SAKI 3Di Programming-HW Level 2 training

June 29TH 2022

WELCOME SANMINA

saki
The Future in Focus

SAKI CORPORATION
Training section

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Precautions for safety

- To avoid electric shock or fire, and to ensure safety, do not disassemble, repair, or modify the machine
- The equipment should not be installed in a place subject to fumes, steam, high humidity, or dust particles. Using the system in an environment in violation of the operating conditions described in the Manual can cause fi re or electric shock
- To avoid damage to the cable, the following actions should never be performed: bending the cord by force, pulling the cord, or placing it near heating equipment
- To avoid electric shock or fire, damaged power supply cords, or loose outlets should not be used.

Precautions for safety

- To avoid electric shock or fire, power supply cords other than those designated should not be used.
- To avoid system malfunction or unexpected accidents, the mounted cover should never be opened.
- Do not cover up the inlet of this machine. And do not insert a foreign substance.

If the inlet is covered up, an inside will be fi lled with heat and it could cause fi re or failure.

- This machine is the Inspection System for Printed Circuit Boards.

Do not put objects other than a PCB on the scan table it may result in malfunction

Precautions for safety

- Do not put the machine on a place with much vibration or shock.

- Objects should not be placed on the system.

Objects can damage the system exterior and affect the system's inspection performance. Objects can fall off the system and cause accidents.

- Objects should not be placed on the system.

Objects can damage the system exterior and affect the system's inspection performance. Objects can fall off the system and cause accidents.

Precautions for safety

- Do not put a hand or any object in the driven section during the machine running.

It may result in personal injury

- With the power supply turned on, please do not move the main machine.

It may result in electric shock or personal injury.

- To avoid electric shock, do not touch the power supply cord with a wet hand.

Risk of electric shock.

Emergency stop

The machine has emergency stop switch for safety, especially to prevent injury at the operating area or material damage

When the upper front door is opened, the machine does the emergency stop.

Push the emergency stop switch, in case that the machine is in an emergency situation.
Beep tones sound and the motor stops immediately. The system operation is suspended.

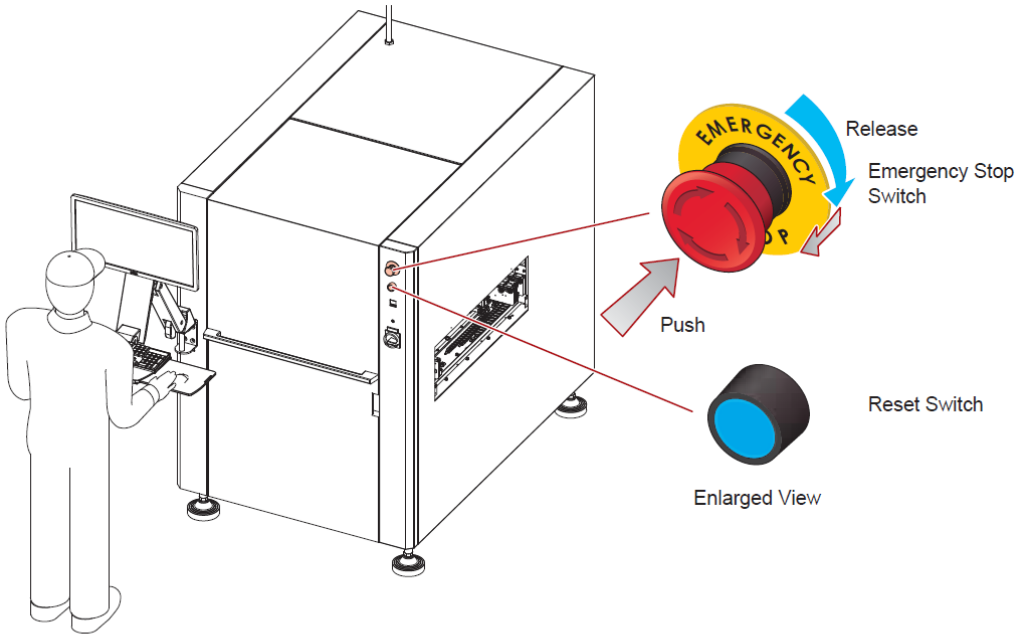

Figure 3-1 Reset Switch and Emergency Stop Switch

Signal tower and buzzer settings

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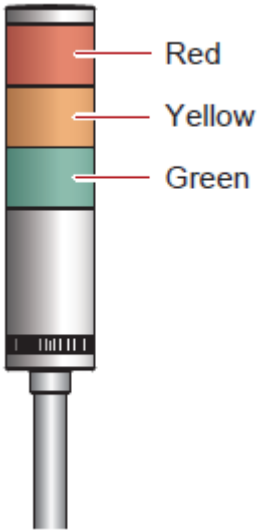
These are some of the settings to configure the signal tower and buzzer.



Machine Status	Buzzer	Red	Yellow	Green
Automatic operation ended				
Automatic operation stopped				
Automatic operation mode				
Manual mode				

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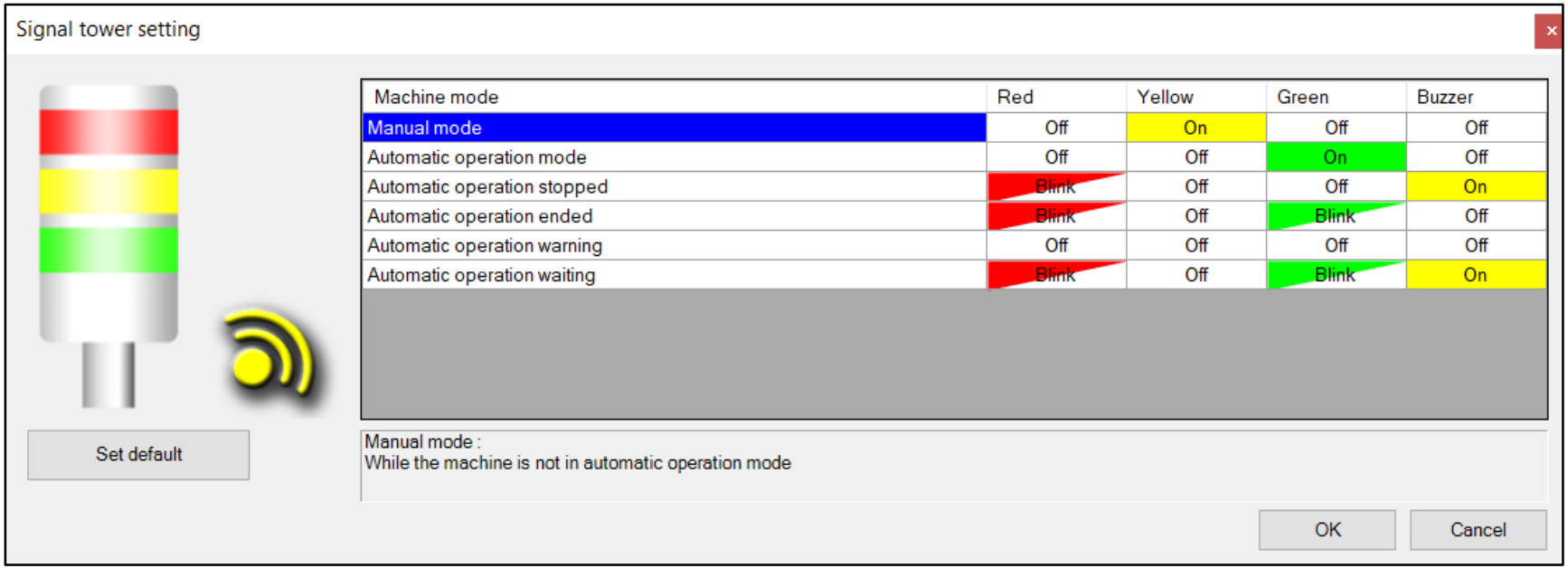
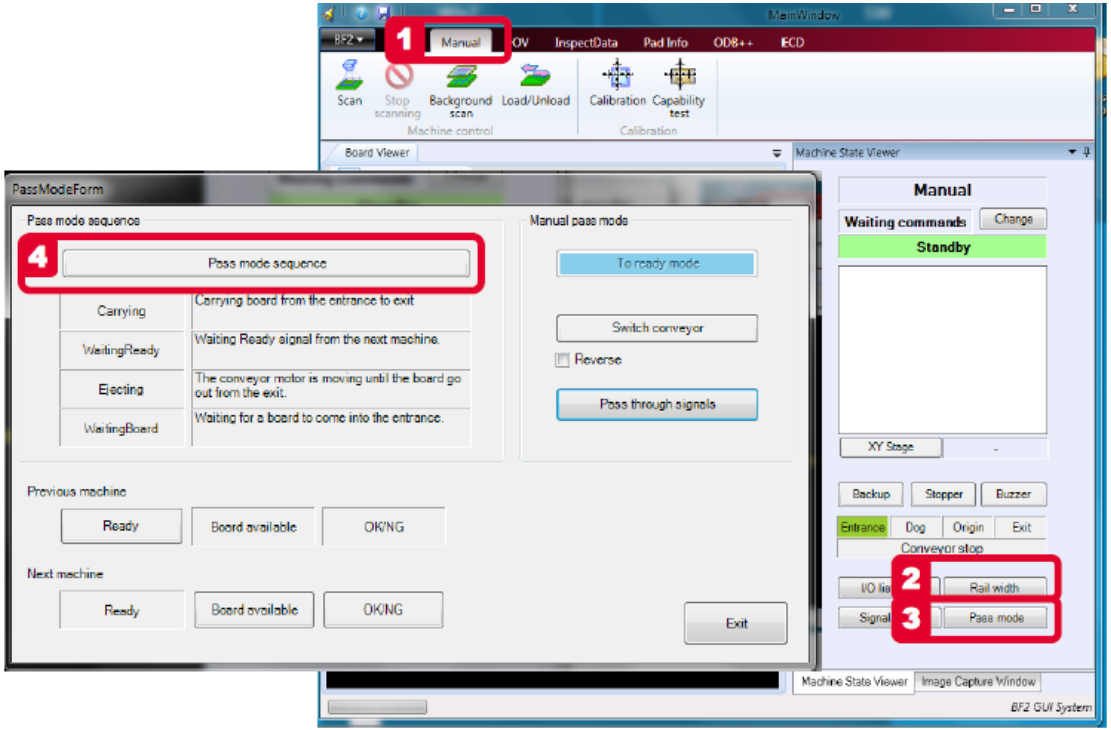
Signal tower and buzzer settings

These are some of the settings to configure the signal tower and buzzer.

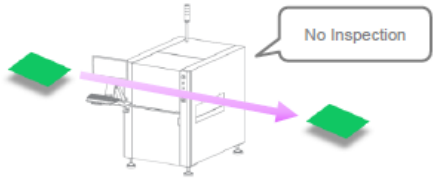


Pass mode by software



Pass mode

A machine just conveys PCBs without inspection.



Software setting

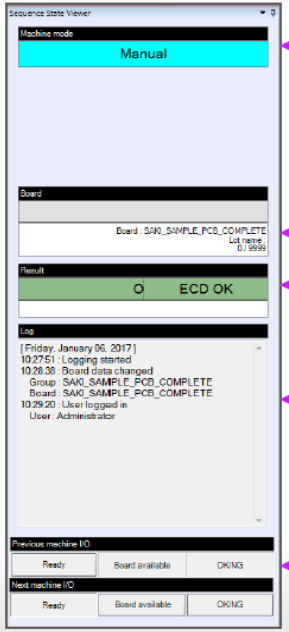
Start BF2.

1. “Manual”
2. “Rail width” → Set correct conveyor width
3. “Pass mode”
4. “Pass mode sequence”

Auto mode overview

Load → Inspect → Judge → Unload

Sequence Status Viewer

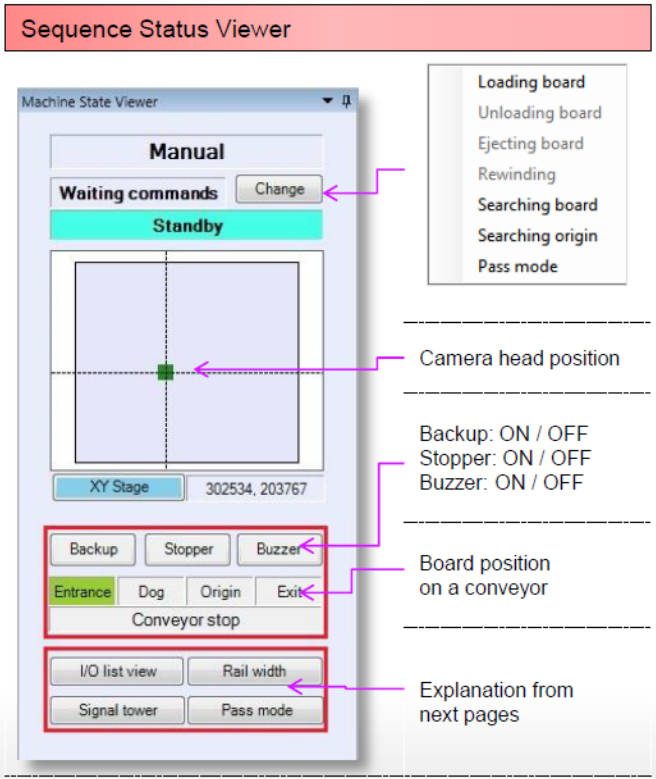


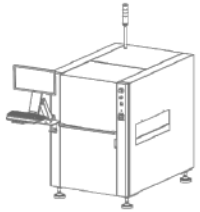
- Machine Status
- Board information (board name, lot)
- Inspection status
- Log information
- SMEMA status

Button functions

Start auto mode	Ruler to measure sizes
Stop auto mode	3D to change a view of 3D mode
White arrow Normal mouse cursor	Board navigator for….
Hand to grab a board image to move	Undo (Command history)

Manual mode overview





All operations by you

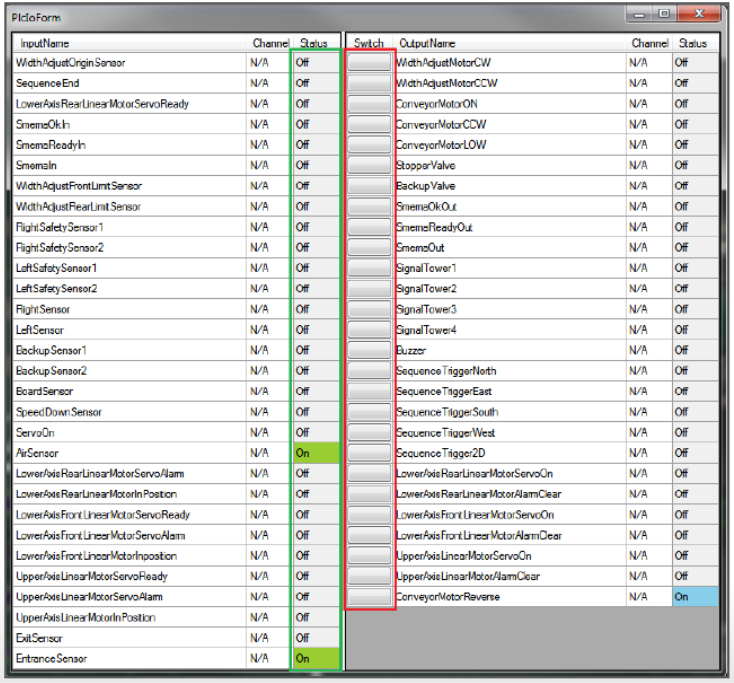
Button functions

Scan	Manual board scan
Load/Unload	Load / Unload a board
Background scan	Background scan

Inputs / Outputs view

I/O list view

This is for checking I/O (In / Out) statuses.



InputName	Channel	Status	Switch	OutputName	Channel	Status
WidthAdjustOriginSensor	N/A	Off		WidthAdjustMotorCW	N/A	Off
SequenceEnd	N/A	Off		WidthAdjustMotorCCW	N/A	Off
LowerAxisRearLinearMotorServoReady	N/A	Off		ConveyorMotorON	N/A	Off
SmemaOkIn	N/A	Off		ConveyorMotorCCW	N/A	Off
SmemaReadyIn	N/A	Off		ConveyorMotorLOW	N/A	Off
SmemaIn	N/A	Off		StopperValve	N/A	Off
WidthAdjustFrontLimitSensor	N/A	Off		BackupValve	N/A	Off
WidthAdjustRearLimitSensor	N/A	Off		SmemaOkOut	N/A	Off
FlightSafetySensor1	N/A	Off		SmemaReadyOut	N/A	Off
FlightSafetySensor2	N/A	Off		SmemaOut	N/A	Off
LeftSafetySensor1	N/A	Off		SignalTower1	N/A	Off
LeftSafetySensor2	N/A	Off		SignalTower2	N/A	Off
FlightSensor	N/A	Off		SignalTower3	N/A	Off
LeftSensor	N/A	Off		SignalTower4	N/A	Off
BackupSensor1	N/A	Off		Buzzer	N/A	Off
BackupSensor2	N/A	Off		SequenceTriggerNorth	N/A	Off
BoardSensor	N/A	Off		SequenceTriggerEast	N/A	Off
SpeedDownSensor	N/A	Off		SequenceTriggerSouth	N/A	Off
ServoOn	N/A	Off		SequenceTriggerWest	N/A	Off
AirSensor	N/A	On		SequenceTrigger2D	N/A	Off
LowerAxisRearLinearMotorServoAlarm	N/A	Off		LowerAxisRearLinearMotorServoOn	N/A	Off
LowerAxisRearLinearMotorInPosition	N/A	Off		LowerAxisRearLinearMotorAlarmClear	N/A	Off
LowerAxisFrontLinearMotorServoReady	N/A	Off		LowerAxisFrontLinearMotorServoOn	N/A	Off
LowerAxisFrontLinearMotorServoAlarm	N/A	Off		LowerAxisFrontLinearMotorAlarmClear	N/A	Off
LowerAxisFrontLinearMotorInposition	N/A	Off		UpperAxisLinearMotorServoOn	N/A	Off
UpperAxisLinearMotorServoReady	N/A	Off		UpperAxisLinearMotorAlarmClear	N/A	Off
UpperAxisLinearMotorServoAlarm	N/A	Off		ConveyorMotorReverse	N/A	On
UpperAxisLinearMotorInPosition	N/A	Off				
ExitSensor	N/A	Off				
EntranceSensor	N/A	On				

Items

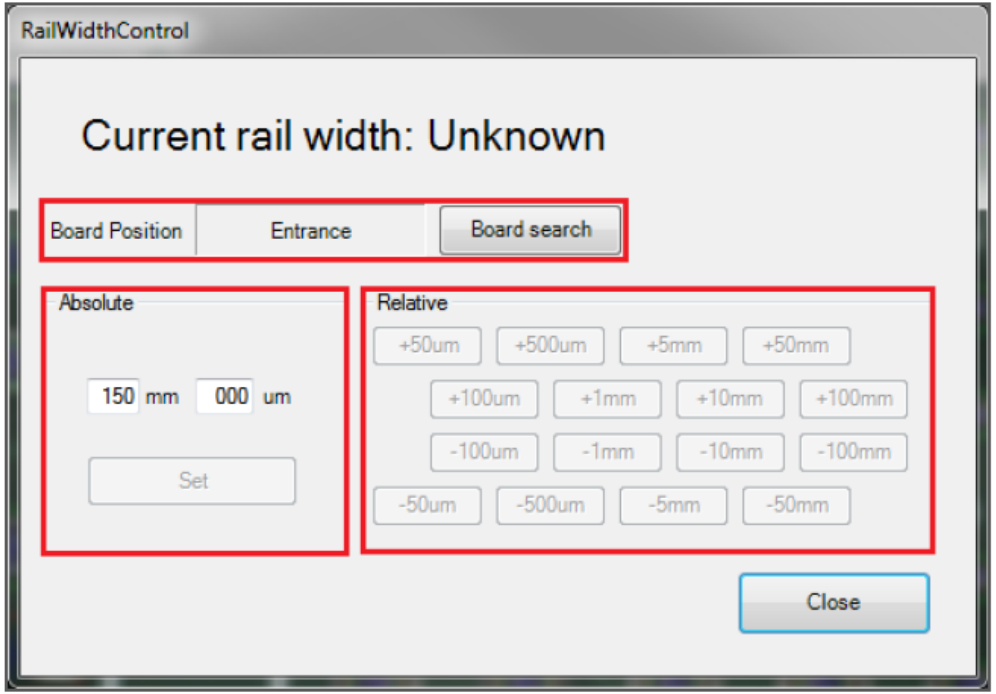
Switches:
Those items can manually be turned on / off.

Status:
Current statuses are visible.

It's useful to play with switches and to know how those work.

Rail width manual adjustment

This window is to manually adjust a rail width.



Board Search

A machine checks if a board inside or not. This is necessary to avoid any damage on the machine and a board inside before changing the rail width.

Absolute

The rail width changed by an input value is executed after pressing “Set”.

Relative

The rail width is adjusted by pressing any button in this item.

Purpose of Backup

Recover to the normal condition using the backup if something abnormal occurs.

For details of backup types, refer to **3.2 Backup Types.**

Purpose	Backup Types	Recovery Method
Recovering inspection software to fix software malfunction	Backing up in C: Drive	Recovers data by overwriting damaged files with saved files.
Recover inspection data	External Backup	
Backing up inspection results in an external device in order to reduce the internal hard disk load.	External Backup	
Recovering to the condition at the shipment due to PC malfunction	Backing up with the **Back up or restore your files function** of Windows10.	Recover with the **Back up or restore your files function** of Windows10.

Table 3-1 Backup Files

Backup Types

It is recommended to backup the machine regularly in order to protect important settings, inspection data, and inspection results from unexpected file crashes, and from inadvertent deletion

Backing up in C: Drive

Here describes how to save the backup of the inspection software and its settings in C: drive.

Step1: Open the backup folder of the inspection software.

Inspection software	Backup Folder Name
BF2	C:\BF2Backup

Table 3-2 Backup Folder

Step2: Create a new folder by assigning the date as a name.
[e.g. Wednesday, January 23, 2017 > Folder name: 20170123]

Step3: Copy all files in **C:\BF2** to the newly created folder.

NOTE When the Inspection software is updated, automatically the backup is stored in the "C:\BF2Backup".

Backup Types

External Backup

Here describes how to save a backup in an external device. Because inspection results daily generate a large number of files, it is especially recommended to backup them to an external device.

Step1: Specify the items to save.

Inspection software	Description	Folder Name
BF2	Inspection software and its settings	C:\BF2
	Inspection data	(*1)
	Inspection Results	(*2)

Table 3-3 Items to Save

NOTE

(*1) The data location is specified in an inspection data creation process.

(*2) The data is saved in the folders which are set in **BF2 Options** > **Operations Tool** > **Inspect Result Manager** > **BF2-Monitor ZClient** > **Reference data save location** and **Result data save location**.

Step2: Specify the saving destination device and copy files.

Recovery methods

Recovery from Backup in C: Drive

Here describes how to recover the inspection software and its settings in C: drive.

Inspection data and inspection results are not recovered.

Step1: Open the backup folder of the inspection software.

Inspection software	Backup Folder Name
BF2	C:\BF2Backup

Table 3-4 Backup Folder

Step2: Select the folder with the most recent date from the backup folder.

Step3: Copy all files in the backup folder to **C:\BF2**.

Recovery from External Backup

Here describes how to recover data files from a backup medium.

Step1: Prepare the previously saved backup files.

Step2: Copy the backup files to their original folder.

Inspection software	Item	Copy to
BF2	Inspection software and its settings.	C:\BF2
	Inspection data	(*1)
	Inspection Results	(*2)

Table 3-5 Backup Files

NOTE

(*1) The data location is specified in an inspection data creation process.

(*2) The data is saved in the folders which are set in **BF2 Options** > **Operations Tool** > **Inspect Result Manager** > **BF2-Monitor ZClient** > **Reference data save location** and **Result data save location**.

What is Gerber?

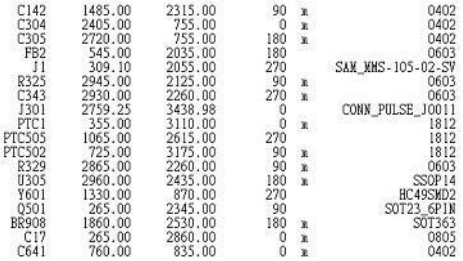
The Gerber format is an open ASCII vector format for 2D binary images.
It is the standard used by printed circuit board (PCB) industry software to describe the printed circuit board images: copper layers, solder mask, legend, etc.

ASCII

Alphanumeric character encoding system that assigns a number from 0 to 127 to each letter, number or special character collected; extended ASCII allows up to 256 different characters.

What is CAD XY data?

It is the Coordinate data of the mounted Components. It includes the data of Ref Name, X location, Y location, Rot, Part Name, etc. It is also called '**Component Coordinate File**', '**Component Pick and Placement File**' or '**Component Reference Designator**'

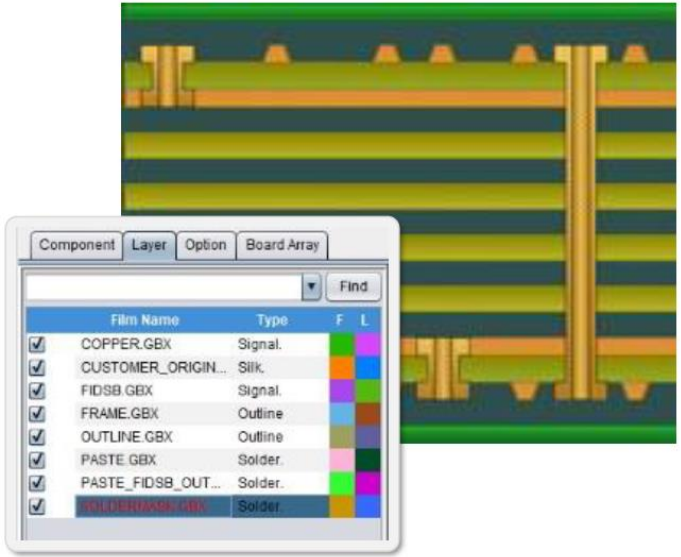


C142	1485.00	2315.00	90	M	0402
C304	2405.00	755.00	0	M	0402
C305	2720.00	755.00	180	M	0402
FB2	545.00	2035.00	180		0603
J1	309.10	2055.00	270		SAM_MMS-105-02-SV
R325	2945.00	2125.00	90	M	0603
C343	2930.00	2260.00	270	M	0603
J301	2759.25	3438.98	0		CONN_PULSE_J0011
PTC1	355.00	3110.00	0	M	1812
PTC505	1065.00	2615.00	270		1812
PTC502	725.00	3175.00	90	M	1812
R329	2865.00	2260.00	90	M	0603
U305	2960.00	2435.00	180	M	SSOP14
Y601	1330.00	870.00	270		HC49SMD2
Q501	265.00	2345.00	90		SOT23_6PIN
BR908	1860.00	2530.00	180	M	SOT363
C17	265.00	2860.00	0	M	0805
C641	760.00	835.00	0	M	0402

CAD Files **contain the basic information (Ref. Name, X, Y, Rot, Part Name, etc.) of Component** that mounted on PCB.

What is Layer?

PCB Layer normally means the each Copper layer.
But, for manufacturing PCB, an additional layers needs to be composed like below.

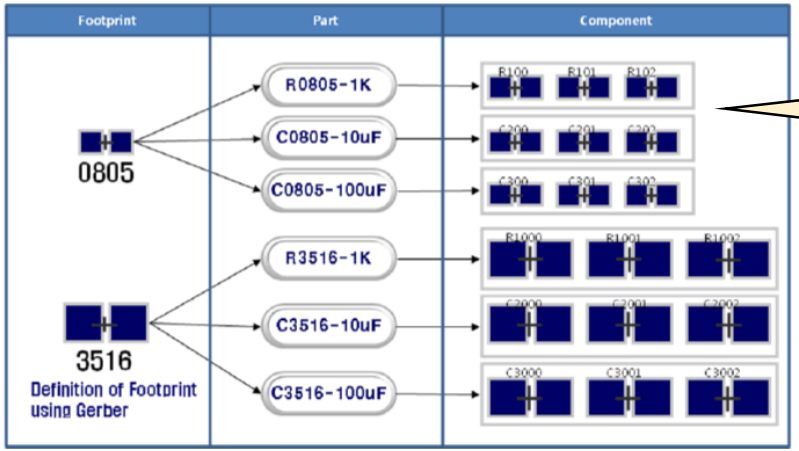


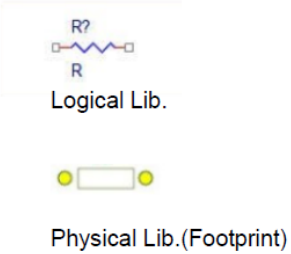
- **TOP Layer**
  - Silk Screen Top
  - Solder Paste Top
  - Solder Mask Top
  - Top Layer
- **Inner Layer 1** — Inner Layer
- **Inner Layer 2** — Inner Layer
- **Inner Layer 3** — Inner Layer
- **BOTTOM Layer**
  - Bottom Layer
  - Solder Mask Bottom
  - Solder Paste Bottom
  - Silk Screen Bottom

What is Footprint?

It means that register the library data for the pattern of Components

If there isn't the concept of footprint, the different parts 'R0805_1K', 'R0805_0.1K, R0804_4.7K will have the different pattern information. But, if there is the Footprint pattern definition, they can have one pattern data for each parts.

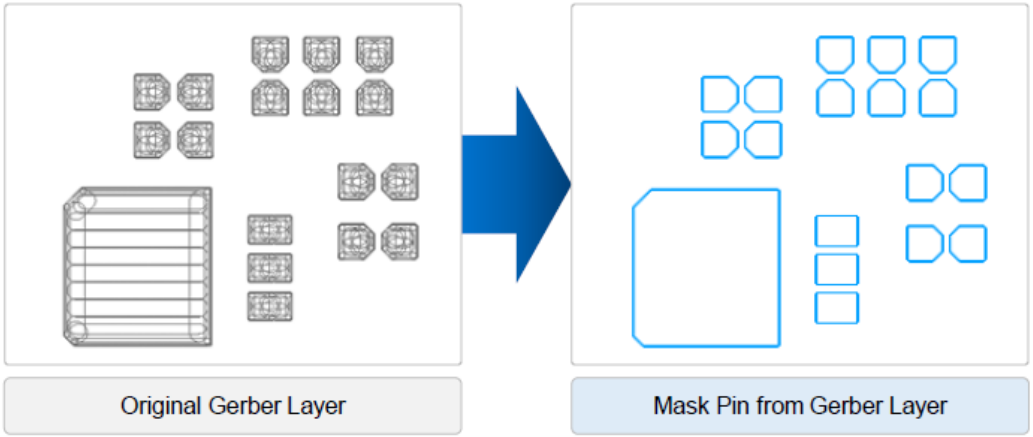




In simple words is the way how we can associate the shape and the size of the pads for the appropriate component its base is the American system measurement

What is Mask Pin?

'Mask Pin' is the term used on ePM. 'Mask Pin' means the Pad(Pin) formed like Metal Mask, and it does not allow inner 'hole'. In other words, Mask Pin generation means that converting Gerber, which composed with one or multi object, to 1 Pad(Pin) object by the outline of Gerber Shape.



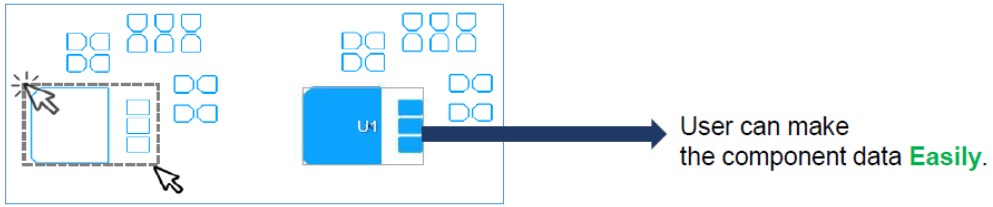
Mask Pin **decrease the data volume** so that can making the Job data more **faster**

What is teaching?

4. Teach Part

Gerber data is a drawing information about components, so that does not have a logical information(Coordinates, Rotation, etc.).

It is easy to generate the logical information as Teach part option in **ePM**.



Teaching the Components with Gerber data.

- ✓ If User create the Job data **only with Gerber**, Teaching Process is **Essential**.
- ✓ **Make the Library**(Component's Shape, Location etc.) based on Gerber File.

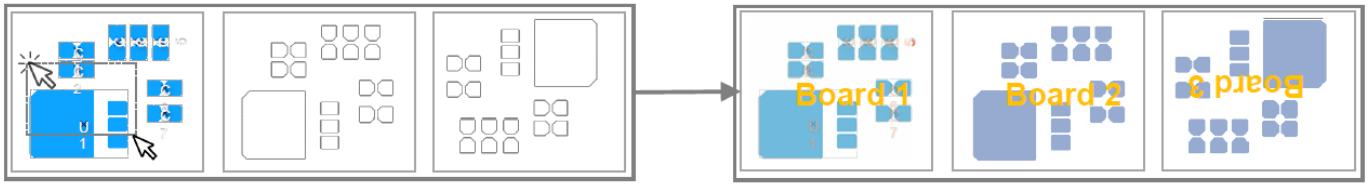
What is Array?

Job Case1 - Gerber

5. Board Array

Board Array means **Copying the Same board** for Fabricate the PCB.

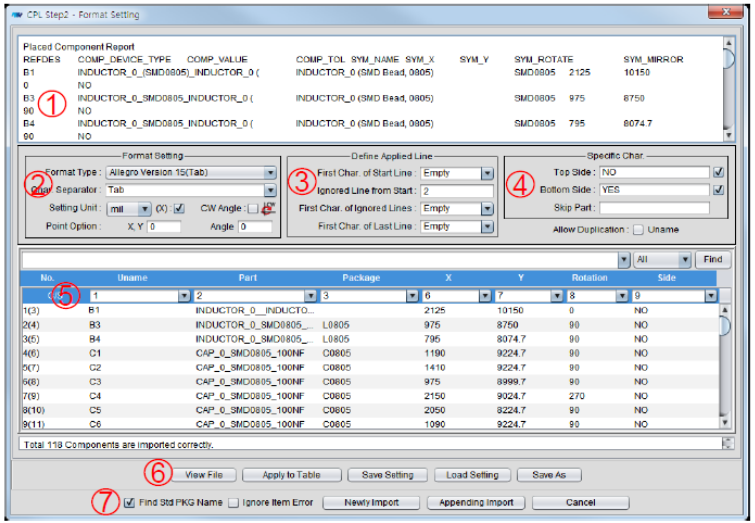
The standard data when Generating the Board Array is **Work Area**.



ePM can Generate array data automatically.

What is CPL? Format setup

- **CPL (Component Placement Location) Wizard**



The following is a function that helps you collect important information (Ref. Name, X, Y, Rot, Part Name etc.).

① View of the Original CAD File
: View the Original CAD File, User can check and edit the CAD File.

② Format Setting Option
: User can set the Format Type of CAD File, Separator, Unit etc.
ePM supports the multiple separator,
User can use it by using comma(,) between separators.

③ Define Applied Line Option
: Defines the Start and end of a comment statement or Ignored Lines in CAD File .

④ Top & Bottom (Special Char.) Options
: User can choose only Top or Bottom Side to import,
When both Top & Bottom side exist in CAD File.

⑤ Set the items of CAD File option
: Used to set each item according to the separator.

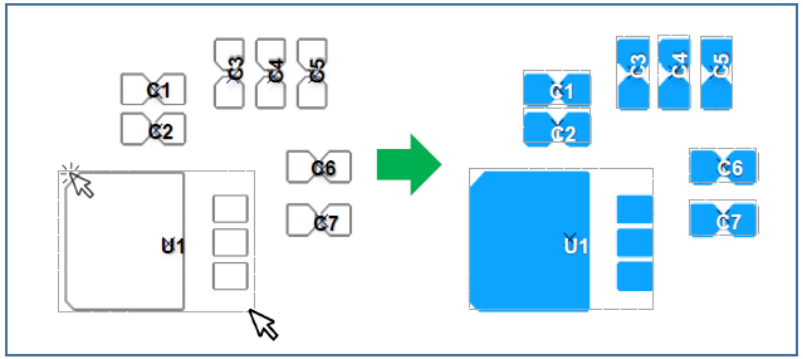
⑥ Table Setting / Applying button
: Use to collect Table Show, Save Settings,
Read Setting Settings and Table information

⑦ Find Std PKG Name Option
: ePM import the Package name by Inferring the Standard Package Name.

What is Add foot print?

4. Add Footprint

Footprint must be used in PCB Fabrication. Simply It means Registering the Shape information of Component.



When creating the job with Gerber and CAD File, User need to add the Footprint to generate shape information for the Components.

User can match Shape & Component information and create the Component data more easily with ePM.

Functions and Concepts Description

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Self Programing

Saki's self programming is the automated way, developed to generates inspection programs Faster and easy (Does not requires high technical skills for programming)

Recipe wizards

They are the wizards to apply all the settings and algorithms in a faster and standardized way

Element wizards

They are all the thresholds, values and settings for each algorithm made for a recipe

Inspection Library

Consists in two main parts (Recipe + Shape)

Recipe

Is the list of inspection steps/windows and algorithms in a sequence that inspect specific component features (I.e check the polarity mark)

Shape

They are the figure of the different parts of the components i.e Connector has (body and leads)

Algorithm

Is a process or set of rules to be followed in calculations or other problem-solving operations
I.E Find plane that calculates the object height based on the moire principle

Functions and Concepts Description

Self tuning

Is a part of the Saki's self programming Its main function is to help optimize the automatic debugging of algorithms.

FOV

FOV is an acronym and means **F**ield **O**f **V**iew in Spanish Campo de vision and is given by the focal range 7um, 12um, 18um

DOP

DOP is an acronym and means **D**istortion **O**bservation **P**oint in Spanish Compensación o ajuste de pandeamientos de tarjetas, Caused by the thinness of the pcb's and sometimes excessive weight of large components

RO

RO is an acronym and means **R**unning **O**rder

Sets the number of ROs. Wide is the number of images with wide stripes, and Fine is the number of images with fine stripes. Reducing the number of striped images increases the scan speed, but images are easily affected by noise -> "the more, the better"

Functions and Concepts Description

Side cameras

Side cameras are a hardware option to inspect specific areas of components in angle view

Offline debug

Is a SAKI tool to optimize and debug the recipes and its thresholds

Threshold

In other words is the tolerance given to an inspection within a range Upper and Lower limit I.E.
The threshold for solder bridge is Upper= 100 Lower=0 using the algorithm distribution

RMS

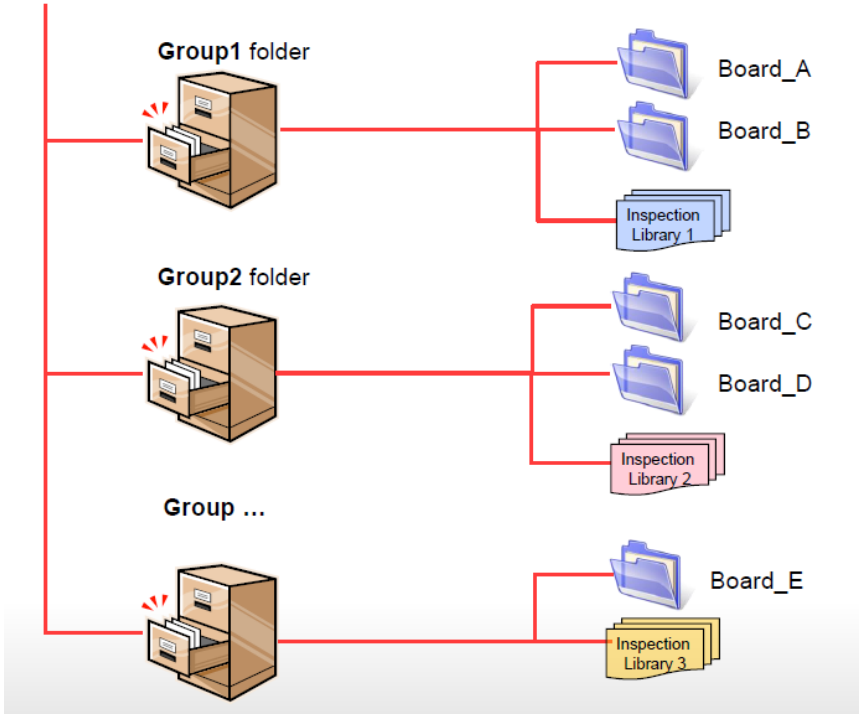
RMS is an acronym and means **R**emote **M**anagement **S**ystem in Spanish Sistema de administración remota
Y su función principal es agrupar todas las estaciones de juicio en una sola central

RTJ

RTJ is an acronym and means **R**eal **T**ime **J**udgement in Spanish Juicio en tiempo real
Y su función principal es habilitar una estacion de juicio en la misma maquina AOI/SPI

Data folder structure

C:¥BF2DATA - default inspection program storage location



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Group folder organization

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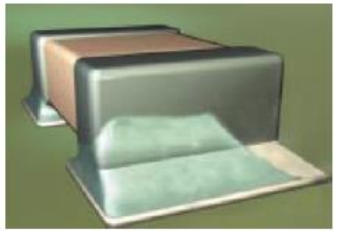
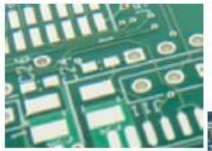
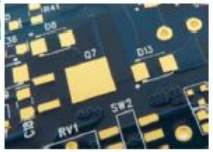
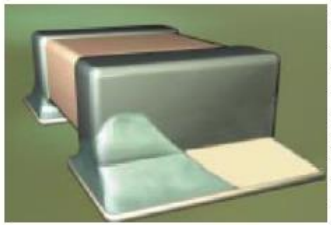
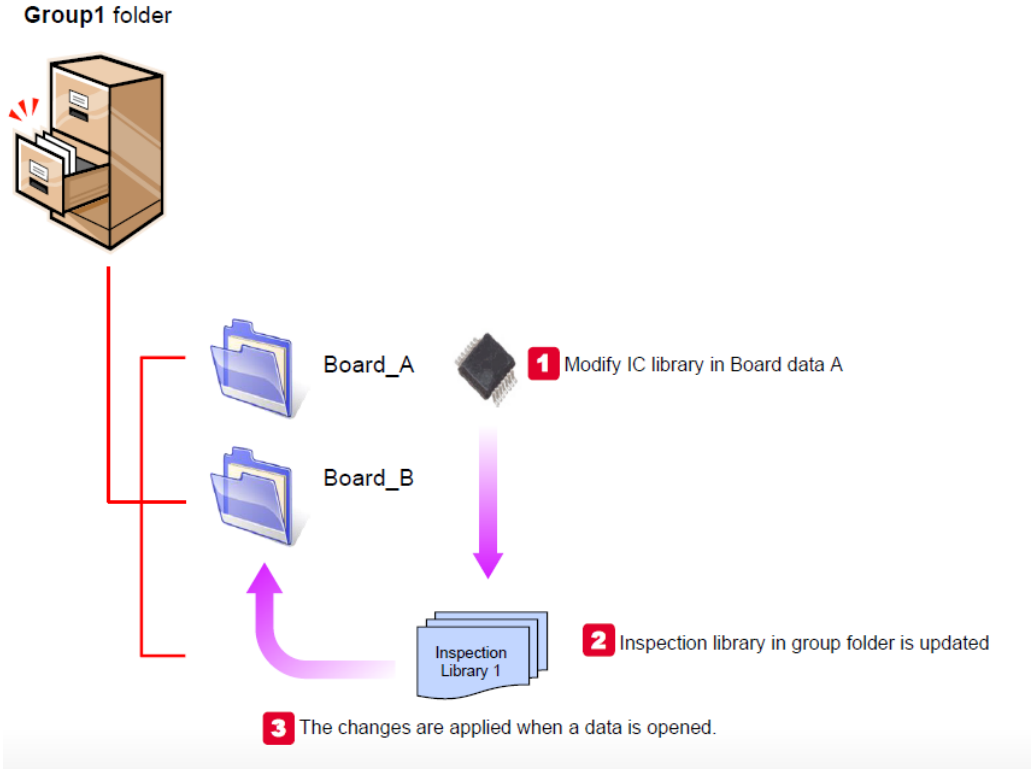
How to organize group folder? ···Based on the same inspection standard

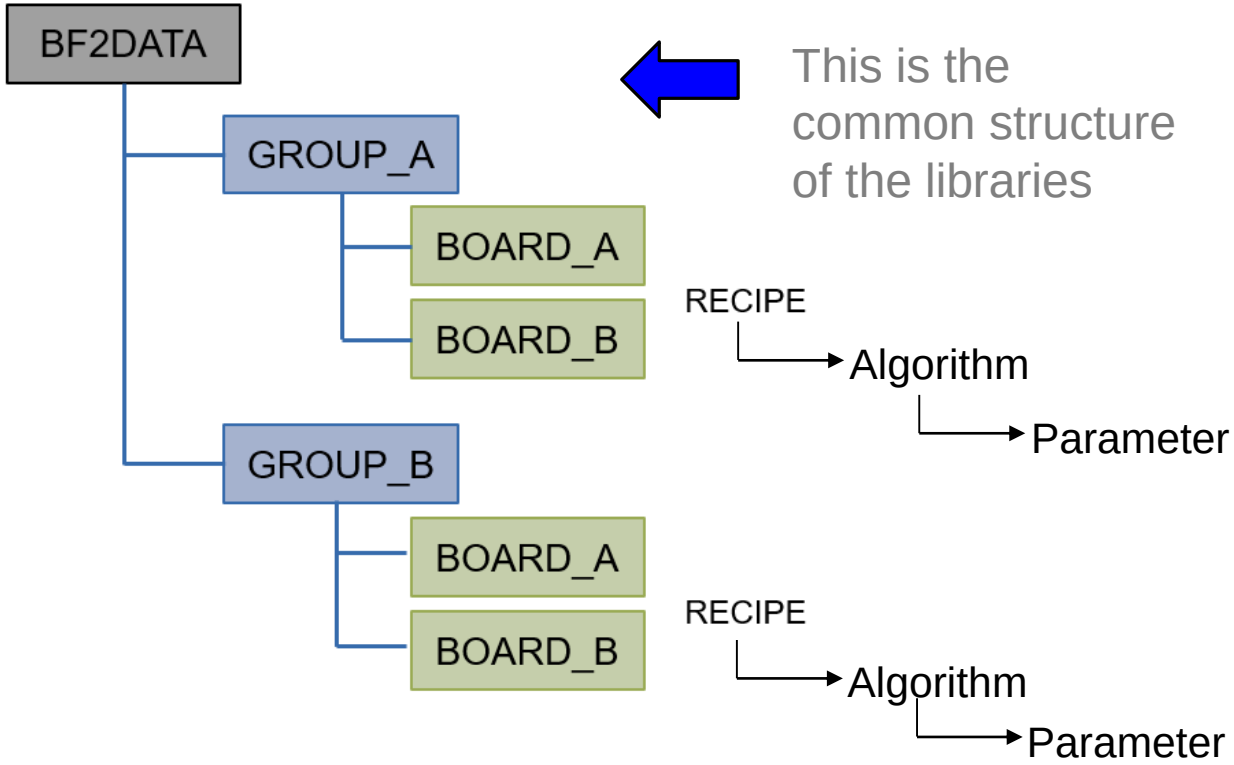
IPC standard IPC Class 2 or 3 ….	Customer	Products	PCB Condition Hasl, Copper,Gold finish… Leaded or Lead free solder
	 		 
	 	 	 

Group folder organization



Inspection Library
Created inspection library is stored in a group folder and is shared among boards data in a same group.
When some changes are made on specific library, the changes are applied to others when program is opened.
Users are able to select that the changes are automatically or manually applied.

Library common structure

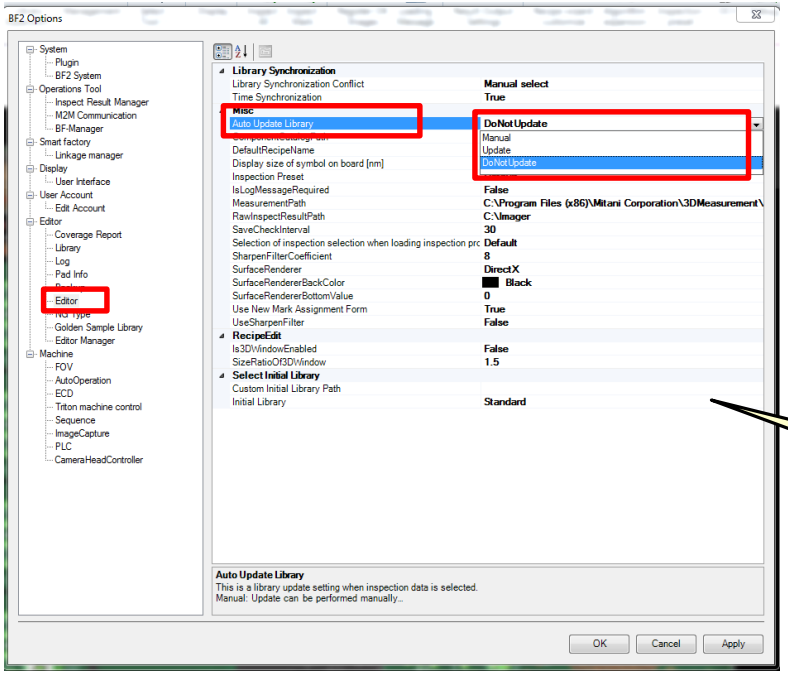


Note: Most of the SAKI customers normally works with a Library group separated per customer to avoid merge the settings
In order to have an AOI inspection process more stable we recommend to use group libraries per customer and import or export specific libraries as you need to others groups

Auto update library option

4)Is there a way to isolate the libraries so that changes in one doesn't affect the others but when new parts are defined the master library is updated?

Yes, but first you have to change the following BF2 Option feature depending of your process needs



1.- Manual: Will ask you every model change

2.- Update: Will update the changes automatically without asking you

3.-DoNot Update:
Will not update any change on the recipes

In your case you can use 3rd 0r 1st, Do Not update or Manual to avoid automatically update the recipe and shape

Auto update library option

4)Is there a way to isolate the libraries so that changes in one doesn't affect the others but when new parts are defined the master library is updated?

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

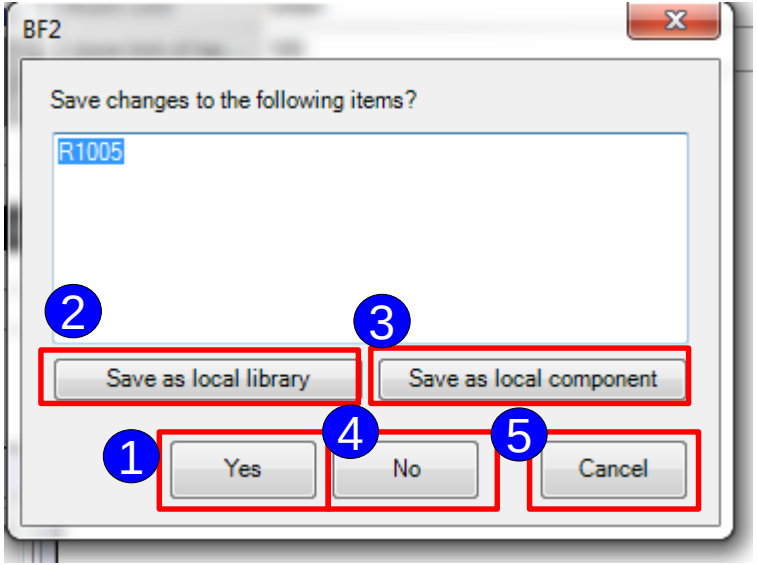


FIG 1-3

- Click **1.- Yes** to save the changes into the currently opened inspection data and library.
- Clicking either **2.-Save as local library** or **3.- Save as local component** saves the contents of the
- update to only the currently opened inspection data without making any changes to the library.
- If you would like to apply changes only to the currently opened inspection data, use either **2.-Save as local library** or **3.- Save as local component**
- **4.- No** Discards all the changes.
- **5.-Cancel** Returns to recipe editing.

FIG 1-3

Auto update library option

4)Is there a way to isolate the libraries so that changes in one doesn't affect the others but when new parts are defined the master libr updated?

If multiple Recipes are assigned to one Shape, the dialog shown below in Figure 1-4 appears.

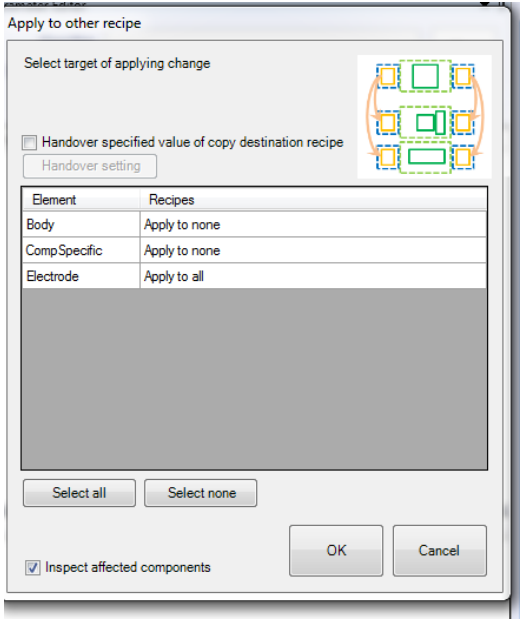
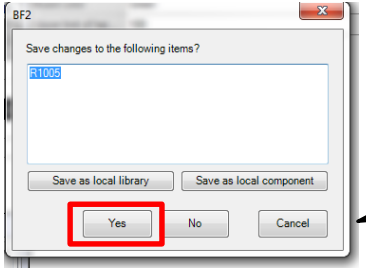


FIG 1-4



•When you press Yes on the Figure 1-7 then appears the window Figure 1-4

FIG 1-7

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

FIG 1-3

Auto update library option

4)Is there a way to isolate the libraries so that changes in one doesn't affect the others but when new parts are defined the master library is updated?

If an inspection data is changed, the dialog shown in Figure 1-5 appears.

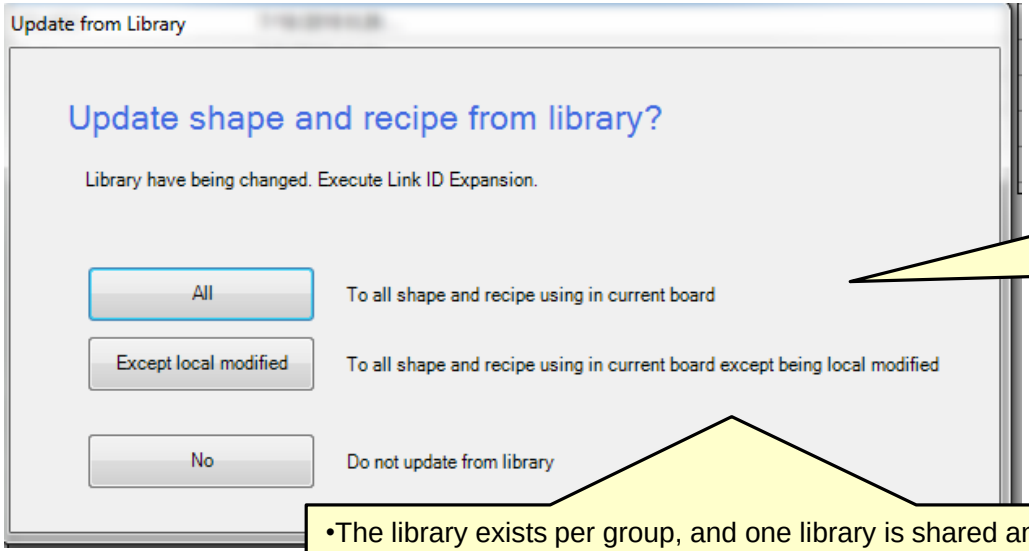


FIG 1-5

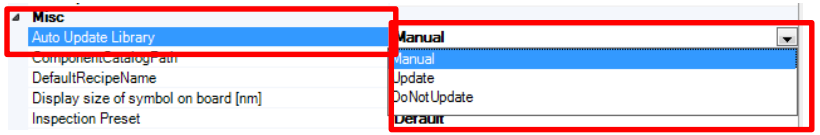


FIG 1-6

•This window (FIG 1-5) appears when you enabled the settings on Figure 1-6 in the feature (manual) and every model change will ask the same question Update shape and recipe from library?

•The library exists per group, and one library is shared and used within the same group.

•When using a library, changes in the recipes and shapes within the inspection data can be easily deployed to other inspection data in the same group.

FIG 1-3

THANKS!

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