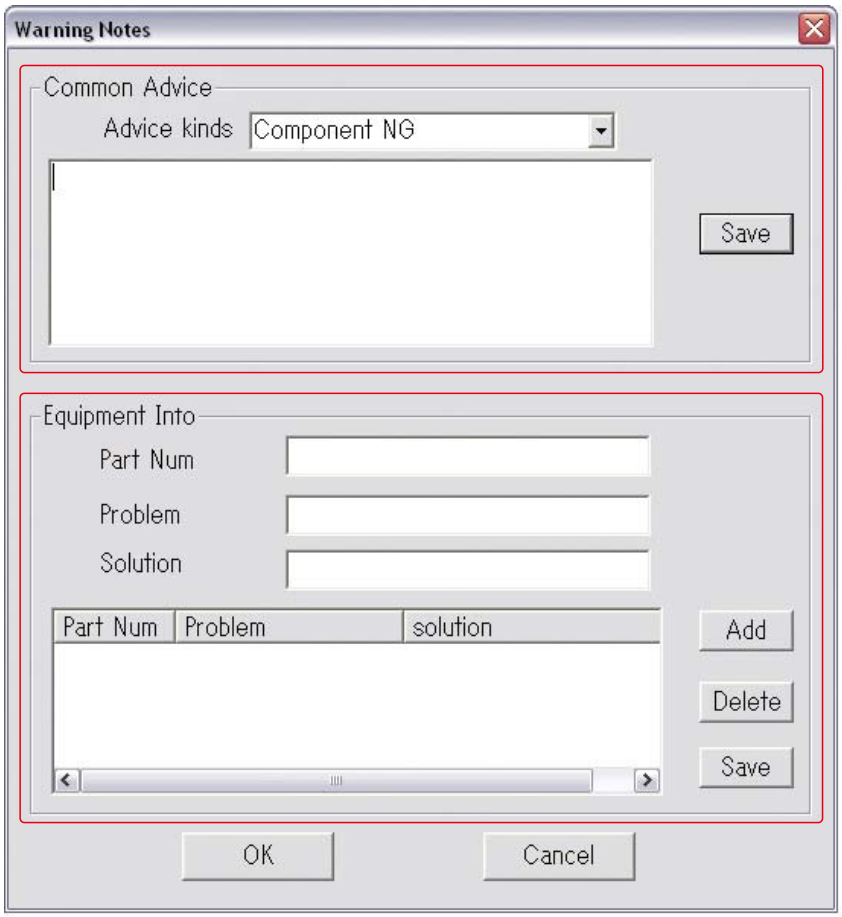


Figure 2-22 Warning Notes

Press **Maintenance Info** in Figure 2-21 **Warning Setting** window. **Maintenance Information** window shown in Figure 2-23 appears. In each text-box, information such as the timing of the maintenance can be recorded. Press **Add** to add new items. Press **Delete** to delete items. Press **Save** to apply changes.

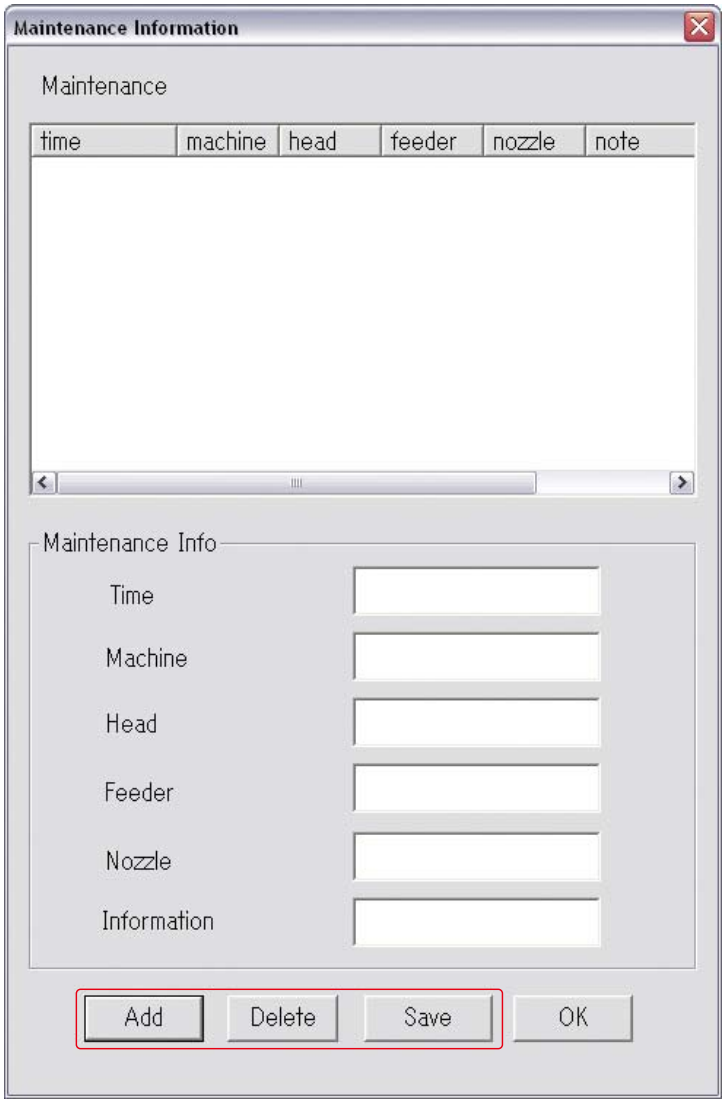


Figure 2-23 Maintenance Information

2.23 Repeatability

Disabled function.

Inspection Data

1 Make Inspection Data

Inspection data can be made by AOI machine and BF-Editor(optional system).

CAUTION Do not use two-byte character, space, tab, and symbolic character(\ < > : " / | ? * . , ; & % =). It would cause unexpected errors.

1.1 Make Inspection Data on AOI Machine

Step1: Press **New** button on the tool-bar or select **File** > **New** from the menu-bar.

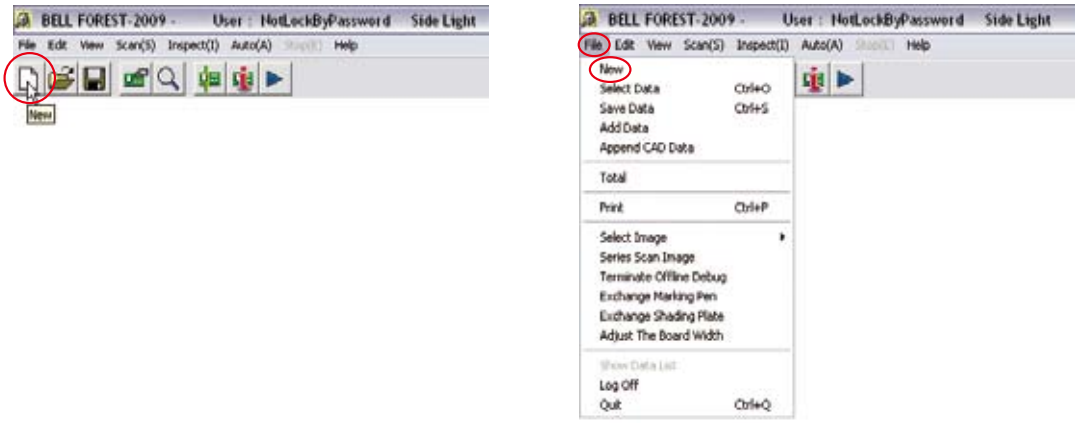


Figure 1-1 New

Step2: Check the **Make Inspection Data for Side A** and press **Next**.

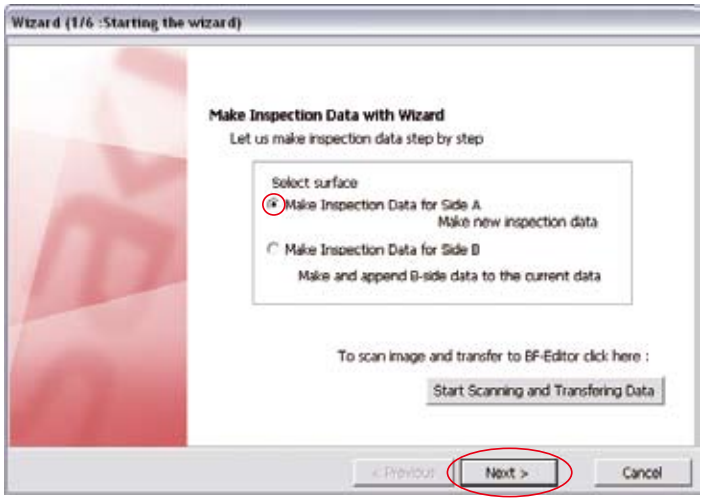


Figure 1-2 Wizard 1

Step3: Press **Browse** in **CAD Data** to specify the CAD data.

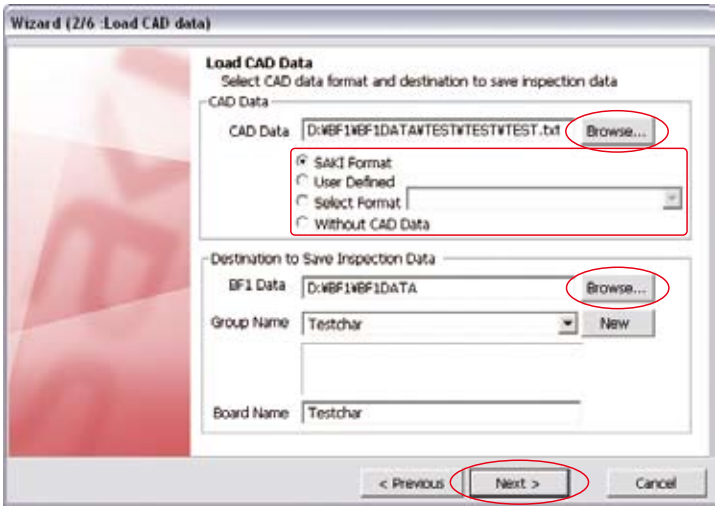


Figure 1-3 Wizard 2

Step4: Select the format of the CAD data.

Item	Description
SAKI Format	Check the **SAKI Format** which CAD data is output with Saki format.
User Defined	Check the **User Defined** which CAD data is output with other format.
Select Format	Check the **Select Format** which mount data is used.
Without CAD Data	Check the **Without CAD Data** which there is no CAD data.

Table 1-1 Select the Format

Step5: Press **Browse** in **BF1 Data** to specify destination to save the inspection data.

NOTE In default setting, the inspection data is saved in D:\BF\BF1DATA.

Step6: Select **Group Name** from the drop-down list. Press **New** to add new group. The window shown in Figure 1-4 appears. After all the settings are completed, press **OK**.

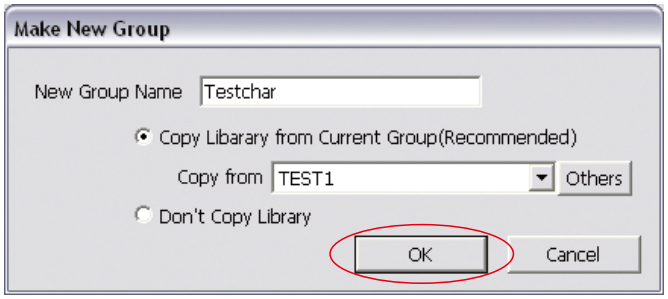


Figure 1-4 Make New Group

Item	Description
New Group Name	Enter new group name.
Copy Library from Current Group	Check the **Copy Library from Current Group** to use existing library data. Select library from the **Copy from** drop-down list.
Don't Copy Library	Check the **Don't Copy Library** not to use existing library data.

Table 1-2 Make New Group

Step7: Enter **Board Name** of **Destination to Save Inspection Data** in Figure 1-3 and press **Next**. If **SAKI Format** or **Select Format** in step4 is checked, CAD data will be automatically extracted. If **User Defined** is checked, the format should be made newly. Refer to **1.3 Make User Define Format**. After format is made, CAD data will be automatically extracted.

NOTE If **Without CAD Data** is checked, CAD data is not extracted. Make inspection data individually.

Step8: After CAD data is extracted, open the image. Press **Load Image** and specify the image file to open the reserved image. Procedures to scan the PCB depend on machine type differs between benchtop machine and inline machine.

In case of benchtop machine
Set the PCB in the machine and press **Scan Board Image**.

In case of inline machine
Adjust conveyor rail width and set the PCB on conveyor rail. Press **Load / Unload the Board**. Set the PCB in the machine and press **Scan Board Image**. To unload the PCB, press **Load / Unload the Board**.

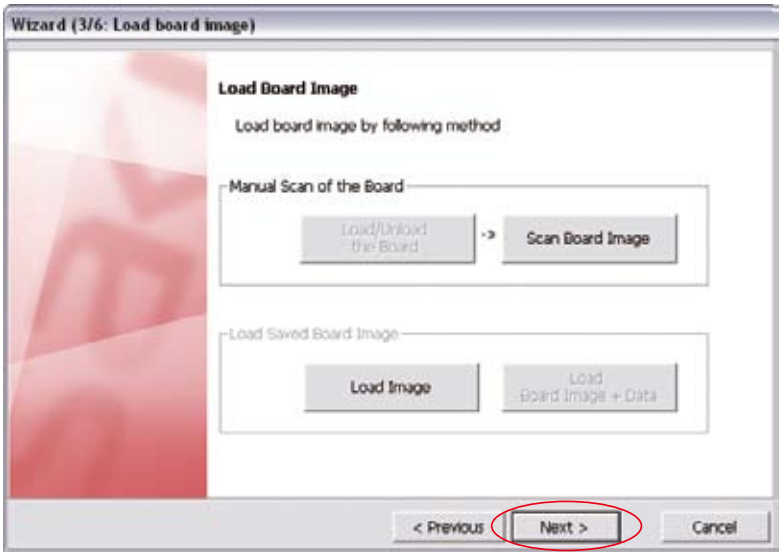


Figure 1-5 Wizard 3

Step9: Check the PCB is scanned properly and press **Next**.

Step10: Select two fiducial mark data from the list-box. The second selected fiducial mark data is displayed. Press **Switch of Mark Data Image** to display another fiducial mark data.

NOTE Magnification percentage of image can be changed by pressing **ENLARGE** or **REDUCE**.

NOTE Top 50 components data in all component data registered as fiducial mark, all component data including **Mark** or all outlying component data from the center of PCB are displayed in the list-box as possible fiducial mark data.

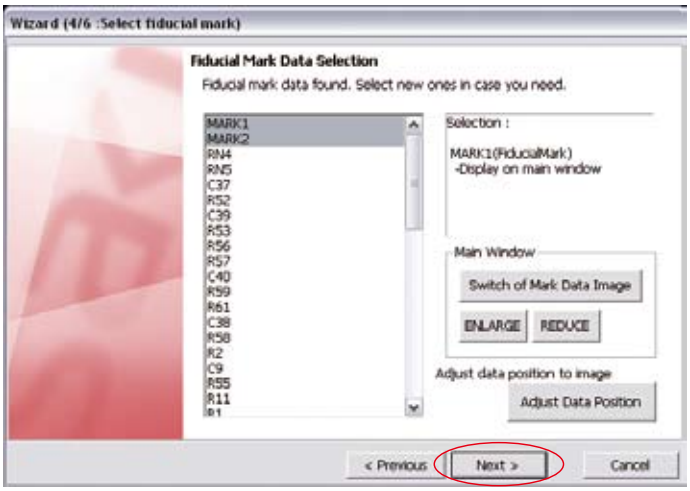


Figure 1-6 Wizard 4

Step11: Press **Adjust Data Position** in Figure 1-6, the window shown in Figure 1-7 appears. Press **Adjust Tool** to match the position of component data and the image. After all the adjustments are completed, press **OK**.

NOTE The position of component data can be adjusted by dragging mouse. In addition, magnification percentage can be changed by scrolling wheel of mouse.

Figure 1-7 Adjust Data Position

Step12: After all the settings are completed, press **Next**.

Step13: Make fiducial mark data and press **MARK1**. The window shown in Figure 1-9 appears.

NOTE If more than one CAD data is used, press **Append** and refer to after Step3.

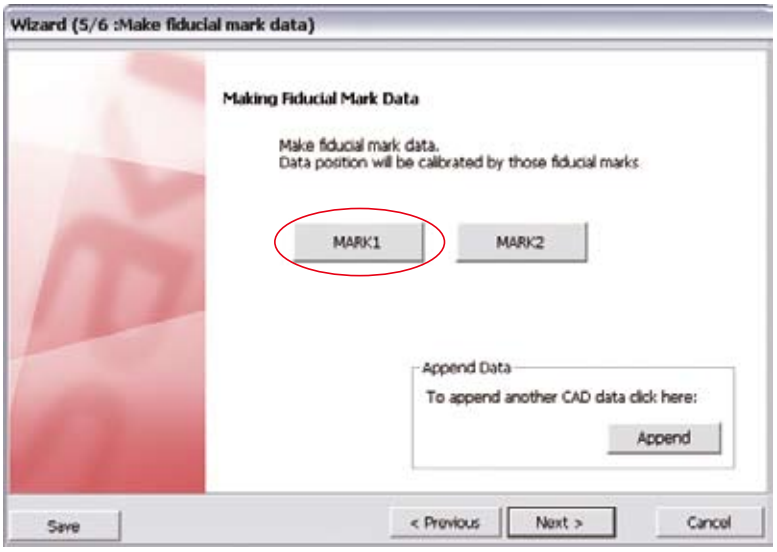


Figure 1-8 Wizard 5

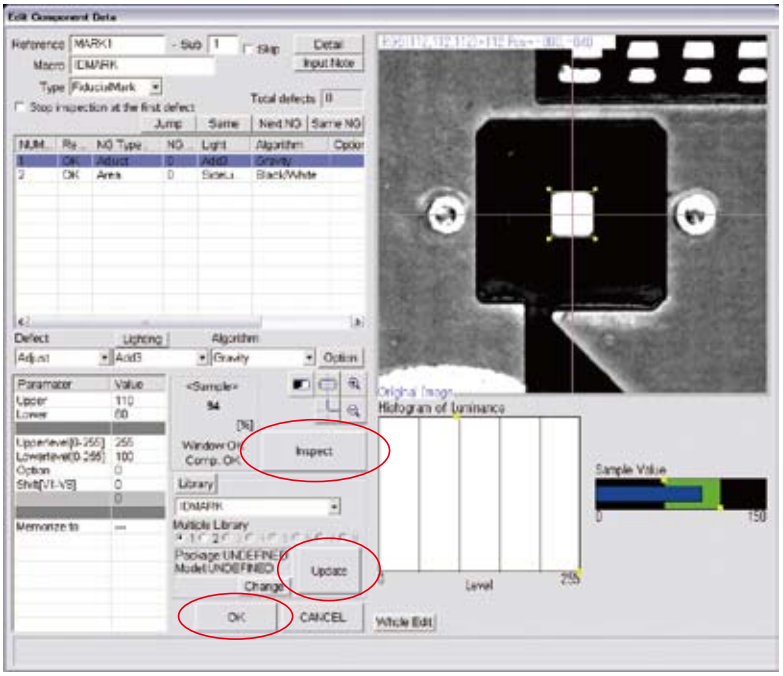


Figure 1-9 Fiducial Mark 1

Step14: Select **Fiducial Mark** from the **Type** drop-down list.

Step15: Right-click on the list and select **New**.

Step16: Select **Adjust** from the **Defect** drop-down list.

Step17: Select a lighting that fiducial mark is visually clear from the **Lighting** drop-down list.

Step18: Select a algorithm from the **Algorithm** drop-down list.

Figure of Fiducial Mark	Description
Square	Select **Gravity**.
Circle	Select **New_Circle**.

Table 1-3 Select Algorithm

Step19: Adjust **Adjust** inspection window size to surround the fiducial mark.

NOTE Change **Diameter** to adjust inspection window size if **New_Circle** is used.

Step20: Enter **Upperlevel** and **Lowerlevel**.

Brightness Level	Description
Fiducial Mark > Surroundings	Enter **255** in **Upperlevel** field and **150** in **Lowerlevel** field.
Fiducial Mark < Surroundings	Enter **150** in **Upperlevel** field and **0** in **Lowerlevel** field.

Table 1-4 Upperlevel and Lowerlevel setting

Step21: Right-click on **Adjust** and select **Copy**. The same parameter will be copied in **2** of **NUM...**.

Step22: Select **2** of **Num...** and select **Area** from the **Defect** drop-down list.

Step23: Adjust **Area** inspection window can inspect the fiducial mark. This is the search range for the fiducial mark data. Ideal window size is about three times bigger than the fiducial mark size as a rough guide.

CAUTION The larger inspection window can inspect the fiducial mark if it is out of the target position. However it takes longer time to inspect it and some PCB pattern might be mis-judged as a fiducial mark.

Step24: Select **Adjust** and press **Inspect**. Pink line crossing center of the fiducial mark appears if the search is successful.

Step25: Press **Update**. The dialog shown in Figure 1-10 appears and press **OK**.

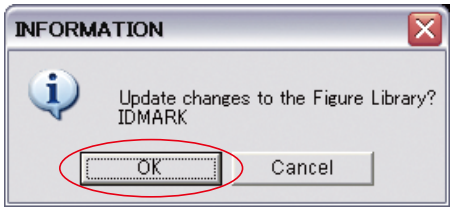


Figure 1-10 Fiducial Mark 2

Step26: The dialog shown in Figure 1-11 appears and press **OK**.

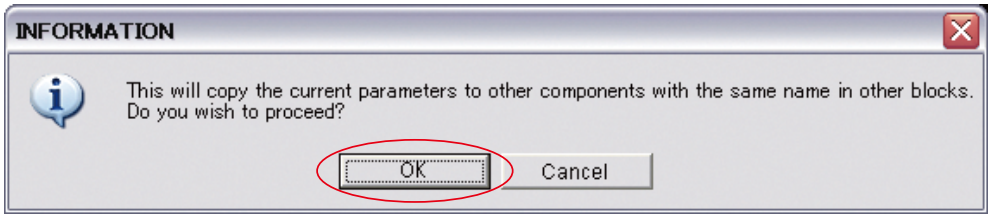


Figure 1-11 Fiducial Mark 3

Step27: Press **OK** in Figure 1-9 and the dialog shown in Figure 1-12 appears. If CAD data is used, press **Cancel**. If CAD data is not used, press **OK**.

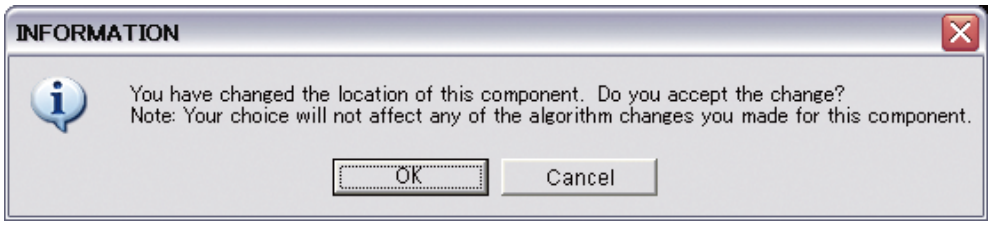


Figure 1-12 Fiducial Mark 4

Step28: The dialog shown in Figure 1-13 appears and press **OK**.

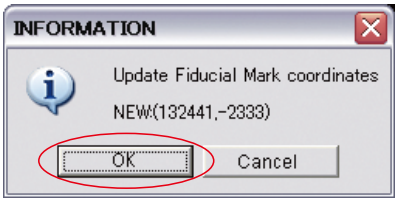


Figure 1-13 Fiducial Mark 5

Step29: The dialog shown in Figure 1-14 appears. If CAD data is used, press **OK**. If CAD data is not used, press **Cancel**.

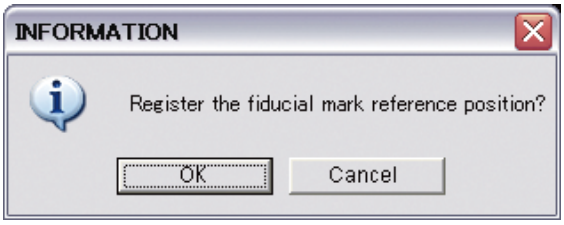


Figure 1-14 Fiducial Mark 6

Step30: Press **MARK2** and set as well as **MARK1**. After all the settings are completed, press **Next**.

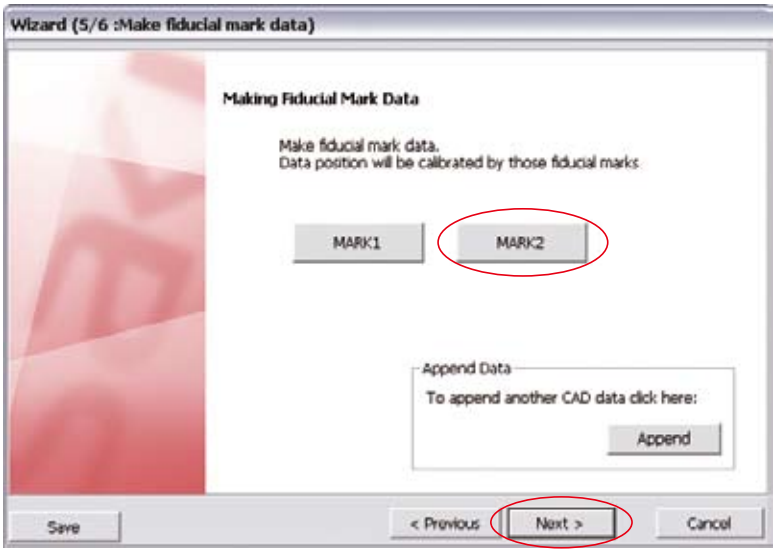


Figure 1-15 Wizard 5

Step31: Assign library to each component data. Library has information of inspection data. The time to make the inspection data can be reduced by sharing the common library among the same component type. The components assigned no libraries are displayed in the list-box. Select a component and press **Library Data Assignment**.

NOTE If there is no library which corresponds to the component, the new library should be made. Refer to **1.4 Auto Deployment of inspection data** to make the inspection data easily.

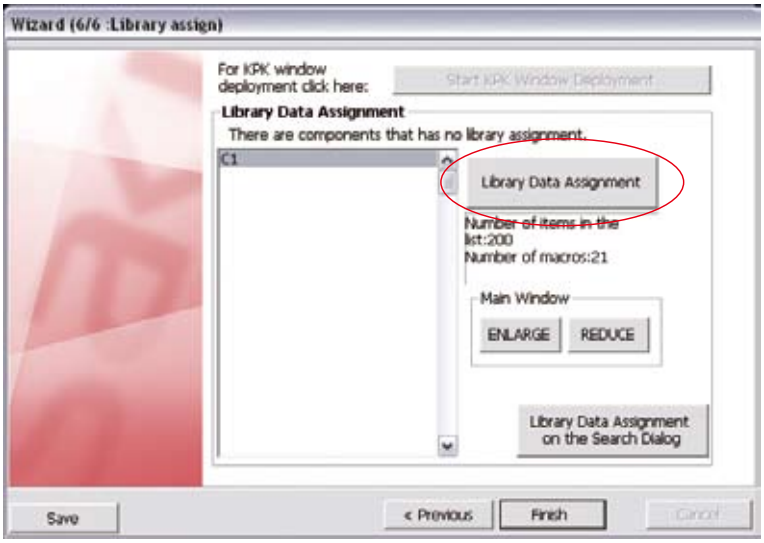


Figure 1-16 Wizard 6

Item	Description
Start KPK Window Deployment	Press **Start KPK Window Deployment** to make KPK inspection data. Refer to **2 KPK**.
ENLARGE / REDUCE	Press **ENLARGE** or **REDUCE** to change magnification percentage of image.
Library Data Assignment on the Search Dialog	Search window appears. Press **Library Data Assignment on the Search Dialog** and close wizard. The window shown in Figure 1-17 appears. In this case, assign library in search window.

Table 1-5 Other Items

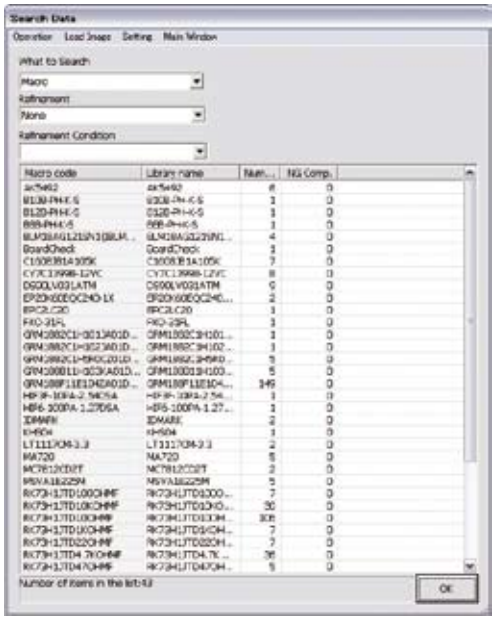


Figure 1-17 Search Data

Step32: The window shown in Figure 1-18 appears. Select an appropriate library for the component. Double-click the library to edit the inspection data. In case of making a new library, select an existing library that can be a base of new library. After select the base library, press **New(Use this as a template)**. The base library is registered as templete library. The window shown in Figure 1-19 appears. Enter the library name and press **OK**.

NOTE In case of making a new library, select a library which can be applied to a lot of similar components and set the library as a template.

NOTE Press **Import** in Figure 1-19. Component name and macro name are displayed.

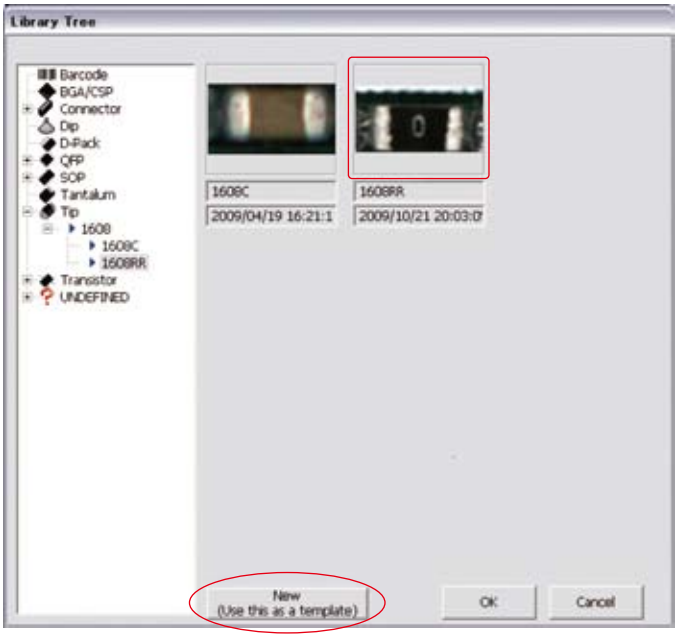


Figure 1-18 Assign Library

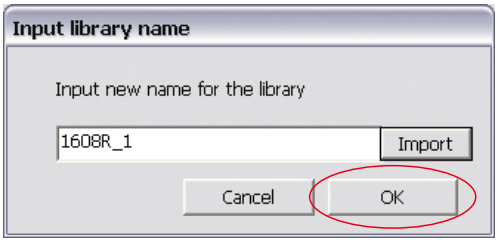


Figure 1-19 Input Library Name

Step33: Edit component data window of template library is appeared. Press **Whole Edit** in the lower side of the window and the window shown in Figure 1-21 appears. The following settings are available to zoom the component, expansion and contraction of one direction only, rotation of 90°, adjust the number of IC lead, clearance, and lead length. After all settings are completed, press **Update** and **OK**.

Figure 1-20 Edit Component Data Window

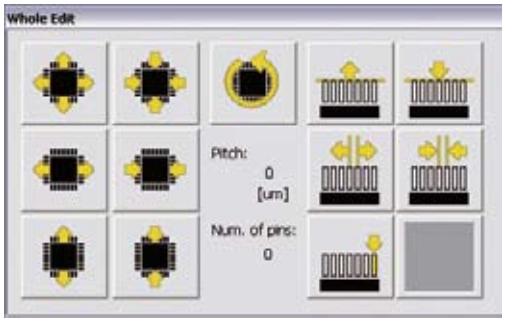


Figure 1-21 Whole Edit

Step34: After libraries are assigned to all components, press Finish in Figure 1-16. The window shown in Figure 1-22 appears and press **Save**. Check **Change destination to save inspection data** and specify the directory to save, if necessary.

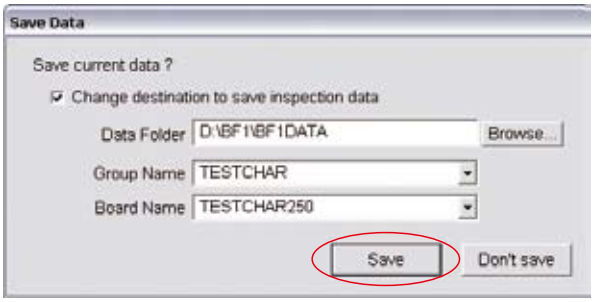


Figure 1-22 Save Data

1.2 Make Inspection Data on BF-Editor

The scanned image can be transferred from AOI machine to the BF-Editor. The inspection data can be made with the transferred image in BF-Editor.

1.2.1 Transfer Data to BF-Editor

Step1: Press **New** button on the tool-bar or select **File** > **New** from the menu-bar on AOI machine.

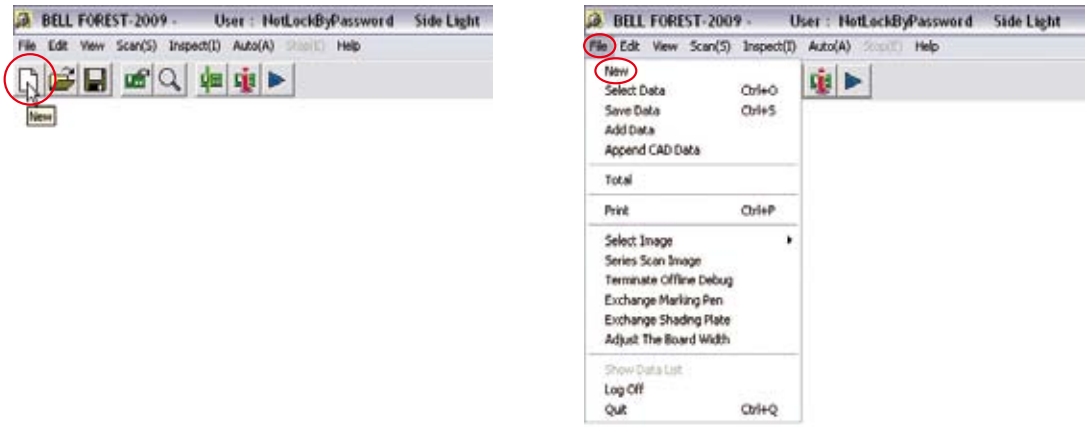


Figure 1-23 New

Step2: Press **Start Scanning and Transferring Data**.

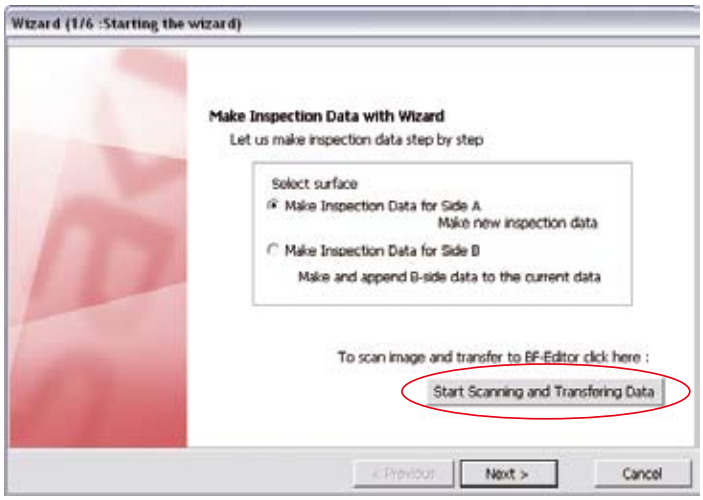


Figure 1-24 Wizard 1

Step3: Check the **BF-EDITOR Transfer Data to**. Enter **Board Name**, **Board Size**, and **Board Thickness**. Press **OK**.

NOTE The destination to save the transfer data was set during the installation of BF-Editor.

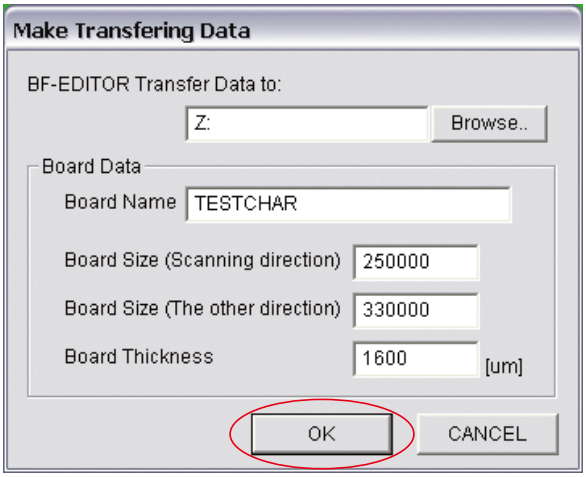


Figure 1-25 Make Transferring Data

Step4: Scan the PCB. Procedures differs between benchtop machine and inline machine.

In case of benchtop machine

Set the PCB in the machine and press **Scan the Board**. After scanning the PCB, the dialog shown in Figure 1-27 appears. Some comment can be added if necessary. Enter comments in the text-box and press **OK**. If you do not need to add comment, press **OK**.

In case of inline machine

Adjust conveyor rail width and set the PCB on conveyor rail. Press **Load / Unload the Board**. Set the PCB in the machine and press **Scan the Board**. To unload the PCB, press **Load / Unload the Board**.

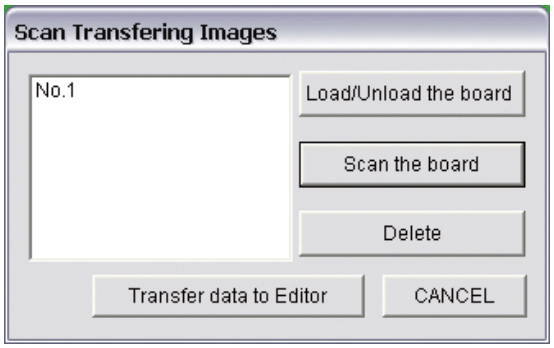


Figure 1-26 Scan Transferring Images

Figure 1-27 Input SERIES Image Comment

Step5: Images can be used for inspection data debugging if several images are saved.

NOTE The maximum number of images that can be saved is 10.

Step6: Press **Transfer data to Editor** to transfer image. Transferred data will be saved in **Transferring destination of BF-Editor data\TRANSDATA** folder.

CAUTION Check the BF-Editor is activated before pressing **Transfer data to Editor**.

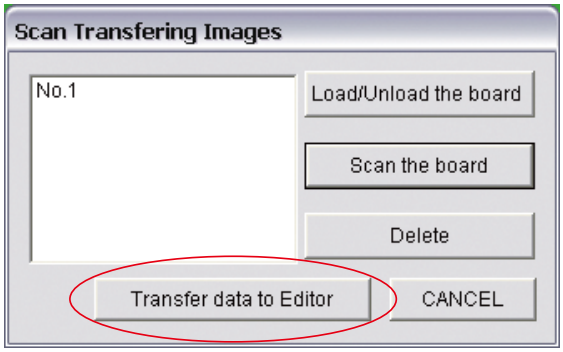


Figure 1-28 Transfer Data to Editor

1.2.2 Make Inspection Data on BF-Editor

Step1: Press **New** button on the tool-bar or select **File** > **New** from the menu-bar on BF-Editor.

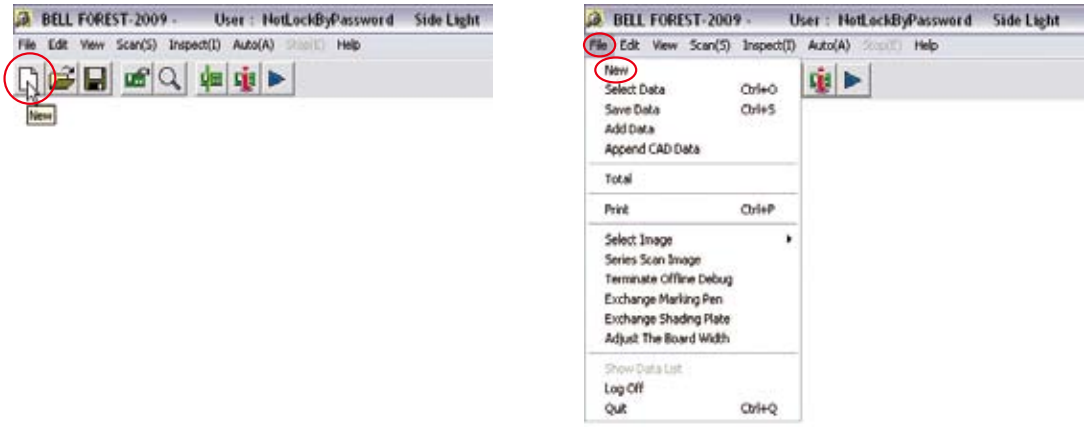


Figure 1-29 New

Step2: Check the **Make Inspection Data for Side A** and press **Next**.

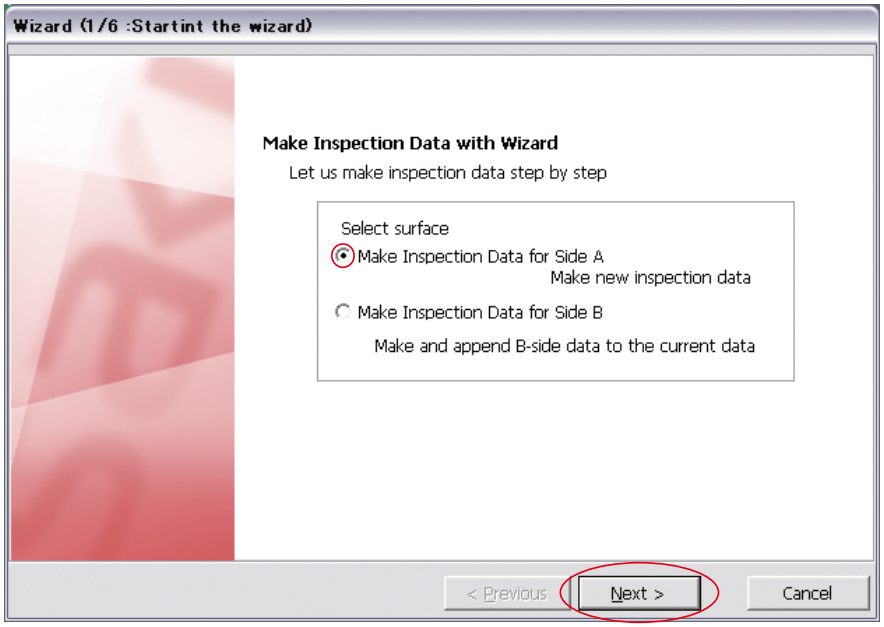


Figure 1-30 Wizard 1

Step3: Press **Load Board Image + Data** and select transferred data from AOI machine. Transferred data will be saved in **TRANSDATA** folder. Select the transferred data and press **OK**. Check if the image is appeared and press **Next**.

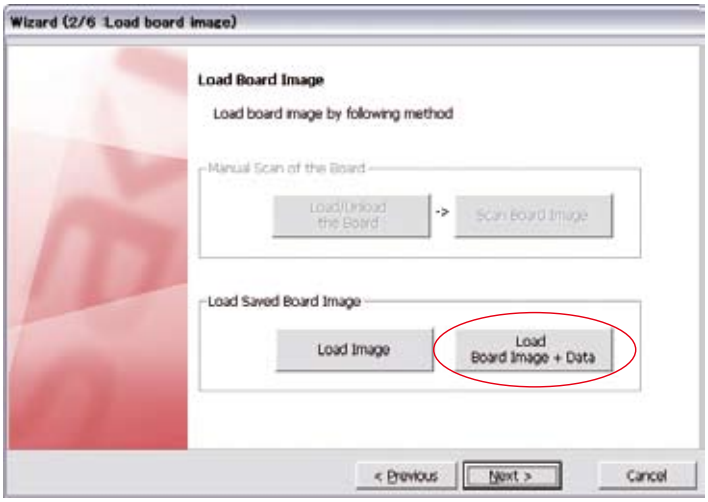


Figure 1-31 Wizard 2

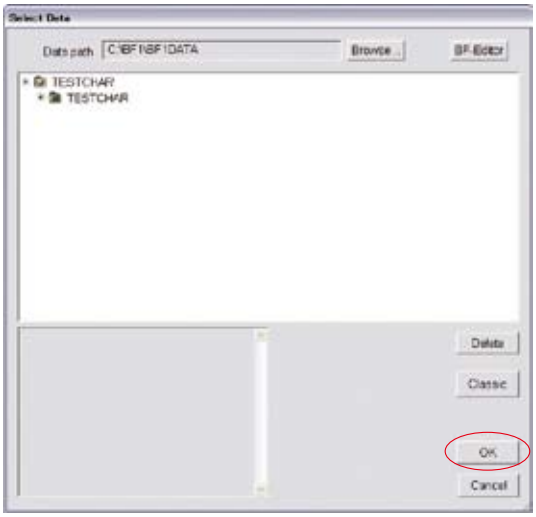


Figure 1-32 Select Data

Step4: Make inspection data with referring to after Step3 in **1.1 Make Inspection Data on AOI Machine**.

1.3 Make User Define Format

If **User Defined** is checked in **1.1 Make Inspection Data on AOI Machine** Step4, the window shown in Figure 1-33 appears. A format can be made to extract the CAD data.
In case of double-side PCB, both sides need each own user define format.

Step1: Press **New Format** to make a new format. If there is a similar format, press **Copy and Edit**.

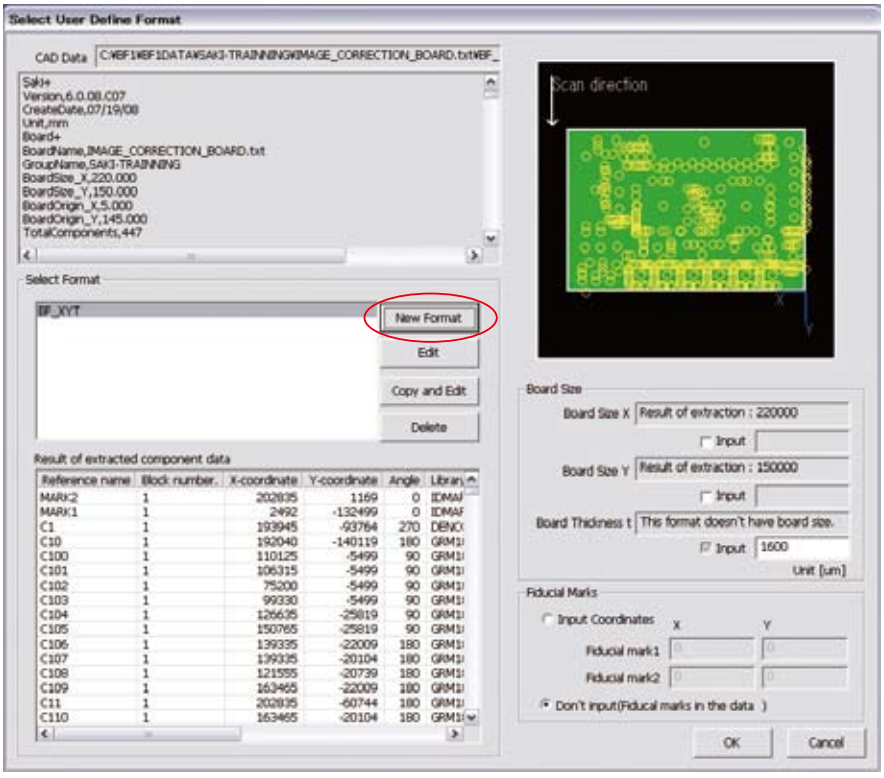


Figure 1-33 User Define Format

Step2: Enter format name in the text-box and press **Next**.

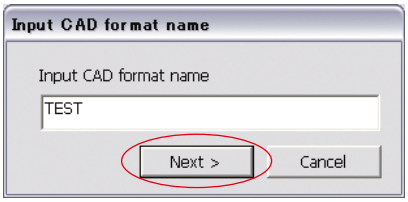


Figure 1-34 Enter Format Name

Step3: CAD data is displayed. Specify lines contains the component data such as name or coordinates of components.

CAUTION Text-box is case-sensitive.

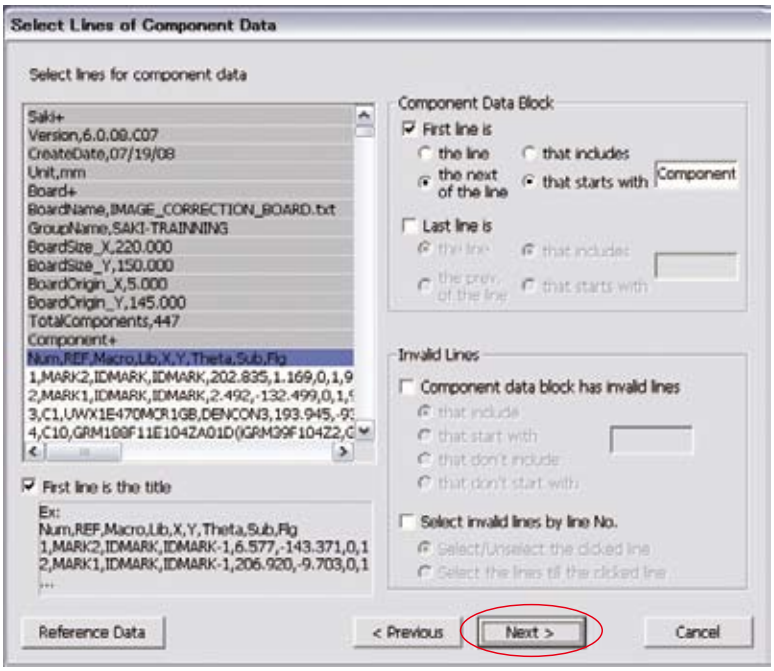


Figure 1-35 Select Lines of Component Data

Parameter	Description
First line is the title	Check the **First line is the title** if the first line of component data defined each columns.
First line is	Check the **First line is** to specify the first line of component data.
Last line is	Check the **Last line is** to specify the last line of component data.
the line and **that includes**	Check the **the line** and **that includes** to specify the line which is including words entered in the text-box.
the next(prev.) of the line and **that includes**	Check the **the next(prev.) of the line** and **that includes** to specify the next(previous) line of the line which is including words entered in the text-box.
the line and **that starts with**	Check the **the line** and **that starts with** to specify the line that start with the entered words in the text-box.
the next(prev.) of the line and **that starts with**	Check the **the next(prev.) of the line** and **that starts with** to specify the next(previous) line of the line that start with the entered words in the text-box.
Component data block has invalid lines	Check the **Component data block has invalid lines** if component data have the line that does not include component information. The specified line becomes invalid line.
that include	Check the **the line** and **that includes** to specify the line which is including words entered in the text-box.
that start with	Check the **the line** and **that starts with** to specify the line that start with the entered words in the text-box.
that don't include	Check the **that don't include** to specify the line which is not including words entered in the text-box.
that don't start with	Check the **that don't start with** to specify the line that doesn't start with the entered words in the text-box.
Select invalid lines by line No.	Check the **Select invalid lines by line No.** to specify the line that is not component data. As the particular line is specified with this function, the user define format might be inapplicable to other CAD data.
Select/Unselect the clicked line	Check the **Select/Unselect the clicked line** to specify clicked line.
Select the lines till the clicked line	Check the **Select the lines till the clicked line** to specify from the top line to the clicked line.
Reference Data	CAD data is displayed in other window.

Table 1-6 Description of Parameters

CAD Data	Board+ BoardSize_X,220.000 BoardSize_Y,150.000 **Component+** (Component data line always starts from the following line of **Component+**) **Num,REF,Macro,Lib,X,Y,Theta,Sub,Flg** (The title line should be also considered as line of component data) 1,MARK2,IDMARK,IDMARK-1,6.577,-143.371,0,1,98 2,MARK1,IDMARK,IDMARK-1,206.920,-9.703,0,1,98 …
Settings	Check the **First line is**. Enter **Component+** in the text-box. Check the **the next of the line** and **that includes.** Check the **First line is the title**.

Table 1-7 Example 1

CAD Data	BSIZEX150000Y300000 ORX5000Y5000 **C** ”R101”X101223Y050234T090 (Component data always starts by **C**) **C** ”C202”X059526Y189256T270 … **C** ”IC5” X033564Y253654T000 **END** (The last line is not component data)
Settings	Check the **First line is**. Enter **C** in the text-box. Check the **the line** and **that starts with**. Check the **Last line is**. Enter **C** in the text-box. Check the **the line** and **that starts with**.

Table 1-8 Example 2

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

Table 1-9 Example 3

Step4: Check all lines of component data are highlighted in white and other lines in gray. Press **Next**.

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

Step5: The lines specified as component data in step4 are displayed. Specify the definition type to classify the data according to the type such as name or coordinates of components.

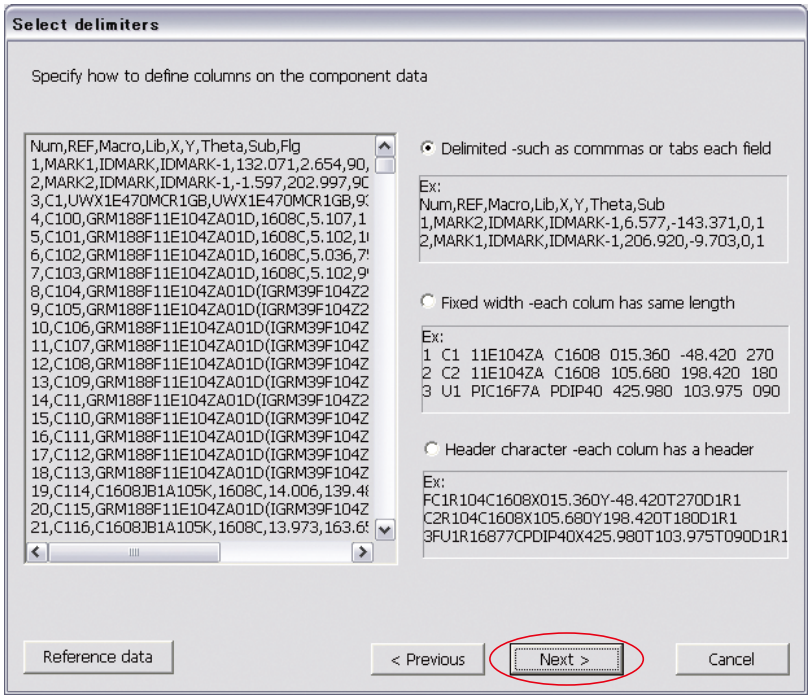


Figure 1-36 Select Delimiters

Delimited(such as commas or tabs each field)

Check the **Delimited** in Figure 1-36 and press **Next** if parameters is separated by comma, tab, or space. Check the item of **Separators** in Figure 1-37. Each parameter is automatically separated. Check the **Treat successive separators as one separator** if more than one space or tab are contained. After all the settings are completed, press **Next**.

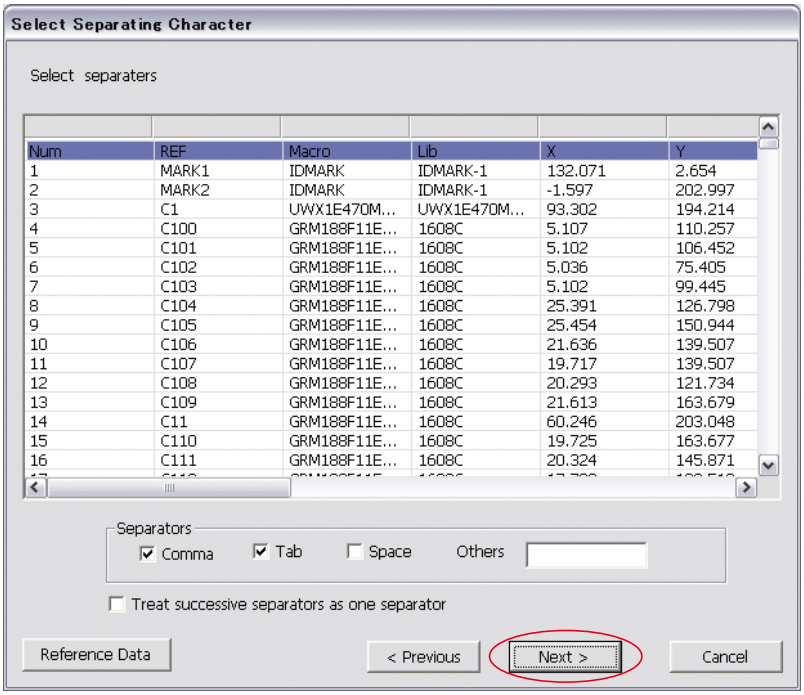


Figure 1-37 Delimited(such as commas of tabs each field)

Fixed width(each column has same length)

Check the **Fixed width** in Figure 1-36 and press **Next** if parameters is separated by fixed width. Adjust column widths by dragging the boundary of the header in Figure 1-38. After all the settings are completed, press **Next**.

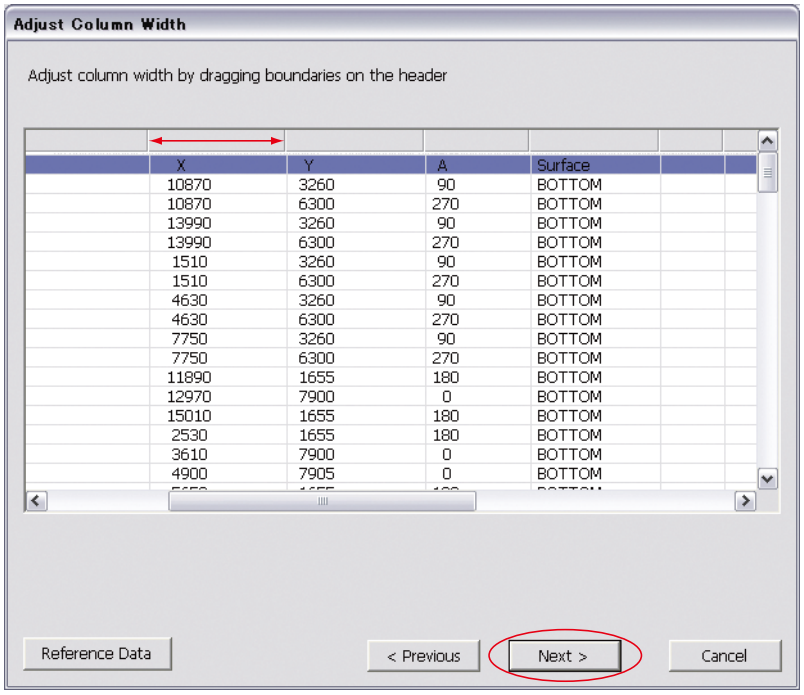


Figure 1-38 Fixed Width(each column has same length)

Header character(each column has a header)

Check the **Header character** in Figure 1-36 and press **Next** if parameters is separated by head character. Enter header character of parameter in the text-box of each columns in Figure 1-39. After all the settings are completed, press **Next**.

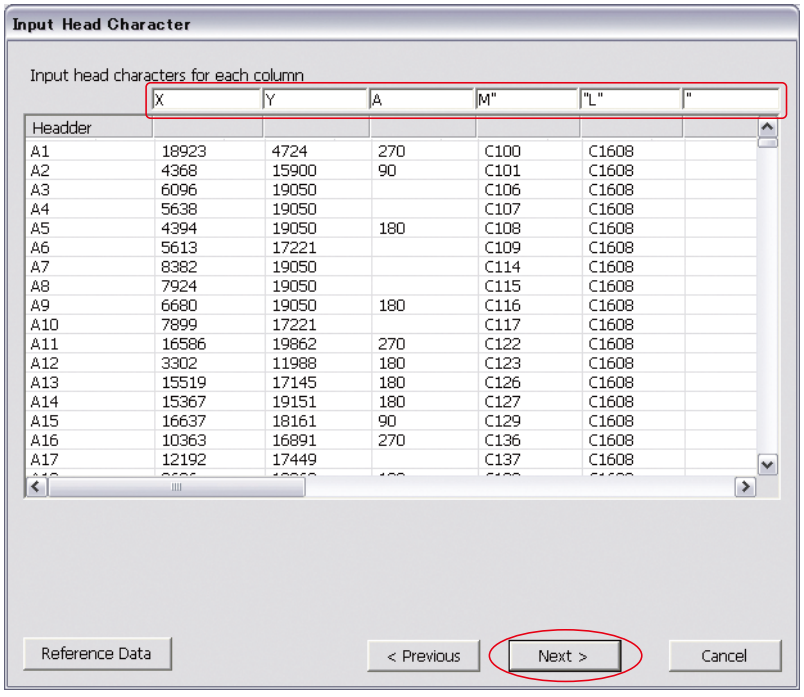


Figure 1-39 Header Character(each column has a header)

Step6: Press each column header, parameter's item is displayed, as shown in Figure 1-40. Select parameters that matched with each column. After all the settings are completed, press **Next**.

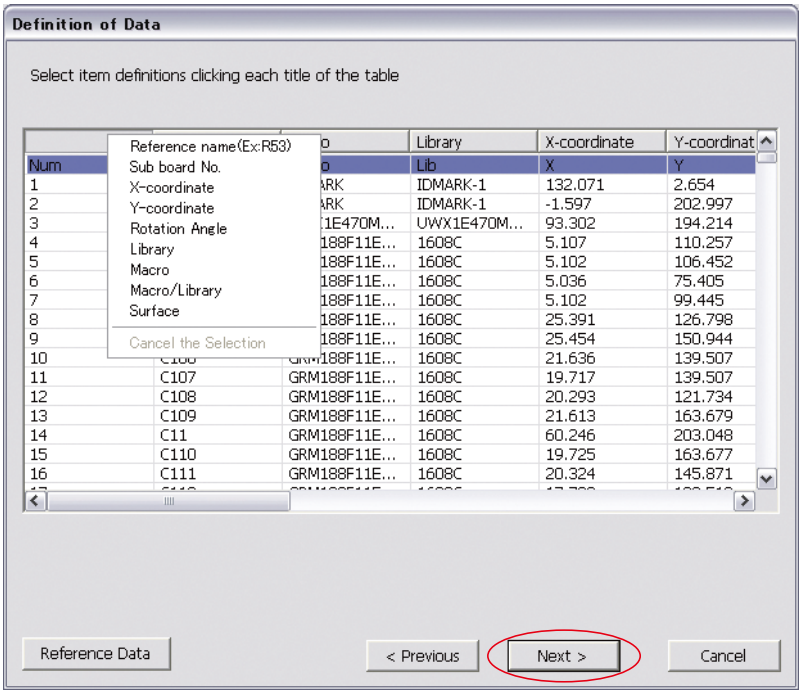


Figure 1-40 Definition of Data

Step7: Specify conversion conditions for coordinate and angle. Select items from the drop-down list. **Multiplier** is available if **Other** is selected from the drop-down list. The specified amount of offset will be added to all the component rotation if enter offset angle in **Offset angle** field.
If **Surface** is specified in step6, enter appropriate parameter in **Assign surface** field.
After all the settings are completed, press **Next**.

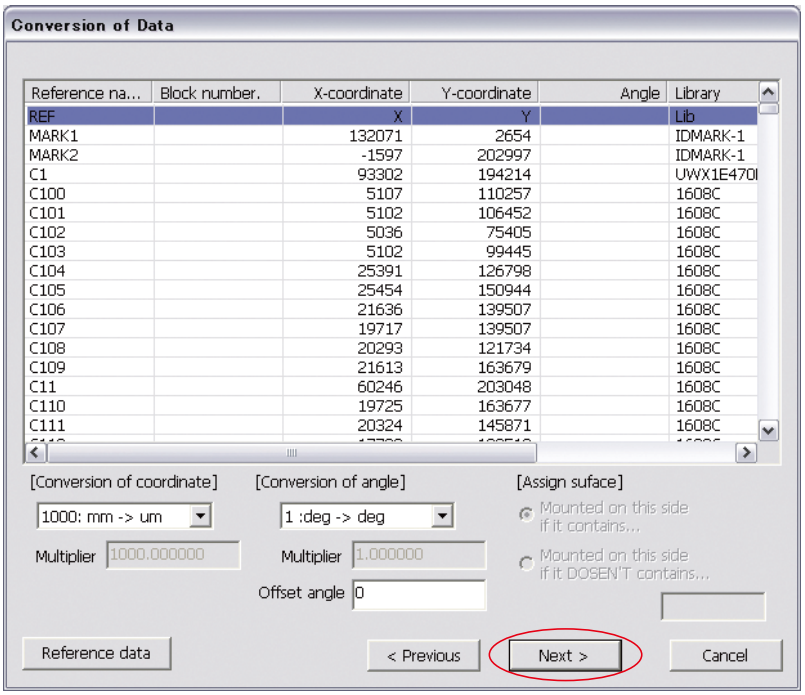


Figure 1-41 Data Conversion

Step8: The part this is not selected as component data in CAD data is displayed. Specify conditions to extract PCB size and PCB thickness from data. These data will be automatically extracted from the next time.

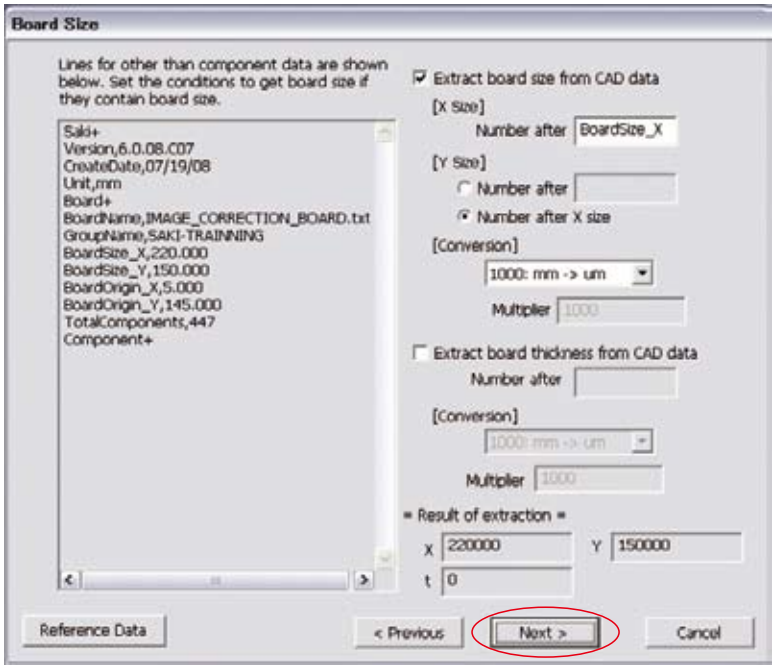


Figure 1-42 Extract PCB Size

Parameter	Description
Extract board size from CAD data	Check the **Extract board size from CAD data** to extract length of X direction and Y direction of the PCB.
X Size	Enter the character preceding the number which shows the X direction length of the PCB. The extracted value is displayed in **Result of extraction**.
Y Size	Enter the character preceding the number which shows the Y direction length of the PCB. Check the **Number after X size** if length of X direction and Y direction are continuing. The extracted value is displayed in **Result of extraction**.
Conversion	Select conversion conditions from the drop-down list. Select **Other** from the drop-down list and enter multiplier in **Multiplier** field.
Extract board thickness from CAD data	Check the **Extract board thickness from CAD data** to extract PCB thickness. Enter the character preceding the number which shows the PCB thickness.
Conversion	Select conversion conditions from the drop-down list. Select **Other** from the drop-down list and enter multiplier in **Multiplier** field.

Table 1-10 Description of Parameters

CAD Data	Board+ BoardSize_X,220.000 (Next value of **BoardSize_X** is always length of X direction of the PCB) BoardSize_Y,150.000 (Next value of **BoardSize_Y** is always length of Y direction of the PCB)
Settings	Enter **BoardSize_X** in **X Size** field. Enter **BoardSize_Y** in **Y Size** field(It can also substitute checking the **Number after X size**). Select **mm→µm** from the drop-down list of **Conversion**.

Table 1-11 Example

Step9: Press **Next** to enter PCB size and PCB thickness manually. Enter necessary conditions to extract these data automatically. Check if necessary data is extracted correctly in **Result of extraction** and press **Next**.

Step10: Press three buttons to match CAD data origin and machine origin. Starting from the left, **Place all data position inside of the PCB**, **Rotate all data 90° in counterclockwise direction**, **Flip all data vertical**. After all the settings are completed, press **Next**.

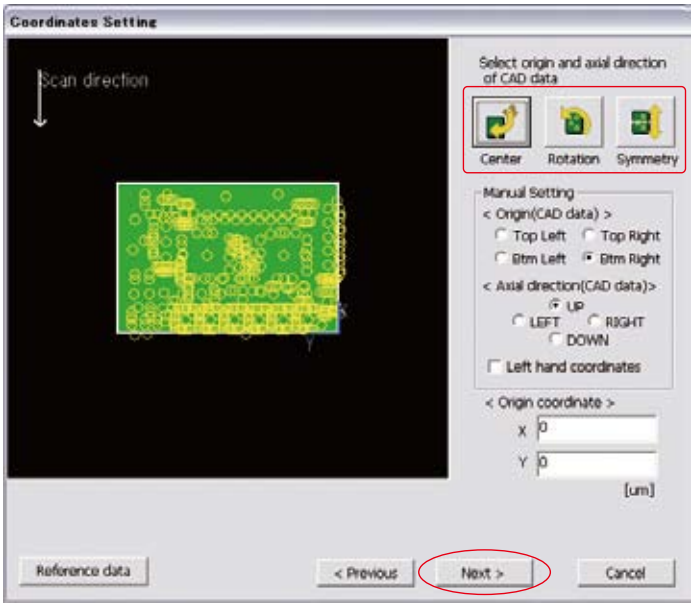


Figure 1-43 Coordinates Setting

Step11: Check if the component data is shown on the PCB image and **board size** is displayed. Enter the PCB size manually if the data is not automatically extracted. Check the **Input coordinates** if the fiducial mark data is not in the data and enter arbitrary coordinates. After all the settings are completed, press **OK**.

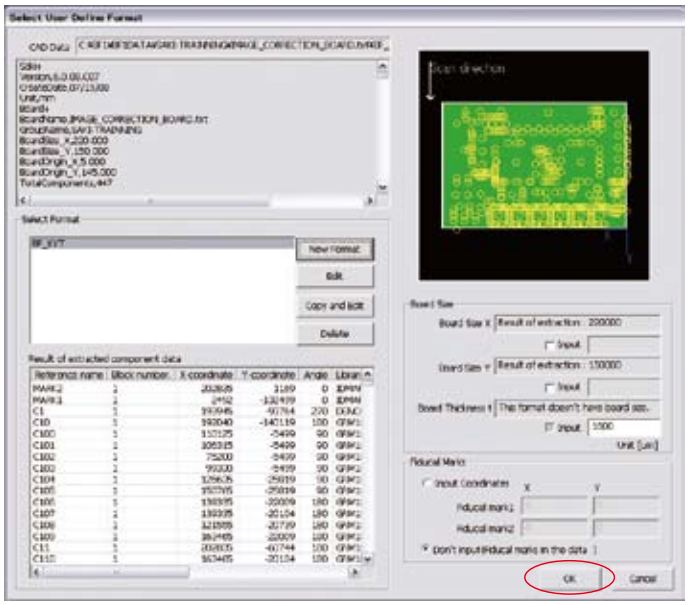


Figure 1-44 User Define Format

Step12: This is the end of making user define format. Refer to after Step8 in **1.1 Make Inspection data on AOI Machine**.

NOTE Once user define format is registered, extracting CAD data is easy when the same format is used from the next time. Select the relevant format from **select format**, set **Board size** and **Fiducial marks**. Press **OK**.

1.4 Auto Deployment of Inspection Data

If component has not corresponding library, need to make inspection data individually.

To use auto deployment of inspection data, make inspection data easily.

Auto deployment procedure differs between chip component and IC component.

1.4 Auto Deployment of Chip Component

Step1: Right-click the center of CAD data and the window shown in Figure 1-45 appears.

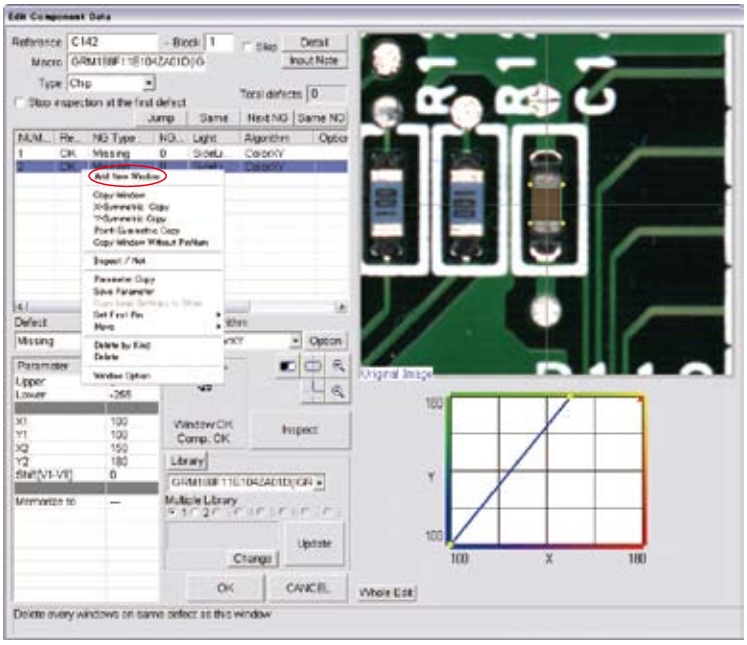
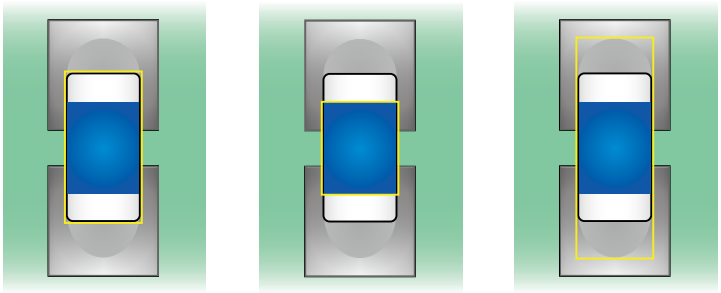


Figure 1-45 Auto Deployment of Chip Component 1

Step2: Select **Add New Window** from right-click to make a window and repeat it three times to make three inspection windows. Adjust the first inspection window size to surround electrode and body of component. Adjust the second inspection window size to surround body of component. Adjust the third inspection window size to surround pad, electrode, and body of component.



(1) Electrode and Body (2) Body (3) Pad, Electrode, and Body

Figure 1-46 Auto Deployment of Chip Component 2

Step3: Select **Chip** from the **Type** drop-down list.

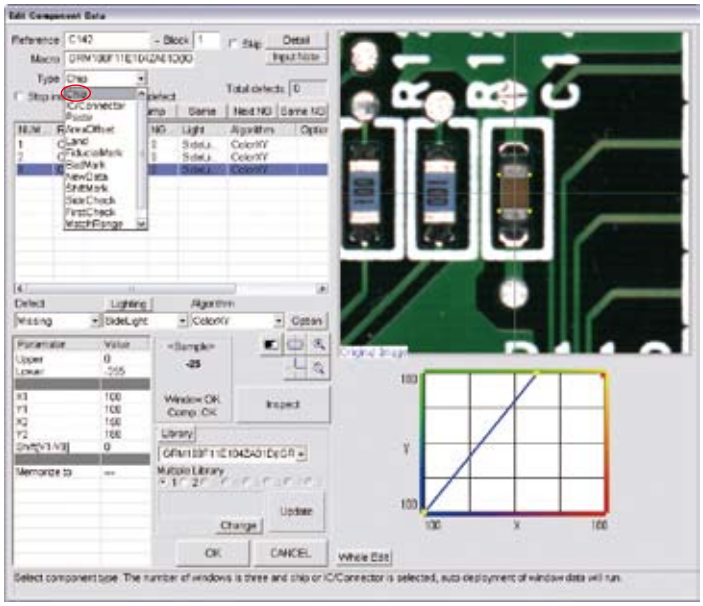


Figure 1-47 Auto Deployment of Chip Component 3

Step4: Check the **Search by NEW_ASC** and press **OK**.

NOTE Check the **Search by L/Wtracking** if the electrode of chip component is not visually clear .

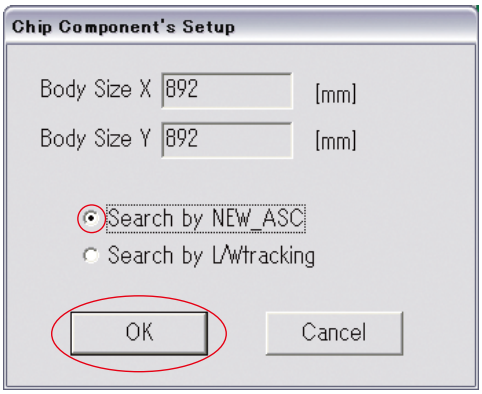


Figure 1-48 Auto Deployment of Chip Component 4

Step5: Inspection items are automatically made. For details of inspection data settings, refer to **3 Inspection Algorithm**.

1.4.2 Auto Deployment of IC Component

Step1: Right-click the center of CAD data and the window shown in Figure 1-49 appears.

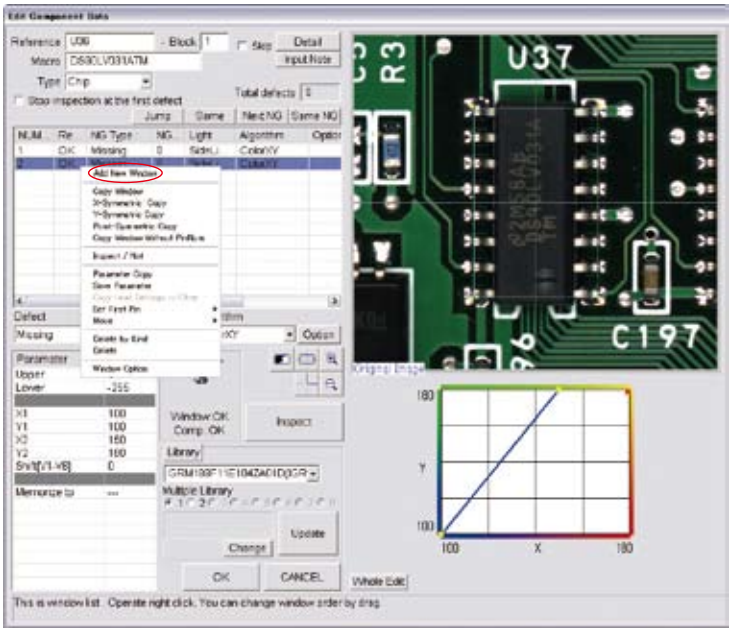
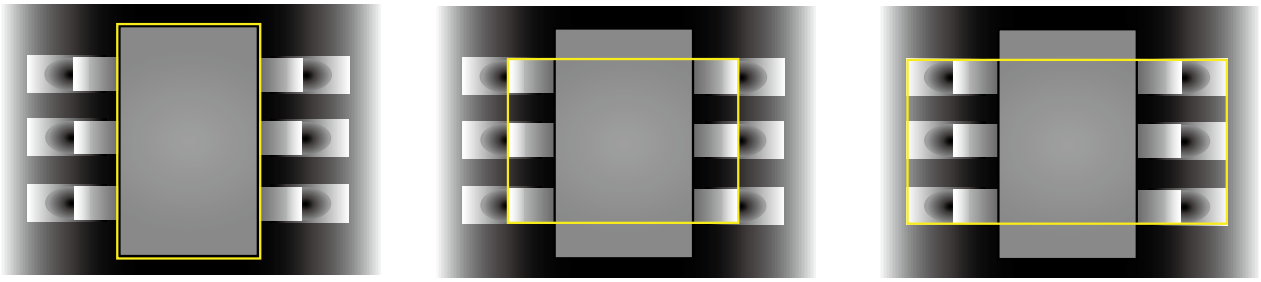


Figure 1-49 Auto Deployment of IC Component 1

Step2: Select **New** from right-click to make a window and repeat it three times to make three inspection windows. Adjust the first inspection window size to surround body of component. Adjust the second inspection window size to surround lead and body of component. Adjust the third inspection window size to surround pad, lead, and body of component.



(1) Body (2) Lead and Body (3) Pad, Lead, and Body

Figure 1-50 Auto Deployment of IC Component 2

Step3: Select **IC / Connector** from the **Type** drop-down list.

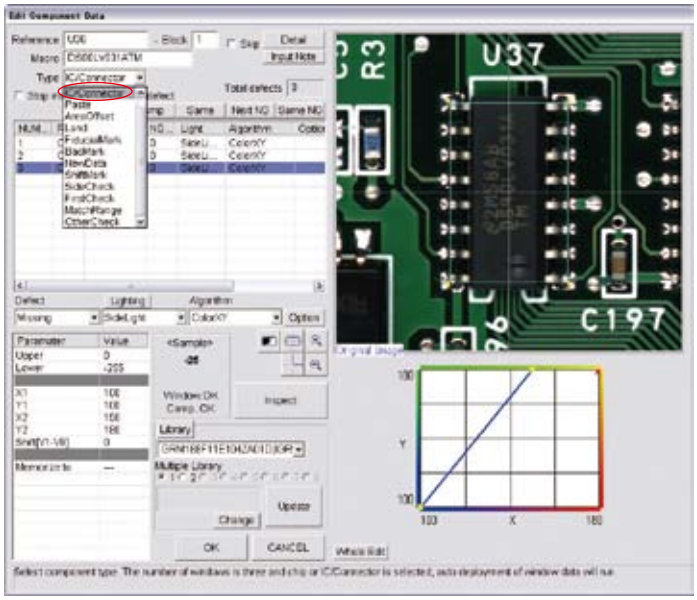


Figure 1-51 Auto Deployment of IC Component 3

Step4: Set **Package Type**, **Lead Pitch**, **Number of Leads X**, and **Number of Leads Y**. After all the settings are completed, press **OK**.

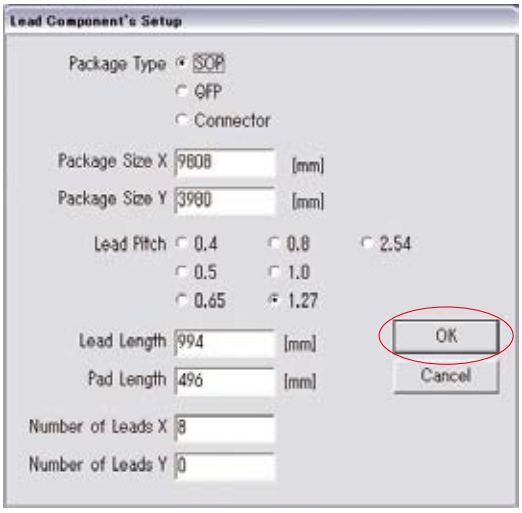


Figure 1-52 Auto Deployment of IC Component 4

Parameter	Description
Package Type	Check the **SOP**, **QFP**, or **Connector**.
Package Size X, Package Size Y	Body size is displayed.
Lead Pitch	Set lead pitch.
Lead Length, Pad Length	Lead length and pad length are displayed.
Number of Leads X, Number of Leads Y	Enter number of leads.

Table 1-12 Description of Parameters

Step5: Inspection items are automatically made. For details of inspection data settings, refer to **3 Inspection Algorithm**.

1.5 Search Inspection Data

Search function is useful to debug data.

Step1: Press **Search** button on the tool-bar or select **Edit** > **Search** from the menu-bar.

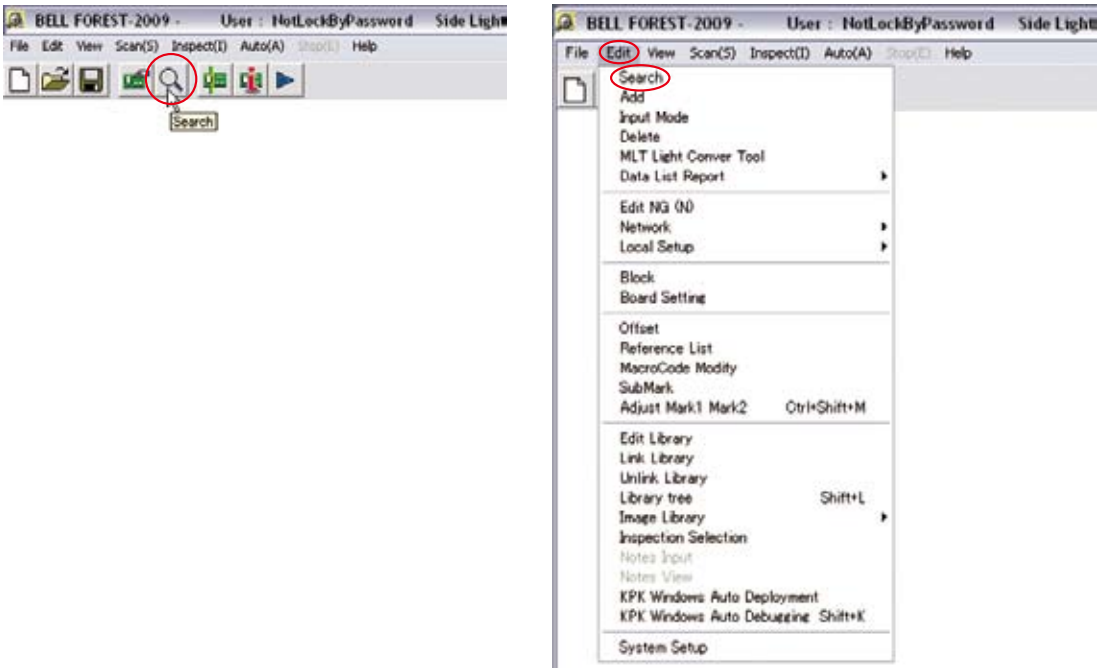


Figure 1-53 Search

Step2: Select **Operation** > **Inspect the Board** from the menu-bar to inspect.

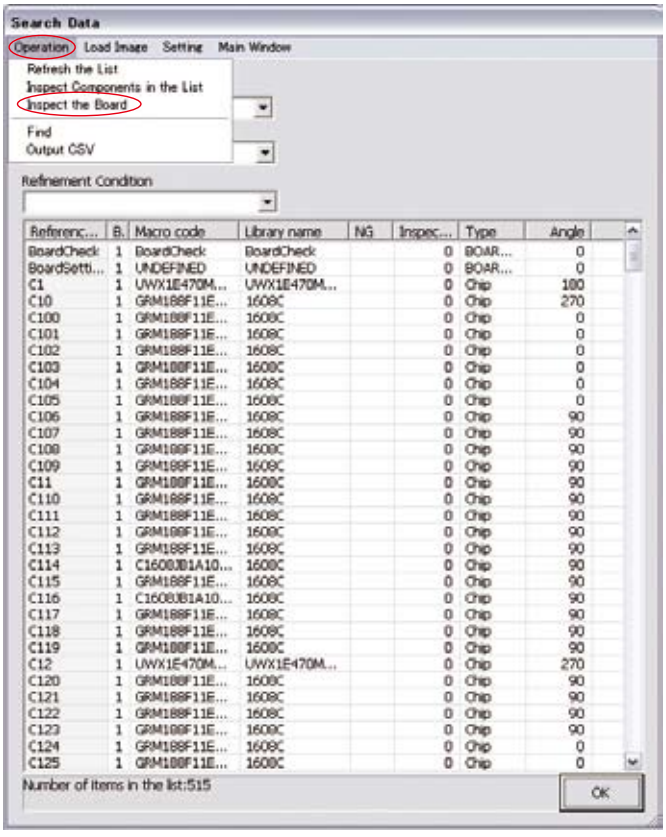


Figure 1-54 Inspect the Board

Step3: Select **library** from the **What to Search** drop-down list. Press **NG Comp.** of header to sort number of NG component in descending order.

NOTE The same operation can also be performed by selecting **Setting** > **Commonly-used settings** > **View Numbers of NG Components** from the menu-bar.

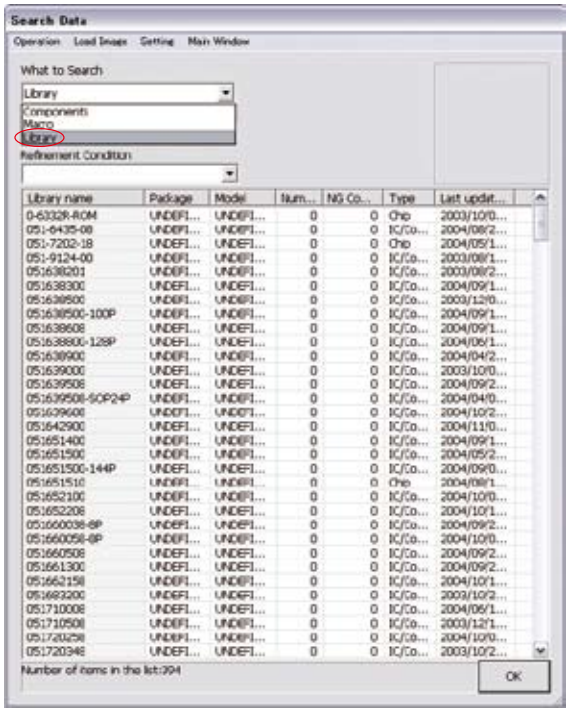


Figure 1-55 Library

Step4: Right-click the library to edit and select **Edit NG of This Library** or double-click the library. The window shown in Figure 1-56 appears. Double-click the library to edit and edit component window appears.

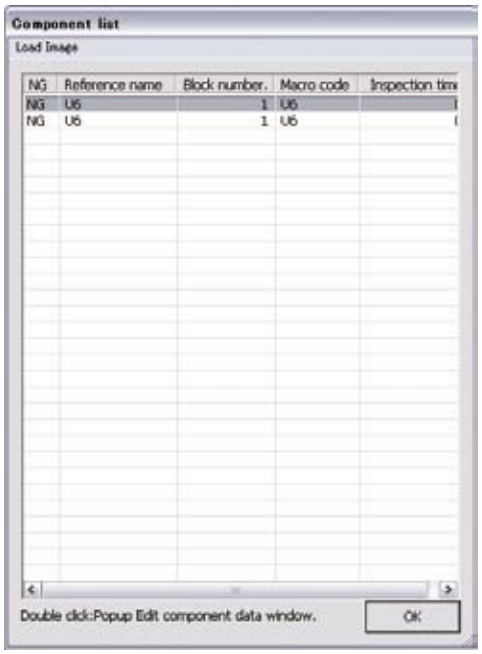


Figure 1-56 Library Component List

Step5: Debug inspection data and press **Update** in edit component window to update inspection data.

1.6 Inspection Image

Combining three different LED lighting, TopLight(Coaxial Overhead illumination), SideLight, and LowLight, create the most appropriate image for the inspection.

Lighting	Top	Side	Low	Description
TopLight	○			Image scanned with TopLight. TopLight is suitable for solder inspection to shed light from the overhead.
SideLight		○		Image scanned with SideLight. Nearly visual color repeatability lighting and a dark part becomes bright. SideLight is suitable for inspection using colors.
LowLight			○	Image scanned with LowLight. Silk characters or characters on a component becomes bright. LowLight is suitable for character inspection.
Density	○			Image that gamma-corrected TopLight brightness level. Density is suitable for denoising of TopLight.
Outline	○			Image that doubled TopLight brightness level. Outline is suitable for contour extraction of component.
MultiColorEx	○			Image that converted TopLight brightness into hue information. Bright part is converted to look like red and dark part is converted to look like blue. MultiColorEx is suitable for solder inspection.
Add	○	○		Image that totaled brightness of TopLight and SideLight.
Add3	○	○		Image that totaled brightness of TopLight and SideLight, and in addition highlighted bright parts and dark parts. Add3 is suitable for inspection of fiducial mark or misalignment correction.
RED		○		Image that outputs constituent of Red at the 256 shades of gray from 0 to 255.
GREEN		○		Image that outputs constituent of Green at the 256 shades of gray from 0 to 255.
BLUE		○		Image that outputs constituent of Blue at the 256 shades of gray from 0 to 255.
HSV_Color		○		Image that converted SideLight brightness to HSV format. It is possible to highlight the specific color information. Each HSV parameter can be set optionally from **Set**.
Two Red-TOP	○	○		Image that subtracted TopLight brightness from double Red constituent. Two Red-TOP is suitable for extract of laser-printed characters such as barcode.
TOP-SIDE	○	○		Image that subtracted SideLight brightness from TopLight brightness. TOP-SIDE is suitable for extract(highlight) of plain surface.
SIDE-TOP	○	○		Image that subtracted TopLight brightness from SideLight brightness. SIDE-TOP is suitable for extract(highlight) of inclined surface.
TOP-LOW	○		○	Image that subtracted LowLight brightness from TopLight brightness. TOP-LOW is suitable for solder inspection to appear fillet part darkly.
LOW-TOP	○		○	Image that subtracted TopLight brightness from LowLight brightness. Silk characters or plain surface becomes brightly.
SIDE-LOW		○	○	Image that subtracted LowLight brightness from SideLight brightness. Silk characters or plain surface becomes brightly.
LOW-SIDE		○	○	Image that subtracted SideLight brightness from LowLight brightness. LOW-SIDE is suitable for extract(highlight) of inclined surface.
Multi-Lighting	○	○	○	Image that can clearly display fillet shape by color. Outputting red in case of TopLight, green in case of SideLight, or blue in case of LowLight.
TOPSIDELOW	○	○	○	Brightness of TopLight, SideLight, and LowLight can be set freely.
UserDefine	○	○	○	Brightness of TopLight, SideLight, and LowLight can be set freely. UserDefine can set more flexible than TopSideLow.
SPECT	○	○	○	Image that converted brightness into hue information. SPECT is used in Algorithm **IC_Solder2**.
OKNGColors	○	○	○	OKNGColors separates between OK color as white and NG color as black. It is possible to detect the difference of similar colors. OKNGColors can use in fare-paying software.

Table 1-13 Description of Each Images

2 KPK

KPK (Key-colors Peak Keeping method) is a new inspection solution, which allows easier programming for missing inspection in terms of operation and speed. KPK is compatible with other functions of inspection software. By the combination use with existing inspection algorithm, missing inspection can be enhanced further. KPK data can be added to the existing inspection data. KPK can use in fare-paying software.

CAUTION If inspection data is made by auto deployment and library assignment after making KPK data, KPK library will be overwritten.

2.1 Inspection Overview

2.1.1 OKNGColors Lighting

OKNGColors lighting separates between OK color as white and NG color as black by registering OK and NG colors in advance. If the color of the detected area is closer to the one registered as OK color, the area would become brighter. If the color of the detected area is closer to the one registered as NG color, the area would become darker. To set component colors as OK color and PCB colors as NG color, component color would become white and PCB color would become black.

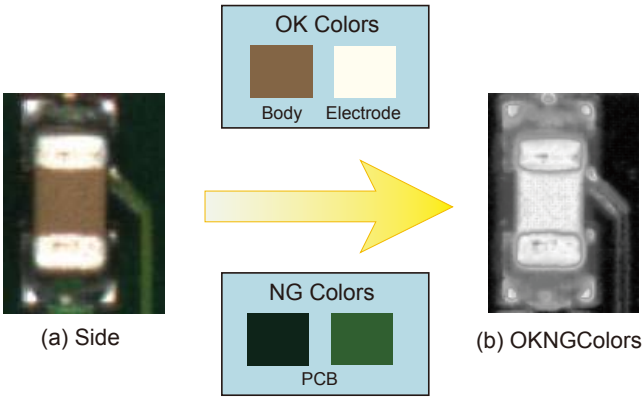


Figure 2-1 OKNGColors Lighting

2.1.2 Inspection Method

KPK uses Black/White algorithm, which calculates the percentage of the area where the pixel is brighter. If the percentage of the area where the pixel is brighter, the result will be missing.

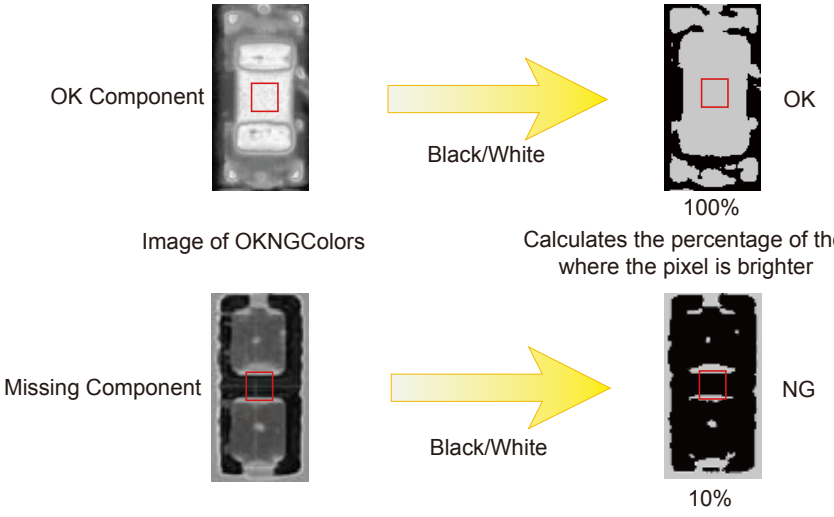


Figure 2-2 Inspection Method

2.2 Make KPK Data

Step1: Open KPK setting window.

Select **Edit** > **KPK Windows Auto Deployment** from the menu-bar to add KPK in existing inspection data.

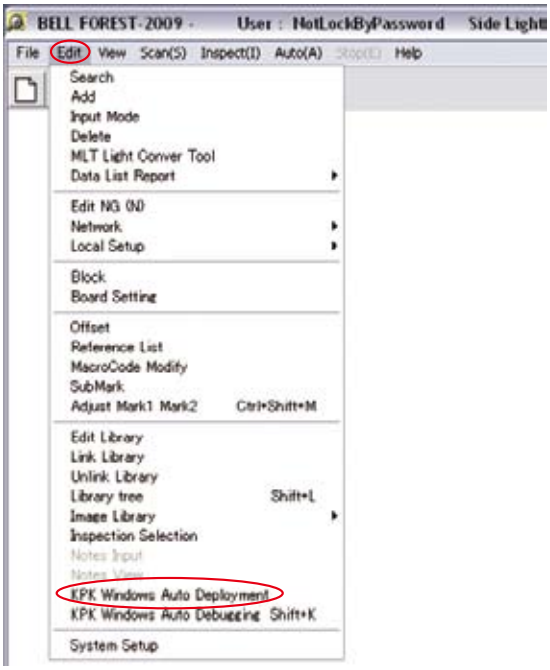


Figure 2-3 KPK Windows Auto Deployment

Refer to **1.1 Make Inspection Data on AOI Machine** to make new inspection data and press **Start KPK Window Deployment** in step31.

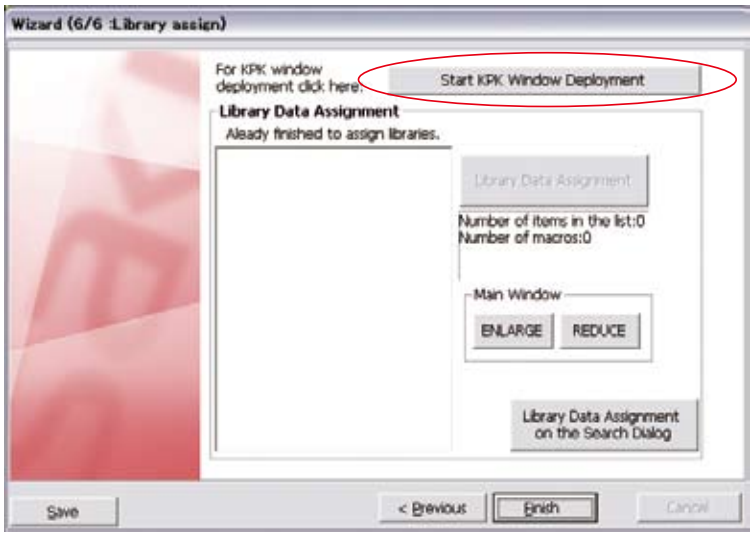


Figure 2-4 KPK Deployment

Step2: The window shown in Figure 2-5 appears. Register the PCB color as NG color. Procedures depend on the presence or absence of bare PCB.

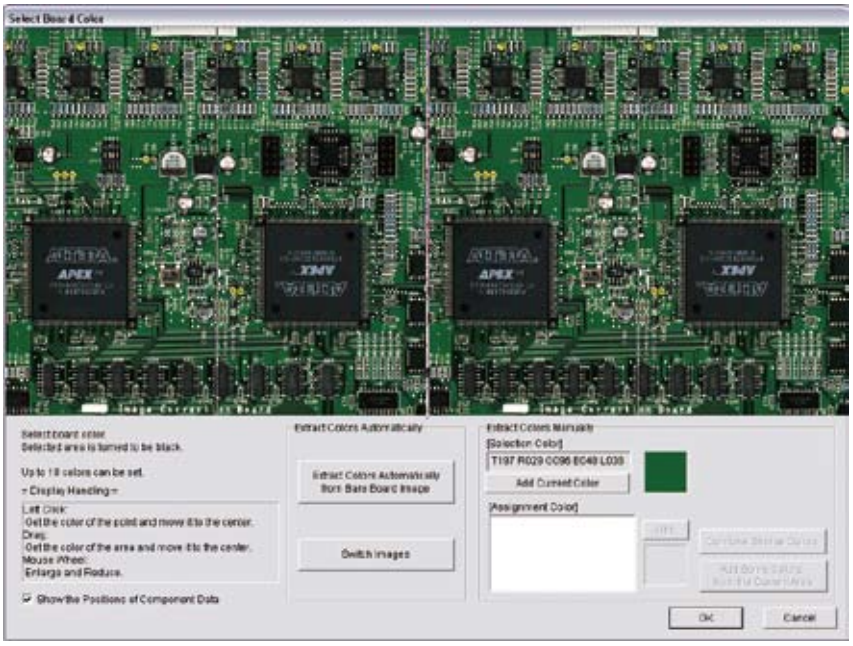


Figure 2-5 Specify PCB Color

2.2.1 With Bare PCB

Extract PCB color from bare PCB and register it as NG color.

NOTE In the case of using KPK for post-reflow inspection, it is recommended to use a bare PCB after reflow-oven. That is able to reduce color variation caused by flux and to extract PCB color properly.

Step1: Press **Switch Images**.

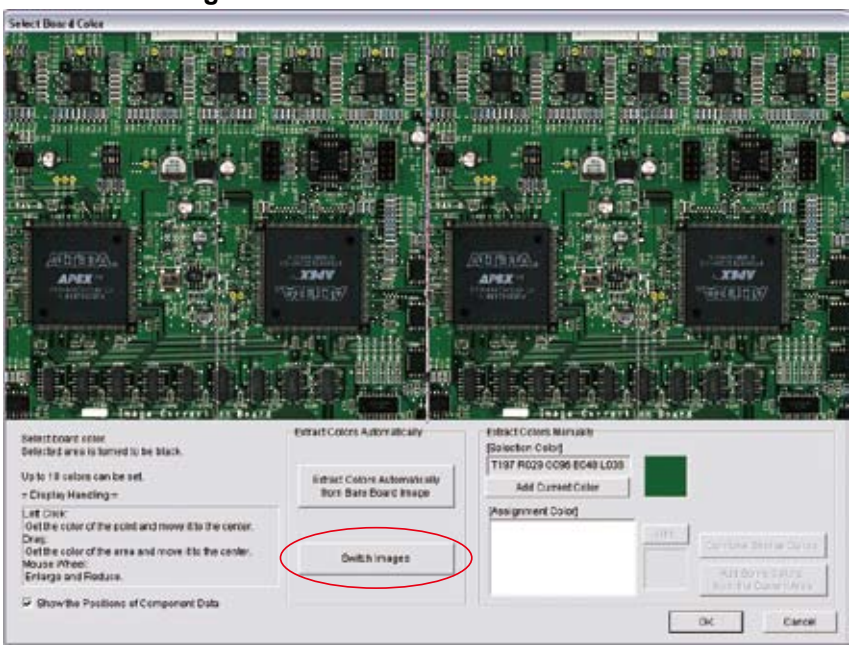


Figure 2-6 Switch Images 1

Step2: If bare PCBs are already scanned and saved, select the file from the **SERIES Image** list-box, and press **Load SERIES Image**. If no series image is saved, procedures depend on machine type benchtop machine, inline machine, or BF-Editor.

In case of benchtop machine
Set the PCB in the machine and press **Scan Board Image**.

In case of inline machine
Adjust conveyor rail width and set the PCB on conveyor rail. Press **Load / Unload the Board**. Set the PCB in the machine and press **Scan Board Image**. To unload the PCB, press **Load / Unload the Board**.

In case of BF-Editor
Press **Load Image** and select **TOPLIGHT.BMP** saved in arbitrary folder.
(e.g. D:\BF1\BF1DATA\Inspection Group Name\PCB Name folder)

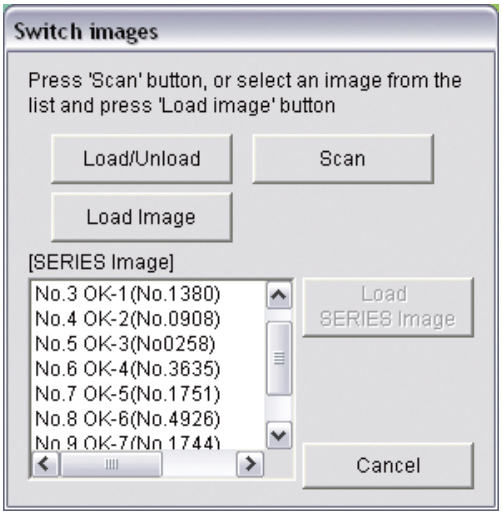


Figure 2-7 Switch Images 2

Step3: Press **Extract Colors Automatically from Bare Board Image** in Figure 2-6, the window shown in Figure 2-8 appears.

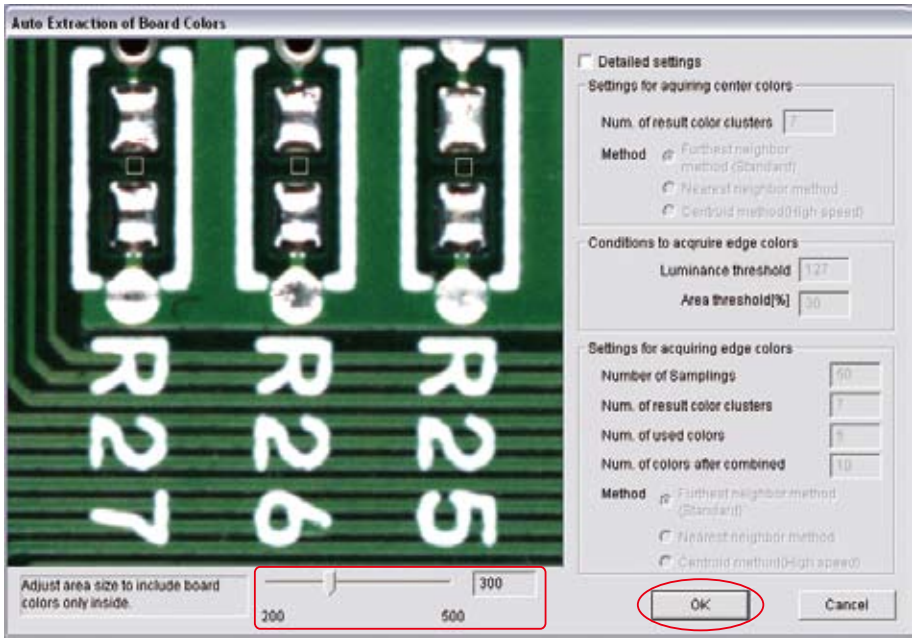


Figure 2-8 Auto Extraction of Bare PCB Image

Step4: Adjust the window size to extract component color by moving a slide-bar. The window size is area to extract PCB color. Press **OK** and start PCB color extraction.

NOTE The specified window size is common to all components data. Therefore make the window size in accordance with the minimum component size.

NOTE No need for **Detailed settings**.

Step5: Check the PCB color is displayed in black. The closer the PCB color is to the extracted PCB color, the darker it displays. Refer to **2.2.3 Auto Deployment of KPK**.

2.2.2 No Bare PCB

Register the PCB color under the component as NG color.

Step1: Click the parts to be registered as NG colors and press **Add Current Color**.
NG color is displayed in the **Assignment Color** list-box.
The area which color is similar to the registered color is displayed in black on the right image. Continue to register all NG colors in the list-box until the NG area is displayed in black.

NOTE Maximum 10 colors can be registered.

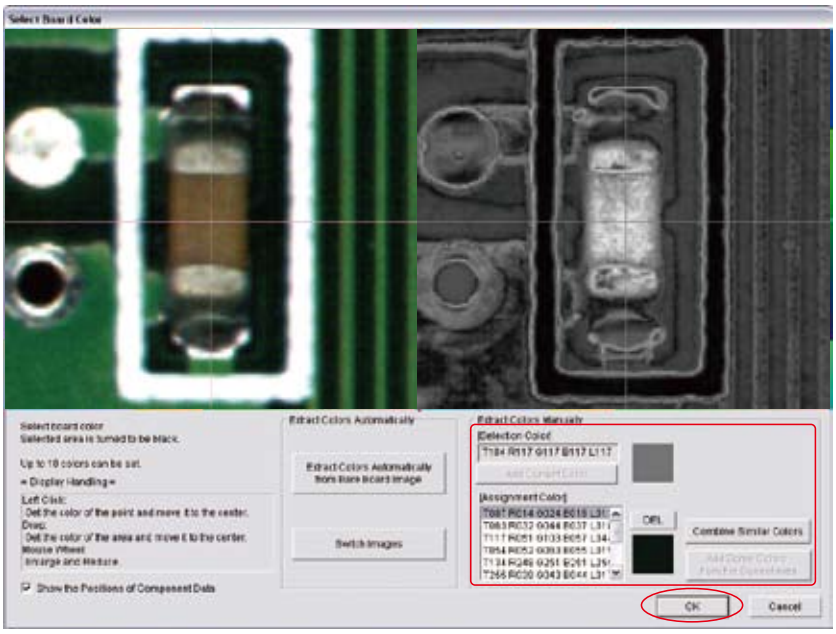


Figure 2-9 Extract Colors Manually

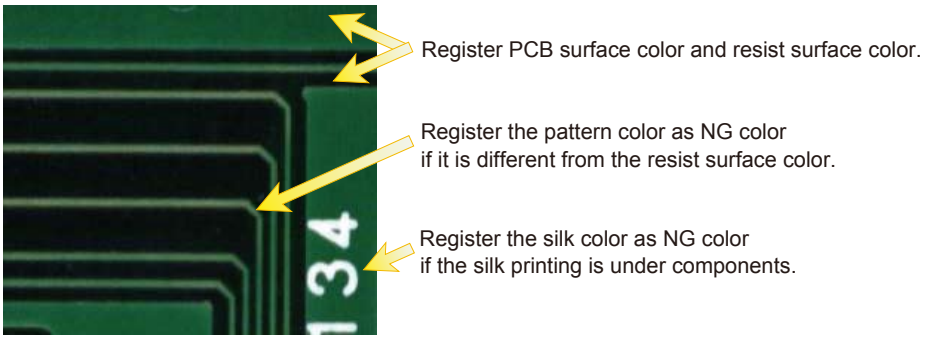


Figure 2-10 Register NG Colors

Item	Description
DEL	Select the color in the list-box and press **DEL** to delete the color.
Combine Similar Colors	Press **Combine Similar Colors** and the window shown in Figure 2-11 appears. Press **OK** to combine the selected two similar colors to decrease the number of registered colors.
Add Some Colors from the Current Area	Select the area which color is to be registered as NG. Press **Add Some Colors from the Current Area** and the window shown in Figure 2-12 appears. Press **OK** and the window shown in Figure 2-13 appears. The extracted colors are displayed. To register the color as NG colors, check the **Set as NG Color** and press **OK**.

Table 1-14 Description of Extract Colors Manually

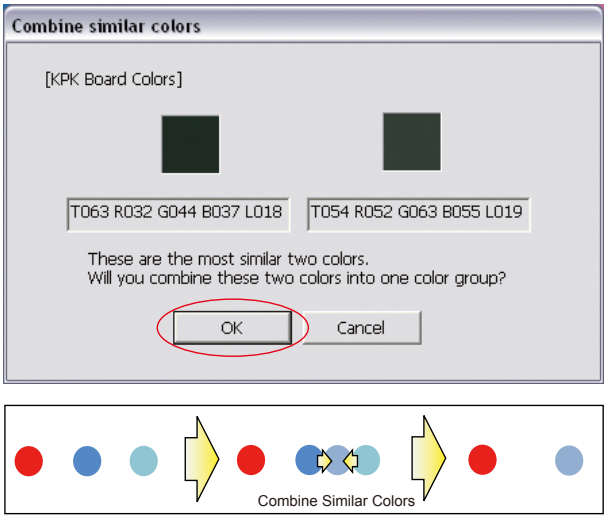


Figure 2-11 Combine Similar Colors

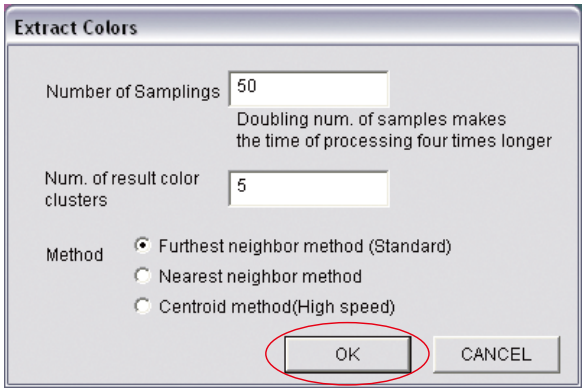


Figure 2-12 Add Some Colors from the Current Area 1

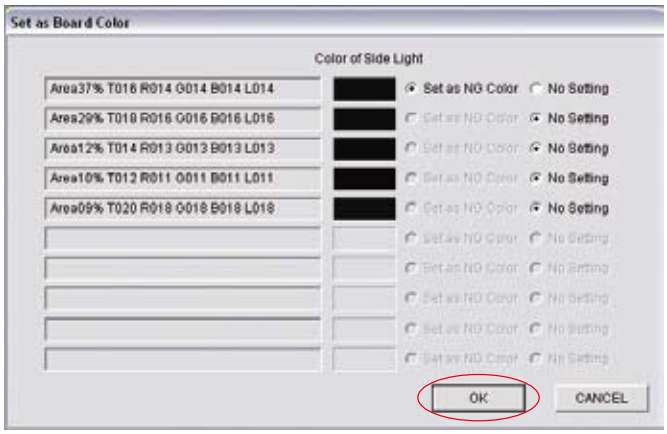


Figure 2-13 Add Some Colors from the Current Area 2

Step2: Check the PCB color is displayed in black. If the PCB color is closer to the extracted PCB color, the PCB color will be darker. Refer to **2.2.3 Auto Deployment of KPK**.

2.2.3 Auto Deployment of KPK

Step1: Register all NG colors and press **OK**. The window shown in Figure 2-15 appears.

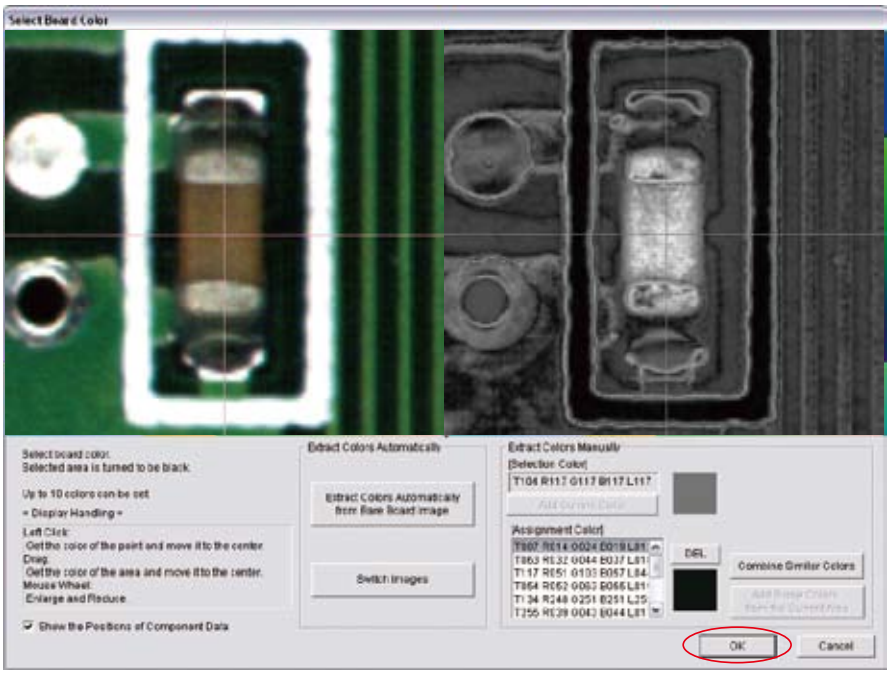


Figure 2-14 Specify PCB Color

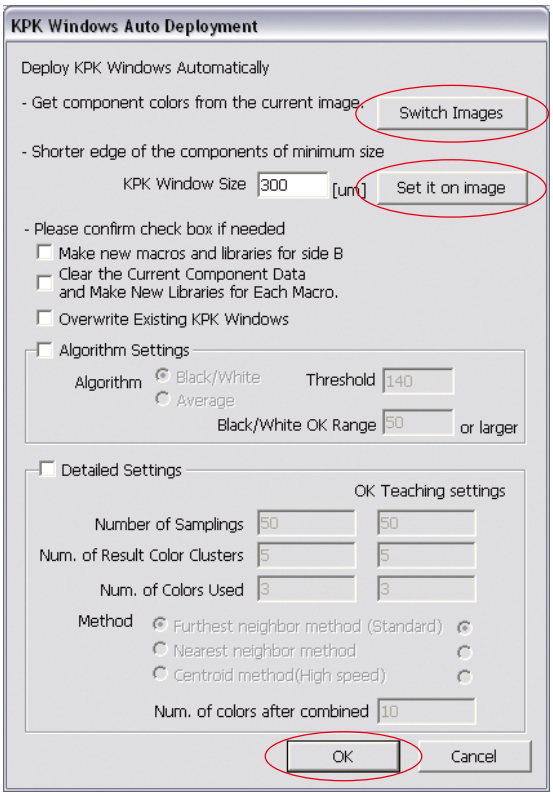


Figure 2-15 KPK Windows Auto Deployment

Step2: Press **Switch Images** and open OK PCB images.

Step3: Press **Set in on image** and the window shown in Figure 2-16 appears. Adjust the window size to extract component color by moving a slide-bar. After all the settings are completed, press **OK**.

NOTE The specified window size is common to all components data. Therefore, make the window size to surround the component color only. If the window size is not appropriate, PCB color or print color on the component might influence the inspection result.

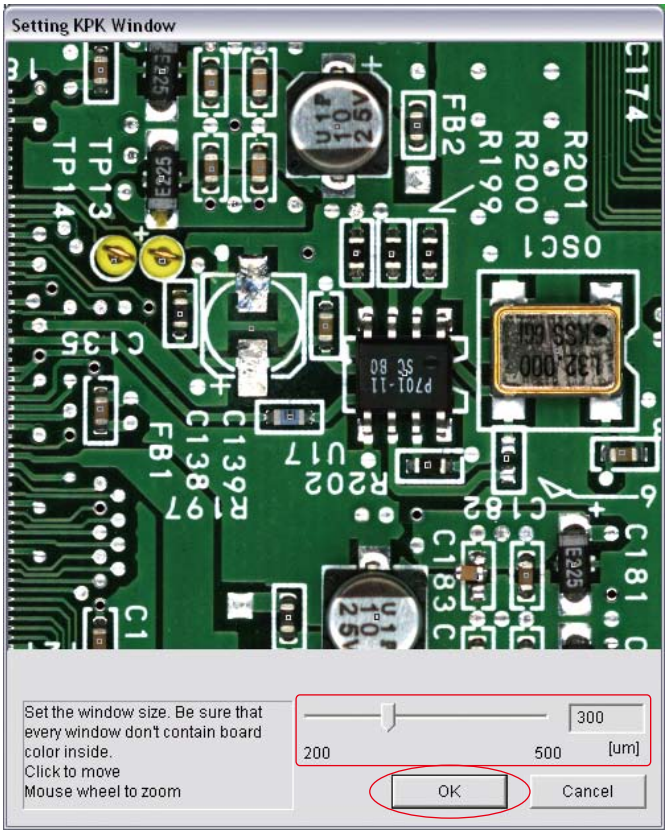


Figure 2-16 KPK Window Size Setting

Step4: If there is only KPK data or KPK data should be assigned newly to each component without deleting existing libraries, check **Clear the current component data and make new libraries for each macro**. Library name corresponds to macro name is assigned.

NOTE Macro classifies the component more finely than library. KPK judges missing component by component colors. It is necessary to extract colors not by library unit, but by macro unit. For the component with **1000C** of library and **123** of macro, a library named **KPK_123** is created and assigned. Therefore, the existing library **1000C** remains.

Component	Library	Macro
	1000C	123
		456
	1000R	789

Component	Library	Macro
	KPK_123	123
	KPK_456	456
	KPK_789	789

Table 2-1 Library and Macro(Left Side: Before Changing, Right Side: After Selecting **Clear the current**)

Step5: When KPK data is opened in B-side for the double-side PCB, the check-box of **Make new macros and libraries for side B** is displayed. Check the **Make new macros and libraries for side B** to have each macro and library data in each side. Macro and library name including side information are assigned to components.

NOTE For the component with **1000C** of library and **123** of macro, a library named **B_KPK_123** is created and assigned. The existing library **1000C** remains.

Component	Library	Macro
	1000C	123
		456
	1000R	789

Component	Library	Macro
	B_KPK_123	B_123
	B_KPK_456	B_456
	B_KPK_789	B_789

Table 2-2 Library and Macro(Left Side: Before Changing, Right Side: After Selecting **Make new macros**)

Step6: After all the settings are completed, press **OK**. KPK data will be automatically extracted .

CAUTION This process might take a few minutes.

Step7: Inspect the data after extracting KPK data. **KPK Debug** window shown in Figure 2-17 appears. Refer to **2.3.1 KPK Debug**.

NOTE KPK inspection window is extracted in second window(Type: Missing, Lighting: OKNGColors, Algorithm: Black/White). When existing inspection data was extracted, KPK window will be added in second window by interruption. Inspection window shifts by one. Although jump settings such as OKJump / NGJump will be automatically updated in order properly by the inspection software.

2.3 Adjust KPK Data

2.3.1 KPK Debug

KPK Debug window shown in Figure 2-17 appears after KPK data is extracted. Adjust KPK inspection data. Double-click the component to open component window. Refer to **2.3.2 Edit Component Data Window**.

NOTE The same operation can be performed by selecting **Edit** > **KPK Windows Debugging** from the menu-bar or pressing Shift + K.

NOTE Select a component from the list-box and component image is displayed. Magnification percentage can be changed by scrolling wheel of mouse.

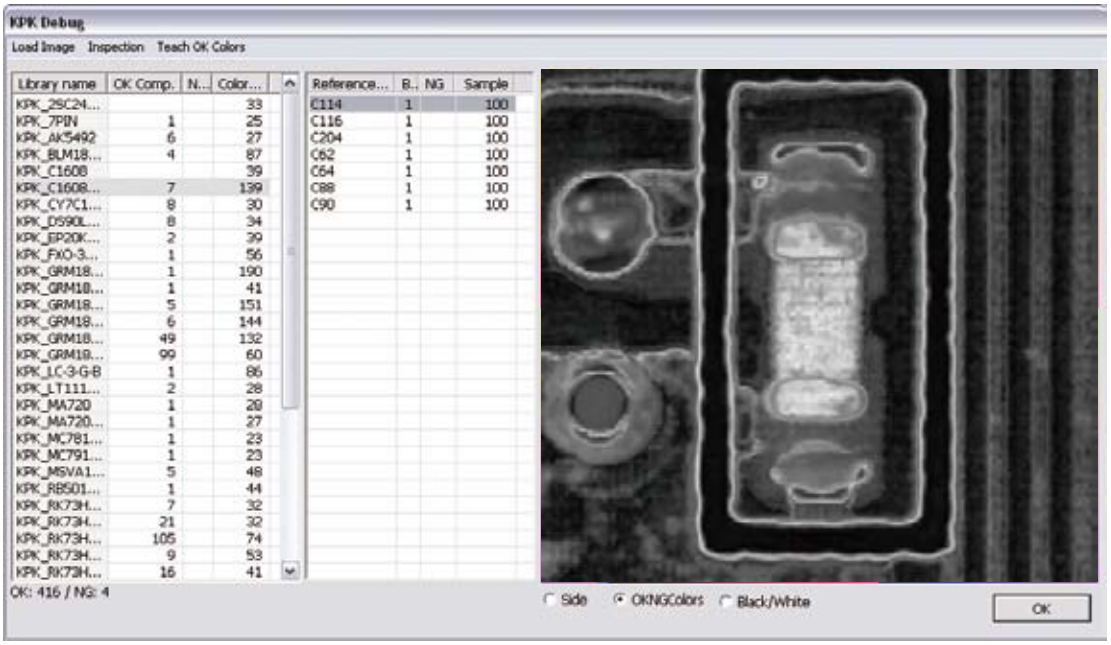


Figure 2-17 KPK Debug

Item	Description
Load Image	Open images or switch images.
Inspection	Inspect opened images. The inspection is automatically operated if the inspection data is changed.
Teach OK Colors	OK component might be mis-judged NG because of component color variation. Combine the color which is mis-judged as NG and the OK color to reduce the false call. Select **All NG components** or **Selected Library** to find the false call data .

Table 2-3 Menu-bar

Component Name	Component Color	Inspection Result before Adjustment (Registered as OK color)	Inspection Result after Adjustment 1 (Combine with OK color)	Inspection Result after Adjustment 2 (Combine with OK color)
C1		OK	OK	OK
C2		NG (False Calls)	OK	OK
C3		NG (False Calls)	NG (False Calls)	OK
C4		NG (False Calls)	NG (False Calls)	OK

Table 2-4 The Example of Teach OK Colors

Item	Description
Library Name	Library name.
OK Comp. / NG Comp.	Each numbers of the component OK/NG is displayed. If the inspection data is adjusted properly, the result will be OK with OK PCB and the result will be NG with bare PCB.
Color distance	Extract two the most similar colors. One is from OK color, another is from NG color. The distance of these two similar colors is displayed as a value. The smaller the value is, the less color difference is between components and PCBs.
Reference Name	Component name.
Block number	Block number.
NG	All NG components is marked as **NG**.
Sample	Sample values is the percentage of area which brightness level is over the specified value in the inspection window if the default algorithm **Black/White** is used.

Table 2-5 Description of Header

Item	Description
Side	SideLight image is displayed.
OKNGColors	OKNGColors image is displayed.
Black/White	Monochrome image by algorithm **Black/White** is displayed.

Table 2-6 Select Lighting

2.3.2 Edit Component Data Window

Double-click the component in KPK Debug window and the window shown in Figure 2-18 appears. The second inspection window is KPK window.

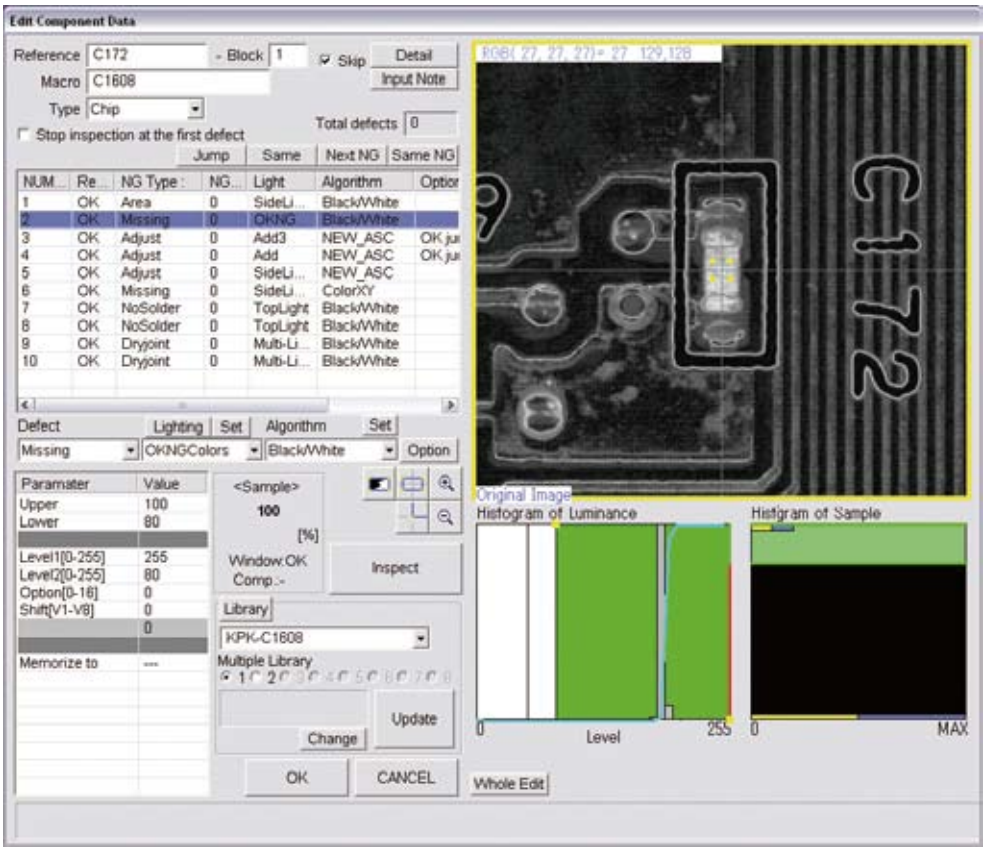


Figure 2-18 KPK Window

Parameter	Description
Defect	Select **Missing**.
Lighting	Select **OKNGColors**. Press **Set** in the right side of **Lighting** to set details.
Algorithm	Select **Black/White**.
Upper, Lower	Set OK range. Enter **100** in **Upper** field and arbitrarily value in **Lower** field.
level1[0-255], level2[0-255]	**Level1** is upper limit of brightness level. **Level2** is lower limit of brightness level. Enter **255** in **Level1** field. Press **Set** in the right side of **Algorithm** to adjust **Level2**.
Option[0-16]	Enter **0**.
Shift[V1-V8]	Enter **0**.
Memorize to	-

Table 2-7 Parameter of KPK

2.3.3 Detail Settings of OKNGColors Lighting

Press **Set** in the right side of **Lighting** in Figure 2-18. The window shown in Figure 2-19 appears. Press **OK Colors**, **Unused**, or **NG Colors** to move colors to the list of **OK Colors**, **Unused Colors**, or **NG Colors.**

NOTE Press **OK Colors**, **Unused,** or **NG Colors** by pressing ***Ctrl*** to copy colors.

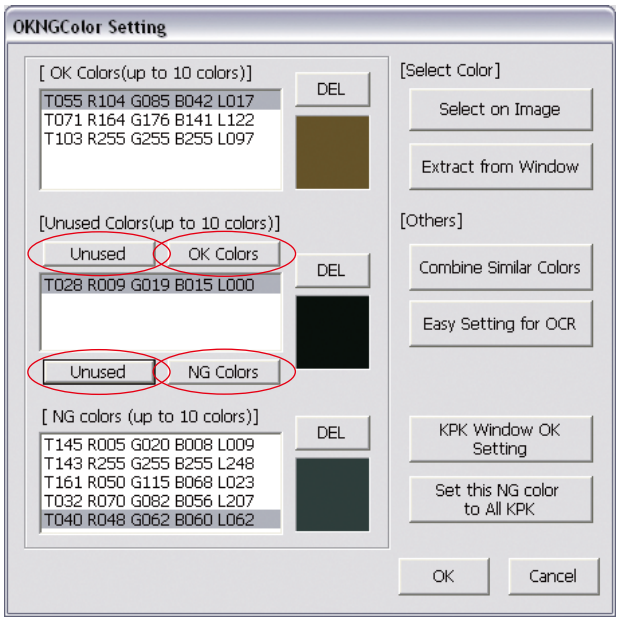


Figure 2-19 OKNGColors Lighting

Parameter	Description
OK Colors	The top list is OK color list. Maximum 10 colors can be registered.
Unused Colors	The middle list is to save data for temporary purpose. Colors listed here can be referred from any other components or libraries.
NG Colors	The bottom list is NG color list. Maximum 10 colors can be registered.
DEL	Delete selected colors.
Select on Image	Extract selected colors manually. Component window appears(Refer to Figure 2-20). Left-click colors and press **Select as OK color** or **Select as NG color**.
Extract from Window	Extract colors from the window automatically. The window shown in Figure 2-21 appears and press **OK**(The window shown in Figure 2-22 appears). Check the **Set as OK Color**, **Set as NG Color**, or **No Setting**. Press **OK**. This setting is suitable for if PCB and component colors are very similar.
Combine similar Colors	Combine the closest colors between OK/NG colors to reduce the number of colors (Refer to Figure 2-23). Press **OK** to combine the selected colors.
Easy Setting for OCR	Register OK colors and NG colors automatically to recognize character on the component.
KPK Window OK Setting	Extract component colors from the window automatically and register as OK Color. The window shown in Figure 2-24 appears and press **OK.** This setting is suitable for if component color changed by change to lot.
Set this NG Color to All KPK	Extract selected NG color of the current window and reflect this NG color all KPK windows. This setting is suitable for if PCB color changed by change to lot.

Table 2-8 Detail Settings of OKNGColors Lighting

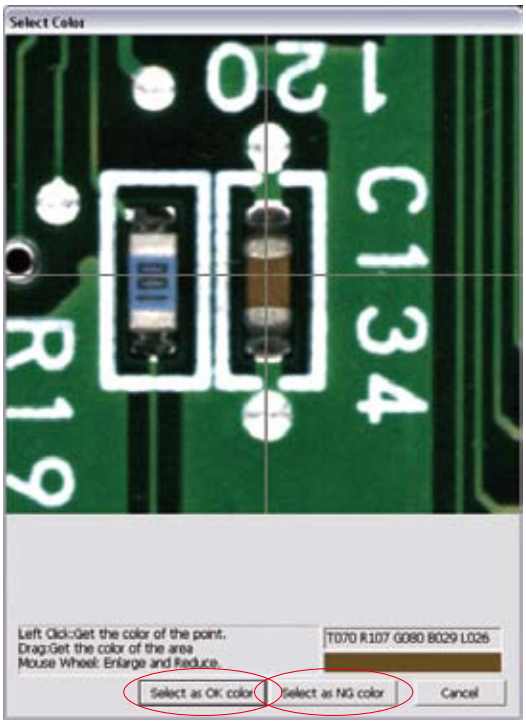


Figure 2-20 Select on Image

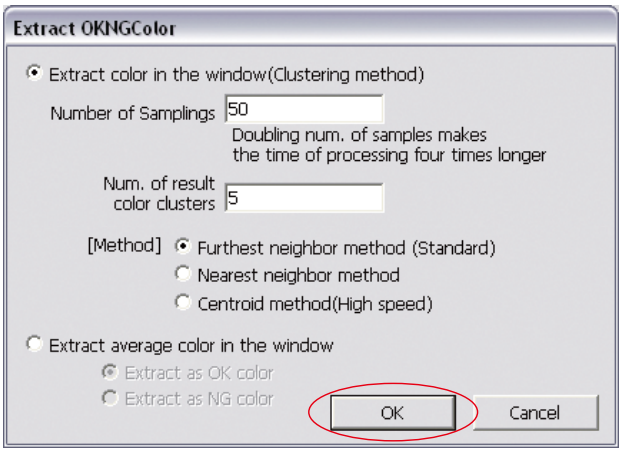


Figure 2-21 Extract from Window 1

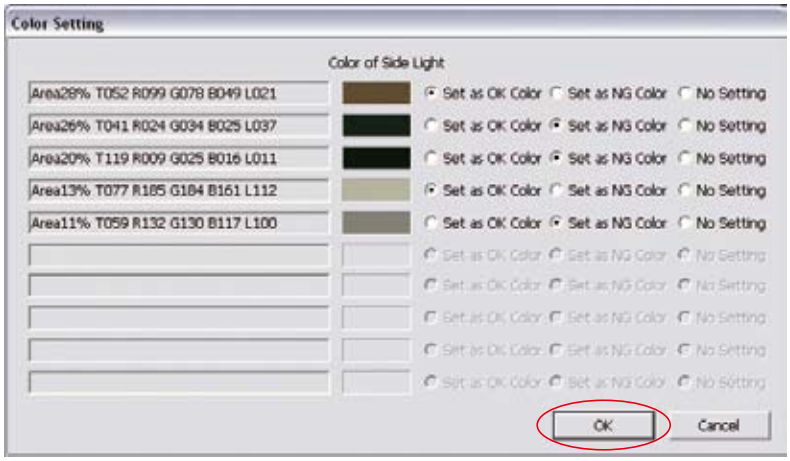


Figure 2-22 Extract from Window 2

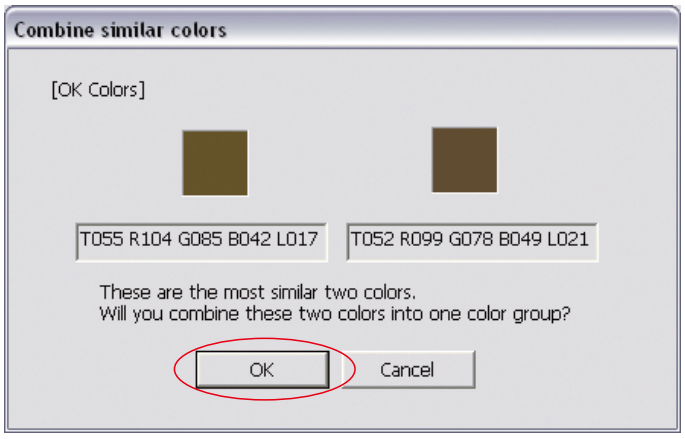


Figure 2-23 Combine Similar Colors

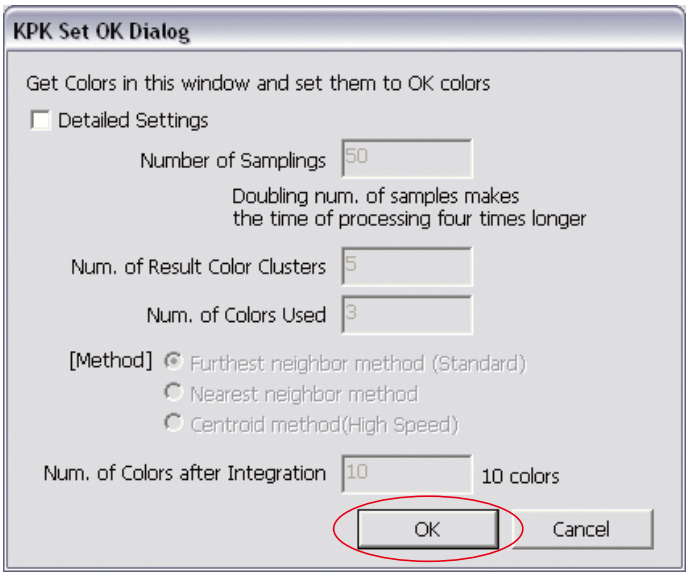


Figure 2-24 KPK Window OK Setting

3 ECD

ECD(Extra Component Detection) is a function to detect extra component which is fallen and attached to the area other than the component mounting area from any cause.

3.1 Inspection Overview

Sample several OK PCBs and make template images. Extra component is detected based on the difference of template images and inspection PCB images. ECD is enable to inspect entire PCB with one inspection window.

3.2 Inspection Procedure

Step1: Select **Edit** > **ECD OPTION** from the menu-bar.

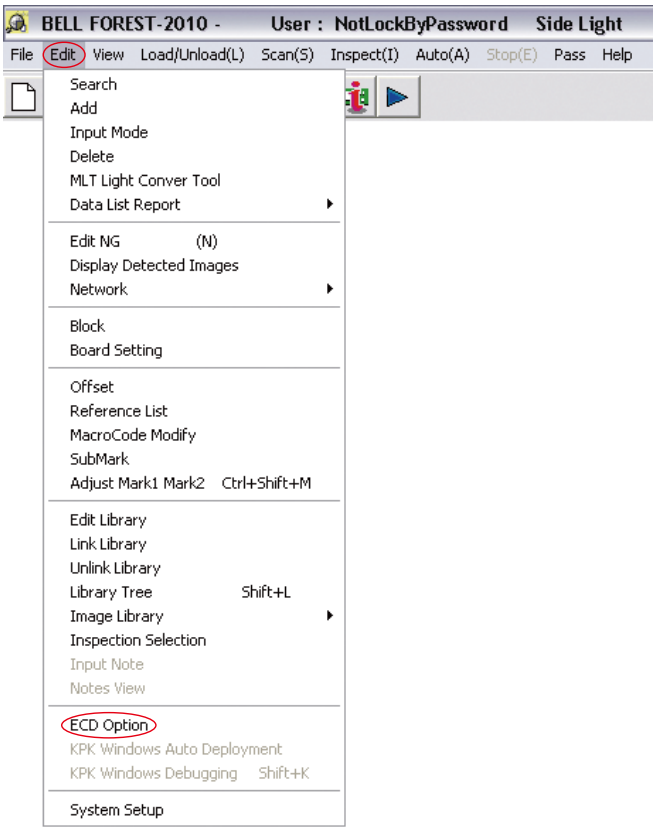


Figure 3-1 ECD Option

Step2: ECD setting window appears. Check the **Mark1**, **Mark2**, **Sampling**, and **Lighting** of **Default Parameters**. Press **OK**. No need to set for **Statistical Process** and **Template Matching Process**.

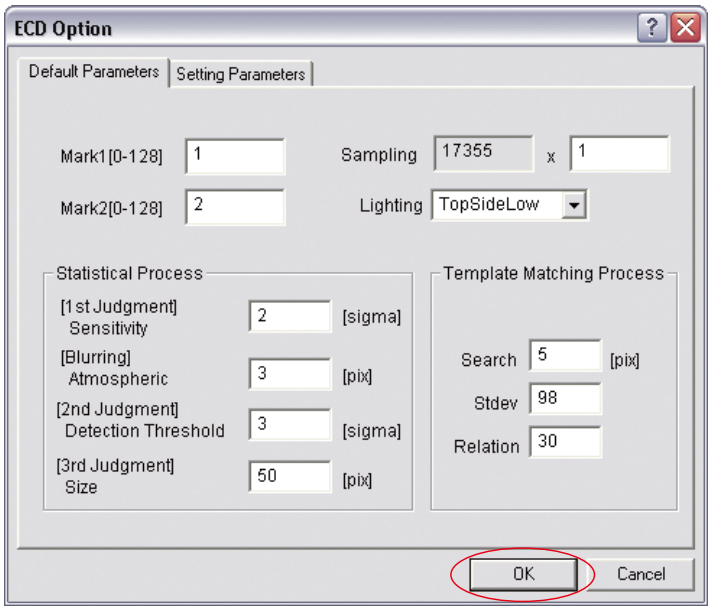


Figure 3-2 ECD Default Setting

Item	Description
MARK1 [0-128]	Enter **1**.
MARK2 [0-128]	Enter **2**.
Sampling	Set the pixel interval to extract brightness. If setting value is **6**, extract brightness at intervals of 6 pixels. If resolution is 10μm, enter **6** or greater. If resolution is 18μm, enter **8** or greater. Enter the bigger value to turn down the resolution accelerate the inspection speed.
Lighting	Select **TopSideLow**.

Table 3-1 ECD Default Setting

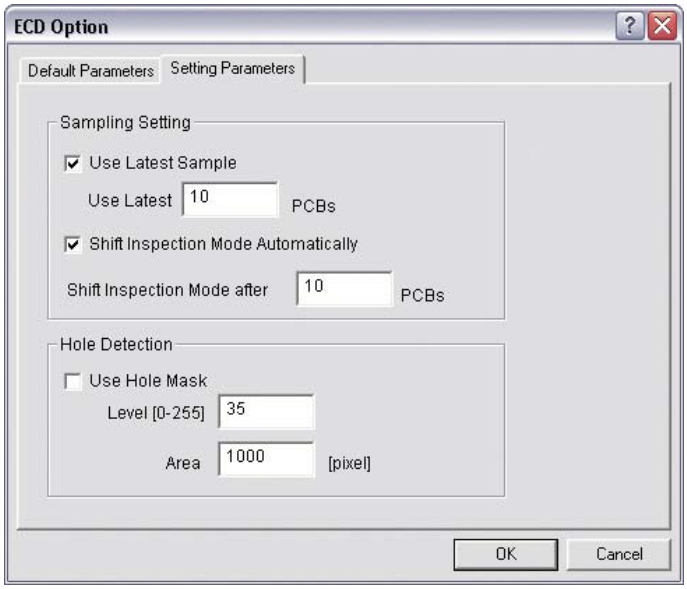


Figure 3-3 Parameter Setting

Item	Description
Use Latest Sample	Latest scanned image is used as template image. Specify the number of PCBs in **Use Latest**.
Shift Inspection Mode Automatically	The mode will be switched to inspection mode automatically after sampling is completed. Default number of sampled PCB is 10.
Use Hole Mask	Exclude the through hole of PCB from inspection target. Specify brightness level of through hole in **Level** field. Specify area of through hole in **Area** field. Areas darker than **Level** and larger than **Area** will be judged as through hole and will not be inspected.

Table 3-2 Parameter Setting

Step3: Set the OK PCB. Press **Scan** button on the tool-bar or select **Scan** from the menu-bar. The dialog shown in Figure 3-5 appears and press **OK**.

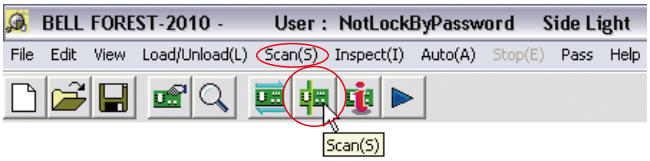


Figure 3-4 Scan

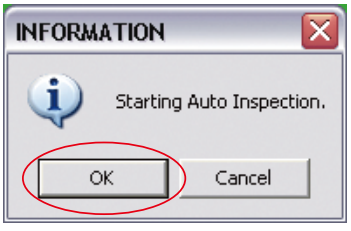


Figure 3-5 Check Auto Inspection Start

Step4: Left-click in the upper left side of the PCB. White cross line appears in the upper left side of the PCB.

Step5: Select **Edit** > **Add** from the menu-bar.

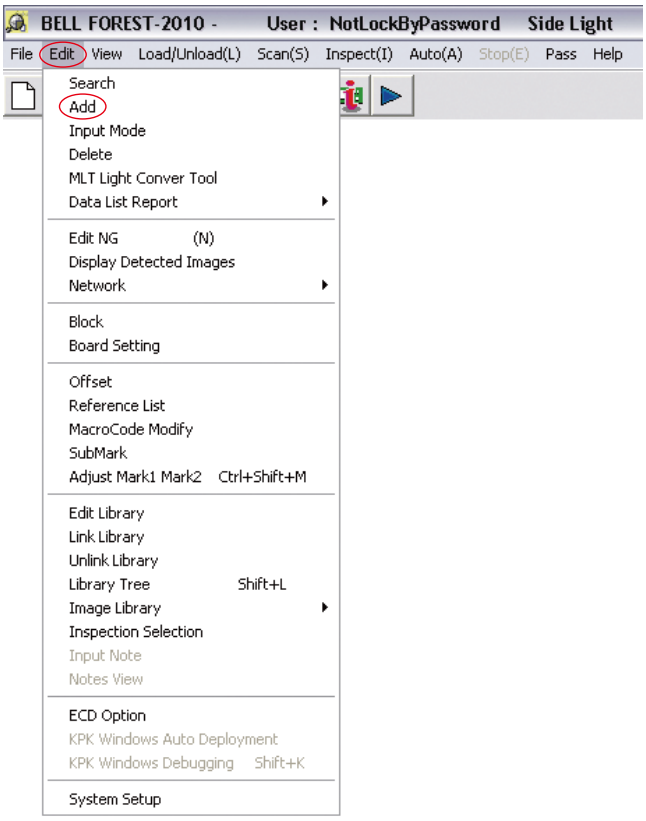


Figure 3-6 Add

Step6: Check the **ECD Area** and press **OK**.

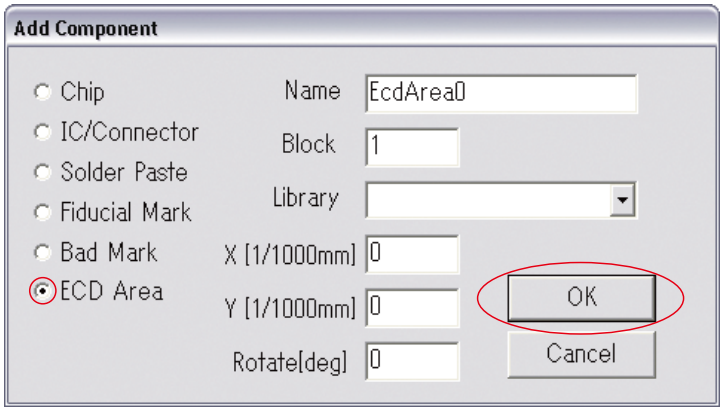


Figure 3-7 ECD Area

Step7: Detail setting window of ECD appears. Press **OK**.

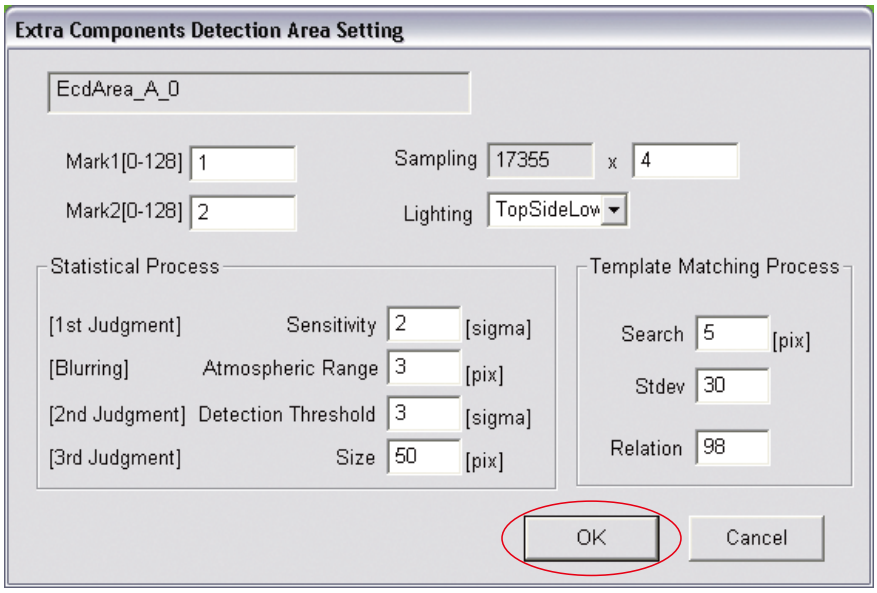


Figure 3-8 Detail Settings of ECD

Step8: Yellow and purple windows are displayed in the upper left side of the PCB. Drag the yellow window to the lower right side of the PCB.

NOTE Purple window shows inspection area. Enlarge inspection area to include the entire PCB by dragging yellow window in the lower right side of the PCB.

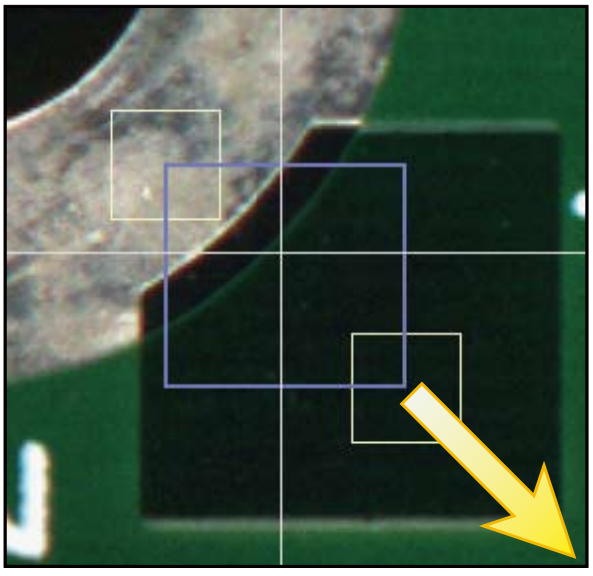


Figure 3-9 Enlarge Inspection Area

Step9: The window shown in Figure 3-10 appears. Check the **Current Component** and press **OK**.

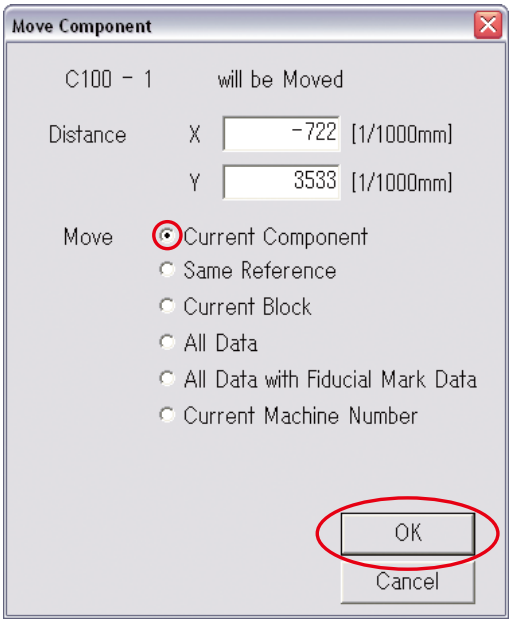


Figure 3-10 Move Component Data

Step10: Press V and the window shown in Figure 3-11 appears. Check the **Activate ECD Function** and press **Sampling**.

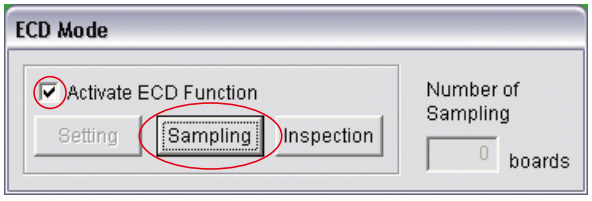


Figure 3-11 Sampling Mode

Step11: The dialog shown in Figure 3-12 appears and press **OK**.

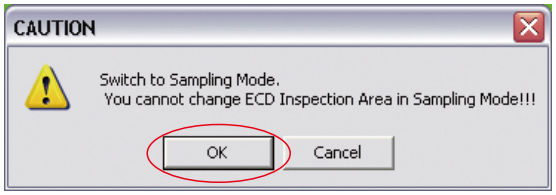


Figure 3-12 Switch to Sampling Mode

Step12: Select **Edit** > **System Setup** > **System** > **Machine** tab from the menu-bar and uncheck the **Hero Use Repair**. After all the settings are completed, press **OK**.

CAUTION In case of benchtop machine, check the **Hero Use Repair** after ECD inspection is completed.

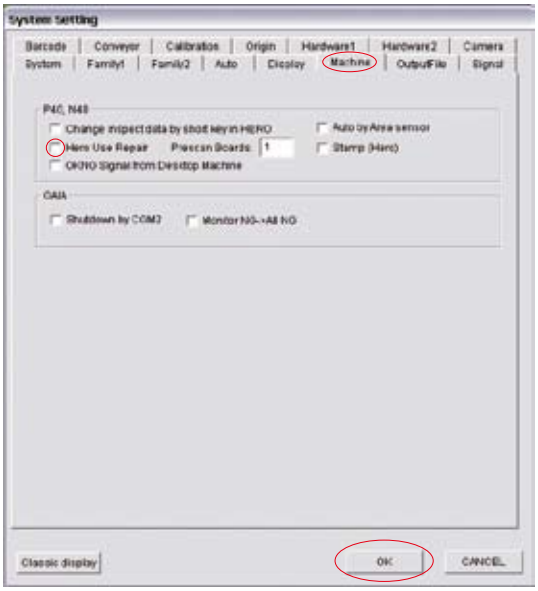


Figure 3-13 Hero Use Repair

Step13: Press **Auto** button on the tool-bar or select **Auto** from the menu-bar.

Figure 3-14 Auto

Step14: Check the **Conveyor**, **Inspect**, and **Monitor Mode**. Press **OK**.

CAUTION No **Conveyor** box in benchtop machine.

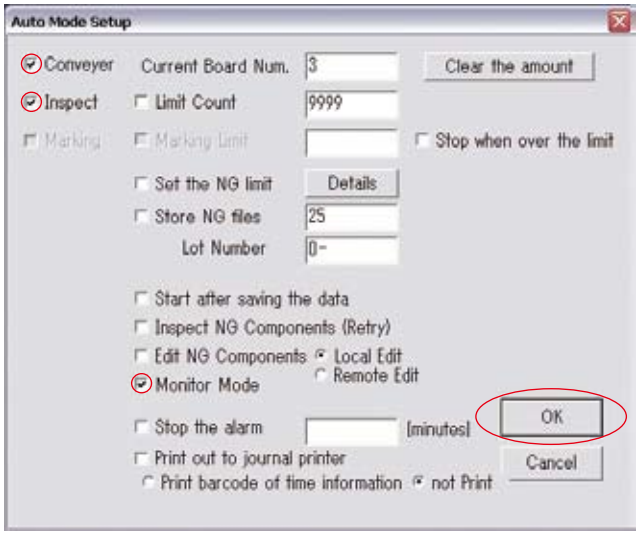


Figure 3-15 Auto Mode Setting

Step15: The dialog shown in Figure 3-16 appears and press **OK**.

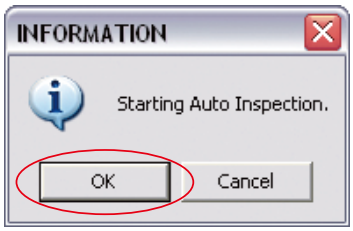


Figure 3-16 Start Auto Inspection

Step16: Start sampling. Scan 10 OK PCBs. The window shown in Figure 3-17 appears and press **OK**. The number of sampled PCB is displayed in Figure 3-18.

NOTE The number of sampled PCB can be set in **Shift Inspection Mode Automatically** of **Parameter Setting** shown in Figure 3-3.

NOTE To initialize sampling data, press **Setting** in Figure 3-18. The dialog shown in Figure 3-19 appears and press **OK**. The window shown in Figure 3-18 appears and press **Sampling**. Proceed from Step10.

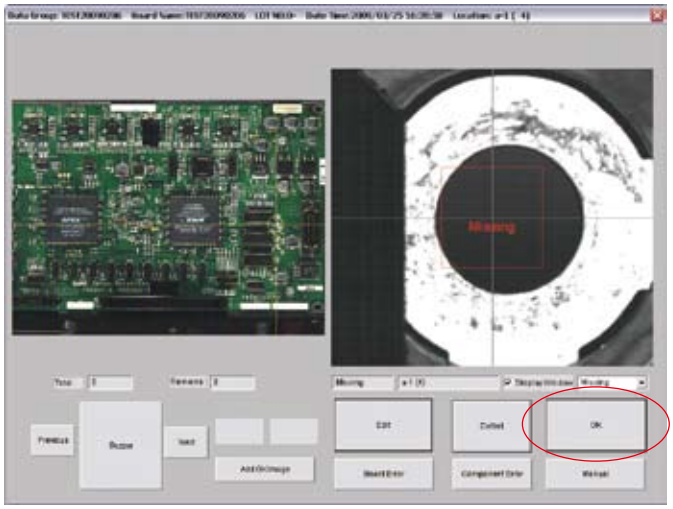


Figure 3-17 Monitor Mode

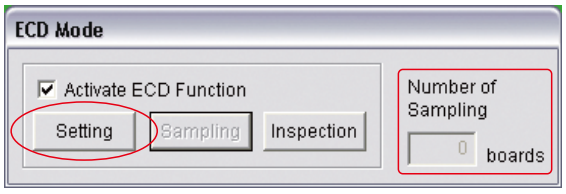


Figure 3-18 Setting Mode

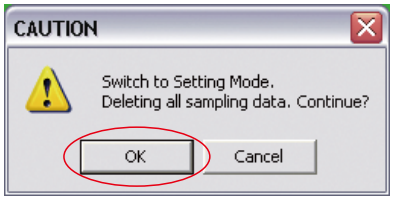


Figure 3-19 Switch to Setting Mode

Step17: After 10 OK PCB sampled, ECD mode will be automatically switched from **Sampling** to **Inspection**.

NOTE If **Shift Inspection Mode Automatically** of **Parameter Setting** shown in Figure 3-3 is unchecked, press **Inspection** after completing sampling of OK PCBs.

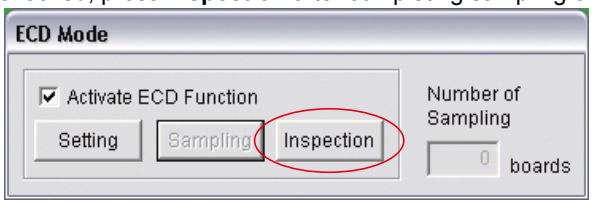


Figure 3-20 Inspection Mode

Step18: Scan sample NG PCB and check if extra components are detected properly. If extra components are detected, a red square frame is displayed in detection area. If any extra components are not detected or these are many false calls, press **Manual** to stop auto inspection. Refer to **3.3 ECD Debug.**

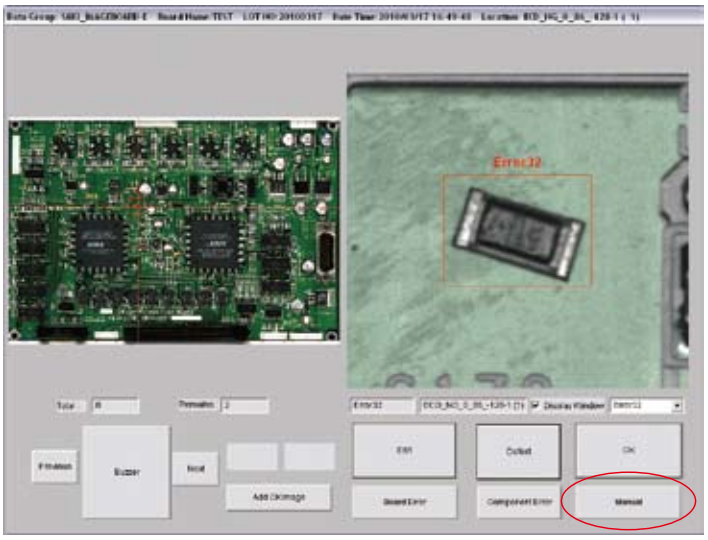


Figure 3-21 Inspection of NG PCB

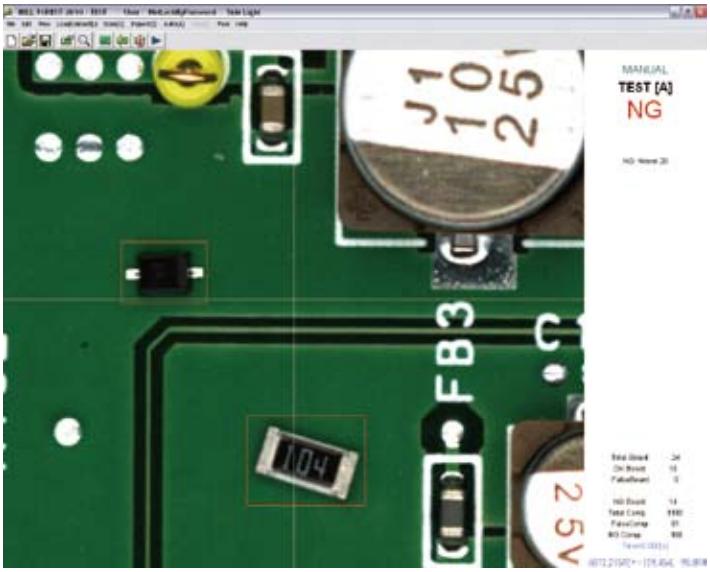


Figure 3-22 Detect Extra Component

3.3 ECD Debug

If any extra components are not detected or there are many false calls, adjust parameters.

Step1: Right-click the red square frame and the window shown in Figure 3-23 appears.

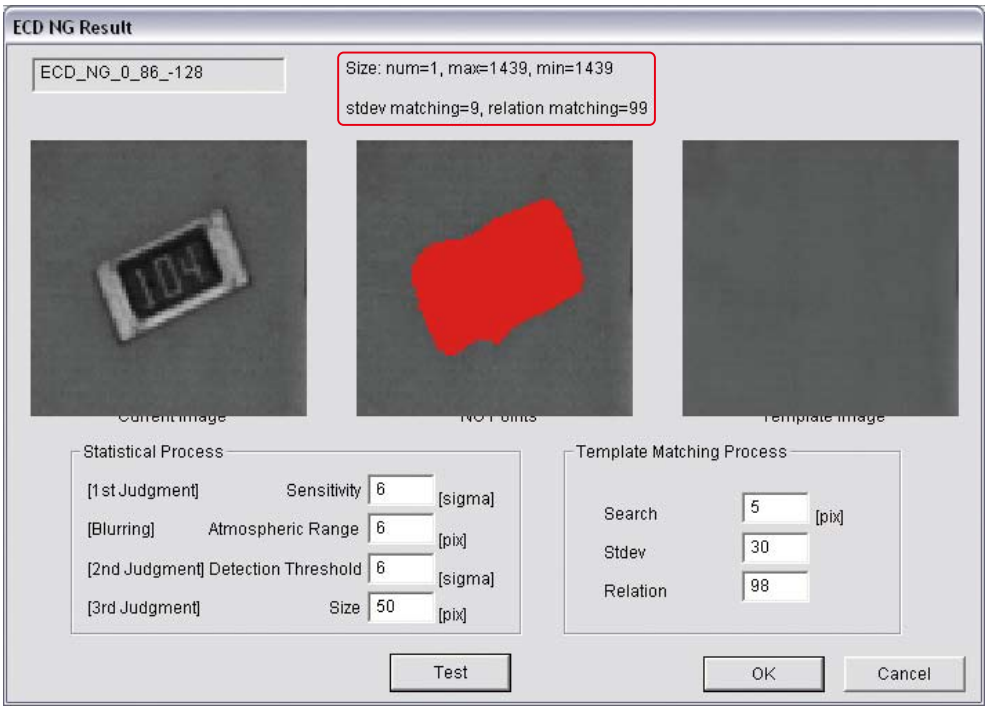


Figure 3-23 ECD Debug

Item	Description
num	The number of NG area is displayed.
max	The number of pixels of the largest NG area is displayed. If value of **Size** in **Statistical Process** is larger than value of **max**, judged as noise. The noise is not inspected.
min	The number of pixels that shows area of smallest NG area are displayed.
stdev matching	NG area is surrounded by circumscribed quadrangle. Calculate **area of circumscribed quadrangle** minus **pixels of the NG area** and the result will be divided by **area of circumscribed quadrangle**. If value of **Stdev Matching** in **Template Matching Process** is larger than value of **stdev matching** in the upper side of the window, the NG area is not detected as extra component.
relation matching	Calculate matching percentage of inspection PCB image and template image. If value of **Relation Matching** in **Template Matching Process** is larger than value of **relation matching** in the upper side of the window, the NG area is not detected as extra component.

Table 3-3 ECD Debug 1

Item	Description
Current Image	Detected extra component image is displayed.
NG Points	NG pixel is displayed in red.
Template Image	The latest sampled image is displayed as template image.

Table 3-4 ECD Debug 2

Item	Description
Sensitivity	Scan several OK PCBs. Calculate average values and standard deviation value. If brightness level of inspection PCB differs from the average value greatly, the result will be NG. Specify OK range of variability in **Sensitivity**. Enter the bigger value to make the OK range wider.
Atmospheric Range	Brightness level of pixels that are judged NG in **Sensitivity** is averaged with brightness level of surrounding pixels. Enter the bigger value to average pixels in wider area.
Detection Threshold	After **Atmospheric Range**, detect pixels which brightness level differs from the average value. Enter the bigger value to make OK range wider.
Size	The size of the NG area which is detected in **Detection Threshold** is inspected in **Size**. If the NG area is smaller than the specified size, the NG area is eliminated from inspection target.
Search Range	The search area for matching inspection. Enter the bigger value to enlarge the search range.
Stdev Matching	Surround the NG area by circumscribed quadrangle. Calculate **area of circumscribed quadrangle** minus **pixels of the NG area** and divide the result by **area of circumscribed quadrangle**. If the **stdev matching** in the upper side of the window is smaller than the sentered value, the result will be NG. Default is 30[%].
Relation Matching	Calculate matching percentage of inspection PCB image and template image. If relation matching in the upper side of the window is smaller than specified value, the result will be NG. Default is 98[%].

Table 3-5 ECD Debug 3

Step2: Refer to Table 3-6 and adjust values of **Sensitivity**, **Atmospheric Range**, **Detection Threshold**, and **Size**. Press **Test** to update parameters. After all the adjustments are completed, press **OK**.

NOTE If any extra components are not detected or there are many false calls, adjust values of **Stdev Matching** or **Relation Matching**.

Item	If extra component is not detected	If there are many false calls
Detection Threshold	Down	Up
Atmospheric Range	Down	Up
Detection Threshold	Down	Up
Size	Down	Up
Stdev Matching	Up	Down
Relation Matching	Up	Down

Table 3-6 Measure of Parameter Adjustment

Step3: Press **Inspect** button on the tool-bar or select **Inspect** from the menu-bar and if extra components on the NG PCB can be detected or not. If extra components are not detected, adjust parameters again.

Step4: Scan a target PCB.

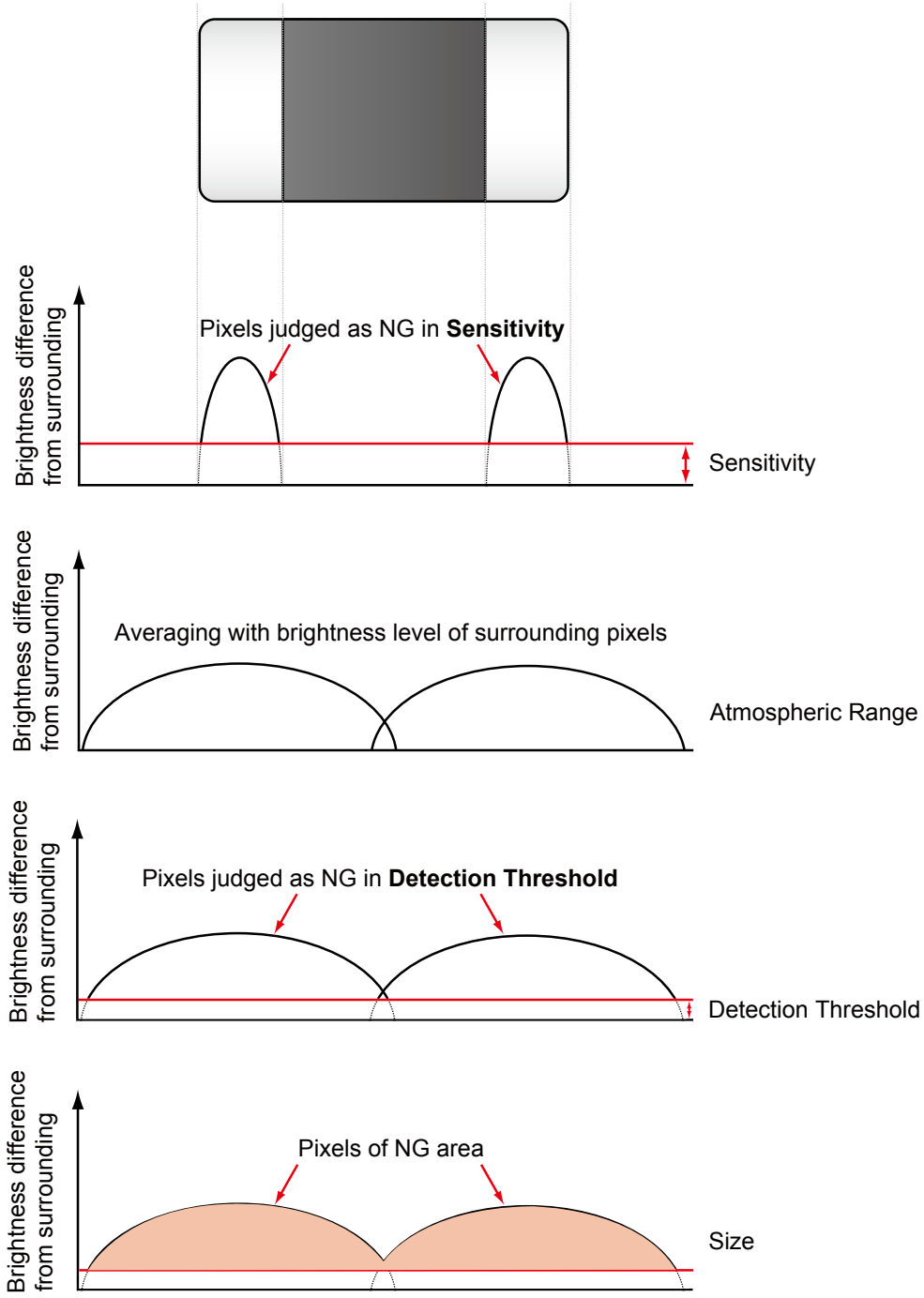


Figure 3-24 Detection of Extra Component

3.4 ECD Mask Function

ECD mask function can specify an area that is excluded from ECD inspection. The setting can be used to reduce false calls such as no-polarity chips as well as unique barcode given to each PCB.

Step1: Right-click the component to mask and the window shown in Figure 3-25 appears.

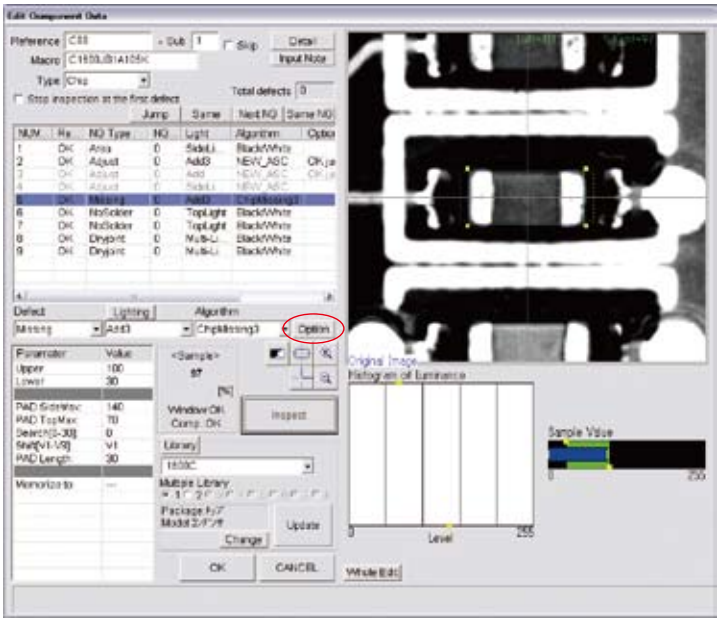


Figure 3-25 Edit Component Data Window

Step2: Selected inspection window size is range to apply mask. Select inspection window and press **Option**.

Step3: Check the **ECD Mask** and press **OK**.

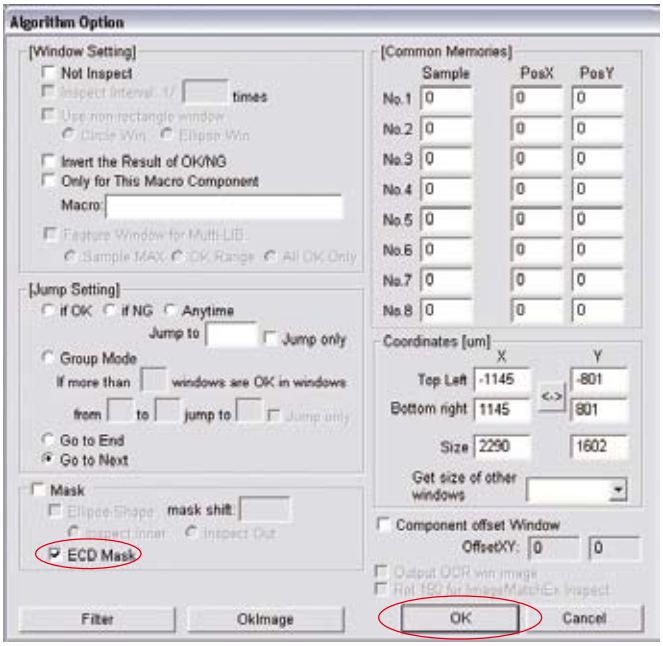


Figure 3-26 ECD Mask

Step4: Proceed to Step10 in **3.2 Inspection procedure**.

Inspection Algorithm

1 Inspection Algorithm

1.1 New_ASC

1.1.1 Inspection Overview

New_ASC is the algorithm to correct the misalignment of CAD data with the actual position of the components. Since the assembled components are easily shifted from the original position where CAD data assigns during the mounting process, this misalignment should be corrected to make the inspection data based on CAD data. New_ASC algorithm searches the chip electrode automatically based on its brightness level and corrects the misalignment(X axis, Y axis, θ axis).

New_ASC is also suitable to detect shift. LTracking / WTracking is more suitable for the chip components that its electrode is visually unclear or IC components. Refer to **1.2 LTracking / WTracking**.

1.1.2 Parameter Setting

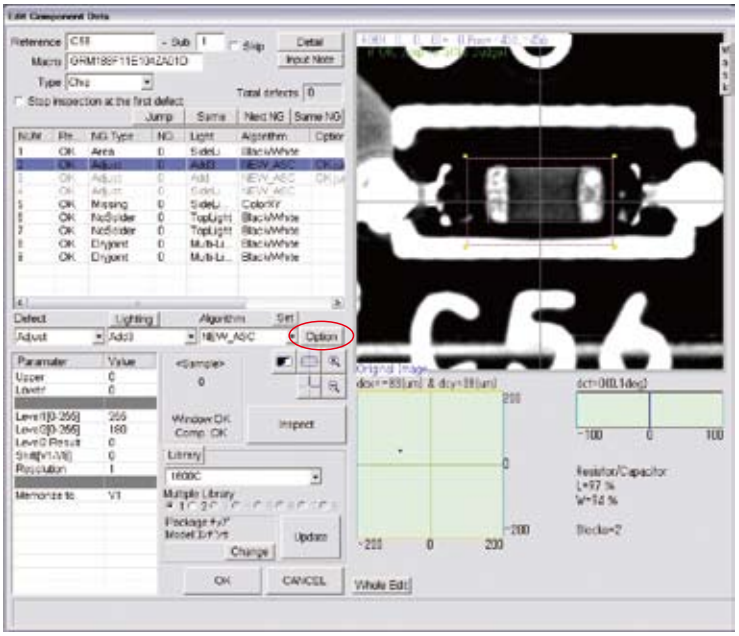


Figure 1-1 New_ASC

Parameter	Description
Lighting	Select a lighting that electrode is visually clear.
Algorithm	Select **New_ASC**.
Upper, Lower	Set OK range.
Level1[0-255], Level2[0-255]	**Level1** is upper limit of brightness level. **Level2** is lower limit of brightness level. Enter **255** in **Level1** field. Enter any suitable value in **Level2** field.
Level2 Result	Enter **0**.
Shift[V1-V8]	Enter **0**.
Resolution	Enter **1**.
Memorize to	Enter **V1** to register the amount of misalignment. Enter **V1** in **Shift** field to reflect this amount of misalignment to other algorithms.
The graph in the lower right side of the window	Display the shift amount as graphs.

Table 1-1 Parameter of New_ASC

1.1.3 Setting Procedure

Step1: Select a lighting that electrode is visually clear from the **Lighting** drop-down list.

CAUTION Select three different kinds of lightings for three adjust windows.

Step2: Adjust the size of **Adjust** window to surround the component body. The ideal window size is about 1.2 times larger than the component size.

Step3: Press **Option** in the right side of **Algorithm**. The window shown in Figure 1-2 appears.

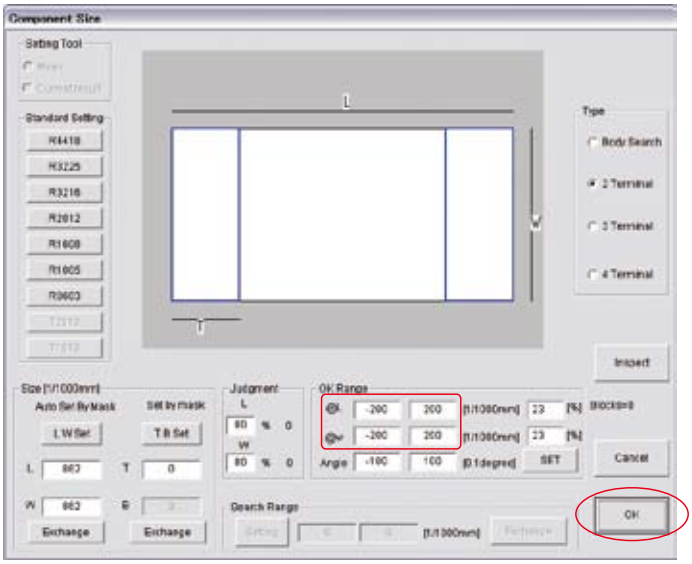


Figure 1-2 OK Range Setting

Step4: Adjust the **L** and **W** values in **OK range** and press **OK**. Check if the specified OK range is appropriate or not.

Step5: Press **Mask**.

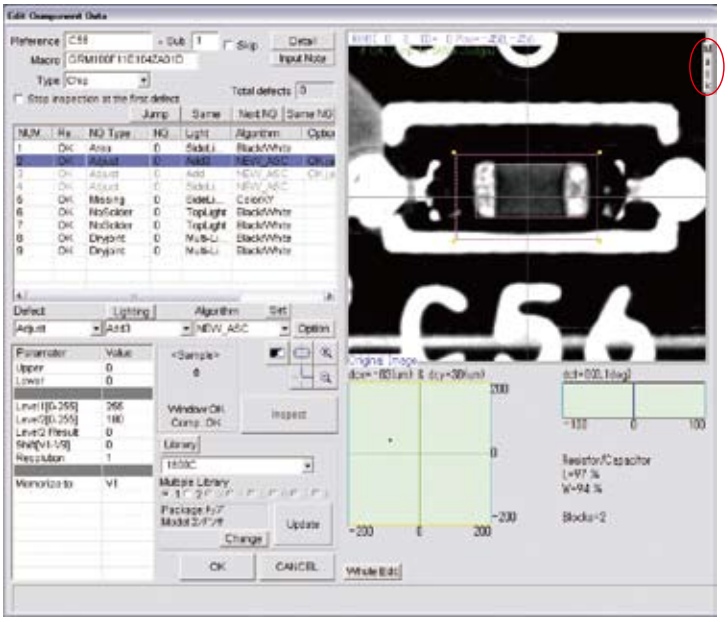


Figure 1-3 Mask Setting

Step6: Mask window appears. Adjust the window size to surround the entire component body (including electrodes).

Step7: Press **Option** in the right side of **Algorithm**. The window shown in Figure 1-4 appears.

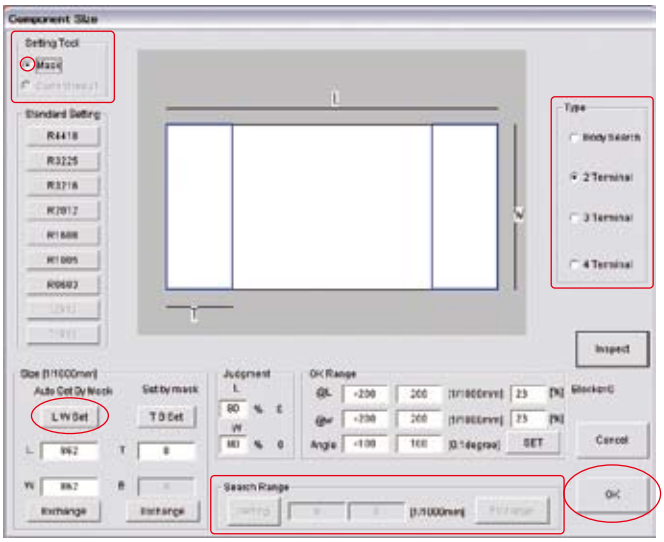


Figure 1-4 LW Setting

Step8: Select a component type from **Type**.

NOTE Search range setting is required if **4 Terminal** is selected.

Step9: Check the **Mask** in **Setting Tool**.

Step10: Press **LW Set** and **OK**.

Step11: Mask window appears. Adjust the window size to surround the one side of the electrode size.

Step12: Press **Option** in the right side of **Algorithm**. The window shown in Figure 1-5 appears.

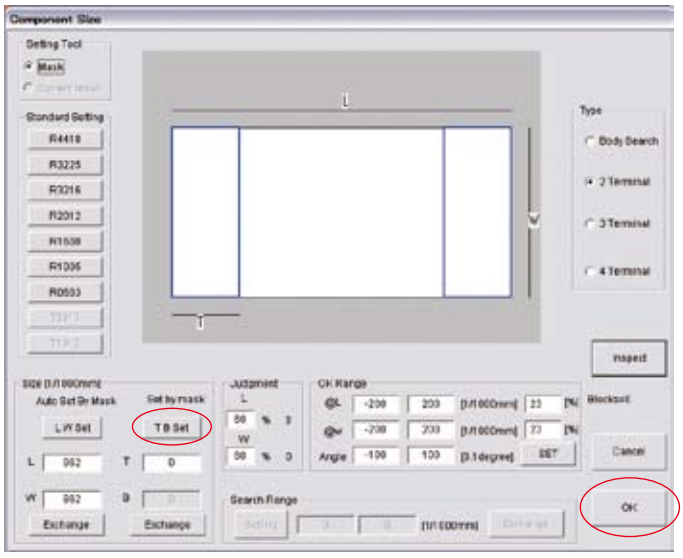


Figure 1-5 TB Setting

Step13: Press **TB Set** and **OK**.

Step14: Press **Mask** to remove mask.

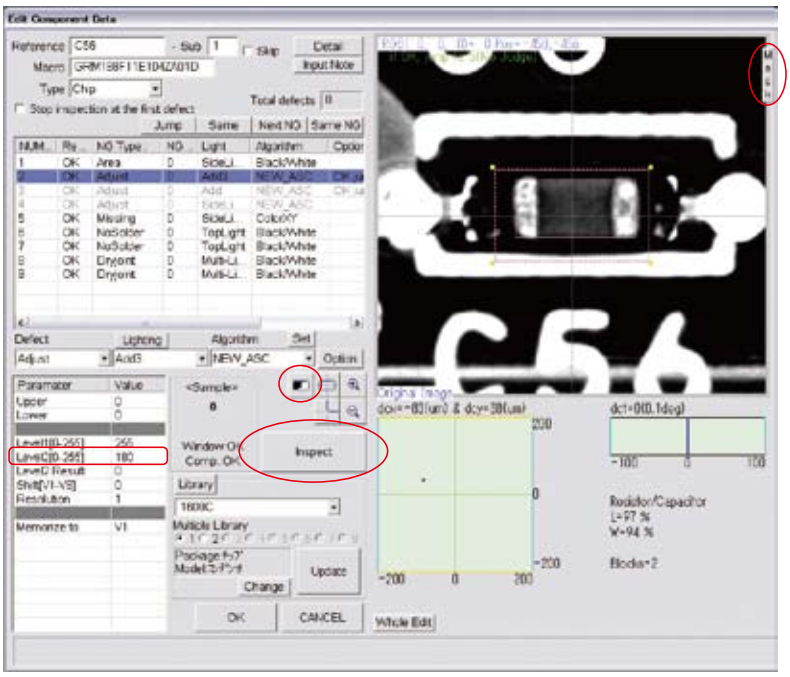


Figure 1-6 Remove Mask

Step15: Press the black-white button in the right side of **Sample** and check if searching electrode is successful.

NOTE Readjust the **Level2** value if the search is not successful.

Step16: Enter **V1** in **Memorize to** field.

CAUTION **V1** to **V8** are available in **Memorize to** field. Enter vector to use New_ASC as adjustment and register the inspection result in **Shift** field to reflect it to other algorithm. Do not use the same vector values in the several **Memorize to** field.

Step17: Press **Inspect**. Pink window surrounding the component's body appears if the search is successful.

1.2 LTracking / WTracking

1.2.1 Inspection Overview

LTracking / WTracking is the algorithm to correct the misalignment of CAD data with the actual position of the components. The actual component position is automatically searched based on the brightness difference between the PCB and the components and LTracking / WTracking corrects the misalignment(X axis, Y axis). LTracking should be used to correct longitudinal direction misalignment of the inspection window. WTracking should be used to correct lateral direction misalignment of the inspection window. LTracking / WTracking is more suitable for the chip components that its electrode is visually unclear or IC components.

1.2.2 Parameter Setting

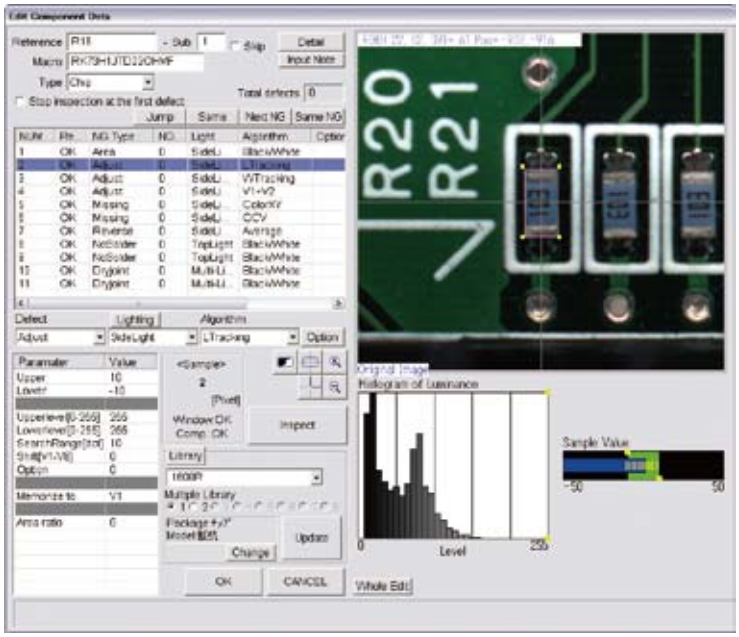


Figure 1-7 LTracking / WTracking

Parameter	Description
Lighting	Select a lighting that edge is visually clear.
Algorithm	Select **LTracking** or **WTracking**(Refer to **1.2.4 The difference between LTracking and WTracking**).
Upper, Lower	Enter the same value of **Search Range** to ± field.
Upperlevel[0-255], Lowerlevel[0-255]	Enter **0** in **Upperlevel** and **Lowerlevel** field if the component brightness level is lower than the one of PCB. Enter **255** in **Upperlevel** and **Lowerlevel** field if the component brightness level is higher than the one of PCB.
SearchRange	Default is **10**. Enter the bigger value to enlarge the search range. However if the **Search Range** is too large, the calculation time might be long or PCB pattern might be mis-recognized as a component.
Shift[V1-V8]	Enter **0**.
Option	Enter **0**.
Memorize to	Enter **V1**, **V2**, and **V3** to each three **Adjust** window. Register the amount of longitudinal misalignment as **V1**, the amount of lateral misalignment as **V2**. These two amounts are added to calculate **V3** by using algorithm **V1+V2**. Enter **V3** in **Shift** field to reflect this amount of misalignment to other algorithms.
Area ratio	Enter **0**.

Table 1-2 Parameter of LTracking / WTracking

1.2.3 Setting Procedure

Step1: Select a lighting that edge is visually clear from the **Lighting** drop-down list.

Step2: Check the **Upperlevel** and **Lowerlevel**. Enter **0** in **Upperlevel** and **Lowerlevel** field if the component brightness level is lower than the one of PCB. Enter **255** in **Upperlevel** and **Lowerlevel** field if the component brightness level is higher than the one of PCB.

CAUTION Select a lighting if the component edge is visually unclear with default setting.

Step3: Enter **V1**, **V2**, and **V3** to each three **Adjust** window. Refer to **1.2.5 Algorithm V1+V2.**

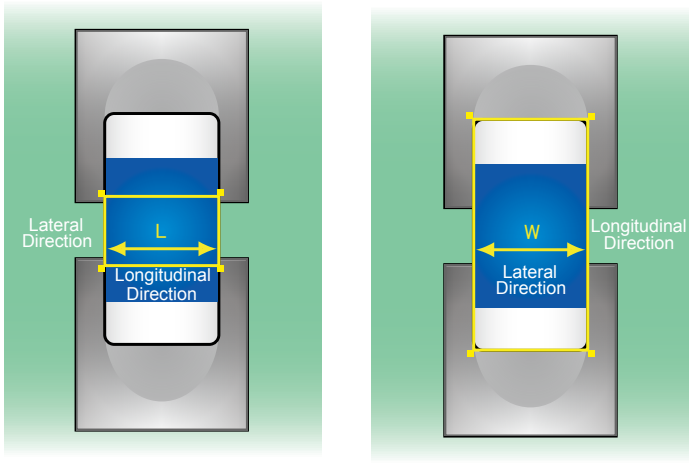
Step4: Press **Inspect**. Pink window surrounding the component's body appears if the search is successful.

NOTE Value in Sample field shows the amount of misalignment. If the sample value is out of OK range, adjust the Area window position and re-check the sample value.

CAUTION Adjust window can be scaled to any size by moving yellow square points in window corners. Do not move the window position with mouse dragging.

1.2.4 The difference between LTracking and WTracking

As the window shown in Figure 1-8(a), LTracking should be used to correct longitudinal direction misalignment of the inspection window. WTracking should be used to correct lateral direction misalignment of the inspection window. This is the same as the difference between ColorLTrack and ColorWTrack.



(a) LTracking (b) WTracking

Figure 1-8 The difference between LTracking and WTracking

1.2.5 Algorithm V1+V2

Three **Adjust** windows are necessary to correct misalignment with **LTracking** and **WTracking**. The first window calculates the amount of longitudinal direction misalignment and the second window calculates the amount of lateral direction misalignment. Enter **V1** and **V2** to each window's **Memorized to** field. Enter **V3** to the last adjust window **Memorized to** field.

Enter **V3** in **Shift** field to reflect this amount of misalignment to other algorithms.

1.3 ColorLTrack / ColorWTrack

1.3.1 Inspection Overview

ColorLTrack / ColorWTrack is the algorithm to correct the misalignment of CAD data with the actual position of the components. The actual component position is automatically searched based on the color difference between Components and PCB. ColorLTrack / ColorWTrack corrects the misalignment (X axis, Y axis). Extract the component color from two places in consideration of color variability(Extracted color should be differ from the PCB color) and register them as criterial color.
ColorLTrack should be used to correct longitudinal direction misalignment of the inspection window.
ColorWTrack should be used to correct lateral direction misalignment of the inspection window.
ColorLTrack / ColorWTrack is suitable if component color is clearly differ from PCB color.

1.3.2 Parameter Setting

Figure 1-9 ColorLTrack / ColorWTrack

Parameter	Description
Lighting	Select **SideLight**.
Algorithm	Select **ColorLTrack** or **ColorWTrack**(Refer to **1.2.4 The difference between LTracking and WTracking**).
Upper, Lower	Set OK range.
R, G, B [0-255]	Value is automatically entered when component color is extracted.
CHA-Width	Default is **30**. Enter the bigger value to enlarge the color OK range.
Memorize to	Enter **V1** to register the amount of misalignment. Enter **V1** in **Shift** field to reflect this amount of misalignment to other algorithms.
Search Range	Default is **10**. Enter the bigger value to enlarge the search area. However if the **Search Range** is too large, the inspection time might be long or PCB pattern might be mis-recognized as a component.
Tracking Side	Default is **2**. If the value is **0** or **1**, misalignment is corrected one-way only.
The graph in the lower right side of the window	Component RGB values are displayed in the left side of the graph if specified color is left-clicked by pressing **Ctrl**. Component RGB values are displayed in the right side of the graph if specified color is left-clicked by pressing **Alt**.

Table 1-3 Parameter of ColorLTrack / ColorWTrack

1.3.3 Setting Procedure

Step1: Select **SideLignt** from the **Lighting** drop-down list.

Step2: **Adjust** window can be scaled to any size by adjusting the yellow square points to the corners of the colored part of the chip. The window position should be adjusted in **Area** window.

CAUTION Do not move the **Adjust** window position with mouse dragging.

Step3: Extract colors from two places.
Component RGB values are displayed in the left side of the graph if specified color is left-clicked by pressing *Ctrl*. Component RGB values are displayed in the right side of the graph if specified color is left-clicked by pressing *Alt*.

NOTE Extract colors two places to put flexibility into OK range. One should be extracted from dark color and another should be extracted from light color.

Step4: Enter **V1** in **Memorize to** field.

Step5: Press **Inspect**. Pink window surrounding the component's body appears if the search is successful.

NOTE Value in **Sample** field shows the amount of misalignment. If the sample value is out of OK range, adjust the **Area** window position and re-check the sample value.

1.4 ChipMissing3

1.4.1 Inspection Overview

ChipMissing3 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(Refer to Figure 1-11).

ChipMissing3 is suitable for chip missing inspection or solder inspection.

1.4.2 Parameter Setting

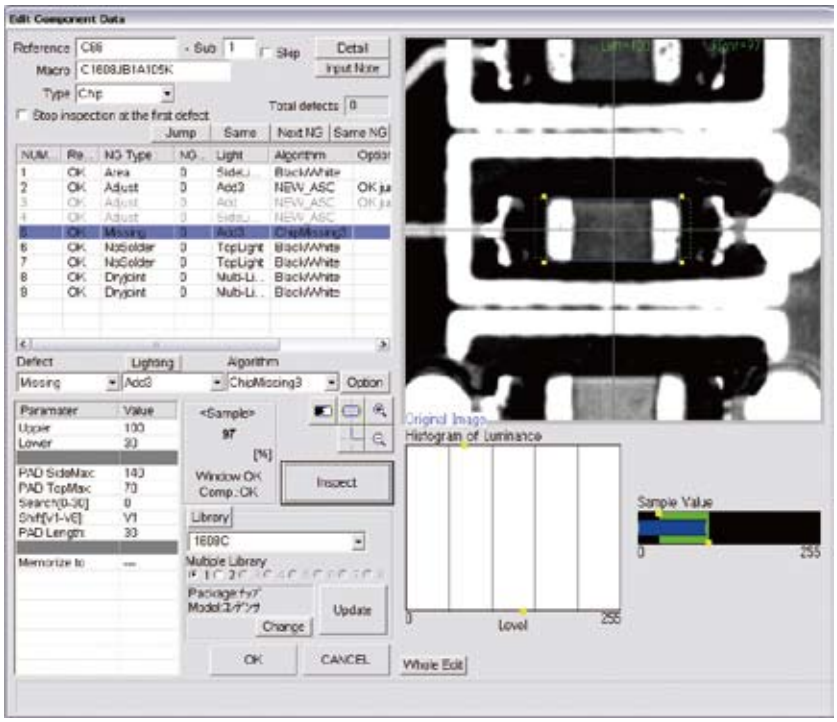


Figure 1-10 ChipMissing3

Parameter	Description
Lighting	Select **SideLight**.
Algorithm	Select **ChipMissing3**.
Upper, Lower	Set OK range.
PAD Side Max	Upper limit of brightness level in OK range(SideLight).
PAD Top Max	Upper limit of brightness level in OK range(TopLight).
Search[0-30]	Enter **0**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
PAD Length	Default is **30**. Enter the bigger value to enlarge the inspection area.
Memorize to	-

Table 1-4 Parameter of ChipMissing3

1.4.3 Setting Procedure

Step1: Select **SideLignt** from the **Lighting** drop-down list.

Step2: Enter appropriate vector in **Shift** according to the vector used in **Memorize to** in Adjust window.

Step3: Check if the sample value is in OK range. If it is out of OK range, change values in **PAD Side Max** field or **PAD Top Max** field.

NOTE If the inspection area is too small, change values in **PAD Length** to larger.

Step4: Press **Inspect**. Check if the inspection is completed properly.

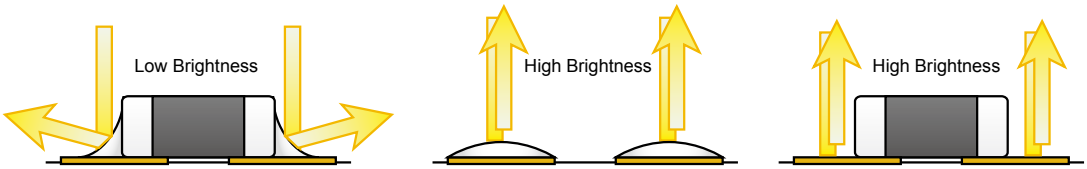


Figure 1-11 Missing / Solder inspection by ChipMissing3

1.4.4 Calculation of Sample Value

Set the OK brightness range of SideLight and TopLight by adjusting **PAD Side Max** / **PAD Top Max** values. The percentages of the area that the result is OK in solder inspection window at either end of the chip component with TopLight and SideLight, are calculated. The lower value is shown as sample value.

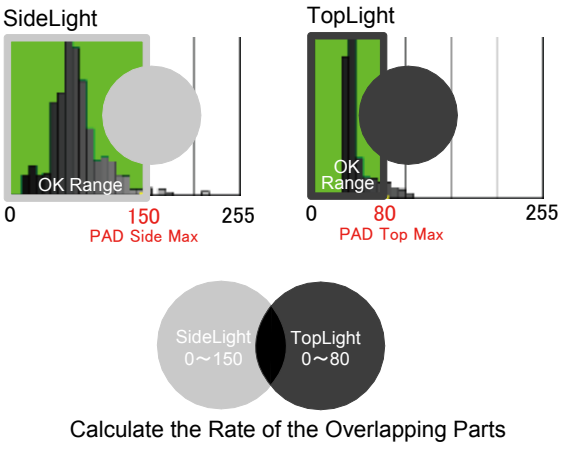


Figure 1-12 Calculation of Sample Value

1.5 Length

1.5.1 Inspection Overview

Length is the algorithm to inspect component's length.
Surround the component and around it by a window. Component's length is calculated based on the changes of brightness level in the window.
If the inspected component's length is in OK range, the result will be OK.
Length is suitable for missing inspection of chip components.

1.5.2 Parameter Setting

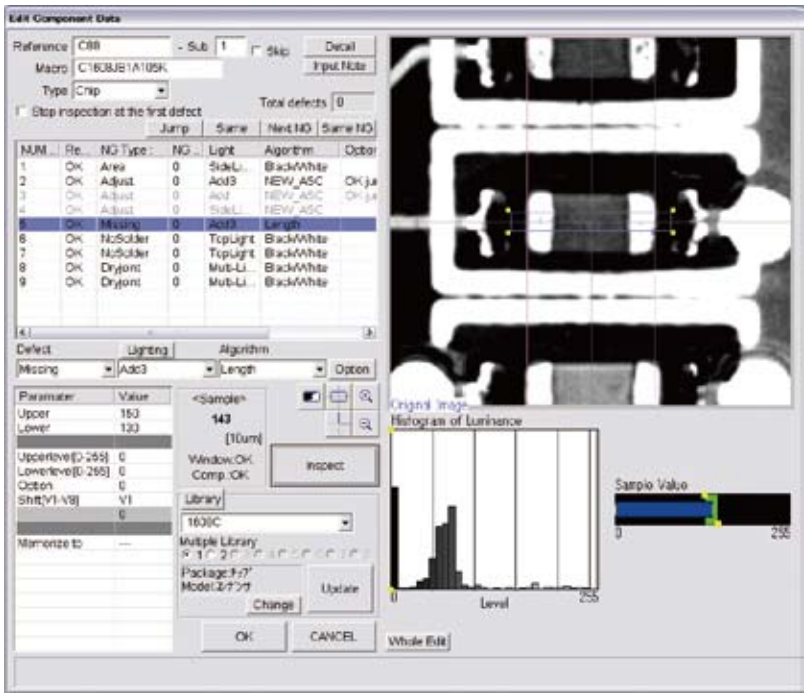


Figure 1-13 Length

Parameter	Description
Lighting	Select a lighting that the component is visually clear.
Algorithm	Select **Length**.
Upper, Lower	Set OK range.
Upperlevel[0-255], Lowerlevel[0-255]	Enter **0** in **Upperlevel** and **Lowerlevel** field if the component brightness level is lower than the brightness level of PCB. Enter **255** in **Upperlevel** and **Lowerlevel** field if the component brightness level is higher than the brightness level of PCB.
Option	Enter **0**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 1-5 Parameter of Length

1.5.3 Setting Procedure

Step1: Select a lighting that the target component is visually clear from the **Lighting** drop-down list.

Step2: Adjust the inspection window to be longer than the length of component in longitudinal direction. In lateral direction, adjust the inspection window to be shorter than the one of the component.

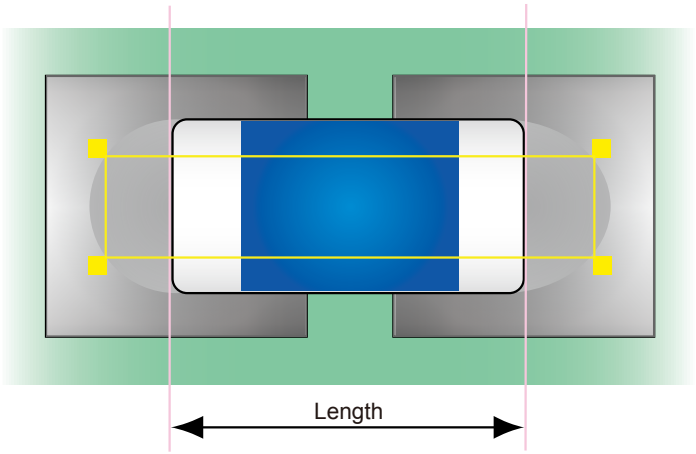


Figure 1-14 Inspection window of Length

Step3: Check the value of **Upperlevel** and **Lowerlevel**. Enter **0** in **Upperlevel** and **Lowerlevel** field if the component brightness level is lower than the one of PCB. Enter **255** in **Upperlevel** and **Lowerlevel** field if the component brightness level is higher than the one of PCB.

Step4: Set OK range. Sample value shows the length of component by 10μm.

Step5: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step6: Press **Inspect**. Check if the inspection is completed properly.

1.6 ColorXY

1.6.1 Inspection Overview

ColorXY is the algorithm to inspect the color of the component.

ColorXY calculates average color of the inspection window and display red x marking at the graph in the lower right side of the window.

The average color of the area which is to be OK and the average color of the area which is NG are displayed in the graph. Compare these two average colors and set the borderline between them.

ColorXY is suitable for missing, misalignment, and polarity inspection of the chip component by using color.

1.6.2 Parameter Setting

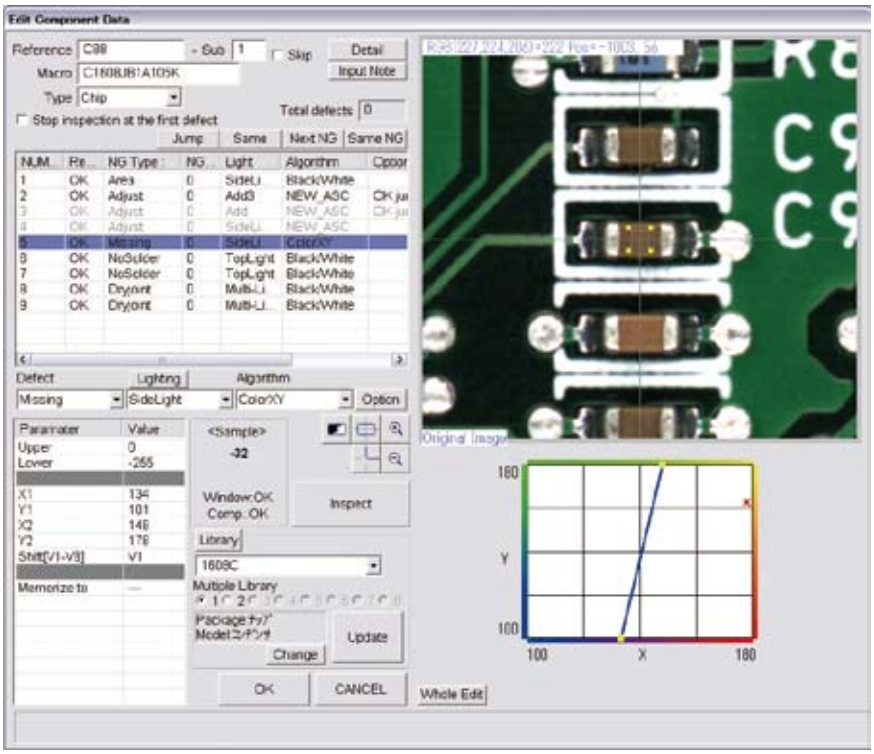


Figure 1-15 ColorXY

Parameter	Description
Lighting	Select **SideLight**.
Algorithm	Select **ColorXY**.
Upper, Lower	If the average color of the area which is to be OK is in the left side of the blue borderline, enter **255** in **Upper** field and **0** in **Lower** field. If the average color of the area which is to be OK color is in the right side of the blue borderline, enter **0** in **Upper** field and **255** in **Lower** field.
X1, Y1, X2, Y2	This field is automatically filled when the blue borderline is moved.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-
The graph in the lower right side of the window	Average color in the window is displayed as red x marking. Green x marking is the average color of other components which are sharing the same library. The borderline can be moved by adjusting the yellow square points at the either end of the blue borderline.

Table 1-6 Parameter of ColorXY

1.6.3 Setting Procedure

Step1: Select **SideLignt** from the **Lighting** drop-down list.

Step2: Check the average color of the area which is to be OK. Adjust the window size smaller and check the x marking distribution in the graph in the lower right side of the window. x marking position is changed according to the window position.

Step3: Check the average color of the area which is to be NG. Adjust the window size smaller and check the x marking distribution in the graph in the lower right side of the window. x marking position is changed according to the window position.

Step4: Set an inspection window on the component.

Step5: Set the borderline between the position of the x marking if the window is in OK area and the position of the x marking if the window is in NG area.

Step6: If the average color of the area which is to be OK is in the left side of the blue borderline, enter **255** in **Upper** field and **0** in **Lower** field. If the average color of the area which is to be OK color is in the right side of the blue borderline, enter **0** in **Upper** field and **255** in **Lower** field.

Step7: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step8: Press **Inspect**. Check if the inspection is completed properly.

NOTE Sample value is the distance of x marking to blue borderline.

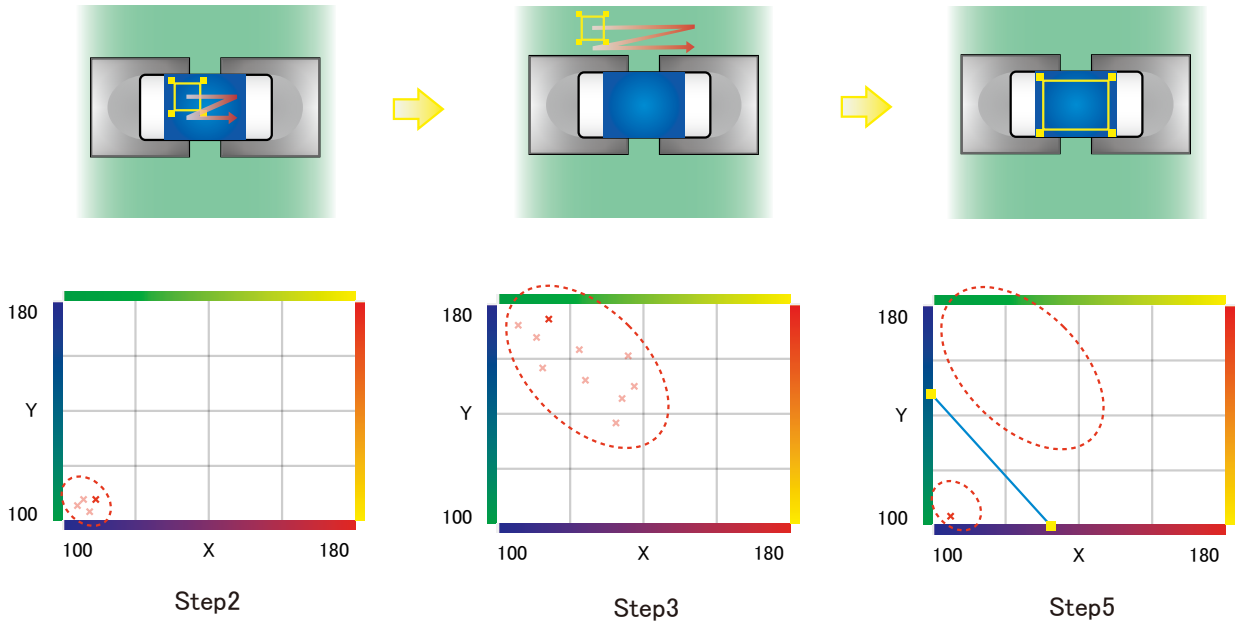


Figure 1-16 Setting Procedure of ColorXY

1.7 AreaColor

1.7.1 Inspection Overview

AreaColor is the algorithm to inspect the percentage of specified color in the inspection window. Extract the component color from two places in consideration of color variability.

Specify any color as OK color. If the percentage of the specified color exceeds a certain value, the result will be OK. Specify any color as NG color. If the percentage of the specified color falls below a certain value, the result will be OK.

AreaColor is suitable for missing inspection of chip components.

1.7.2 Parameter Setting

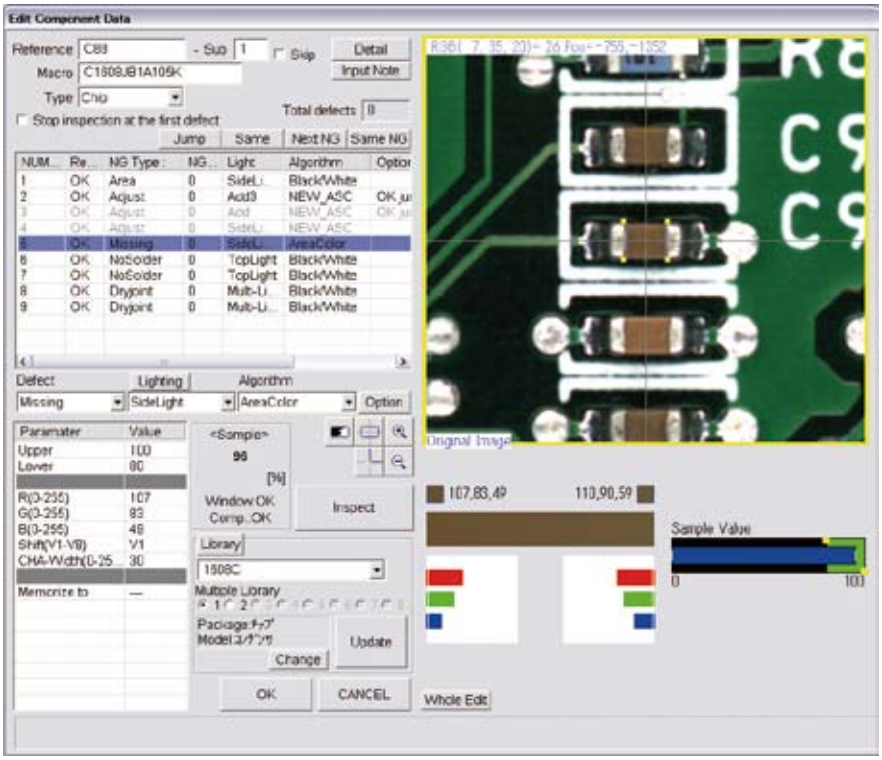


Figure 1-17 AreaColor

Parameter	Description
Lighting	Select **SideLight**.
Algorithm	Select **AreaColor**.
Upper, Lower	If the specified color is registered as OK color, enter **100** in **Upper** field and arbitrarily value in **Lower** field. If the specified color is registered as NG color, enter arbitrarily value in **Upper** field and **0** in **Lower** field.
R, G, B [0-255]	Value is automatically entered when component color is extracted.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
CHA-Width	Default is **30**. Enter the bigger value to enlarge the color OK range.
Memorize to	-
The graph in the lower right side of the window	Component RGB values are displayed in the left side of the graph if specified color is left-clicked by pressing **Ctrl**. Component RGB values are displayed in the right side of the graph if specified color is left-clicked by pressing **Alt**.

Table 1-7 Parameter of AreaColor

1.7.3 Setting Procedure

Step1: Select **SideLight** from the **Lighting** drop-down list.

Step2: Extract colors from two places.
Component RGB values are displayed in the left side of the graph if specified color is left-clicked by pressing Ctrl. Component RGB values are displayed in the right side of the graph if specified color is left-clicked by pressing Alt.

> **NOTE** Extract colors two places to put flexibility into OK range. One should be extracted from dark color and another should be extracted from light color.

Step3: If the specified color is registered as OK color, enter **100** in **Upper** field and arbitrarily value in **Lower** field. If the specified color is registered as NG color, enter arbitrarily value in **Upper** field and **0** in **Lower** field.

Step4: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step5: Press **Inspect**. Check if the inspection is completed properly.

1.8 Average

1.8.1 Inspection Overview

Average is the algorithm to average the brightness level of the inspection window.
If the average of brightness level is in OK range, the result will be OK.
Average is suitable for reverse inspection of chip components or polarity inspection of IC components.

1.8.2 Parameter Setting

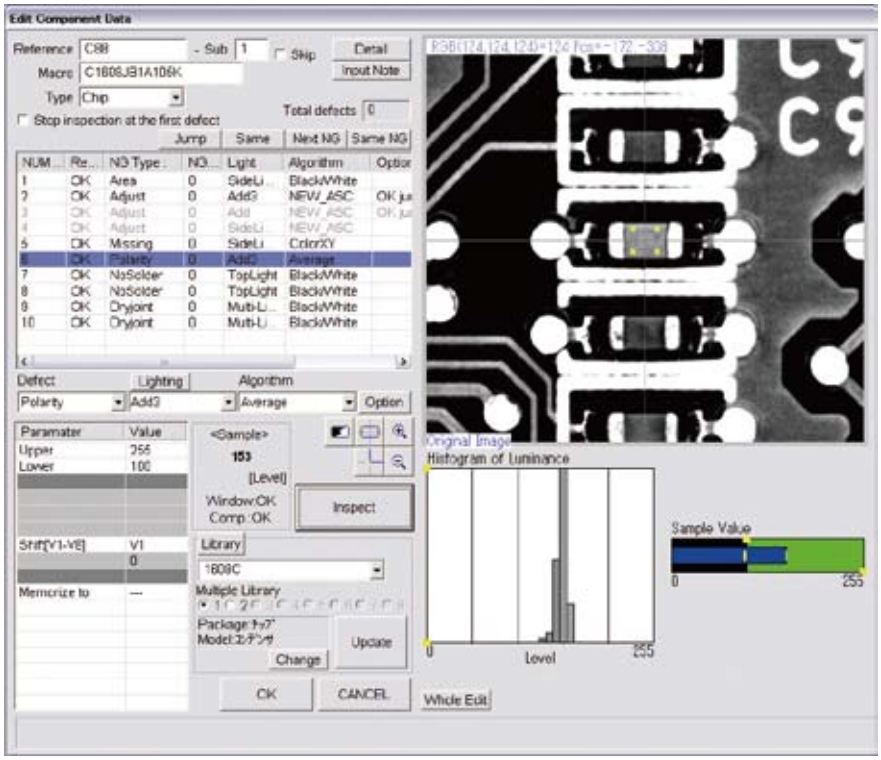


Figure 1-18 Average

Parameter	Description
Lighting	Select a lighting that the brightness level difference between the surface and the back side is visually clear.
Algorithm	Select **Average**.
Upper, Lower	Calculate a value intermediate between OK sample value and NG sample value. If OK sample value is smaller than NG sample value, enter the **intermediate value** in **Upper** field and **0** in **Lower** field. If NG sample value is smaller than OK sample value, enter **255** in **Upper** field and the **intermediate value** in **Lower** field.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 1-8 Parameter of Average

1.8.3 Setting Procedure

Step1: Select a lighting that the brightness level difference between the surface and the back surface from the **Lighting** drop-down list.

Step2: Check the OK brightness level. Move the inspection window onto the surface of the component and check the sample value.

NOTE Sample value is the brightness level average of the inspection window.

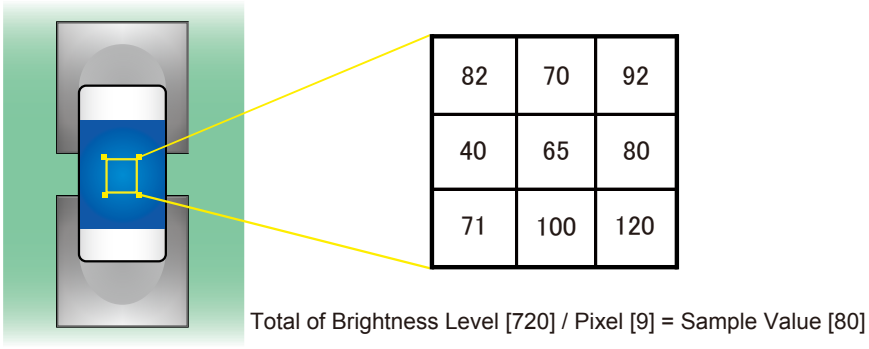


Figure 1-19 Calculation of Sample Value

Step3: Check the NG brightness level. Move the inspection window onto any position which brightness level is the nearly same as the brightness level of the back side of the component and check the sample value.

Step4: Calculate a value intermediate between OK sample value and NG sample value.

CAUTION Change the lighting if there is no difference between OK sample value and NG sample value with default lighting.

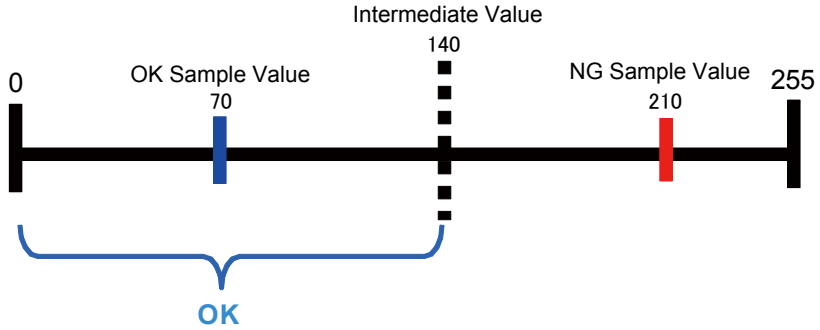


Figure 1-20 Calculation of Intermediate Value

Step5: If OK sample value is smaller than NG sample value, enter **intermediate value** in **Upper** field and the **0** in **Lower** field. If NG sample value is smaller than OK sample value, enter the **255** in **Upper** field and **intermediate value** in **Lower** field.

Step6: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step7: Press **Inspect**. Check if the inspection is completed properly.

1.9 Black/White

1.9.1 Inspection Overview

Black/White is the algorithm to inspect the percentage of the specified brightness level of the inspection window.

If the percentage of the specified level exceeds a certain value, the result will be OK.

Black/White is suitable for solder inspection of chip components.

1.9.2 Parameter Setting

Figure 1-21 Black/White

Parameter	Description
Lighting	Select **TopLight** to inspect solder paste.
Algorithm	Select **Black/White**.
Upper, Lower	Set OK range. The maximum value is **100** in **Upper** field and minimum value is **0** in **Lower** field.
Level1[0-255], Level2[0-255]	Calculate a value intermediate between OK sample value and NG sample value. If OK sample value is smaller than NG sample value, enter the **intermediate value** in **Level1** field and **0** in **Level2** field. If NG sample value is smaller than OK sample value, enter **255** in **Level1** field and the **intermediate value** in **Level2** field.
Option	Enter **0**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-
The graph in the lower right side of the window	The **Histogram of Luminance** bar graph shows the number of pixels of every bright levels. Green area is the specified area by **Level1** and **Level2**. **Sample value** shows upper limit and lower limit.

Table 1-9 Parameter of Black/White

1.9.3 Setting Procedure

Step1: Select **TopLignt** from the **Lighting** drop-down list.

Step2: Adjust the **Black/White** window position to surround the solder fillet.

Step3: Enter value in **Upper** field and **Lower** field.

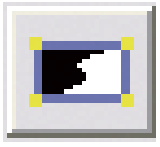
NOTE **100** is for **Upper** field and **60** is for **Lower** field as a rough guide.

Step4: Check if the sample value is in OK range. If it is out of OK range, adjust values in **Level1** and **Level2**.

CAUTION Inspection windows are created at either end of the chip component after auto deployment of chip component.

NOTE The percentage of the specified brightness level in the inspection window is displayed as a sample value.

NOTE Press the black-white button on the right side of **Sample**(Refer to the red circle in Figure 1-22). The OK area will be colored in gray.



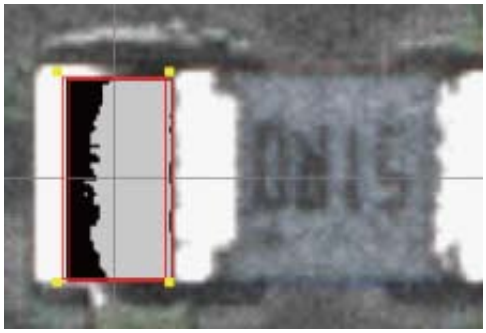


Figure 1-22 OK Range

Step5: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step6: Press **Inspect**. Check if the inspection is completed properly.

1.9.4 Algorithm BrightLevel

BrightLevel algorithm is available for components which brightness level are quite-variable. Black/White algorithm calculates the percentage of the specified brightness level in the inspection window. BlightLevel algorithm inspects the brightness level which accounts for the specified percentage.

Figure 1-23 BrightLevel

Parameter	Description
Lighting	Select an appropriate lighting depend on with which algorithm the bright level is used. (e.g. Select **Toplight** if the threshold of BrightLevel is used with Black/White for solder inspection.)
Algorithm	Select **BrightLevel**.
Upper, Lower	Enter **255** in **Upper** field and **0** in **Lower** field.
Bright[%], Dark[%]	Enter arbitrarily value in **Bright** field and **0** in **Dark** field to specify the percentage of brighter area in the inspection window. Enter **0** in **Bright** field and arbitrarily value in **Dark** field to specify the percentage of darker area in the inspection window. (e.g. The percentage of brighter area is 70% and the percentage is darker area is 30% if digitize the area of inspection window, enter **70** in **Bright** field, **0** in **Dark** field or enter **0** in **Bright** field, **30** in **Dark** field.)
Option	Enter **0**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window. Enter **0** in **Shift** field if the threshold of Bright level is used for misalignment correction.
Memorize to	Register the threshold of BrightLevel in **Memorize to** as **M1**. Enter **M1** in appropriate parameter field if other algorithms use the threshold of BrightLevel.

Table 1-10 Parameter of BrightLevel

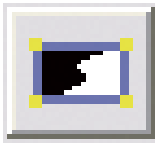
1.9.5 BrightLevel Setting Procedure

Step1: Select a inspection window which BrightLevel algorithm needs to be applied. Select **Copy** from right-click and change the **algorithm** to **BrightLevel**.

Step2: Enter arbitrarily value in **Bright** field and **0** in **Dark** field to specify the percentage of brighter area in the inspection window. Enter **0** in **Bright** field and arbitrarily value in **Dark** field to specify the percentage of darker area in the inspection window.

NOTE Display the brightness level which accounts for the specified percentage as sample value.

NOTE Select **Black/White** as **Algorithm** and press the black-white button in the right side of **Sample**. Brightness level in OK range will be colored in gray.



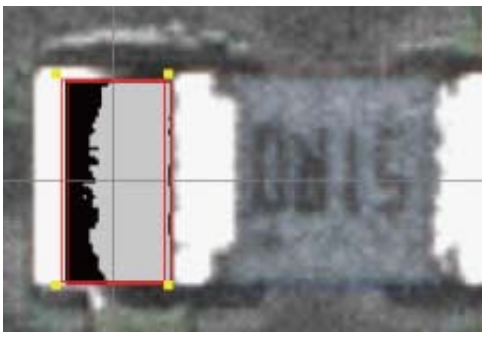


Figure 1-24 OK Range

Step3: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

CAUTION Do not enter any words in **Shift** field if the threshold of BrightLevel is used for misalignment correction.

Step4: Enter **M1** in **Memorize to** field.

CAUTION Register the inspection result of BrightLevel in **Memorize to** field. Any value from **M1** to **M8** is available. Enter it in the appropriate field to reflect the result to other algorithm.

Step5: Enter **M1** into the appropriate field.

NOTE In case the inspection result of brightLevel is used for the solder paste inspection of Chip component, enter **M1** in **Level1** or **Level2** field depending on the brightness level.

Step6: Press **Inspect**. Check if the inspection is completed properly.

1.9.6 Algorithm LandJudgement

LandJudgement is the algorithm to digitize the specified area with two selected lighting. Specify the brightness levels with each lighting and calculate the overlapping area where the each specified brightness levels surround in the window. The percentage of the overlapped area in the window is displayed as Sample. LandJudgement is suitable for the solder paste inspection of chip component.

Figure 1-25 LandJudgement

Parameter	Description
Lighting	The selected lighting in this field does not influence to the inspection result. Select two kinds of lighting to use LandJudgment. Press **Set** in the right side of **Algorithm**. Select two lighting in this window. Default setting is **TopLight** and **SideLight**.
Algorithm	Select **LandJudgement**.
Upper, Lower	Set OK range. The maximum value is **100** in **Upper** field and minimum value is **0** in **Lower** field.
[Lighting1] Min, [Lighting2] Min, [Lighting2] Max, [Lighting1] Max	Specify brightness level in each lighting. The percentage of the area where the specified brightness levels in each two lighting overlap in the window is displayed as Sample.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 1-11 Parameter of LandJudgement

1.9.7 LandJudgement Setting Procedure

Step1: Select two kinds of lighting to use LandJudgment. Press **Set** in the right side of **Algorithm** and select two lighting in this window. Default setting is **TopLight** and **SideLight**.

Step2: Specify brightness level in each lighting.

NOTE Calculate the area where the specified brightness levels in each two lighting overlap in the window. The percentage of the overlapped area in the window is displayed as Sample.

Step3: Set OK range. Enter value in **Upper** and **Lower** field.

Step4: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step5: Press **Inspect**. Check if the inspection is completed properly.

1.10 Peak

1.10.1 Inspection Overview

Peak is the algorithm to inspect based on peak value within the inspection window.
If the peak of brightness level is in OK range, the result will be OK. This algorithm is not affected by noise, brightness level within the inspection window is stable.
Peak is suitable for missing inspection of IC components.

1.10.2 Parameter Setting

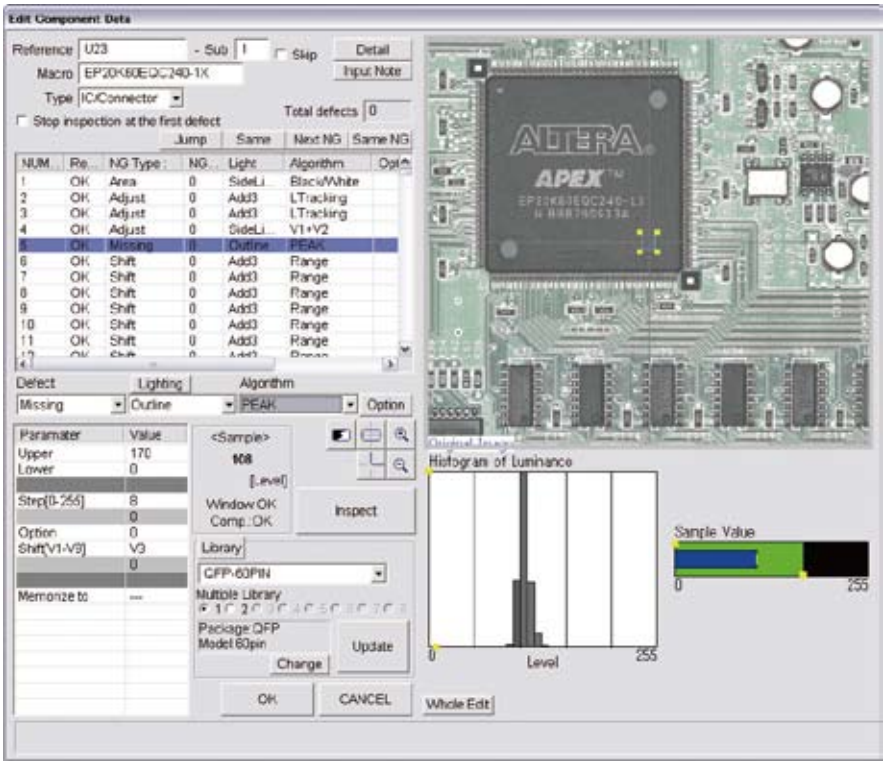


Figure 1-26 Peak

Parameter	Description
Lighting	Select a lighting that the brightness level difference between the component and the PCB is visually clear.
Algorithm	Select **Peak**.
Upper, Lower	Calculate a value intermediate between OK sample and NG sample value. If OK sample value is smaller than NG sample value, enter **intermediate value** in **Upper** field and the **0** in **Lower** field. If NG sample value is smaller than OK sample value, enter the **255** in **Upper** field and **intermediate value** in **Lower** field.
Step[0-255]	Default is **8**. The bar graph shows the number of pixels that is divided brightness level by **8** in the graph in the lower right side of the window.
Option	Enter **0**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-
The graph in the lower right side of the window	The **Histogram of Luminance** bar graph shows the number of pixels of every bright levels. Sample value is the largest brightness which is distributed within the inspection window.

Table 1-12 Parameter of Peak

1.10.3 Setting Procedure

Step1: Select a lighting that the brightness level difference between the component and the PCB from the **Lighting** drop-down list.

Step2: Check the OK brightness level. Move the inspection window onto the surface of the component and check the sample value.

NOTE Sample value is the peak value within the inspection window.

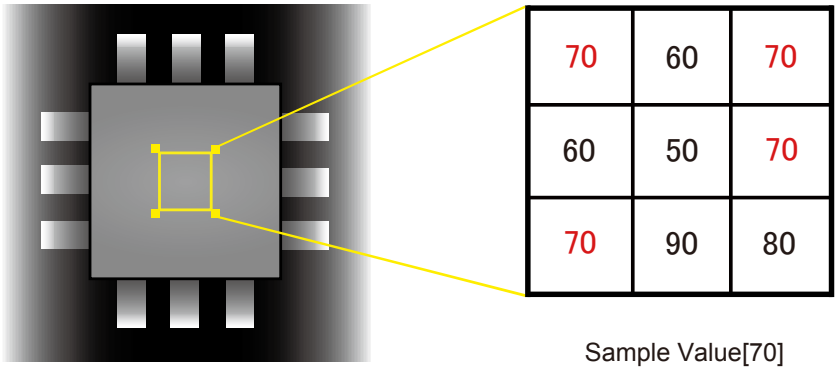


Figure 1-27 Calculation of Sample Value

Step3: Check the NG brightness level. Move the inspection window to the PCB and check the sample value.

Step4: Calculate a value intermediate between OK sample value and NG sample value.

CAUTION Change the lighting if there is no difference between OK sample value and NG sample value with default lighting.

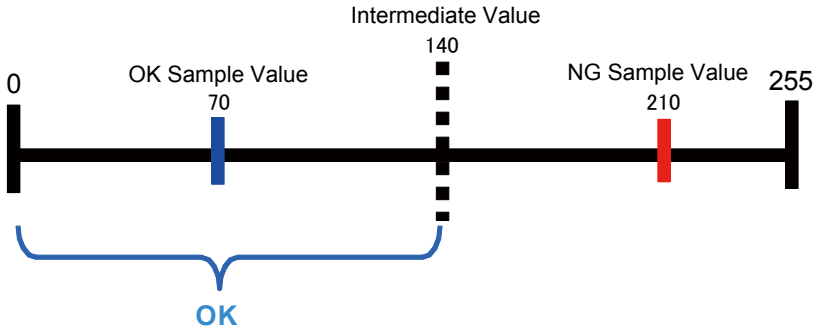


Figure 1-28 Calculation of Intermediate Value

Step5: If OK sample value is smaller than NG sample value, enter **intermediate value** in **Upper** field and the **0** in **Lower** field. If NG sample value is smaller than OK sample value, enter the **255** in **Upper** field and **intermediate value** in **Lower** field.

Step6: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step7: Press **Inspect**. Check if the inspection is completed properly.

1.11 Range

1.11.1 Inspection Overview

Range is the algorithm to subtract the difference between the maximum brightness level and minimum brightness level within the inspection window. If the range of the brightness level is in OK range, the result will be OK. Range is suitable for shift or polarity inspection of IC components.

1.11.2 Parameter Setting

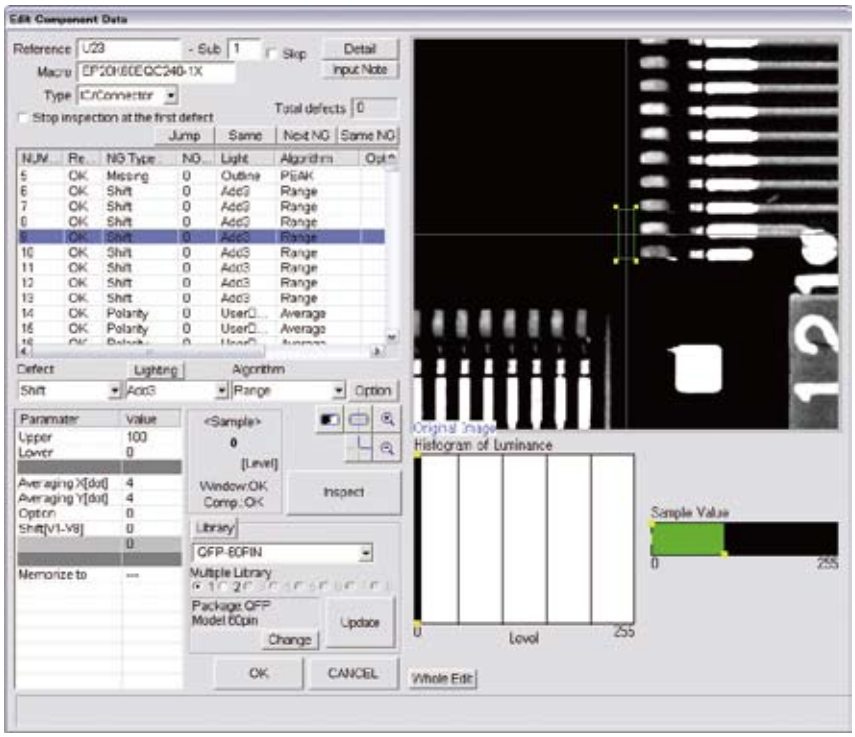


Figure 1-29 Range

Parameter	Description
Lighting	For shift inspection, select a lighting that the brightness level difference between OK and NG is visually clear. For polarity inspection, select a lighting that a polarity is visually clear.
Algorithm	Select **Range**.
Upper, Lower	Calculate a value intermediate between OK sample value and NG sample value. If OK sample value is smaller than NG sample value, enter the **intermediate value** in **Upper** field and **0** in **Lower** field. If NG sample value is smaller than OK sample value, enter **255** in **Upper** field and the **intermediate value** in **Lower** field.
Averaging X [dot], Averaging Y [dot]	Default is **4**. Enlarge the value to reduce the effective of dusty or noise.
Option	Enter **0**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-
The graph in the lower right side of the window	The **Histogram of Luminance** bar graph shows the number of pixels every brightness levels.

Table 1-13 Parameter of Range

1.11.3 Setting Procedure of Shift Inspection

Step1: Select a lighting that the brightness level difference between OK and NG clear from the **Lighting** drop-down list.

Step2: Check the OK brightness level.

NOTE Sample value is the brightness level range of the inspection window.

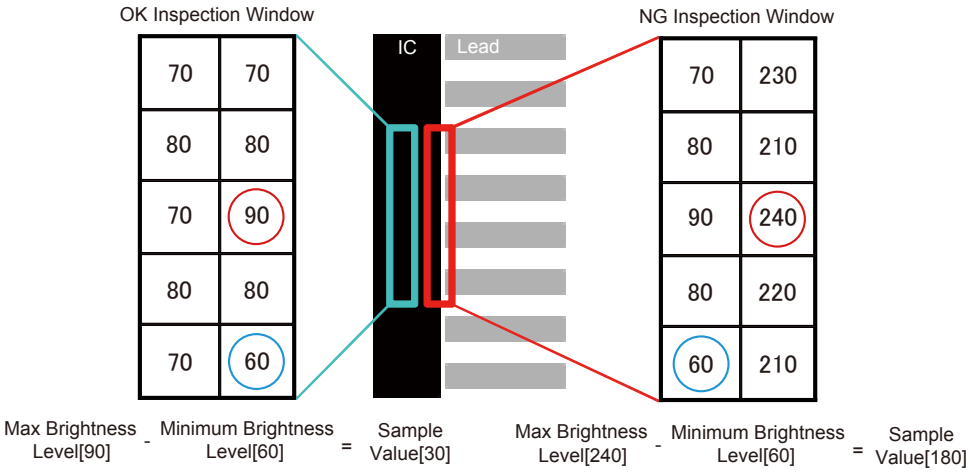


Figure 1-30 Calculation of Sample Value

Step3: Check the NG brightness level. Set the value in between the OK sample value and the NG sample value as OK range.

Step4: Calculate a value intermediate between OK sample value and NG sample value.

CAUTION Change the lighting if there is no difference between OK sample value and NG sample value with default lighting.

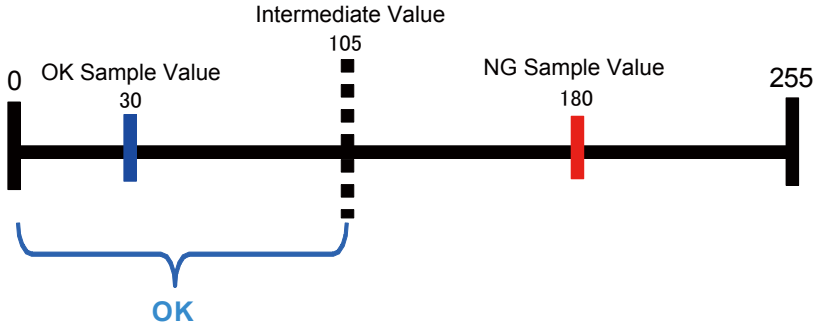


Figure 1-31 Calculation of Intermediate Value

Step5: If OK sample value is smaller than NG sample value, enter the **intermediate value** in **Upper** field and **0** in **Lower** field. If NG sample value is smaller than OK sample value, enter the **255** in **Upper** field and the **intermediate value** in **Lower** field.

Step6: Enter appropriate vector in Shift field according to the vector used in **Memorize to** in Adjust window.

Step7: Press **Inspect**. Check if the inspection is completed properly.

1.11.4 Setting Procedure of Polarity Inspection

Step1: Select a lighting that a polarity is visually clear from the **Lighting** drop-down list.

Step2: Adjust the **Range** inspection window position as surrounding the polarity.

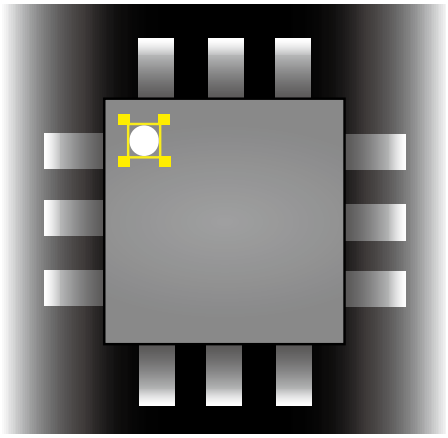


Figure 1-32 The Inspection Window for Polarity Inspection

Step3: Check if the sample value is in OK range. If it is out of OK range, adjust value in **Lower** field.

NOTE Sample value is the subtracted value between maximum and minimum brightness level inside the inspection window.

Step4: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step5: Press **Inspect**. Check if the inspection is completed properly.

1.11.5 Use of Average

Polarity inspection by using Average provides higher accuracy. In case of SOP, set the inspection window on point symmetric of the polarity by using point-symmetric copy and subtract the brightness level of both inspection windows to reduce the effective of dusty or noise. In case of QFP, set the inspection window on four corner of component by using X-symmetric copy, Y-symmetric copy and point-symmetric copy and subtract the brightness level of each inspection window.

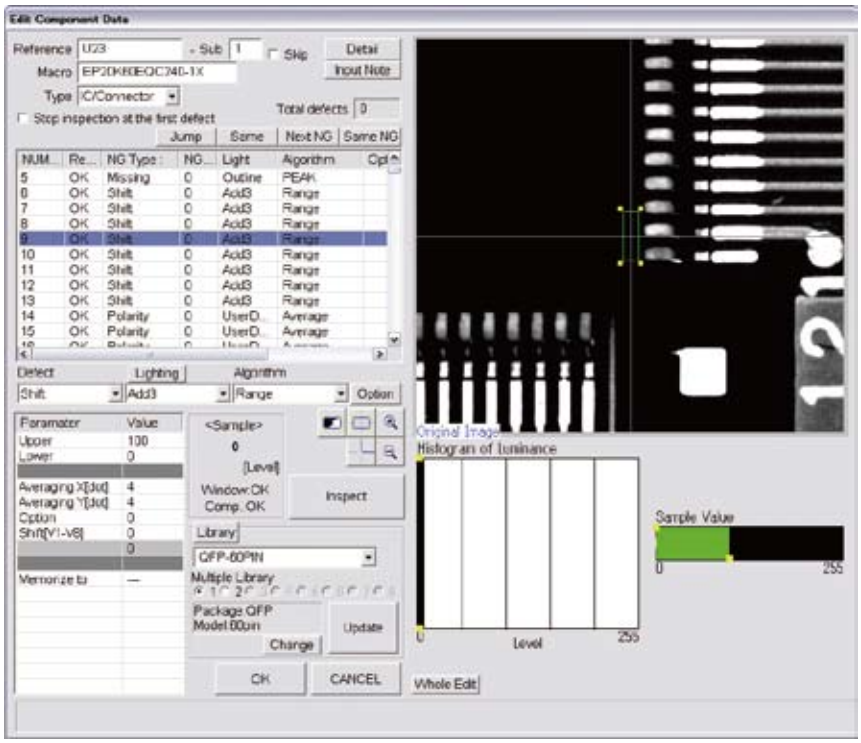


Figure 1-33 Average(Polarity)

Parameter	Description
Lighting	Select a lighting that the brightness level difference between the polarity and the surface is visually clear.
Algorithm	This inspection use **Average** and **Mem1-Mem2**.
Upper, Lower	Enter **255** in **Upper** field and **0** in **Lower** field of **Average**. If brightness level of polarity is higher than brightness level of component body, enter **255** in **Upper** field and **1** in **Lower** field of **Mem1-Mem2**. If brightness level of polarity is lower than brightness level of component body, enter **-1** in **Upper** field and -**255** in **Lower** field.
Shift[V1-V8]	This parameter is displayed only **Average**. Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memory1[M1-M8], Memory2[M1-M8]	This parameter is displayed only **Mem1-Mem2**. If SOP is inspected, enter **M1** in **Memory1** field and **M2** in **Memory2** field. If QFP is inspected, make three **Mem1-Mem2** inspection window. Enter **M1** in **Memory1** field in the three inspection window. Enter **M2** in **Memory2** in the first inspection window, **M3** in **Memory2** in the second inspection window, and **M4** in **Memory2** in the third inspection window.
Memorize to	If SOP is inspected, enter **M1** or **M2** in two **Average** inspection window to register the brightness level. **Mem1-Mem2** calculates **M1** minus **M2**. If QFP is inspected, enter **M1**, **M2**, **M3**, or **M4** in four **Average** inspection window to register the brightness level. **Mem1-Mem2** calculates **M1** minus **M2**, **M1** minus **M3**, and **M1** minus **M4**.

Table 1-14 Parameter of Average

1.11.6 Setting Procedure of Average(SOP)

Step1: Select a lighting that a polarity is visually clear from the **Lighting** drop-down list.

Step2: Change the algorithm of **Polarity** to **Average**.

Step3: If polarity figure is circle, change the inspection window figure to circle. Press **Option** in the right side of **Algorithm**. Check **Use non-rectangle window** and **Circle Window** and press **OK**.

Step4: Adjust inspection window size of **Polarity** with polarity mark.

CAUTION Change the lighting if there is no difference between polarity and component body with default lighting.

Step5: Enter **255** in **Upper** field, **0** in **Lower** field, and **M1** in **Memorize to** field.

Step6: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step7: Right-click on **Average** in the inspection item list and select **Point-Symmetric Copy**.

Step8: Enter **M2** in **Memorize to** field which made on Step7.

Step9: Right-click on Average which made on Step7 in the inspection item list and select **Copy Window**.

Step10: Change the algorithm which made on Step9 to **Mem1-Mem2**.

Step11: 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.

Step12: Enter **M1** in **Memory1** field and **M2** in **Memory2** field.

Step13: Press **Inspect**. Check if the inspection is completed properly.

1.11.7 Setting Procedure of Average(QFP)

Step1: Refer to step1 to 6 of **1.11.6 Setting Procedure of Average(SOP)**.

Step2: Right-click on **Average** in the inspection item list and select **Point-Symmetric Copy** to copy the inspection window onto polarity.

Step3: Select two **Average** inspection window by pressing Shift and select **Y-Symmetric Copy** from right-click.

Step4: Change the **Memorize to** of **Average** inspection window. Enter **M2**, **M3**, or **M4** in **Memorize to** field which made on Step2 and Step3.

Step5: Right-click on **Average** which made on Step3 in the inspection item list and select **Copy Window**.

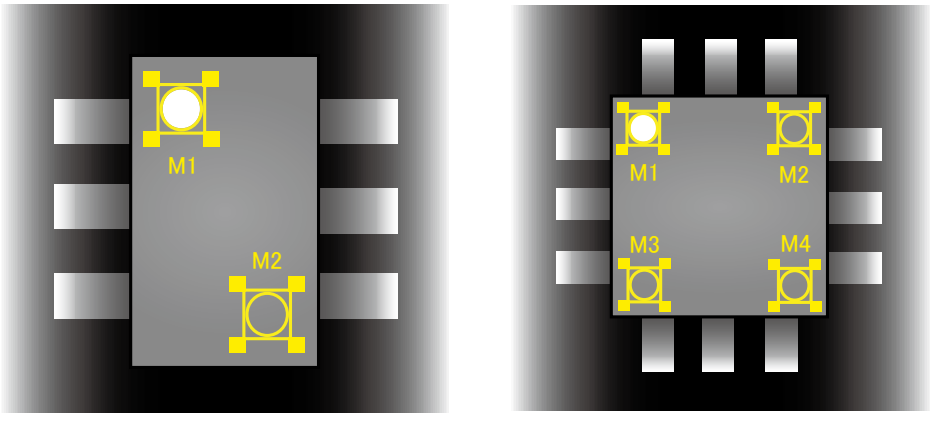
Step6: Change the algorithm which made on Step5 to **Mem1-Mem2**.

Step7: Right-click on **Average** which made on Step5 in the inspection item list and select **Copy Window**. Repeat the same step twice.

Step8: Change the **Memory2** of **Mem1-Mem2** inspection window. Enter **M2**, **M3**, or **M4** in **Memory2** filed which made on step7.

Step9: Change the **Upper** field and **Lower** field of **Mem1-Mem2**. 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.

Step10: Press **Inspect**. Check if the inspection is completed properly.



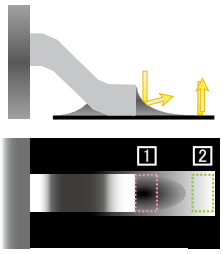
(a)SOP (b)QFP

Figure 1-34 The Inspection Window for Polarity Inspection

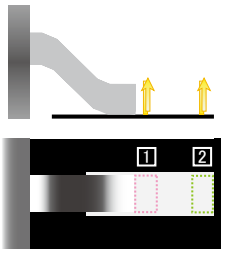
1.12 LiftedLead

1.12.1 Inspection Overview

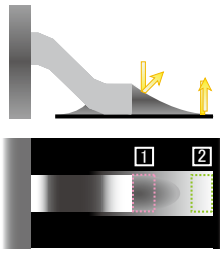
LiftedLead is the algorithm to calculate brightness level of solder in the lead end of IC components and in the pad end. In ideal solder joints form, the TopLight displays lower brightness level in pad lead area and higher brightness level is pad end area. LiftedLead is suitable for solder inspection of IC components. According the solder shape, brightness level in pad lead area will be higher.
In this case, if the brightness level is higher in pad end area, the result will be OK.

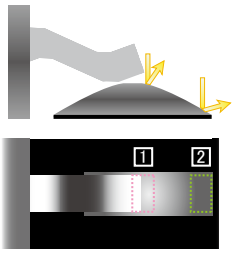


(a) The result will be OK, if the brightness level of 1(Lead end) is lower. 2(Pad end) does not inspect.



(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 1-35 Inspection of LiftedLead

1.12.2 Parameter Setting

Figure 1-36 LiftedLead

Parameter	Description
Lighting	Select **TopLight**.
Algorithm	Select **LiftedLead**.
Length, Width	Size of inspection window. The enter value is automatically changed after the inspection window is resized.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 1-15 Parameter 1 of LiftedLead

Parameter	Description
LEVEL1, LEVEL2	Set the brightness level of no fillet shape. Enter **255** in **LEVEL1** field. **LEVEL2** is lower brightness level defined as NG(Default is 90). Enter the bigger value in **LEVEL2** field if the OK sample value is higher and the result is NG.
OK Upper, Upper, Lower	The result is the percentage of specified brightness level as NG inside inspection window. The result will be NG, if sample value is higher than **OK Upper**. The result will be OK, if sample value is in the range between **Upper** and **Lower**. If sample value is in the range between **OK Upper** and **Upper**, pad end inspection will be done. Refer to **Table 1-17 Parameter 3 of LiftedLead(Pad Black/White)** to see detail settings of solder inspection at pad end area. Default of **OK Upper** is **60**, **Upper** is **10**. Enter **0** in **Lower** field.
Length	Width of the inspection area for solder inspection(surrounded by pink dotted line).
Search Range	Enlarge the value, automatically detecting the inspection area where the solder in the lead end(automatically picking between two pink lines) will extended.
Search Light, Inspection Light	Both **Search Light** and **Inspection Light** are fixed to **TopLight**.
Sample	The percentage of specified brightness level as NG inside window in pad lead area.

Table 1-16 Parameter 2 of LiftedLead (Solder Black/White)

Parameter	Description
LEVEL1, LEVEL2	If it is difficult to inspect solder condition only in pad lead area, the pad end inspection will be done. 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 1-35 **Inspection of LiftedLead**). Set the brightness level of LiftedLead. Enter smaller value in **LEVEL1** field, if the OK sample value is lower and result is NG. **LEVEL1** is the upper brightness level specified as NG. The default is **100**. Enter **0** in **LEVEL2** field.
Upper, Lower	Tolerance of the sample value. The result will be OK, If sample value is in the range between **Upper** and **Lower**. Default of **Upper** is **10**. Enter **0** in **Lower** field.
Length	Width of the inspection area for lead end inspection(surrounded by green dotted line).
Search Range	Enlarge the value, automatically detecting the inspection area where the solder in the pad end(automatically picking between two green lines) will extended.
Search Light, Inspection Light	**Search Light** is fixed to SideLight. **Inspection Light** is fixed to **TopLight**.
Sample	The percentage of specified level as NG inside window in pad end area. In case the inspection is done in pad lead area, inspection at the pad end area is skipped and **-1** will be displayed.

Table 1-17 Parameter 3 of LiftedLead (Pad Black/White)

1.12.3 Setting Procedure

Step1: Select **TopLight** from the **Lighting** drop-down list.

Step2: Set search range for solder joint area. After changing **Search Range** value in **Solder Black/ White**, press **Inspect**. Check if the pink dotted window is located on solder joint area.

Step3: Set the inspection area of solder in the lead end. After changing **Length** value in **Solder Black/White**, press **Inspect.** Adjust the size of the pink dotted window.

Step4: Check if the OK **Sample** value in **Solder Black/White** is in the between **Upper** and **Lower**. Enter bigger value in **LEVEL2** if OK sample value is out of **Upper** and **Lower** range.

NOTE The percentage of specified brightness level as NG is displayed.

Step5: Set search area for pad end area. After changing **Search Range** value in **Pad Black/White**, press **Inspect**. Check if the green dotted window is located on pad end area.

Step6: Set the inspection area of solder in the pad end. After changing **Length** value in **Pad Black/ White**, press **Inspect**. Adjust the size of the green dotted window.

Step7: Check if the OK **Sample** value in **Pad Black/White** is in the between **Upper** and **Lower**. Enter smaller value in **LEVEL1** if OK sample value is out of **Upper** and **Lower** range.

Step8: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step9: Right-click the **LliftedLead** inspection item list and select **Parameter Copy** to copy the parameter to other leads.

Step10: Press **Jump** in the upper left side of the window and adjust inspection window size of the corner leads in each.

Step11: Press **Inspect**. Check if the inspection is completed properly.

1.12.4 LiftedLead Setting Window

Press **Set** in the right side of **Algorithm**. The window shown in Figure 1-38 appears. The parameter can be set in this window. Press **Apply** to apply parameter. After all the settings are completed, press **OK**.

Figure 1-37 LiftedLead setting

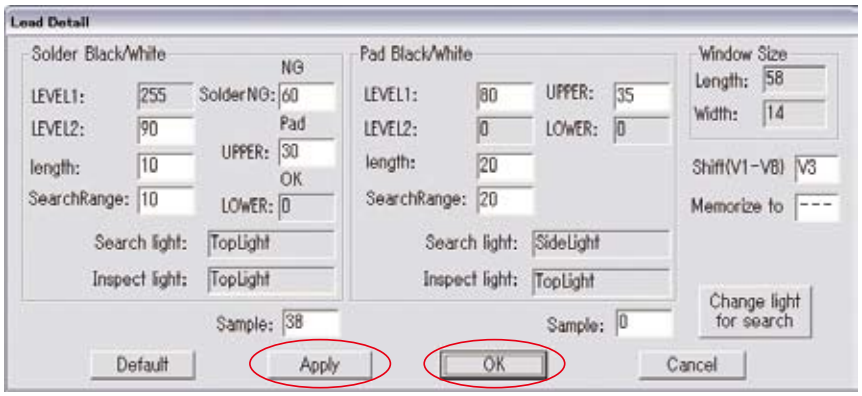


Figure 1-38 Detail settings of LiftedLead

1.13 ASLeadLength

1.13.1 Inspection Overview

ASLeadLength is the algorithm to inspect leads length of IC components by measuring length from lead base area to lead end area.

Scanning with TopLight, brightness level of lead base area and lead end area are bright.

If lifted lead occurs, lead length is longer compare to normal condition.

If sample value is within OK range, the result will be OK.

ASLeadLength is suitable for lifted lead of IC components.

1.13.2 Parameter Setting

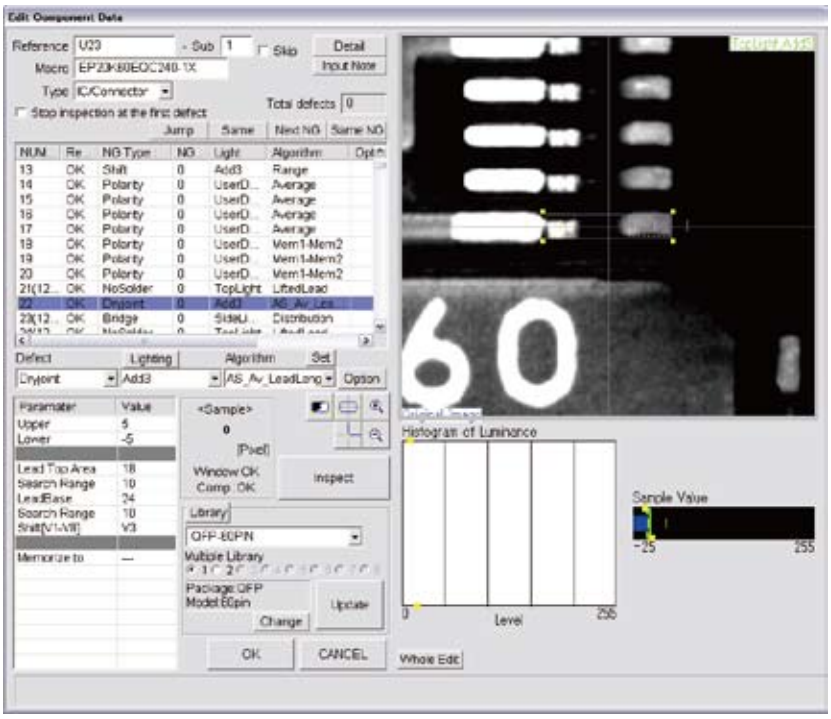


Figure 1-39 ASLeadLength

Parameter	Description
Lighting	Select arbitrarily lighting.
Algorithm	Select **ASLeadLength**.
Upper, Lower	Check sample value of OK lead. Enter the value(sample value plus 20) in **Upper** field and the value(sample value minus 20) in **Lower** field.
Lead Top Area	The inspection window size of lead end area (=yellow dotted line).
Search Range	Default is **10**. Enter the bigger value to extend the search range of the lead end area.
LeadBase	The inspection window size of lead base area (=pink dotted line).
Search Range	Default is **10**. Enter the bigger value to extend the search range of the lead base area.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 1-18 Parameter of ASLeadLength

1.13.3 Setting Procedure

Step1: Set search range for the lead end area. After changing parameter of **Search Range** below **Lead Top Area**, press **Inspect**. Check if the lead end area is surrounded by yellow dotted line automatically or not.

Step2: Set inspection window size for lead end area. After changing parameter of **Lead Top Area**, press **Inspect**. Adjust the size of the yellow dotted window.

Step3: Set search range for the lead base area. After changing parameter of **Search Range** below **LeadBase**, press **Inspect**. Check if lead base area is surrounded by pink dotted line automatically or not.

Step4: Set inspection window size for lead base area. After changing parameter of **LeadBase**, press **Inspect**. Adjust the size of the pink dotted window.

Step5: Check **Sample Value** of OK lead. Enter the value(**Sample Value** plus 20) in **Upper** field and the value(**Sample Value** minus 20) in **Lower** field.

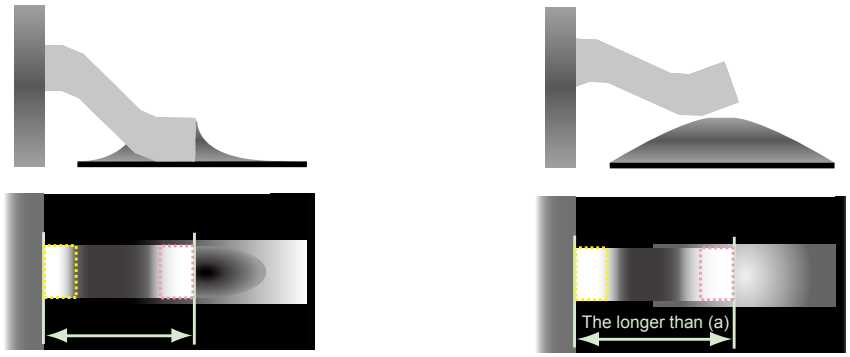
NOTE Sample value is distance of lead end area to lead base area.

Step6: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step7: Right-click on **ASLeadLength** in the inspection item list and select **Parameter Copy** to copy parameter to the other leads.

Step8: Press **Jump** in the upper left side of the window and adjust inspection window size of the corner leads in each.

Step9: Press **Inspect**. Check if the inspection is completed properly.



(a) Normal (b) Lifted Lead

Figure 1-40 Lifted Lead Inspection by ASLeadLength

1.14 AS_Av_LeadLength

1.14.1 Inspection Overview

AS_Av_LeadLength is the algorithm to inspect leads length of IC components by measuring length from lead base area to lead end area.
Scanning with TopLight, brightness level of Lead base area and lead end area are bright.
If lifted lead occurs, lead length is longer compare to normal condition.
Sample value of ASLeadLength is lead length but sample value of AS_Av_LeadLength is average of lead length on the same line. If sample value is within OK range, the result will be OK.
AS_Av_LeadLength is suitable for lifted lead of IC components.

CAUTION It is also not valid in combination with IC_Solder2.

1.14.2 Parameter Setting

Figure 1-41 AS_Av_LeadLength

Parameter	Description
Lighting	Select arbitrarily lighting
Algorithm	Select **AS_Av_LeadLength**.
Upper, Lower	Enter **5** in **Upper** field and **-5** in **Lower** field.
Lead Top Area	The inspection window size of lead base area(=yellow dotted line).
Search Range	Default is **10**. Enter bigger value to extend search range of the lead end area.
LeadBase	The inspection window size of lead base area(=pink dotted line).
Search Range	Default is **10**. Enter bigger value to extend search range of the lead base area.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 1-19 Parameter of AS_Av_LeadLength

1.14.3 Setting Procedure

Step1: Set search range for the lead end area. After changing parameter of **Search Range** below **Lead Top Area**, press **Inspect**. Check if lead end area is surrounded by yellow dotted line automatically or not.

Step2: Set inspection window size for lead end area. After changing parameter of **Lead Top Area**, press **Inspect**. Adjust the size of the yellow dotted window.

Step3: Set search range for the lead base area. After changing parameter of **Search Range** below **LeadBase**, press **Inspect**. Check if lead base area is surrounded by pink dotted line automatically or not.

Step4: Set inspection window size for lead base area. After changing parameter of **LeadBase**, press **Inspect**. Adjust the size of the pink dotted window.

Step5: Enter **5** in **Upper** field and **-5** in **Lower** field.

NOTE Sample value is distance of lead end area to lead base area.

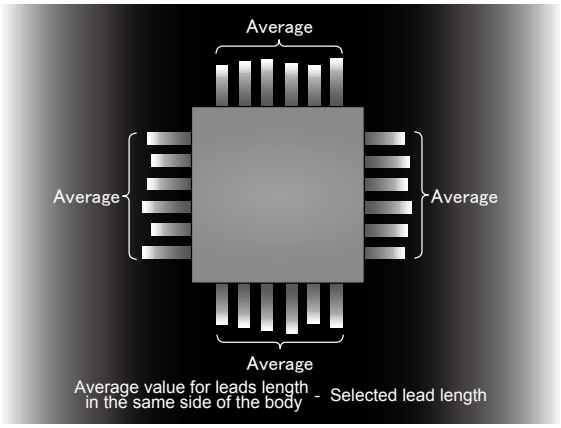


Figure 1-42 Lifted lead inspection by AS_Av_LeadLength

Step6: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step7: Right-click on **AS_Av_LeadLength** in the inspection item list and select **Parameter Copy** to copy parameter to the other leads.

Step8: Press **Jump** in the upper left side of the window and adjust inspection window size of the corner leads in each.

Step9: Press **Inspect**. Check if the inspection is completed properly.

1.15 Distribution

1.15.1 Inspection Overview

Distribution is the algorithm to detect bridge of IC components.

Set the inspection window between leads. If bridge occurs between leads, the solder which is brighter than PCB acrosses lateral direction of the inspection window.

The inspection window will be separated to several windows in longitudinal direction. The differences between maximum minus minimum brightness level in each separated windows are calculated.

The sample value is the minimum value calculated among separated window.

1.15.2 Parameter Setting

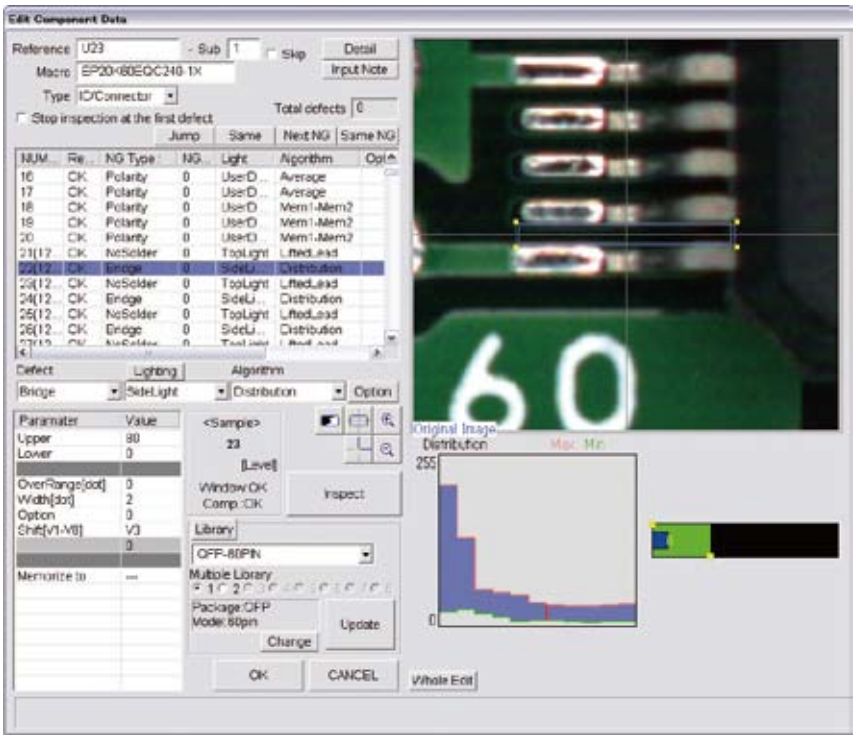


Figure 1-43 Distribution

Parameter	Description
Lighting	Select **SideLight**. Change the lighting to **LowLight**, if flux is detected as bridge with SideLight.
Algorithm	Select **Distribution**.
Upper, Lower	Set OK range.
OverRange[dot]	Enter **0**.
Width[dot]	Default is **2**. Set the bigger value to reduce noise.
Option	Enter **0**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 1-20 Parameter of Distribution

1.15.3 Setting Procedure

Step1: Select **SideLight** from the **Lighting** drop-down list.

NOTE Change the lighting to **LowLight**, if flux is detected as bridge with SideLight.

Step2: Surround inspection window from lead base to pad end. Adjust lateral direction of the inspection window with lead pitch.

Step3: Enter value in **Upper** field and **Lower** field.

NOTE **80** is for **Upper** and **0** is for **Lower** as a reference value.

Step4: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step5: Right-click on **Distribution** in the inspection item list and select **Parameter Copy** to copy parameter to the other leads.

Step6: Lead pitch is adjusted automatically by pressing **Jump** in the upper left side of the window.

Step7: Press **Inspect**. Check if the inspection is completed properly.

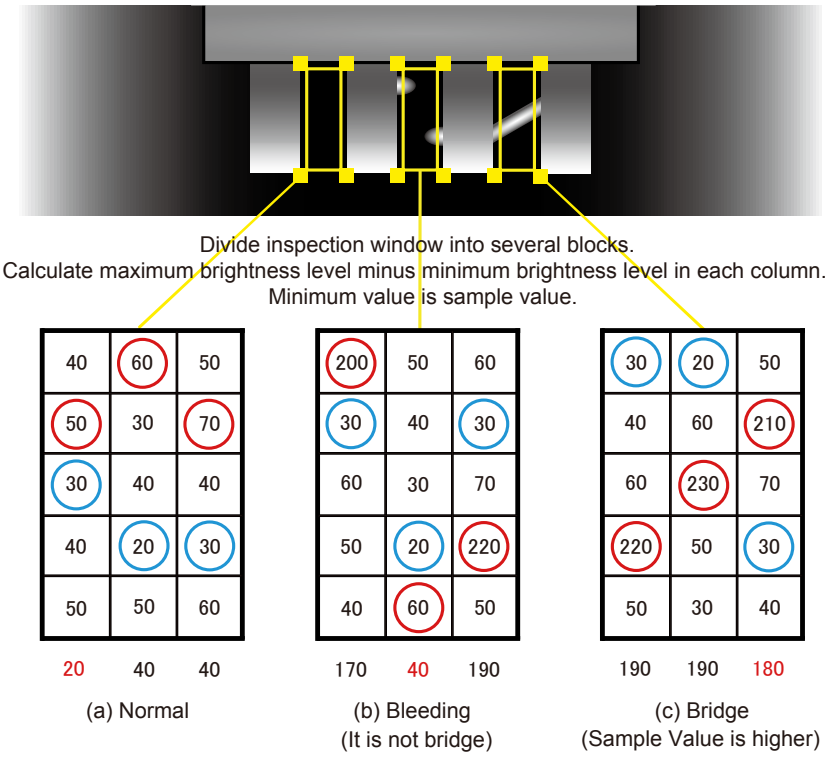


Figure 1-44 Bridge Inspection by Distribution

1.16 IC_Solder2

1.16.1 Inspection Overview

IC_Solder2 is the algorithm to inspect lead's length and shift, solder condition and lifted lead in one inspection window with high accuracy.

It automatically locates "inspection points" (lead end, lead base, pad end) on an IC component. Inspection flow is as following, lead length, lead shift, solder, copper, and lifted lead.

CAUTION If lead length or lead shift inspection is NG, all the following inspections, solder, copper and lifted lead inspections are skipped.

CAUTION IC_Solder2 is not available for two lighting system machine. It is also not valid in combination with AS_Av_LeadLength.

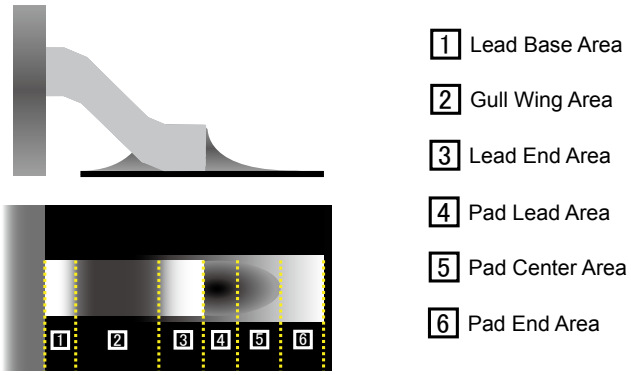


Figure 1-45 Inspection of IC_Solder2

1.16.2 Parameter Setting

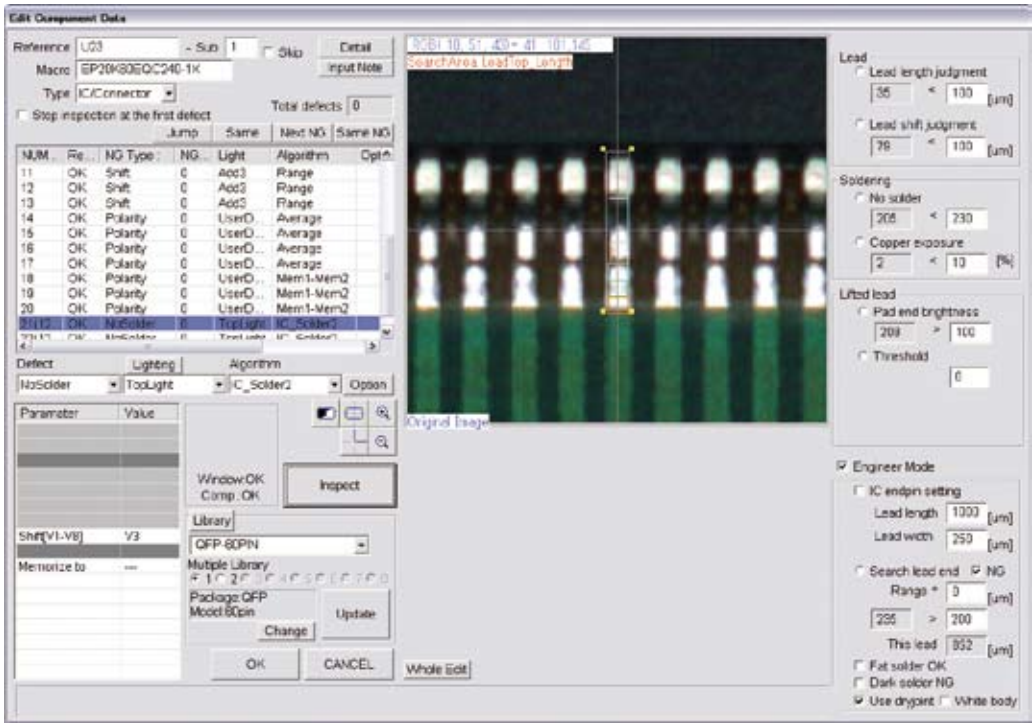


Figure 1-46 IC_Solder2

Parameter	Description
Lighting	Select **SPECT**.
Algorithm	Select **IC_Solder2**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 1-21 Parameter1 of IC_Solder2

Parameter	Description
Lead length judgement	Set inspection parameters for lead length inspection. Refer to **1.16.3 Setting Procedure** Step5 for details.
Lead shift judgement	Set inspection parameters for lead shift inspection. Refer to **1.16.3 Setting Procedure** Step6 for details.

Table 1-22 Parameter3 of IC_Solder2 (Lead Inspection)

Parameter	Description
No solder	Set inspection parameters for solder inspection. Refer to **1.16.3 Setting Procedure** Step7 for details.
Copper exposure	Set inspection parameters for copper inspection. Refer to **1.16.3 Setting Procedure** Step8 for details.

Table 1-23 Parameter3 of IC_Solder2 (Solder Inspection)

Parameter	Description
Pad end brightness	Set inspection parameters for lifted lead inspection. Refer to **1.16.3 Setting Procedure** Step9 for details.
Threshold	Set inspection parameters for lifted lead inspection. Refer to **1.16.3 Setting Procedure** Step10 for details.

Table 1-24 Parameter4 of IC_Solder2 (Lifted Lead Inspection)

Parameter	Description
Engineer Mode	Engineer Mode enable to set detailed setting for parameters. The check mark to set parameter with bar chart.
Lead length	Enter measured value in lead length.
Lead width	Enter measured value in lead width.
Range	Search range for edge between solder and lead end.
This lead	Display measured lead length.
Fat solder OK	Judge heavy solder amount as OK.
Dark solder NG	Judge small solder amount as NG.
Use dryjoint	Detect dryjoint.
White body	It is useful to search component body which is brighter than lead base.

Table 1-25 Parameter5 of IC_Solder2 (Detail Setting)

NOTE Check a radio button and corresponding histogram shows in the lower right side of the display.

NOTE When press **Inspect**, colored mark showed in the left side of the radio button If it's NG. Red refers NG and white refers skip inspection.

1.16.3 Setting Procedure

Step1: Adjust the size of the inspection window to surround the lead base to pad end. Window width should be same as pad width.

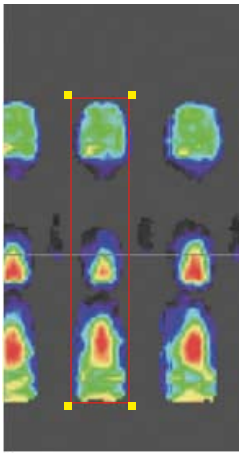


Figure 1-47 Inspection window of IC_Solder2

Step2: Lead length and width will be displayed in the upper right corner of the window if left-click a lead base and drag the pointer to opposite corner of the lead end. Enter window size shown in the upper right side of the display in **Lead length** and **Lead width**.

CAUTION Measure lead size at next lead of inspection window otherwise the inspection window is misaligned.

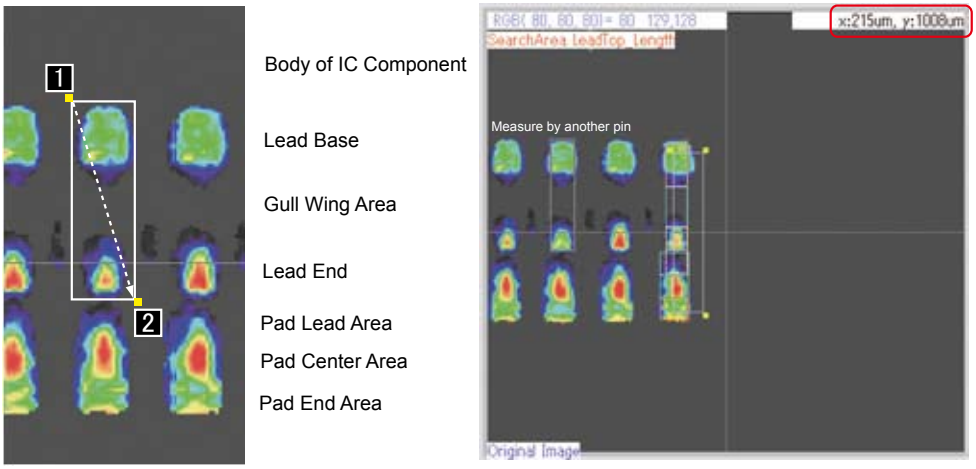


Figure 1-48 Enter Lead length and Lead width

Step3: It automatically locates the edge of lead end area and pad lead area by searching the edge of lead end and solder. Check if the pink dotted area includes both edge of the lead end area and solder. If the search range is too small or too large, change **Range** value to adjust search area size.

NOTE **NG** should be always checked.

NOTE The center of the search area is at the lead end. Adjust search area size by changing **Range** value.

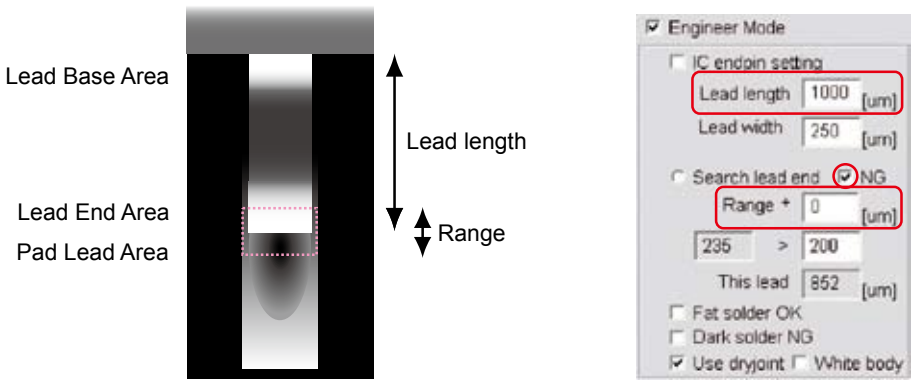
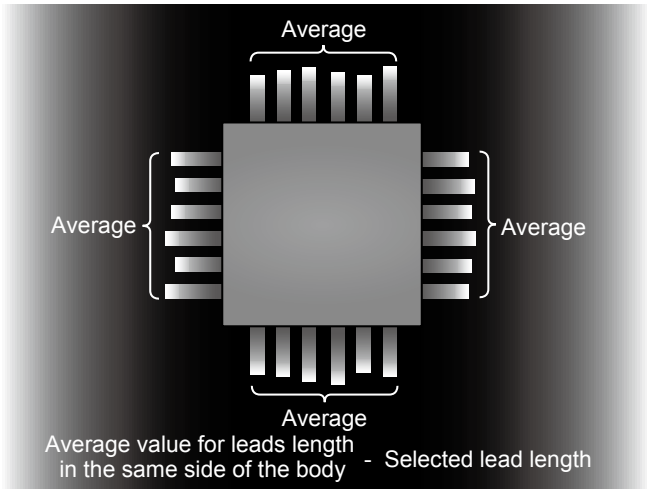


Figure 1-49 Adjust Search Range

Step4: Enter brightness different level between lead end and pad lead area in the lower right side of **Range**. In search area, the alogorithm calculates maximum brightness level minus minimum brightness level as sample value(Sample value is shown in the lower left side of **Range**). If the sample value is larger than OK range, lead end will be located. Default is **200**. Depends on solder condition, adjust parameter.

NOTE In case lead end is covered with heavy solder, fillet area has brighter brightness level and the difference between lead end and pad lead is smaller. In this case, enter search range lower than **200**.

Step5: This is the parameter setting for lead length inspection. It calculates the average value of leads length in the same side of the component. Then the different amount between average length and actual lead length is shown as sample value(Gray text-box in the lower left side of **Lead length judgement**). If the sample value is lower than OK range, the result wil be OK. The inspection logic is same as **1.14 AS_Av_LeadLength**.
Default is **100[μm]**. If necessary, change the value depends on inspection accuracy.



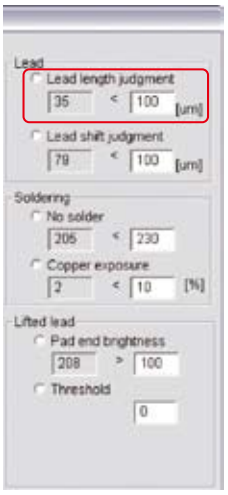
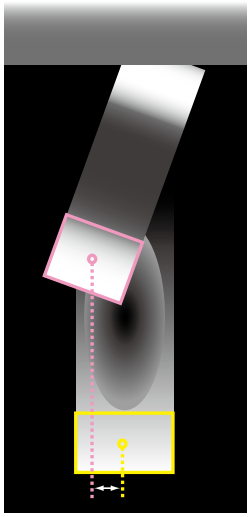


Figure 1-50 Lead length

Step6: This is the parameter setting of lead shift inspection. The shift amount from lead end area and pad end area is shown as sample value(Gray text-box in the lower left side of **Lead shift judgement**). If the sample value is lower than OK range, the result will be OK. Default is **100[μm]**. If necessary, change the value depends on inspection accuracy.



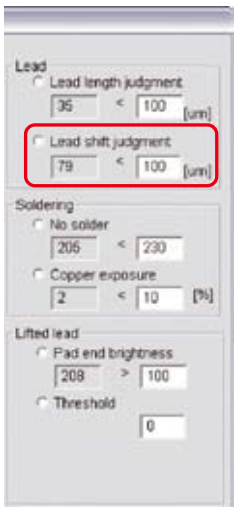
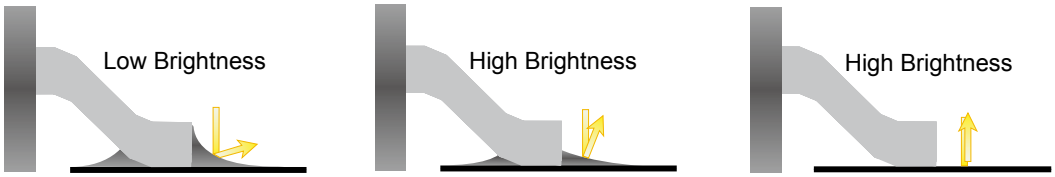


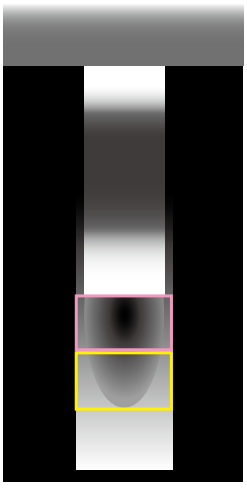
Figure 1-51 Lead shift

Step7: This is the parameter setting for solder inspection. It calculates average brightness level in pad lead area and pad center area as sample value. If the sample value is lower than OK range, the result will be OK. Default is **230**. If necessary, change the value depends on inspection accuracy.

NOTE The average brigthness level is lower in case of no solder or insufficient solder.



(a) Normal (b) Insufficient Solder (c) No Solder



Pad Lead Area

Pad Center Area

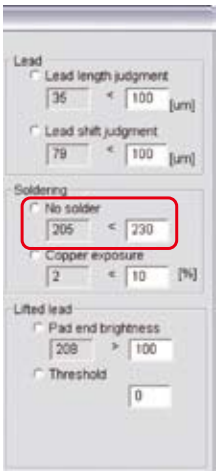
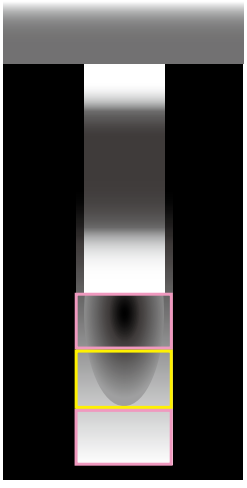


Figure 1-52 Solder Inspection

Step8: This is the parameter for copper exposure inspection. It is useful to detect copper area due to insufficient solder. It calculate the percentage of copper color defined as more than 80% of hue and color saturation and more than 60% of brightness in pad lead, pad center, and pad end area. If the sample value is lower than OK range, the result will be OK. The default is **10%**. If necessary, change the value depends on the solder condition.



Pad Lead Area

Pad Center Area

Pad End Area

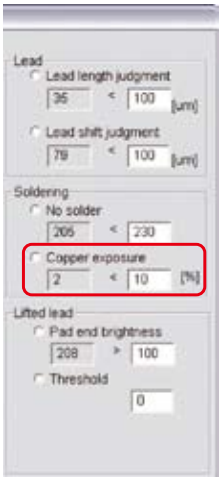


Figure 1-53 Copper Inspection

Step9: This is the parameter of lifted lead inspection. Lifted lead inspection has two steps. First inspection calculates average brightness level in pad end area. If the sample value is higher than OK range, the result will be OK. Default is **100**. If necessary, change the value depend on inspection accuracy. If the first inspection is NG, the second inspection shown in step10 will be done.

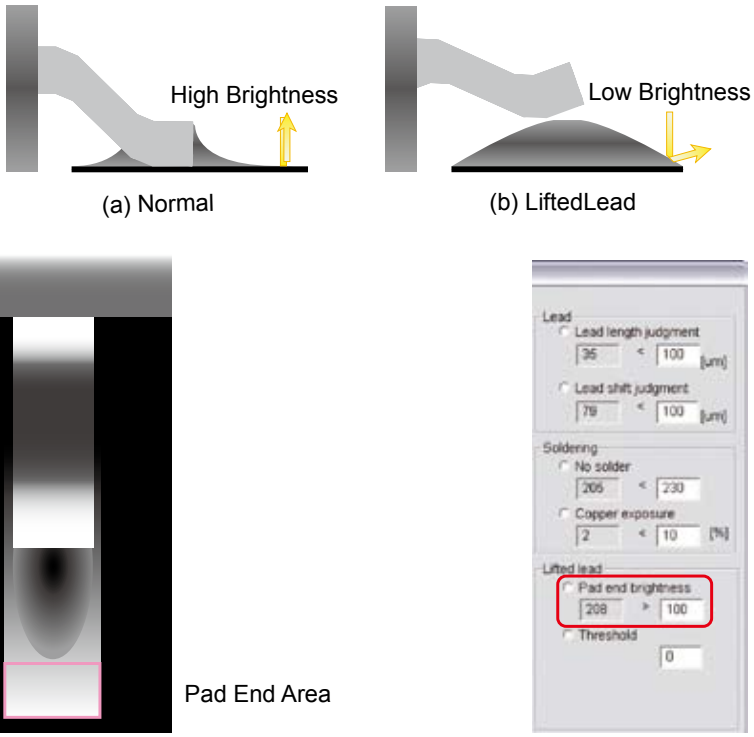
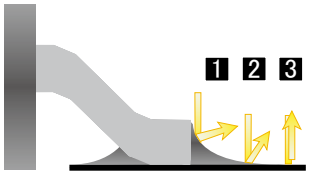


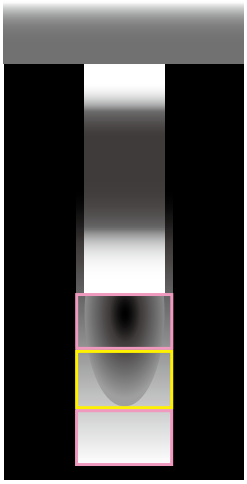
Figure 1-54 Lifted Lead Inspection 1

Step10: If the first inspection shown in Step9 is NG, the second inspection will be done. The comparison brightness level in pad lead, pad center, and pad end area will be shown as sample value. If solder is in good condition, the brightness level is darker in pad lead area and brighter in pad end area. This inspection is separated into two steps. The comparison of brightness level, **the brightness level in pad end area minus pad center area** and **the brightness level in pad end area minus pad lead area**, is shown as sample value in first inspection. If the sample value is larger than **Threshold**, the result will be OK(Default is **0**). If either **the brightness level in pad end area minus pad center area** and **the brightness level in pad end area minus pad lead area** is NG, the second inspection, **the brightness level in pad center area minus pad lead area**, will be done. If the sample value is larger than **Threshold**, the result will be NG. If necessary, change the value depends on the solder condition.



(1) Calculate following equation. If the result will be NG, proceed to (2).
Pad End Area(3) - Pad Center Area(2) > Setting Value(Default is 0)
Pad End Area(3) - Pad Lead Area(1) > Setting Value(Default is 0)

(2) Calculate following equation. If the result will be NG, judged as lifted lead.
Pad Center Area(2) - Pad Lead Area(1) > Setting Value(Default is 0)



Pad Lead Area

Pad Center Area

Pad End Area

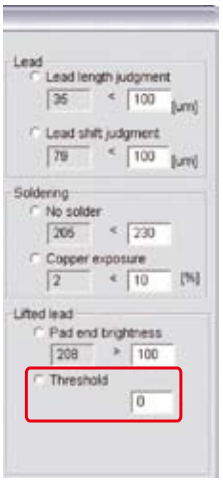
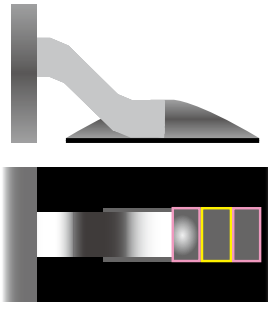


Figure 1-55 Lifted Lead Inspection 2

Step11: If solder volume is extremely high, the brightness level in pad area is darker. In case to judge high-volume-solder as OK, check **Fat solder OK**. If **Fat solder OK** is checked, the lifted lead inspection is skipped. Also after copper exposure inspection, If the average brightness level of pad lead, pad center and pad end area is lower than 100, the result will be OK.



Fat Solder

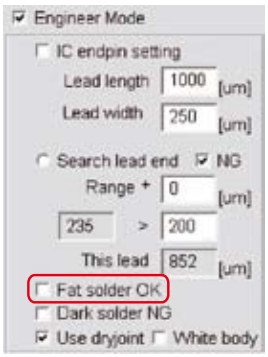
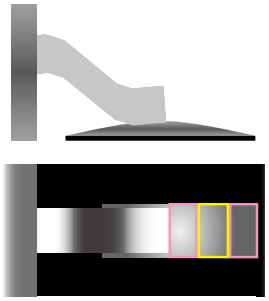


Figure 1-56 Fat solder OK

Step12: If solder volume is extremely low, the solder brightness level in pad end area is darker than pad center area. Check **Dark solder NG** if necessary. The inspection is done as following steps, lead shift, lead bend, no solder, copper exposure, and lifted lead. If **Dark solder NG** is checked, lifted lead inspection will be changed. After copper exposure inspection, the average brightness level in pad lead, pad center, and pad end area is calculated. If the sample value is lower than 100, the result will be NG. In this case, the lifted lead inspection will be skipped.



Dark Solder

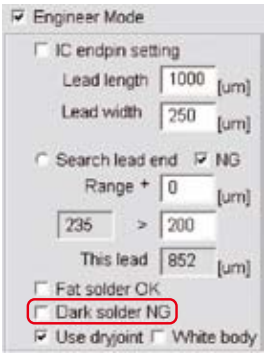
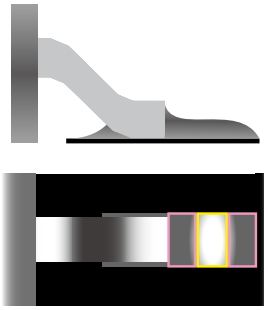


Figure 1-57 Dark Solder NG

Step13: In case of dry joint, the brightness level in pad center area is brighter than pad lead and pad end area. Check **Use dryjoint** if necessary. If **Use dryjoint** is checked and either of brightness level in **the brightness level in pad end area minus pad center area** or **the brightness level in pad end area minus pad lead area** is failed, the result will be NG. In this case, the third inspection, **the brightness level in pad center area minus pad lead area**, is skipped.



Dryjoint

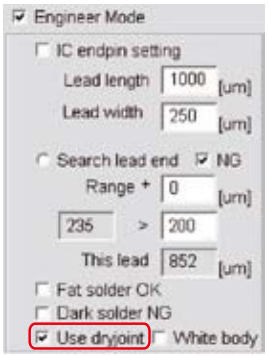


Figure 1-58 Use dryjoint

Step14: Check **White body** in case the body is brighter than leads.

Step15: If you change number of leads, press **Detail** shown in Figure 1-59. The window shown in Figure 1-60 appears.

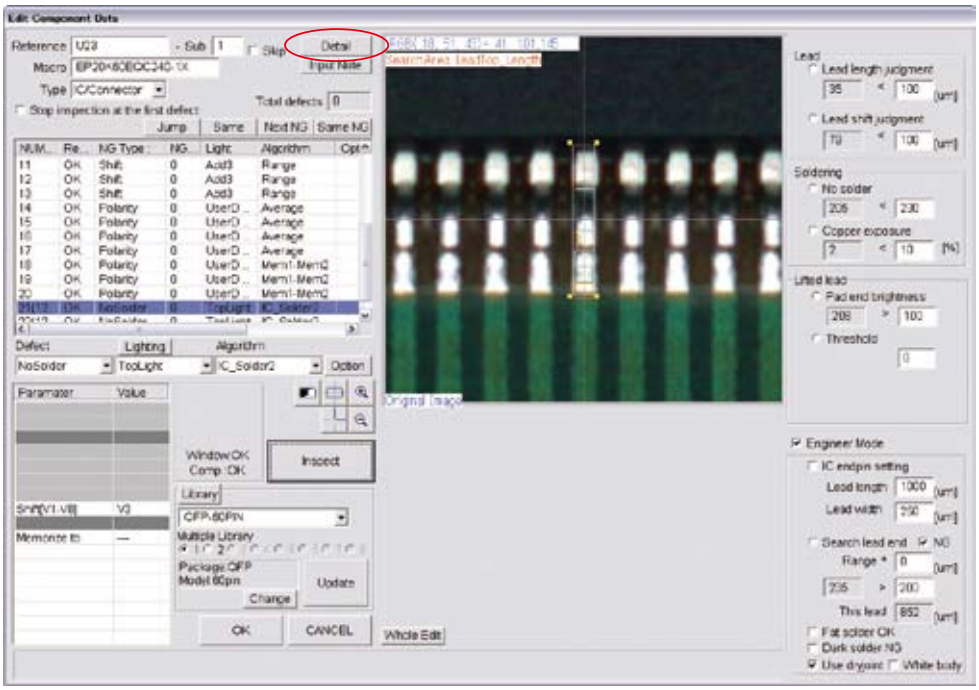


Figure 1-59 Detail

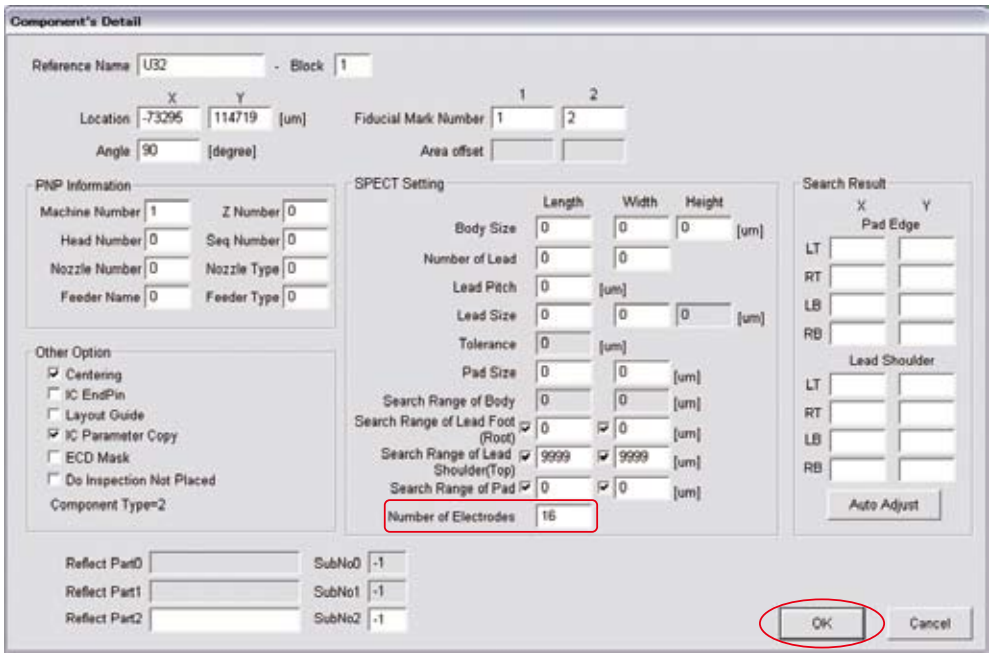


Figure 1-60 Number of Electrodes

Step16: Enter number of leads in **Number of Electrodes** and press **OK**.

Step17: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step18: Press **Inspect**. Check if the inspection is completed properly.

1.17 New_OCR

1.17.1 Inspection Overview

New_OCR is the algorithm to recognize character.
Register target the character before inspection. The sample value is number of characters matched with the target characters.
New_OCR can recognize alphanumeric characters.
New_OCR is suitable for missing and miss-mounting of any components inspection.

1.17.2 Parameter Setting

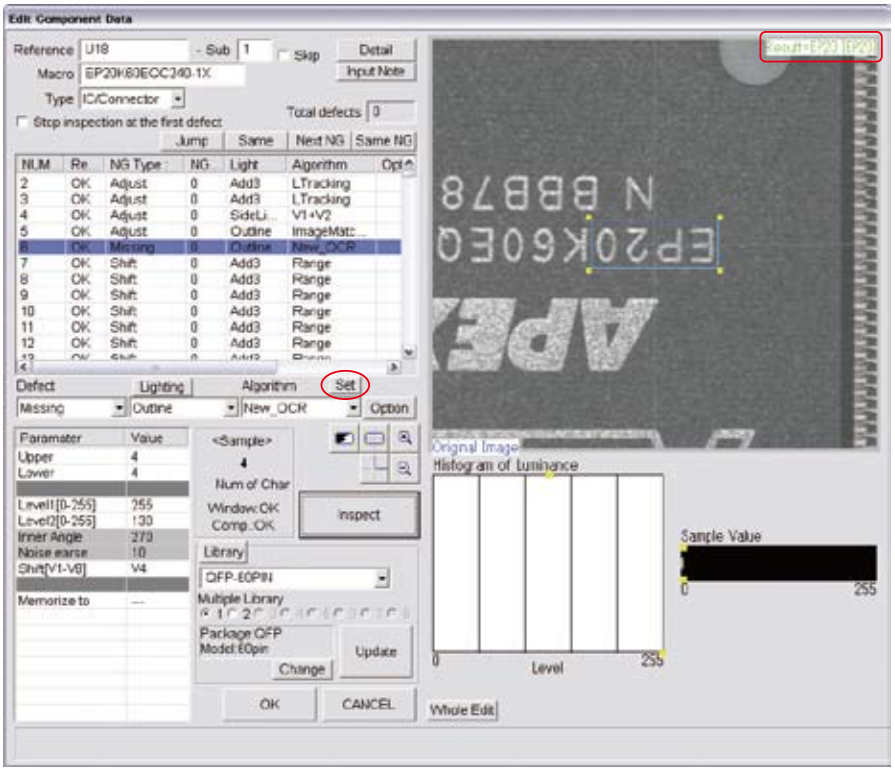


Figure 1-61 New_OCR

Parameter	Description
Lighting	Select a lighting that characters are visually clear.
Algorithm	Select **New_OCR**.
Upper, Lower	After setting parameters in another window, the recognized number of characters is reflected in the **Upper** value and **Lower** value. If the number of target characters recognized characters are the same, the result will be OK.
level1[0-255], level2[0-255], Inner Angle, Noise erase	No needs to setting. The entered parameter values in Figure 1-62 window will be applied.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window. Enter **V4** to reflect the amount of misalignment calculated by **ImageMatchEx**.
Memorize to	-

Table 1-26 Parameter of New_OCR

1.17.3 Setting Procedure

Step1: Select a lighting that the characters are visually clear from the **Lighting** drop-down list.

Step2: Adjust the size of the inspection window to surround the target characters.

Step3: Press **Set** in the right side of **Algorithm**. The window shown in Figure 1-62 appears.

Figure 1-62 Setting window of New_OCR

Step4: Adjust the character angle by **Rotation Degree** if the character is not upright.

Step5: Adjust the luminosity and the noise to recognize a character clearly. Adjust the **Bright setting** of **Level1** and **Level2** then press **Apply**, recognition **Result** will be displayed in the right side of **OK Value**. Adjust the parameter to recognize characters correctly. If the recognized characters are noisy, reduce the noise with slide-bar in the right side of **Clear Noise**.

Step6: If the similar characters such as "**1**" and "**l**" or "**0**" and "**O**" is miss recognized, enter similar characters to two text boxes in the right side of **Similar character** and press **Add** to register. Either of characters are recognized the result will be OK. Press **Delete** if remove similar characters.

Step7: If the character is recognized correctly, press **<-**, the recognition result is copy **Result** to **Reference**. Press **OK**.

Step8: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

NOTE Enter **V4** if you use positional correction information on ImageMatchEx. For details, refer to **1.20 ImageMatchEx** for details.

Step9: Press **Inspect** and check if the recognized character is display correctly in the upper right side of the window of Figure 1-61.

1.18 ImageMatchEx

1.18.1 Inspection Overview

ImageMatchEx is the algorithm to inspect for pattern matching inspection.
ImageMatchEx compares resistered image and actual image inside the inspection window and calculate matching rate.
ImageMatchEx can be recognized not only alphanumeric character but also symbol.
ImageMatchEx is suitable for missing or miss-mounting of any components inspection.

NOTE ImageMatchEx can be used for Adjust. This algorithm correct the amount of misalignment of CAD data with the actual position on the components.

1.18.2 Parameter Setting

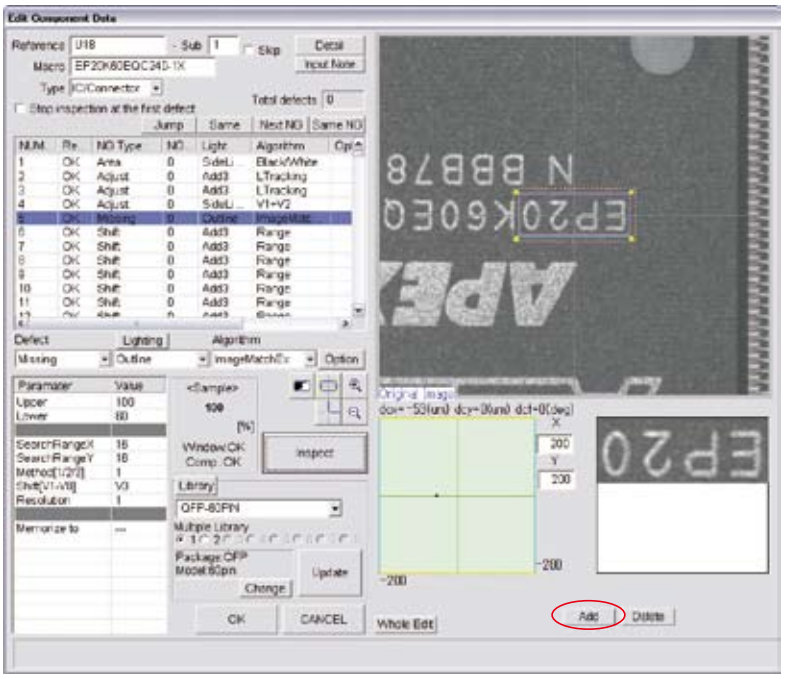


Figure 1-63 ImageMatchEx

Parameter	Description
Lighting	Select a lighting that characters are visually clear.
Algorithm	Select **ImageMatchEx**.
Upper, Lower	Set OK range.
SearchRangeX, SearchRangeY	Set search range(=yellow dotted line). Enter the bigger value to enlarge the search range. If the search range is not appropriate, the calculation time might be long.
Method [1/2/3]	Enter **1**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window. If ImageMatchEx use for Adjust, enter **0.**
Resolution	Enter **1**.
Memorize to	Enter **V4** in **Memorize to** to reflect this amount of misalignment to other algorithm.
The X and Y in the lower right side of the window	Enter **99999**. If ImageMatchEx use for Adjust, enter OK range in X,Y field.

Table 1-27 Parameter of ImageMatchEx

1.18.3 Setting Procedure

Step1: Select a lighting that the characters are visually clear from the **Lighting** drop-down list.

Step2: Adjust the size of the inspection window to surround the target characters.

Step3: Press **Add** in the lower side of the window. The window shown in Figure 1-64 appears and press **Cancel**. The image surrounded by inspection window appears.

NOTE Press **Delete** and **Inspect**, then the reference image is deleted.

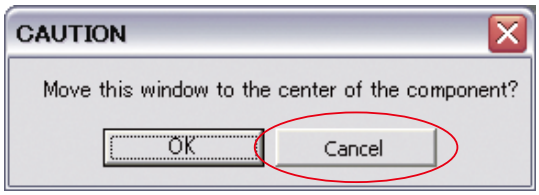


Figure 1-64 Dialog of ImageMatchEx

Step4: Adjust the value of **SearchRangeX** and **SearchRangeY** to define the search range.

Step5: Enter value in **Upper** field and **Lower** field.

NOTE As a guide, **100** for **Upper**, **60** for **Lower**.

Step6: Enter **99999** in **X** field and **Y** field in the lower right side of the window.

NOTE To use ImageMatchEx for position alignment, enter the tolerance of misalignment value to X field and Y field.

Step7: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step8: Enter **V4** in **Memorize to** to reflect this amount of misalignment to other algorithm.

Step9: Press **Inspect**. Check if the inspection is completed properly.

1.19 OCV

1.19.1 Inspection Overview

OCV is the algorithm to inspect for pattern matching inspection.
Register characters of component as font.
Scanned image is inspected by pattern matching with registered image as font.
OCV is suitable for missing and miss-mounting of any components inspection.

1.19.2 Parameter Setting

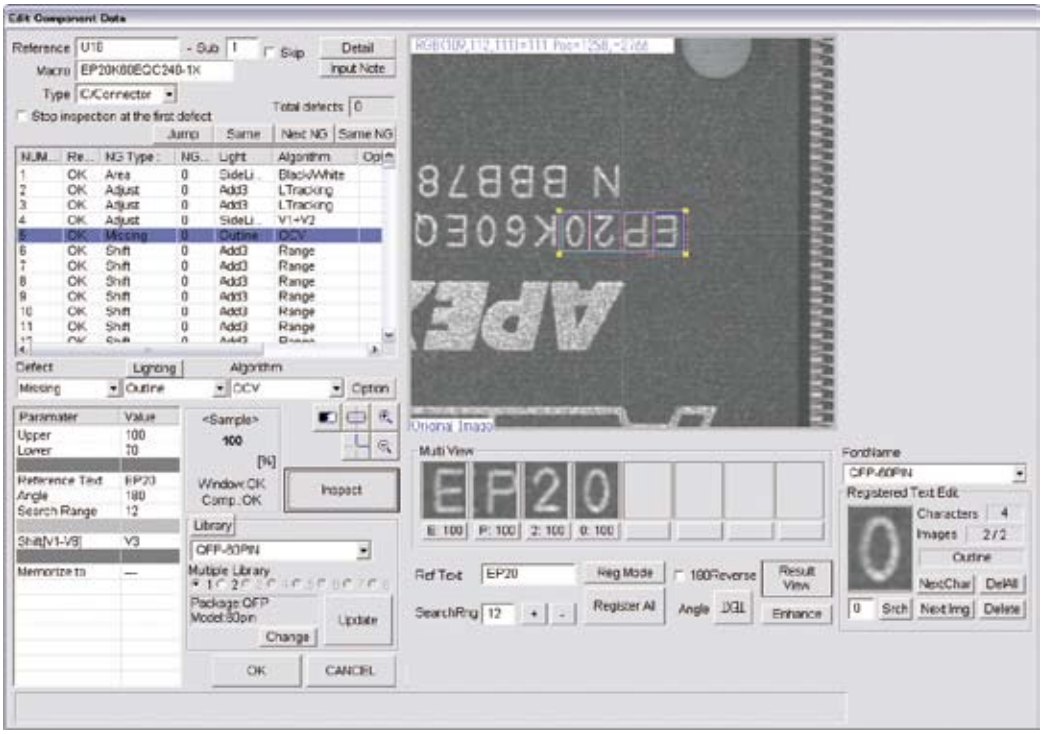


Figure 1-65 OCV

Parameter	Description
Lighting	Select a lighting that characters are visually clear.
Algorithm	Select **OCV**.
Upper, Lower	Set OK range.
Reference Text	No need for setting. **Ref Text** shown in Table 1-29 is displayed.
Angle	No need for setting. **Angle** shown in Table 1-29 is displayed.
Search Range	No need for setting. **SearchRng** shown in Table 1-29 is displayed.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 1-28 Parameter of OCV

Item	Description
Multi View	Display recognized characters. Match percentage for each character is displayed below each character. Sample value refers the lowest match percentage of inspected characters.
Ref Text	Enter characters to read.
SearchRng	Search Range for characters. Display the search range as the yellow dotted line. Enter the search range or press **+** and **-** to adjust the search range.
Reg Mode	Register characters one by one.
Register All	Register all characters.
180 Reverse	Check the **180 Reverse** for components with no polarity.
Angle	Adjust direction of text by pressing **TEXT**.
Result View	Display is changed **Result View** (=scanned image) -> **Font View** (=registered image) -> **Source View** (=search image) by pressing **Result View**.
Enhance	Display a contrast enhanced image by Black/White.

Table 1-29 Each Item of OCV Window

NOTE Adjust the inspection window direction by pressing **TEXT** to become the same direction as the target.

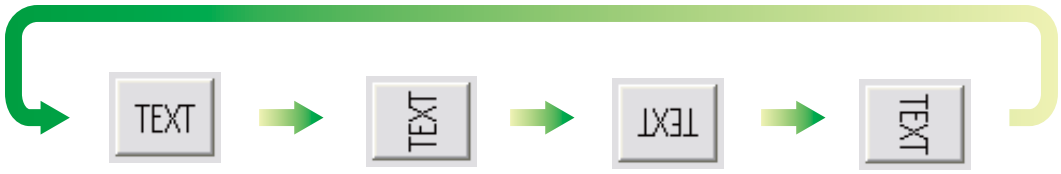


Figure 1-66 Angle

1.19.3 Setting Procedure

Step1: Select a lighting that characters are visually clear from the **Lighting** drop-down list.

Step2: Adjust direction of text by pressing **TEXT**.

Step3: Enter correct value of text in **Ref Text**.

CAUTION Do not use two-byte character, space, tab, and symbolic character(\ < > : " / | ? * . , ; & % =).

Step4: Adjust direction of text by pressing **TEXT**.

Step5: Check the **180 Reverse** for components with no polarity.

Step6: Enter appropriate vector in **Shift** field according to the vector used in **Memorize to** in Adjust window.

Step7: Press **Inspect**.

Step8: Press **Register All**.

Step9: Press **Inspect**. Check if the inspection is completed properly.

NOTE If the library is assigned to two component type, press **Option** in the right side of **Algorithm**. The window shown in Figure 1-67, check the **Only for This Macro Component** and press **OK**.

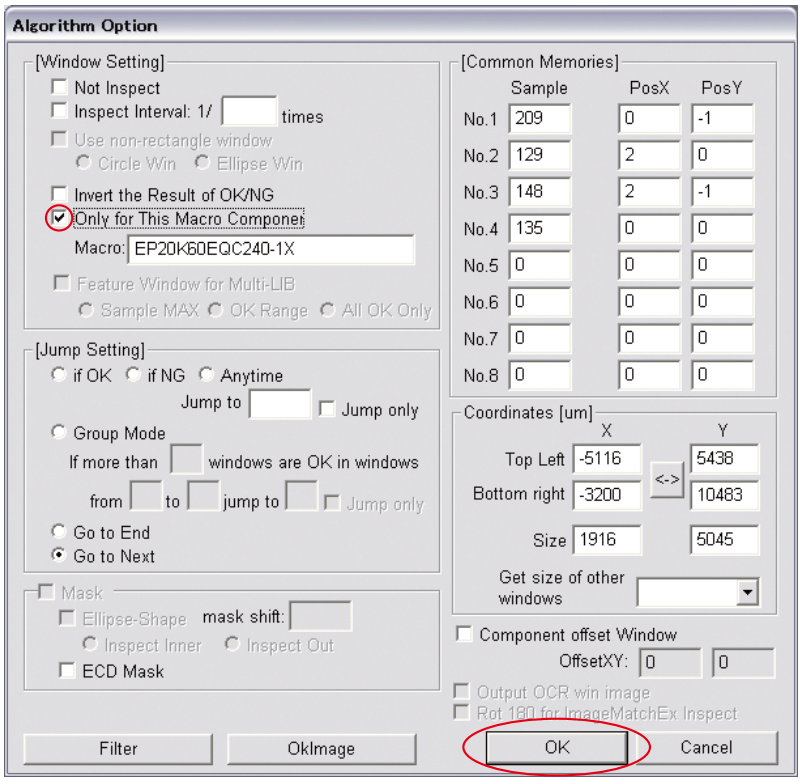


Figure 1-67 OCV

1.19.4 Registered Text Edit

Registered images can check in **Registered Text Edit**.

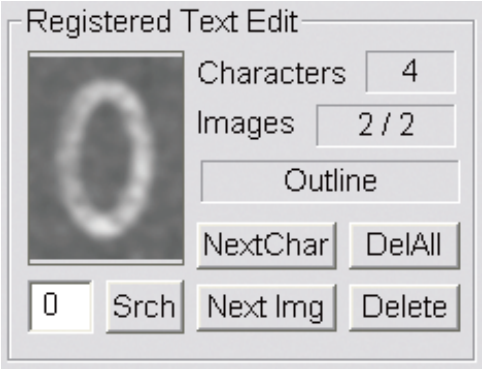


Figure 1-68 Registered Text Edit

Item	Description
Characters	Display number of registrated characters(Excluding same characters).
Images	Number of registered images for each character.
Below image of Text-box	Display a lighting name of current image.
Next Char	Display next character in the library.
Next Img	Display next registered character for that character.
DelAll	Delete all images.
Delete	Delete current image.
Srch	Enter the character in field and press **Srch** to search for a character.

Table 1-30 Each Item of Registered Text Edit

1.20 Barcode

1.20.1 Inspection Overview

Barcode is the algorithm to recognize 1D barcode. Register the target barcode. The result will be OK digit number of recognized barcode is in tolerance.
Barcode is suitable for PCBs traceability.

NOTE Refer to **2.2 Barcode Pro** for 2D barcode inspection.

1.20.2 Parameter Setting

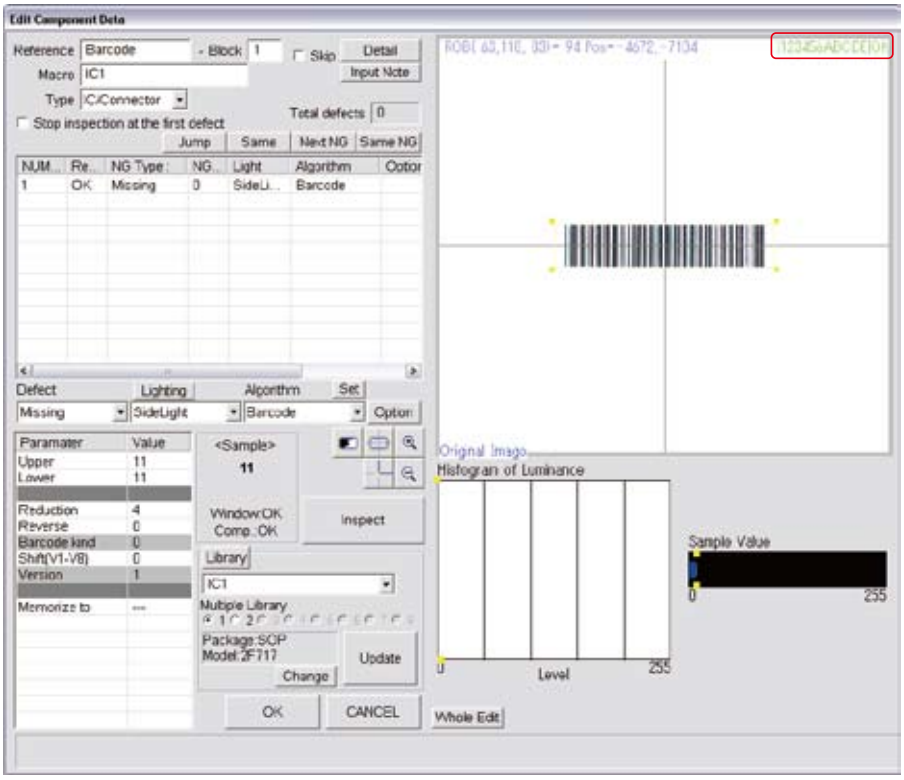


Figure 1-69 Barcode

Parameter	Description
Lighting	Select a lighting that barcode is visually clear.
Algorithm	Select **Barcode**.
Upper, Lower	Enter the barcode digit number in **Upper** field and **Lower** field. The sample value is the digit number of recognized barcode. If the target digit and recognized digit number is the same, the result will be OK.
Reduction	Enter **4**.
Reverse	Enter **0** if the brightness level of the barcode is lower than surrounding brightness. Enter **1** if it is higher.
Barcode kind	-
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Version	-
Memorize to	-

Table 1-31 Parameter of Barcode

1.20.3 Setting Procedure

Step1: Select a lighting that barcode is visually clear from the **Lighting** drop-down list.

Step2: Adjust the size of the inspection window to surround the barcode. Leave space at the either end of barcode(make space three times wider than widest blank space in the barcode).

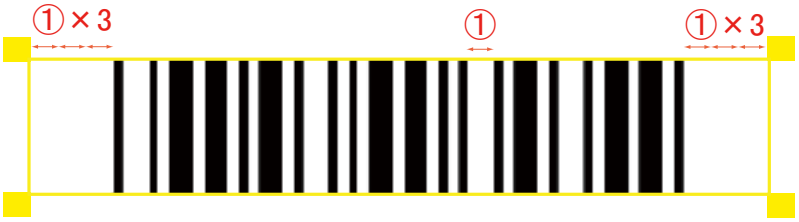


Figure 1-70 Inspection window of Barcode

Step3: Press **Set** in the right side of **Algorithm**. The window shown in Figure 1-71 appears. Select the barcode kind and press **OK**.

NOTE Check **BT_Autodetect for one dimension code**, the barcode will be recognized automatically. However inspection time will be longer.

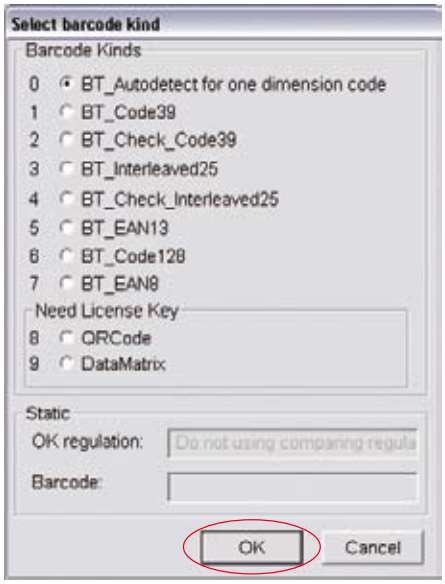


Figure 1-71 Barcode kind

Step4: Press **Inspect** and check if the alphanumeric character of the barcode is correctly displayed in the upper right side of the window shown in Figure 1-69.

2 Optional Function

2.1 OCR_Pro

2.1.1 Inspection Overview

OCR_Pro is the algorithm to recognize characters.

Any kinds of font can be recognized.

OCR_Pro is suitable for the missing or miss-mounting component inspection.

2.1.2 Parameter Setting

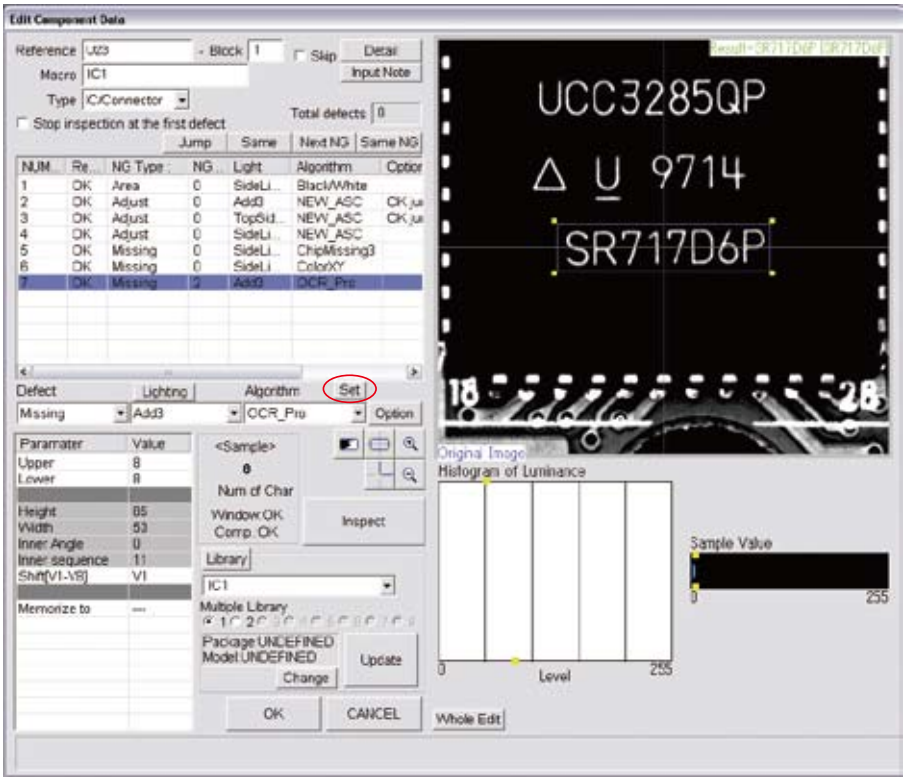


Figure 2-1 OCR_Pro

Parameter	Description
Lighting	Select a lighting that characters are visually clear.
Algorithm	Select **OCR_Pro**.
Upper, Lower	Enter the number of characters to **Upper** field and **Lower** field. The sample value shows the number of recognized characters. The registered character and the recognized character are corresponding, the result will be OK.
Height, Width, Inner Angle, Inner Sequence	No need for setting. Value will be applied to the window displayed by pressing **Set**.
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Memorize to	-

Table 2-1 Parameter of OCR_Pro

2.1.3 Setting Procedure

Step1: Select a lighting that characters are visually clear.

Step2: Adjust the size of the inspection window to surround the target characters.

Step3: Press **Set** in the right side of **Algorithm**. The window shown in Figure 2-2 appears.

Figure 2-2 OCR_Pro1

Step4: Adjust the character angle by Angle setting if the character is not upright.

Step5: Press **Define Font**. The window in Figure 2-3 is appeared. Switch the lighting to **Black / White** by pressing **-->**.

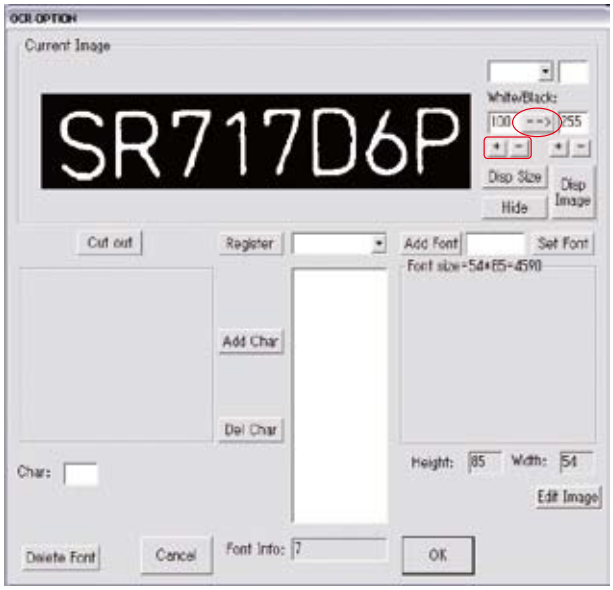


Figure 2-3 OCR_Pro2

Step6: Adjust the brightness level by pressing **+** and **-** in the lower side of **-->** until the characters are visually clear.

Step7: Enter the arbitrary font name to the text-box at the right of **Add Font**, and press **Add Font**. The font name is displayed in the drop-down list in the right side of **Register**.

NOTE Enter the font name within 8 characters.

Figure 2-4 OCR_Pro3

Step8: Left-click in the upper left part of the first character.
Adjust the window size by dragging the mouse to the lower right side of the first character.

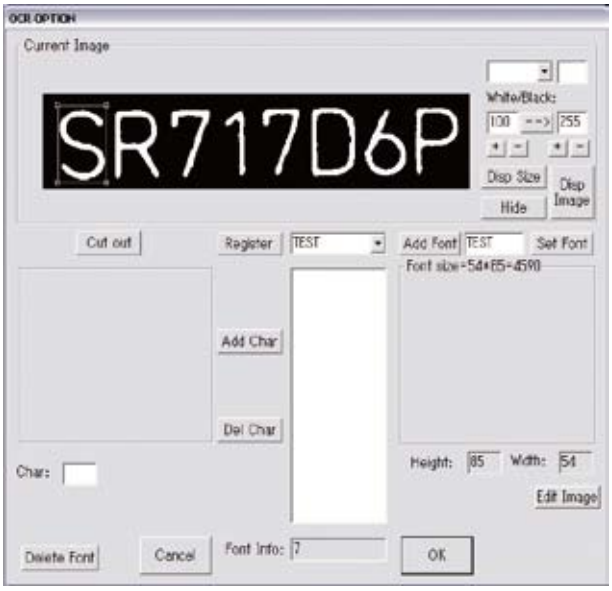


Figure 2-5 OCR_Pro4

Step9: Press **Cut out**, the selected image is displayed under the **Current Image**. Enter the first character to the text-box in the right side of **Char:**.

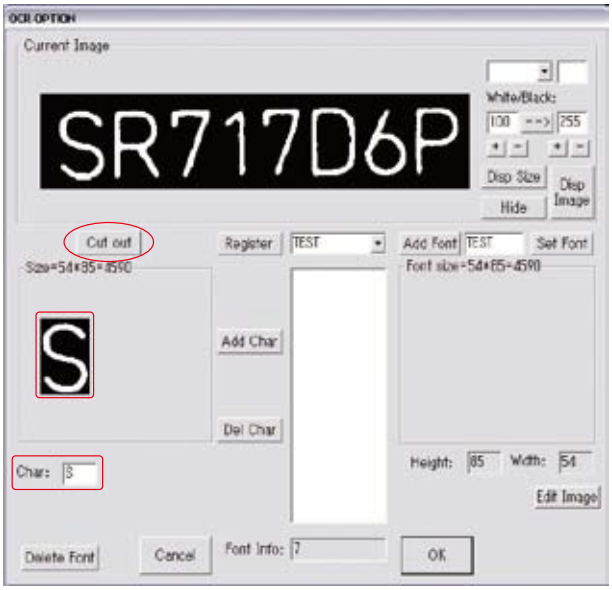


Figure 2-6 OCR_Pro5

Step10: Press **Add Char** to register the character and the image as a font added in Step7.

NOTE To delete characters, select character from the list-box and press **Del Char**.

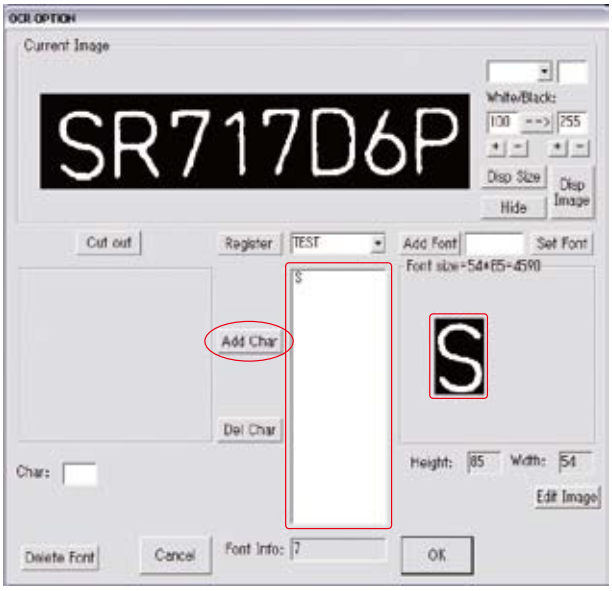


Figure 2-7 OCR_Pro6

Step11: Press **Disp Size**, the window will be displayed again, and it to surround the second character. Register the second character as follows Step9 and Step10. After the second character, repeat the same procedure to register all characters.

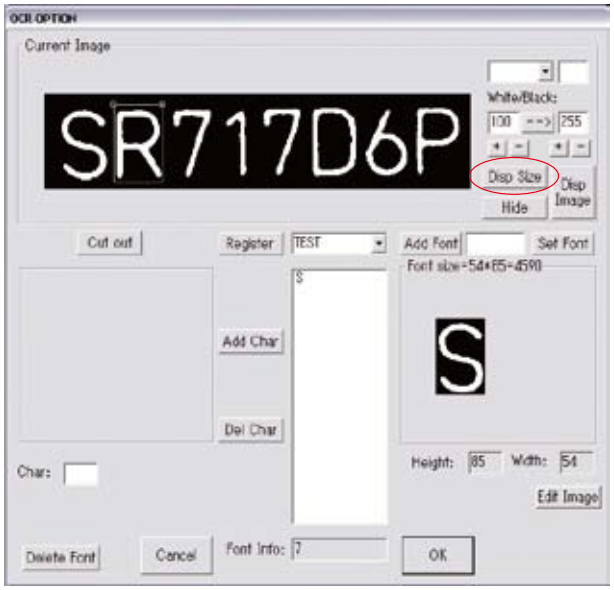


Figure 2-8 OCR_Pro7

Step12: All characters are registered and press **OK**. The dialog shown in Figure 2-10 appears and press **Yes**.

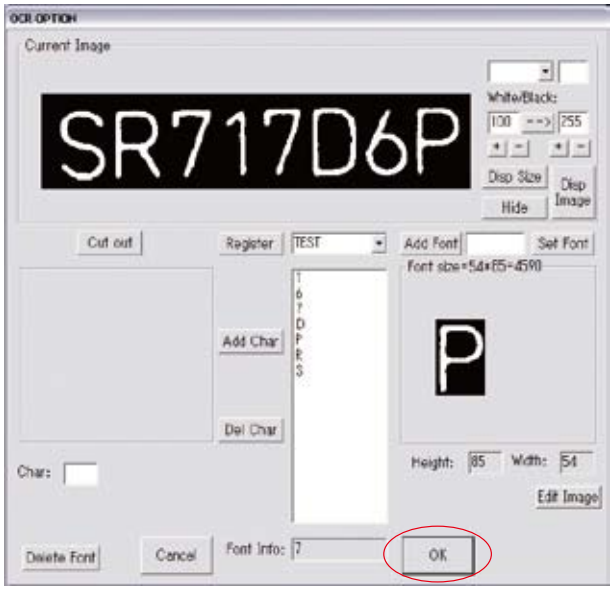


Figure 2-9 OCR_Pro8

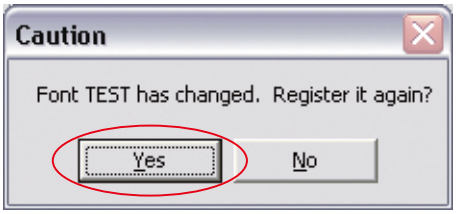


Figure 2-10 OCR_Pro9

Step13: Select **Font** from the **Define Font** drop-down list.

Figure 2-11 OCR_Pro10

Step14: Enter all target characters in the **Reference** text-box.

NOTE If "?" is registered, any character is judged OK.

Figure 2-12 OCR_Pro11

Step15: Adjust the window size to surround a character and press **GetSize**. **Height** and **Width** are automatically calculated.

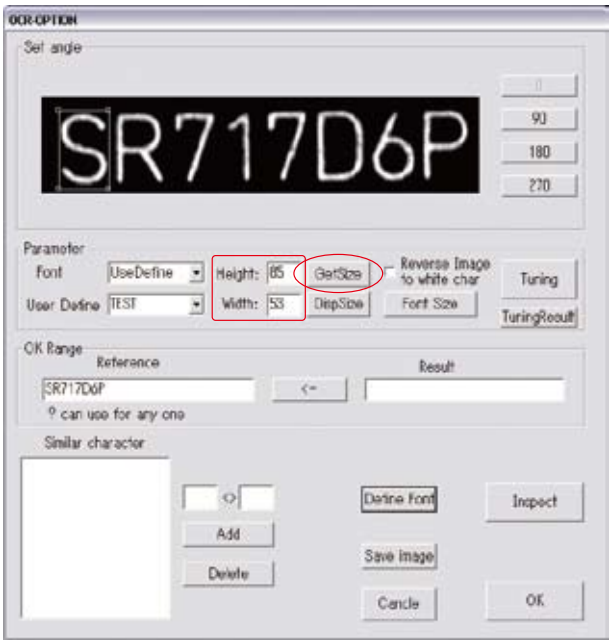


Figure 2-13 OCR_Pro12

Step16: Press **Tuning**. The recognized characters are displayed in the **Result** text-box.

Figure 2-14 OCR_Pro13

Step17: If similar characters are mis-recognized such as "**1**" and "**l**" or "**0**" and "**O**", enter the similar characters into two characters to two text boxes in the right side of **Similar character**. Once the characters are registered, the result will be OK, regardless of recognized character. To delete the registered item, select the item and press **Delete**.

Figure 2-15 OCR_Pro14

Step18: If all target characters are correctly displayed in **Result** field. Press **OK**.

Step19: The window shown in Figure 2-16 appears. Enter the number of characters to **Upper** field and **Lower** field.

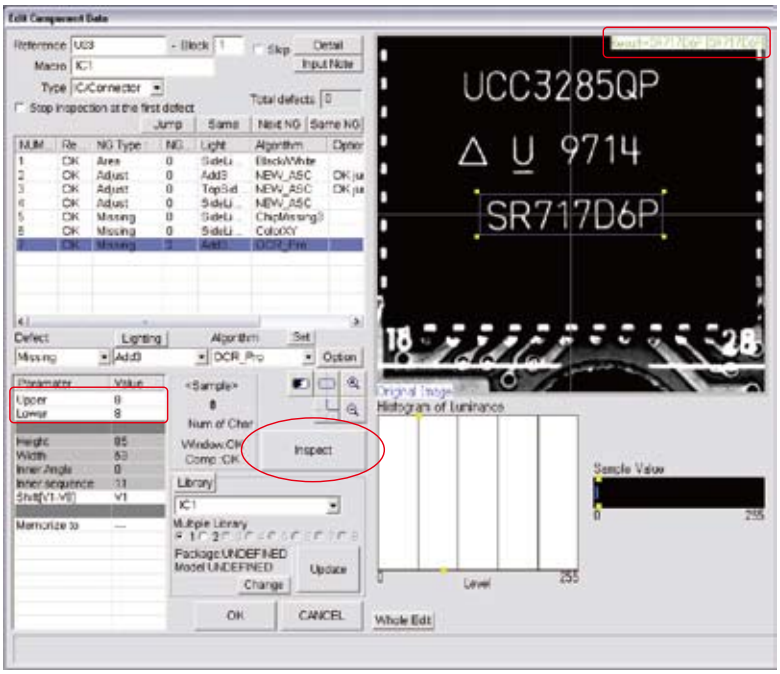


Figure 2-16 OCR_Pro15

Step20: Press **Inspect**. Check all target characters are correctly displayed in the upper right side of the window in Figure 2-16.

2.2 Barcode_Pro

2.2.1 Inspection Overview

Barcode_Pro is the algorithm to recognize 1D barcode and 2D barcode.
If the target digit and recognized digit number is the same, the result will be OK.
Barcode_Pro is suitable for PCBs traceability.

2.2.2 Parameter Setting

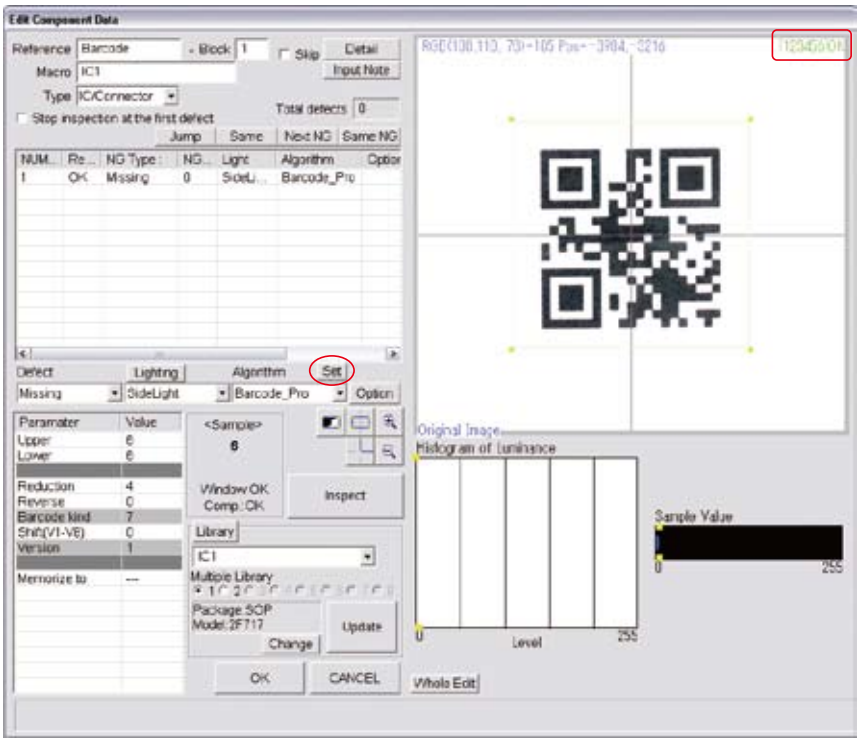


Figure 2-17 Barcode_Pro

Parameter	Description
Lighting	Select a lighting that barcode is visually clear.
Algorithm	Select **Barcode_Pro**.
Upper, Lower	Enter the digit number of barcode to **Upper** field and **Lower** field. The sample value is the digit number of the recognized barcode. If the target digit and recognized digit number is the same, the result will be OK.
Reduction	Enter **4** this field.
Reverse	Enter **0** if the brightness level of the barcode is lower than surrounding brightness. Enter **1** if it is higher.
Barcode kind	-
Shift[V1-V8]	Enter appropriate vector according to the vector used in **Memorize to** in Adjust window.
Version	-
Memorize to	-

Table 2-2 Parameter of Barcode_Pro

2.2.3 Setting Procedure

Step1: Select a lighting that barcode is visually clear from the **Lighting** drop-down list.

Step2: Set the inspection window three pixels wider than actual barcode.

NOTE Refer to **1.20.3 Setting Procedure** step2 for 1D barcode inspection.

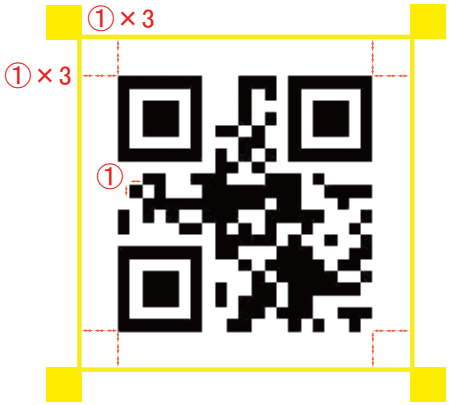


Figure 2-18 Inspection window of Barcode_Pro

Step3: Press **Set** and the window shown in Figure 2-19 appears.
Check the barcode kind and press **OK**.

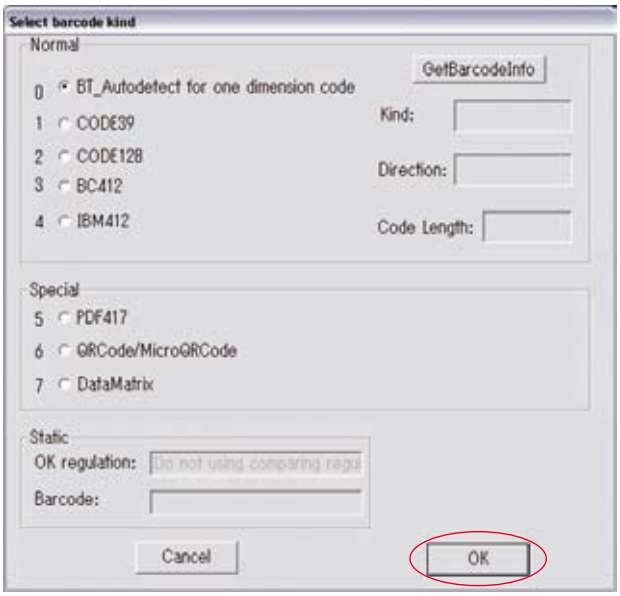


Figure 2-19 Barcode kind

Step4: Press **Inspect** and check if the alphanumeric character of the barcode is correctly displayed in the upper right of the window shown in Figure 2-17.

Customer Support Contacts

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