mek®

MODEL 22X
Operation manual

Version 6.8.x

EN

2025.05.16

Rev.2

Contents

Introduction

Thank you for purchasing the Model 22X PCB Automated Optical Inspection (AOI) system. To ensure proper use, please read this User's Manual carefully.

- It is forbidden to reprint or copy the part or all of contents of this manual without permission.
- Contents of this manual may change without notice for improvement.

Please be advised of the following:

1. Users should have basic computer skills. Personal computers and peripherals have been purchased by proxy, and our responsibility, when failures or problems occur, shall be limited to making repair and replacement requests to the computer manufacturer

2. Regarding all defects and bugs in the software, update notices will be sent to you for 1 year after shipment. The latest software is available for free download at http://www.marantz-mek.co.jp .

3. Please dedicate a personal computer for use only with this device. Changes in the operating environment may lead to decreased performance or result in defective operation.

4. Failures and problems that occur within 1 year after purchase, and for which we are responsible, will be repaired and improved at no additional charge. However, please understand that we will not be responsible for any data loss that occurs during the repair process. Data restoration shall be the customer's responsibility.

5. The principle of pattern matching is based on measuring the level of similarity between two images. The tolerances for determining similarity can be set higher or lower. However, the inspection result may incline toward either OK or NG.

6. We will not be liable for any damage to the inspected PCB by our AOI or for missing or False NGs.

7. The brightness of lighting may change depend on environment, please calibrate the lighting regularly using the 22X software.

1. Model 22X

Model 22X is a PCB Automated Optical Inspection (AOI) system that inspects PCBs (Printed Circuit Boards) for the presence of parts, misalignments, incorrect parts and letters, extra parts (such as solder balls and scratches), as well as detecting solder printing, solder shorts and solder fillets.

■ Model 22X Features

- The inspection process is very simple; using the mouse, just make a frame over the component/part to be inspected or drag & drop the inspection frame from library on component.
- The Model 22X can inspect PCBs after many processes; after solder printing, after chip placer, after mounter, and after re-flow.
- The Model 22X displays the inspection results in 3 view modes; Map View, NG List View, NG Cell View.

■ Inspection Procedure Overview

The Inspection procedure of Pattern Matching algorithm is as follows:

> Place the Inspection Frame onto the part of the PCB that you want to inspect.
> Store the Master Picture for each Inspection Frame. The Master Picture is an OK sample picture.
> Compare the Inspection Frames to the Master Picture.
> The Inspection Frame is divided into small grids and within each grid, if the difference rate caused by the subtraction (displayed as light leakage) is within acceptable tolerances, it will be judged OK. If the rate is out of acceptable tolerances, it will be judged NG. Color in each grid is also checked, which means that even if the brightness and geometry are the same, the Inspection Frame will be judged NG if the color is different.

As described above, the inspection method is quite simple, but OK/NG criteria can be customized in various ways. Moreover, screen displays can be customized for ease of use. Various Inspection settings are possible depending on the PCBs manufacturing process. Using this manual as a reference, please find the method that best meets your needs.

2. 22X Interface

22X interface differs depending on the camera. 4M interface and 5M interface are displayed here. For the detail of each components, see the next page.
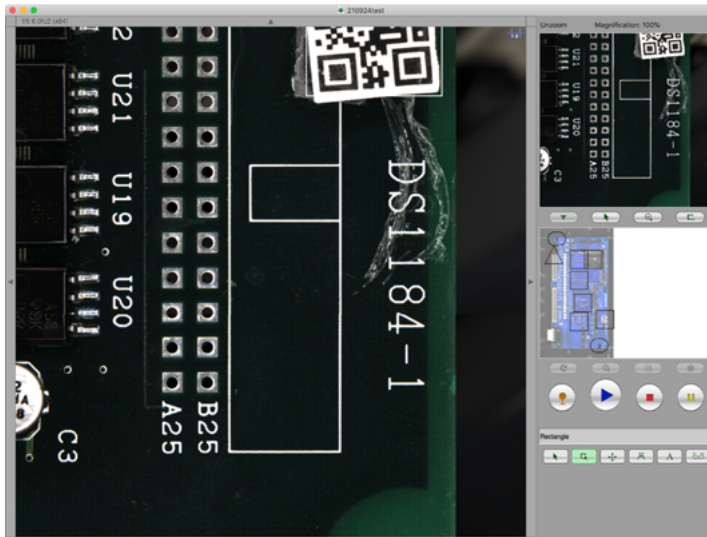
4M screen
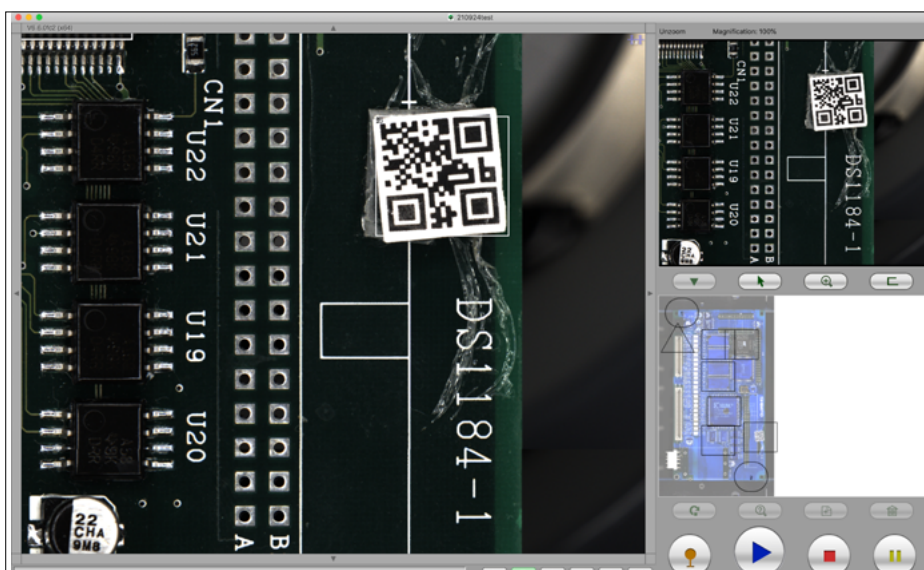
5M screen

Main Window (4M size Display)

No.	Name	Description
1	**Work area**	An area used in many tasks such as changing the displayed area or placing Inspection Frames.
2	**Pointer Tool**	Used to create stamp from automatic stamp creation wizard, or select Inspection Frames. Frames can be moved by dragging and dropping.
3	**Inspection Frame Tool**	used to create Inspection Frames. The default is the Rectangle tool, but by clicking and holding down the mouse, you can select the Rectangle, Oval or Polygon. This tool can also be changed to the Stamp tool 🔲 while selecting a stamp.
4	**Move Tool**	Moves the camera and changes the display area.
5	**Eject Button**	This button moves the PCB to the front in order to eject it. By holding mouse down, sub menu appears. You can select menu from "Eject", "Home", and "Origin".
6	**Swap A/B Button**	When inspecting both sides of the PCB, this button allows you to select either the A or B-side.
7	**Map View Button**	Used to create or display the Map View, or to display NG Symbols.
8	**Pitch Button**	When you click on the frame, the PCB moves by the Pitch value. The Pitch value can be customized from the **Settings** Menu > **Configuration** > **General** and changing the **Pitch X%**/**Pitch Y%**. Operator name is displayed on the lower left of the frame and Lot number is displayed on the upper right.
9	**Message Bar**	Information and warnings about the inspection frame are displayed.
10	**Master Picture**	When you select the inspection frame in the Work Area, the Master Picture of the selected frame will be displayed here. The ▼ button displayed on the upper left is the Master Picture Pull-Down Menu that includes menu items to edit the Master Picture. The magnification rate can be changed at the top.

Main Window (5M size Display)
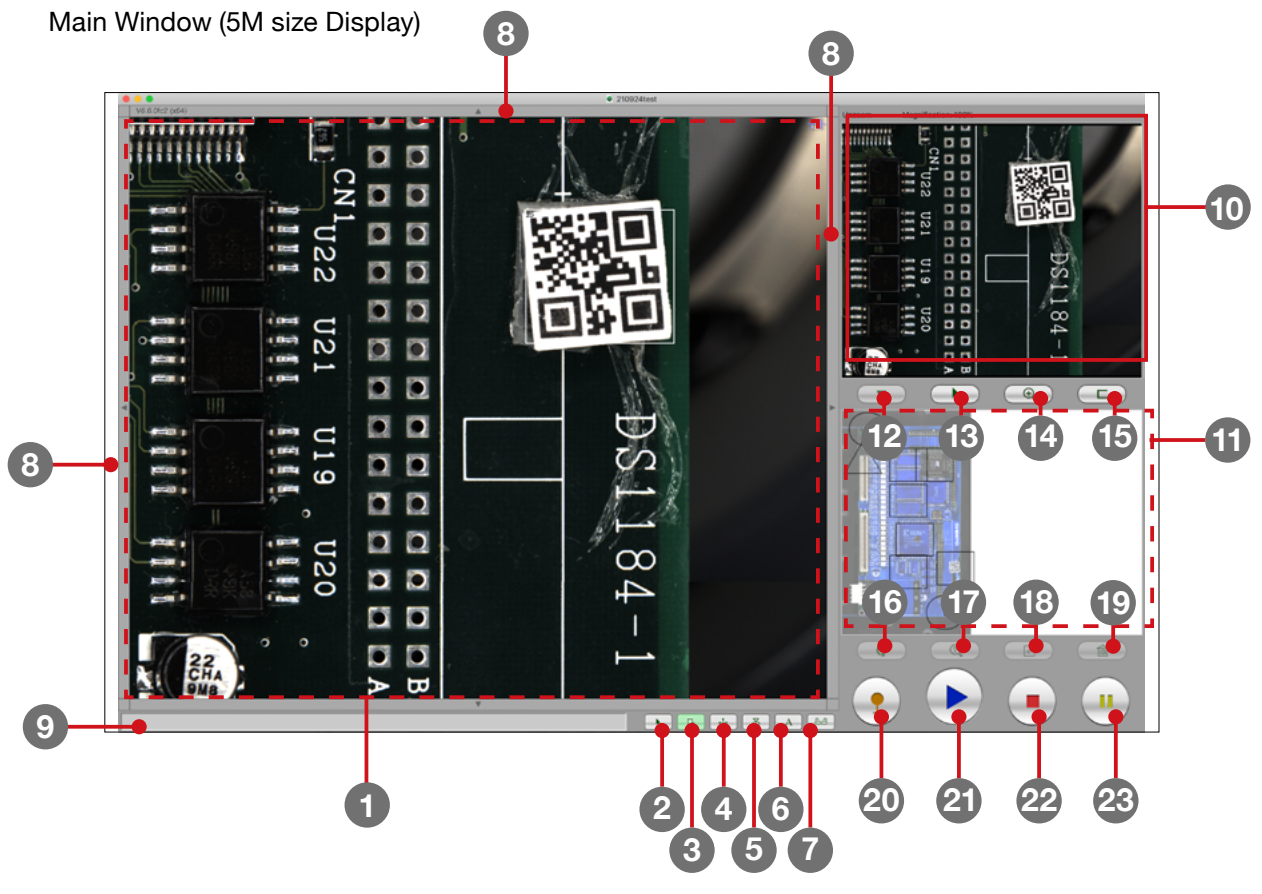
No.	Name	Description
11	**Cell Map Area**	Displays the position of each cell on the PCB. When a cell is selected, details of the selected cell are displayed in the work area. When a cell is selected in the Cell Map Area, Inspection Frames will not be displayed.
12	**Cell Menu Button**	Pull-Down menu for cell operations.
13	**Cell Selection Tool**	The Cell Menu Button becomes active only after selecting this tool and dragging over cells.
14	**Cell Expansion Tool**	The selected cell(s) within the Cell Map Area will be enlarged.
15	**Blend Tool**	This tool allows you to set the blend rate when displaying the PCB image as the cell map background. The PCB image will not be displayed when no cell is selected. The PCB image is displayed clearly at FULL, but the cells will become somewhat blurry.
16	**Re-inspection**	This button is for inspecting the selected Inspection Frame again.
17	**Analyze Button**	This button is for analyzing the selected Inspection Frame.
18	**Add Master Picture Button**	This button is for adding the selected Inspection Frame image as a Master Picture.
19	**Delete Button**	This button is for deleting the selected Inspection Frame.
20	**NG Pause Button**	This button sets the system to pause when an NG point is found during inspection. To use this setting, click to highlight this button before inspection.
21	**Start Button**	This button starts inspection.
22	**Stop Button**	This button stops inspection. When this button is pressed, the next inspection will start from the beginning of the inspection process.
23	**Pause Button**	This button pauses inspection. When pressing the Start Button, the inspection is re-started from the paused position.

2. 22X interface

3. Startup, Shut Down and Authorisation

Operations for Startup and Shut Down as well as Authorisation are explained in this chapter.
If Software Installation or initial settings are required, please refer to chapters 25 and 26.

3-1 Startup

The **Startup** procedure is as follows:

1. Turn on the power on the 22X machine.
2. Press the power key of the Mac to start up the computer.
3. If the 22X software is included as a startup item, the program will launch automatically. If not, double click the 22X icon to launch the software.
4. After starting up, message for machine warm-up will be displayed. This message will be displayed whenever you reboot the computer.
5. When the "Warm-Up" button is clicked, the 22X machine confirms the Origin positions and begins the warm-up procedure until lighting stabilization is done. Press "Cancel" button, and message will disappear when warm-up procedure is not necessary.
6. If warm-up procedure is not done, press "Origin" button to confirm the Origin positions.

* The user can set the warm-up time. Click on the clock icon in the warm-up dialog to enter the warm-up time. The warm-up time can be set in minute increments ranging from 5 to 60 minutes.

3-2 Shut Down

The **Shut Down** procedure is as follows:

1. Select **Shut Down** from the **File menu** to shut down the 22X software.
2. Select **Shut Down**… from the **Apple Menu** on the left top corner of the Mac screen to shut down the system.
3. Turn off the power on the 22X machine.

3-3 Authorisation

Authorisation sets the user level.

Operator Mode …… Allows operations for inspection.
Programmer Mode …… Allows editing of inspection programs.
Supervisor Mode …… No limits.

The mode can be changed by selecting **File menu** > **Authorisation** (Screen 1). Supervisor Mode is required to make 22X system settings. In that case, please follow these steps:
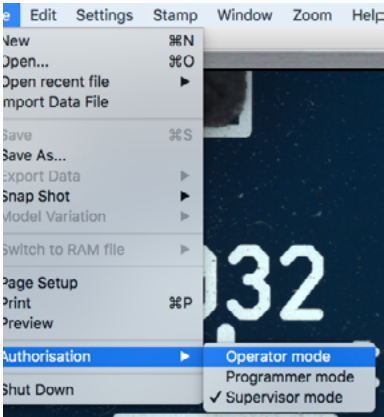
1. Password setup is required when you enter Operator Mode for the first time. When the entry dialog is displayed, enter a password up to 16 characters.
2. Enter the password again and the mode will switch. The software will launch in the selected mode the next time you run the software.

Menu bar is hidden on the Operator Mode. Following items are displayed when clicking the top of 22X:
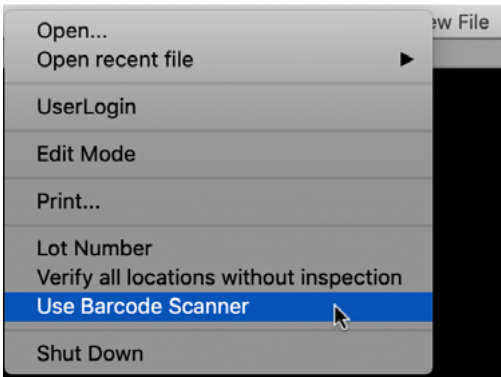
Open	Opens an inspection program.
Open Recent file	Opens the lis of programs recently used.
Operator Login	Logins by entering an operator name registered.
Edit Mode	Switches authorisation.
Print	Prints a list.
Lot Number	Enters a lot number.
Verify all locations without inspection	Confirms every locations.
Use Barcode Reader	Uses a barcode reader.
Shut Down	Closes 22X and turns off the Mac.

* The password is required when changing from Operator Mode to Programmer Mode, or from Programmer Mode to Supervisor Mode.
 * In Programmer Mode, the following items in the Settings menu cannot be changed; Calibrate Pixel/cm, For Supervisor, Mechanical Calibration (except Check) and Reset Camera.

3-3

(Screen 1)   (Screen 2)

3. Startup, Shut Down and Authorisation

3-4 Operator Login

Who was operating AOI? By using Operator Login function, it will be obvious. Operator Login should not be set if AOI is run by one person. But in the factory, many operators may work in different time schedule. The AOI operator name can print on roll-paper or send to data server software CS-Center together with the inspection result.

Please create and activate account as following;

1. Start 22X in Supervisor mode or Programmer mode.
2. Select Operator Account in Settings menu's Configuration (Screen 1).
3. Operator Account window opens (Screen 2). Press "+" button to add new operator, and press "-" button to delete operator.
4. Set Log-in ID, Password, and Protect mode (optional). Protect mode can be selected from "Unset", "Operator Mode", "Programmer Mode", and "Supervisor Mode". Initial setting is "---" (No setting). Setting stays as same as setting which had been set at last time you close 22X.
5. If the checkbox "Show Login window at software startup" is checked, log-in window is displayed at startup from next time, and software can't be started without log-in (Screen 3). After log-in, the [Logout] button is displayed.
6. 22X starts by Protect mode which had been set at procedure 4. Operator name is displayed after log-in at the bottom left of Work Area (Screen 4).
7. If you start software in Operator mode, Operator Login menu is selectable and operator can login also from this menu. This menu is useful at factory, in case the line keeps working and can't stop AOI, from this menu, new operator can login without stopping AOI.

* In order to save AOI Operator name, "Show Login window at software startup" must be checked and all staff has to login always.

(Screen 1)

(Screen 2)

(Screen 3)

(Screen 4)
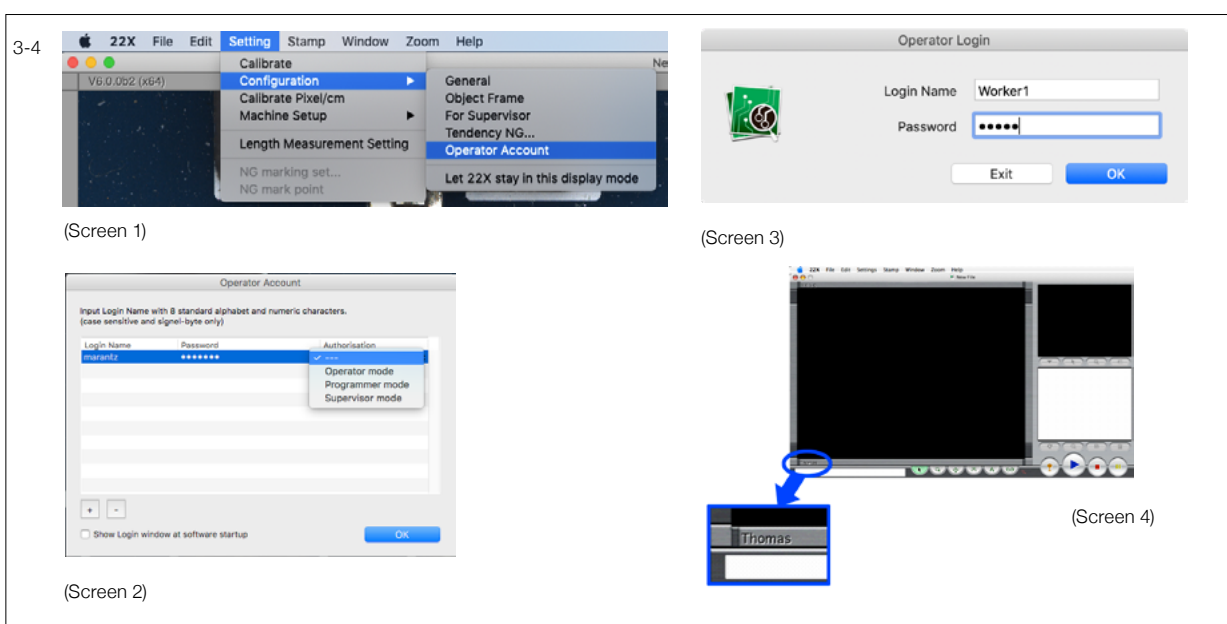
AOI operator name can be confirmed on repairing software CS-Repair greater version than below.

CS-Center: Version 1.1.3.1   CS-Repair: Version 1.1.3.2

3. Startup, Shut Down and Authorisation

4. Quickstart Guide

In order to use this software effectively, it is important to create an accurate Inspection program.. Creating a good Inspection Program is the key to enabling a smooth inspection process. This chapter outlines the operation for creating and verifying an Inspection Program (please refer to related chapters for details of settings and other items).

Work Flow

Here is the basic inspection work flow:

▼[Creating Inspection Program]

1. Preparation

Execute Automatic calibration.

2. Setting the PCB (Described in Chapter 6)

Correctly set the PCB and place Fiducial Mark(s).

3. Creating Stamp Library (Described in Chapter 7, 8 and 9)

Create Inspection Frames on the components you want to inspect. Only area where these Inspection Frames are placed will be inspected.

4. Pasting Stamps

Paste stamps on the same components on PCB

5. Cell Optimization (Described in Chapter 11)

Merge neighboring cells to reduce the inspection time.

6. Test Run / Improvement

Test run the Inspection Program with the PCB used to create the program. If there are any problems, review the program..

7. Creating Map View (Described in Chapter 12)

Create Map View for verification/classification.

▼[Tune-Up]

8. Inspect another PCB

Run the Inspection Program with different PCBs.

▼ [Starting Inspection]

9. Let's start inspection

The above is just one example of an inspection workflow. The optimal method will vary depending on your environment. Once you are familiar with the application, please identify the optimal method for effective inspection.

 * This software can handle CAD data when creating an Inspection Program (comma or tab delimiter data in the CSV/Text format). By loading CAD Data, you can set Inspection Frames based on location data contained in the CAD Data. Since part numbers are included in the data, it is much easier to find the corresponding parts, and much faster to make the Inspection Program. Details for this process are described in the following chapter.

4-1 Preparation

▼ 4-1-1 Selecting the PCB

For accurate inspection, you need to select a reliable PCB to create the **Master Pictures**. Due to variations in the color of PCBs and components, and the glare of the solder, trial PCBs and old PCBs are not suitable for creating the Master Picture.

▼ 4-1-2 Calibration Settings

Confirm whether brightness and color are set up correctly

1. Select **Calibrate** from the **Setting** menu.
2. When the dialog "Move to calibration position?" appears, click **OK**.
3. The Work Area is colored in grey and the color meter will be displayed.
4. Click on the **Auto Cal. button** and make sure that all the color meter indicators except for saturation and hue are pointing close to the center. In some kind of machines, indicators may lean (Screen 1).
5. If your AOI has Diffuse-On Axis LED, press [renew DOAL timing] to adjust the lighting timings.
6. Press **Finish** to exit calibration.
7. Press the **Eject** button to move the carrier to the front.

4-1-2

In case of 5M + ML Lighting

(Screen 1)
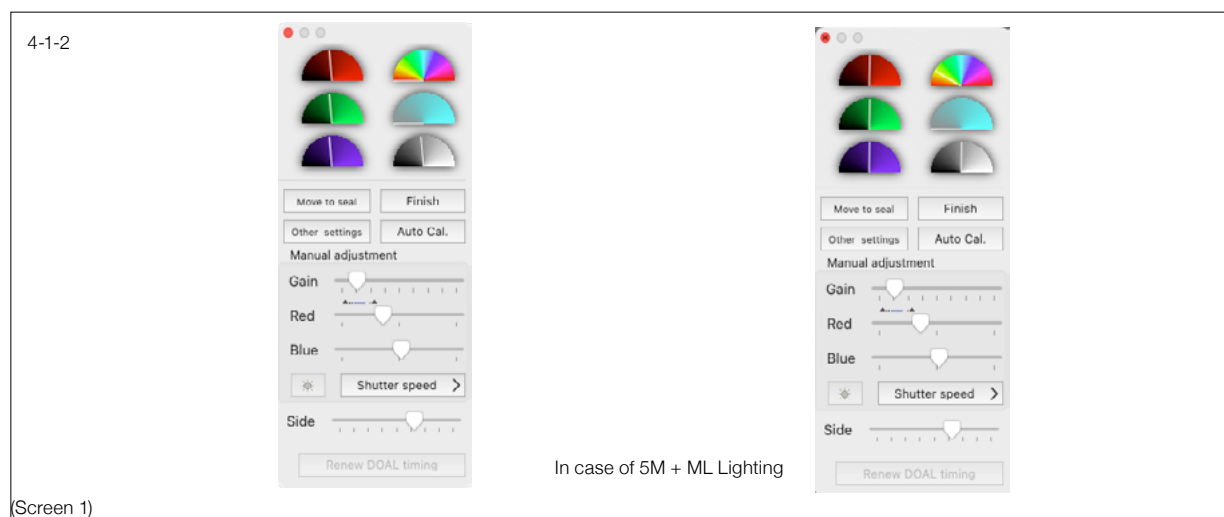
▼ 4-1-3 Environment Settings Confirmation

Select **General** from the **Setting** > **Configuration** menu. Normally, this can be left at the default settings, but the settings may need to be changed depending on the PCB. Please refer to Chapter "Settings" for details.

4-2 Setting the PCB

▼ 4-2-1 PCB Carrier Adjustment (Desktop type only)

The carrier width should be adjusted to match the width of the PCB. Loosen the knobs on the carrier rail, adjust the width to match the PCB, and tighten them well. If the PCB is even slightly loose, the results will not be accurate, so please make sure that the PCB is completely fixed (Screen 1).

In F series and S (GTAz) series with top clamping, PCB will move to the position of clamping when clicking "PCB Width Setting" in sub menu when PCB is in eject position (Screen 2). You can adjust the width to prevent PCB shifting after moved position.   Also the model with the area sensor can perform adjustment without detecting a sensor.

▼ 4-2-2 Fiducial Mark(s) Setting

Set fiducial marker(s). For more detail, see the chapter 6 "Create Fiducial Markers".

1. Display a marker in the center of the screen by using the **Move Tool** and **Pitch Button**.
2. Select **Inspection Frame Tool**, and create a frame about twice the size of the marker (Screen 1).
3. Select **Assign Fiducial Mark** from the **Edit** menu. A square icon appears within the frame, and this frame will be recognized as the **Fiducial Mark** (Screen 2).
4. Click the frame to display the **Marker Setting Window**. Choose a method to detect a Fiducial Mark from tabs above the window.
5. Activate the Centering Button by adjusting **Contrast divergent Lever** on method1 (Screen 3) or

4-2-1

(Screen 1)

(Screen 2)

4-2-2
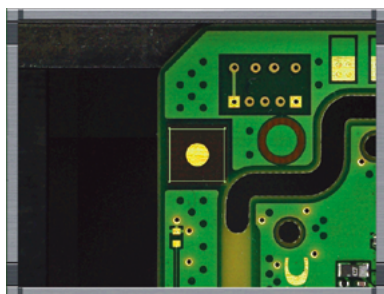
(Screen 1)
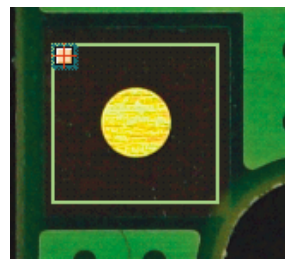
(Screen 2)
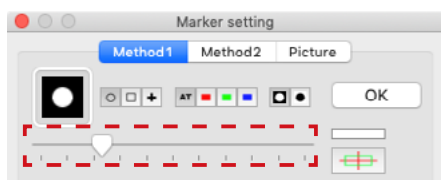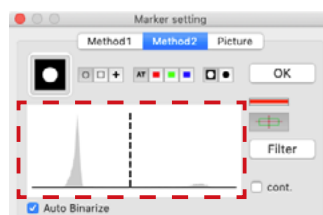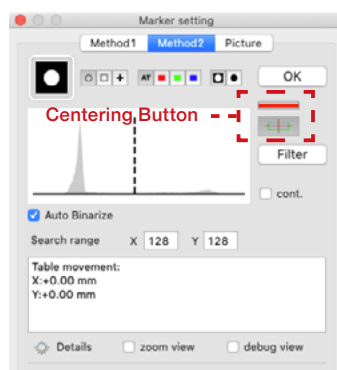
(Screen 3)

(Screen 4)

(Screen 5)

clicking **Histogram** on method2 (Screen 4).

6. Keep pressing **Centering Button** to unite red lines above the button (Screen 5), then click **OK**.

7. Following the same procedure, set a second Fiducial Marker (Sub-Marker) on the diagonally opposite side.

4-3 Creating Stamp (Library)

This software inspects only the areas designated as Stamp Frames. It first checks the Inspection Frame displayed on-screen, then the nearest Inspection Frame and so on. Creating Inspection Frame is a very important process that defines the areas to be inspected while also creating an Good sample for comparison. The recommended procedure here is to create Stamps starting from the top left and then move right or down by Pitch Button.

You can create stamp by drawing frame with mouse. Please refer to Chapter 7 for creating stamps.

4-4 Pasting Stamps

Library for many components may be created in the previous step. Next step is placing stamps on all components on PCB. When you have CAD data, move to the next chapter. When you place stamps manually, there is two ways to place stamps; "one by one" or "multiple and automatic"

The operation to place "one by one".

> Select "Stamp Palette" from Stamp menu. Stamp list will be shown. Select a (pack) stamp. After selecting a stamp, mouse cursor holds transparent stamp picture (Screen 1).
> Move mouse cursor onto the component, and click the mouse. Stamp will be pasted.

There are two methods for "multiple and automatic" paste. One is to paste stamps on the similar images of the current view in Work Area and the other is to paste stamps on Map View, that is, on the whole PCB at once automatically.

The method to paste stamp automatically in the current view:

1. Select "Stamp Palette" from Stamp menu. Stamp list will be shown. Select a (pack) stamp, the mouse cursor holds transparent stamp picture (Screen 1).

4-4
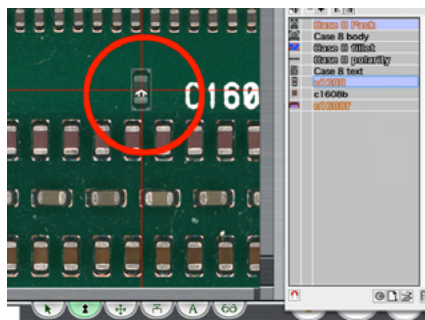
(Screen 1)

2. Select "**Automatic Paste (Current View)**" from Stamp menu. Stamp will automatically be pasted on similar components in Work Area (Screen 2).

*The **number** of stamp pasted is shown in the message bar at the bottom left.

4-4

(Screen 2)

14
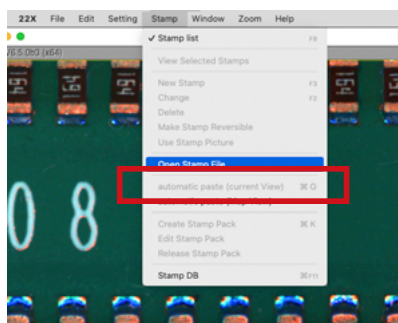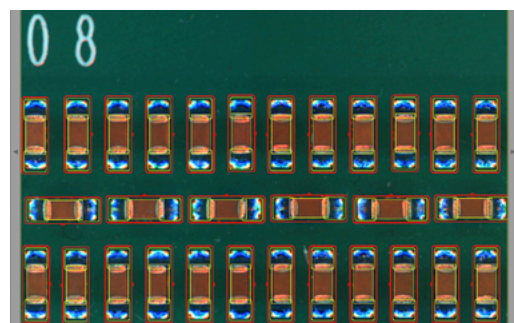
4-4
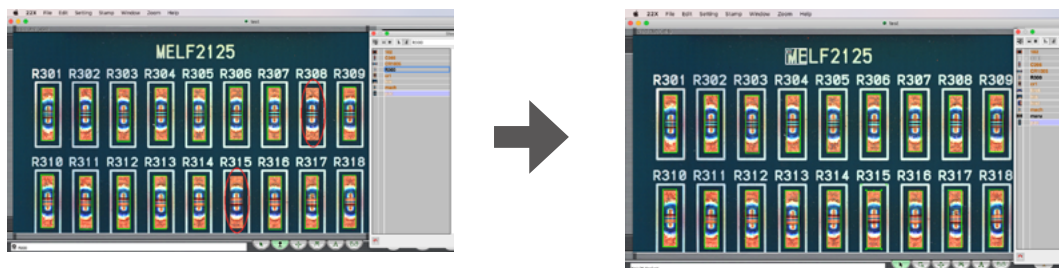
(Screen 3)

3. There is **short cut** for "Automatic Paste", press "**command + g**" on keyboard. After executing Automatic Paste, if there is still a few components on where no stamp is pasted, press "command + g" quickly twice or three times. The threshold of matching is more tolerant on second and third "command + g". As a result the components on where no stamp is pasted will now have stamps (Screen 3).

The method to paste on the whole Map View:

1. Select "Stamp Palette" from Stamp menu and show Stamp list on the screen.
2. Create a Map View by clicking the glasses icon of the bottom menu bar.
3. Select "**Automatic Paste (Map View)"** from Stamp menu. [Automatic Paste List] window appears. Add here the stamps you want to paste from the stamp list .
   First, click a stamp from the Stamp list and move the mouse cursor to [Automatic Paste List] window. When the mouse cursor shape changes into "+", click the mouse there.
   The stamp is added in [Automatic Paste List]. (Screen 4)
   If you want to paste multiple stamps, repeat the same steps. If you want to delete a stamp from the list, click on the stamp and press [delete] key from the keyboard.
   *Stamp without Master Picture cannot be added in the Automatic Paste List.

4. When completed the [Automatic Paste List], click [Start] button and 22X software starts pasting the stamps in Map View.
   * Stamp is not pasted at the edge of frame.
   * Stamp is not pasted on angled component (such as 30 degrees, not 0/90/180/270 degrees).
   * Stamp is pasted by referring master picture, therefore not all stamps are pasted.

4-4

Click the stamp on stamp list and move the mouse to Automatic Paste List.
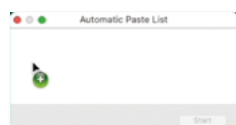
Click the mouse on Automatic Paste List and ...

now the stamp is added.

(Screen 4)

4-4
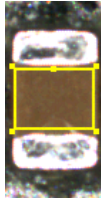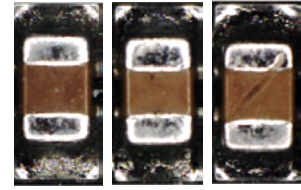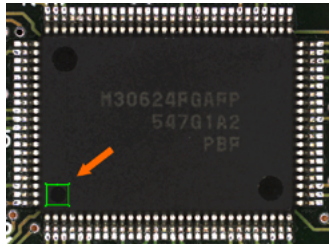
(Screen 5)

There stamps won't be pasted automatically: color too simple (one or two colors only), not characteristic, including solder which shape and reflection differs. (Screen 5)

* The automatically pasted stamps have frames colored in red. By pressing [Stop] button, the frame color turns back to normal.

* Automatic pasting on Map View takes time. (It takes about 20 minutes to paste 10 different stamps on M sized PCB.) Recommended to use this function when you have enough time.

4-5 Cell Optimization

By optimizing cells, neighboring cells will be merged, thus reducing the total number cells and improving inspection speed. After placing inspection frames, select all cells in the Cell Map, click on the Pull-Down menu and select **Cell Optimization** (Screen 1).

* This is not necessarily the best way for optimization. There are other methods for optimization. Refer to Chapter 11, "Cell Operation" for more details.

4-5
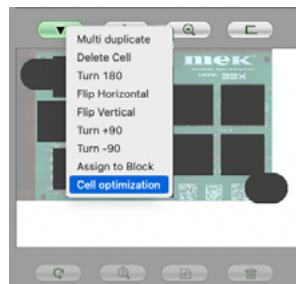
(Screen 1)

(Image 1)

4-6 Tune-Up/Improvement

Now, click the **Start Button** .

If the procedure has been followed correctly, the inspection will be executed starting with the **Main Marker** > **Sub-Marker** > **Inspection Frames**, then move to the Eject position and OK/NG will be displayed in the Work Area.(Image 1).

If NG is displayed, the filter setting may be too sensitive, reacting to camera noise or even to slight board misalignments. Please check the NG Inspection Frame and adjust filter settings. For adjusting, please read Chapter 8 for pattern matching frames, and Chapter 9 for histogram frames. Adjust untill all inspection frames to be OK.

* In this procedure, the exact same PCB is being inspected, but it will not always return a 100% match. The discrepancies are due to slight differences between the picture from the Master Picture setup and the picture at the time of inspection. To avoid unnecessary re-inspections, this program is designed to judge OK within a user-set range of acceptable tolerances.

4-7 Creating Map View

Click on the **Eyeglass Button** to create a PCB Map. NG points are displayed in red. Now, the work for creating the Inspection Program is complete.

4-8 Inspect other PCBs

For the next step, the Inspection Program should be tested using a different PCB. Since the condition of components/parts varies from PCB to PCB, it is important to test the inspection program using a second PCB to adjust the tolerance of the Inspection Program in order to avoid False NGs and missing NGs.

1. Remove the PCB used for creating Inspection Program and set a different PCB.

2. Press the **Start button** on the machine to start inspection.

Even though there may be no actual NGs, slight differences will be detected NG. These will be displayed on the screen as red frames or red cells (Screen 1).

3. If there are any NG points, the Map View with red marked NG points will be displayed after the

4-8
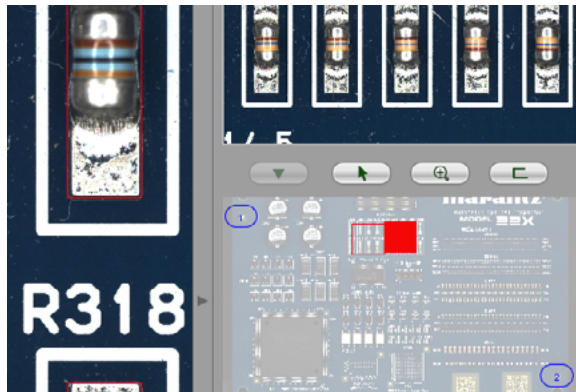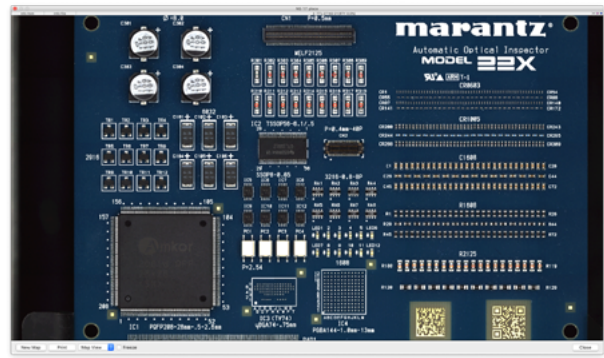
(Screen 1)   (Screen 2)

inspection. (when **Display NG on Map** is checked in **Setting** > **General Setting** (Screen 2)), otherwise an NG message is displayed in the Work Area.

If NG is displayed, the filter setting may be too sensitive, Please check the NG Inspection Frame and adjust filter settings. For adjusting, please read Chapter 9 for pattern matching frames, and Chapter 10 for histogram frames. Adjust untill all inspection frames to be OK.

4-9 Actual Inspection

Inspection preparation is now complete. Let's start inspection. While inspecting, if there are too many false NG or a missing NG, please read next "Handling of missing NGs" and "Handling of false NGs".

* Please carefully check if there are any NG points that have been missed or if there are any OK points that have been flagged as NG (False NG). The following explains how to handle these cases.

4-10 Handling of missing NGs and false NGs

If an obvious defect has been missed or good components are detected NG, please try the following. In order to reduce False NGs, the filter setting should be kept at high accuracy while slackening the tolerance

  - Tune-up parameters of Pattern Matching and Histogram stamps.
  - Change inspection algorithm (Pattern Matching <-> Histogram <-> Others).

First, you need to analyze the cause of the missing/False NG and find the problems.
Following is the methods to measure false NG of pattern matching frames.

▼ **4-10-1 Analysis**

4. Quickstart Guide

Following is the procedure to analyze False NGs.

1. Select the frame which was judged as NG. If you have moved from the Map View or the NG List View, it is already selected.
2. Click on the **Analyze** button on the right. (Analysis can be suspended by clicking on the **Stop** or **Pause** button.)
3. The interior of the frame is separated by grids. The sections divided by grids are colored in blue or red. The blue frame is the matching area and the red frame shows the area that does not match. In order to be judged as OK, all grids must be in Solid lined blue. The definition of the grid colors is as follows (Screen 1).

   Blue frame (Solid line) ... Within acceptable tolerances (OK)
   Blue frame Dotted line ... Slightly out of acceptable tolerances NG
   Red frame Solid line ... Matching NG
   Red frame Bold line ... Saturation or hue NG

First, you need to closely study the color of the frames.

4. During the analysis, the cursor changes to a triangle, designating the direction being searched for a matching pattern. The frame moves slightly to find the matching pattern.
5. In the end, the search for a matching pattern will terminate, marking the area as an NG. In this case, the message bar will show the major causes of the failure. The failure definitions are as follows:

■ Mismatch - A pattern matching method is evaluated on each element of RGB. Pattern matching is evaluated at each required resolution, and if acceptable tolerances are not met, it will be evaluated as a Mismatch.

■ Mismatch by Hue - After pattern matching is OK, hue differences are evaluated. Hue differences must also fall within defined tolerances.

■ Mismatch by Saturation (too low/too high) - After matching by hue, saturation differences are evaluated. Saturation differences must also fall within defined tolerances.

After finding the problems, read Chapter 9 and change filter settings, add more master pictures or use lighting selection to reduce missing/false NGs.

6. With Histogram stamps, open the setting window after analysis. You can confirm the % and thresholds, read Chapter 10 and take measurements.

4-10-1

(Screen 1)

4-11
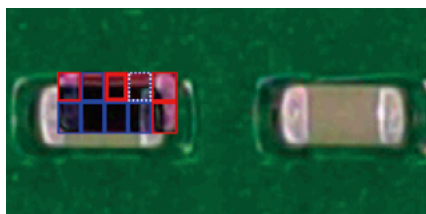
(Screen 1)
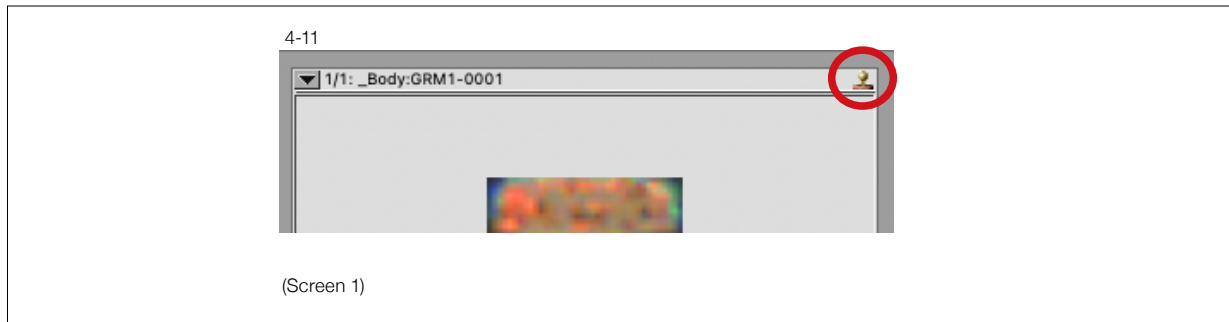
If the frame has multiple Master Pictures, switch the Master Pictures and press the **Analyze button** again. The analysis is executed only on the activated Master Picture.

4-11 Updating Stamps

When adjusting various Inspection Frames, you may need to change the frame size or the filter settings of the same Stamp that is used in more than one place. If you change settings on Stamps one by one, you are not taking full advantage of "common stamps".

Therefore, we recommend that you find optimum filter settings that can be used under as many conditions as possible, and apply these changes to the Stamp itself. By using this method, you will no longer need to edit the filter for each Inspection Frame. Just click on the **Revising Stamps button** (Screen 1) and select **Update all**.

4-12 Save

Save the Inspection Program. For new Inspection Programs, the command will always be "Save As". Changes to the software environment are also saved. From V6.8.0, a [Backup] folder is automatically created in the folder where the inspection program is saved, which stores up to 3 generations of backups. The backup file name will be [filename_backup-date-ofcreation].

1. Enter the file name.
2. Click on "Save".
3. The window title will change to the saved name.

* File name should be within 31 bytes. If exceeds, file name may not be shown/saved correctly.
* Save the programs in disks in Mac formatted. If you save them in Windows PC or Unix system
  including NAS server, the program files are destroyed and you can't open them.

It is also possible to save data for both the surface and the back of the PCB as SIDE A and SIDE B. Refer to 6-5, "Fiducial Mark and PCB side" for details.

5. CAD Data Application Guide

This software can import CAD Data and NC data (Numerical Control Data) created by the P&P machine. In this manual, such Data is called NC data. NC Data is a data file which indicates the coordinates of components. The coordinates can be used to place each Inspection Frame into the Inspection Program. This chapter explains how to apply NC Data.

This is a very useful method for positioning Inspection Frames, but since the size of the frame is not included in the data, some additional works are required.

5-1 File Format to Import

The file formats that can be imported are one of the following. Rotation direction is counter clockwize.

1. CSV/TEXT Format (Comma, Tab separator)

This software also supports tab-delimited and comma delimited data. One component information must be written in one line.

(Example)
```
1215,00795,000,1,R123, Partsname 1
1210,04455,090,2,C123, Partsname 2
3605,04430,000,3,D123, Partsname 3
3580,02665,000,4,E567, Partsname 4
```

This format follows the order "X, Y, W, Z, Ref.Des, Part Name".

X…… Absolute location in direction X in 1/100mm units (Example: 123.56 X12356)
Y…… Absolute location in direction Y in 1/100mm units (Example: 345.67 Y34567)
W……rotation in 90 degree increments (Example: W00180)
Z…….Part cassette number

The absolute position in the .XY direction is in 1/100mm units, but when decimal points are included, the data will be interpreted in mm units.

2. Panaformat Type 1

Text format, file starts with a "$" and ends with an "*".

(Example)

```
        $
        N001/0G1M0T004X+00000Y+00000Z-00V+W+
        N002/0M004T000X-14760Y-18930Z001V3W7
        .....................
        .....................
        N051/0M004T000X-14990Y-18985Z025V1W1
        N052/0M000T000X000000Y000000Z025V1W1
        N053/0*
```

In the example above, the software imports only X, Y, Z and W data (other data will be ignored).

* Numbers for W can be 1 = 45 degrees, 2 = 90 degrees, 3 = 135 degrees in Pana format. Do not forget to press Step 90' in following procedure to avoid to treat W=1 as 1 degree.

3. Panaformat Type 2

Type 2 includes Ref.Des and Part Names in addition to X, Y, Z and W values.

```
    (Example)
        % HEADER
        .....................
        % NCDATA
        N0001X0Y0W0Z1PN ()C ()M000100T/0;MARU1515
        N0002X-08340Y+1666'0W000Z001PN (R1234)C (R 01)M000002T0/0;
        .....................
        *
```

4. 22X Data Format

Format that is output by 22X, which can be imported to 22X.

```
    (Example)
        $
        X20300Y04500W00180Z00062;R121 \RA05010205
        X21100Y11500W00180Z00062;R77 \RA05012005
        X20300Y11500W00180Z00062;R10 \RA05047205
        .....................
        .....................
        *
```

The format follows these rules:
   $...... Data start
   ;...... Ref.Des, 15 characters or less (Example: ;ABC)
   \...... Part Name, 31 characters or less (Example: \RA345)
   data is delimited with line breaks
   *....... Data end

Ref.Des and Part Name must be placed after the separators (X, Y, Z, W) and Ref.Des always precede Part Name. Ref.Des and Part Name must not include ";" or "\".

Ref.Des and Part Name are not a requirement for NC Data. However, Ref.Des make the program much easier to understand since Ref.Des will be included in the Stamp's information and when showing the inspection result in the Map View, 22X will display the Ref.Des next to the red circle pointing NG. When applying Stamps to the corresponding components, the inclusion of Part Names will allow for a more intuitive matching process. If NC Data contains the Part Name, the Stamp Name will be automatically generated from the Part Name while in Teach Mode.

5-2 Creating Stamps from CAD Data

5-2-1 Setting the PCB

Set the PCB. The PCB must be completely non-defective.

5-2-2 Importing Stamps

When using NC Data, a common technique is to create a Stamp beforehand, and apply the Stamp to the components after importing NC Data. Before Importing NC Data, you should Import the Stamps that correspond to the Part Names.

5-2-3 Importing NC Data

Select **Import Data File** from the **File menu**, and choose the NC Data file. NC Data can be imported for either side A or side B, but the Inspection Frames for the first side must be set and Combine Cells After Import must be completed before importing the other side.

5-2-4 Adjust PCB rotation

When NC Data is imported, the CAD coordinates arrangement window showing the coordinates of the NC data will appear. Align it until it comes at the same position as the PCB by 3 buttons in orientation menu. PCB size is shown at the bottom of the window.

* If the angle direction of your CAD data is clock wise, press **flip to cw** button.

Horizontally

When the lateral position of the layout and the actual PCB is inverse, click on Horizontally.

Vertically

When the longitudinal position of the layout and the actual PCB is inverse, click on Vertically.

90 Degrees

When the layout and the actual PCB is misaligned by 90 degrees, click on 90 Degrees will rotate in ccw.

flip to cw

Switch the direction of rotation. Default rotation directory of this machine is counter-clockwise, but some Mounters rotation is clockwise. By pressing this button, the rotate direction will be clockwise.

Flip marks

The coordinates X and Y are represented by the symbol mark of long square in the Position adjustment window. By pressing this button, the marks rotate +90 degrees. This button only changes the view..

* When rotating Horizontally/Vertically, component angle may not match to stamp angle.

Step 90°

If you want 22X to interpret 89 degrees to 90 degrees because of inaccurate P&P machine, or data is in Panaformat, press this button to convert odd angles to 0/90/180/270.

5-2-5 Positioning

Align the actual components shown in the Work Area and the NC Data coordinates shown in the Position Adjustment Window by taking 1 fiducial point and 1 reference point (maximum 4 reference points). (Screen 1)

1. If the data contains Part Name and Ref.Des, the CAD coordinates arrangement window will display the Ref.Des and Part Name when you move the cursor over the marks of coordinates. First, select a point to be a fiducial and double click on it. The point should be nearest point from the corner. The clicked point will be colored in red (Screen 2).

5-2-5
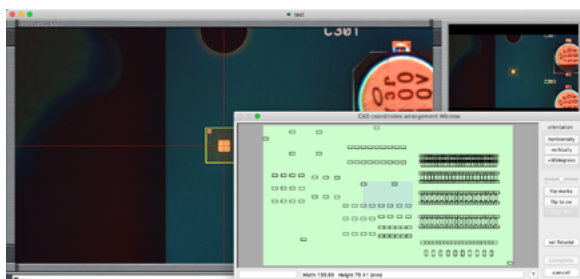
(Position Adjustment Window (Screen 1)   (Screen 2)
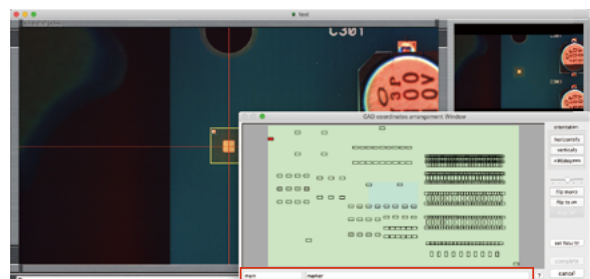
2. In the Work Area, move to the component which corresponds to the coordinate chosen in step.1, and set the component in the center of Work Area. Moving is possible by 4 arrow keys. You can move 1 pixel by clicking arrow key. You can move 8 pixel by clicking arrow key with pressing **option** or **control** key. You can move 64 pixel by clicking arrow key with pressing **option + control** keys. You can move a Cell by clicking arrow key with pressing **shift** key.
Click "Set fiducial" (Screen 3). The red color will turn blue, green grid is displayed and the window in separated into 4 blocks.

3. Next, select a point in the CAD coordinates arrangement window that is diagonally opposite to the fiducial point. This will be a reference point. Click on the mark, and it will be colored red, and the camera will automatically move to that point in the Work Area.

4. The component selected as a reference point will be displayed in the center of the Work Area. If it is accurately aligned in the center, click **OK** and skip **step 5**. If it is misaligned, Move the actual component to the center of the Work Area as well as **step 2**. After adjustment, the blue point will be appeared at the corner of that block. (Screen 4)

5. Confirm if the coordinates are in the center of the Work Area by clicking some marks. If they are not aligned in center, take 2nd reference point. The 2nd reference point should be set in the block where no fiducial or 1st reference point is set. After setting 2nd reference point and confirmation, if there is still misalignment, you can set 3rd reference point. (Screen 5) If your PCB is

5-2-5

(Screen 3)
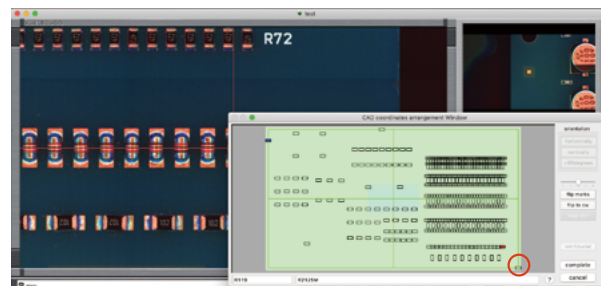
(Screen 4)
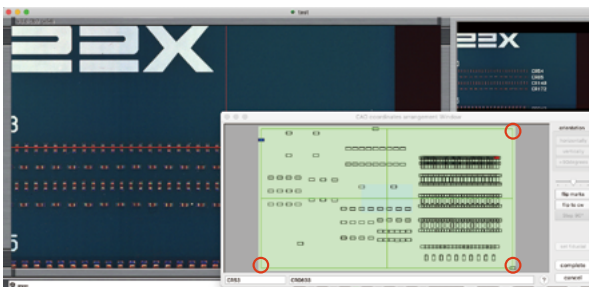
(Screen 5)
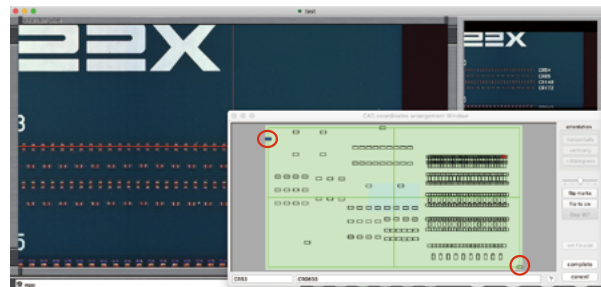
(Screen 6)

very large and the center of PCB is warping, you can set 4th reference point in the center area which the color is altered.

6. If the CAD data contains fiducial markers coordinates, you can create main fiducial marker and sub fiducial marker from the coordinates by setting them as fiducial point and 1st reference point. In this case, click on the fiducial point or 1st reference point by pressing **control** keys. Then blue fiducial point changes its shape into square, and red 1st reference point changes its shape into circle. (Screen 6)

Note: Hints for selecting a fiducial and reference points

There are not many PCBs on which CAD coordinates match perfectly. Especially PCBs after reflow oven are expanded, and after cooling down, they are shrinking and warping.

When setting a fiducial or reference point, the software can calculate the more accurately the closer
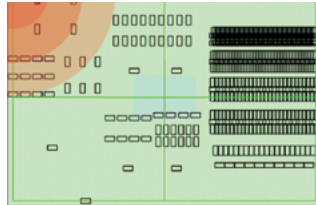
you set these points to the corners of PCB.

In case, if the components' coordinates are gathered and there is distance from one fiducial marker, delete coordinates of fiducial markers and arrange rest of coordinates, then create fiducial markers manually. In this way, components' coordinates can be set more accurately.

---
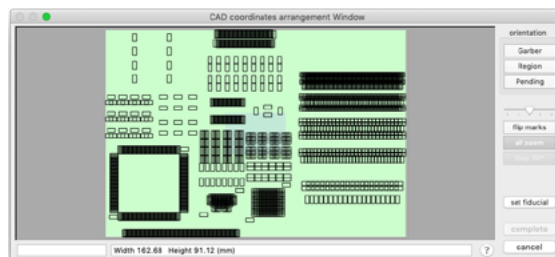
* Reference points can be reset by pressing **clear** key, however fiducial can not be undo.

Click the **OK** button, the apply stamps window will appear.

5-2-6 Applying Stamps

The next step is applying stamps to Parts Name or Z number. When importing NC data, if the data has Parts Name, then Parts Name is displayed in Stamp Applying Window than Z number. "Zxxxx" represents the data without a Part Name. The software automatically names the components without Part Names. "xxxx" begins from 0000.
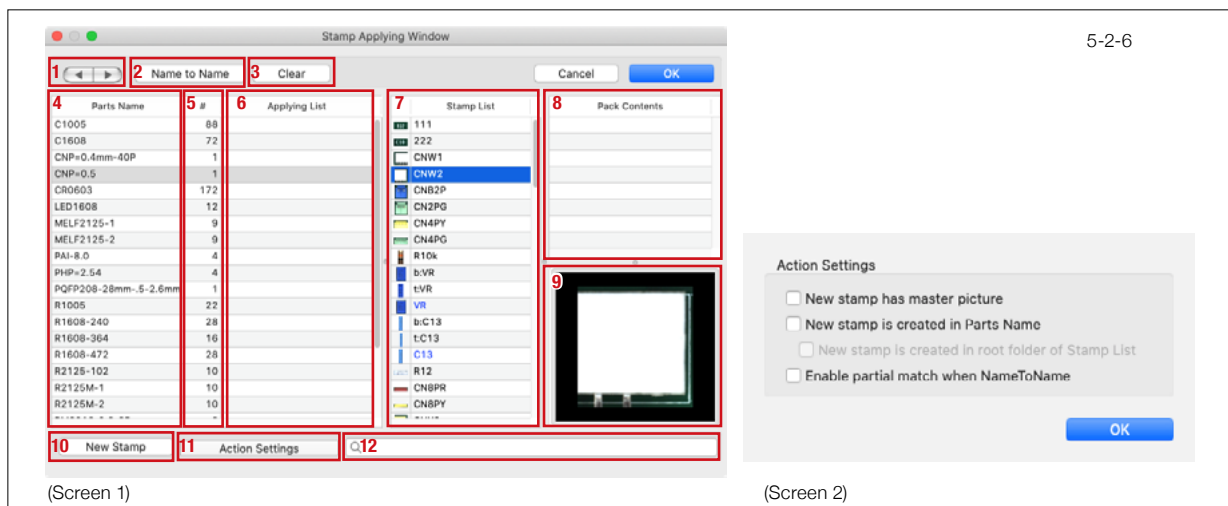
(Screen 1)   (Screen 2)

Stamp Applying Window (Screen 1)

1. Display coordinates of selected Parts Name in Work Area. If you can not guess a component from Parts Name, it is possible to confirm the shape by moving with these buttons.

2. Apply stamp automatically if Parts Name is equal to Stamp Name.

3. Undo applying and delete newly created stamps.

4. Parts name or Z number in NC Data file is listed.

5. Total number of the parts.

6. Column to place the applicable stamp.

7. If stamp library is loaded in advance, displayed here. The stamp in blue color represents Pack stamp.

8. Click on a Pack stamp, then stamps to configure the Pack stamp is displayed.

9. Selected stamp or pack is displayed.

10. A copied stamp is created with new name of "Applied stamp name _ Parts Name". Press this button with **option** key to apply the action to all stamps on Applying List.

11. Action settings window (Screen 2) is opened. Actions can be set when New Stamp button is pressed.

    New stamp has master picture

    Snap master picture automatically during Teach Mode (first inspection after quitting this Window.).

    New stamp is created in Parts Name

    A new stamp is created with "Parts name". It is useful when you would like to manage stamps in original CAD names. On default, new stamp is created with the name of "Stamp name_Parts name".

    New stamp is created in root folder of Stamp List

    The new stamp is created in the root directory of Stamp List. The advantage of creating new stamp in root directory is that you can apply stamps by "Name to Name" next time. This is an option when New stamp is created in Parts Name is active. On default, new stamp is created in the same directory as applied stamp.

    Enable partial match when NameToName

    Stamp with same end-text can be searched. On default, when applying stamps by Name to Name, whole Parts name should match to stamp name.

12. Search stamp(s).

5-2-6
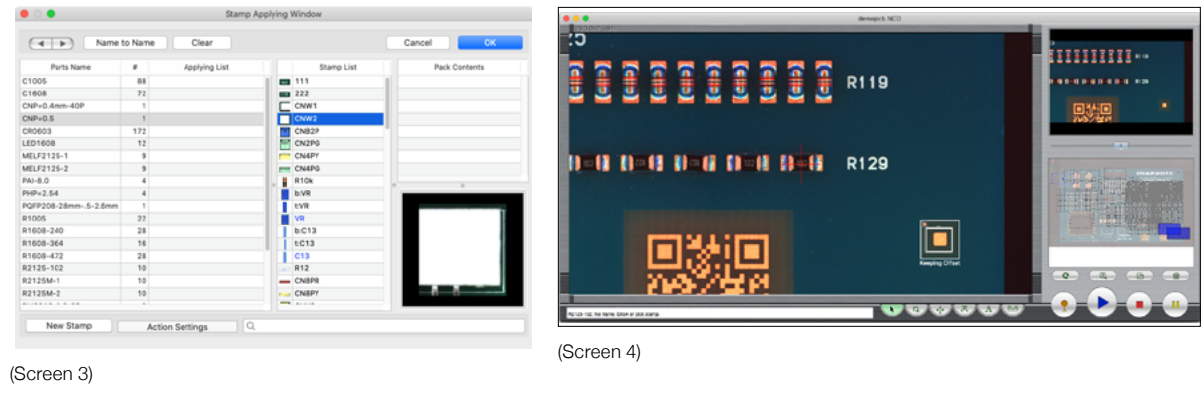
(Screen 3)

(Screen 4)

Basic procedure when applying stamps. (Screen 3)
- When you have no stamp library, do nothing and click OK.
- When you load stamp library, and there are stamps with same name as Parts name, execute "Name to Name".
- When you load stamp library, and apply stamps from Stamp List, drag & drop (or double-click) the stamps onto Applying List. If you want to apply a stamp to more than one components, select by pressing shift key or command key.
- If you like to apply copied stamp from original stamp, press "New Stamp" button after drag & drop a stamp.

Once applying is complete, click "**OK**". When there are no corresponding Stamps, a message "**Some CAD name was not applied any stamp. Are you sure to continue?**" pops up. By pressing OK, a message to ask Cell Optimization (Combine Cell) pops up.

5-2-7 Cell Optimization and converting Parts names to comments

In the message, you can select to optimize Cells now. (If no stamp is applied to any component, this message does not be displayed because optimization is impossible.)
By executing Cell optimization, you can reduce inspection time because the number of Cells are decreasing by combining Cells.

In case stamps are applied to all components, another message pops up. The message asks you to execute only Cell Optimization (Optimize) or Cell Optimization + converting Parts names to comments (Opt.+Comment). If you select Opt.+Comment, the Message Bar will display the Part Name during the inspection in **G/NG Confirmation Mode**. If you only execute Optimize, you can not execute converting Parts names to comments any more in following process. Then, Stamp Applying window will disappear, and many squares (cells) will be displayed on the Cell Map (Screen 4).
* In case, some components are not applied stamps, the selection of Opt.+Comment is not displayed.

5. CAD Data Application Guide

5-2-8
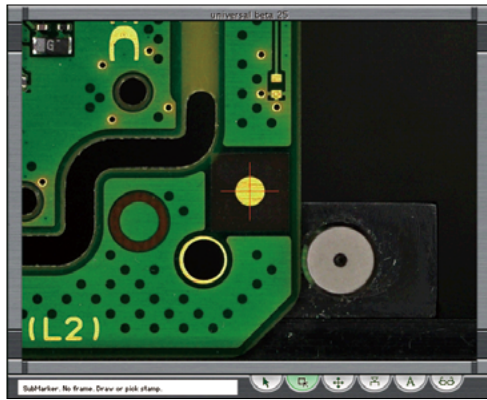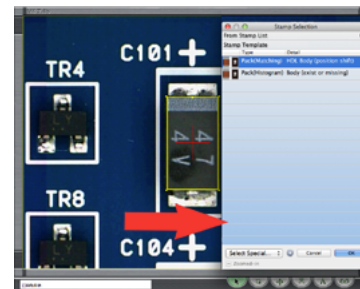
(Screen 1)

(Screen 2)

(Screen 3)

5-2-8 Teaching

Click the **Start button** to start Inspection for Teaching.

Components without Stamps will show red cross marks, and the Inspection will pause here. The message "No frame. Draw or pick stamp" will be displayed in the Message Bar. (Screen 1)

You can select a Stamp from the Stamp List

* To create a new Stamp from existent Stamp with a Part Name from CAD Data. Select a Stamp and
   click the Copy button to activate the copy stamp option

In order to create a new Inspection Frame, Draw a Frame on the component with the Inspection Frame Tool. Once a Frame is drawn, the inspection will proceed to the next component. When drawing a frame by mouse, a pattern matching type frame will be created. But, if you switch Inspection Frame Tool to Selection Tool (Screen 2) and draw a frame, Stamp Creation Wizard will be displayed and you can create Pack stamp or Passive Component stamp (Screen 3).

* For detail of Stamp Creation Wizard, please read Chapter 7.

When stamp is assigned to all coordinates, teaching is completed

* Please move on to the next step even if there are NG points due to stamp misalignment Later,
   misalignment can be adjusted.

5-2-9 Changing Stamp Angles

With the Stamps created during NC Data import, all the same Stamp placed in the Work Area can be rotated. Select a Stamp you want to change the angle and select **Flip/Turn** > **Rotate Right/Rotate Left** in the **Edit menu** by pressing the Option key.

* After applying the Stamps, please make sure that the Inspection Frame is correctly overlaid on the component in the Work Area. If the Inspection Frame is at an incorrect angle, the Stamp's 0 degree can be different from component in CAD data's 0 degree.

5-3 Convert Part Names to Comments

If Part Names are not converted into Comments, execute this process right after.

Select **Part name to comment** from the **Edit menu**. This process should be executed before **Combine Cells After Import**. After **Combine Cells After Import**, Part name to comment can no longer be selected.

5-4 Combining Cells

After creating Inspection Frames, sometimes the positions of Cells are not ideal. Therefore, it is best to merge cells together to improve efficiency. **Select Combine Cells** After Import. Neighboring cells will be merged into single cells or optimized.

* If Combine Cells is not executed, a warning message will be displayed every time at file opening.

5-5 Confirming position of Inspection Frames

Click on the Cell one by one in the Cell Map Area to check if the Inspection Frames are placed in the correct positions.

* If all the Inspection Frames are misaligned toward a certain direction, press the command and option keys and drag the Work Area in order to adjust the components to the Inspection Frame using the Pointer Tool.

5-6 Importing Additional CAD Data

After Combine Cells After Import is complete, additional NC Data that has been created separately, can be imported into the same Inspection program. Additional imports are possible only after Combine Cells After Import. It is impossible to apply a different Stamp to a component to which a Stamp has already been applied in the first NC Data import procedure.

5-7 Placing Fiducial Marks

In general, the NC Data does not contain Marker locations. If Markers are necessary, manually add the Fiducial Marks.

* The sample screens of NC Data contain Marker locations.

5-8 Editing Stamps

Inspection Frames that did not have corresponding Stamps become new Stamps automatically. The created Stamps have names of Part Names. "Zxxx" should look like "Z0012". Double click on the Stamp Name shown in the Stamp List Window to change the Stamp Name.

If the stamp in the Stamp Library has an angle other than 0 degrees, the Stamps positioned in the Work Area will be at an unexpected angle. In this case, refer to Chapter 10, "Stamp".

5-9 Filter Settings

Automatically created stamps are not optimized in filter settings. It may be necessary to set up filters for each stamp (refer to Chapter 8 for Filter Settings).

If you change the settings of a stamp, the changes are automatically applied to all stamps of the same type. If you change the size of a stamp or add/delete a master picture, click the **Stamp Update button** in the upper right corner of the master picture area to apply the changes.

* If there are any stamp misalignments, improve the position.

* This chapter has covered the first half of Chapter 4, "Quickstart Guide". Please see 4-6 "Test Run/ Improvement" to continue.

Note: Importing Gerber Data

Gerber Data converted by GBtmz software for Windows® can be handled like CAD Data importing. Import the Gerber Data, and switch to one of the 3 buttons **Solder Paste Inspection Frame**, **Inspection Frame**, and Positioning Only in the Position adjustment window for setup (Screen 1).

The **Solder Paste Inspection Frame button** automatically positions all of the frames as for Solder Paste Check. At this time, the Stamps are created depending on the size of the Inspection Frames.

The **Inspection Frame button** automatically positions Inspection Frames. However, since the Gerber Data converted by GBtmz does not contain Part names, Stamps cannot be created automatically.

The **Positioning button** does not create Frames. Press the **Start button**. When the inspection is paused on the component marked by red cross, apply a Stamp from the Stamp List. Inspection points that seem to be the same size, will have the same Stamps applied automatically.

The all zoom button is active on default. This means that all inspection frames will be Zoomed frames. This button can be OFF by clicking. This means that frames which width or height is more than 12 pixel will be non-Zoomed frames, and rests will be Zoomed frames.

* It is not possible to create Markers from fiducial/1st reference points.

Create Solder Paste Inspection Frame

Create Inspection Frames

Positioning Only

(Screen 1)

5. CAD Data Application Guide
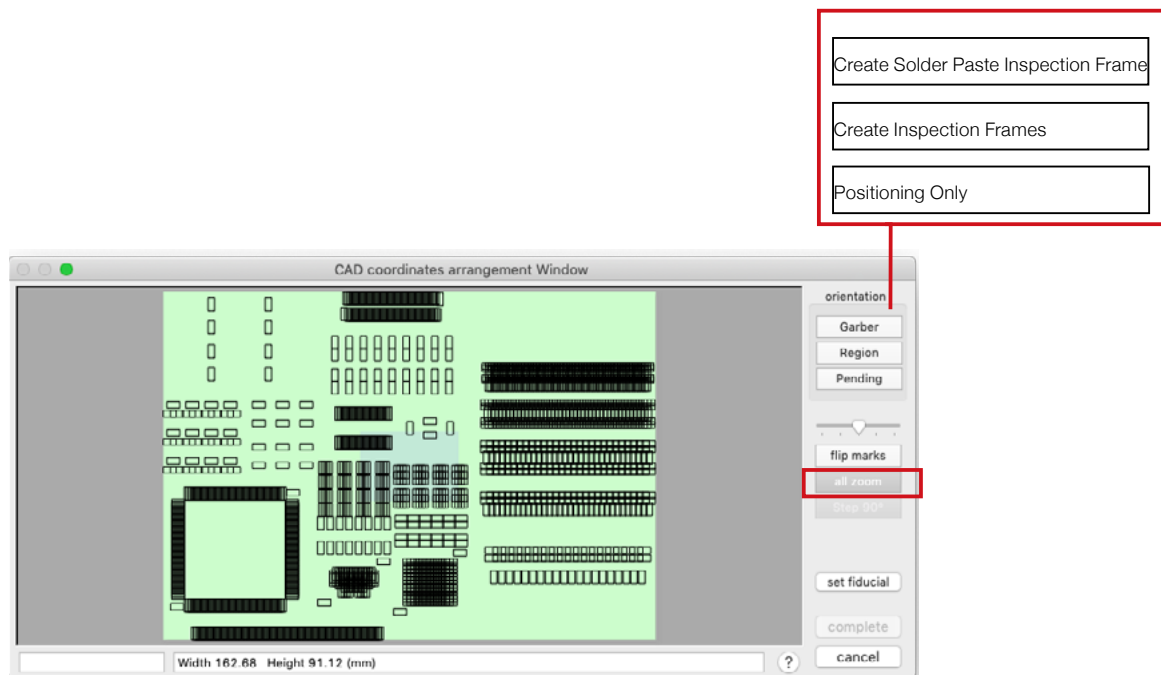
6. Fiducial Marker and PCB Side

When handling PCBs that have Fiducial Marks, you should set up the Fiducial Markers first for smooth inspection data creation, and giving offset to PCB.

6-1 Create Fiducial Markers

You can select 3 methods - **Method1**, **Method2** and **Picture** - to create Fiducial Markers. In plinciple, **Method1** or **Method2** are used. **Picture** is used only when the Fiducial Marker cannot be detected.

6-1-1 Procedure common to Method1 and Method2

This section describes the marker creation procedure common to Method1 and Method2.

1. Display a marker in the center of the screen by using the **Move Tool** and **Pitch Button**.
2. Select **Inspection Frame Tool**, and create a frame about twice the size of the marker (Screen 1).
3. Select **Assign Fiducial Mark** from the **Edit** menu. A square icon appears within the frame, and this frame will be recognized as the **Fiducial Mark** (Screen 2).
4. Click the frame to display the **Marker Setting Window**. Choose a method to detect a Fiducial Mark from tabs above the window. If you select a method different from the initial setting, a confirmation message for resetting the setting will be displayed. Select **Continue**.

6-1-1

Screen 1

Screen 2
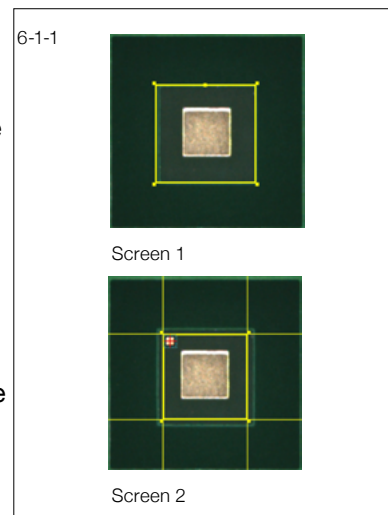
* The initial setting can be changed from **Default Method** on **Details**.

5. Select the shape, color, and black/white setting according to the shape and lightness of the marker. AT (automatic) is basically used for color setting.
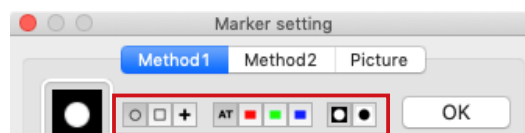
The following steps are different for Method1 and Method2. The following items explain each procedure.

6-1-2 Procedure for Method1

Method1 is compatible with software Ver. 6.1.1 and prior.

1. Adjust the **Contrast divergent Lever** so that the binarized part on the screen has the same shape as the marker (Screen 3).
2. **Centering button** is activated after adjusting the Contrast divergent Lever. Continue to press it down until red lines above the button become a single line ⊞ . Then, click **OK**.

Screen 3

3. Following the same procedure, set a second Fiducial Marker on the diagonally opposite side.

For more detail of the settings on Method1, see 6-2-2.

6-1-3 Procedure for Method2

Method2 is a highly accurate marker.

If you open an inspection program that includes this marker with software Ver. 6.1.1 or earlier, the marker cannot be detected. You need to recreate a new marker.

1. Lines are spread from corners to around when **Method2** is set. Those lines mean a search range of the marker (Screen 4). Search range can be edited on the setting.
2. Click the histogram part to binarize. Adjust settings so that the binarized part on the screen has the same shape as the marker (Screen 5).
3. **Centering button** is activated if the marker is detected. Continue to press it down until red lines above the button become a single line ⊞ . Then, click **OK**.
4. Following the same procedure, set a second Fiducial Marker on the diagonally opposite side.

Screen 4

Screen 5

Text area turns red if the detection fails. If auto detection fails, uncheck **Auto Binarize** and manually operate the threshold bar to find a place where binarization is possible (Screen 6). You may be able to binarize by changing the color setting to something other than AT.

Screen 6
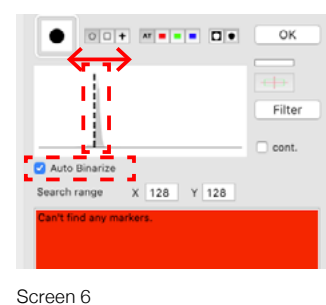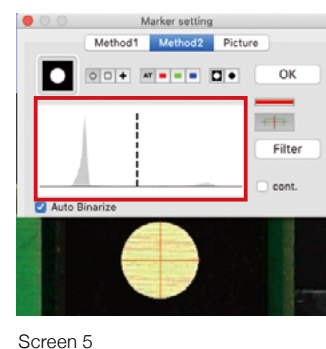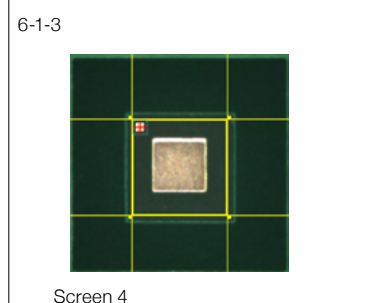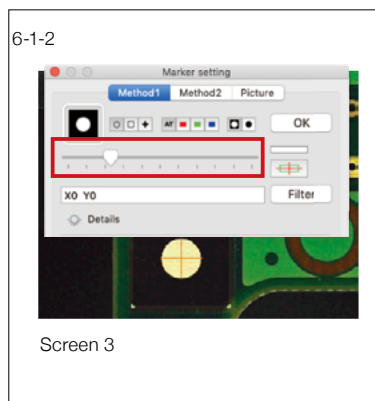
Switch Black/White to use a through-hole as a fiducial marker. Markers can be detected stably without being affected by the surrounding colors.

For more detail of the settings on Method2, see 6-2-3.

6-1-3
Screen 7

6-1-4 Procedure for Picture

If Fiducial Mark detection is difficult, the **Picture** pattern matching is available instead of Fiducial Mark.

1. Display a marker in the center of the screen by using the **Move Tool** and **Pitch Button**.
2. Adjust the frame size to be slightly larger than the Fiducial Mark.
3. Select **Assign Fiducial Mark** from the **Edit** menu, click the marker frame and select **Picture** tab.
4. Lines are spread from corners to around. Those lines mean a search range of the marker (Screen 8). Search range can be edited on the setting.
5. To confirm whether the Marker is recognized correctly, double-click the frame or click TEST button. A red cross will appear in the center of the frame (Screen 9).
6. The Master Picture Area will now show 1/1:50 at the top. The number 50 means OK with 50% matching (Screen 10). To change this value, double-click the value, change the **reference** value in the window, and click **OK** (Screen 11).

* Make sure in the Machine offset that all Inspection Frames are in the correct positions.

* This method is not suitable for reflective solder-plated patterns, or parts that differ by PCB.

6-1-4

(Screen 8)

(Screen 9)

(Screen 10)

(Screen 11)
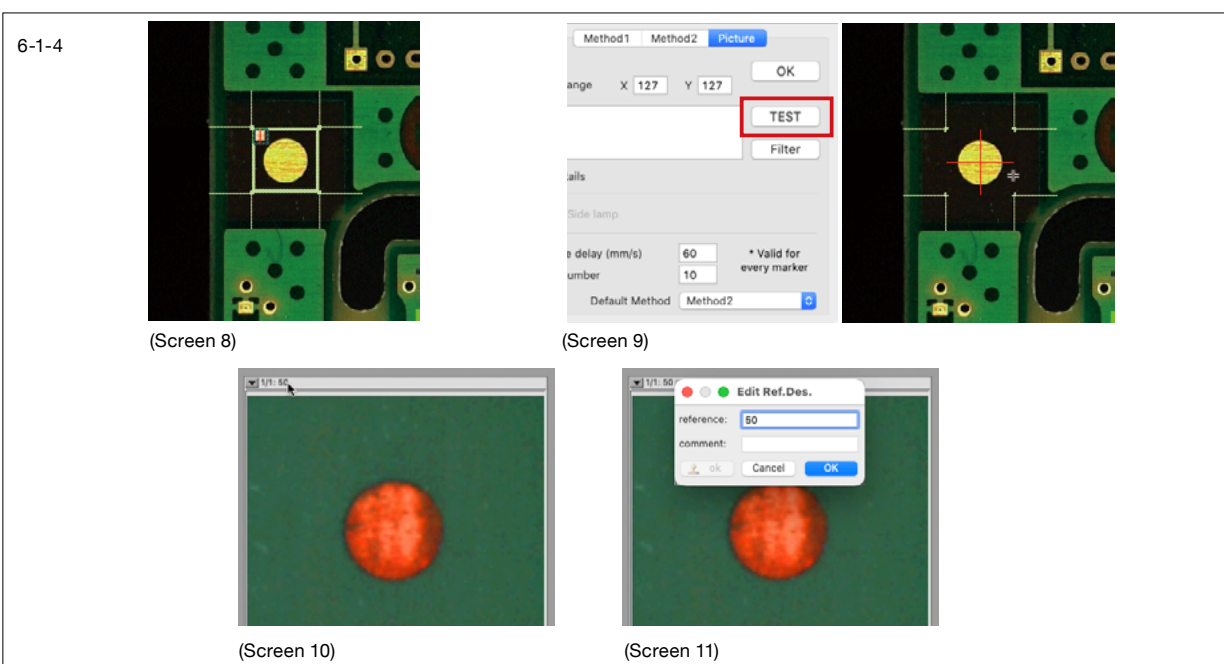
6-2 Marker Setting Window

This section describes settings on each methods.

6-2-1 Common functions on Method1 and Method2

Shape Select Button

Select the shape that matches the shape of the Fiducial; oval, rectangle or cross.

Color Button

In the Fiducial Marker, the Marker must always be converted to 2 colors (ex. black and white).

The default AT shows automatic binarisation. If binarisation does not work well in AT, click red/green/

blue. The Fiducial Marker is binarised based on contrast of the selected color.

Black and White reversing button

Click on an icon depending on whether the inside of the Fiducial Marker is white (bright) or black (dark).

Centering button

This button moves the Fiducial Marker to the center in order to set the Marker accurately. Marker

position is fixed when the bars above the button are unified like this . This button becomes active

when you touch Contrast lever on **Method1** or Histogram on **Method2**.

* This button can only be used when creating Fiducial Markers. You can no longer press the button

   after closing the setting window.

Filter button

When binarisation does not work well due to lack of contrast, use this button to open the Filter and

adjust the contrast. Camera Special Settings are also available from V6.8.0. Refer to chapter 11 for

details on filter handling.

Side lamp

Turns on the side lamp to improve accuracy when there is little difference between the colors of the

Fiducial Mark and its surroundings, or when the edges cannot be detected and Marker is unstable.

Capture delay

This is the waiting time for the mechanical vibrations to subside after movement. The waiting time can

be set from 0-3000 (mm seconds), with the default value being 66.

Retry Number

Designates the frequency of retries when Marker reading fails. It can be set from 1-10, with the default value being 2.

Default method

Decides the method to be used next time from **Method1**, **Method2** and **Picture**.

6-2-2 Unique functions on Method1

Contrast divergent Lever

This lever can be used to set the contrast divergence point. If the value is X0 Y0 (+/-1) when you press down the mouse while dragging, it means that the color has been binarised.

6-2-2

Size limit

Limits the size of Fiducial Markers.

Use virtual center

Use this function if the point is not stabilized with the Centering button. In order to use this function, an accurate Virtual Center must be obtained. In addition, even if this setting is ON, it will not run if a Virtual Center has not been set. In order to obtain the Virtual Center, **check Use Virtual Center** during AT mode and press down on the **Centering** button. Red lines will appear over the button. Continue to press down [icon] until they become a single line (this feature is available only when creating Markers).

Picture Search

An option "**Search fiducial with Master Picture**". With this option active, at first the fiducial frame searches position with Master Picture, then binarizes the fiducial. This option is inactive on default and can be active / inactive by each inspection program.

* If the Fiducials are the type that are embossed by lighting, they may be difficult to identify. Do not create Markers if they are unstable or there is not enough surrounding space to apply contrast.

Low contrast control

In AT mode, turn this function ON when the border changes drastically when the Contrast divergent lever is only slightly moved. The default level is 5. Note that if you increase the value too much, it will have the opposite effect. If there is a lot of noise near the Fiducial Marks, lower the level.
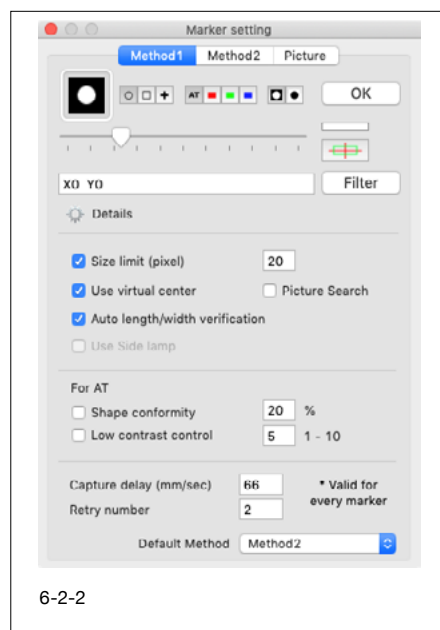
Auto length/width verification

This feature records the length and width at Marker setup as well as the dimensions. Level adjustment is made automatically to adjust the detected Marker to the recorded size and dimensions. It is recommended that you leave this item checked in AT mode.

6-2-3 Unique functions on Method2

Histogram Area

A histogram of the binarized image. The black dotted line is the threshold bar, which can be changed manually when "Auto Binarize" is off. Click here to detect a Fiducial Marker. If the detection fails, text area below turns red.

Auto Binarize

If checked, the binarization threshold will be calculated automatically. Uncheck it if you want to change it manually.

continuous (cont.)

Performs marker extraction processing continuously.

Search range

6-2-3

Sets the range of pixels to search the Fiducial Mark. The unit is pixel. Values are shared between the Method2 and "Picture". Search range disappears when the method turns from Method2 or Picture to Method1.

zoom view

Enlarges the image during marker extraction processing.

debug view

Displays the information during marker extraction processing.

Image identify score check

To avoid misrecognizing objects of similar size, the correlation value with the registered image is calculated, and the correctness is judged after detecting the marker.

6. Fiducial Marker and PCB Side
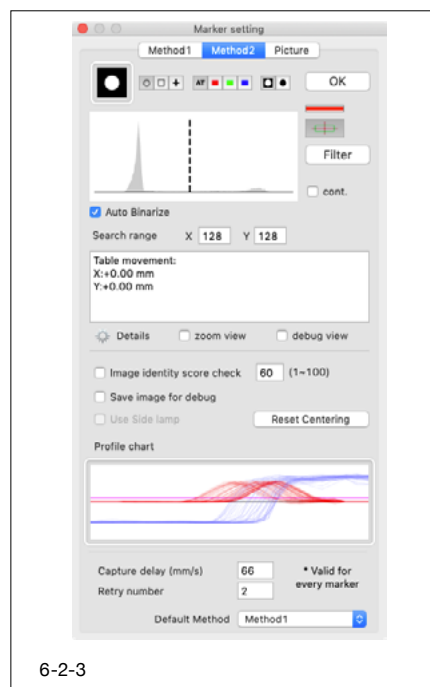
Save image for debug

Gets an image for the log when detection fails and save it in the marantz_AOI folder.

Reset Centering

Unlocks the centering process. Same operation is executed with "Shift+OK" .

Profile chart

This is a graph for visually confirming the stability of edge detection.

6-2-4 Unique functions on Picture

Search range

Sets the range of pixels to search the Fiducial Mark. The unit is pixel. Values are shared between the Method2. Search range disappears when the method turns from Method2 or Picture to Method1.

TEST

6-2-4

A red center line is displayed on the marker to verify that the marker is recognized correctly.

Filter

See chapter 11 for more detail.
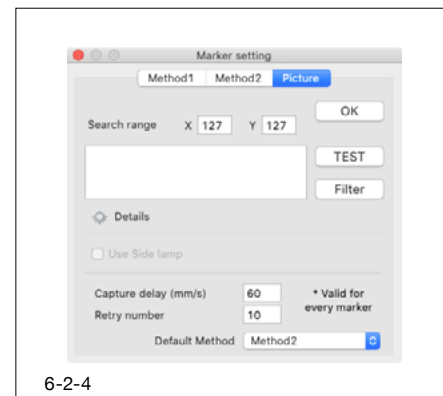
6-3 Fiducial Marker Status

Fiducial offset becomes active when you inspect the program once. Normally the program must be created / debugged in this status. Fiducial status is shown as following (Screen 1);

1. The cell including fiducial marker is shaped Oval in place of Rectangle in Cell Map Area.

2. Keeping Offset is displayed on bottom of fiducial marker frames, if fiducial offset is active.

3. To release the fiducial offset, press Stop button, or click the marker frame by mouse. A message will be shown. Press **Release** to unlock (Screen 2).

Sometimes, you accidentally press Stop button, and make program without fiducial offset. As a result, inspection frames are placed at unexpected position, and inspection result would be incorrect. There is an option to prevent such careless mistakes (Screen 3).

(Screen 1)

(Screen 2)

(Screen 3)

6. Fiducial Marker and PCB Side
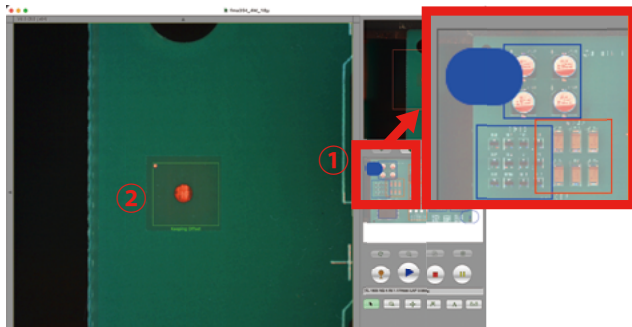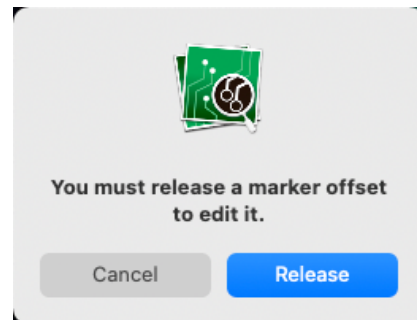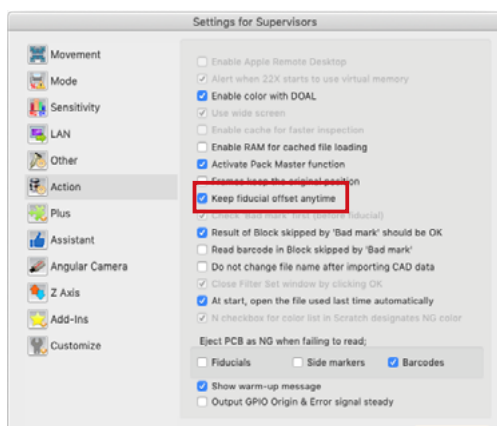
6-4 Fiducial Marker Setting by Pattern Matching

6-4-1 Limitations

Fiducial can be assigned maximum 3. Assigning only one fiducial compensates XY position shifting, assigning two fiducials compensates XY plus theta (angle) position shifting, and assigning three fiducials compensates XY, angle and stretching/shrinking.

- 3rd fiducial frame must be created at the coordinate where X or Y of 1st and 2nd fiducials crosses (Fig.1), and all fiducials must be at the 1/6 corner area of PCB to align large PCB preciously. When assigning the 3rd fiducial, software allows a little distance from the exact XY crossing position. However if there is large distance, an error message is displayed and you can't proceed the operation.
- When there is component (inspection frame) out of fiducial alignment area, you can't assign the 3rd fiducial (Fig.2). If you still like to align such PCB with 3 fiducials, it is possible by following operation; Create (Add) inspection frames after assigning fiducial frames.
  However, the alignment for components out of fiducials is less precision than components within fiducials. Plus, the selected Cell on Cell Map won't be painted for these components (this is only the matter of appearance, no problem in function).
- PCB tilting or shrinking/stretching is possible to align, but PCB warping irregular can't (Fig.3).
- You can't define the 3rd fiducial in Block. For aligning panellized PCB at 3rd fiducial, please assign to the PCB sheet.(Fig.4)

6-4-1

(Fig. 1)

(Fig. 2)
Components Out of Fiducial Area

(Fig. 3)
Warp Irregular
Reflow
Tilt or Shrink/Stretch

(Fig. 4)
Block 1   Block 2
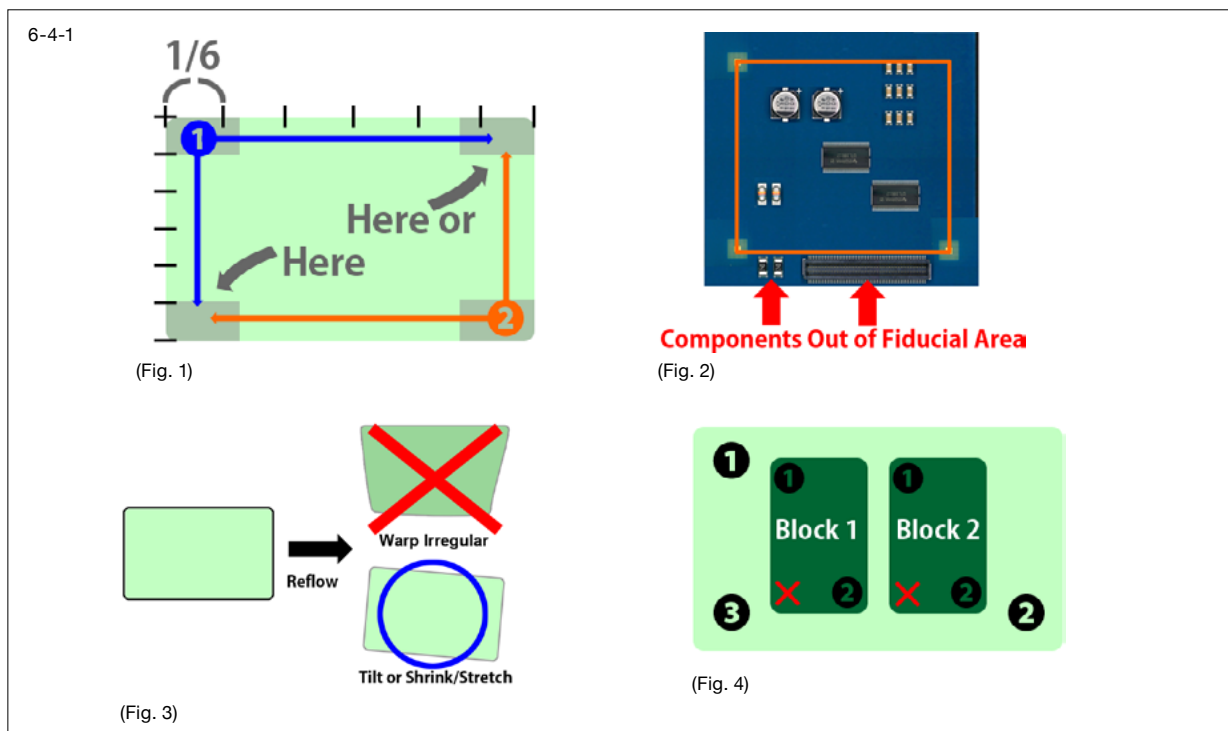
6-4-2 Streching/Shrinking offset with 2 fiducials

Often it is difficult to assign the 3rd fiducial. The accuracy is low but you can still giving stretching/shrinking offset with 2 fiducials.

Create fiducial frames on main and sub fiducial. In setting window of sub fiducial, there is "stretch/shrink" button at the right-bottom of OK button. Click this and you will be asked "Enable to compensate size offset in addition to theta offset?". Click OK, the button is turned to blue color and stretch/shrink offset is enabled.

* If main fiducial and sub fiducial is too close (closer than 25mm), the button is not permitted to press.

* Not possible to assign when the fiducials are in block.
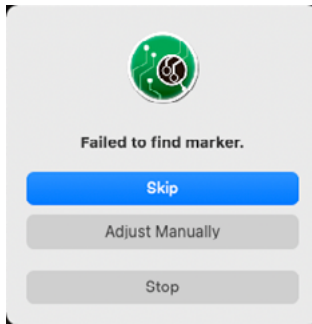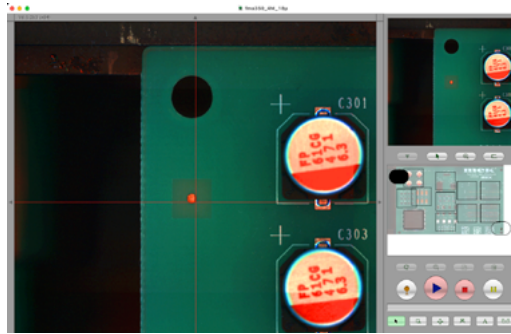
(Screen 1)   (Screen 2)

6-5 Manual Positioning at Reading Error

If a Marker error occurs, there are 3 corrective measures; Stop, Skip or Manual Adjustment.

Stop will terminate inspection, Skip will continue inspection without position correction by Fiducials, and Adjust Manually will continue inspection by forcing the Fiducial Marker to be in the center of the screen. Manual Positioning is effective for handling extremely unstable Markers.

Manual Positioning Procedure

1. If a Fiducial Marker reading error occurs during inspection, an error message will appear, and then a dialog, shown in Screen 1, will be displayed.
2. If you click Adjust Manually, the part to be inspected (Fiducial Marker) will be displayed on the screen, with a red cross pointer. The Start and Stop buttons will also be shown in red (Screen 2).
3. Drag the Fiducial Marker to the center of the screen. Click the Start button and the distance dragged will be regarded as the offset, and inspection will be resumed.

Eject PCB at reading error

There is an option to eject PCB as defect when failing to read fiducial marker. This is useful for inline AOI without operator where line must not be stopped by any reason. Activate "Eject PCB as NG when failing to read fiducials".

6-6 PCB Top/Bottom Side Recognition

One program can include data for both A (top) and B (bottom) sides. In this case, Stamps and preferences will be shared. Set up according to the following procedure:

1. Find a place that clearly differs on side A and side B near the Fiducial Points and select it with the **Inspection Frame Tool** (rectangular).
2. Double-click on the Frame, and reduce sensitivity using the Blur and Resolution filter so that minor differences in the PCB will be judged OK, but the B side will be judged NG.
3. Select Edit > Assign to A side.
4. The letter A will be displayed on the Frame (Screen 1).
5. When setting up steps 3 – 4 for side B, switch over to side B using the **Swap A/B Side Button.**
6. When inspecting, the side will be recognized first and the data will be switched to the matching side. If neither side matches, a message window will be displayed saying that the side could not be recognized.

(Screen 1)
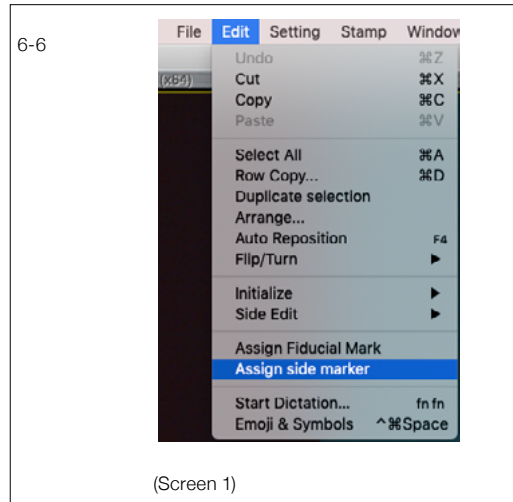
* To change data from side A to side B, go to **Edit > Side Edit > Swap A/B Side**.

* To copy data from either side, go to **Edit > Side Edit > Side Copy**.

Auto A/B swap mode

 To switch A/B, A/B... automatically, press Swap A/B Side Button with option key. Red arrow mark is displayed on the button.

A block barcode on A side can be used on B side too.

7. Easy & Speedy Stamp Creation

In this Chapter, the step of the stamp creation is introduced.

7-1 Stamp Creation Wizard

An wizard creating stamp by selecting component by mouse, without learning filter and parameter settings.

▼ 7-1-1 How to use

1. Select the Move Tool ⊕ and move to the area where the top left of the component is displayed.
2. Switch to Selection Tool ↖ and press mouse down and drag a part in Work Area (Screen 1).
3. Dot line turns to blue line after holding mouse button for more than 0.75 second (Screen 2). The blue frame can be resized. Press esc button to cancel.
4. Release the mouse button to open [Stamp creation] wizard (Screen 3).
5. Select suitable template from Template List.
6. Press OK button to input New Stamp name (Screen 4).
7. The stamps are saved in Stamp List, select Stamp Palette from Stamp menu to confirm.

7-1-1

(Screen 1)
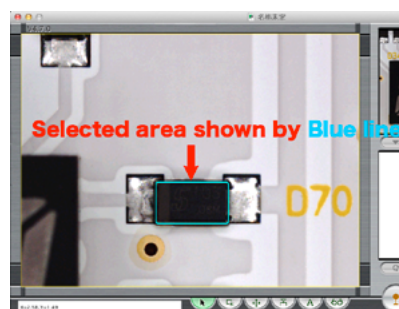
(Screen 2)
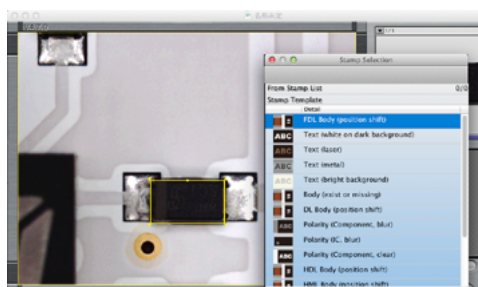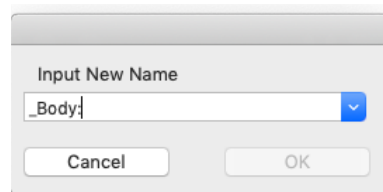
(Screen 3)

(Screen 4)

When creating Inspection Frames, if the frame is too large, it will lead to slower inspection speed and to an increase in False NGs. It is important to understand the characteristics of each component/part to create proper Inspection Frames. Here are the typical methods for creating Inspection Frames:

- ・Body of capacitors/resisters
  Create a frame on the body in a bit smaller size, including lead (Screen -a)
- ・Polarity of tantal capacitor
  Create a small frame on the body where polarity color is (Screen -b)
- ・Text
  Create an accurate frame not to include too much empty space. (Screen -c)
- ・Lead of QFP
  Use IC Lead Gap stamp (Screen -d)

7-1-1
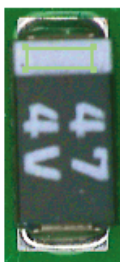
(Screen -a) (Screen -b)   (Screen -c)   (Screen -d)
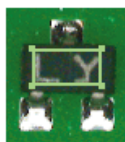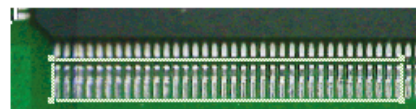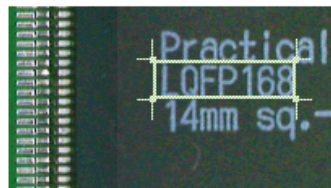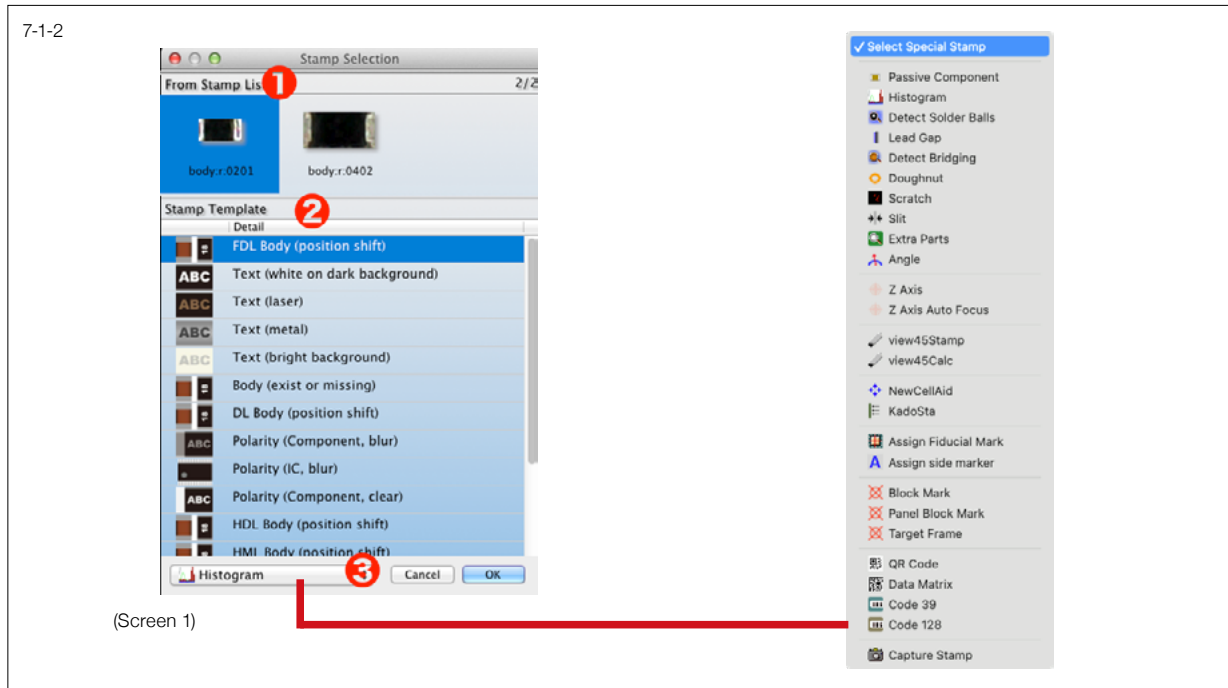
(Screen 1)

▼ **7-1-2 Window**

In Stamp Selection list, there are 3 methods to create a new stamp (Screen 1).

1. From Stamp List

If there are already stamps in Stamp List, the similar stamp(s) is listed from Stamp List. Selecting the stamp and pressing OK button will paste the stamp.

* No similar stamp will be listed when size, shape or color is different.

2. Stamp Template

Major inspection libraries are supplied such as Solder Fillet, Component, Polarity or Text. There aren't too many template but the templates for inspecting component are supplied for all camera type because these cameras' color sensitivity is different.

- Normally the stamp made from template is **non-zoom** frame, however if the short side of the rectangle is less than 0.6mm, the frame will be made **zoomed**.

3. Special Stamps

The following special stamps are available. Selectable stamps vary by model.

Passive Component	Histogram	Detect Solder Balls	Lead Gap
Detect Bridging	Doughnut	Scratch	Slit
Extra Parts	Angle	Z Axis	Z Axis Auto Focus
NewCellAid	KadoSta	Assign Fiducial Mark	Assign side marker
Block Mark	Panel Block Mark	Target Frame	QR Code
Data Matrix	Code 39	Code 128	Capture Stamp

▼ 7-1-3 Example of inspecting Aluminum Electrolytic Capacitor

With Aluminum Electrolytic Capacitor, you need to create 4 frames "Component", "Text", "Fillet" and "Polarity".

    1. First, create frame for "Component". Draw a frame on component by Selection Tool. Select "FDL Body (position shift)" from Template. Save the stamp with new name (Screen 1).
This stamp will detect component "existence", "wrong" and "shifting". You do not need to adjust this stamp. If there is false detection or detection failure after testing some pieces of PCB, please adjust at the timing.

    2. Next, create frame for "Text". Draw a frame on text. Select "**Text (metal)**" from Template. Save the stamp with new name (Screen 2).
Open Filter Set window by double clicking the frame, and confirm if the text is clearly detected.

    Press Brightness bar, the filtered image will be shown in screen (Screen 3). If the text is unclear, slide Brightness or Contrast bar until you get the clear image. When adjusting levers doesn't improve, test the other Text template. There are 4 kind of template to detect text.

    3. Create frame for "Fillet". Draw a frame on fillet. Select "**Fillet DL,HDL,FDL**" from Template. Save the stamp with new name (Screen 4). This stamp is Histogram stamp. Double click the stamp's frame and open window (Screen 5).

7-1-3

(Screen 1)
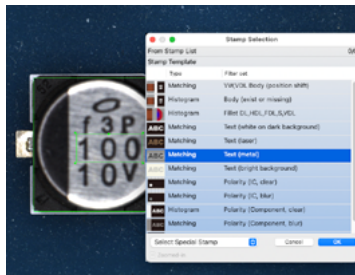
(Screen 2)
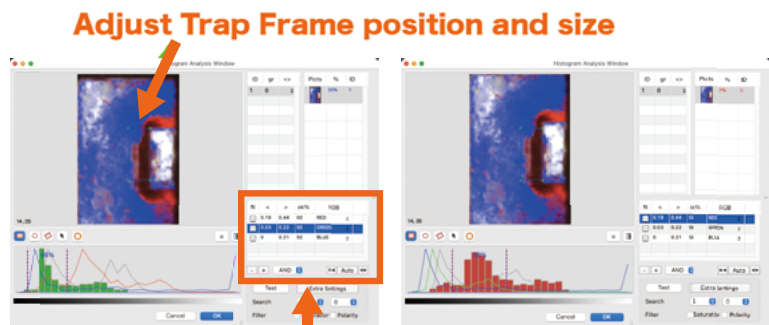
(Screen 3)

(Screen 4)

Adjust Trap Frame position and size

Select each color and press Auto button
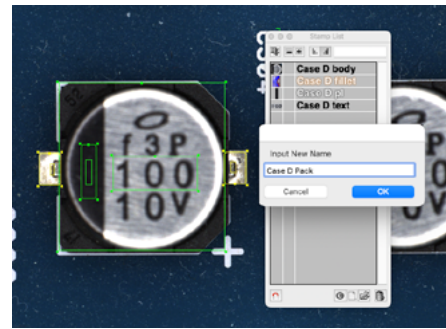
(Screen 5)

(Screen 6)

(Screen 7)

1. There is a trap frame. Move the trap frame to the position where image changes obviously at defect. Resize the frame size if necessary.

2. There is a list to set the threshold of color tolerance at the right-middle in the window. Select each RED/GREEN/BLUE color and press "Auto" button. Threshold will automatically be set.

3. At the end, press check button and confirm if the result is OK. Paste the stamp on the fillet at the opposite side by selecting from Stamp List and press space key twice to rotate 180 degrees.

4. Create frame for "Polarity". Draw a frame on polarity. Select "**Polarity (Component, clear)**" from Template. Save the stamp with new name (Screen 6). This stamp is Histogram stamp. Adjust trap frame and threshold as same as when you create stamp for fillet.

5. Now all stamps are created. It will be easier to handle to make these stamps in a package as Pack Stamp when pasting. To make Pack Stamp, select all stamps by dragging mouse. Select Stamp Pack from Stamp menu. Save the package with new name (Screen 7).

* Stamp Template is not included in 22X software. It must be installed by Installer together with 22X software. If you upgrade software manually by copy and paste, template won' be installed and Stamp Template list will be empty.

7. Easy & Speedy Stamp Creation

7-2-1
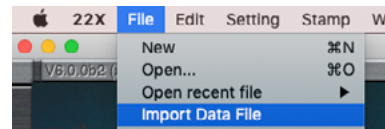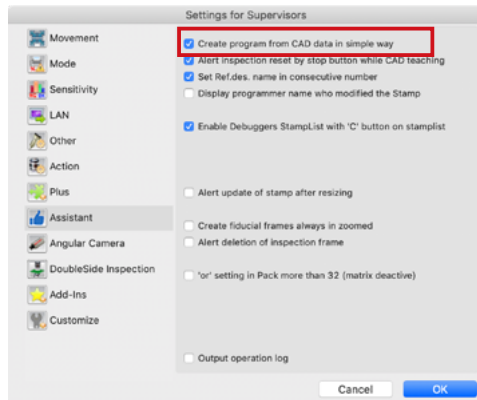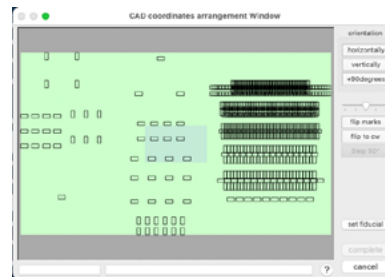
(Screen 1)
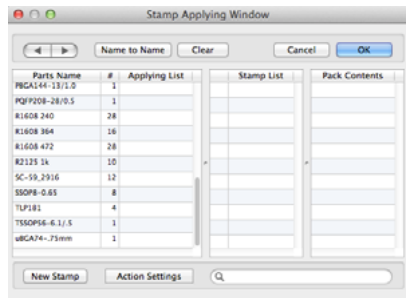
(Screen 2)
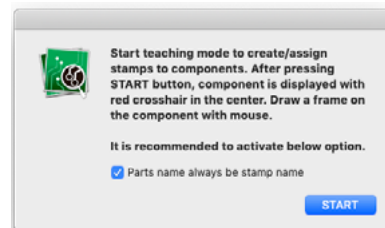
(Screen 3)

(Screen 4)

(Screen 5)

7-2 Create Stamps by Wizard from CAD data

With Stamp Creation Wizard, you can easily create stamp libraries after importing CAD data.

▼ 7-2-1 How to use

1. Open **For Supervisors** menu from **Configuration** in **Settings** menu. Move to **Assistant** tab, check on " **Create program from CAD data in simple way**" (Screen 1).

2. Import CAD data (Screen 2).

3. Arrange CAD data to meet the actual PCB in CAD coordinates arrangement window (Screen 3).

4. Assign stamps if there is any pre-loading stamp library in Stamp Apply Window (Screen 4).

5. Message to start teaching will be displayed. Press START button. There is an option "**Parts name always be stamp name**". We recommend to check-on this option (Screen 5).

* By activating this option, you can create duplicated stamp easier. For example, if the second component is very similar to the first component, by pasting the stamp for 1st component, it is automatically duplicated in 2nd component's parts name. Without activating this option, by pasting 1st component's stamp is simply pasting stamp, new stamp for 2nd component isn't created.

7-2-1
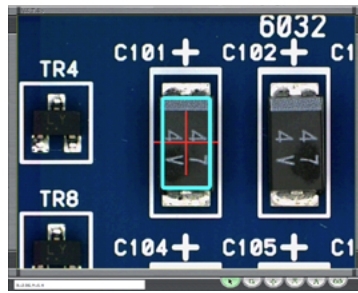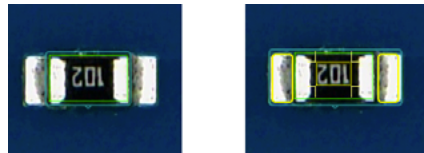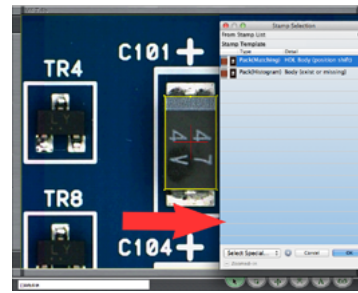
(Screen 6)

(Screen 7)

(Screen 8)

6. The first component is shown in the center of Work Area. Draw a frame on the component body by mouse. Keep the mouse holding for 1 or 2 second, light-blue line will be shown. Release the mouse. **Stamp Creation Wizard** will be displayed (Screen 6).

7. Select **Stamp Template** from Wizard or stamp type from **Select Special Stamp** below the Wizard.

* When you are not satisfied with the frame size, press Cancel button in the wizard window. You can re-draw the frame.

8. Screen is still stopping at the component. You can adjust more filter settings or even add stamps for inspecting fillet, text or polarity (Screen 7).

9. Press START button to move to the next component. Create stamps in same procedure (Screen 8).

10. If there are similar components in different parts name such as 0402 size MLCC, paste existent stamp from stamp list. Stamp is duplicated in new parts name with same setting.
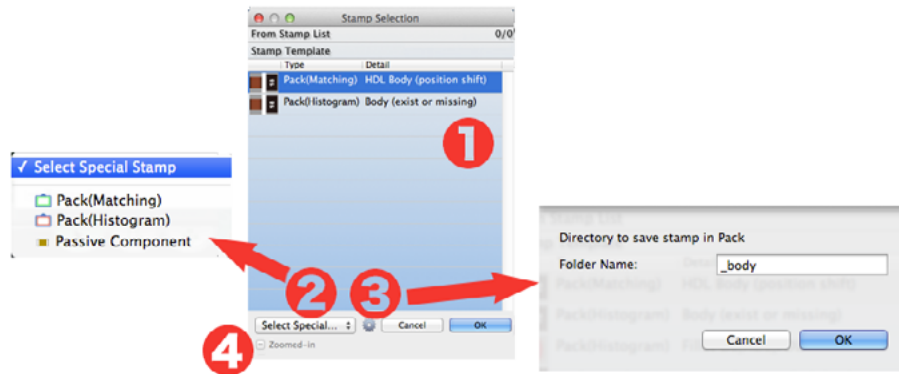
(Screen 1)

▼ **7-2-2 Window**

The window's contents is different from usually at creating stamps (Screen 1).

1. Template

Template recommended for component inspection. Standard filter setting is already set. All stamps are **created in Pack stamp**.

2. Special Stamps

There are 3 selections; Pattern matching Pack stamp, Histogram Pack stamp and Passive Component stamp.

3. Directory to save stamp in Pack

Because Pack stamp is created in parts name, the stamp must have another name. Therefore, the stamp is saved in the folder. You can change folder name. Default folder name is _body.

4. Zoomed-in

At assigning "Pack(Matching)" or "Pack(Histogram)", you can select to create in Unzoomed or zoomed.

* When this option is greyed-out, this means that the stamp is not possible to flip zoomed / Unzoomed.

7-3 Special Stamp for Passive Components

This is a special stamp for capacitors/resistors. You can choose this [Passive Components] stamp from pull down menu of [Special Stamp] in the Stamp Creation Wizard,

The basic premise of this stamp is a capacitor/resistor contains two leads (electrodes) at both sides. This stamp recognizes a capacitor/resistor by finding two leads first, then it assumes and finds capacitor/resistor body between the leads and fillet outside of each lead.

Each part of capacitor/resistor is judged OK/NG by whether the matching rate of its color and area is within the threshold or not.

This stamp also can check rotating and position shifting by detecting the center of each part.

*This function is not applicable for models <u>without</u> Side lighting and DOAL (Diffuse-On-Axis LED) lighting.

*This function may not work properly when inspecting a red PCB under RGB layered illumination.

*Detection may not work properly on the customized RGB layered illumination machines which RGB lighting position is reversing. (normally RGB, but became BGR)

7-3

Configuration: two fillets, two leads and a body

Rotating: default limit is within 6 derees.

Position shifting: more than 66% of lead edge has to touch the fillet.

7-3-1

Do not surround this side too big.
Otherwise, cannot detect properly.

Surround this side to be +30% of the original

Consider the area in case component shifts or rotates

(Screen 1)

(Screen 2)
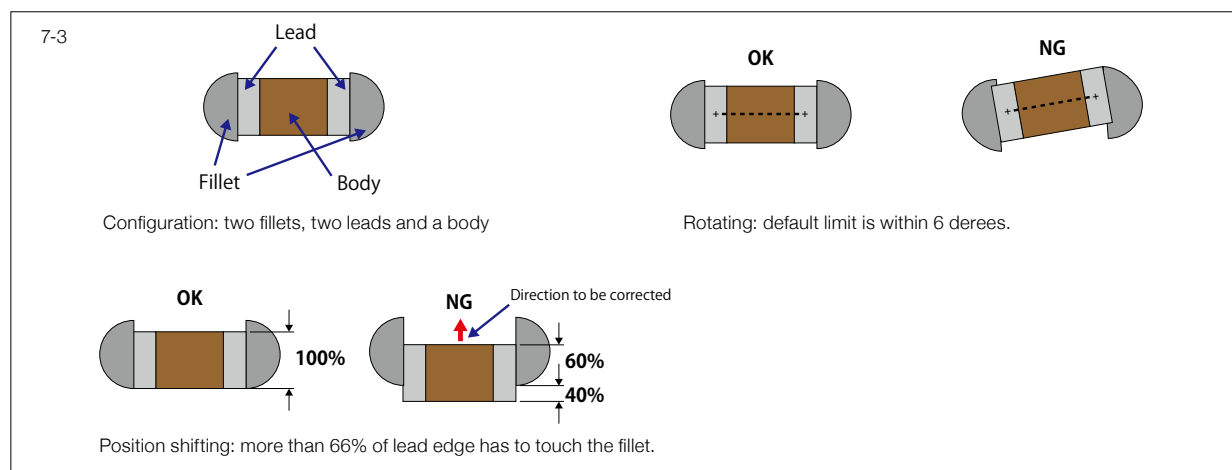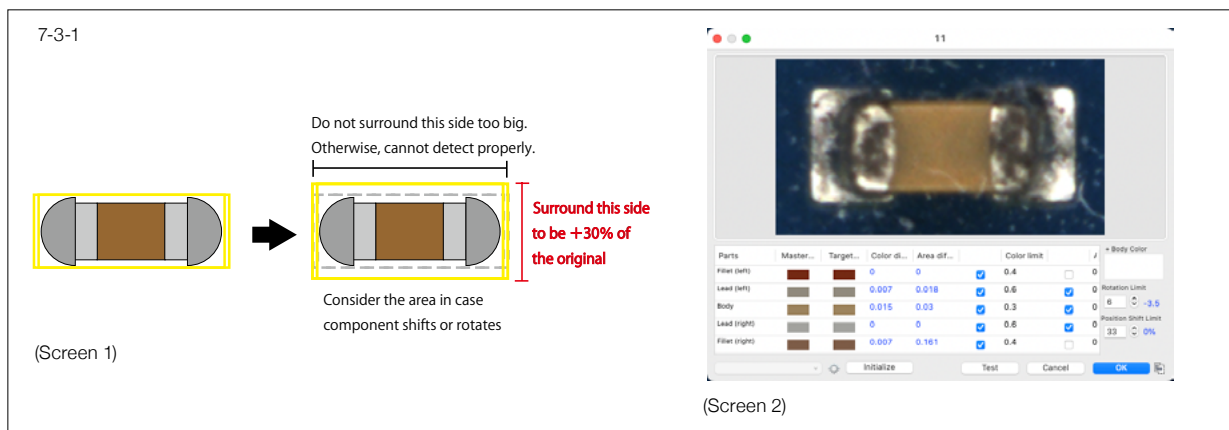
▼ 7-3-1 How to Use

To use this stamp, detecting leads (electrodes) is the essential point. Therefore, make a stamp with a component whose leads are easily distinguished.

1. Be sure that the mouse function is Selection function. Surround the component by dragging the mouse and hold the mouse for a second. Stamp Creation Wizard runs. Choose [Passive Components] from the bottom left pull-down menu of [Special Stamp].

* Be sure to surround the component a little bit bigger than the original component size so that it can detect position shifting. (Screen 1)

* Be sure not to include silkscreen inside the frame with wave soldering PCB.

2. If the stamp recognizes the component as capacitor/resister, color and area information of each part is immediately captured and shown in Stamp Setting Window. (Screen 2) If not, an error saying [Unable to find component] appears and stamp creation is rejected. When pressed [Test] button, you can confirm the detection level.

3. Click [Create] button if detection level is OK. When you make no change in Step 2.,default threshold is automatically input in the threshold column.
Default threshold is as follows:

	Color Difference	Area Difference
Fillet	0.4 (40%) or less -> OK	0.5 (50%) or less -> OK
Lead (electrode)	0.6 (60%) or less -> OK	0.6 (60%) or less -> OK
Body	0.3 (30%) or less -> OK	0.7 (70%) or less -> OK

* When the value is "0.0" it means it matches 100% and when the value gets closer to "1.0" it means the matching rate is getting worse.

* The default is [OFF] (not to inspect) for Fillet Area Difference. This is because fillet shape is not uniform even in "GOOD" components and it is often not reliable to include it as inspection point.

4. Name the stamp in Stamp Name window and the stamp is created.

7. Easy & Speedy Stamp Creation

▼ 7-3-2 Stamp Debugging

The stamp created is not always having the standard color and size of all the same components. Paste the stamp onto all the same components of the PCB and start inspection for debugging.

1. Press [Start] button and inspect all the frames. Usually, not all the components pass and you will find some false NG.
2. Double click one of the false NG stamps. Stamp Setting Window opens. At the left bottom, a pull-down menu is available to improve false NG.

   *Add current color: Body Color
   *Merge current color: Lead/Fillet Color
   *More tolerant: Body Area Limit
   *More tolerant: Rotation Limit
   *More tolerant: Shifting Limit

3. [Add current color: Body color] is one of the typical method to reduce false NG. This means that actual body color is different from the master body color. Unlike the other methods, this does not change any thresholds or settings but simply adds a master color. The added color is displayed in [+Body Color] window.

* The stamp can have maximum 24 colors.

* If you want to delete a color, double-click the color in the [+Body Color] window. When a dialog appears, click [OK] to delete.

* Passive Component stamp has automatic positioning function. (searching for 8 pixels around the component in the default setting.) In case a big difference lies between the master and the actual component about the color or the whole image, the automatic positioning function will not work. To solve this, the stamp will automatically add the actual component image as a master picture.

* In Passive Component Stamp, Master picture is only used for automatic positioning fuction and not used for matching criterion.

* When handling a warping PCB and there is more than 8 pixel position shifting, you can set a wider search range by following method: select the stamp and drag the bottom left edge of the stamp to the outer area with pressing [Control] key.

4. After improvement, click [OK] button and the setting change will be automatically applied to all the frames of the same stamp and they will be reinspected automatically.
   When the inspection result is changed from [NG] to [Good], the inspection frame color will be changed from Red to Blue.
5. If any of the False NG frames remain unchanged and still colored red, additional setting change or body color addition is needed. Go back to Step 2. and debug the stamp again.

7-3-3

Very tiny component

Square

Leads difficult to be recognized

Components with more than 3 leads

Lead color other than silver

Body having multiple colors

Large pad as bright as lead

Awkward lead shape
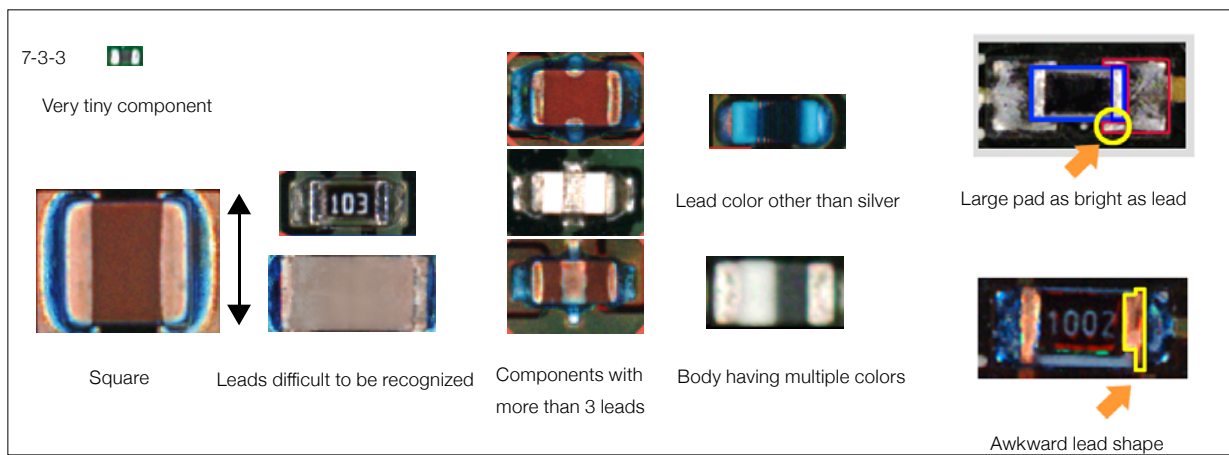
▼ 7-3-3 Limitations

Below are limitations for [Passive Components] stamp.

* Capacitor/resistor having multiple body colors cannot be detected by this stamp.

* Capacitor/resistor whose body color is similar to leads color cannot be detected.

* This stamp may detect falsely and cause false calls as position shifting those capacitors/resisters whose solder pads look like a part of lead, whose pad is as bright as lead or whose lead is shaped awkward, not rectangle.

* Capacitor/resistor whose leads are difficult to be distinguished may not be detected.

* Under HDL illumination, a capacitor/resister having non-lead free solders is difficult to be detected by this stamp.

* Resister values cannot be inspected with this stamp.

* Not possible to detect solder ball.

* You can make this a Pack Stamp. Filter setting, however, cannot be done from pack stamp setting menu.
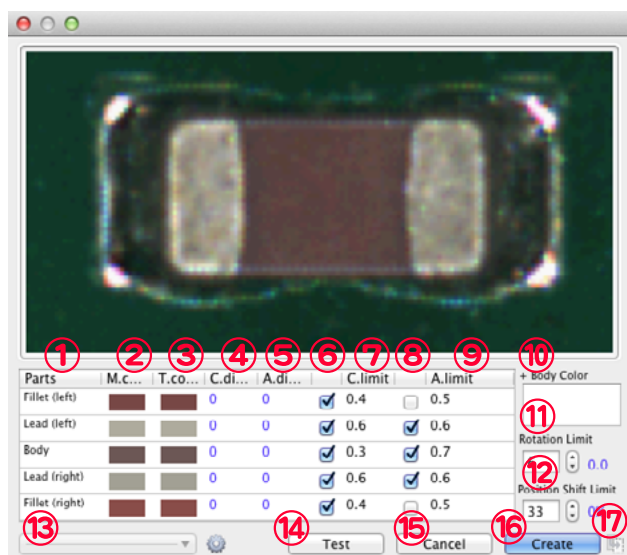
Special setting A (18)
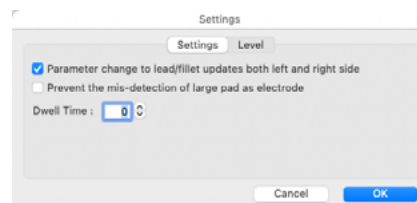
Special setting B (19)
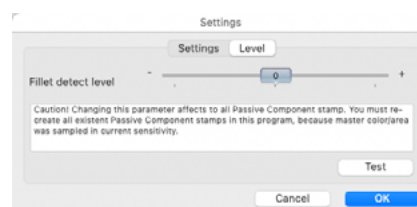
▼ **7-3-4 Passive Components stamp setting window**

Name	Description
1. Parts	The parts detected by Passive Components stamp is listed here. Usually it consists of the following: Fillet (left), Lead (left), Body, Lead (right) and Fillet (right).
2. Master Color	Master color of each part is shown here.
3. Target (Actual) Color	This is the color of the inspection frame you are opening now.
4. Difference of Master and Target color	Difference between Master color and Target color. Value ranges from 0.0 (100% identical) to 1.0.
5. Difference of Master and Target area	Difference between Master area and Target area. Value ranges from 0.0 (100% identical) to 1.0.
6. Active / Deactive Color inspection	You can define whether to activate / deactivate color difference detection. The default setting is "ON" (activated).
7. Color Limit	This is the threshold setting of color detection. Directly input the value you want.
8. Active / Deactive Area Inspection	You can define whether to activate / deactivate area difference detection. The default setting is "ON" (activated) for "Body" and "lead".
9. Area Limit	Threshold setting for area detection. Directly input the value ranging from 0.0 to 1.0.
10. +Body Color	When you add applicable body color besides the Master body color, the color you add is listed in this window. You may have maximum 24 different colors in one stamp.
11. Rotation Limit	The angle difference limit between the master and the current component. Threshold can be set by directly by inputting the value or by selecting value from drop down list.
12. Position Shift Limit	The position difference limit between the master and the current component. Threshold can be set by directly inputting the value or by selecting value from drop down list.
13. Improve False Error	After inspection, open the inspection frame and change the settings and threshold to improve False NG errors if needed. Color difference, area difference, rotation difference and position shift can be improved by changing the threshold of each settings. Body color difference NG can be improved by adding current body color in this menu.
14. Test	You can check the detection conditions of each part in the setting window.
15. Cancel	When clicked this button, setting window is closed without updating the setting.
16. Create/OK	When clicked this button, setting window is closed updating the settings. The update setting is applied to all the inspection frames having the same stamp.
17. Copy	When you click Copy icon, you can create another stamp with the same settings. A new window to input new stamp name appears. Name and click [OK], and it replaces the master picture and master colors and make it as a new stamp.
18. Special setting A	Option menu to adapt the the same setting automatically to the opposite side when either the left or the right fillet/lead setting is changed.
19. Special setting B	Option menu to change the detection level of fillet. When the lens is extremely dirty, this stamp cannot detect the fillet properly.

8. Stamp Operation

Basically, this software performs inspection by detecting differences between Master Picture of Inspection Frames and actual components. Normally Inspection Frames are saved as Stamp in Library.

When inspection frame is saved as stamp, it is called stamp. The Stamp can be selected from the Stamp list, and once the frame is saved as a stamp, you can use it anytime when needed.

8-1 Create/ Operate/ Rotate/ Zoom/ Save/ Update/ Replace

■ About Stamp and Inspection Frame

The definition of "Inspection Frame" is "a pattern matching frame not saved as stamp". "Stamp" is a "re-usable" frame. Each inspection frame has master pictures, and stamp shares the same master picture.

To create an Inspection Frame, first select the Inspection Frame Tool. The **Inspection Frame Tool** is set to the Rectangle by default. Press down on this tool with the mouse, to display a pop-up window where **Rectangle**, **Oval** and **Polygon** can be selected (if there are Stamps, Stamps can be selected too) (Screen 1-1). Select the tool according to the shape of the component/part to be inspected. The behavior will be different depending on the tools.

* When drawing a frame, pressing and holding the mouse at the first point will zoom the screen 200%.

* When moving Inspection Frames, other Inspection Frames can be Hidden. Check **Hide near frames** in **Object Frame in Configuration** from the **Settings** menu (Screen 1-2).

* Press the **Capslock key** to hide all Inspection Frames.

8-1-1

(Screen 1-1)

(Screen 1-2)

▼ 8-1-1 Create/Operate/Rotate/Zoom

■ Rectangle

Create	To create a Rectangle Inspection Frame, select **Rectangle** and drag the mouse over the Work Area, starting from the corner of the component/part. Picture under the Inspection Frame will be displayed in the Master Picture Area (Screen 2).
Move	Move the mouse pointer over a Frame, the mouse pointer will change to a cross icon. Move the Frame by dragging (Screen 3).
Resize	Move the mouse pointer over the Handle on the upper left or the lower right of the Frame, and the mouse pointer icon will change to an arrow icon. Drag the mouse to enlarge or reduce the frame size. (Screen 4).
Rotate	Move the mouse pointer over the anchor point on the top of the frame, the mouse pointer will change to the Rotate icon. Drag the mouse and the frame can be rotated left/right to +/-180 degrees (Screen 5). Dragging while pressing down the Shift key will limit the rotation angle to 15 degrees steps for each rotation.

(Screen 2)   (Screen 3)   (Screen 4)   (Screen 5)
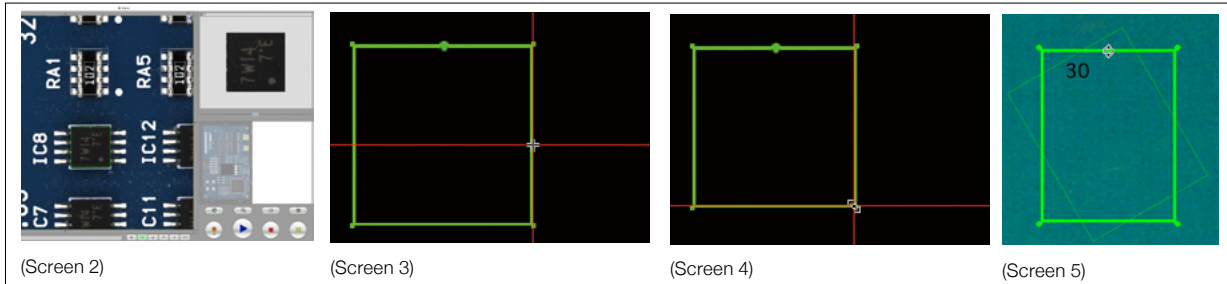
■ Oval

Create	To create an Oval Inspection Frame, select **Oval** and drag the mouse over the Work area.
Move	Handles will appear in all 4 corners when the Oval is selected. The mouse pointer changes to a cross icon when moved over the lines, allowing the frame to be moved.
Resize	Move the pointer icon over the Handle located in the upper left or the lower right.
Rotate	Enable to set angle from Filter Set window. Please refer Chapter 8 for detail.

■ Polygon

Create	Select Polygon then click drag and release the mouse to create the first side of the polygon. Then, move the mouse pointer and click to add polygon corners. Click on the first point of the polygon or double click to complete the Polygon Inspection Frame.
Move	When the mouse pointer is moved over the edge of a selected frame, the pointer changes to a cross icon, and the frame can be moved.
Change Shape	For Polygons, the corner points will become Handles. The shape can be changed by clicking and dragging the Handles (Screen 6).
Rotate	Enable to set angle from Filter Set window. Please refer Chapter 8 for detail.

shift key + dragging   option key + dragging   (Screen 6)

8. Stamp Operation
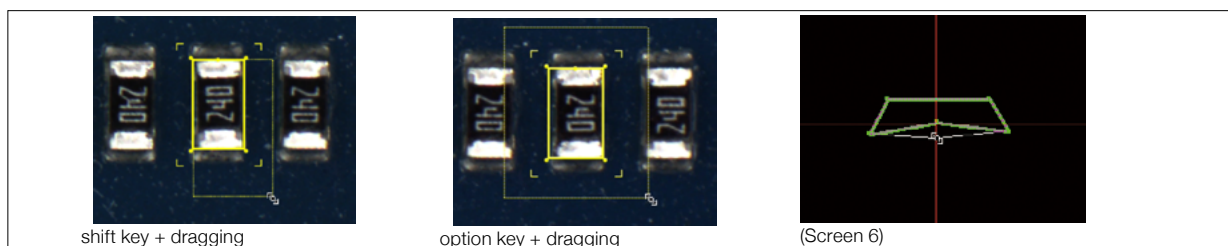
■ Selecting/Resizing Frames

Drag over frame(s) to be selected by using the Pointer Tool. To select all Inspection Frames in a Cell, choose Select All from the Edit menu.

To resize, select the handle located on the corners and drag the Frame.

* Hold down the shift key to change the inspection frame size while maintaining the ratio.
  Hold down the option key to change the inspection frame size symmetrically.

shift key + dragging   option key + dragging

■ Copy

Select an Inspection Frame with the Pointer Tool. Press down the Option key, while the mouse pointer is over the Inspection Frame, the mouse pointer will change to a Stamp icon. Drag and drop the Inspection Frame to create a new copy. Press the Shift key while to limit copying vertically and horizontally.

■ Row Copy

Select an Inspection Frame using the Pointer Tool, and choose **Row Copy** from the Edit menu. The **Row Copy** dialog will be displayed. Define how many pictures and the direction and spacing for each copy. Check **Duplicate Master Picture** on when copying master pictures (Screen 7).

* Enable [Set Ref.des. name in consecutive number] to add numbers to the end of Ref.des.

■ Duplicate Selection

When **Duplicate Selection** is selected from the **Edit menu** while the Inspection Frame is selected, the selected Frame is copied by Cell units. The position and number of copies can be set up in the Duplicate dialog. To copy to the right or down, enter negative values for the Pitch (Screen 8).
If no Inspection Frames are selected here, this menu becomes Matrix Copy into Cells, and copies all In-spection Frames in the cell.

* Enable [Set Ref.des. name in consecutive number] to add numbers to the end of Ref.des.

(Screen 7)   (Screen 8)

8. Stamp Operation
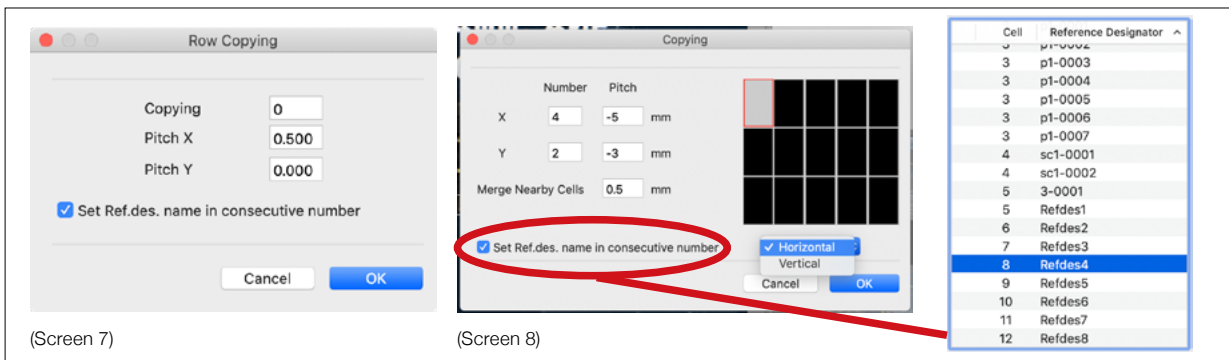
8-1-1
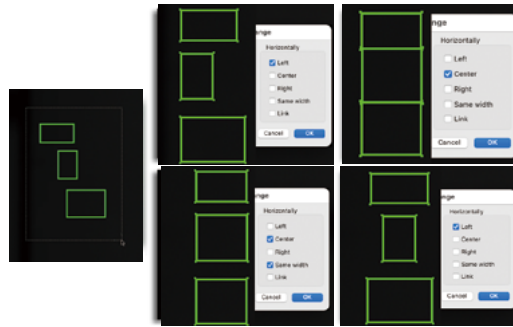
(Screen 9)

■ Arrange

Using the Arrange feature allows to align selected Inspection Frames to the top / bottom / left/ right / center or same height/width. Select Align from the Edit menu and select the type of alignment. A preview is displayed when the Frame is selected. Press OK to execute alignment (Screen 9).

■ Copy / Paste

Copy / Paste, Rotate and Flip are available from the Edit menu or by using shortcut keys.

▼ 8-1-2 Save as Stamp

Save the inspection frame as stamp.

1. Select the Inspection Frame that you would like to make a Stamp.
2. Select Stamp list from the Stamp menu to display the Stamp list.
3. Click the **New** button in the Stamp list.

   A message window "Input a new name" will be displayed, enter the name of the Stamp here (Screen 1). If a Stamp with the same name already exists, you will not be able to click OK. If you would like to create directories, insert a : (colon) separator (Ex. Capacitor:0603 creates a Stamp with the name 0603 in the folder Capacitor (Screens 2, 3)).

8-1-2
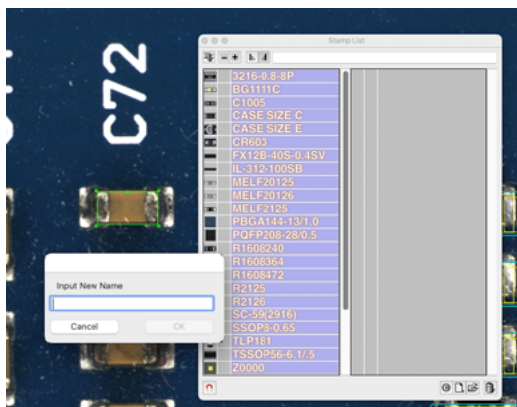
(Screen 1)

(Screen 2)
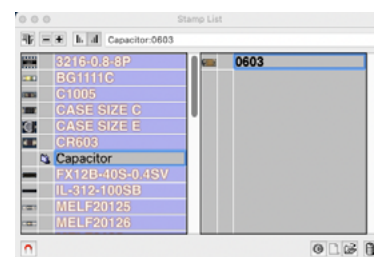
(Screen 3)

8-1-2
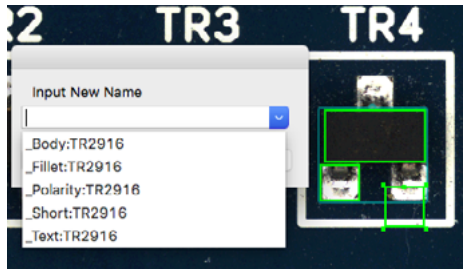
(Screen 4)
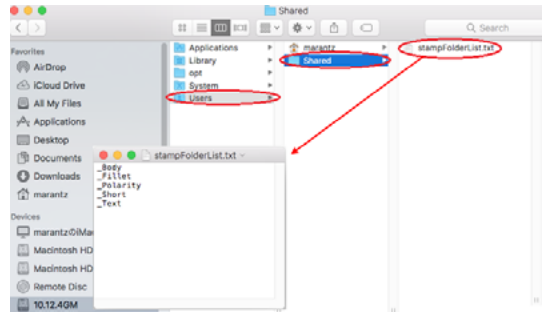
(Screen 5)

- You can also select Stamp name from folder list which is registered beforehand (Screen 4). With this procedure, you can create the Stamp more easily by omitting the manual input of folder name and part name at the time of importing CAD data.

  Procedure

 1. Create inspection frame for less than 1mm around Packed Stamp.

 2. Display Stamp name registration window.

 3. You can find Stamp name list from pull down menu.

■ Stamp name registration window which will show Stamp name

- Create Stamp from Stamp template.

- By pressing F3 key, registrating Stamp name of inspection frame which has no registered name.

- "New Stamp" in the window for updating Stamp setting.

■ Format of Stamp name in the list

- Stamp name is configured with "Folder name: Pack name".

■ Addition or modification of folder name displayed in the list

- To change the folder name in the list, open "stampFolderList.txt" in "/User/Share" folder with text edit, and overwrite save with any folder name. (Screen 5). Maximum folder names which can set for "stampFolderList.text" is 1000. This file is created when the function is used for the first time. Folder names with initial status are as follows.

 "_Body", "_Filet", "_Polarity", "_Short", "_Text"

The Stamp is now registered. The Stamps with rotated pictures will be displayed in italics, As this, you can create stamp from zero, but you can easier create by Stamp Creation Wizard introduced in Chapter 4.

8. Stamp Operation

(Screen 1)

(Screen 2)

8-1-3
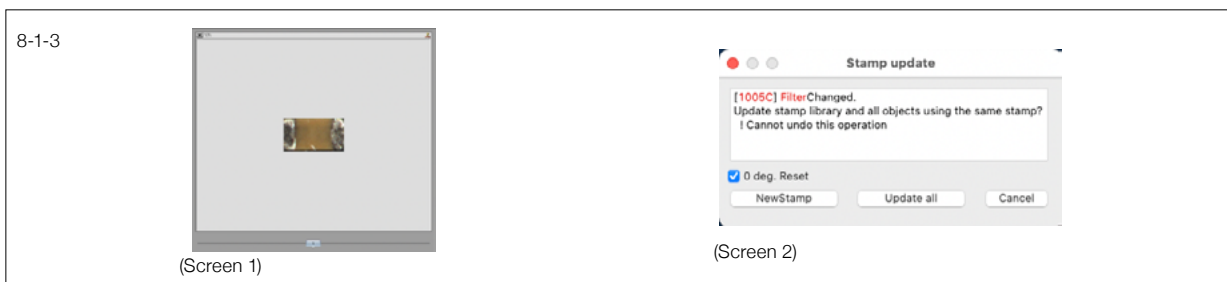
▼ 8-1-3 Stamp Update button

The modified stamp filter settings will be applied to all stamps. When resizing or adding/deleting a base picture, the **Stamp Update button** will appear in the upper right corner (Screen 1).

1. Click the button, and a message window shown in Screen 2 will appear. If you would also like to change the angle when changing Stamps, check **0 deg reset**.

2. If you select Update all, the same settings will be applied to all Inspection Frames with this Stamp applied. Click **NewStamp** to treat the updated Stamp as a different Stamp.

▼ 8-1-4 Replace Stamp

Replaces applied Stamp(s) with a Stamp which id dragged from the Stamp list.

1. Set the PCB and move to the position of the Stamp that you would like to replace in the work area.

2. Display the Stamp list, and drag the new Stamp to the frame of the Stamp to be replaced in the work area. If the angle is incorrect, rotate it with the Space bar.

3. Place the mouse pointer on the frame, and release the mouse button when the form of the pointer icon is changed (Screen 1). Select [Current stamp only] to replace just a selected Stamp. Select [All stamps] to replace all Stamps placed on the work area (Screen 2).

* When the message "**Some frames couldn't be replaced**" is displayed, some of the Stamps could not fit in the cell screen. In this case, the former Stamp will remain.

* The Stamp to be replaced with will only be applied to the side currently displayed.

▼ 8-1-5 Function to Display Stamp Editor's Name

In version 4.9.9r1 or later, you can display programmer name on Stamp Palette. Open "Settings for Supervisors" window from menu Settings > Configuration > For Supervisor. Open Assistant tab. Put check mark on "Display programmer name who modified the Stamp" (Screen 1).

(Screen 1)

(Screen 2)

8-1-4

63
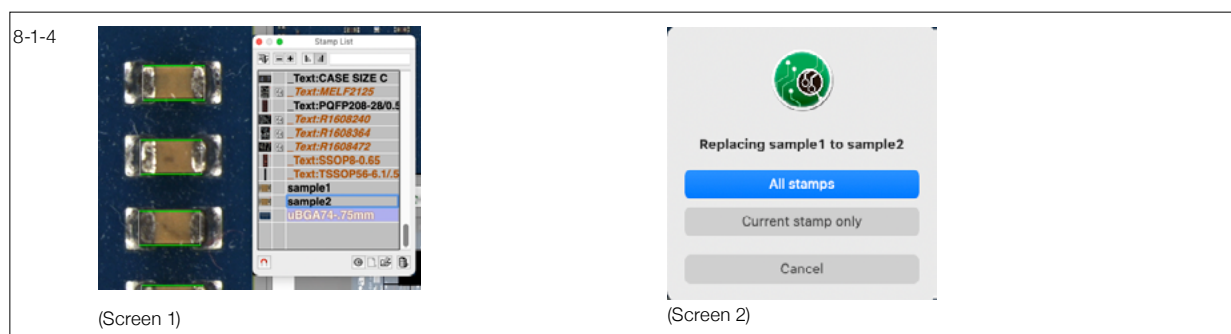
8-2 Zoom and Magnification

▼ 8-2-1 Zoom/Non-Zoom

The inspection frame can be switched to zoom mode. More detailed inspections can be performed, but the false NG may be increased. Switch zoom/non-zoom appropriate for the object to be inspected.

Perform any of the following three operations to activate Zoom.

Click [Unzoom] displayed at the top of the master picture area to switch to [Zoom].
Select Zoom-in from Zoom menu.
Press F1 key.

Unzoomed inspection frames are displayed in green, and inspection frames created in the zoomed view are displayed in yellow (Screen 8). To turn a unzoomed inspection frame into a zoomed inspection frame, select the box frame click [Flip Zoom/Unzoom] from [Zoom] menu (Screen 9).

8-2-1

(Screen 8)　　　　　　　　　　　　　　　　　　　　(Screen 9)
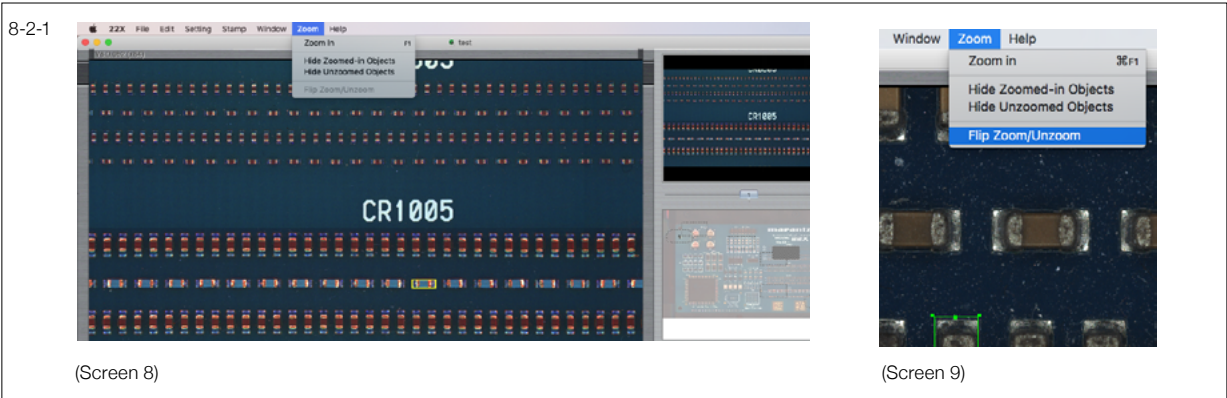
In Zoom mode, a portion of the camera's total view is displayed. The currently displayed area is indicated by a red frame in the master picture area. Drag the red frame with the mouse to move within the field.

8-2-1
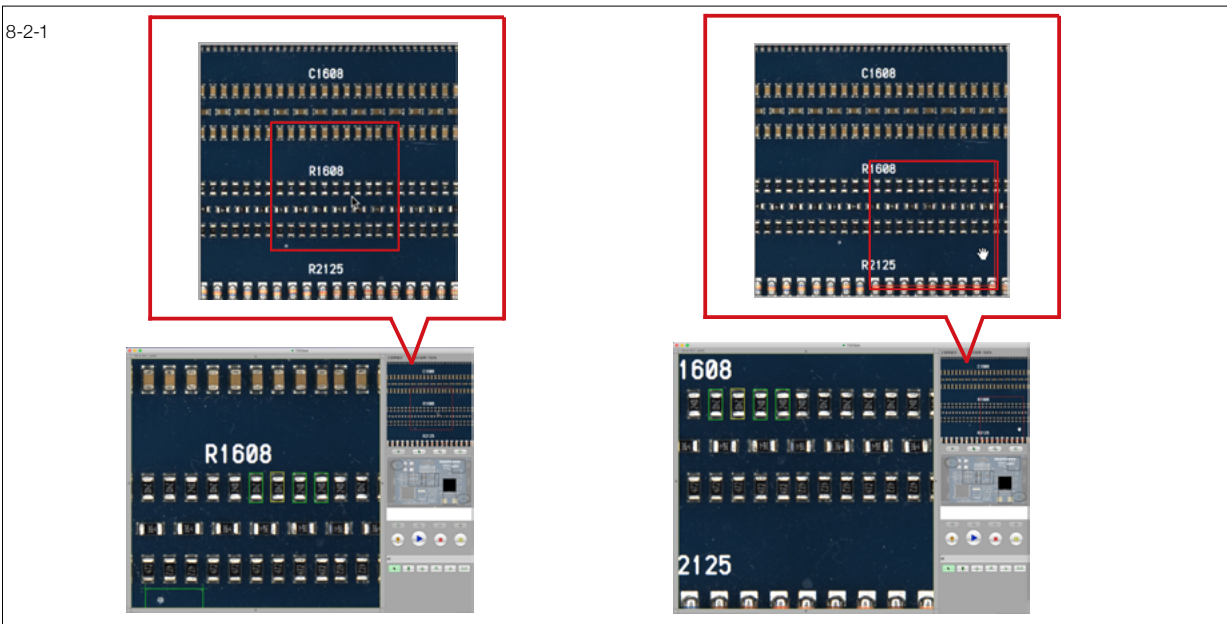
▼ **8-2-1 Zoom/Non-Zoom**

Magnification ratio can be changed by clicking on [Scale] in the upper right corner of the screen or [Magnification] in [Zoom] menu. When selecting [Input...], you can key in any ratio.

8-2-2
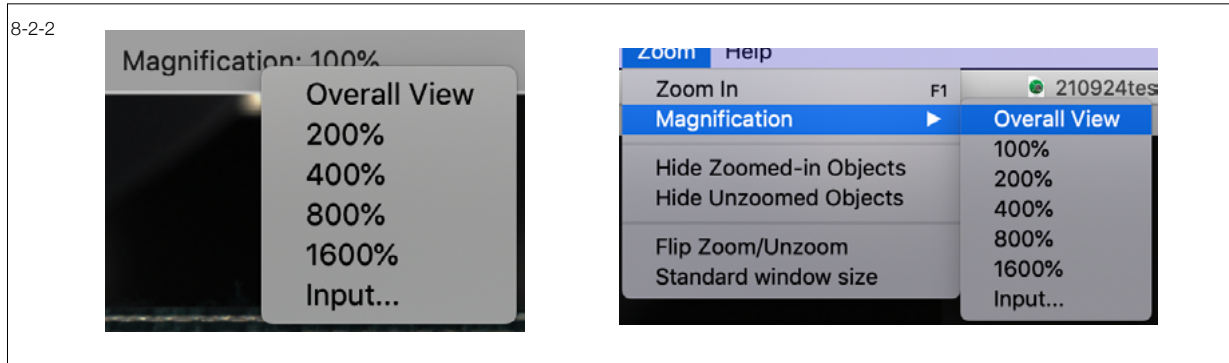
8-3 Stamp List

Select Stamp list from the Stamp menu and the Stamp list will be displayed (Screen 1).

All the stamps that you create is saved here.

8-3

(Screen 1)
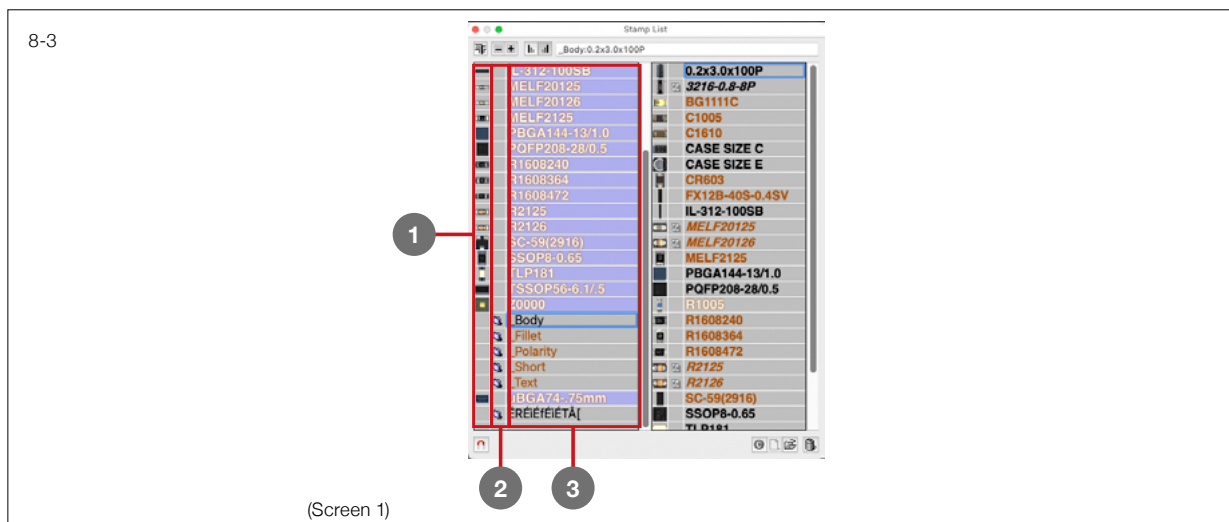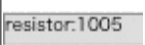
(Within list)

No.	Function	details
1	Master Picture Status	Except some special stamps, every stamp uses Master Picture(s). Double clicking the small image of the Master Picture can switch some special stamps to be not using the Master Picture(s).
2	Folder icon/ Horizontally flipped Master Picture icon	When using directories, a folder icon ⬛ is displayed here. When only one Master Picture is registered on the stamp, double-clicking this area displays the rotation icon ⬛ and adds a 180-degrees-rotated Master Picture. This is useful for inspecting parts that are not affected by orientation. The image can also be set by selecting [Make Stamp Reversible] in the Filter Settings window or in the Stamp menu.
3	Stamp Name/ Level Name	The Stamp name or the level name is displayed here. The name can be changed by double-clicking on it. The zoomed-in objects is displayed in an orange color.

For buttons above and below the list, see the next page.

65

(Upper tier buttons)

Icon	Function	Details
	Window positon auto ajustment	Window moves automatically as below when the button is active. - If the Stamp overlaps with the Work Area and mouse pointer is off of the Stamp List, the Stamp List will move aside. - If the Stamp List extends off the screen and the cursor is placed inside the list, the windows moves automatically to view the entire contents of the list.
	Expand / Collapse	Stamps can be managed in hierarchical directories. + adds a level, and - removes a level. The number of levels must be a minimum of 1 and a maximum of 4. The display width can be changed by placing the mouse pointer over the top right corner of the frame of each level.
	Order	Stamp names can be sorted in ascending or descending order.
resistor:1005	Stamp name	The currently selected Stamp name is displayed here (the stamp name will not be displayed if there is only 1 level even if the Stamp is on the lowest level.).

(Lower Tier Buttons)

Icon	Function	Details
	Display selected stamp only	By clicking this button after selecting the Stamp, only the selected Stamp will be displayed in the main area (this is the same feature as **View Selected Stamps** in the Stamp menu). To return to the main screen, select **Return to main view** from the **Selected Stamp** menu. **Enable debugging stamplist with 'C'** in the For Supervisor menu should be activated.
	New	Registers a new Stamp. It will become active when the Inspection Frame is selected.
	Open	Opens StampDB (Stamp library for database). By pressing Option key, it works as Load Stamp File.
	Delete	Deletes the Stamps. You can also select **Delete** from the Stamp menu. To delete all unused Stamps at once, press it down and hold.
	Magnet	While active and a stamp is selected, the mouse cursor moves automatically to the similar component as magnet.

8. Stamp Operation

8-4 Paste Stamps

▼ 8-4-1 Paste Stamp manually

1. Click on a Stamp name in the Stamp list. The Inspection Frame Tool will switch to the Stamp Tool (press down on the tool button to switch back to the Inspection Frame Tool). At the same time, the name of the currently selected Stamp will appear in message bar.

2. When you move the mouse pointer inside the screen, a frame showing the size of the Stamp will always be displayed. Even when the Stamp is Round or Polygon, the frame will be a square. Place this square over the part/component to be inspected (Screen 1). If the Stamp has a master picture(s), the master picture(s) will be displayed in the Master Picture area. If not, a picture under the Stamp position (called local picture) will be displayed.

3. In order to rotate Stamps, press the Space bar before placing the Stamp. It will rotate 90 degrees clockwise each time you press the Space bar (Screen 2).

8-4-1

(Screen 1)　　　　　(Screen 2)
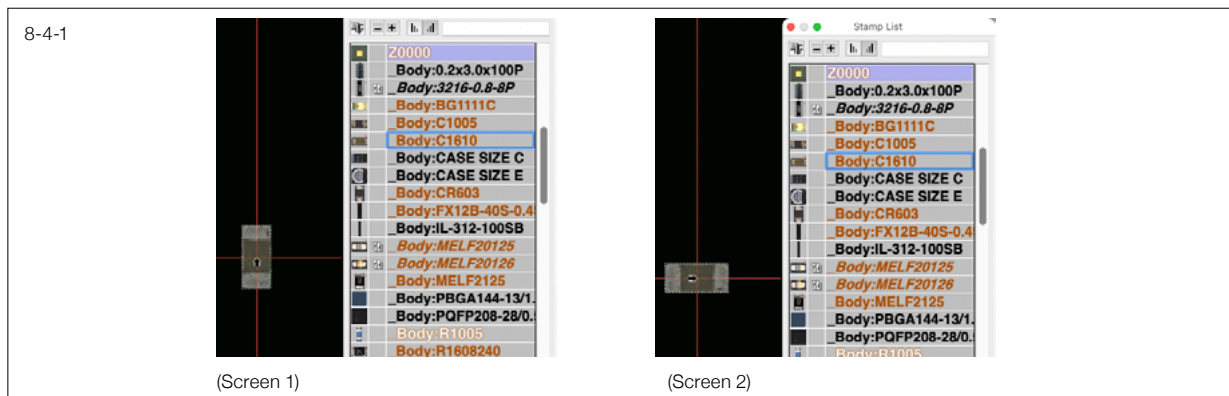
▼ 8-4-2 Paste Stamp by Magnet tool

Magnet tool helps you to paste stamps in good position easily. Stamp sticks on similar component/parts.

1. Activate "**Magnet Tool**" on Stamp List . Select a stamp from Stamp List.

2. Move mouse cursor closer to the similar component. The mouse will stick onto the component and **blink in blue frame**. The thickness of blue frame changes in 3 levels. The thicker the line is the higher maching level.

3. Click the mouse, stamp will be pasted in the good position.

* Magnet Tool does not recognize the component in different angle.

* Magnet doesn't work to angled component (such as 30 degrees, not 0/90/180/270 degrees).

8-4-2

Rotate

(Screen 1)　　　　　(Screen 2)
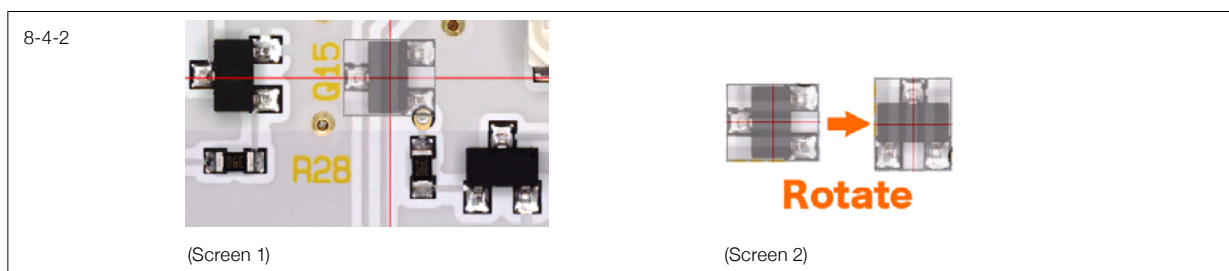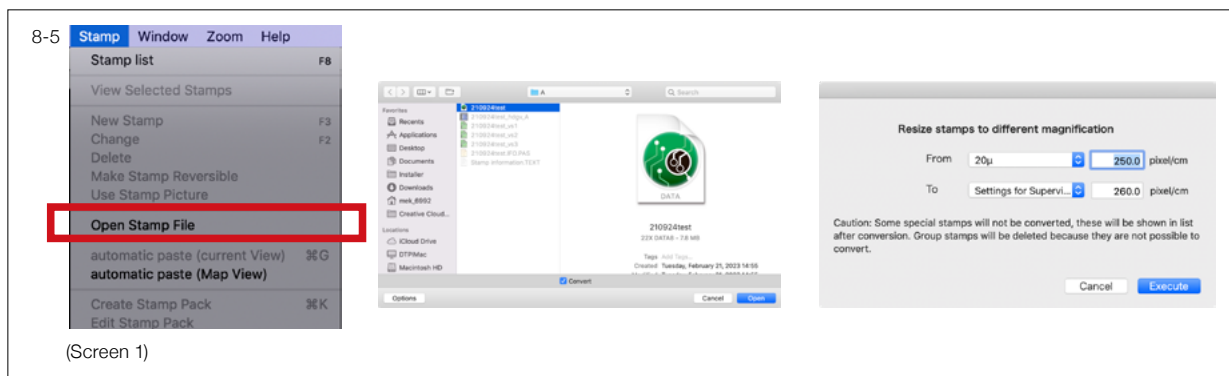
(Screen 1)

8-5 Loading Stamp Files

To load a Stamp file, select **Open Stamp File** from the Stamp menu (Screen 1) and select an inspection program. To change the Stamp magnification, click on [Options] in the lower left corner of the Import screen, check [Convert], and select the inspection program to import the stamps.

* If an inspection program is open, [Options] will be hidden and this function will not be available.

Select [Open] to display the conversion screen and set the pixel/cm before and after conversion. If you select [25µ] - [10µ], the corresponding pixel/cm will be automatically input.

If Stamps with same names already exist, a list will be displayed to replace stamps (Screen 2).

The default setting replaces all Stamps with the same name in the list, therefore all Stamp names that already exist will be highlighted. If there are Stamps that you do not want replaced, click the corresponding Stamp name to remove the highlighting.

When replacing, position, size and angles will not be changed, but all filters and mask settings will be replaced. These changes will be applied to all positioned frames. When replacing a Stamp with Master Picture(s), the size will also be replaced. Resizing will be executed with the existing frame as the center.

* While creating data from CAD data, if there are coordinates where no stamp is assigned, you can't load stamp.

(Screen 2)
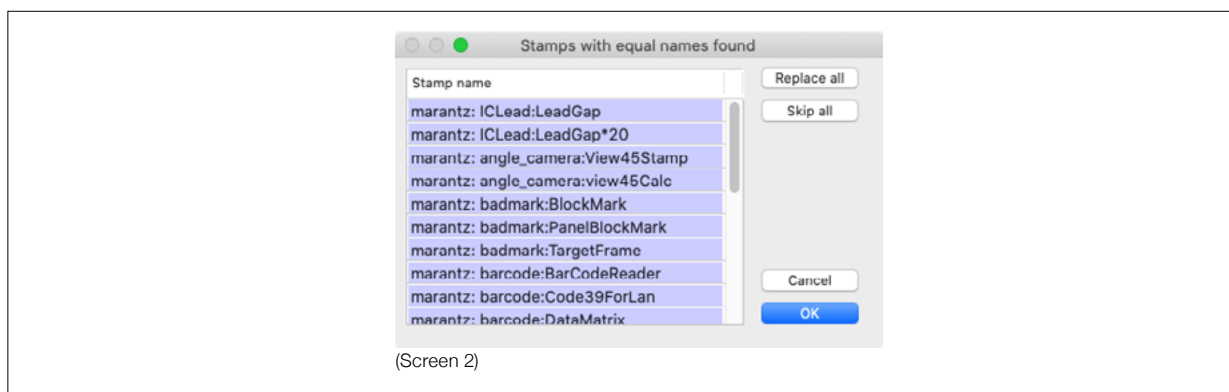
8-6 Stamp list for debugging

You can switch to the Stamp list to display the Stamp list for debugging When this Stamp list is shown, you can select the Stamps to be shown and to be inspected (you can select multiple Stamps by clicking while pressing down the Shift key). Tasks such as Filtering, resizing the frame or Masks, or adding Master Pictures can be performed as usual, and the changes will be saved even when you go back to the original palette. The Stamp list for debugging will have the same buttons as the Stamp list with some exceptions.

▼ 8-6-1 How to Display

1. In order to activate the Stamp list for debugging, select Settings > Configuration > For supervisor > Assist tab, and activate "Enable debugging stamp list with "C" (Screen 1) .
2. When you click on the C button in the Stamp list window, it will switch to **Stamp list for debugging**.
3. In order to switch back to the original palette, close the Stamp list for debugging window.

8-6-1

(Screen 1)

8. Stamp Operation

▼ 8-6-2 Function

The debugging list is shown in screen 1. The differences between the normal list are explained below.

8-6-2

(Screen 1)
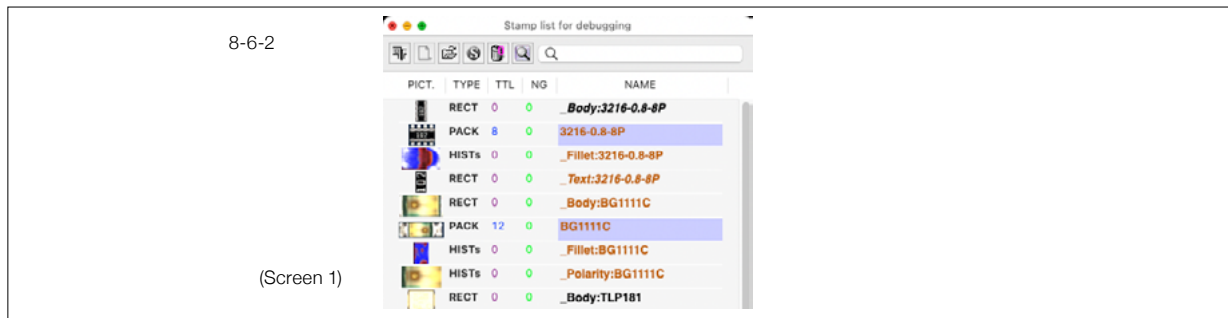
■ Select Button (S button)

By highlighting this button, only the Stamps selected in the list will be displayed in the Work Area.

■ Search

Enter the Stamp name here and press Enter to search for Stamps from the list.

■ Search History Button (Magnifying glass icon)

Click here to display the search history, from which you can select Stamps.

■ TYPE

Shows the type of each Stamp. Descriptions are as follows:

Short Name	Stamp Type	Short Name	Stamp Type
BC39L	Barcode 39)	PACK	Stamp Pack
BCDM	Barcode data matrix	BC128	Barcode 128
BCIL	Barcode data	BCQR	Barcode QR code
EP	EP Stamp	BC39	Barcode 39
ICGAP	LeadGap Stamp for IC	CELLA	Cell aid Stamp
SOLDM	Mask for SPI	BADM	BlockMark Stamp
PTPCB	Stamp to Paint	SOLD	Solder print inspection
RECT	Rectangle	CAPT	Captured picture
OVAL	Oval	HISTs	Histogram Frame
POLY	Polygon	RGN	Region (area, mask)
MKOK	OK Mark Stamp	ST05	Extremely narrow frames
MKAW	Always Mark Stamp	MKNG	NG Mark Stamp

■ TTL

Acronym of TOTAL. This is a value that shows how many of these Stamps are currently being used. This value is updated at the beginning or the end of inspection, and will not be updated immediately. It can be manually updated by double-clicking on the number.

■ NG

This value shows the number of NG (defects). The value is 0 before inspection. After the inspection has been completed, the total number of NGs will be displayed. By default, if there are more than 5 defects, the number will be displayed in red. Double click on the cell to temporarily change the default value of 5 to another value within the range 1-9.

■ NAME

This is the Stamp name. Font styles and background colors conform to the original Stamp list.

8-7 Stamp Pack

Stamp Pack is a group of multiple Stamps as one package. Stamp Packing seems like one Stamp in the Stamp list window, and the settings depends on each individual stamp.

▼ **8-7-1 Pack**

1. You can create a Pack Stamp from multiple Stamps, but not from Frames.
2. Select the Stamps in the Work Area, and select [Create Stamp Pack] (Screen 1).
3. A window asks you to input a Pack name (Screen 2). Packs can be made from 1 Stamp. Fiducial Marks and Marks assigning Side cannot be packed.
4. Packed Stamps will be shown on a blue colored background with embossed characters on the Stamp list (Screen 3). Pack names can be changed in the same way as Stamps.
5. In order to confirm each Stamp's settings, the Pack must be in edit mode. Select a pack in the work area and double-click on the frame. A Pack Setting window will be displayed.
6. Select [Release Stamp Pack] to Release a packed stamp.

* Pack Stamp is almost same as normal stamp, however resizing and set Offset Limit is not possible.

8-7-1

(Screen 1)　　(Screen 2)　　(Screen 3)
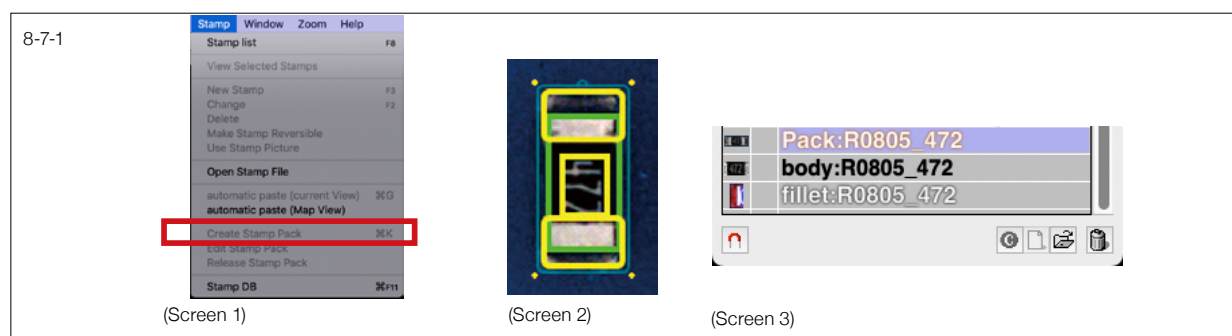
■ **Pack Inspection and verification**

Different inspection criteria can be included in a Pack. For example, zoomed /unzoomed Stamps, stamps for Fillet Inspection, and Stamps with different Lightings can be put together. If there are NG of more than one stamp in Pack stamp, only one voluntary NG reason is displayed during G/NG confirmation.

If the option " **Show multiple NG reasons in Pack stamp**" is active in For Supervisors menu Mode tab, more than one NG reasons can be shown. If there are too many NG stamps, or if Pack stamp is too large and not enough free space to show many NG reasons, "**... More**" will be added after NG reason(s).

* When showing multiple NG reasons, the Reference Designator and Comment is displayed on the upper. (On default, they are displayed together with NG reason.)

* Inspection result sent to Production Management Software CS-Center, does not include multiple NG reasons even this option is ON. Only one voluntary NG reason is sent.

▼ 8-7-2 Pack Setting Window

The Pack Setting window includes the **Pictures** tab, the **Matrix** tab, and the **Edit** tab. If you input angle value on left-bottom **Rotation** field, Pack Stamp rotates +/-180 degrees. By pressing up/down buttons, +/-15 degrees are automatically input. **Extra Settings** enhance functions of Pack Stamp.

▶Picture tab

This shows the Inspection Frames and their Master Pictures contained in the Pack.

* The master picture assigned as NG is shown with red frame, locked picture is shown with blue frame and both assigned as NG and locked is shown with rose frame.

(Screen 4)
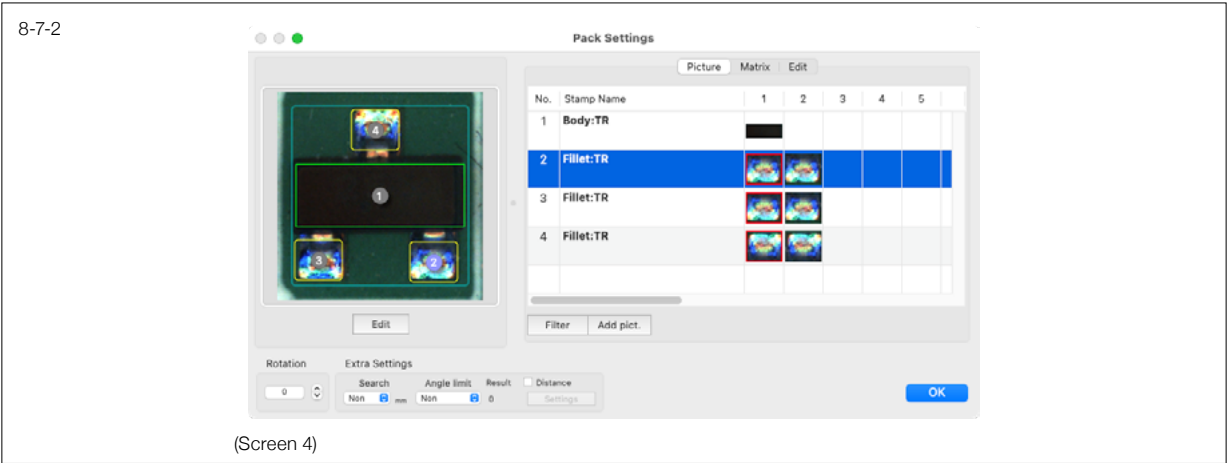
The usage of each button is as follows.

Name	Description
Edit	This is used to change Stamp positions contained in the Pack. Click here and the mode will change to **Edit Stamp Pack** mode.
Filter	This button is used to edit filters of selected Stamps (blue on this screen). Click here, and the Set filter window will appear (the Set filter window can also be displayed by double-clicking on the STAMP NAME or the numbers in the image).
Add pict.	This adds a Master Picture to the selected Stamp.

Double-click the master picture to delete or switch Good/NG picture.
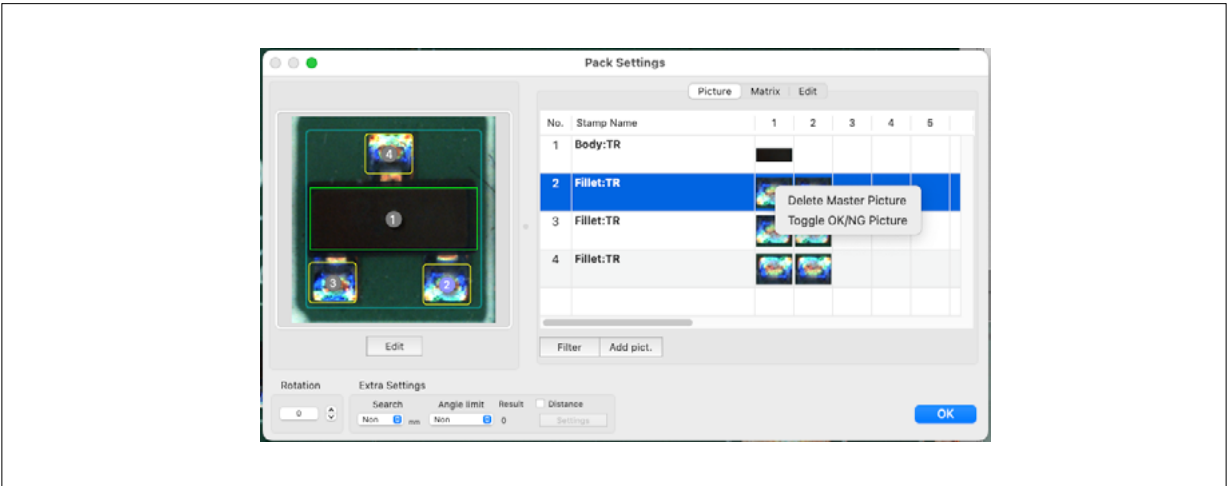
▶Matrix tab

This window enables a combination of inspection criteria within the Pack.

In general, in order for a pack to be judged as OK, all the Stamps must be judged OK. However, by setting up search criteria here, you can allow a pack to be judged as OK even if components are judged as NG.

* Maximum 32 stamps can be used for matrix, however by activating "or setting in Pack more than 32 (matrix deactive)", all stamps in Pack can be used for 'or' condition. However, A, B, C... matrix table is not possible to use.

8-7-2

(Screen 5)
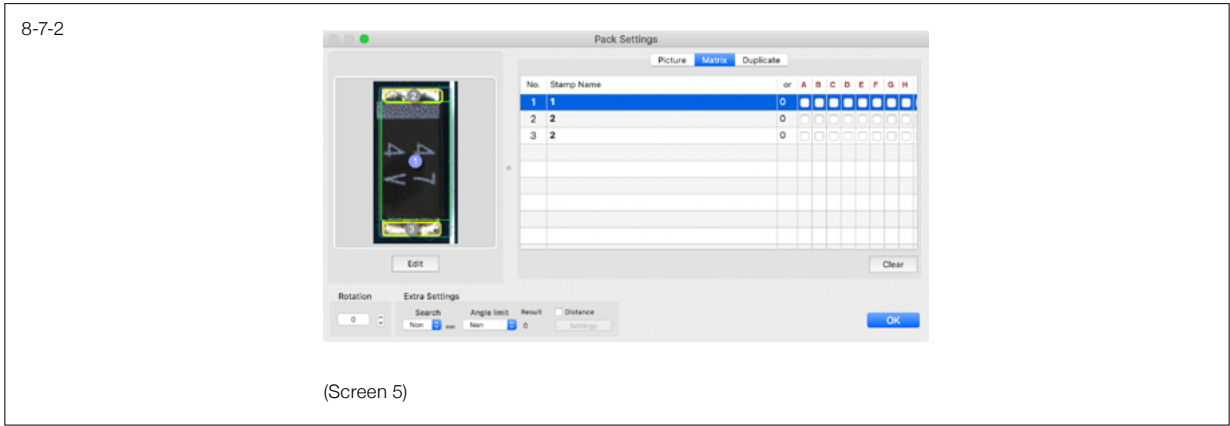
Displayed information is as follows.

Name	Description
or	Default value is 0. By changing this value from 1 to 99, the stamp with same number is in a group. Stamps in the group has a relation of OR condition. This means that if one of the stamp is judged OK, the inspection result is OK whether the rest of stamps are OK or NG.
A, B, C...f	By using Matrix criteria, you can set more complex. These combinations can be set for up to 32 conditions from A to F.

■ Pack Matrix Usage

Printed texts on parts vary by manufacturer. By using Matrix, the difference between characters by manufacturer can be accounted for while checking for defect parts.

▶Edit tab

You can rename or duplicate Pack Stamp. When copying Pack, you can select if you use original child stamp, or create new stamp from original child stamp by succeeding size/filter settings etc.
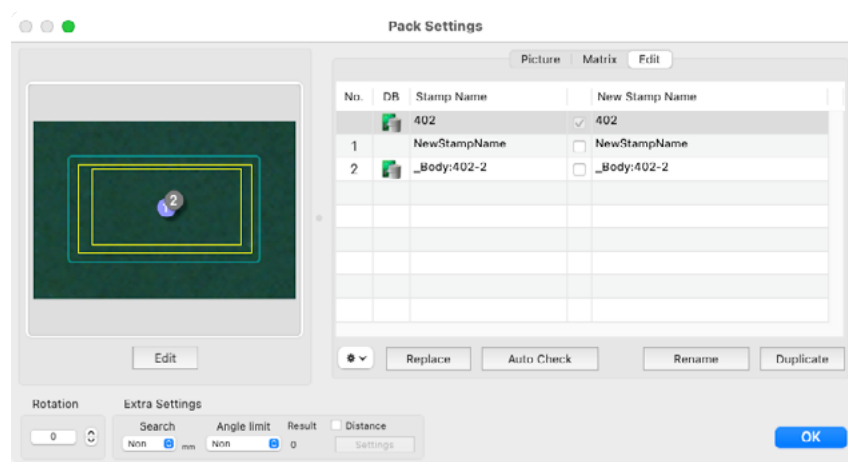
(Screen 6)

Displayed information is as follows.

Name	Description
DB	StampDB icon is displayed here if the stamp is registered in DB. When the stamp name is altered, the synchronization with StampDB is released.
Stamp Name	Names of original pack stamp and its child stamps are displayed
Check box	Checked child stamp is replaced in newly generated stamp. Un-checked child stamp is used in new Pack without change.
New Stamp Name	The field is editable. Input new Pack/child stamp names on which you check.
button	You can select [Check] or [Uncheck] from the icon. You can add or remove check-marks from all selected stamps in a table at once. * Select [Duplicate] after replacing to confirm the modification.
Replace	Replaces selected stamp names in bulk. In the input dialog, enter the string you want to change in the [Find] field and the string to be changed in the [Replace] field, then click the [Replace] button to replace the string. Enable [Checked stamp only] to replace just stamps checked in the Pack Settings window.
Auto Check/Input	If there are multiple child stamps with same name, check on one of them and change its name. Then, press this button. The rest of this child stamp's name will be changed, and all checked on.
Duplicate	This button executes duplication. While executing, master pictures are automatically taken for newly created Pack and child stamps. Also, select [Duplicate] to confirm the modification of [Replace]. If you select [OK] without pressing [Duplicate], the modification will not be reflected.

■Unsynchronization with StampDB by renaming

Editing a stamp name with an icon in the [DB] column will result in a warning. Selecting [Force action] will cause the icon in the [DB] column to disappear and synchronization with StampDB will be disabled.
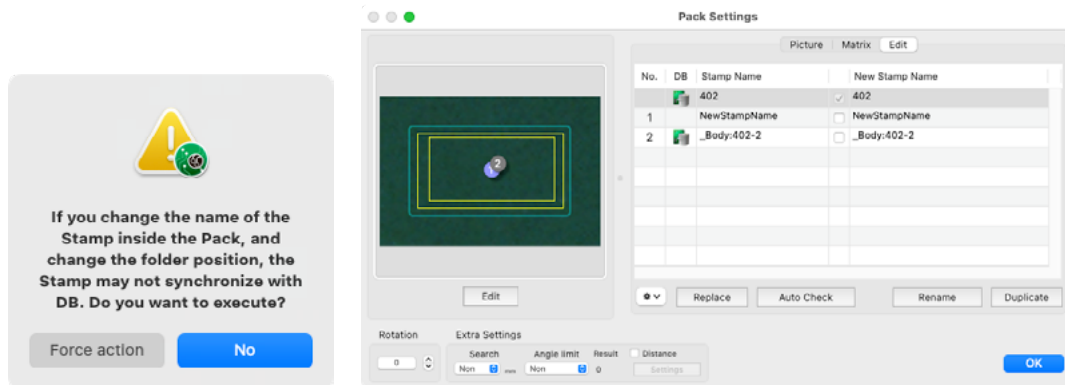
■ Pack Duplicate usage example

To make a new pack stamp "Pack:R0805_364" by copying the pack stamp "Pack:R0805_472":

At first, paste the pack stamp "Pack:R0805_472" onto the target component (resister with text 364) in Work Area. Open Pack Setting Window.

    1. Checked on child stamp No.4, and input new stamp name.

    2. Input new pack stamp name.

    3. Press Duplicate button.

Then, the pack stamp in Work Area is changed into "Pack:R0805_364l". On stamp library, there are new stamps saved automatically, "Pack:R0805_364" and "text:364".

8-7-3
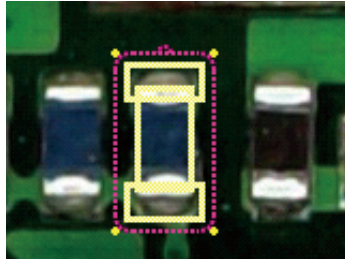
(Screen 8)

▼ 8-7-3 Position (Editing Pack)

1. Press **position** button to get into Edit mode using, all other Inspection Frames will temporarily be invisible, and the Packed Frame will change to a purple color (Screen 8). By placing the mouse pointer on the Packed Frame, the pointer will change to an x icon, this will allow you to make individual changes to Filters, Size and Position. You can make a copy of the Stamp by pressing Option key while dragging the Stamp within the Pack. Each frame can also be deleted.

2. After editing, select **Edit Stamp Pack** from the **Stamp** menu or double-click on the Packed Frame to return to the un-editable Pack state. This will now apply changes to the Pack and child Stamps. If you would like to terminate the task while editing, change the Packed Frame back to Edit Mode and press the **Esc key**.

▼ 8-7-4 Pack Master

In many cases, the Pack method is used to gather Stamps for the component's body, solder and electrodes. Since there are electrodes and solder near the body, if by inspecting the body, the amount of misalignment will be reflected to the electrodes and the solder, the entire cluster can be handled more efficiently. In this case, the body will become the Pack Master (the Anchor Inspection Frame) within the Pack, informing other frames of the offset. This is called the Pack Master Method.

Screen 1 shows how Pack Master Method is applied in case a. First, the component misaligned from the original data position is detected, and then, according to it's correlation to the component, the similarly misaligned electrodes and solder junctions are inspected.

Meanwhile, case b shows an inspection not using the Pack Master method. The component is being inspected, but since the correlation between the body and the electrodes/ solder junctions is not recognized, it will be judged NG.

8-7-4

(Screen 1-a)

(Screen 1-b)

8-7-4
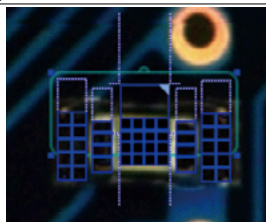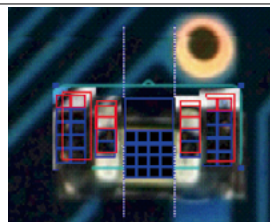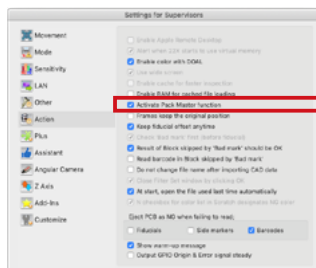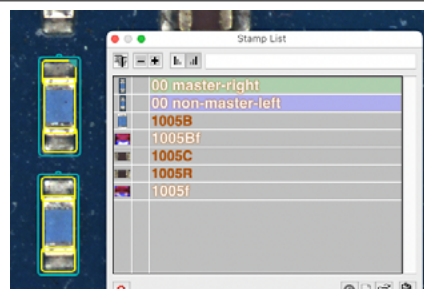
(Screen 2)   (Screen 3)   (Screen 4)

■ **Pack Master Setup**

1. In order to use the Pack Master Method, go to Settings for supervisor >Action, check Activate the Pack Master function (Screen 2).

2. Now, create a Pack, and press down on the Pack Icon on the Stamp list for more than 0.5 seconds. The Stamp name background will change from light blue to light green. This shows that the Pack Master method has been applied.
The Master Inspection Frame (anchor Inspection Frame) within the Pack will have a small light blue mark on the top right corner (Screen 3). This mark is displayed for the frame created first.

3. While the Pack is selected, the master (anchor) can be changed by pressing Shift+Tab. Determine which part should become the master.

4. Within the Pack, the pack master will be inspected first, and the amount of misalignment detected here will be applied as an offset to other frames within the Pack. The range for "Find" of the frames that receive the offset will all be replaced to 2 pixels temporarily even if each frame had a designated the range for "find", and find will be run for only up to 2 pixels. This is because with chip part inspections, finding too wide from the body position may result in missing NGs.

5. If you do not need a Pack Master, for example, when you have packed a row of BGA solder positions, each must be inspected individually. In this case, press the small Packed Stamp icon in the Stamp list for 0.5 seconds to remove the Pack Master feature. This will change the background color of the Stamp list name from light green to light blue, and the corner mark will disappear from the Pack in the work area (Screen 4). Pressing the small Stamp icon again for 0.5 seconds will change it back to the Pack Master Mode.
These settings will be saved and applied when creating the next new Pack.

* The number of the stamp assigned as master by shift + tab keys is colored in purple in Pack window.

* Pack master is not automatically applied to new packs even Enable the follow Pack Master function is activated. Please set individually.

* Histogram stamp can't be anchor, if Pack contains only histogram stamps, Pack master not applied.

* The Pack Master cannot be applied to frames with Special Camera Settings.

* If the Pack Master inspection result is NG, all other frames within the Pack will ignore the offset of the Pack Master.

▼ 8-7-5 Extra Settings No.1 Search Area

This function lets Pack Stamp search component by master picture of Pack Stamp.

* Take good master picture when using this function.

■ How to set

1. Open Pack Settings window. Click **Search** tab in **Extra Settings** (Screen 1). Search area can be selected from **Non (don't search), 0.1, 0.2 ... 0.5**.
2. After selecting area, **thin green line** will be shown around the Pack Stamp (Screen 2).
3. When large area such as 0.5 mm is selected, **thin blue line** will be shown at the frame of Pack Stamp picture (because it is too wide and can't display in picture). (Screen 3)
4. If Pack's master picture is featureless, or less different from surrounding, Search area can't be set. In this case, the master picture is **crossed out** (Screen 4).

■ Caution

- Master picture of Pack Stamp may include not only component also PCB. If various shape of silk print is painted around components, Pack Stamp may not find the correct place.
- Searching of Pack Stamp takes **2 Ms** per inspection point. For example, if Search is activated on 1,000 inspection points, inspection speed will be decreased 2 seconds. <u>Do not set Search on unnecessary points.</u>

▼ 8-7-6 Extra Settings No.2 Measure/offset Angle

This is the function to inspect component's position shifting (especially theta rotation). Without complex settings, theta rotation of the components/connectors can be detected.Also, assign the detected angle for rotation offset.

* NG points can not be confirmed in NG Cell View mode.

| 8-7-5 | (Screen 1) | (Screen 2) | (Screen 3) | (Screen 4) |
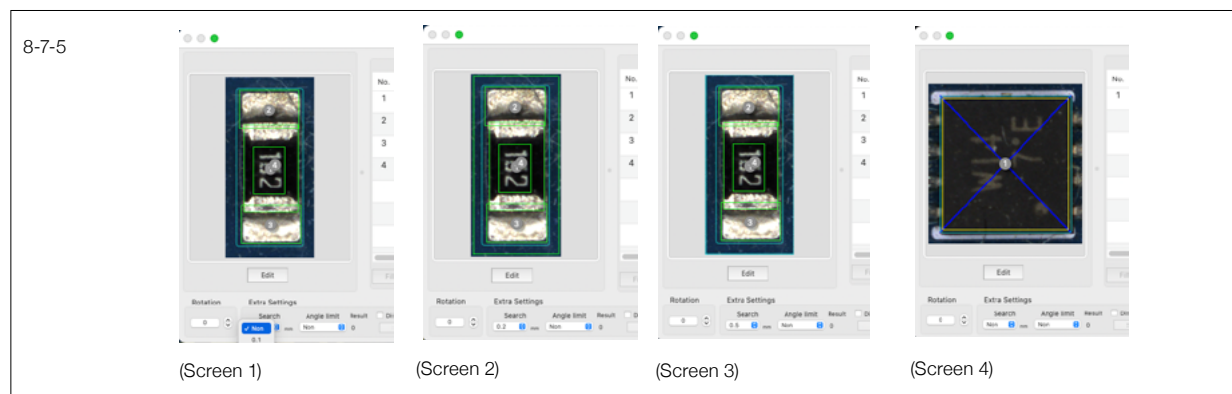
■ How to set (Measure)

1. Open Pack Settings window. Click **Angle Limit** tab in **Extra Settings** (Screen 1). Angle limit can be selected from **Non (don't search), 0.5, 1.0 ... 6.0**.
   Select "mylimit" in **Angle Limit** (Screen 2). Window for optional angle setting is displayed (Screem 3), and you can set the angle with 0.1 step from 0.1 to 6.0.
   When using AngleCheck stamp on the machine with DOAL lighting, **DOAL** is displayed for selection. When you select **DOAL**, switching of main lighting and DOAL lighting is possible, so please use the function depending on the place and parts.

(Screen 1)　　(Screen 2)　　(Screen 3)
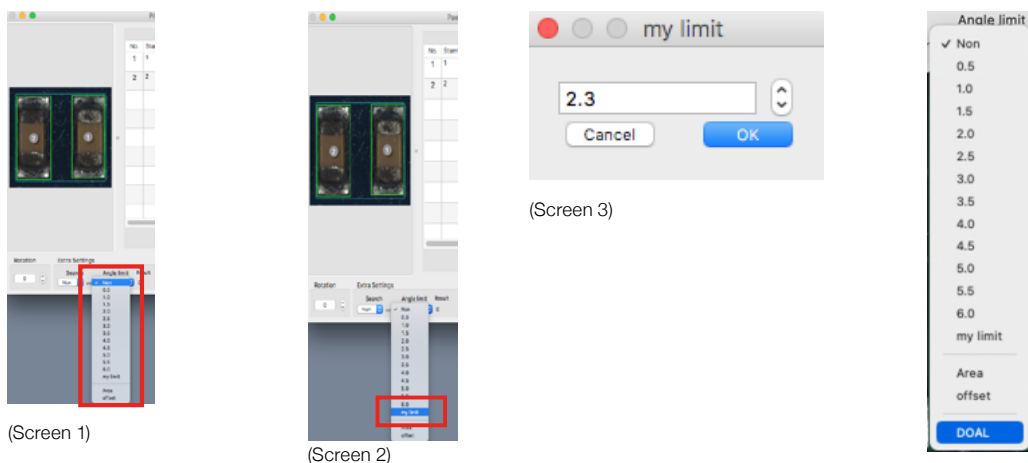
2. Select **Area** at the bottom of pull-down menu (Screen 4). **Option settings for Angle Limit window** will be displayed (Screen 5a). In this window, you can set "Angle detection area" or enhance "Image processing".

3. The area that angle should be detected is shown by **red frame**. As below picture, Pack Stamp which includes solder fillet, **should exclude solder fillet area** from red frame. Detection area should be <u>component body only</u>.
   Click down arrow of **Expand/Shrink long side**, long side of the red frame will be shrunk, click until solder fillet is excluded. Click upper arrow of **Expand/Shrink short side**, the other side should be enlarged, in order to detect the edge of component stable.

4. Start inspection. The exceeded angle is shown on the NG component (Screen 5b).

(Screen 4)　　(Screen 5a)　　(Screen 5b)

8-7-6

(Screen 6) (Screen 7) (Screen 8) (Screen 9) (Screen 10)
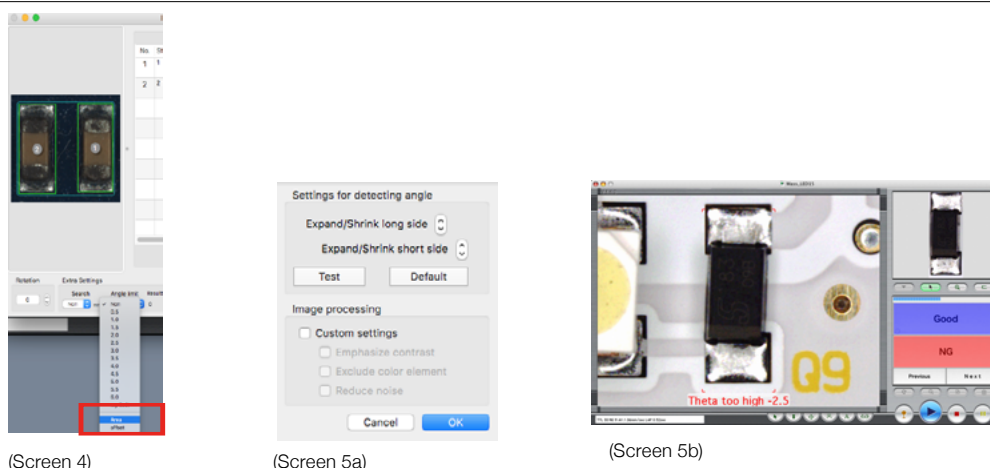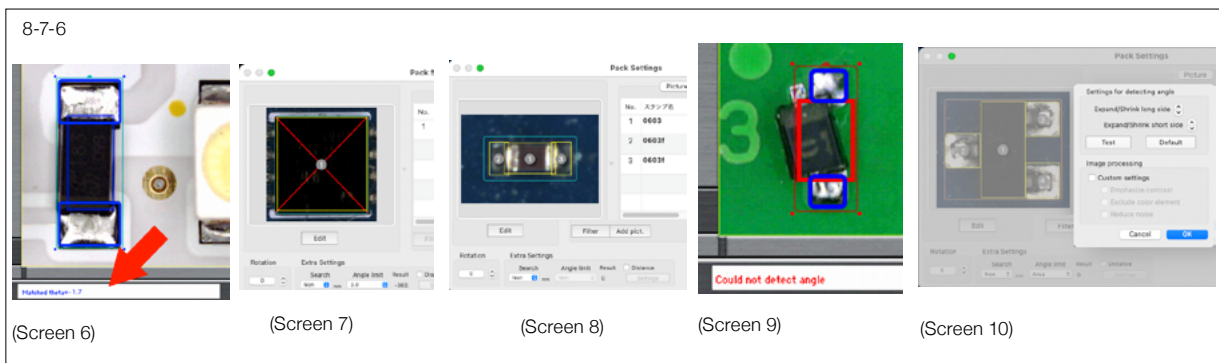
5. You can even know the angle of good component by re-inspecting or analyzing. Result will be displayed in message bar (Screen 6).

6. If Pack Stamp picture has less difference to compare with surrounding, the master picture is **crossed out** (Screen 7).

7. If angle can not be detected well, test Image Processing in **Option settings for Angle Limit window.** It can be improved. For detail of the options, please refer to the following item "Option settings menu".

■ **How to set (Offset)**

Select offset from pull down menu. Now up to maximum 12 degrees rotation is detected and assigned as rotation offset. If it is failed to detect rotation, inspection continues without offset.

■ **Notice**

- Component such as 0201 size (0402 in millimeter) is too small, as a result Angle Limit pulldown menu is greyed out and unable to select (Screen 8). At least **36 pixels** are necessary for long side. (To convert in millimeter, approx. 0.9mm with 25 micron lens, 0.7mm with 18.8 micron lens and 0.35mm with 10 micron lens.)

- If the component edge is not sharp (trapezoid or rounded), the line for measuring angle can not be clearly detected and an error message will be shown (Screen 9). Also if component color is similar to PCB color, angle can not be detected.

- Angle is detected along long side. Therefore the Pack Stamp which shape is nearly square such as SOP, can not exclude solder fillets even shrinking long side as much (Screen 10). Such component is not suitable to detect angle in Pack Stamp setting. Try the method "Include AngleCheck stamp in Pack Stamp" described on next.

- Angle Limit function requires **15 Ms** per inspection point. However, the calculation is carried out in the other thread. Therefore, this will not affect to inspection speed much.

- Angle limit can be set in 0.5 steps, nevertheless actual measurement accuracy is 0.08 degree.

- **NG pictures are not sent to CS-Center in NG Cell View or Auto send for all NG in faster mode.**

■ Include AngleCheck stamp in Pack Stamp

Though Pack Stamp already has the function to measure angle, there is an exclusive stamp to measure angle called AngleCheck stamp. This stamp can be included in Pack Stamp, and in Pack Stamp this can work as "**Measure angle of desired area**", and "**Able to use Image Processing options such as Emphasize Contrast that AngleCheck stamp does not have**".

For example SOP mentioned in Notice on Page 7, is nearly square shape and can not exclude solder fillets. But this can be measured well by using AngleCheck stamp in Pack Stamp (Screen 11).

* Expand/Shrink long side and **Expand/Shrink short side** is not possible to use when AngleCheck stamp is included in Pack Stamp, because AngleCheck stamp can be resized flexibly (Screen12).

8-7-6

(Screen 11)

Various lines exist, could not detect angle.

Could detect angle because detection area was limited.

(Screen 12)

8. Stamp Operation

8-7-6
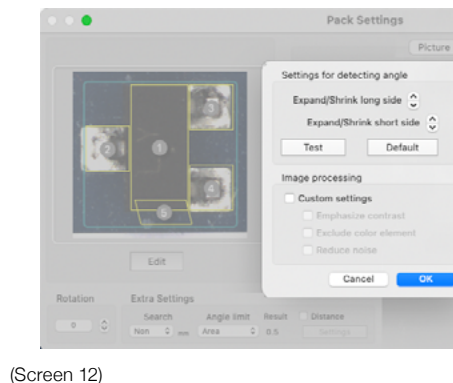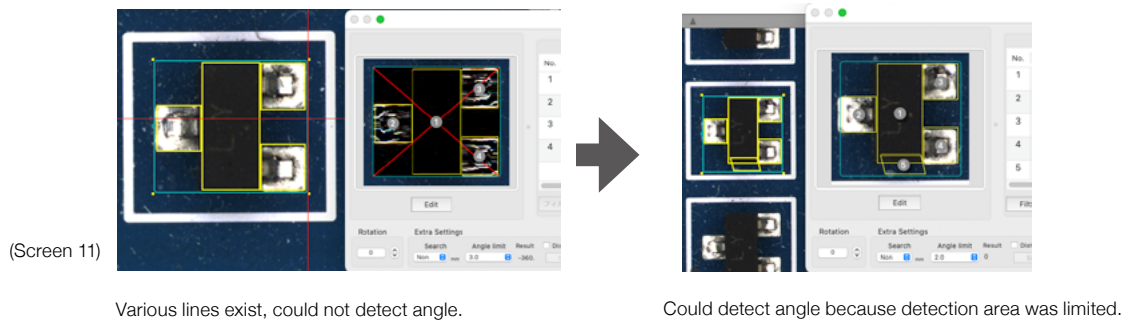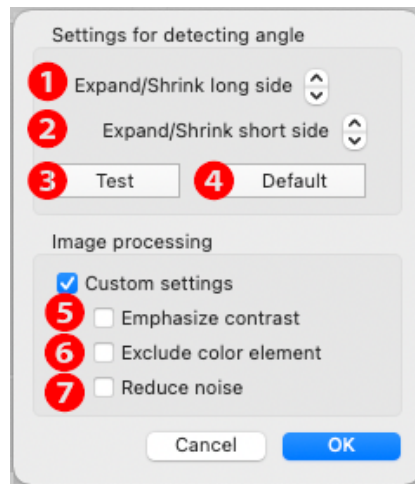
(Screen 13)

■ **Option settings window (Screen 13)**

1.	Expand/Shrink long side	Make area of long side where angle is detected be longer/shorter. The area is displayed in red rectangle. There is limit to expand/shrink.
2.	Expand/Shrink short side	Make area of short side where angle is detected be longer/shorter. The area is displayed in red rectangle. There is limit to expand/shrink.
3.	Test	Confirm how line will be detected in current condition.
4.	Default	Clear increase/decrease of item 1 and 2. Set detecting area to be on default size.

Below options can be selectable after checking "Custom settings" on.

5.	Emphasize contrast	Enhance detection level.
6.	Exclude color element	In order to avoid detecting unclear/thin lines, exclude RGB color and binarize in black/white.
7.	Reduce noise	Exclude unclear/thin lines, and set only clear/thick line to be the measurement target.

▼ 8-7-7 Extra Settings No.3 Measure Distance

With this function, we can measure the shifting distance by setting the point to be base (Start Line). We can obviously see the shifting amount numerically.

* Shifting to X direction can not be measured in current version. To Y direction only.

* If you can not find a good line to be Start Line, you can not use this function.

* This function is to detect slight position shifting in small area.

* The menu is greyed out until activating in For Supervisor's menu.

■ How to set

1. First of all, activate this function. Open **For Supervisor** in Configuration menu. Select **Plus** tab, check on **Enable measuring [Distance] in Pack window**. Press OK button in, then quit For Supervisors settings (Screen 1).
2. Open Pack settings window. Check **Distance** on, then click **Settings** button (Screen 2). **Settings for measuring distance** window opens (Screen 3).
3. Please refer Settings below, how to set measuring distance.

* When using Distance function, activate Search function also in Pack Settings window. If no Search area is set, distance is measured from coordinates where you placed the pack stamp.

For example, below LED component is shifting 0.1mm downward. If no Search is set, the distance is measured from the position where Pack Stamp is placed (Screen 4). If Search is set, Pack Stamp searches LED component, correct distance is measured (Screen 5). The pack stamp's position after searching is shown by **thin black frame** by re-inspecting. The measurement accuracy is 0.01mm.

8-7-7
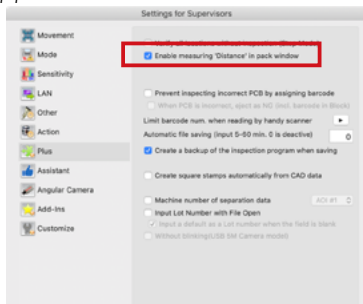
(Screen 1)
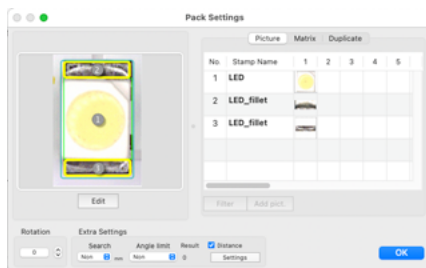
(Screen 2)
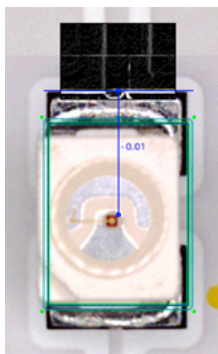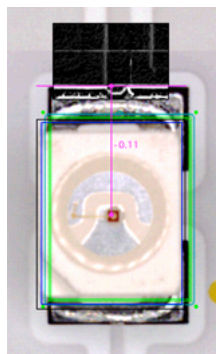
(Screen 3)
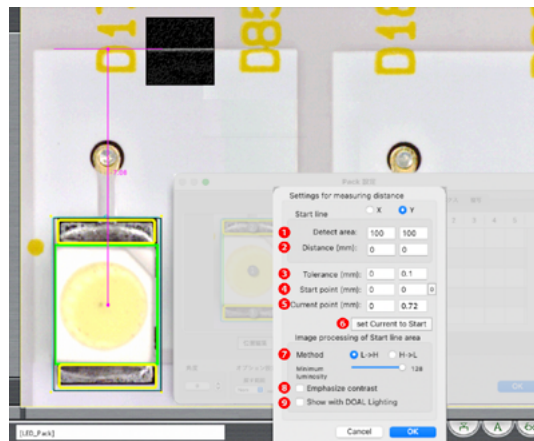
(Screen 4)

(Screen 5)

(Screen 6)

■ **Start Line settings window (Screen 6)**

1.	Detect Area	The **black square** indicated by red arrow in above picture is Detect Area. Start Line should be found in this black area. Set the size, default value is 100x100 pixels. It is possible to set smaller value, however the information to detect Line will be not enough and the detection will be unstable. Set 100x100 or 200x200 pixels. Maximum value is 300x300.
2.	Distance (mm)	**Rose color line,** that runs from the center of pack stamp to Start Line. This defines the position of Detect Area. In above picture, Start Line is set to be the border of the pattern, -7 in Y direction (7mm to upper), +2 is set for X (2mm to right) in purpose of avoiding yellow silk print.
3.	Tolerance (mm)	Limit of shifting. Component will be judged as defect when distance between the center of pack stamp and Start Line exceeds this value.
4.	Start Point (mm)	Set Start Line's distance from the center of Pack Stamp. This defines the standard distance. Normally you do not need to input here manually, because after inputting "1. Detect Area" and "2. Distance (mm)", length is automatically calculated and result in "5. Current Point (mm)". Press "6. set Current to Start" button, then the value in Current Point will automatically be copied in Start Point field.
5.	Current Point (mm)	Distance between the center of Pack Stamp and Start Line is automatically calculated after inputting "1. Detect Area" and "2. Distance (mm)". Input is not permitted in this field.
6.	set Current to Start	The value in "5." will automatically be copied in "4." by pressing this button.
7.	Method	Start Line is detected by Edge method. The method is selectable from brightness high to low or vice versa by switching H -> L and L -> H. Select either that line can be detected clearer.
8.	Minimum luminosity	For detecting Edge steady, the brightness of 128 level is necessary. Normally do not change this value. Nevertheless, according to PCB color, you may decrease this level when you can not get enough luminosity, even after switching Edge method or activating Emphasize contrast. The level can be decreased at 64 minimum.
9.	Emphasize contrast	When detection of Edge is not successful, try this on. Sometimes Edge can be detected well.

8-7-7
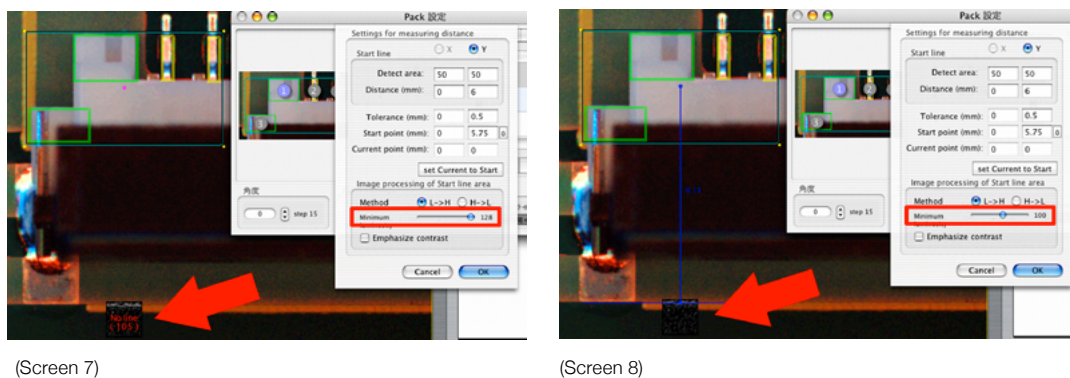
(Screen 7)   (Screen 8)

■ **Caution**

When luminosity is not enough, a number is displayed with error message 'No Line' while

setting (Screen 7). Sometimes, detection may be succeeded by decreasing luminosity level

(Screen 8). However, brightness is not enough therefore some inspection points may fail to

be measured.

- Measure Distance function takes **1.5 Ms** per inspection point. For example, if Distance is

activated on 1,000 inspection points, inspection speed will be decreased 1.5 seconds.

Plus, Search function must be used simultaneously, additional 2.0 seconds are required.

Do not use Measure Distance function on unnecessary points.

- It is not possible to set Start Line in the other FoV (Cell).

8-8 Masking (Non-inspection area)

The Mask is used to designate non-inspection areas. Masked areas will be treated the same as the Master Picture, and only the unmasked areas to be compared.

▼ 8-8-1 Mask Settings

1. Select the Inspection Frame (Screen 1).
2. Select **Edit Mask** from the Pull-Down menu in the **Master Picture Area** (Screen 2).
3. Use the **Edit** tools beneath the **Mask window** to define the masked area (Screen 3).
4. Click **OK** to apply the Mask.
5. The masked area will be shaded (Screen 4).

There are the Rectangle, Oval, Pencil, Polygon and Line tools in Mask tools. The Rectangle mask can be rotated. Draw a mask area with the Rectangle tool, at the end of drawing, press Option key. While pressing Option key, release your mouse. Again press the mouse button, and move the mouse to the direction where you want to rotate the rectangle mask. When the mask area reaches to the desired angle, release the mouse. The angle is shown at the message bar in Main screen. Pencil and Line tools can thicken lines up to x3 by clicking x1 button. Undo is possible by pressing delete key (above return key).

■ Editing mask size

In version 4.9.9r1 or later, you can change the size of "Rectangle" and "Oval" mask for "Pattern matching" and "Scratch setting Stamp" . Use the Edit tools of "Rectangle" and "Oval" at the bottom of Mask Editor window to define the masked area, then drag the anchors on Mask edge.

8-8-1

(Screen 1)

(Screen 2)

(Screen 3)

(Screen 4)
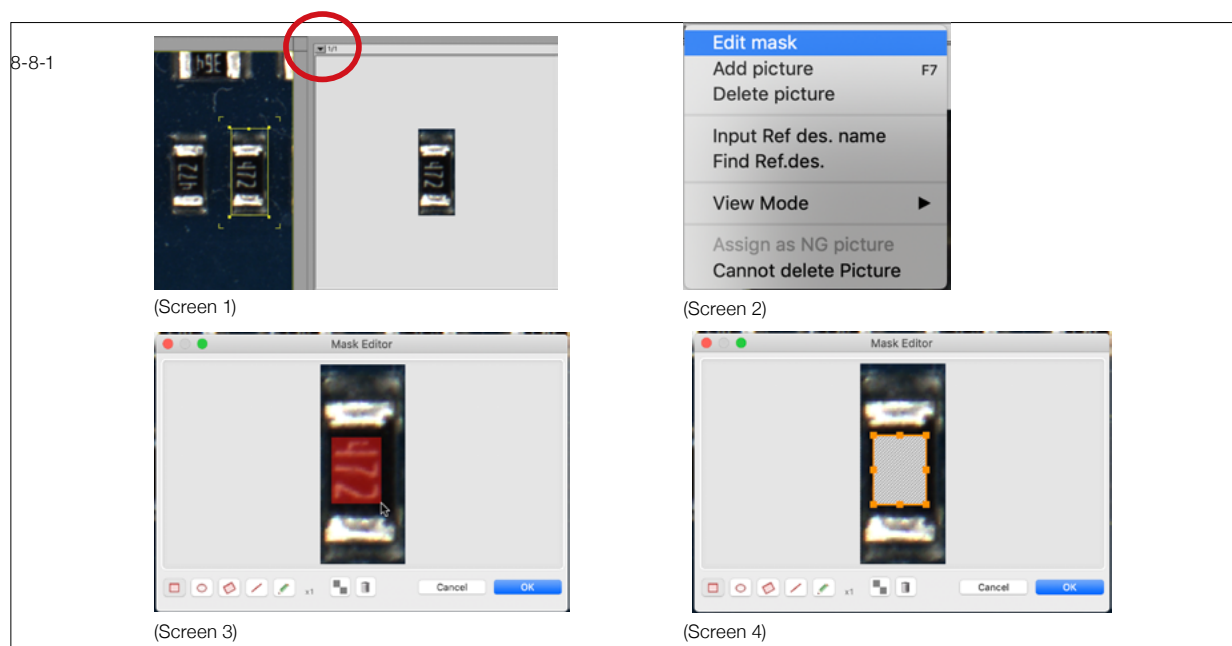
8-9 Reference Designators and Comments

Ref.Des. (= Reference Designator) and Comments can be applied to Inspection Frames and Stamps. For example, when the component/part name is set as a Ref.Des., it is easy to work by looking at the component when importing NC Data. It is also possible to search for components/parts by the Ref.Des. Inspection Frames include the Ref.Des. and other data such as unique number, position information, number of inspections, number of NGs, data created and data updated (refer to "15-1 Exporting Data" for details). The data can be displayed in Map View and exported to a text file.

▼ 8-9-1 Input Ref.Des.

Select an Inspection Frame and select **Input Ref.des. name** from the **Master Picture** menu (Screen 1) to display the Ref.des. Properties (Screen 2). For example, a frame with the Ref.Des. "P1005R", "1/1: P1005R" will be 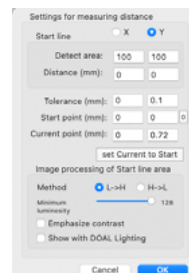displayed on the upper part of the Master Picture Area (Screen 3). Ref.Des. should be no longer than 255 single byte characters.

If the Frame is duplicated by **Duplicate Selection**, (X. Y) will be added at the end of the copied Ref.Des.

■ Set Ref.Des. name in consecutive number

In version 4.9.9r3 or later, you can apply Reference Designator number by fixed rules when you place the Stamp. Open "Settings for Supervisors" window from menu Settings > Configuration > For Supervisor. Open Assistant tab. Put check mark on "Set Ref.des. name in consecutive number". When you place the Stamp, Ref.Des. name is assigned with the rule "Stamp name – consecutive number".

Ref.Des. name is assigned as same as for "Row Copy" function.

* If you place the Stamp more than 9999, consecutive number is not updated. All number will be 9999.

* This rule is not applied for the function of "Duplicate Selection" , "Matrix Copy Into Cells" , and "Multi Duplicate" from the Cell menu.

* If Stamp name has more than 10 characters, Stamp name after 10th character will not be displayed.

8-9-1

(Screen 1)   (Screen 2)   (Screen 3)
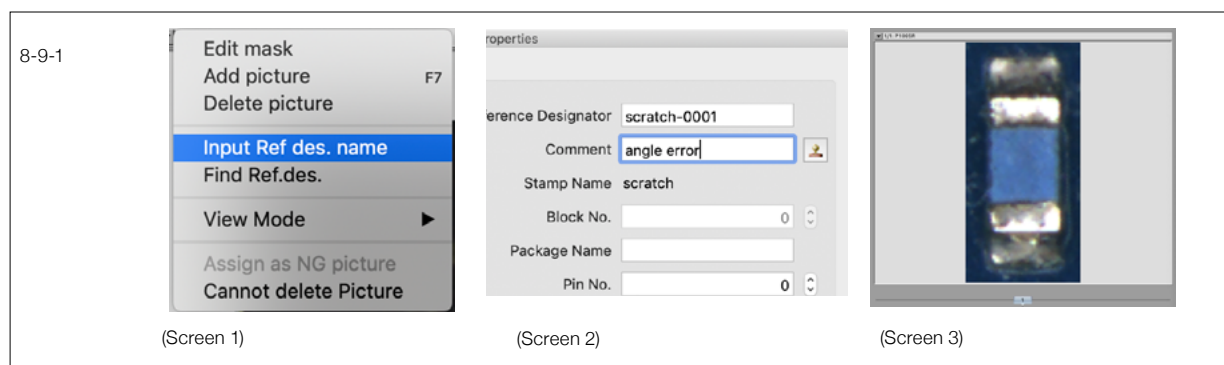
▼ 8-9-2 Find Ref.des.

List of all reference designator is displayed in ascending order when selecting **Find Ref.des.** in the **Master Picture** menu (Screen 1). Number which is included in symbol name is displayed by numerical value order, not character code. You can move to Symbol by clicking **Jump** button or Symbol name. Only the Symbol including the input character is displayed when you use Search window.

▼ 8-9-3 Show/ Enter Comments

When the operator judges OK/NG in the G/NG Confirmation Mode (See "13-4 G/NG Confirmation Mode"), misjudgments may occur if the operator does not understand the programmer's OK/NG concept correctly Therefore, comments and orders of up to 30 single byte characters or 15 double byte characters can be entered when creating Frames (Screen 1).

To apply a comment to all the same Stamp Frames, click on the **Stamp** button on the right of the comment.

In the G/NG Confirmation Mode, this comment can be displayed in the Map view by checking Result with Ref.Des comment in the Mode tab of the Settings For Supervisor window (Screen 2).

When importing NC Data containing Part Names, the Part Names can be converted as Comments. After importing the data and before executing Combine Cells After Import, select **Part Name to Comment** in the **Edit** menu (Screen 3) and click OK. Note that once Combine Cells After Import is executed, **Part Name to Comment** cannot be selected.

8-9-2

8-9-3

(Screen 1)

(Screen 1)

(Screen 2)

(Screen 3)

8. Stamp Operation
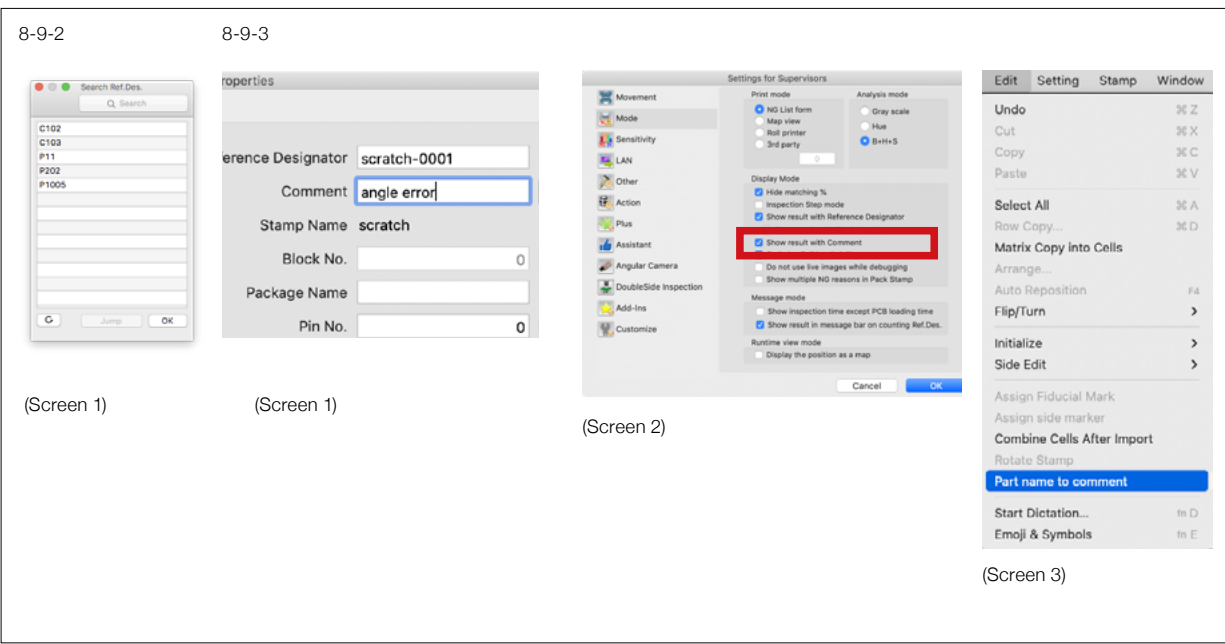
▼ 8-9-4 Ref.des. Properties

[Ref.des. Properties] window can be opened from the Window menu.

The window has the following contents.
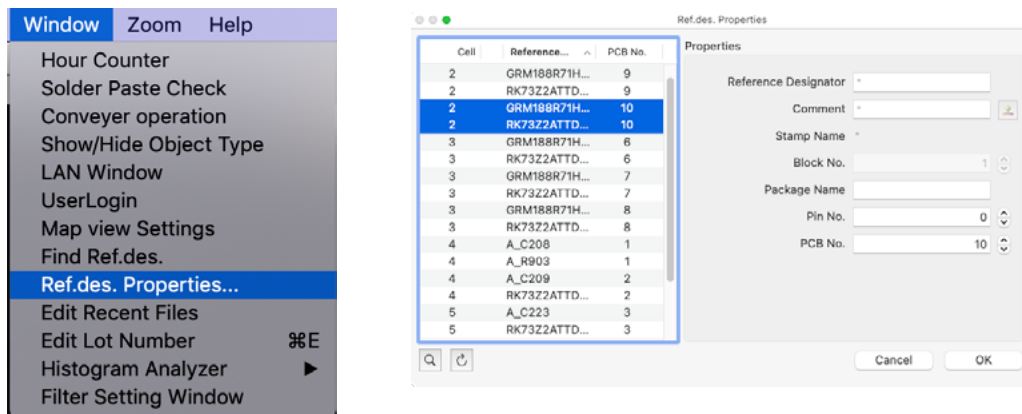
Name	Detail
Cell	The number of the cell containing the inspection frame. This is a temporary number assigned for identification.
Ref.des.	Reference Designator of the inspection frame.
Comment	Comment of the inspection frame. Click on the stamp button on the right of the column to paste the comment to same frames.
Stamp Name	Stamp name registered at the time of creation. It cannot be changed.
Block No.	The number allocated at the time of blocking. It cannot be changed. See [11-5 Creating Cell Blocks] for details.
Package Name	Package name can be registered.
Pin No.	Pin number can be registered.
PCB No.	This is the field for setting PCB number. The entry field appears when [Record inspection results by PCB number] is enabled in [LAN] in For Supervisor settings. See [11-6 Cell Management with PCB Number] for details.
Move to Cell	Move to the cell where the currently selected inspection frame exists. When multiple inspection frames are selected, clicking moves to the cell where the topmost inspection frame is located.

Reference Designator and comment of the selected inspection frame can be edited. Multiple inspection frames can be selected and edited simultaneously. A pencil icon will appear on the left of the Cell number whose information has been edited.

8. Stamp Operation
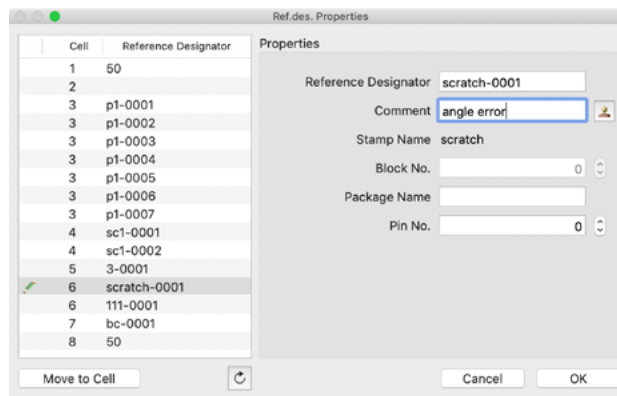
8-10 Frame Type and Show / Hide Setting
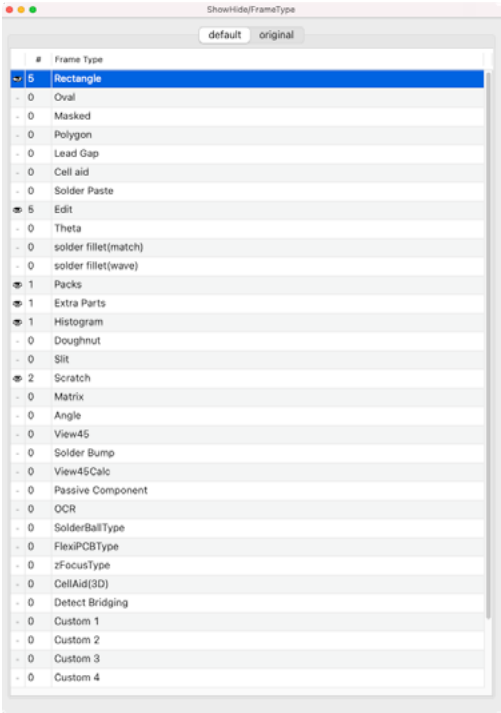
Select **Show / Hide Object Type** from the **Window** menu to display the **Show/ Hide Object** window. In the **Show / Hide Object** window, Inspection Frames are categorized by type and user can set frames to be visible or invisible.

▼ 8-10-1 Frame type assignment
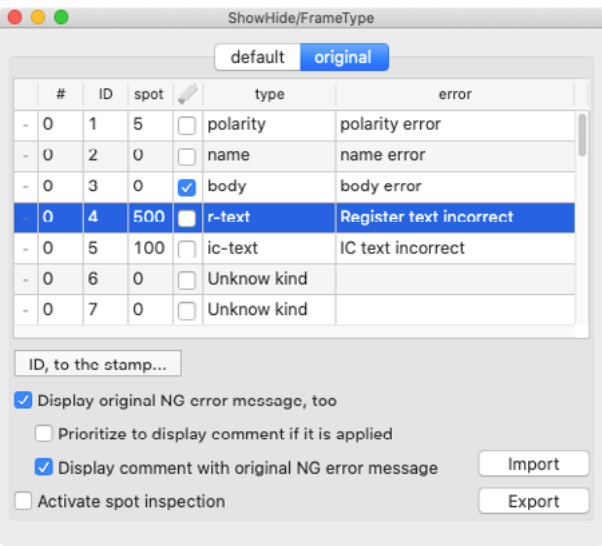
There are 2 tabs in the **Show / Hide Object** window. **Default** tab lists frames/stamps by shape and type which this software defines such as Rectangle, Oval, Masked, Cell Aid, Solder paste, Custom 1 to 8 (Screen 1-a). In **original** tab, user can set the original frame type from ID 1 to ID 255 (Screen 1-b).

* Please refer to Chapter 9-2-1 Set filter Window to know how to apply original frame type to a frame. Please refer to [Extra settings] on Chapter 10-4 [10-4 Settings Window] - [6. Control Panel] to know how to apply original frame type to histogram inspection frame.

* Frame type defined in original tab is saved in software, therefore it is not possible to define per each inspection data.

8-10

(Screen 1-a)

(Screen 1-b)

(Screen 2-a)

(Screen 2-b)

(Screen 3)

▼ 8-10-2 Display my original error message

Error message defined in **error** column is displayed together with machine original message after back slash (/) when **Display original NG error message, too** is checked (Screen 2). By ticking both "Display original NG error messages, too" and "Display comment with original NG error message", displaying both a comment applied on the inspection frames and an original error message is enabled.

Registered comments on the inspection frames are displayed by ticking Prioritize to display comment if it is applied. Also, settings can be applied from/into another AOI by clicking Import/Export button on the lower right.

▼ 8-10-3 Send Original ID as NG-ID to CS-Center

If you use CS-Center, inspection point judged as NG is marked NG ID 0 usually, however if you assign frame types, the ID number is sent instead of 0. Define frame type per inspection area like fillet, body, etc, and define NG ID in CS-Center also the same. This is very powerful if you are activating "Auto send for all NG", because even sending NGs automatically to CS-Center, you can still roughly recognize the defective trend on CS-Watch. Also it can be good reference when reviewing defects on CS-Repair or CS-Watch. When using NG ID in this way, check "Assign NG ID input0-9" on.

* If a number is input from Tenkey, the number is sent to CS-Center in stead of frame type ID.
* If there are more than one defective stamps in Pack stamp, the younger ID number is sent.
* If you set frame type on both Pack stamp itself and stamps to configurate Pack stamp, the frame type ID for Pack stamp is sent to CS-Center. Thus, "number from Tenkye" > "Pack Stamp frame ID" > "youngest frame ID of a stamp in Pack stamp" .

▼ 8-10-4 Stamp ID correspondence list

This list is displayed when clicking on **ID to the stamps...** (Screen 3). On this list, you can confirm which stamp is assigned to what kind of original frame type.

However this is correspondence list for stamp, thus frame (not saved as stamp) is not listed. Stamp with no ID, stamps which can not be assigned original frame type (Pack stamp, ExtraParts stamp, New Cell Aid stamp and etc.) has ID:0.

By inputting ID number from 1 to 255 in correspondence list, you can define assign ID to stamp. By this method, stamps such as Pack, ExtraParts, NewCellAid can also be assign ID.

▼ 8-10-5 Hide / Show

Since Show / Hide can be applied by Frame type, it is easy to temporarily eliminate certain types of Inspection Frames from inspection.

Clicking on the Eye Icon, closes the Eye, hiding the inspection area of that Category. Hidden areas will not be inspected. Click again to open the Eye and show the Category, allowing that Category to be inspected The value next to the frame type shows the number of Inspection Frames. For example, for Solder Paste Check Inspection, the Inspection Frame will be counted as both Rectangle and Solder Paste, which means that the total number may not be equal to the number of Inspection Frames (Screen 4).

8-10-5

(Screen 4)
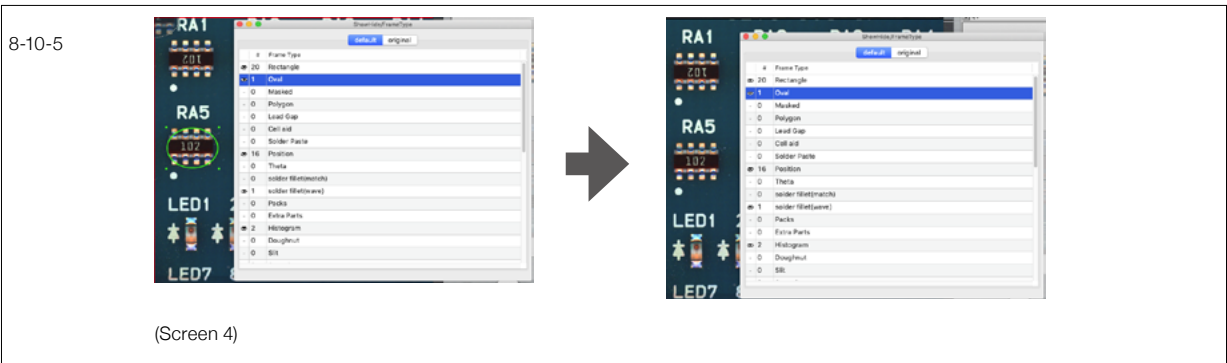
▼ 8-10-6 Control Tendency NG by NG-ID

Possible to set the number of NG inspection frame by each type in Show/Hide Object window. Possible to show the alert when NG inspection frame more than set value is detected. This function is available when Tendency NG function is activated.

■ How to set

1. Display "Tendency/Ignore NG report" window from menu Settings > Configuration > Tendency NG.

2. Put check mark to "Active" at "Tendency NG" tab, and click "OK".

3. Select "Show/Hide Object Type" from the "Window" menu to display the Show/Hide Object window.

4. From Original tab, set the number of inspection frame at NG column to display alert.

   * NG column appears when Tendency NG function is activated.

5. Execute the inspection.

6. Alert message is displayed when NG inspection frame more than set value is selected (Screen 5).
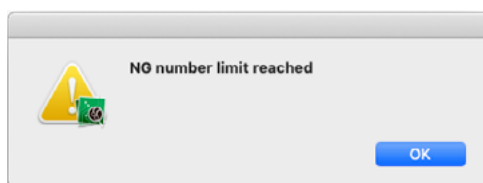
8-10-6	
	NG number limit reached OK
	(Screen 5)

8-11 Assign Spot inspection

▼ **8-11-1 How to set**
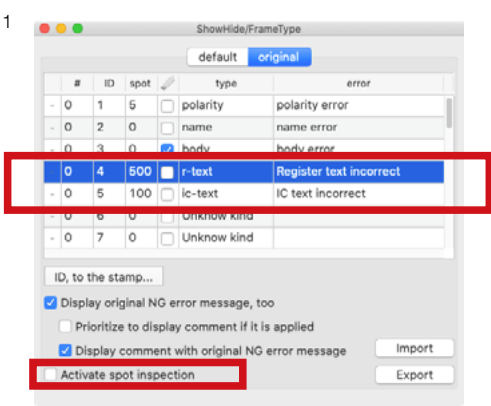
You can set spot sampling in Show/Hide window's original tab. Inspection for registers' value or laser text on IC are often detected NG by AOI because of misalignment or flux remaining on surface, though most of them are actually Good. In PCB production line, if there are too many false NG, the whole line speed gets slower and the rate of rolled through put yield is down. This function enables the spot testing of specified inspection point such as text, register's value. The setting is as following.

Input number in spot column where you want to assign spot inspection. Check Activate spot inspection on the bottom of the window (Screen 1). In case you input 500 for type "r-text", the inspection for "r-text" is executed on 1st time, 501st time, 1001st time... (Screen 2)

* All frames are inspected on the first time inspection.

* Count is initialized when closing inspection program or open other inspection program. If you want to initialize during inspection, select Delete Logdata from Initialize in Edit menu. Be careful when deleting Logdata, other logs are also deleted.

(Screen 1)

1st inspection   2nd to 500th inspection

(Screen 2)

Memo: Advice when applying spot inspection

If you apply spot inspection for a number on register, you should better create a frame for body inspection to check presence and reversing.
Filter Setting for the body frame can be very tolerant. Set higher blur level, and set lower saturation and resolution.

94
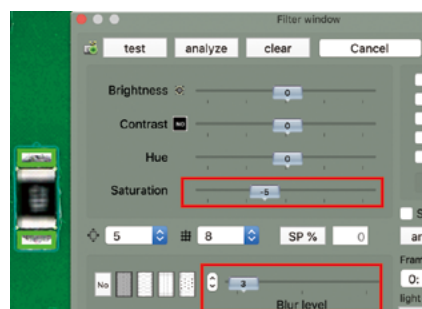
8-12 Automatic Positioning

When opening programs made by other 22Xs or making Cell copying or importing CAD data, position misalignment may occur, it is time consuming to align one by one. Therefore, this software has an Auto Reposition function. Select the Inspection Frame, and select Auto Reposition from the **Edit** menu or press F4. The Inspection Frame will move to the position where it matches the Master Picture.

Also, pressing F9 aligns all Inspection Frames within the current Cell without selecting these Inspection Frames. F10 aligns every Inspection Frame displayed within a Cell (including white Inspection Frames which belong to other Cells), and include these white Inspection Frames into the Cell.

These Auto Reposition features will not function well if the difference between the Master Picture and the local picture is too big, or the difference between the local picture and its surroundings is too small. Check the positions with your eyes after Auto Reposition, and if it has not worked well, reposition manually.

8-13 Fixing Position

Opposite to the need of "Auto Reposition", some of you need to "inspect at exactly same position as P&P placed components" or " move back the frame exactly the same position after moving frame and adding picture in pattern matching frame". There is an option to fix the frame position.

1. Open ForSupervisors menu from Configuration in Settings menu. Move to Action tab, check on " Do not unlock fiducial offset ".

2. Open an inspection program. Debug the program. After debugging, frame position may change. Press Start to check the program (Screen 1).

3. If there is any stamp which position has changed, an alerting message will be shown (Screen 2).

Select **Back to Original position** will move the frame(s) back to the original coordinates.

Select **Update position** will update the frame(s) position to new coordinates.

Pressing **Cancel** button will cancel the inspection. Also Cancel button can use to confirm which frame is moved, the Cell including moved frame is colored in red in Cell Map Area. The moved frame is also colored in red (Screen 3).

8-13

(Screen 1) (Screen 2) (Screen 3)
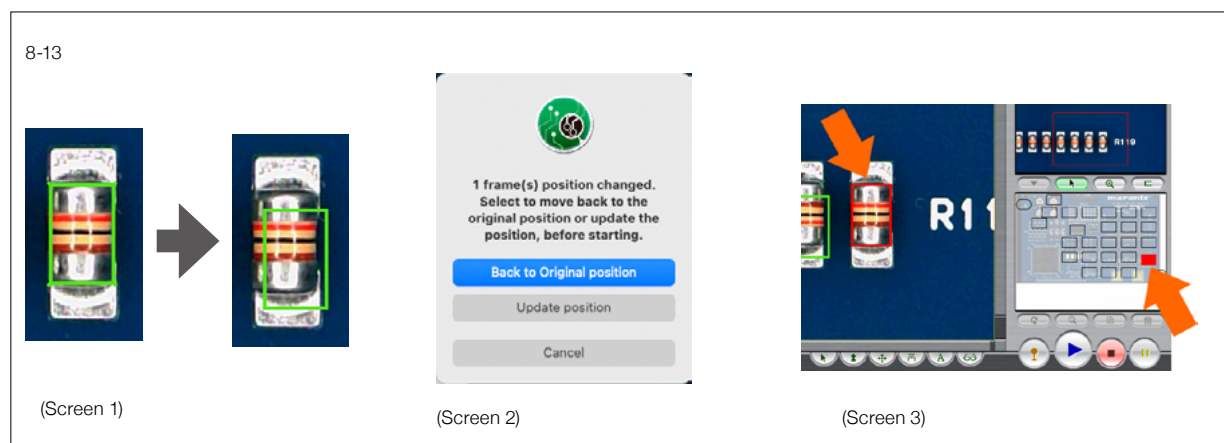
8-14 Load Program of Another AOI and Reposition

Misalignments caused by importing NC data or CAD data or from Duplicate Selection, can be corrected by adjusting the offset of the Cell. To apply the offset only to specific cells, select the Move Tool and move the Cell while pressing down the Option key (Screen 1).

To apply the offset to all Cells, press down the Option and Command keys while moving the Cell.

■ Automatic Offset-- Reading programs made by different model machines.

When reading programs from machines with differing PCB sizes, the offset must be set because the Origin positions are different. In this software, the movement range of the machine is written in the program. If the movement range of the program is different than the movement range of the current machine, a dialog will be displayed asking if an offset should be set up or not. If this dialog is not displayed, the movement range of the machines match.

When you press OK in the dialog, a rough offset will be set up.. The default offset values are X=0, Y=0, please contact your local distributor for the proper values. To change these values, select **For Supervisor** from the **Settings** menu and change the Machine Offset in the Movement tab (Screen 2).

However, since each machine is slightly different, final adjustments must be made manually by moving the Cell or the Frames. In addition, if a programs for large PCBs are opened by a machine for small PCBs, then a message, **Position beyond movement limits**, will be displayed. This means that the offset limit is out of acceptable tolerances, making offset impossible.

■ Automatic Offset – Reading programs made by machines of the same model.

Even if the machines are the same model, Origins vary by machine. So, when reading data created by another machine, an offset will need to be set. If there are several machines of the same model, designate one as the standard setup, and apply that offset value to the other machines.

The offset value should be entered in the Machine Offset dialog in the Movement tab in the Settings For Supervisor window.

* Please be aware that the changed offset value will be applied to all of the Programs.

(Screen 1)   (Screen 2)
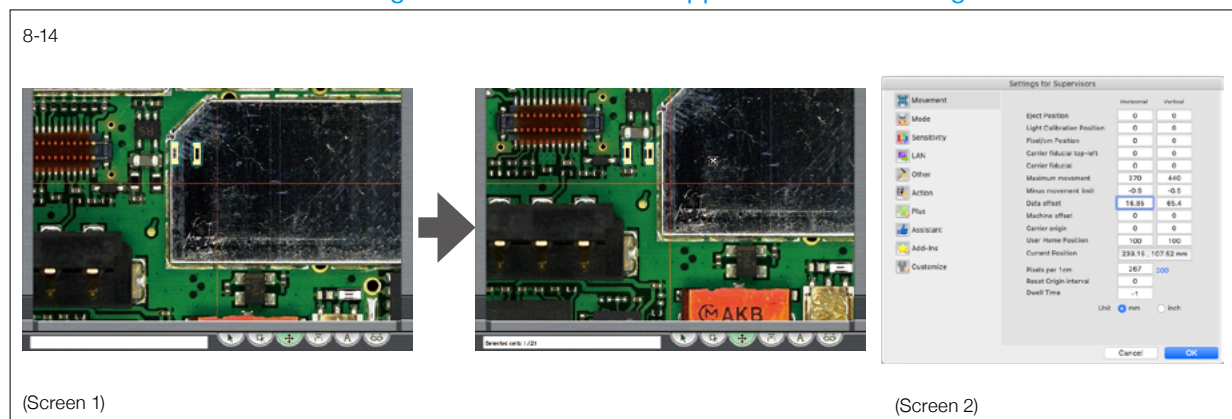
8-15 Convert stamp resolution

This function is useful for re-using inspection programs or stamps on new AOI with high resolution lens.

* If the illumination may differ, you need to re-take master pictures or tune-up histogram settings.

▼ **8-15-1 How to convert**

    1. Select a menu.
To change the magnification of the inspection program, select [Open] from the File menu. To change the magnification of a stamp, select [Open Stamp File] from the Stamp menu.

    2. Finder is displayed. Select [Show Option] and check on [Convert] at the bottom, then select the file that you want to convert (Screen 1).
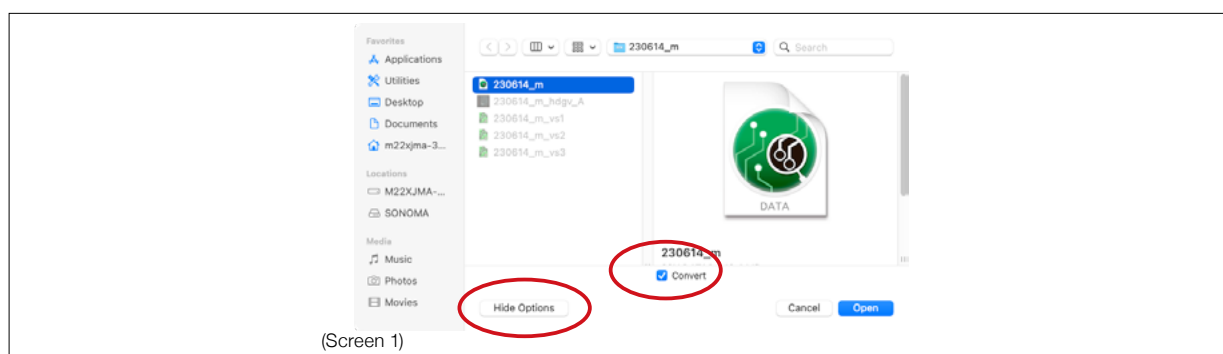
(Screen 1)

    3. Convert window is displayed. Select the resolution of this inspection program and the resolution to output. Press Execute button (Screen 2).
22X version 6.6.3 or later has the resolution information registered in the inspection program, so the resolution before conversion is set to [Inspection Program] and the resolution value is displayed in the box on the right. If the resolution before conversion is [Inspection Program] and after conversion is [Machine Manager Settings], the conversion can be performed by clicking [Execute] without changing the values in principle.
If no resolution is registered, the value for [From] will be blank, so select a resolution from the pull-down menu or set the resolution before conversion by entering a numerical value.

(Screen 2)
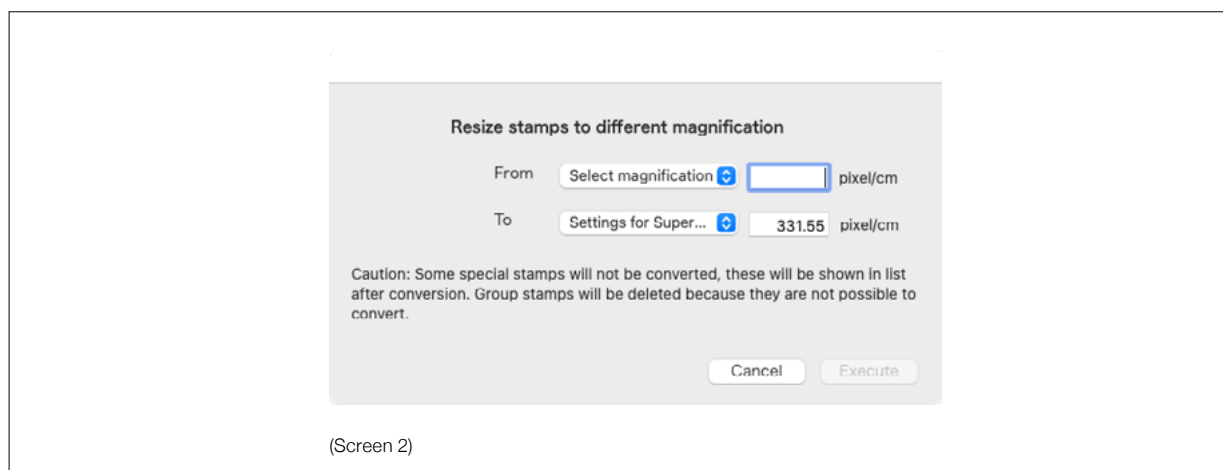
StampDB settings

When the converted stamps are registered in StampDB, setting is aquired. If the program contains stamps which have the same name with DB, the window below will be displayed. Select stamps you want to keep.
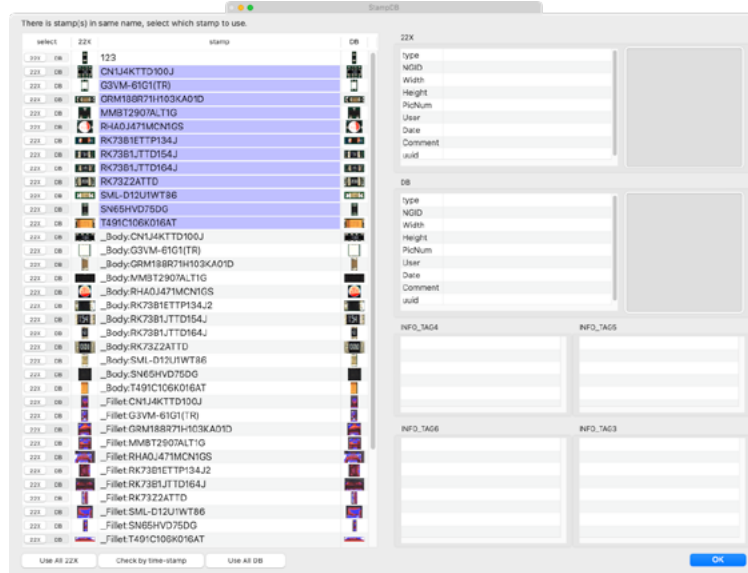
Stamps that do not support resolution conversion

Some stamps do not support resolution conversion. If placed, those stamps will be listed in TextEdit.
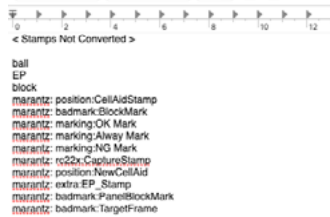
Non-supported stamps are as below.

Invalid stamps		
CellAid	NewCellAid	CaptureStamp
BlockMark	PanelBlockMark	TargetFrame
NG Marking	OK Marking	Alway Marking
EP (Extra Parts)	Solder ball	

9. Pattern Matching Method

9-1 How to Use

Pattern matching type is an inspection method that applies filter processing to an image and compares the picture of a good product with the picture to make OK/NG judgment. If the difference in brightness or color between a good and a bad product is close, the difference should be emphasized. If there are variations among good items, it is necessary to expand the range of good items.

9-2 Settings Window

▼ 9-2-1 Set filter Window

Select the Pointer tool in the Work Area and double-click on the Inspection Frame, and the Filter Window will appear (Screen 1). These settings can be confirmed in the Work Area in real-time.

(Screen 1)
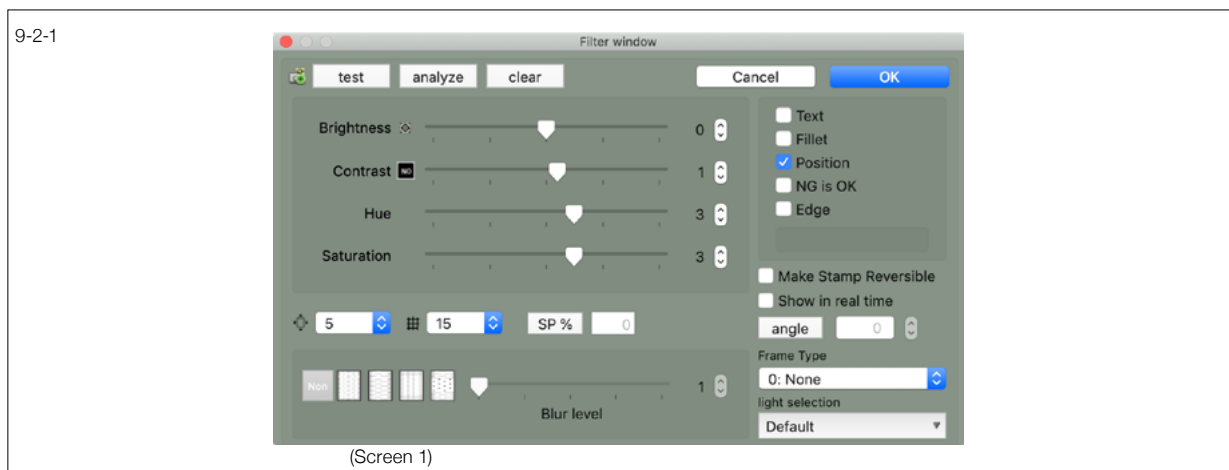
■ Brightness

Brightness can be adjusted within the range of -16 to +15. Click the icon on the right of the Brightness to open **Camera Special** settings. For detail, please refer "20-1 Camera Special Settings".

■ Contrast

The contrast value can be adjusted within the range of -16 to +14. The highest value will be binarised into black and white (BW). When converted, the brightness lever will be used to determine the divergence point. The contrast can be changed using the Emphasis Area button to the left of the Contrast fader.

■ Hue

Hue (color condition) sensitivity can be adjusted. Moving the lever to the right (+ direction) will increase sensitivity, and moving to the left (- direction) will decrease sensitivity.

Since monochrome images (white, black, gray) tend to react easily even to the slightest noise, sensitivity should be lowered. An X will be shown when the value is set at the minimum, and the hue will not be detected. When setting this item, the preview of the frame in the Work Area will be divided into two, showing the range of acceptable colors (for example, with yellow parts, the left side may show red, and the right side may show blue colors). The higher the sensitivity, the smaller the color difference in the two displays will be (Screen 2).

■ Saturation

Saturation (the shininess of color) can be adjusted. Moving the lever to the right (+ direction) will raise sensitivity, and moving to the left (- direction) will lower sensitivity.

An X will be shown when the value is set at the minimum, and the Saturation will not be detected.

When setting this item, the preview of the frame in the Work Area will be divided into two, showing the acceptable range of brightness. The higher the sensitivity, the smaller the color difference in the two displays will be (Screen 3).

* Optionally you can use Human Saturation instead of default saturation. Human Saturation's sensitivity is very much like human eyes. The option is selectable by checking on **Apply Human Saturation** in **General** in **Setting** menu. The option is applied per each inspection program.

9-2-1

(Screen 2)

(Screen 3)
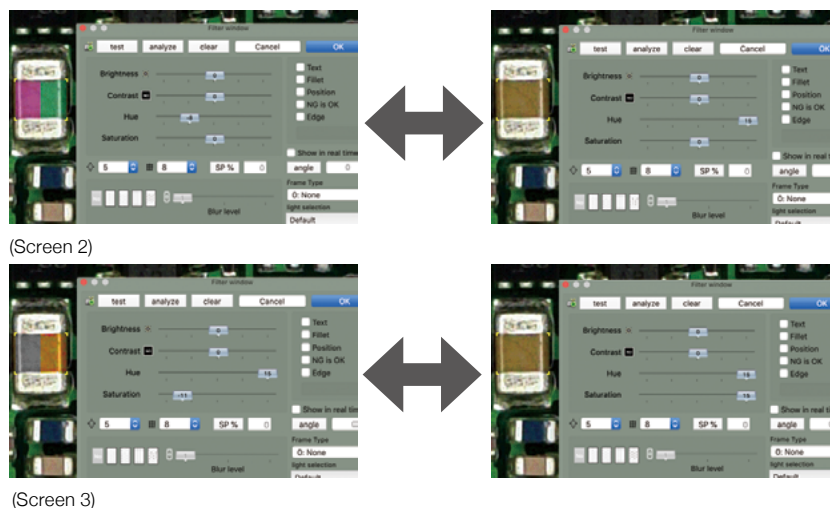
■ Text

This setting binarises the Inspection Frame in black and white. This is used for inspecting text printed on IC packages. When this box is checked, the left levers will change to those used to adjust brightness, contrast and letter sensitivity (Screen 4). The Letter Sensitivity lever will change to AT when moved to the far right, and will automatically binarise in black and white.It will change to AV when moved to the far left, and will become a grayscale image. An another option button will be shown next to Text with RGB light type AOI. For detail of this option, please refer Chapter 20-7 Text filter for AOI with RGB LED.

■ Fillet

Check this box when executing solder fillet inspection. Refer to **Chapter 21** Solder Fillet Inspection.

■ Position

Inspection Frames in which position misalignments occur depending on the PCB, can be made to be judged OK by widening the inspection area, or, conversely, to be judged NG by limiting the acceptable range of misalignment. Select the Position option for this setting.

* For details on this window, refer to 8-2 Position Limit/Tolerance Settings.

■ NG is OK

When making judgments based on the existence of parts, an image with no parts can be recorded as the Master picture, and be used as an OK when something is found. Check Match NG in this case.

■ Edge

This filter extracts the outline of the picture in the frame. The extracted outline will be displayed in a light color (normally white). When there is noise, both Blur and Edge should be used.

■ Chase selection tab

This button sets the range for tracking a component/part. A component/part will be looked for within this range, until inspection is OK. Click on the button to select the range of pixels to be tracked (Screen 5). If it is set to 0, Track will not be executed.

(Screen 4)　　　　(Screen 5)

■ Resolution selection tab

This is used to designate how many pixels an Inspection Frame should be partitioned by. The default value is the **Default grid size** in the **Settings for supervisor** window. It can be set within the range of 4 – 32 (Screen 6). Select a small value to look at details such as the shapes of letters, and select a large value to ignore details. Inspections with high variances such as solder fillet inspection tend to have more false reports when the frame is partitioned into grids. In this case, the frame can be partitioned into horizontal/ vertical, or not be partitioned at all (max).

■ Special %

This corresponds to the Match Rate for OK in General Settings. You can set what % of a match will be judged as OK. The default is OFF, and in this case, the Match Rate for OK will be applied. By highlighting this button, the match rate within this filter can be changed within the range of 1 – 100% (Screen 7). Click again to remove the highlight, and the Match Rate for OK will be highlighted.

■ Blur level

The following 4 types of blurs will be selected by clicking:
    Blur All : The entire image will be uniformly blurred. This is effective for decreasing false reports.
    Horizontal Blur : Strong blur only in horizontal direction. Used to eliminate noise on a flat surface.
    Vertical Blur : Strong blur only in vertical direction. Effective for deleting letters.
    Electrode Blur : Blurs electrodes to decrease false reports.

The blur level can be changed up to 48 using the triangle icons on the right. Also, when you click inside the Blur Range frame, an arrow will appear. Dragging the mouse in the direction of the arrow will change the level (Screen 8). If you would like to ignore slight differences based on the condition of the parts, the blur level should be set as high as possible.

(Screen 7)

(Screen 8)

(Screen 9)

■ **Make Stamp Reversible**

Adds the 180-degrees-rotated Master Picture of the currently selected stamp. This function is used to register parts that are not oriented. The same operation can also be performed by selecting [Make Stamp Reversible] from the Stamp menu.

■ **Show in real time**

When this button is checked, inspection will be done in real time when changing filter settings. However, if this button is activated, blur or Letter extract condition will not be displayed. We recommend to check-off button when creating frames, and check-on when debugging.

■ **angle**

Field to input component angle. By pressing up and down button, input +/-15 degrees automatically.

■ **Frame type**

If you define original frame type in advance in Hide/Show in Window menu, the original frame types are selectable. Please refer **Chapter 8-10** Frame type and Hide/Show settings to define original frame type.

■ **light Selection**

This feature only works in AOI with multi lightings. Refer to 9-4 "Image Filtering by Lighting Selection".

■ **Camera Button**

Renew or Add Master picture by clicking this button.

■ **test / analyze**

Confirm inspection result or see inspection step.

■ **clear**

Set filter to default.

▼ 9-2-2 Cautions When Setting Filters

■ Re-inspection

When filter settings have been adjusted, make sure to confirm the results before moving on to the next task. After changing filter settings, you can re-inspect and analyze the selected Inspection Frame with the **test button and the analysis button** In the Set filter window

* When there are multiple Master pictures, re-inspection will be executed for all Master pictures, but analysis will be run only for the one displayed on the screen. To analyze other Master pictures, switch over Master picture displays and press the Analysis button.

■ Sensitivity Setting

Please note the following when setting sensitivity.

There are many ways to set sensitivity, but in general, raising Contrast will increase sensitivity, and reducing the Resolution value will increase sensitivity to fineness.

• When sensitivity should be increased Defects tend to be missed in the following cases.
  In these cases it is better to set sensitivity to a high level.

1. The PCB color is dark, and components/parts are also dark
2. The components/parts are mainly black and white (monochrome), with little differentiating characteristics
3. The frame is small (inspection target is small)

• When sensitivity should be decreased False reports tend to increase in the following cases.
  This can be avoided by setting the sensitivity to a low level.

1. The color condition of the components/parts varies
2. Electrode area too large
3. The frame is large (inspection target is large)

■ NG judgment

Steps in NG judgment by pattern matching are:

1. Pattern matching of each RGB element --> 2. Hue judgment --> 3. Saturation judgment.

Judgment must be OK in each step in order to move on to the next step. When judged as NG, a message window will appear showing where the problem was found (up to which step was OK). The messages include the following:

1. Mismatch

Does not meet specified value in RGB pattern matching.

2. Mismatch by Hue

Does not meet specified value in Hue judgment. (OK in RGB pattern matching.)

3. Mismatch by Saturation (too low) Mismatch by Saturation (too high)

Does not meet specified value in Saturation judgment (OK in RGB pattern matching and hue judgment.)

■ Text Extraction

The Master picture and the Inspection Frame picture must overlap to a certain extent to make the Track
feature (Find target object feature) function well.

When making judgments based on letter extraction or binarising, if positions of pictures or text do not
overlap correctly, activate Find. It will be highly sensitive to differences when comparing binarised pictures.
In general, in order to prevent false reports, Blur All should be activated. If there are still false reports, try
lowering contrast (Screen 1).

If **Letter B/W threshold** in **Settings for supervisor** is 0, the image will automatically become mono-
chrome. This setting will consider white objects as text even if the actual color of the text is black. In this
case, the sensitivity lever will be used to adjust the surrounding noise level.

■ Limit of Text Extraction

Binarising (black & white) will be executed when Letter is selected, but in order to convert correctly, a more
than 5% difference in brightness will be necessary. If the text is blurred, it may be difficult to accurately
display by conversion, change letter sensitivity to AV. The picture will change to a grayscale image. Adjust
brightness and contrast here before applying Blur to eliminate excess noise. The effect by this process
is different from the binarising process. However, this method is not versatile. Please think of this as one
possible option.

■ Position settings

When finding the misalignment of text in the horizontal direction, the Find will be more efficient if the area
is larger horizontally. In this case, you should set a Find area for each Inspection Frame.

9-2-2
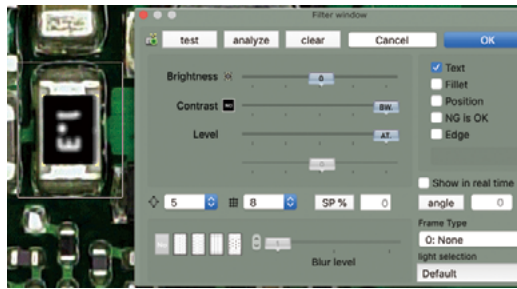
(Screen 1)　　　　　　　　　　　　　　　(Screen 2)

9-3-1
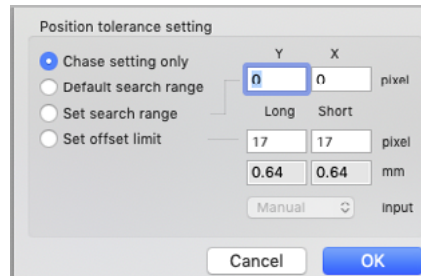
(Screen 1)

■ Show Matching%

When inspecting without speed priority, re-inspecting and analyzing each Inspection Frame, the inspection results can be displayed in %. Normally this may obstruct the view of the inspected object, so % is hidden. To display, go to Settings for supervisor > Mode and Remove the check of **Hide Matching%**.

■ Binarising Using Contrast Adjustment

When the contrast adjustment lever is set at a maximum, the value will be binarised in black and white, and if Text Extraction is not selected, the saturation lever will change to Automatic Correction and be used to adjust conversion levels (Screen 2). This will not change on the negative side but only on the positive side, and the larger the value, the wider the accepted range will be.

When you continue to press down the button where you set the lever, the screen and the Master picture will show the range of correction.

9-3 Position Limit/Tolerance Setting

When **Position** is selected in the Set filter window, the Position tolerance setting window will appear. You can set the tolerance value here (Screen 1).

Position is mainly applied to items that are easily misaligned but would like to ignore the misalignment of, such as text printed on a chip. If the Position Limit is designated, the misaligned distance can be obtained when the results are displayed. You should set offset limit with chip parts that you would like to judge as NG if misalignment exceeds this level.

▼ 9-3-1 Position tolerance setting Window

The following items can be defined in the Position tolerance setting window. Input values.

■ Chase setting only

When this is selected, no searching or position limit is set (default).

■ Default search range

The rate designated in Default find range frame in the Sensitivity tab of the Settings for supervisor will be applied as the seeking range for Inspection Frame (default is 200%).

■ Set search range

You can designate the seeking range in pixels. The values can also be confirmed and adjusted here. Use the pull-down menu below to automatically set values depending on the proportion to the Inspection Frame (1/2 - 1/5). If this value is 1/2, the seeking range will be 1/2 the length of the lateral side of the Inspection Frame added to each side of the Inspection Frame.

■ Set offset limit

The position limit can be designated in mm. When the limit is set here, the distance of misalignment will be displayed with the results. The limit can also be designated by Command + drag. In addition, as with Range designation, you can use the pull-down menu to automatically set the values by the proportion to the lateral side of the Inspection Frame.

▼ 9-3-2 Position tolerance setting Using the Mouse

■ Set search range

To set the search range, select the Inspection Frame with the selection tool, and place the mouse pointer on the bottom right corner. Press the Control key and the pointer icon will change. Press down the Control key while dragging the mouse to set the range. The range will be displayed as a line extended from the Inspection Frame (Screen 1).

9-3-2

(Screen 1)

(Screen 2)
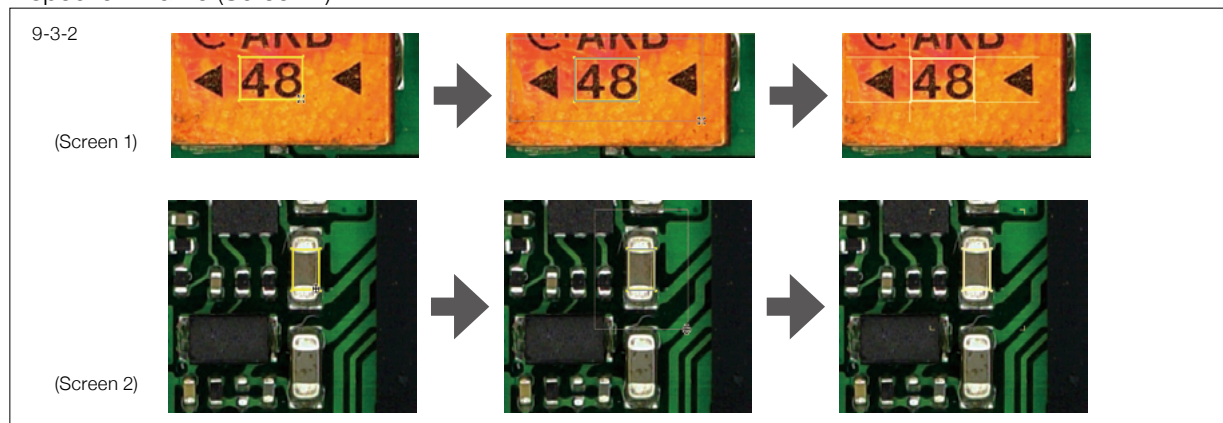
■ Set offset limit

To set the offset limit using the mouse, select the Inspection Frame with the selection tool, place the mouse pointer on the bottom right corner and press the Command key. After the icon has changed, press down the Command key while dragging the mouse. The limit will be shown as a frame with 4 corners (Screen 2).

* The maximum search/offset limit is 127 pixels.

9-4 Image Filtering by Lighting Selection

This feature only functions on AOI with multi lighting which can be switched off/on individually. Settings for lighting at inspection can be selected on devices equipped with DOAL (Diffused On Axis Lighting). Depending on the inspection, you can select from 6 options: Default, Main, Main + DOAL, DOAL, Side, and Side + DOAL. Multiple settings can be applied to the same cell (these settings will not increase the number of camera movements).

▼ 9-4-1 Light Selection Window

Click on the **light selection** button in the Filter Setting window, and the lighting selection window will be displayed (Screen 1).

■ Default

Main light only. Select this to reset the other settings.

■ Main

Main light.

■ Main + DOAL

When the DOAL is shined on the PCB, the convex sections of parts will appear black since the light does not reflect back. This setting combines the image from the main light to this part. When inspecting parts that have colors similar to the PCB, Main + DOAL will enable stable inspection by making the PCB surface glitter and make parts stand out.

(Screen 1)
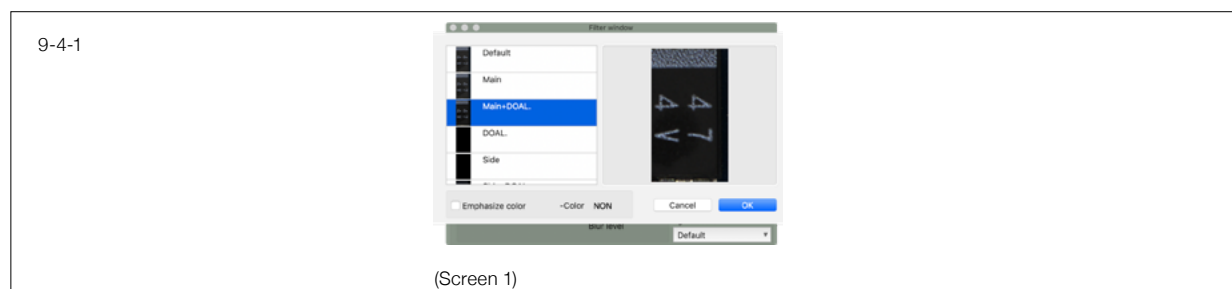
■ DOAL

This lighting shines on the PCB vertically and reflects back only the flat parts, with the flat parts appearing white, and the convex parts black. It will be easier to check for the presence of solder or scratches that are hard to detect with the main light.

■ Side

The lamp shines from the side to vertically reflect light that hits objects with angles. It makes solder fillet forms and text prints with laser markers stand out.

■ Side + DOAL

This combines the side lamp red image with the black DOAL image. It is easier to see the condition of the solder of the leads that are difficult to distinguish with only DOAL or side lamps because the image becomes all black or all red.

■ Emphasize Color / - Color

[Emphasize Color] and [- Color] can be used on [Main + DOAL] and [DOAL] lighting.
Check [Emphasize Color] to make colors vivid. It can be used to detect unsoldered areas and inspect solder fillets. Click [Non] to remove a color (Screen 2). The color can be chosen from red, green and blue. This function can be utilized to remove the specified color when the color of the PCB is reflected in the solder fillet. To use [Emphasize Color] and [- Color], check [Enable color with DOAL] from [For Supervisor] - [Action] (Screen 3).

* With inspections that allow less solder in the pad, it may be judged as NG depending on the amount of solder.

▼ 9-4-2 Settings of Light Selection

1. Double-click on the **Inspection Frame** to display the Filter Setting screen.
2. Click on the **light Selection** on the bottom right to display the Lighting Selection window.
3. Click on a button and the Work Area will change to the selected lighting.
4. Choose the proper lighting, and click **OK** to close the window.

(Screen 2)   (Screen 3)

9. Pattern Matching Method
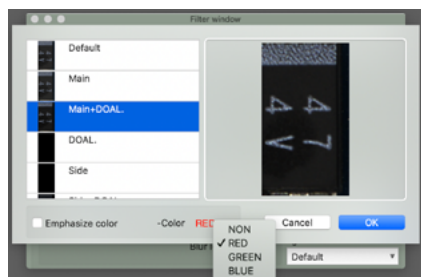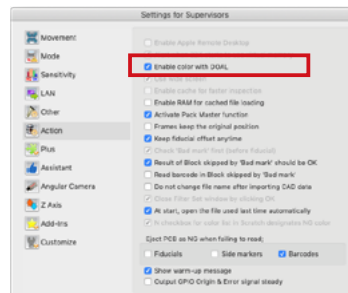
5. Lighting selected here can be confirmed with the status icon located at the left of the Lighting Selection button.

6. Press the **Camera** button to change the Master picture, and set filters if necessary.

7. After all the settings are complete, press **OK** and close the window. If the Master picture has not been replaced, a warning window will appear.

Place the mouse pointer on the Inspection Frame for which you set the lighting selection, and the screen will change to the selected lighting.

* If there is problem with captured image because of a flash synchronization, press the **Renew DOAL Timing** button in the calibration window to make corrections.

9-5 Measurement against escaping NG and false NG

While debugging pattern matching stamps, if defect is escaped or if there are too many false NG, please change filter parameters accordingly;

- If there is little difference in color tone between an OK and NG component, select only the distinctive

  part as the Inspection Frame.

- If the colors of both the component/part and the PCB are similar, use histogram algorithm.

- Change grid from default 8 to 6 or 5 to detect the details.

- Increase Hue/Saturation level to catch the slight difference of the color.

- The Chase Limits setting allows slightly misaligned parts to pass the inspection process. However, if the range is set too wide, parts that should fail will be passed. Decrease the Chase level to be judged as NG or set Offset Limit in "Search" setting, in case the component is misaligned.

▼ 9-5-1 Filter Adjustment

Check the analysis results, then adjust the filter. Inspection results will change depending on the settings of the filters. To find the optimum settings, it is important to execute a re-inspection every time the filter setting is changed for improvement. Set Filters by double-clicking on the Inspection Frame.

Handling false NG is to say in another word, "increase tolerance". Set blur or increase blur level to absorb the slight difference of lead area. Decrease Hue/Saturation level to absorb the slight difference of colors.

In addition, changing grid number is also effective. Default number is 8, this means OK/NG criteria is done per 8 pixels. If you increase the grid pixel number such as 12 or 14, OK/NG criteria is done per 12 or 14 pixels. As a result, criteria becomes more tolerant.

▼ 9-5-2 Adding Master Pictures

A quick way to reduce False NGs is by adding an additional Master Picture, that has been found to be

False NG. The problem with this is, the more pictures there are for comparison, the longer the inspection time will be, and it also narrows the choices of future adjustment methods. If possible, we recommend using techniques like Filter Adjustment, that have been explained above. Master Pictures can be added by the following procedure (**Up to 24 Master Pictures can be saved.**).

1. Select the frame.
2. Select **Add Picture** in the Pull-Down menu on the **Master Picture Area**.
3. The added picture will appear next to the existing Master Picture. Each Master Picture can be activated using the slider bars below.
4. In order to Delete a Master Picture, display the picture to be deleted and select **Delete Picture** from the Pull-Down menu on **Master Picture Area**. Please be careful because this process cannot be undone.

▼ 9-5-3 Change lighting

This is a feature limited to systems equipped with multi lighting. When inspecting a small component mounted on a similar colored PCB, a common technique used to emphasize differences is to increase the brightness and contrast settings. However, the disadvantage of this technique is that the system will be overly sensitive to the uniformity of the components/parts themselves, resulting in increased False NGs. In addition, non-uniformity in the brightness of the solder area affects the shape and size of the surface area in solder print inspection, resulting in non-uniformity upon inspection. Therefore, in order to make it easy to see the difference between each image, change lighting or use combined lighting. This feature can be accessed from the Filter Settings Window.

▼ 9-5-4 Assign as NG picture

Adding Master Pictures will reduce False NGs, but since this process requires the pattern matching of all Master Pictures, it will result in longer inspection times. Therefore, an effective way to reduce inspection time is to assign Master Picture as NG picture. If there is a certain pattern that is judged to be, you can register that pattern as an NG picture. Since the system first compares the picture with NG pictures, the NG points can be judged NG before detailed analysis. This is effective, for example, in cases where errors follow a certain pattern such as parts not being where they should be or part B being located where part A should be. NG pictures can be added as Master Pictures, and then set as an NG pattern by selecting **Assign as NG picture** from the Pull-Down menu in the **Master Picture Area**.

After these changes are made, inspect again. In order to improve accuracy, inspect at least 5 PCBs and make filter adjustments to reduce False NGs.

10. Histogram Analysis Method

Histogram Inspection judges Good/NG if the amount of Brightness of the target color out of Grey/Red/Blue/Green is within the specified range of histogram.

10-1 How to Use

We recommend to use this inspection method for the unstable shaped parts which the inspection can be result in False NG or escaping NG, such as solder paste or solder fillets.

Also, applying this for inspecting the color code on resisters or for inspecting simple color such as polarities can make the inspection speed faster. This stamp can increase the inspection accuracy and performance to use with the combination of pattern matching inspection.

10-2 General Procedure

1. Set a PCB (It is better if the board is a good one or if you already know the NG points.)
   Draw a frame, go to Window -> Histogram Analyzer and open the window.
2. Open Sampling tab and press Sampling button. Press OK and quit the window.
   A dialogue to input a stamp name appears, input stamp name.
3. Paste this stamp where to inspect, then start inspection.
4. After inspection, open Histogram Analysis Window and open Stamp tab.
   Check images on sampling list, if there is any image which is widely shifting or obviously defective, delete from the list by sub menu [Delete from list].
5. Press [sample image] button, and create composite image. Draw trap frames on the composite image. Press [debugging] button in order to check if all sampling image can be OK.
   Adjust trap frames until all sampling images to be OK.

10-3 Limitations

You can treat Histogram stamp as same as pattern matching stamp, however these are not possible.

- Set offset limit for position tolerance settings.
- Hold horizontally flipped master picture.
- Flip Zoom/Unzoom.
- Create from Oval/Polygon Frame.
- Rotate stamp with Option key

10-4 Settings Window

Each function in this window is shown below;
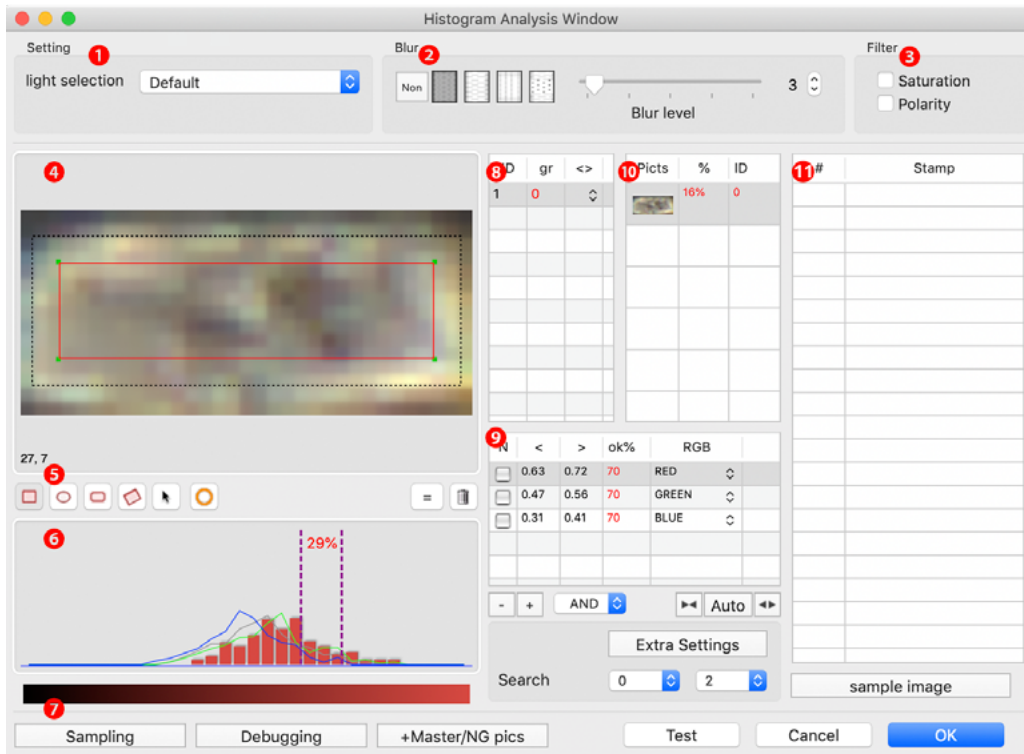
No.	Name	Details
1	Light Selection	Selects lighting.
2	Blur	Blurs the trap frame.
3	Filter	Sets a filter that facilitates detection.
4	Work Area	The inside of the inspection frame is displayed. Set the trap frame here.
5	Trap frame tools	Selects or deletes the shape of the frame to set on the inspection area.
6	Graphs	Displays the color % and judgment range within the selected trap frame.
7	Sampling	Extracts, debugs, and reads inspection frames of the histogram inspection.
8	Trap frame attribute	Sets ID, group, and detection result comparison for each trap frame.
9	Histogram settings	Sets trap frame settings, color selection for inspection, OK/NG settings, inspection conditions, special settings, and search range.
10	Sampling image list	When the sampling button in [6. Sampling] is pressed and an inspection or re-inspection is performed, a list of inspection frames with the same name stamp is displayed.
11	Stamp Window	Displays the type and number of stamps sampled. Stamps can be switched by double-clicking on the name of the stamp.

The flow of setting inspection locations is as follows:

1. Select **(4)** trap box shape according to the inspection target and place it in **(3)** work area.

2. Set **(1)** blur settings, **(2)** filter settings, **(5)** detection range on the graph, **(7)** ID and group, and **(8)** inspection settings within the frame.

3. **(6)** Set sampling and register as a stamp by clicking [OK] in the lower right corner.

Subsequent pages will explain each function in detail.

1. Light Selection
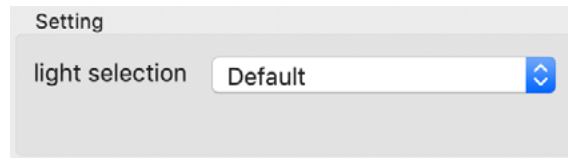
The lighting can be changed for models with selectable lighting.

* Confirmation message is displayed after changing Lighting.

2. Blur
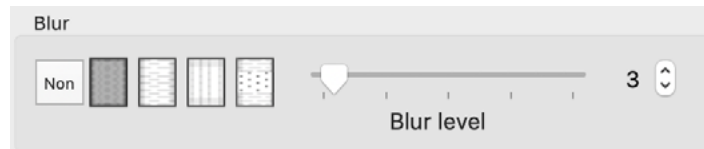
The meanings and recommended uses of each button are as follows;

No	**Unblurred**	No blurring.
	Total	Uniformly blurs the entire inspection frame. Effective in suppressing false NGs.
	Horizontal	Blurs horizontally. Effective for eliminating noise on flat surfaces.
	Vertical	blurs Vertically. Effective for erasing text.
	Edge	Blurs the edges of the inspection frame. Effective for reducing false NGs at the electrode.
	Blur level	After setting the blur type, the blur intensity within the inspection area can be set with the button or slider. The maximum value is 48.

3. Filter

Saturation	Checking this increases saturation balance of image in Work area. Check when you can not see enough contrast on the image.
Polarity	Checking this reinforces image contrast. Check when you can not distinguish a polarity mark.

4. Work Area

Create trap frames by trap frame tools. Trap frame is colored in blue when Good, and colored in red when NG.

5. Trap frame tools

"Trap frame" represents the area to be inspected for criteria. Maximum 31 trap frames can be created.

	Tools for creating the trap frame. Rectangle, Oval, Rounded Rectangle and Polygon tools are selectable. Default tool is Rectangle tool.
	Group select tool. Drag mouse on to multiple trap frames with this to make frames in group. Selected trap becomes [OR] and group ID [gr] is set. Group ID is set on **(7) Trap frame attribute.**
	Mask tool for Rectangle, Oval, Rounded Rectangle trap frames. The slider is displayed to adjust the mask size. Mask shape can be altered to the exact circle by clicking a button on the right edge of the slider. * Mask is not used for Polygon.
	Synchronize tool. Changes on a trap frame can be applied to all trap frames with the same group number [gr] or ID number [id]. Number 0 is regarded as not belonging to any groups. The message **"Apply to "group number" or "id number" ?"** is displayed when selecting. Choose a number to be synchronized.
	Trash. Selected trap frame is deleted. Trap frame is also deleted by 'Delete' key. * It is not possible to delete multiple trap frames at once.

6. Histogram Area

Each graph of Grey/Red/Blue/Green colors, percentage, and target range are displayed.

The grey scale bar on beneath is a reference for brightness/darkness.

Graphs	The color chosen in **(8) Histogram settings** is represented in bar graph. The other colors are represented in line graphs.
Percentage	Displays the amount of light between the target range. It is colored in blue when the amount is within OK percentage, and is colored in red when out of OK percentage.
Target range	The range between the dot lines is the target range for OK/NG judgement. The range can be enlarge/narrow by dragging the dot lines. The target range can be moved without changing the width by dragging on the letters of [%]. The exact positions of dot lines are displayed on [< >] in **trap frame condition**.

* When you click anywhere within the judgment range, the area within the trap frame will be highlighted in yellow.
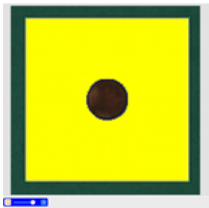
7. Sampling window

Performs inspection frame extraction and debugging, as well as loading of master picture and NGs.

Sampling	All histogram Inspection frames are sampled by inspection with this button on.Possible to activate from Window menu. Shorcut key is option+command+F. When sampling is ON, the icon is displayed in message bar. * Sampled data is deleted from sampling list. It does not mean that actual frames in Work Area are deleted.
Debugging	By pressing this button, you can re-inspect all frames in sampling list.
+Master/NG pics	Read [master picture] and [master picture assigned as NG picture] on sampling list.

8. Trap frame attribute list

Set an attribute for each trap frame; ID [id], Group [gr] and compare detection result [< >].

* The line colored in grey is selected trap frame in Work Area.

id	ID number. Unique continuous numbers are automatically set when you create trap frames. By manual keyboard input, you can change this number.
gr	Group number. Number 0 is the default value when you create a trap frame. By inputting another number, you can change this number. You can make trap frames with same number in a group. There is 'OR condition' of inspection criteria in this group. The images below contains 2 trap frames with [gr] number 1, in this case there is a condition 'if one of the trap frame is OK, the other can be NG'. * [id] and [gr] numbers can be set from 1 to 32.
< >	If the trap frame with the same ID is in the column directly below, select "<" (less than) or ">" (greater than) to compare the detection results. The percentage of the trap frame to be compared is judged as non-defective, and the OK% is ignored.

10. Histogram Analysis Method

9. Trap frame condition table

N	<	>	ok%	RGB
☐	0.63	0.72	70	RED ↕
☐	0.31	0.41	50	BLUE ↕

Target range <>, % to be OK, inspection target color, reversing OK and NG are set on the table.

N	The roll of OK and NG changes. The target range not reached to OK % (=NG) results in OK. Same function as NG=OK in filter setting window of pattern matching frame.
Target range (<>)	The histogram graph is from 0.00 to 1.00. The value in [<] is the position of left dot line. The value in [>] is the position of the right dot line. These values change automatically by moving dot lines by mouse. Manual value input is also possible.
ok%	Percentage which should be judged OK. Default value is 50%.
RGB (inspection target color)	Selects inspection target color from GRAY / RED / GREEN / BLUE. The colors not selected here are out of inspection.
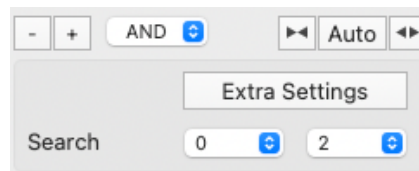
Number of condition(s), AND/OR, target range adjustment and Extra settings are set below the table.

Add/delete [-/+]	[-] button deletes a condition, and [+] button adds a condition. They are useful when you'd like to inspect more colors or inspect under multiple conditions. Maximum 31 conditions can be added.
AND/OR	In case if a trap frame has multiple conditions. you can select their criteria condition to be AND condition [&], or to be OR condition [or]. In AND condition, all settings should be OK. In OR condition, if one setting is OK then the rest can be NG. Default condition is OR [or]. It can be switched to AND [&] by clicking on the pull-down.
Auto / Enlarge◀▶/ Narrow▶◀	Auto button sets target range and color automatically. Enlarge button enlarges target range +0.03 to both side, and narrow button narrows target range -0/03 in both side. Enlarge button does not spread when the range is over 50%, narrow button does not shrink when the range is less than 5%.
Search: left	Decides the pixel(s) amount for the program to track the parts/components positions.
Search: right	Decides the pixel(s) amount for the program to search the histogram matching area.
Extra settings	Menu for advanced settings. See the next page for detail.

Items for Extra Settings are as below.

Angle	Set an angle on histogram inspection frame. Enable to input 1 to 89. By check on "To all" option, the same stamped frames in Work Area change into angled frames. Also this stamp on Stamp Library will change into angled stamp.
Frame Type	As same as pattern matching inspection frame, original frame type can be set.
Customize default settings	Possible to customize the default value for search area. "Trap has all colors in AND condition" is, normally one color is selected to analyze, with this option all 4 colors are selected in AND condition.
Picture display option	Image in Work Area can be displayed in only inspection target color. Blend (%) is the percentage that the original image is blended. Activate this option when you are new to histogram inspection, and if it is difficult to decide where to create trap frames.

10. Histogram Analysis Method

10. Sampling List

The list for debugging efficiently. If [Sampling] button in 8. Sampling tab is ON, then inspect or re-inspect, same stamps pasted on PCB is all collected and displayed here.

Picts	Displays picture(s).
%	Displays matching %. It there are multiple trap frames in Work Area, The minimum matching OK% from all trap frames is displayed when OK. The maximum matching NG% from all trap frames is displayed when NG. * If Search for trap frame is set, % displayed here is the % after searching and moving. Therefore the value can be different from which of shown in histogram graph area.
id	Different ID numbers and text colors are displayed depending on the inspection results. The detail is as below;

   0 : NG   Red

   1 : OK   Blue

   2 : sample image   Right Green

   3 : master picture assigned as NG picture   Rose

   4 : master picture   Dark Green

* List can be arranged in descending/ascending order by double clicking on [%] or [id].
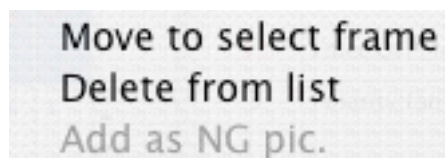
When double clicking on the picture, a sub menu pops up.

        Move to select frame: Move to the position in Work Area.

        Delete from list: Delete from the list.

                                     (Does not mean to delete stamp in Work Area)

        Add as NG pic: Save the image as NG pic in stamp.

* Add as NG pic function is not active and un-selectable when saturation filter is ON.

119

11. Stamp window

Sampled stamps are listed by name with placed numbers. By double clicking on stamp name, sampled images of the stamp is listed in sampling list.

#	Displays the collected stamp number. If there is NG stamp, the number is colored in red.
Stamp	Name of stamp(s).
Sample image	Creates a composite image from all sampled images. The composite image has id number 2. Once you press this button, composite images are generated not only for selected stamp but also for all stamps. Because the composite image is the average of all, it can be the best example for drawing on trap frames for the first time.

* Please reload the sampling list by double clicking on the stamp name. Without reloading, composite image is not displayed on sampling list.

10-5 Hints for creating/adjusting trap frame

When creating trap frames, it is the most important to understand the feature of NG parts/components.

Place trap frames where differences between good part and defect part is obviously caught.

Here are the examples of trap frames to detect major defective phenomenons. (By Model22X HDL-350)

▼**10-5-1 Tombstone (Machine: M22X HDL-350)**

Such error can clearly be detected with lighting combination of MAIN + SIDE + DOAL.

Paste histogram stamps on fillets of both side.

Good fillet is skewed, and skewed area is colored in red because of SIDE lighting detection.

Bad fillet is not soldered, thus not skewed and red.

Therefore, create a trap fame as below.

- All color except red is gathered around the middle of histogram. Select Blue/Green/Grey as inspection
   target color. You may like to select Red because the image is Red, but in deed the graph of Red is not
   characteristic enough.

- Press ◀▶ button a few times to increase tolerance slightly.

- Check the trap frame on bad fillet, it is detected as NG. The histogram is very bright in all colors, the
graph shape is very different from good fillet.
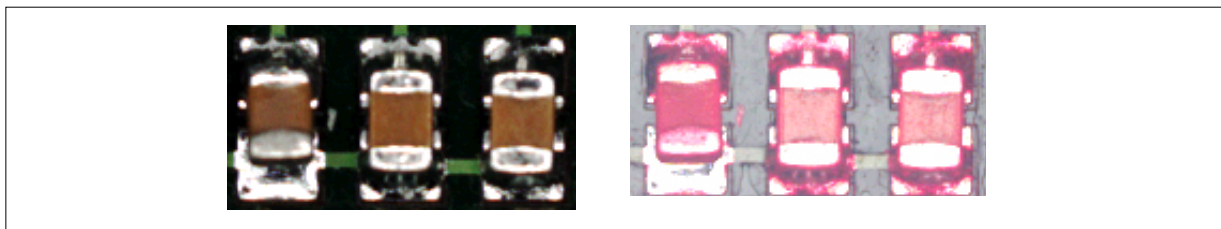
10-6 Measurement against escaping NG and false NG

If the traps allow NG to escape or if there are too many false NG, adjust accordingly.

1. [enlarge / narrow] target range. [increase / decrease] ok%.
2. Change the target color.
3. Add a target color. ex. Create 2 conditions by AND/OR; 'should be more than 50% of red in
   brighter area' and 'should be more than 50% of blue in darker area'.
4. Increase numbers of trap frames, and create a group from them. By placing multiple trap frame,
   you can increase/decrease criteria tolerance. Also this is effective for position shifting.
5. If you have NG PCB, make trap frames which detect the NG correctly.

10-7

(Screen 1)　　　　　　　　　　　　　　　　(Screen 2)
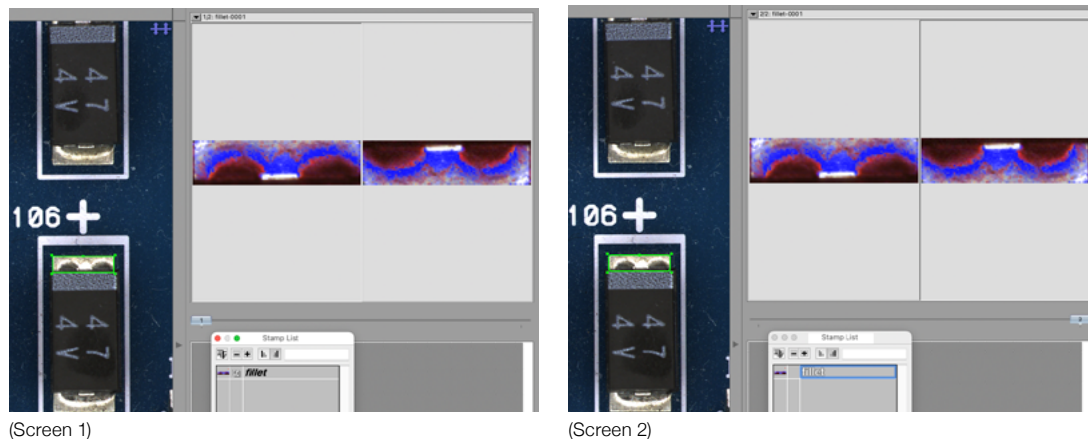
10-7 Convert pattern-matching stamp into histogram stamp

You can convert pattern-matching type stamp into histogram type frame by following procedure. This is very useful. For example, in case if you want to change fillet inspection frames in Pack stamp into histogram frames in current program, by using this function, you do not need to create new stamp and replacing it to current stamp.

▼ 10-7-1 Limitations

1. Stamp in Pack Stamp can not be converted from Pack Editing. The only way to convert stamp in Pack is placing the stamp in Work Area and convert. Then the stamp in Pack also changes into histogram stamp.
2. Stamps with custom setting (Custom 1 to 8, which can be set by clicking sun icon next to Brightness adjustment bar in Set filter window) can not be converted into histogram stamp. If you even want to convert, reset the custom settings.
3. Oval and Polygon frames transform into rectangle frames when converting into histogram.
4. The stamp holding horizontally flipped master picture can not hold the flipped master picture anymore.

▼ 10-7-2 How to convert

1. Select stamp in Work Area. Select Histogram Analyser from Window menu (Screen 1). A message asks "Create a histogram-type inspection frame?", press OK.
2. Histogram Analysis Window opens. Set and quit the window.
3. The pattern matching type stamp in Work Area is converted into histogram type stamp. And stamp in stamp list is also changed into histogram stamp (Screen 2).

* The change on stamp list can not be seen immediately, unless stamp list is updated, for example by adding new stamp or by deleting a stamp.

11. Cell Operation

A Cell is the area the camera can cover in one shot.

11-1 Basic Cell Operation

When executing operations such as creating Inspection Frames in the Work Area, the screen of that Work Area will be recorded as a Cell. When creating another Inspection Frame after moving by using Pitch buttons or the Move Tool, the Inspection Frame created there will be stored in a different Cell.Cell positions will be displayed in the Cell Map Area at the lower right. Clicking on a Cell on this map will display the cell in the Work Area (Screen 1).

To edit Cells, drag the mouse over the Cell (Screen 2). The Cell will become shaded, showing that it is selected. The selected Cell can then be edited using the Pull-Down menu in the Cell Map Area to perform tasks such as Assign to Block, Duplicate, Delete, Flip and Turn (Screen 3).

* Shaded Cells mean that they are selected. Cells displayed in black are the Cells currently displayed in the Work Area. This status does not activate the Pull-Down menu, therefore the Cell cannot be edited. Drag the mouse over the Cell to edit it.

If you want to perform the same task on multiple Cells, select multiple Cells. Press down the **Shift** key while dragging the mouse over areas that are not selected yet to add to the selection. If there are Cells that you want to eliminate from the selected area, click on the Cell while holding down the **Command** key.

11-1

(Screen 1)

(Screen 2)

(Screen 3)
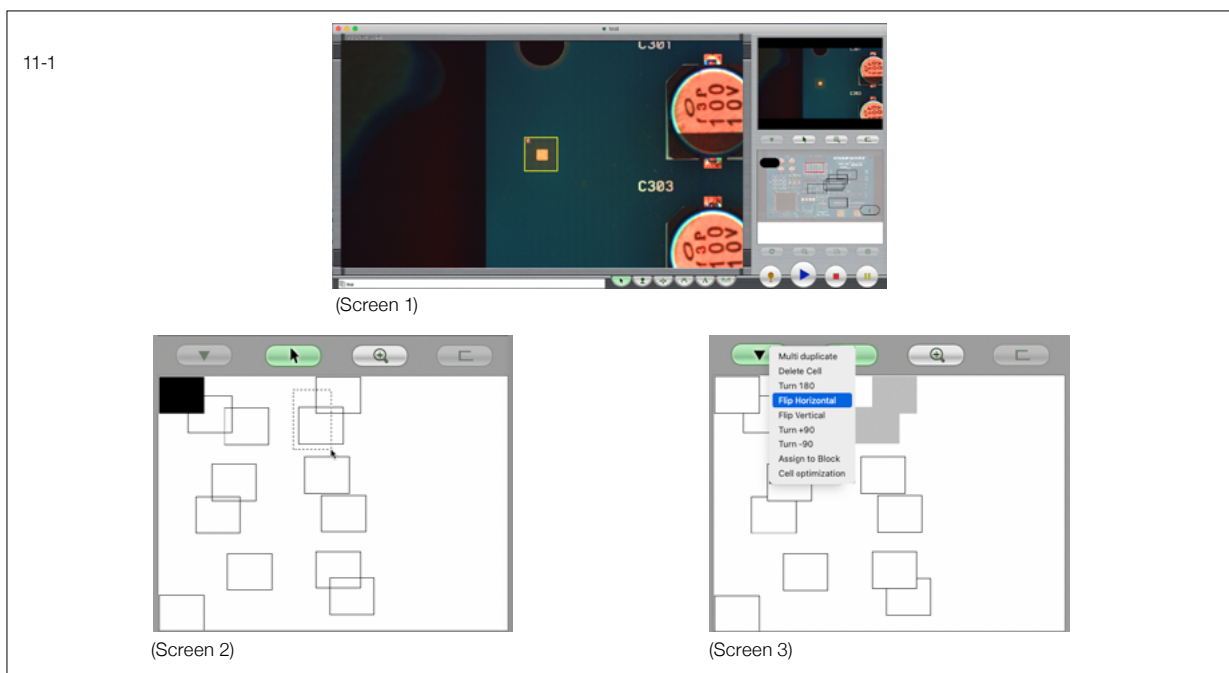
11-2 Duplicating Cells

Multiple Cells can be duplicated in a bundle using the Multi Duplicate command. When working with multiple PCBs, once you set up an Inspection Frame for one PCB, the other PCBs can be set up by copying. The procedure is as follows:

* Some special stamps may not be copied, barcode stamps will not be copied unless they belong to block Cellss.

1. Select the Cell to be copied in the Cell Map Area, and select **Multi Duplicate** from the **Cell** Menu, or select **Matrix Copy Into Cells** from the **Edit** menu.

2. When the **Multi Duplicate** dialog appears, designate how many copies will be made along the X- and Y-axis at the desired pitch. When duplicating from upper left to lower right, the pitch should be set to a negative value.

3. The **Multi Duplicate** dialog contains a Preview Map that shows how the selected Cell will be copied. The copied Cell will be positioned in black, and if you click on the Cell in a position where a copy is not needed, the Cell will change to white and will be removed from the copy series (Screen 1).

* When there are too many copies to be displayed on the preview map, it is not possible to remove copied cells from the copy series.

4. If there is a Cell in the exact same position that a copied Cell is to be placed, that Cell will be replaced. In addition, if the gap between the existing Cell and the copied Cell is very small, the Cell will be replaced. The **Merge Nearby Cells** trigger value, which sets the amount of mis-

(Screen 1)

Cell Map before Duplication

Cell Map after Duplication
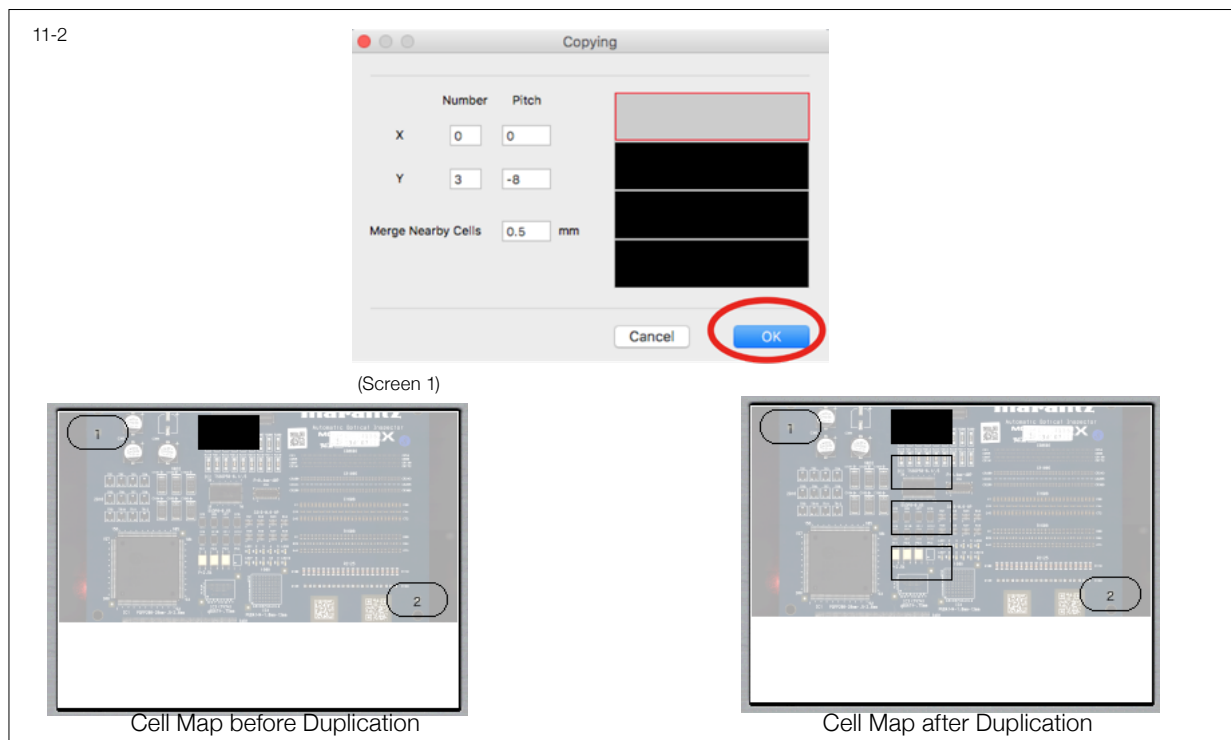
alignment allowed to replace cells, can be changed from the **Merge Nearby Cells** in the Duplicate window (the value of **Merge Nearby Cells** must be between 0.25 - 2.5mm).

With this feature, if you duplicate Cell A and make Cell A', when you modify the Cells, you only need modify either Cell A or A' and duplicate the modified Cell on the other Cell.

5. After copying, confirm that the Cell is positioned as intended on the Cell Map. If the position is noticeably wrong, select **Undo** from the **Edit** menu, or press **Command + z** and repeat the procedure.

* If you want to copy the Barcode Stamp, open Copying window, and click "OK" with pressing Option key. If there is check mark in "Apply for barcode in Block" function, Block number is assigned automatically. For the detail of Block number, please refer to chapter "24-1-5 Block Assignment".

11-3 Adjusting Cell Position

When the PCB is warping or parallel errors, misalignments occur. In this case, Adjust the Cell position.

1. Select the Cell you want to adjust in the Cell Map Area.
2. Select the Move Tool in the Work Area and drag over the screen while holding down the Option key. The cursor icon will change, and as you move, the position of the Cell will move in the Cell Map Area (Screen 1). If you want to move only along the X-axis or the Y-axis, drag while holding down the **Shift + Option**. This will prevent the Cell from moving in other directions.

11-4 Rotate/ Flip Cells

By selecting the Cell and then selecting **Flip Horizontal**, **Flip Vertical**, **Turn +90** or **Turn -90** from the Cell menu, the Cell can be flipped or rotated. In all cases, the center will be the center of the selected area. With the case of 90 degree rotation, the Inspection Frame may be out of the Work Area due to differences in the aspect ratio. In this case a new Cell will be created in the vertical direction.

(Screen 1)
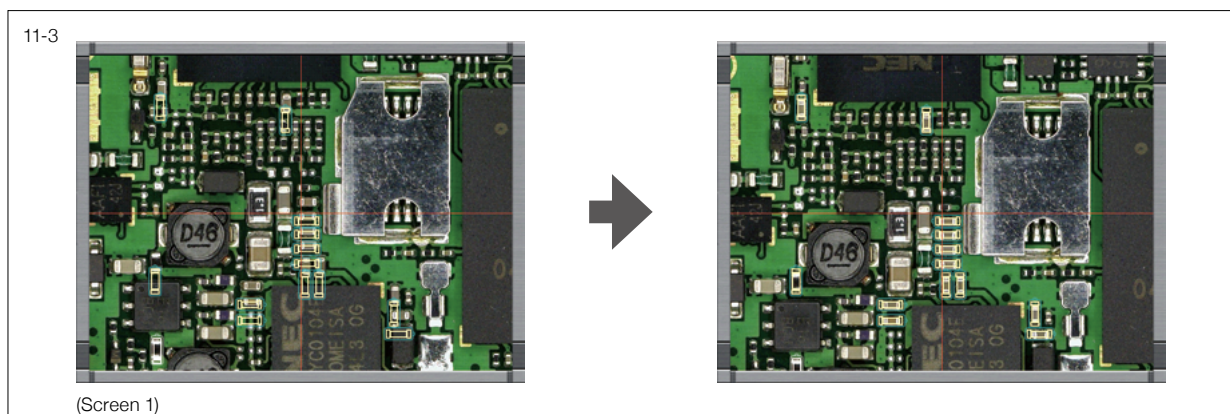
11-5 Creating Cell Blocks

In general, this software executes inspections starting from the location closest to the current position, but this is not necessarily the most efficient method. Therefore, there is a feature that allows multiple Cells to be unified as a Block and inspection can be executed by Block. Each Block will have a Block Number defined, and the inspection will start from Cells not assigned to Blocks and continue on to lower numbered Blocks.

If the original Block contains a fiducial mark(s), duplicating the entire Block will create a new Block that contains a new fiducial mark(s). This feature is useful when the relative position of each Block differs slightly in the multiple PCB.

When copied without creating Blocks, the fiducial mark(s) will be copied as a regular Inspection Frame.

■ In order to create Blocks, select the Cells that you wish to unify in the Cell Map, and select **Assign to Block** from the **Cell** Menu.

■ When you click on the Cell Block in the Cell Map and hold down for longer than 0.5 seconds, a **Block Control** menu will be displayed. The Block Number can be confirmed here (Screen 1).

■ In order to exclude a Block from inspection, select Disable Block. In order to delete a Block, select Remove Block.

■ Block can be optimized. For example, if the order to Block the Cells are as Screen 2, camera moves around as a result time is more consumed. By executing Block Optimizing, the Blocks are re-numbered as Screen 3. Setting procedure is, select any block in Cell Map, display **Block Control** menu, click Block Number, then a dialogue is displayed. Click "Optimize block position" button.

In order to change the number of a Block that has already been created, you must create the Block again. The blocked cell can be inspected while [**Machine number of separation data**] is activated on [For Supervisor] -[Plus].

* The Block Numbers will change when you choose **Assign to Block**, Delete Block, **Assign Fiducial Mark** or set **Cell Aid Stamps** or **Block Mark Stamps**.

(Screen 1)   (Screen 2)   (Screen 3)
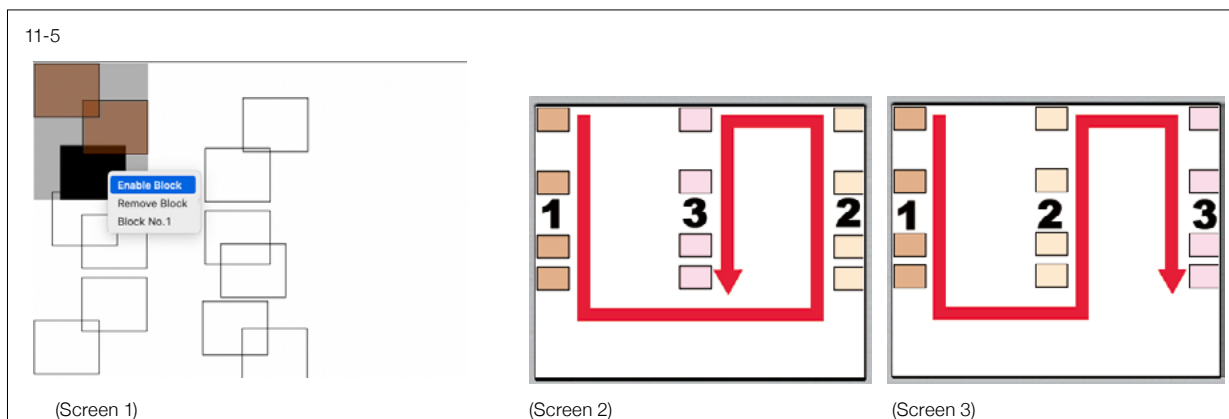
11-6 Cell Management Using PCB Numbers

PCB number is used when you want to set a unit finer than a block and manage the inspection results for each child PCB.

Block Number	PCB Number
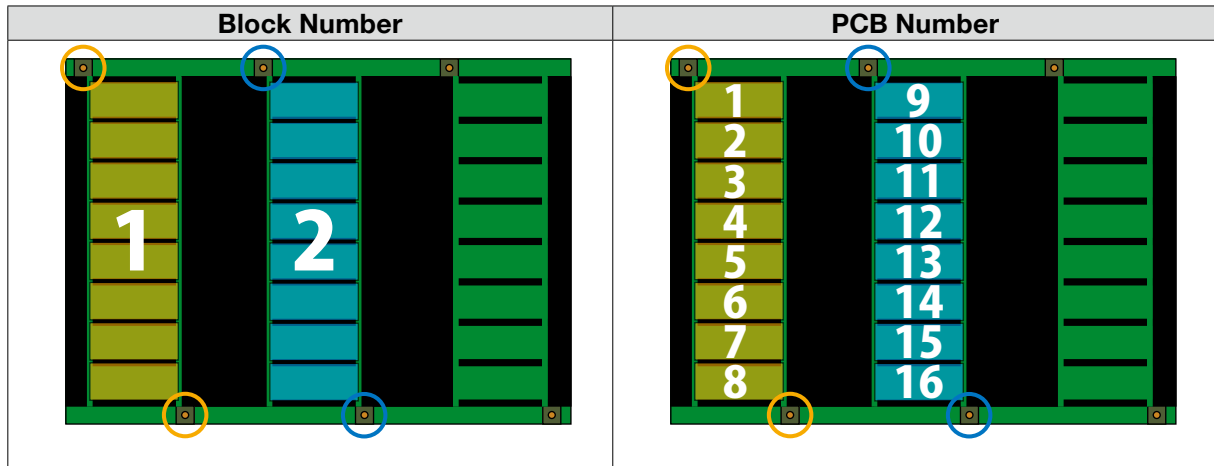
To use this setting, enable [Record inspection results by PCB number] added to [LAN] in [For supervisor]. When this setting is enabled, [PCB Number] will appear on the Ref.des. Properties window and an input field will be added to the right side of the screen.
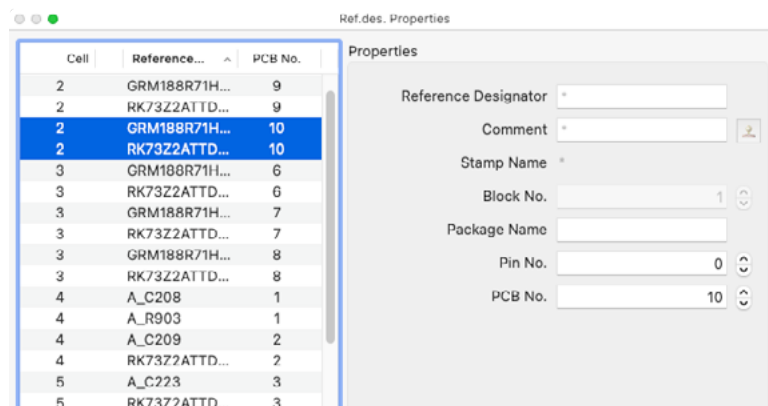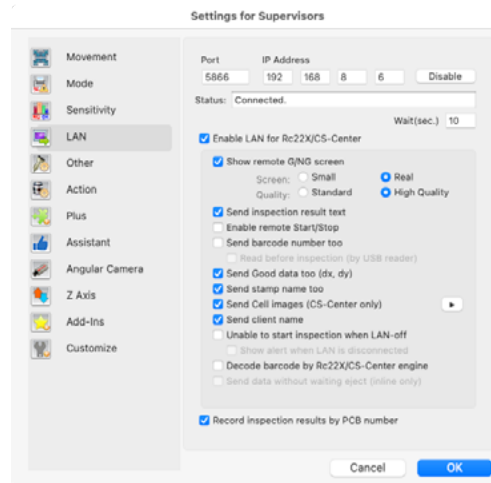
To set PCB numbers, open [Ref.des. Properties] in [Window], select inspection frames you want to assign group numbers to with the selection tool, and assign PCB numbers in [PCB No.]
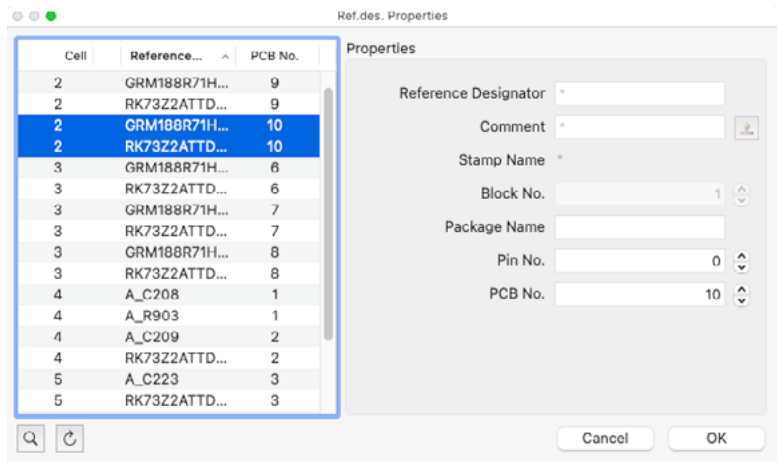
If an inspection is performed with the [Record inspection results by PCB number] setting enabled, the PCB number is sent to CatchSystem instead of the block number. Images below are CS-Repair. Block number [1] or PCB numbers [6] to [10] are displayed after Ref.des. number.

Block Number	PCB Number

11-7 Block Mark Stamps

This software includes a special stamp called the Block Mark Stamp. This stamp is used to skip Block (or Cell) inspection if the inspection result of this stamp is NG. Block Mark stamp is inspected first. If it is NG, other area of the Block (Cell) where this stamp is belonging will not be inspected. This has been designed to eliminate unnecessary inspections. This stamp is effective especially when inspecting penalized PCBs.

Normally the result of skipped PCB is NG, however you can change the result to be OK in ForSupervisors menu "Result of Block skipped by 'Bad mark' should be OK" .

Block Mark Stamps should be used according to the following procedure:

1. Load the Special Stamp, **BlockMark.**
2. Select **BlockMark** from the Stamp List Window), and place it on the part that will be criteria to inspect or not (often called Bad Mark). Click **OK** when a message **This stamp should become part of a Block** is displayed. Block Mark placed has a checkmark on the upper left (Screen 1).
3. As well as normal Frames, align the position and resize the Block Mark to fit. When you enlarge the Frame, a message "Is this an inclusion frame?" will appear, but do not select this.
4. Start inspection. BlocMark stamp is inspected first, if the result is NG, the Block (Cell) that this stamp is belonging will not be inspected. If the result is OK, inspection is executed as usual.

In case if you want to apply Block Mark stamp not to Block or Cell, but specified area, please set Block Mark stamp as followings.

1. Select the message "Is this an inclusion frame?" displayed when resizing the stamp (Screen 2). Drag the frame then target area (inclusion frame) is set, and the 4 corners of the Block Mark will become rounded (Screen 3).
2 . If you want to rotate the area (Inclusion Frame), select "and frame which has an angle?" instead of "Is this an inclusion frame?". Then a small window to input an angle will be displayed. Input an angle, then the area (inclusion frame) will be rotated.

(Screen 1)

(Screen 2)

11. Cell Operation

11-7
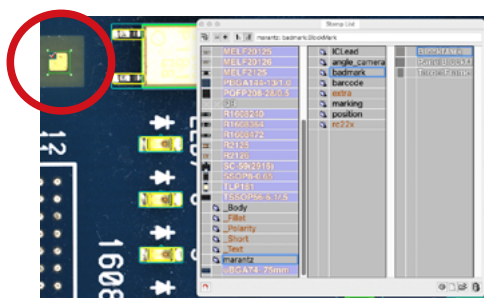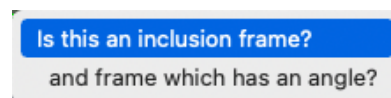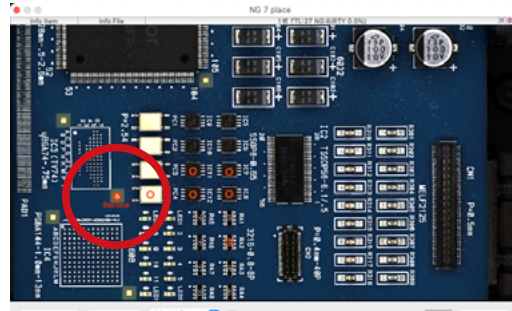
(Screen 3)

(Screen 4)

3. This process can be repeated as many times as you are succeeded.

* This Block Mark will be applied only on Inspection Frames which are contained "completely" within the Inclusion Frame.

* When the target area (inclusion frame) is defined to be smaller than the Block Mark, it does not work as inclusion frame, but work as normal Block Mark.

* When making continuous copies of Blocks that contain a Block Mark Stamps, the Block Mark Stamp will not be copied unless Assign to Block is executed.

* Block Marks cannot be packaged.

* If Block Mark's inspection result is NG, it is displayed bigger in Map View than other NG (Screen 4).

11. Cell Operation

11-8 Cell Optimization

The fewer the number of Cells, the faster and more efficient the inspection will be. By using Cell optimization in the Cell menu, you may be able to reduce the total number of Cells. In order to use this feature, select multiple Cells that you want to optimize, and select **Cell Optimization** from the **Cell** menu. Unnecessary Cells will disappear, and the Inspection Frames that were contained in the eliminated Cells will be merged into other Cells.

However, in order to optimize cells, the screen ratio settings must be accurate. Make sure that the Inspection Frames are overlaid correctly on the components/parts before performing this task. If not, change the **Pixels per 1 cm** value in the **For Supervisor** menu, making adjustments so that the Inspection Frame will be overlaid on the components/parts.

11-9 Merging Cells

■ Merge Inspection Frames into One Cell

When Cells have many overlapping parts, you can manually merge Cells to reduce the number of Cells for more efficient inspection.

For example, when a Cell is displayed in the work area, an Inspection Frame belonging to another Cell may be displayed in a white frame. In this case, use the **Pointer** tool to select all the Inspection Frames while holding down **Control** key, and those Inspection Frames will be merged to become Inspection Frames belonging to the same Cell (Screen 1).

Even if the Cells do not have overlapping parts, you can use the same procedure to select Inspection Frames belonging to adjacent Cells and unify them into one Cell (In order to perform this task, the Pixels per 1 cm ratio must be accurate)

Inspection Frames that do not fit in one Cell due to minor misalignments can be merged by individually clicking and dragging the frames while pressing down the Control key.

11-9
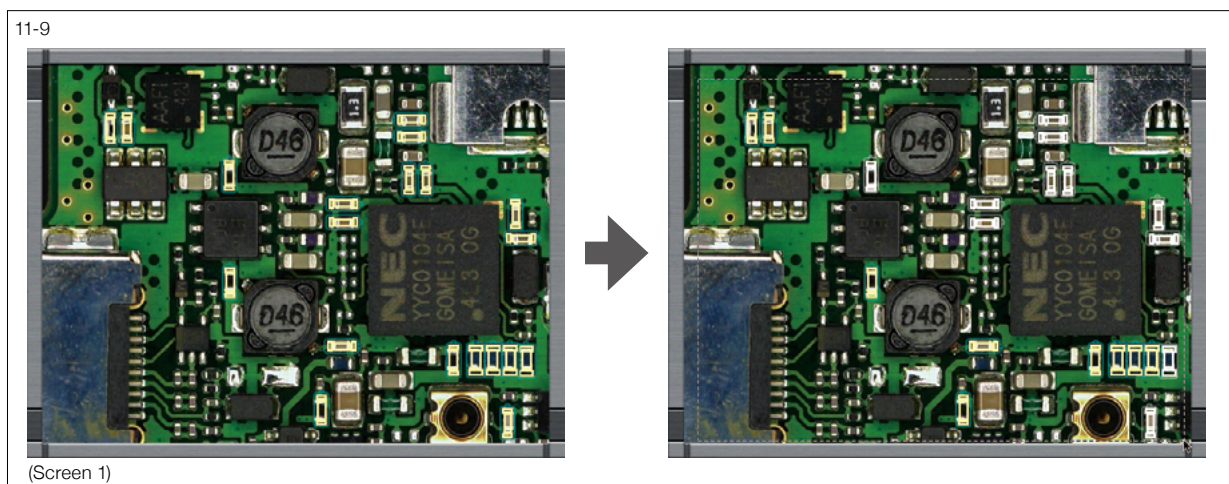
(Screen 1)

■ Merge All Inspection Frames Within the Work Area

In order to fit all Inspection Frames in the screen into one Cell, click in the Work Area while pressing down **Control + Shift**. A square frame will appear momentarily, and the Cells will be merged. The size of this frame will be determined by Pitch, which is defined in General Settings. If the value is 80%, then the frame length will be 80% of the screen width. The Cells can be optimized by merging Inspection Frames using **Control + Shift** click.

■ Correct Misalignment and Merge Cells

Pressing **F10** will correct all misalignments of frames currently displayed on the screen and merge them into one Cell.

* If a function is assigned to F10 by Mac OS, this feature cannot be used. With Mac OS X 10.3 or later, F10 is assigned to the show Application Window function. In order to remove this assignment, you must change the settings in the Dashboard and Expose panel in System Preferences so that there will be no function assigned to F10.

11-10 Cell Map Operation

The buttons on the Cell Map Area are useful for Cell Map operations.

■ Expanding Cell Map

In order to zoom into a part of the Cell Map, use the Cell Expansion Tool. The mouse pointer will change to a magnifying glass. Select this tool and drag over the area to expand. The mouse pointer will change to a hand icon. Click and drag the mouse to move around the expanded Cell Map area (Screen 1).

If you press down on the mouse button for longer than 0.5 seconds, the mouse pointer will switch back to the magnifying glass, and the designated area will be zoomed further.

In order to reset the zoomed view, select the **Cell Selection** tool and click outside the Cell in the Cell Map.

■ Blending Pattern

If you have already created a Map View, you can use the Blend tool. The blend rate of the Map View and the Cell Map will be displayed in "%" when you click the Blend tool. In general, this is set to "none" or at about "60%" (Screen 2). Pattern blending is used to show the approximate position, and does not ensure an accurate position.

This tool will not be available if you do not create a Map View.

11-10
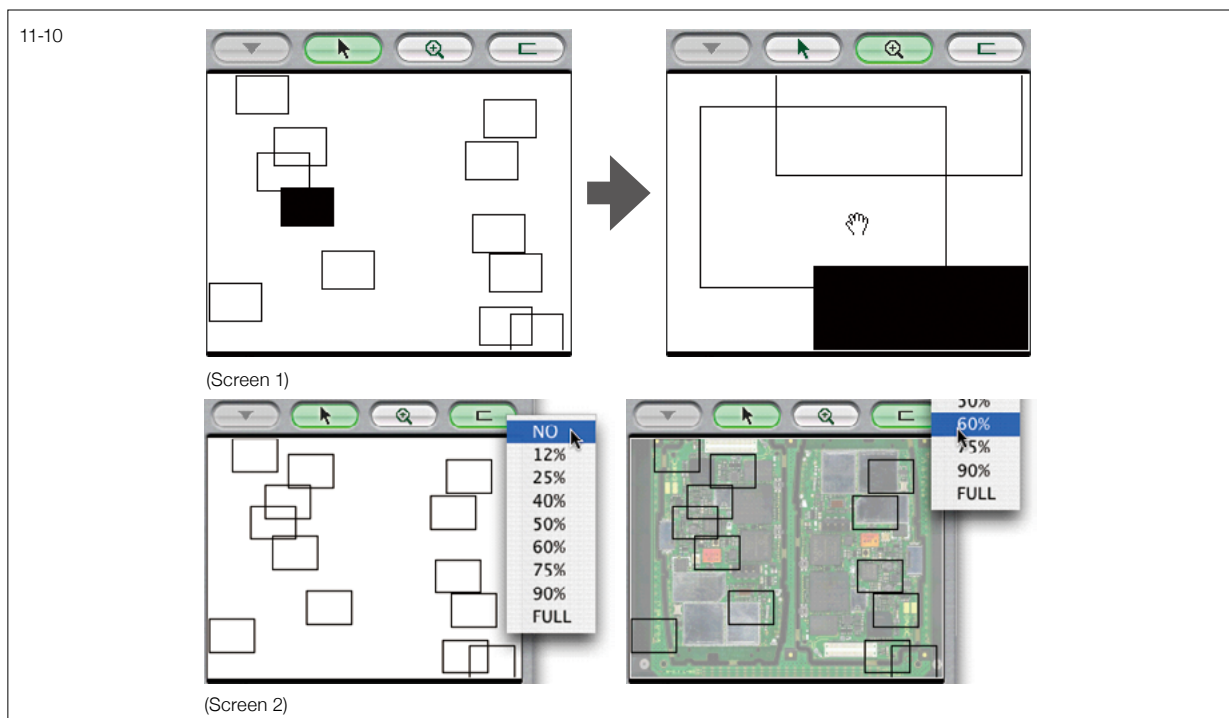
(Screen 1)

(Screen 2)

12. Verification after Inspection

After inspecting, the result is displayed OK or NG in the screen, and instant result (number of total inspected frames, number of NG frames or cycle time) is displayed in message bar. NGs can be verified/identified in many ways such as by displaying in the entire PCB picture (Map View) or displaying by list. This software also has a mode to visually verify the actual PCB after inspection.(This software uses the expression "Map View" to include all these display modes.)

12-1 Map View Mode

▼ 12-1-1 Create and display Map View

• Click on the **Eyeglass Button** under the work area to display the Map View picture (Screen 1). If it is after an inspection, NG points will be displayed in red circles. (If you set 13-4-2 Prevent continuous Good button clicking, the NG which must not be classified Good is displayed in red square.)

• If there is no Map View, a verification dialog "**Create Map**" will appear. Click **OK**. Then the frames will be taken sequentially starting from the bottom right corner of the PCB. The PCB Map is created in another file named "program name_**hdgv_A(B)**". When you save the inspection program, a folder with 22X logo is automatically created in the same directory where the insection program is (Screen 2), and both inspection program and high density PCB Map is put in the folder (Screen 3).
  After the Map is created, click again on the **Eyeglass button** to display the Map View (View window).

• The size of the Map View picture is determined by the monitor that was connected when the map was created (screen pixels). If you would like to change the size due to monitor changes, recreate the Map View using the **NewMap button** (or press Command + N in View window).

* The larger the Map View becomes, the more memory it requires.

12-1-1

(Screen 1)

(Screen 2)   (Screen 3)
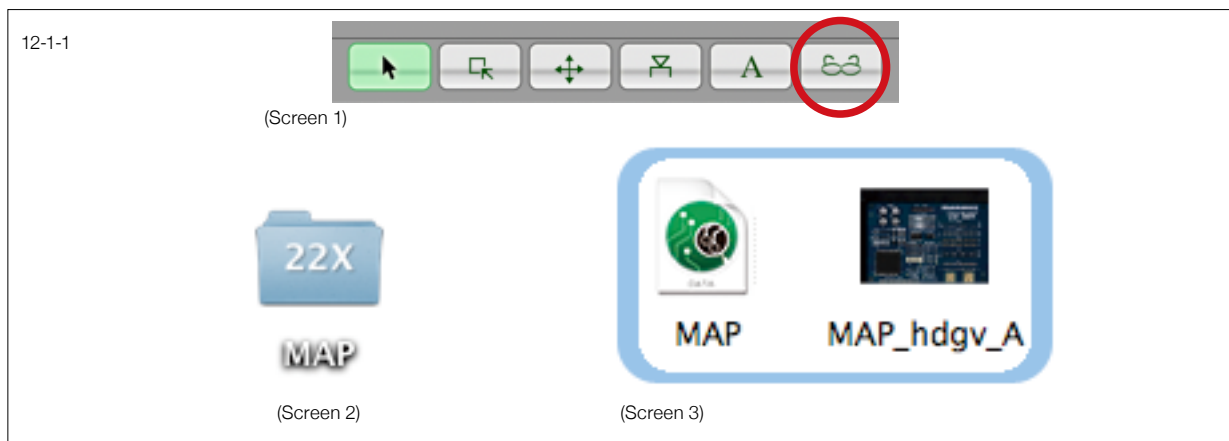
▼ 12-1-2 Map View Window (View window)

The Map View Window looks like Screen 1. Descriptions of each button and menu are as follows:

(Screen 1)

Header menus and buttons:

Info Item Button	Click here and a pull-down menu will appear (Screen 2). Select the items to be displayed from the 8 items above, and they will be displayed next to the NG points that are shown with red circles. **Error rate 0.00%** and **Error rate ppm** cannot be displayed at the same time. The Map View can be flipped using **Vertical reversing** and **Horizontal reversing**.
Info File	A pull-down menu will be displayed (Screen 3). **Information**, **Position**, **Past** (history) and **Stamp information** can be exported.
Inspection Count Bar	The current total number of inspections, number of points and NG points will be displayed (Screen 4). Clicking here will display the Inspection History.
Grid Button	The grid will be displayed (Screen 5). The address will be displayed in letters for horizontal, and in numbers for vertical directions. This address will be shown in the format of "A01" for Print and **Information output**.
Inspection Area Display Button (Blue/ Purple)	The blue button will show points that were never judged as NG in past inspections, and the purple button will show points that have been judged as NG at least once. Click again to hide the circle points. If you set Unable to click Good button in G/NG confirmation mode, the NG is displayed in red square.

(Screen 2)   (Screen 3)   (Screen 4)   (Screen 5)

Footer menus and buttons:

NewMap Button	This is used to create a new picture for the Map View. If a new cell(s) is created due to added inspection points, the added points may not be displayed, in this case you will need to recreate the Map View. * When the display is zoomed, the Circle Mark may become misaligned from the zoomed section of the Map View picture. This is due to the misalignment between the actual dimensions and the number of pixels. This can be resolved by editing **Pixels per 1cm** and recreating the Map View picture.
Print Button	Click here and the Page Setup dialog will be displayed first, followed by the Print dialog.
View Mode Switch Menu	Switches between G/NG Confirmation/List view/NG Cell view. If the protect mode is [Supervisor], **Map view settings** can be selected also. When the setting is switched here, the window will be closed once, and opened with the selected display mode the next time.
Freeze	If Freeze is checked, the Map View picture and the NG lists will not be deleted even when the machine starts a new inspection. Use this when verifying NG points during inspection.
Close Button	This will close the Map View window.

12-1-3

(Screen 1)

(Screen 2)
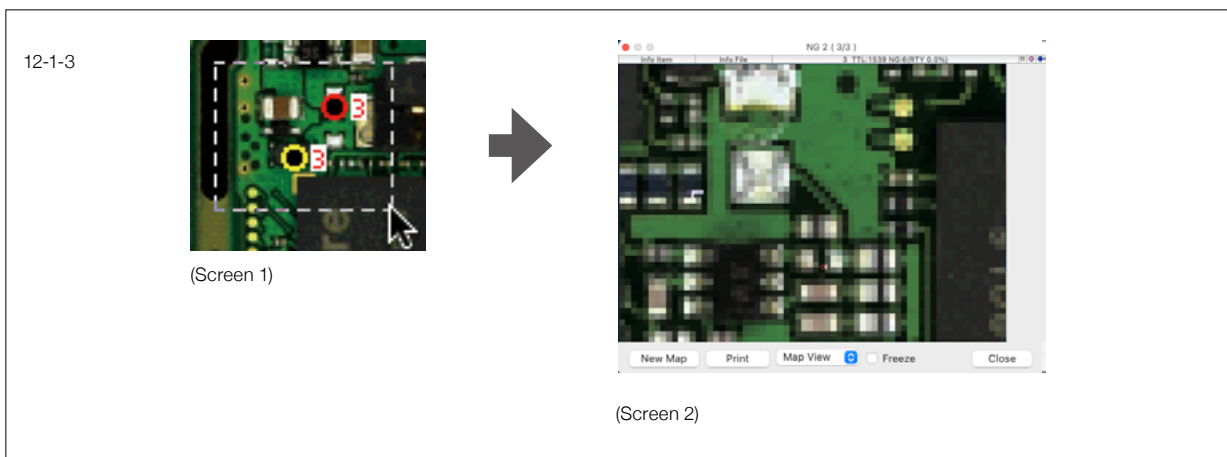
▼ 12-1-3 Display Operations in the Map View Mode

■ Go to the specified point in the Work Area

When you double-click on any point in the Map View, the Map View will be closed and the place that you clicked will be displayed in the work area. This is useful when making corrections to the inspection frames.

■ Zoom into the specified area

• If Info Items in the Map View are overlapped and hard to see, they can be zoomed in. Drag a part of the Map View to select it (Screen 1), and that area will be enlarged (Screen 2) (you can also hold down the mouse button at any given place until the mouse pointer changes to the magnifying glass icon).

• During zoom, the cursor will change to a hand shape when you drag the screen, and the entire screen can be moved while it is zoomed.
  Hold down the Shift key while dragging to move faster.

• Inspection points displayed in a circle can be displayed in the Work Area by double-clicking (if you double-click on other areas, the Map View display window will simply close).

• The buttons on the top of the window will not be shown during zoom display.

• You can go back to the normal state by holding down the mouse button somewhere outside of the circle mark until the mouse pointer shows "x1".

* The Zoom display simply enlarges the picture, so the resolution will be low quality unless high density Map is created.

■ Inspection Frame Offset

If the component/part in the picture and the position of the circle that designates the inspection area is misaligned, hold down the Option key in the zoomed screen and drag to the correct position.

137

(Screen 1) (Screen 2)
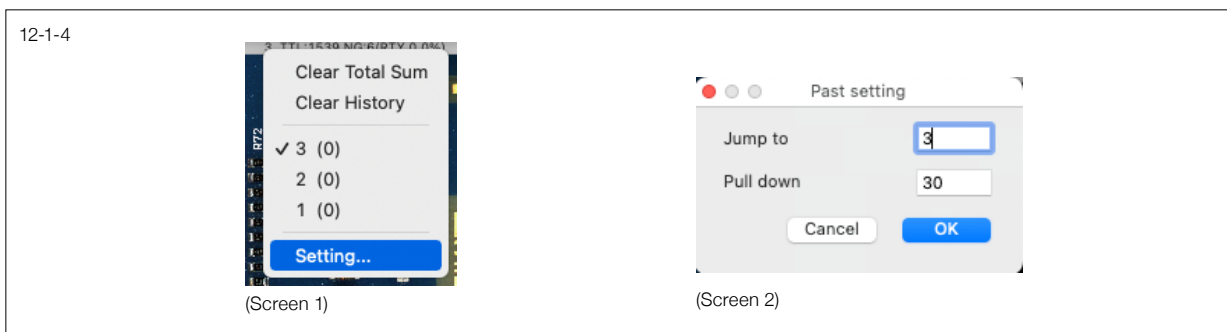
▼ 12-1-4 Check results in the past

The Map View can display NG points found in previous inspections. Up to 1024 sets of inspection data can be recorded, and the 1025th picture will be recorded as the 1st picture.

■ **Display results in the past**

1. Press the **Inspection Count bar** on the top right corner of the Map View window, the list of past inspections and the corresponding number of defects will be displayed in the pull-down menu (Screen 1).
2. Select the number of the target inspection to display the NG points. You can also enter the number of the target inspection in the "**Jump to**" dialog in Setting. Please note that images of the NG points are not saved.
3. When you display the Map View next time, the current result will be displayed.

■ **Settings**

Select **Setting** from the Inspection Count Bar on the top right of the Map View window, and a dialog will appear (Screen 2). You can set the number to be displayed in the **Pull down menu** (up to how many previous inspection results should be displayed).

In general, the Map View displays the current result first, but you can make previous results display first. To do this, hold down the Option key while selecting the start position from the pull-down menu with the Inspection Count Button. Once selected, the value will be displayed in bold letters.

To cancel this setting, hold down the option key again while selecting the current number.

* The number of PCBs to be displayed is always the number from the first inspection, but here, the designated number of pictures preceding the current inspection will be recorded.
* These settings will be recorded in the parameter file, and will be effective for other Inspection Programs when launched next time.
* NG points' pictures will not be recorded in the past history. Pictures cannot be viewed, and picture lists cannot be displayed.

12-1-5

(Screen 1)   (Screen 2)
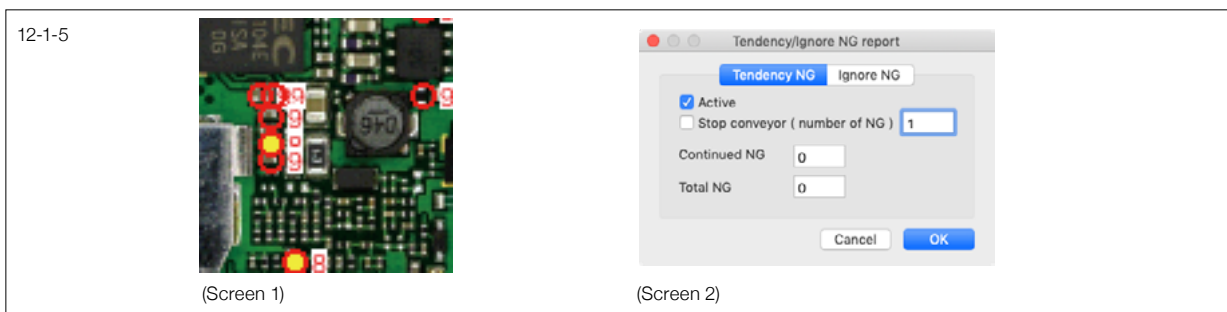
▼ **12-1-5 Defect Warning**

This software counts the number of times a frame is judged as NG, and frames consecutively judged as NG and frames that have a high number of cumulative NGs can be displayed in a special way in the Map View: Consecutive NGs will flash in yellow, and cumulative NGs will flash in pink in the red circle (Screen 1). The flashing count will be cleared when the next inspection starts or when the Stop button on the screen is pressed, and will be counted from zero at the next inspection.

In order to activate this feature, select **Configuration > Tendency NG** and check **Active in Tendency**, then set the number of **Continued NG** and **Total NG** in the **NG report setting Window** (Screen 2). Default is 3 for **Continued NG**, 5 for **Total NG**.

12-2 NG List View Mode

Select **NG List View** in the View Mode Switch Menu, and the List Display Window will be displayed with the Eyeglass button. The list will also be displayed after the inspection instead of the Map View.

▼ **12-2-1 NG List Window**

NG List window (Screen 1) will display NG points as a list. The Map View picture will be displayed on the left, followed by the picture judged as NG and Master Picture. In the Map View picture, the target point will be displayed as a red circle. As with the Map View, results in the list can be viewed during inspection.

• When **Freeze** is checked, Map View pictures and NG Lists will keep displayed even under inspection.

• If there are too many defects, pictures of NG points may not be displayed due to insufficient memory.

• When a Map View picture is double-clicked in a list, that area will be displayed in the **Work Area**, and the NG frame will be selected.

• The NG List Window will be displayed after the next inspection is complete or after the eyeglass button has been pressed. To go back to the Map View mode, select Map View from the pull-down menu.

12-2-1

(Screen 1)

12. Verification after inspection
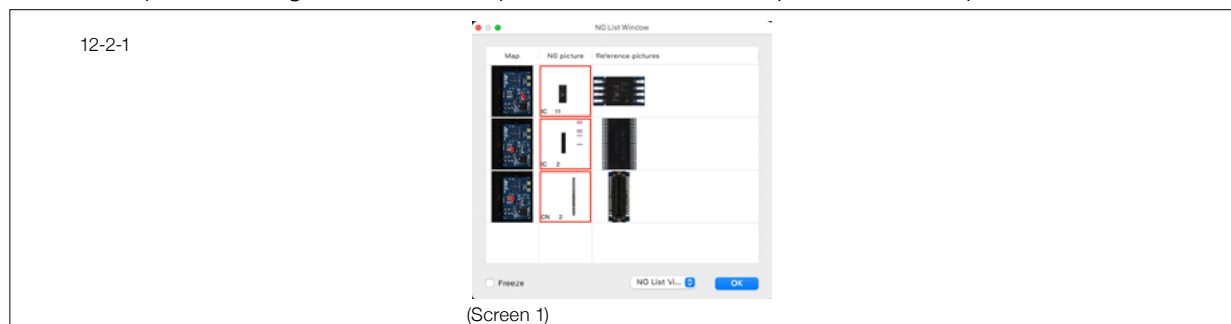
12-3 NG Cell View Mode

The NG Cell View mode is "**Enable Good/NotGood verification by operator while inspecting next PCB**" This mode specializes in viewing previous results during inspection. This allows human verification without stopping desk-top AOI.

▼ **12-3-1 Advantages of NG Cell View Mode**

- Defective component is displayed large in the center of window as well as G/NG confirmation mode (See next chapter 12-4), operator can check one by one easily.
- Operator can confirm without stopping AOI.
- Data is sent to CS-Center after each inspection, requiring less time to wait for data transmission.

▼ **12-3-2 Interface**

PCB count lamp	Displayed at the right bottom of Work Area. The lamps are on (colored in white) when PCB is waiting for verification. Maximum **4 PCB** data can be stored. The A side is displayed in blue and the B side in red.
Flip View button	This button is at the right bottom of operation window. It switches inspection window and **verification window**. * The window automatically switches to verification window after inspection.
Master Picture Area	**Master Picture** and **PCB Map** can be switched by clicking there. If you display PCB Map, the position of component currently verifying is highlighted by red circle.
Status Lamp	The lamp at the right bottom corner of Work Area shows inspection progress. **Red:** Memorizing NG pictures while inspecting. If AOI is connecting to CS-Center, the blinking interval can be measure of transferring speed. **Green:** Store the result after inspection **Blue:** Clear the result when verification is completed

Press **end** key to skip verifying current PCB and move to next PCB. The inspection result will be aborted.

If 4 lamps are occupied, and start inspecting 5th PCB, the result of 1st PCB will be **aborted**.

However if you set **Update by Start button** to be OFF (in Map view setting's NG cell veiw setting), a warning message appears and the result will **not be aborted**.
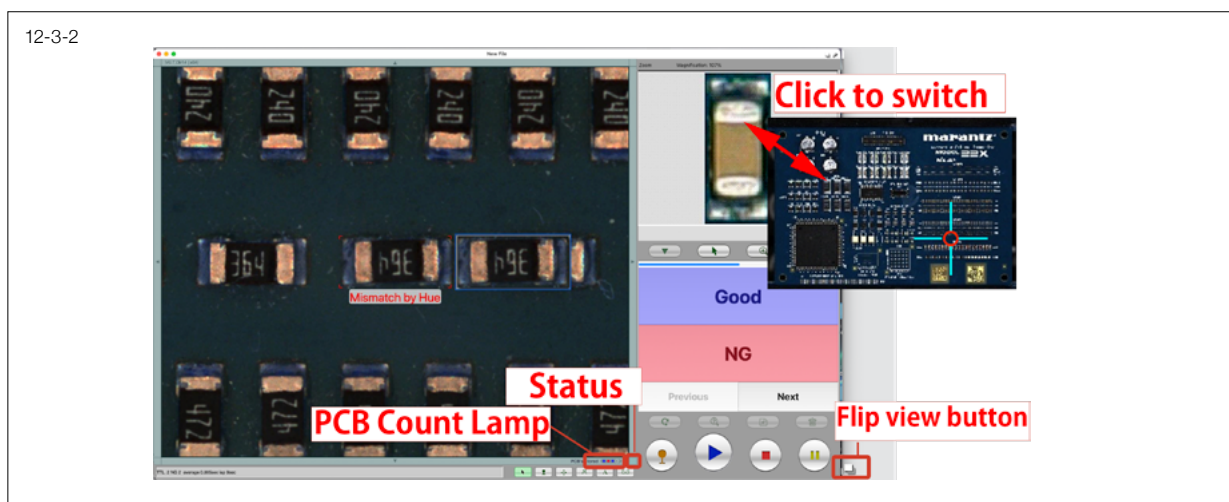
12-3-2

■ Remarks: inspection speed

- In this mode, AOI is creating images of defective components while inspection. It takes 40 to 50 mm/sec per 1 point to create, this will affect inspection speed.

■ Remarks when CS-Center is connected

- The inspection result of 1st PCB is automatically sent to CS-Center if you start inspecting 3rd PCB while 2 lamps are occupied, while Update by Start button is ON. This data is just inspection result from AOI because it is not verified by operator. However **no images of NG components is sent**.

- Also if you abort verification by pressing 'end key', just AOI's inspection result is sent and **no NG components image is sent.**

- If Auto send ALL NG is used and all data is sent without verifying by operator, or operator does not press Good button for good PCB to fix the result, correct inspection data will not be sent. PCB number and inspection results may be combined incorrect or result may be sent double.

* NG Cell View can not be remotely controlled on CS-Center.

* Inspection result is NG if the inspection is skipped by BlockMark, even if you check on the option "Result of Block skiipped by 'Bad mark' should be OK" is checked.

12-3-2
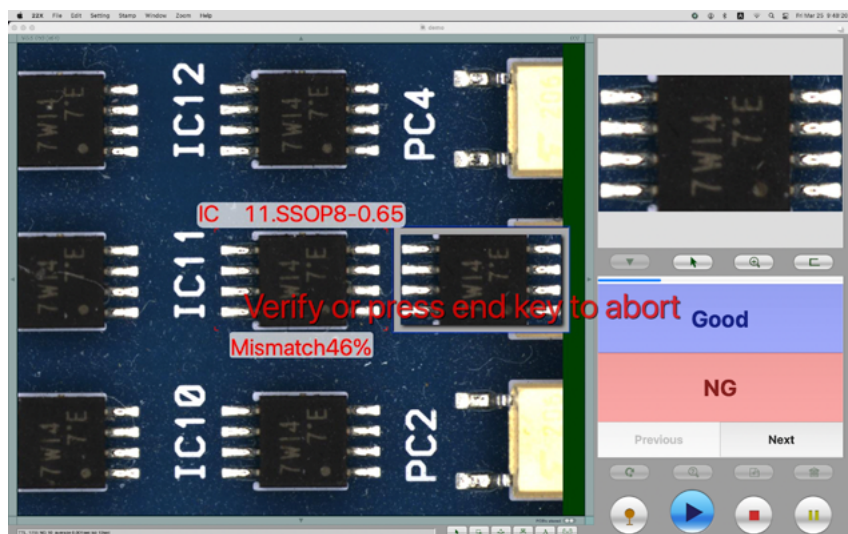
▼ 12-3-3 Basic Operation

1. Select this mode. Change view mode by pressing eye glasses button to NG Cell View.

2. Start inspection.

3. Screen changes to verification window from inspection window after inspection is completed. One of PCB count lamp is on. If no defect is found, OK is displayed in the center of screen. Press Good button to fix the result (Screen 1). If there are defects, operator should verify by pressing Good/NG buttons (Screen 2).

4. When no PCB is waiting for verification, 'Ready' is displayed on screen (Screen 3). Start inspection on this status, you can see the process of inspection penetrated on behind (Screen 4).

▼ 12-3-4 Enable options

Some options in Map view setting can be applied to new NG Cell View.

NG cel view settings ...	**Update by START button**
G/NG Confirmation Mode ...	**Zoom pictures, Assign NG-ID input 0-9, Show whole group if NG, Show NG reason**
Enable options in Extra settings for G/NG mode...	**Unable to click Good, Interval timer**

* Screen will be shown on selecting light when Stamp uses Lighting Selection.

* For detail of each option, please refer to 12-5 "Map View Settings Window". For Enable option in Extra settings for G/NG mode, please refer to Chapter 22, "Options for G/NG Confirmation Mode".

12-3-3
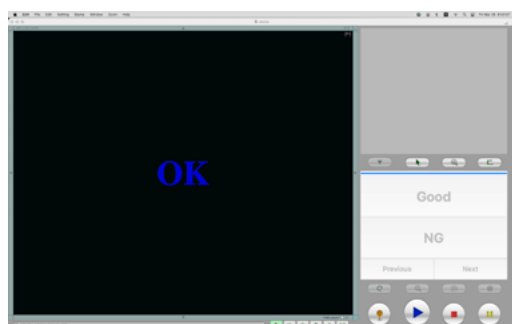
(Screen 1)
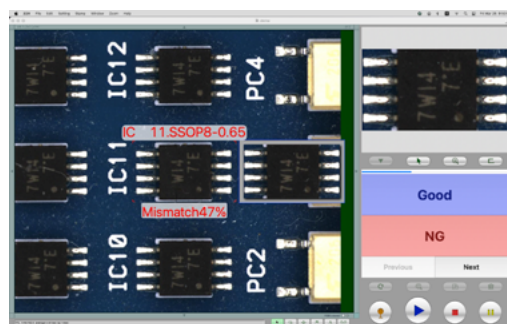
(Screen 2)
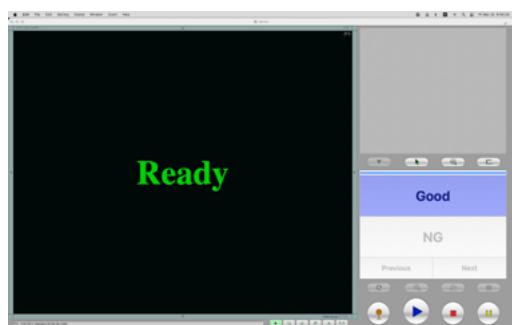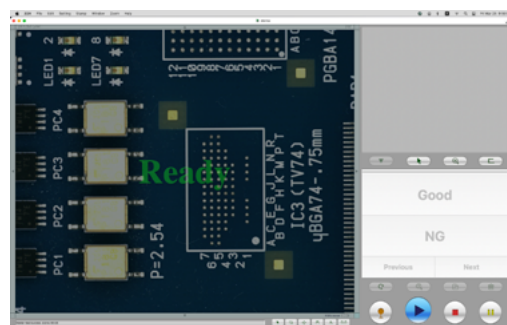
(Screen 3)

(Screen 4)

12-4 G/NG Confirmation Mode

In this mode, defective frames will be displayed one by one after the inspection for verifying.

▼ 12-4-1 Basic Operation

Check **G/NG Confirmation Mode** in **Map view settings** (Screen 1). This setting will become effective after closing the View Window.

1. When the inspection finishes in G/NG Confirmation Mode, 4 buttons; Good, NG, Previous and Next will be displayed in the Cell Map Area (Screen 2). A shortcut key is allocated to each button.

- Good (up arrow) … Judge the currently displayed point as Good
- Good + Shift (up arrow +shift) …Judge as Good and add as master picture

* Only for NG of pattern matching or for NG in Pack Stamps that include pattern matching

- NG (down arrow) …Judge as NG the currently displayed point
- Previous (left arrow) …Go back to the previous point
- Next (right arrow) …Move to the next point

2. Click the Mastar Picture area to display the Map View. Red circle is displayed with a red circle (Screen 3). Click the Mastar Picture area again to display the Mastar Picture.
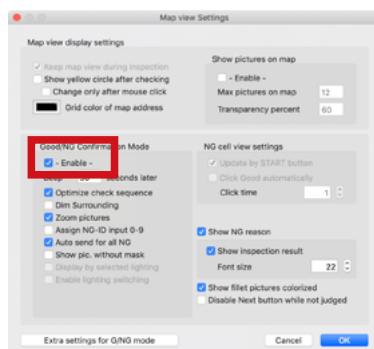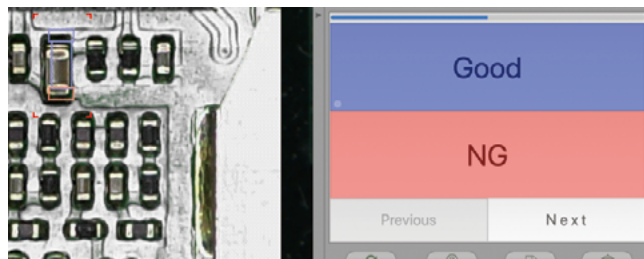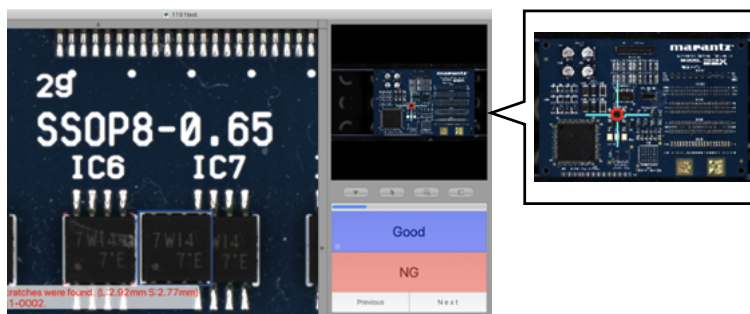
(Screen 1)

(Screen 2)

(Screen 3)

3. G/NG Confirmation is complete when the progress bar on the Good button has moved up to select the last Good/NG. Results will be reflected in the verification history. The same results will be reflected in the Map View picture. If **Auto Printing** is selected, the results will be printed out to roll paper printer, or if data is set to send to CS-Center, will be transmitted.

In the NG List View mode, points judged as Good will be included in the list but with a blue frame. When you click on a defective picture with a red frame, the frame will turn blue. This is the same as a Good judgment, and this judgment will be reflected in the history (Screen 4).

* Press Esc key to exit from the **G/NG Confirmation.** Defective points are automatically judged NG.

* Please note that if **Auto send for all NG** is selected in **Map view settings**, all defective points will be judged as NG. This option is for verifying on CS-Repair afterwards.

* The **Mark number limit** for machines equipped with marker pen unit will be ignored in the **G/NG Confirmation Mode**.

12-4
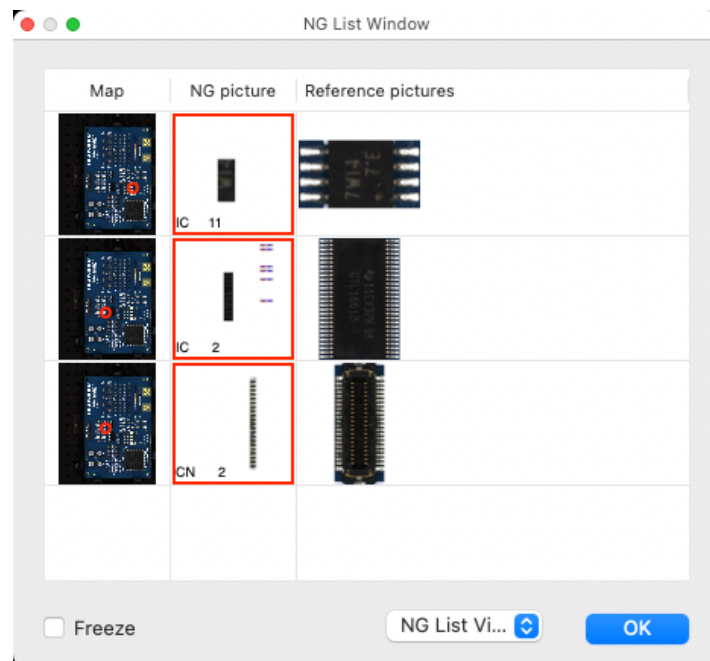
(Screen 4)

▼ 12-4-2 Customizing text/master picture appearance

You can change the comment text size, display/not display master picture, etc in 12-5 Map View setting Window. While verification, you can temporary hide comment or frames when they hide components.

tab: hide red frames which indicate defective area

space: hide comment and master picture

control: pattern matching frame with Text filter is displayed with filter. However the image quality is less than when you adjust in filter settings window. NG Cell View mode not possible.

You can see through all master pictures by scrolling mouse wheel or clicking the picture.

Scrolling: **Forward / Rewind** by scrolling wheel **up / down**.

Clicking: **Forward** by **clicking**. **Rewind** by **clicking with shift key** pressing.

* Master picture assigned as NG picture will be skipped.

* G/NG confirmation mode only, not possible in NG Cell View.

* Only one master is sent to Rc22X/CS-Center. Therefore only one master picture can be seen on Rep22X/CS-Repair.

▼ 12-4-3 Display Comment

It is helpful to include comments (or Ref. Des. name) in order to accurately communicate the intentions of the programmer to operators after inspection. Comments can be set up with the following steps. Comments added here can be displayed in the Map View.

1. Check Setting for supervisor > Mode > Show Result with Reference and Comment (Screen 1).
2. Click on the **Inspection Frame** in the work area (Screen 2).
3. Select **Input Ref. Des. name** from the **Master Picture Menu** and enter comments. Up to 15 characters in double-byte, or 30 characters in single-byte, may be entered.
4. These are set up for each Inspection Frame, but if you input a comment in a stamp, click on the **Stamp Update button**. Comments (and Ref.Des. name) will be entered in all Inspection Frames

12-4-3

(Screen 1)
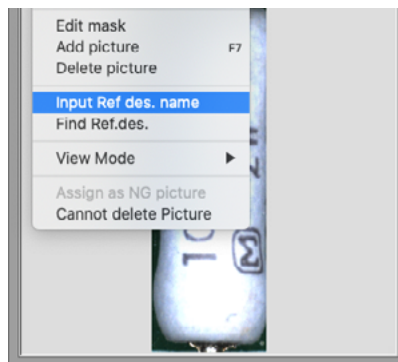
(Screen 2)

with the same stamp in the Work Area (Screen 3).

Since these settings will not be registered to the Stamp in the Stamp list, comments will not be included in the Stamps placed after this instruction.

5. Check **Show NG reason** in the Map view settings.

6. If you want to display your original message, refer to Chapter 8-10-1 Frame type assignment.

7. If you want to display multiple NG reasons in Pack, refer to Chapter 8-7 Stamp Pack.

(Screen 3)
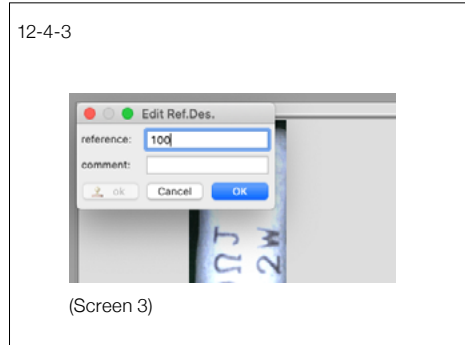
▼ 12-4-4 NG-ID Setting

In the Good/NG Confirmation Mode and the NG Cell View Mode, an ID can be set to NG. Check **Assign NG-ID input 0-9** in the **Map view settings** Window, and press **0 – 9** on the numeric keypad instead of clicking Not Good and the keys you pressed will be set as an ID for each defective point. To assign as false NG, press comma (,) or period (.) keys. The results will be displayed in the Map View picture, and printed from the roll-paper printer. The following will be printed:

New File [01.2.20 10:20 AM]
Total PCBs checked[20] block<0> (Thomas)
Total NG PCBs [14] block<0>
Current result (check 272 NG 3) Spent time 9
BarNum 356512110

SYN TTL NOK/NG_ID
C101 8 4 0
R682 8 4 1
C301 8 4 1

▼ 12-4-5 Verify all points

On this mode, you can verify all points no matter if they are NG or Good. Even you can verify all points without inspecting by AOI (AOI just captures images). This mode is for testing P&P machine or for testing new PCB before mass-production. Also effective in case you want to send all images to CS-Center.

1. Check Setting for supervisor > Others > Verification Step Mode.

2. Click inside the **Message Area**, and a Magnifying Glass Icon will be displayed. Start inspection, AOI will not inspect at all, all points will be shown for G/NG confirmation.

3. Click again the Glass icon, the Glass icon will be colored blue (if you click again, the setting will be disabled. In this case, set **Verification Step Mode** again). Start inspection, AOI will inspect, however not only NG but also Good points will be shown for G/NG confirmation.

12-5 Map View Settings Window

Most view settings can be set in this window (Screen 1). Select **Map View Settings** from View Mode Switch Menu in the Map View Window or Window from the menu bar to access this window.

(Screen 1)   (Screen 2)

Map view settings

Menu	Function
Keep map view during Inspection	When this is selected, the previous inspection results will be displayed during the next inspection. Since machine power is mainly devoted to inspection, response will be slower than with just the Map View Picture. If there is insufficient memory, the picture may not be displayed.
Show yellow circle after checking	When this is selected, the red circle (defective points) will turn yellow after verification and the number of remaining points to be verified will be shown by a number and a progress bar. When the pointer is placed on the red circle, it will turn yellow, and after every point is verified, the buzzer will sound and the Map View Picture will momentarily go dim.
Change only after mouse click	If it is selected, the color will not change unless you click on it. This is intended to check whether you have verified all points (this may not function depending on the size of the Map View Picture).
Grid color of map address	The grid color can be changed. Click on the black square to select colors from the color palette.
Show pictures on map	When this is selected, the pairs of defective points and Master Pictures are displayed in the Map View if there aren't too many defects. Maximum 24 is possible to set. When there are too many pictures to be displayed, they will not be displayed on the Map View, but only when the cursor is placed on the red circle.

G/NG Confirmation Mode

Menu	Function
-Enable-	Sets the G/NG Confirmation Mode.
Beep	In the G/NG Confirmation Mode, if Good or NG is not specified within the time frame set here, an intermittent warning will beep. The beep will not sound if "0" is entered. The default is 30 seconds.

Menu	Function
Optimize check sequence	Click here to display the menu and select sorting by XY (Coordinates), Comment, New Stamp, NG type, Stamp Name or Location No.(Screen 2)) The default is No sorting. No sorting is basically the order when stamp is pasted. If you would like to match the order of G/NG Confirmation and List display, select **No sorting**. Coment, Stamp Name and Location No. is ASCII order. This setting will affect the defect marking feature regardless of the G/NG Confirmation Mode settings.
Dim Surrounding	It makes the area surrounding the target in the center of the screen darker for easier verification. This effect is deactive on AOI with angular cameras.
Zoom pictures	This option will automatically zoom the picture to 2x display.
Assign NG-ID input 0 - 9	When setting up NGs in the OK/NG verification mode, IDs can be assigned using the numeric keypad. By clicking twice, the check mark changes to bar check mark. A.B.C...Z keys will be ID numbers 10,11,12...35.
Auto send for all NG	Automatically sends all judgments in the Good/NG Confirmation Mode as NGs by one click. By clicking twice, the check mark changes to bar check mark, and fast data transfer is enabled. Fast data transfer mode is only available when connected to CatchSystem.
Show pic. without mask	This shows master pictures without masks in the G/NG Confirmation Mode.
Display by selected lighting	In the G/NG Confirmation Mode, this shows the image with the lighting set up in the lighting selection.
Enable lighting switching	This menu enables to switch lighting on G/NG Confirmation Mode by ticking "Enable lighting switching" on "Setting at the whole view picture". The option is not enabled on Auto send for all NG (including fast data transfer mode) on G/NG Confirmation Mode, NG Cell View Mode, and Online Teaching Software (OLT).

NG cell view settings

Menu	Function
Update by START button	If this is checked, and 2 PCBs are already waiting for verification, then press START button, the oldest PCB data is aborted without warning. If this is unchecked, you can not start next inspection unless verifying one PCB.
Click Good Automatically	This setting is enabled in NG Cell View mode. Good button is automatically clicked when the inspection result is [OK]. [Click time] allows you to set the number of seconds until the Good button is clicked from a minimum of 1 second to a maximum of 10 seconds.

12-5

12. Verification after inspection
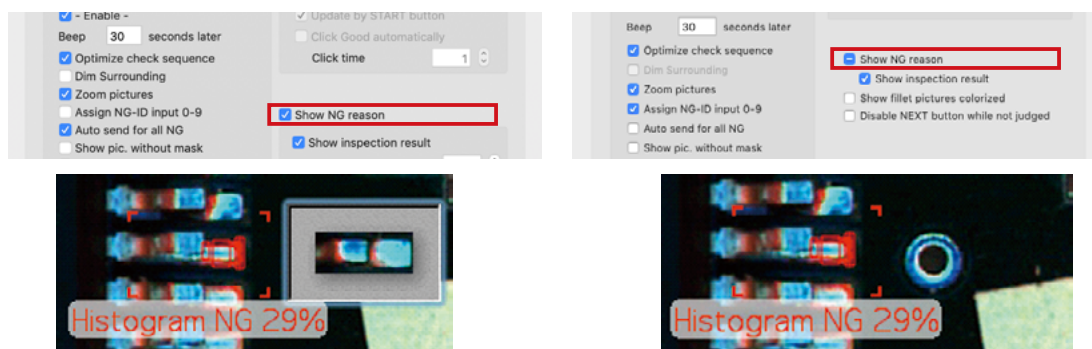
Menu	Function
Show NG reason	The defect reason will be displayed in red in the G/NG Confirmation Mode and the NG Cell View Mode. Click it once to display defect reason and master picture (Screen 3). Click twice to display only defect reason (Screen 4).
Font size	Font size of [Show NG reason] message can be altered between 9 to 48.
Show inspection result	If you untick this option, you can hide the inspection result message.
Show fillet pictures colorized	When this is selected, the fillets in the Inspection Frame will be displayed in red, and the other parts will be displayed in blue. This setting is available in the G/NG Confirmation Mode.
Disable NEXT button while not judged	This option prevents worker from unintentional skipping without a judgement.
Extra settings for G/NG mode	This option prevents worker from omission of NG by adjusting OK button clicking settings. Refer to 22-1 [Prevent operator's mis-judgement] for detail.

If you want to see the PCB area hidden by NG reason comment, press space key to invisible NG reason. To make it visible, press space key again.

* Font size can also be adjusted in the "small/big" menu that appears when you click on the displayed content (Screen 5).

* If the picture displayed in Work Area is too small and difficult to check, drag on the picture by mouse, zoomed picture is displayed in Master Picture Area.

12-5
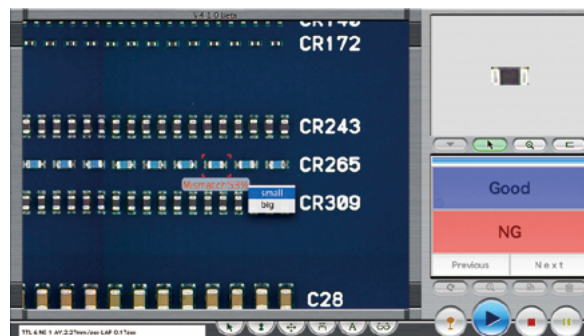
(Screen 5)
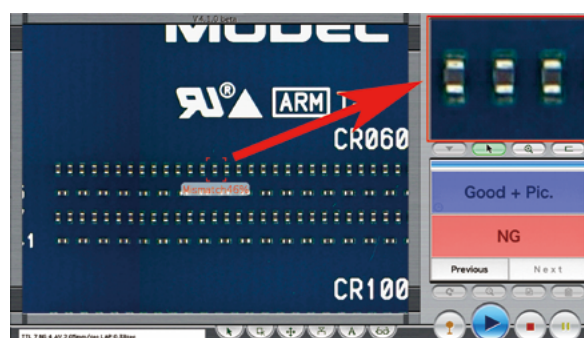
(Screen 6)

12-6 About Instant Result displayed in Message bar

After inspection, the brief inspection result is displayed in message bar.

(Screen 1)

TTL : Total number of frames inspected

NG : Number of defective frames

AV. : Average time spent for inspecting one frame

LAP : Total time spent for inspecting this board

* If "Show result in message bar on counting Ref.Des" is active in Mode tab of For Supervisors menu,
TTL, NG and AV is calculated based on Pack stamp number.

Clicking message bar once will change the contents and the text color turns to blue (Screen 2).

Point : Total frames inspected side A: total frames inspected side B: total number of stamps (count
stamps in Pack too)

Pict. : Total master pictures used for inspection

AV. : Average % of total frames which results in % / total frames of side A+B

Use : Memory spent for this inspection

Clicking message bar again will change the contents and the text color turns to black (Screen 3).

Point : Total stamps inspected side A (count pack as 1 stamp) : total stamps inspected side B (count
pack as 1 stamp): total number of stamps (count pack as 1 stamp)

Pict. : Total master pictures of Pack used for inspection

AV. : Average % of total frame0s which results in % / total Pack stamps of side A+B

Use : Memory spent for this inspection

12-6
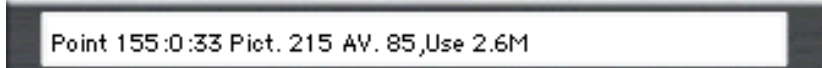
TTL 510 NG 29 AV.1.99mm/sec LAP 6.30sec

(Screen 1)

Point 510:0:71 Pict. 690 AV. 73,Use 2.6M

(Screen 2)

Point 155:0:33 Pict. 215 AV. 85,Use 2.6M

(Screen 3)

13. Settings

Please note that these settings are applied to all inspection programs that you will create.

13-1 General Setting

To display **General Setting**, select **Settings menu** > **Configuration** > **General**.

(Screen 1)

Menu	Description
OK %	This is used to designate the percentage for making pattern matching judgments. If the value is too high, even the slightest differences between parts may be judged as defective, increasing the number of false reports. The default value of 60% is a standard value. It can be set by each inspection frames.
Pitch X% / Pitch Y%	Designates the pitch % to move the PCB using the pitch button. If you set this to 100%, the displayed area of the PCB will be changed without overlapping. Around 80% is the most convenient value to prevent lack of inspection frames.
Emphasis Area	This is used to designate the area to be emphasized. Icons with bigger white spots in the center will have stronger contrast.
More Emphasis	This will increase the contrast already emphasized in the **Emphasis Area**.
NG Re-inspect	This is used to reduce noise and false NG by inspecting and capturing again. Numbers in the yellow box indicates times of additional inspection that camera moves to the position. Rose box indicates times of additional capturing on the additional inspection position. * When a high value is designated here, inspection will take more time. * When the **Speed Priority** option is bar-checked, additional capturing box does not appear.
Find first an object	This setting detects misalignments of pattern matching inspection frames before starting inspection. As this option is not set to whole inspection frames, it is turned off usually.
Speed Priority	This mode stops displaying the currently inspected Cell and prioritizes inspection. Speed Priority allows a 25 – 30% increase in inspection speed.

Menu	Description
Apply Human Saturation	Saturation sensitivity of pattern matching frame becomes closer to the sensitivity of human eyes.
Display NG on Map	Check here to automatically display the **Map View** after inspection if there is an NG point, showing the position and details of the defect.
Warning frame Size	There will be redundancies if the Inspection Frame is too big. This box should be unchecked under normal conditions.
Auto Printing	If NG points are contained in the results, the details are printed automatically. To execute it, you must complete the printer settings in **Page Setup** from the **File** menu in advance. Printing takes much longer than inspection. If printing instructions are issued frequently, do not check this box, and print manually.
Move via closest cell	If this box is checked, inspection will be performed by moving to the cell closest to the current position regardless of the order in which the cells were created. When this is disabled, the camera will move in the order the cells were created.
Reduce/Enhance light	Reduce gain of illumination. By clicking twice, it turns to "Enhance light" and works to gain light. For details, please refer to chapter 20-5 "White or Black PCB/Components Inspection".

13-2 Frame Color Settings

Select **Object Frame** from the **Configuration** menu (Screen 1).

(Screen 1)
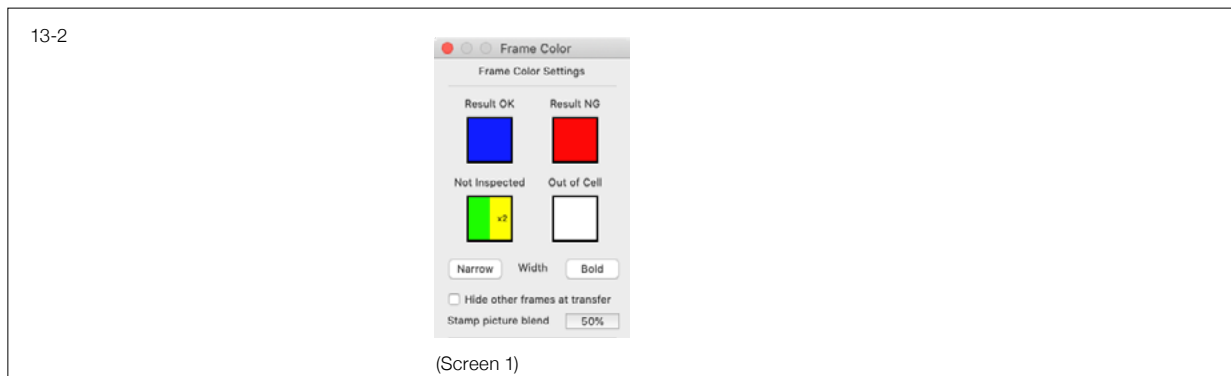
Menu	Description
Result OK, Result NG, Not Inspected, Out of Cell	designates each Frame color. Double-click inside the Frame to display the color picker and select the color.
Narrow/Bold	Click on these buttons to change the width of the Frame with the above color settings applied. Select the optimum line width here.
Hide near frames	Hides all other Frames when moving Frames. This is useful when the PCB is hard to see.
Picture blend	When placing Stamps with Master Pictures, they will be shown blended in the work area. The blend rate can be determined here. 0% will not show the Stamp Picture, and 100% will hide the PCB.
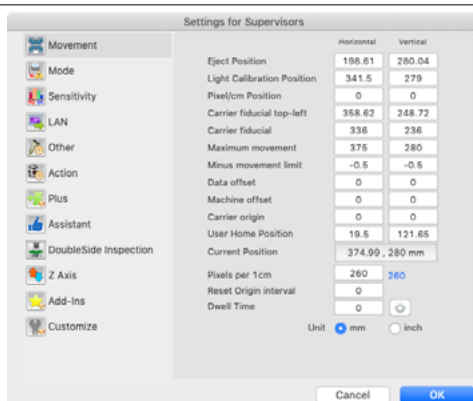
(Screen Movement)

13-3 Setting for Supervisor

Select **Settings** > **Configuration** > **For Supervisor**.

Items in **Setting for supervisor** do not need to be changed in general.

▼ Movement

Name	Description
Eject Position	Position that the carrier moves to when the Eject button is pressed.
Light Calibration Position	This is where calibration will be performed.
Pixel/ cm Position	mm per dot settings will be applied.
Carrier fiducial top-left	Position for the top left Fiducial of the carrier. This is used to correct the distortion.
Carrier fiducial	This is the distance between the fiducials of the carrier.
Maximum movement	This is the maximum value for mechanical movement.
Minus limit	The minimum value for mechanical movement in the negative direction.
Data offset	When reading Inspection Programs on other machines that have different carrier sizes, the offset value can be set here.
Machine offset	When reading Inspection Programs on another machine that is the same model, the offset value can be set here.
Carrier Origin	When sending data to CS-Center, input Carrier origin coordinates here.
User Home Position	There is Home button in sub menu of Eject button. You can input favorite value here to be Home.
Current Position	The position is displayed as X, Y coordinates. This value will be updated to the current position by clicking this button after changing the position.
Pixels per 1cm	This sets how many dots correspond to 1cm on the screen. The blue number on the side is the value at the fiducial of the carrier. Since V6.4.0, the resolution has been increased and input to one decimal place is possible.
Reset Origin interval	If cumulative errors are suspected due to a missed pulse in a machine driven by a pulse motor, you can give instructions to reset the origin. If this value is 0, Reset Origin Interval will not be applied.
Dwell Time	This is the standby time to wait for the mechanical vibration to cease and can be set in 0.1 second increments. When entered negative values, the time becomes shorter. Enter the value n (-1 - -5) to set -(-n × 0.016) seconds. When entered positive values, the time becomes longer. Enter the the value n (1-5) to set (n x 0.1).

Name	Description
Capture Wait	Capture Wait is a function to wait for a specified time before capturing to reduce the vibration. This function is valid for models with a 5 Mpixel camera; for the V22X, the setting is valid only when [Extend] - [Without blinking] is enabled.

Click ⚙ to open the menu.

Enable Capture Wait Function	Check here to enable Capture Wait.
Wait time	Sets the waiting time other than during inspection.
Max distance for wait	If the move distance is shorter than the value specified here, the wait time becomes active. However, if it is the first move after startup or if the move direction is reversed, the waiting time is valid regardless of the distance.
Wait time during inspection	Sets the waiting time during inspection.

The Max value of the Wait time is 5000 ms, and The Max distance is 20000 mm.

(Screen Mode)

▼ Mode

Name	Description
Print mode	Select whether the automatic printing should be executed in NG List format, Map View format, Roll printer, or 3rd party.
Analysis mode	Select the display mode during analysis. You can choose from Gray scale, Hue and B + H + S.
Hide matching %	Hide the matching rate displayed on the Frame after inspection. This is useful for high density PCBs.
Inspection Step mode	When Inspection Step mode is enabled with the **NG Pause button** pressed, inspection will pause every time each inspection for 1 screen (1 cell) is complete. When Inspection Step mode is disabled, the inspection will pause only when a defective point is found. To activate the **Inspection Step mode**, the **Speed Priority** in **General Setting** must be disabled.
Show result with Reference Designator	After inspection, place the cursor near the Frame and the **Reference Designator** (Symbol) will be displayed along with the inspection results.
Show result with Block Number	A block number is displayed next to the Symbol name on G/NG confirmation mode when you make an inspection area a block after inputting Symbol.
Show result with comment	After inspection, place the cursor near the Frame and **Reference Designator Comment** will be displayed along with the inspection results.
Optimize Cell by pitch %	When optimizing Cells, optimize by pitch % set in General settings.
Do not use live images while debugging	If AOI gets vibration influence by P&P machines, you can stop image capturing while debugging. Camera only takes shot soon after moving to the Cell. While inspection, this is deactivated automatically. * On older machine which unables to use Light Selection, the fillet light will not be shown correctly.
Show multiple NG reasons in Pack Stamp	When Pack has multiple NG stamps, one voluntary NG reason is shown. But if this is active, as much as NG reasons are shown.
Show inspection time except PCB loading time	Normally inspection time includes the time while PCB is draw in. If this is active, inspection time is count excluding PCB drawing in time.
Show result in message bar on counting Ref. Des.	When checked this, Pack is simply counted as one even when it contains multiple NG frames.

155

(Screen Sensitivity)

▼ Sensitivity

Name	Description
Alert too big frame at file open	If **Warning frame Size** in **General Setting** is checked, a warning will be displayed when a frame over the pixel size (width) set here is created.
Alert too small frame at file open	If **Warning frame Size** in **General Setting** is checked, a warning will be displayed when a frame below the pixel size (width) set here is created.
Default grid size (pixel)	If the resolution is not set in filter settings, this value will be set as the default value.
Matching allowance (%)	resolution grid must meet the **OK** % set in **General Setting**, but they can be set to be OK even if some grid boxes are less than the OK % value. The **Matching allowance** determines the percentage of these grid boxes. For example, if the **Matching allowance** is 20%, up to 2 grids out of 10 can be below the **OK** % to be judged as OK. However, those 2 grids must fit within the area designated in the **Maximum allowance area**.
Maximum allowance area (%)	**Maximum allowance area** sets the range to be judged OK even if the result is under the OK % value. For example, if **OK** % is set to 60% and the M**aximum allowance area** is 10%, grid boxes that fall within the range of 50% - 60% will be subject to the Matching allowance.
Small/Big frame Search threshold	This is an optional parameter for **Find**. The **Find** method differs by Frame size. This setting is for the threshold of the size. For small Frames, all pixels in the Frame will be searched. For big Frames, some sampled pixel groups in the Frame will searched.
Small frame search range (1/..)	When searching a small Frame with **Find**, the size of the search area (how many times larger than the Frame) is set here.
Big frame coarse search	Since the **Find** for big Frames is time-consuming, the value to reduce searching accuracy according to the size can be set here. A small value will result in a rough search, and a large value will result in a detailed search.
Text Black/White threshold	When letters are extracted, they are extracted based on differences in brightness. If that brightness does not exceed the value set here, it will not be regarded as a brightness change. The default value is 5, and the smaller the value, the higher the sensitivity. The range is between 1 and 96.

Name	Description
Default Hue tolerance	This value defines the tolerance to hue differences between the Master Picture and the picture in the Inspection Frame. This can be set within the range of 0 - 65535.
Default Saturation tolerance	This value defines the tolerance to saturation differences between the Master Picture and the Picture Inspection Frame . This can be set within the range of 0 - 65535.
Brightness Variation range (%)	If there is a hue defect, or the saturation is too low, you can set how much compensation can be applied with brightness.
Default Pixel Search (chase)	This designates the number of searches (tracks) made to identify misalignment. Each search will look at 8 pixels around of the object. For example, if the value is 5, it will search up to 40 pixels, searching in places up to 5 pixels away from the object. The maximum search distance is displayed on the right in mm.
Red auto adjust range	This sets the upper limit of **Auto Adjust** on Fillet inspections.. 2 means 20%.
Limit number of used picture	In Fillet inspections, **Find** is performed using the Master Pictures first. This designates the number of Master Pictures used for inspection, including the pictures used for **Find**
Solder Detect Gain	This is the sensitivity of solder detection when detecting a short circuit with a doughnut stamp. The higher the value, the wider the area. The default value is 1.0 and can be set in the range of 0.1 to 5.0.
High Speed Search	When using Highspeed Search for misalignment compensation, if the machine cannot find the coordinates where the matching rate is lower than 50%, it will terminate the search and start inspection at the original coordinates. In the current model, this setting is always ON and therefore grayed out.
Fillet search by red	The fillet part will be searched using a red LED.
Search text carefully	When letter extraction is set in the filter settings, it will run a very strict search so that letters written in fine lines can be found. In the current model, this setting is always ON and therefore grayed out.
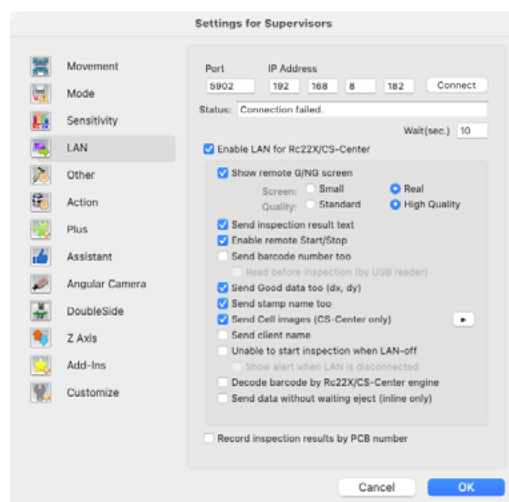
(Screen LAN)

▼ LAN

Name	Description
Port, IP Address	When connecting to Rc22x software via LAN, input the terminal port and the IP address, then press the **Connect** button on the right to connect.
Status	Displays the current connection status.
Wait (sec.)	The time to wait the reply from CS-Center/Rc22X. Default is 10 seconds.
Enable LAN for Rs22X/ CS-Center	Check here to connect to Rc22x via LAN at software startup and activate the following items. If communication with the CS-Center is lost while it is active, it will automatically attempt to reconnect.
Show remote G/NG screen	Remotely operates G/ NG confirmation from CS-Center/Rc22X. The Simple mode, is an abbreviated version, and Real mode, is the same screen as displayed on the Mac. This must be checked for sending data.
Send inspection result text	Inspection results will be sent to Rc22x in text format. The contents will be the same as that of the output to the roll-paper printer.
Enable remote Start/ Stop	The machine can be stopped/started from the terminal. Press Tab + C to stop and Tab + G to start up.
Send barcode number too	The inspection result will be sent to the server after reading the barcode.
Read before inspect (by USB reader)	When this is checked, the operator should read the barcode before inspection.
Send Good data too (dx, dy)	Send not only NG results but also OK and False NG results including shift information.
Send stamp name too	The stamp name will be added as NOTE column.
Send Cell images (CS-Center only)	When connected to the CS-Center software, send Good images. When this setting enabled on the AOI without UV lighting, press the button on the right to set the lighting to be sent to CS-Repair. See the next page for details of the function.
Send client name	Displays [CLIENT] on [Edit Recent Used] window. See 24-2-3 for details.
Unable to start inspection when LAN-off	When disconnected to the CS-Center software, inspection can not be started.
Decode barcode by Rc22X/CS-Center engine	Normally barcode is decoded in 22X software, however special barcode such as MicroQR must be decoded on Rc22X/CS-Center software.

Name	Description
Send data without waiting eject (inline only)	Normally data is sent after ejecting PCB, however activating this function will allow to send data right after inspection. Do not activate this unless the decision of manufacturer.
Record inspection results by PCB number	Enable this setting to subdivide the management of inspection results by using PCB numbers instead of block numbers. For details, refer to "11-6 Cell Management Using PCB Numbers".

When 22X version is V6.8.0 or later and CS-Repair version is V2.0.1.0 or later, lighting images other than main lighting can be sent to CatchSystem. the added setting [Send cell images (CS-Center only)] is checked, the output lighting can be selected.

* For UV illumination inspection machines, this setting is grayed out and cannot be changed.
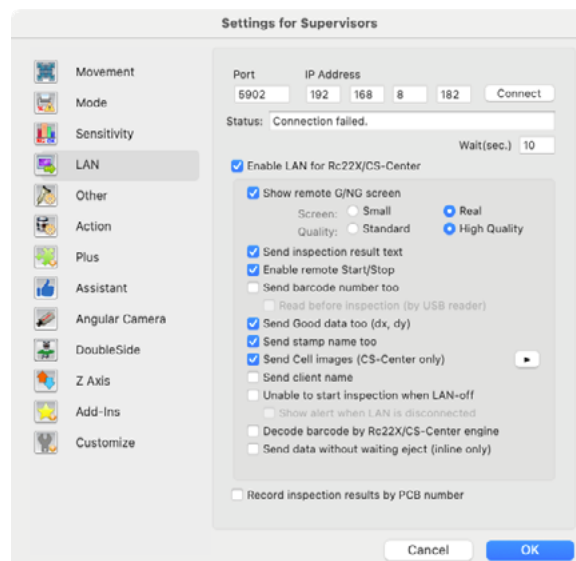
After activating the [Send Cell Image (CS-Center only)] setting, press the button to the right of the setting to activate the lightings to be output. The activated lighting will be marked with a check mark. The Main lighting is always output and the setting cannot be changed.

To display the image of the set lighting in CS-Repair, left-click on the Ref.Des. picture displayed under the split window.

Specify the lighting on the lower right tab of the Ref.Des. image window.

The lightings enabled on the 22X can be selected.

The image volume stored in the PC for CatchSystem increases with the number of lightings selected. The size depends on lightings and image, but as a rough guide. As a reference, the following field of view with 5M camera and Main lighting will be about 300KB.

13. Settings

(Screen Other)
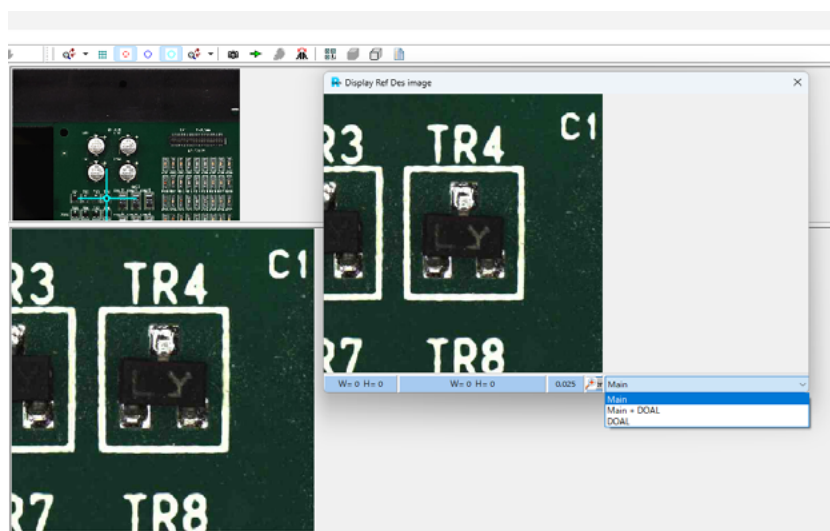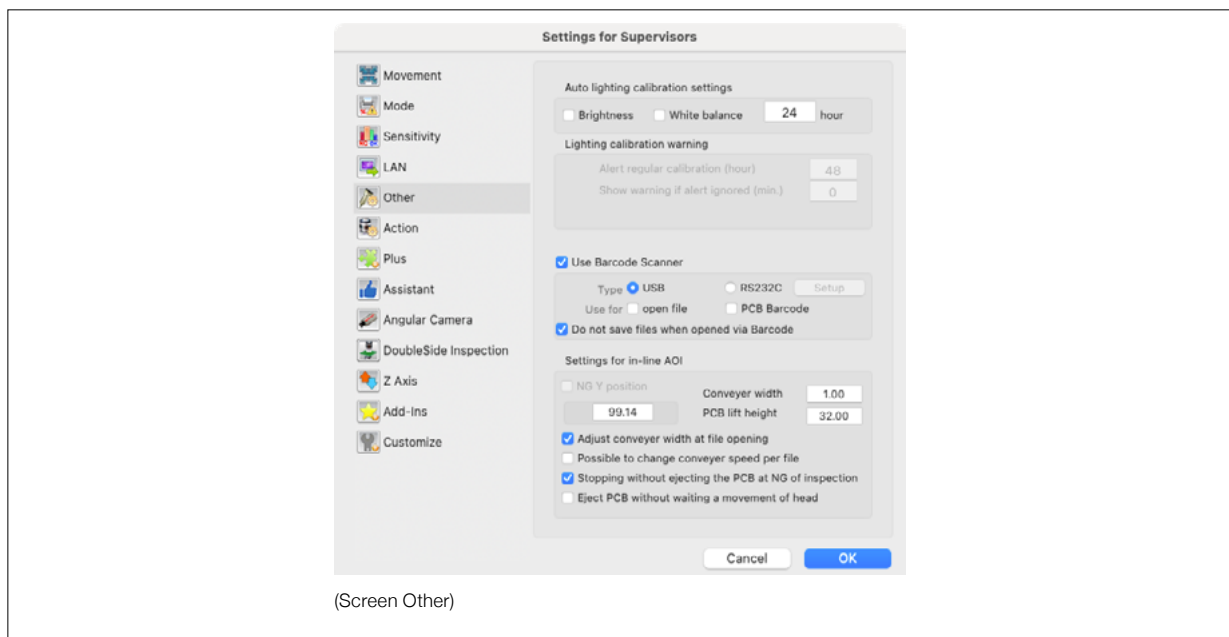
▼ Other

Name	Description
Auto lighting calibration settings	Automatic adjustment of Brightness and White balance will be made at minute intervals defined by the settings. This correction is for the software to set an approximate value. It is not intended for hardware.
Alert regular calibration (hour)	When performing calibration regularly, the time to show warning can be set here.
Show warning if alert ignored (min.)	When regular calibration alert is ignored, show warming message.
Alert if Gain value is too high (not enough light)	When Gain value is high at calibration, there is possibility that florescent light must be replaced.
Use Barcode Scanner	Change barcode reader settings here. You can set up the device type and its purpose.
Do not save files when opened by barcode scanning	When file is opened by barcode scanning, the file is opened in read-only mode. Message to confirm save or not save file isn't displayed.

Settings for In-Line AOI are available only when connected to an in-line model machine.

Name	Description
NG Y position	Unavailable on the current models.
Conveyer width	The conveyer width adjustment value.
PCB lift height	The regular height for backup pin.
Adjust conveyer width at file opening	Conveyer width is automatically adjusted when the inspection program is loaded.
Possible to change conveyer speed per file	Loader speed can be adjusted per file.
Stopping without ejecting the PCB at NG of inspection	PCB stays clinched without discharging when NG is found during inspection. This function is used to correct the error without moving PCB.
Eject PCB without waiting a movement of head	This option is available only for 1200mm special machine.
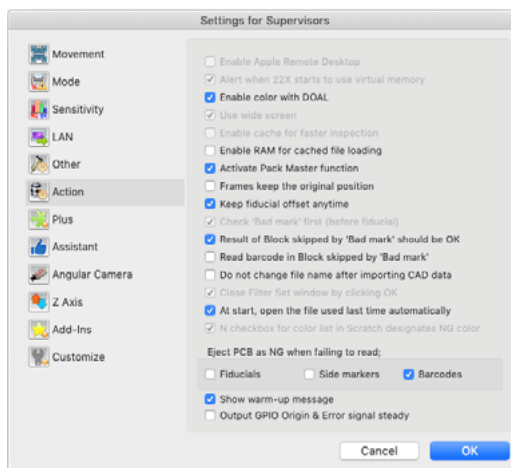
(Screen Action)

▼ Action

Name	Description
Enable Apple Remote Desktop	In the current model, this setting is grayed out.
Alert when 22X starts to use virtual memory	When the amount of memory used exceeds the actual memory capacity, virtual memory (hard disk) is started to use. In the current model, this setting is always ON and therefore grayed out.
Enable color with DOAL	When inspecting solder pads with no solder paste using DOAL, it may not be able to make a judgment since the expected over exposure does not occur. Use this option to add the color to the image obtained by the MAIN LED, making it easier to detect solder pads with no solder paste.
Use wide screen	This feature enables inspection of all inspection Frames to be run in the standard Frame cell size, saving inspection time even with the zoom option active. In the current model, this setting is always ON and therefore grayed out.
Enable cache for faster inspection	By using the cache, the matching rate at inspection will become slightly wider and redundancies in the matching process will be eliminated, reducing inspection time. Filters for the Master Picture will also be stored in the cache. In the current model, this setting is always ON and therefore grayed out.
Enable RAM for cached file loading	When switching files by barcode, they will be stored in memory without being saved as files each time, data is saved when the software is shut down.
Activate Pack Master function	Check here to inspect using the Pack Master Method. See 10-10 for details.
Frames keep the original position	If this is active, and any frame is moved during programming, an alert is shown when pressing Start whether move back to original position, or update the position.
Keep fiducial offset anytime	Keep fiducial offset even Stop button is pressed.
Check 'Bad Mark' first (before fiducial)	Inspect blockmark stamp before inspecting fiducial marks.
Result of Block skipped by 'Bad mark' should be OK	Option for G/NG confirmation mode. The result of PCB skipped by Block Mark is OK when this is on.

13. Settings

Name	Description
Read barcode in Block skipped by 'Bad mark'	Normally the barcode pasted in the block skipped by 'Bad mark' is not scanned, but if this option is active, the barcode is read and sent to Rc22X/CS-Center.
Do not change file name after importing CAD data	After importing CAD data file, 22x inspection program name is automatically changed to the name of the CAD data. This option enables keeping file name unchanged. This setting is fixed as effective since Ver. 6.6.1.
Close Filter Set window by clicking OK	Filter Set window is the floating type window. If this option is active, window closes by pressing OK like a dialogue window.
At start, open the file used last time automatically	When starting up software, automatically open the file which is opened last time.
N checkbox for color list in Scratch designates NG color	Activate "N"(NG is OK) of specified color in Scratch setting when you execute the inspection by NG color. In the current model, this setting is always ON and therefore grayed out.
Eject PCB as NG when failing to read;	Activate this when you do not like to inspect PCB and eject it immediately when set value of fiducial, side markers, or barcode does not match.
Show warm-up message	Activate this when you want to display the message of warm-up operation when you start up 22X.
Output GPIO origin & Error Signal Steady	For Origin completion and error, change the I/O-S output signal from one-shot to level output.
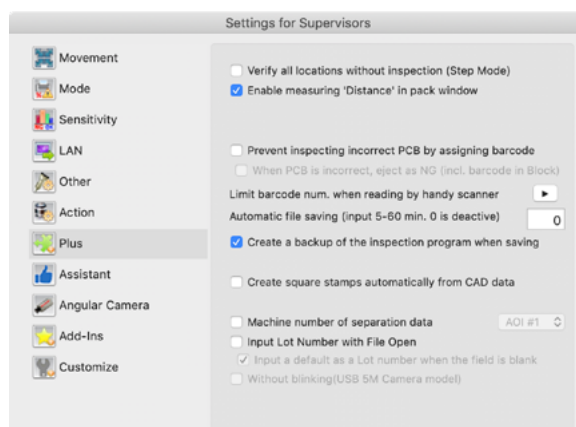
(Screen Plus)

▼ Plus

Name	Description
Verify all locations without inspection (Step Mode)	You can check parts/components only by using the G/NG confirmation mode without inspection. This is useful for PCBs where the parts/components are mounted for the first time after switching PCB models. Please activate "G/NG confirmation mode" in Map view ssettings.
Enable measuring [Distance] in Pack window	Activate [Distance] function in Pack Stamp. For detail, see 10-10 Pack Stamp.
Prevent inspecting incorrect PCB by assigning barcode	Function to prevent human mistake of opening incorrect inspection program. File switching is disabled.
Limit barcode number when reading by handy scanner	Enable to limit the input from barcode or keyboard for preventing error. Select the desired number from list. Only effective when "Read before inspection (by USB reader)" is activated in LAN setting.
Automatic file saving	Save file automatically at background per setting minutes. If there is no change on file, file is not saved.If you are editing filter/stamp at saving timing, save will be skipped by next timing.
Create a backup of the inspection program when saving	The [Backup] folder is created in the inspection program folder. Up to 3 generations of backups are automatically saved.
Create square stamps automatically from CAD data	Create square stamps from CAD data without size information for inspecting component present/absent.
Machine number of separation data	Activate this when you want to split inspection area for the inspection with multiple AOI's. You can split the inspection program up to 3 AOI's.
Input Lot Number with File Open	The lot number edit screen is displayed each time the detection program is opened.
Input a default as a Lot number when the field is blank	This function can be selected when the setting of [Input Lot Number with File Open] is enabled. If you open a file and press [OK] while leaving the lot number entry field blank, the present date and time will be automatically entered as the 12-digit lot number. For more informations, see "Edit Lot Number" on "14-1 Menu" - "Window Menu".
Without Blinking (USB 5M Camera model)	If checked, the camera lighting will blink only when necessary. This allows you to perform inspections with less negative visual impact from flashing. * This setting is only for 5M camera models.
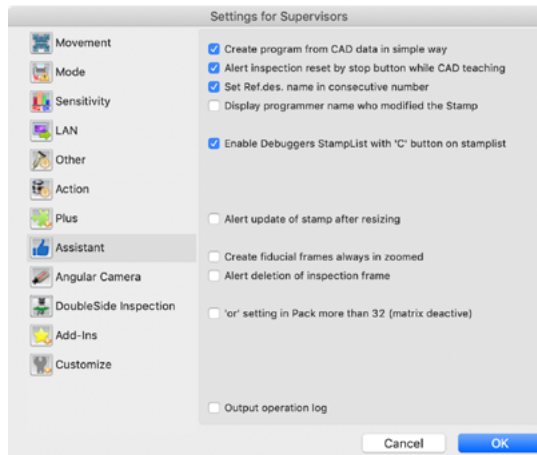
(Screen Assistant)

▼ Assistant

Name	Description
Create program from CAD data in simple way	Create stamp during CAD teaching in simple way by using Stamp Creation Wizard.
Alert inspection reset by stop button while CAD teaching	Show alert when pressing stop button twice during CAD data.
Set Ref.des. name in consecutive number	Activate when you want to put consecutive number to Ref.des. name automatically for same Stamp name. * Consecutive number you can set is from "0001" to "9999".
Display programmer name who modified the Stamp	Activate this when you want to display programmer name in Stamp detail who modified the Stamp.
Enable debugging stamp list with "C"	When this item is checked, the **Stamp list for debugging** window will be displayed when the C button is clicked in the stamp list. This will make debugging work easier.
Alert update of stamp after resizing	This is for the beginner. To show update dialogue automatically after resizning for user to prevent forgetting update.
Create fiducial frames always in zoomed	Always create fiducial frames in zoomed even they are made in non-zoomed frame.
Alert deletion of inspection frame	Prevent human mistake to delete frame unexpectedly.
'or' setting in Pack more than 32 (matrix deactive)	Maximum 32 stamps can be assigned 'or' condition in matrix tab of Pack setting. However activating this option enables to assign 'or' condition to all stamps in Pack. If this is active, matrix is deactive.

165
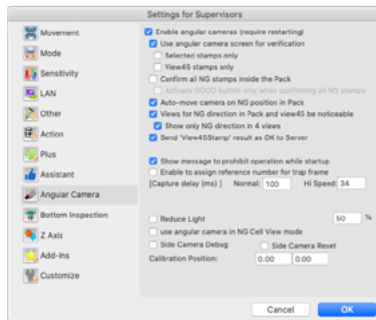
(Screen Angular Camera)
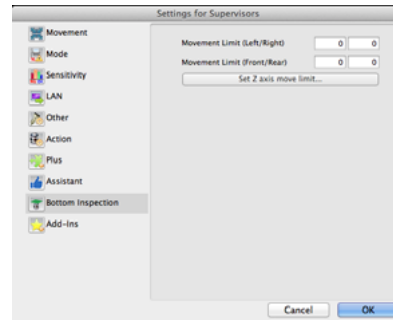
(Screen Bottom Inspection)
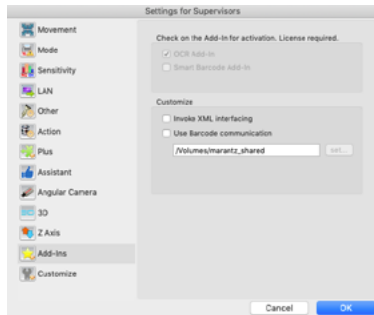
(Screen Add-ins)

(Screen External)

▼ Angular Camera (This menu is not displayed on AOI without Angular Cameras)

Please refer Chapter 28-2 "Settings Menu of Angular Cameras (Option)",

▼ Bottom Inspection (This menu is only displayed on AOI inspecting from bottom)
■ Movement Limit

Limit for Z axis up/down to prohibit the camera hitting jig or carrier.

▼ Add Ins (paid option)
■ OCR Add-in

Enables optical character recognition function.

▼ External (paid option)
■ External Communication

Enables external communication function.

13-4 Tendency NG / Ignore NG

Alert when defect is counted consecutively/cumulatively, or count as NG only when continuously NG.

▼ 13-4-1 Tendency NG (Screen 1)
■ Active

When same location is NG consecutively in multiple PCB, the inside red circle to mark NG location on Map View is colored in blinking yellow. In case of NG cumulatively, is colored in blinking rose.

■ Stop conveyer

Stop conveyer too in addition to the mark on Map View.

■ Number of NG

The convayer stops when the number of NG exceeds this number.

■ Continued NG / Total NG

Number of NG occured in the same location consecutively/cumulatively.

* Any of Continued NG / Total NG or Stop of No. exceeds limit, the count will be reset.

(Screen 1)
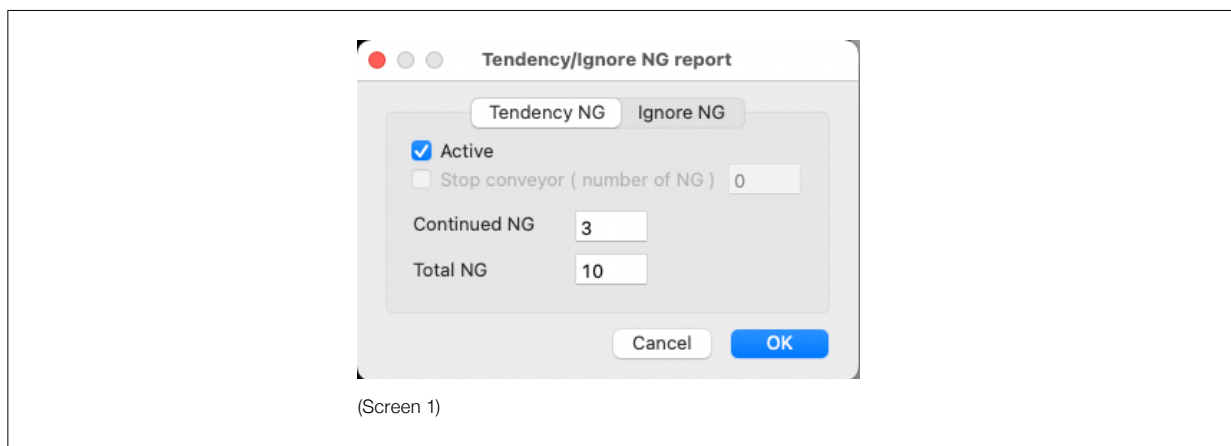
▼ 13-4-2 Ignore NG

This is a function "**Count as NG after reaching to the setting continued NG number**", is useful for high speed inline AOI to inspect text on components.The text inspection is tend to generate false calls because text is not always beautifully printed. The text inspection before reflow is often done for confirming if correct reel is set to the feeder. This means that you do not need to inspect all PCB for text. By activating this function, AOI only reports NG when NG is reported continuously.

1. Select a stamp in Work Area.Open Settings -> Configuration -> Tendency NG/ Ignore NG
2. Check on "Active" and input number of after how many continuous NG is occurred (Screen 2).
3. The stamp not only selected but also in the same name will have the counter at the bottom left of the frame.(Screen 3)
4. Start inspection. When frame is NG, the count will be increased (Screen 4).When the frame is NG on next PCB (means continuous NG), the count will be increased. But when the frame is OK on next PCB, the counter will be reset to 0. As well, if the filter is adjust, it is regarded as debugging, the count is reset to 0. Count is also reset 0 at closing file.
5. The stamp frame will regarded OK until it reaches to continuous NG setting number even it is actually NG.

13-4

(Screen 2)
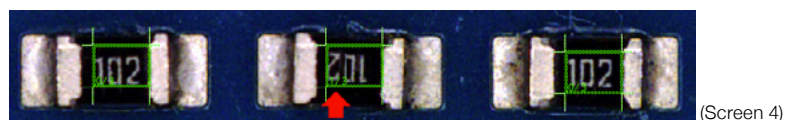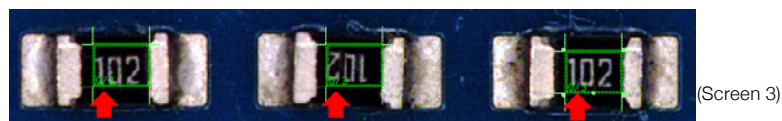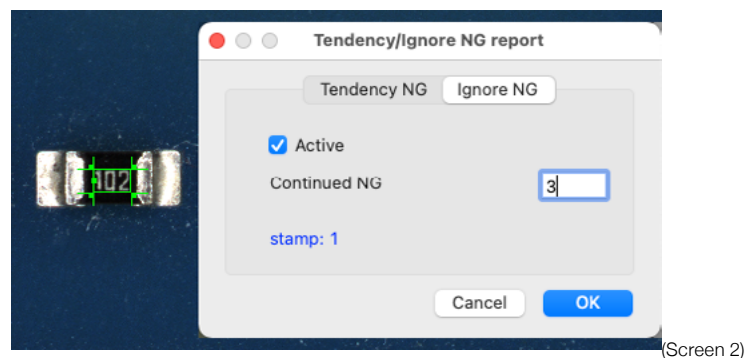
(Screen 3)

(Screen 4)

14. Menu and Shortcut List

14-1 Menu
▼ File Menu

14-1
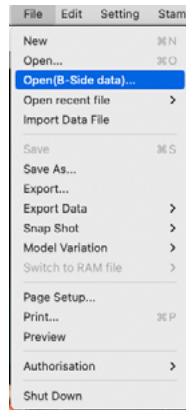
(Screen File Menu)

Menu	Description
New	Creates a new Inspection Program.
Open	Opens an Inspection Program.
Open(B-side data)	Opens B-side data. This menu is displayed when there is data in A-Side and B-Side is selected with the Swap button.
Open Recent File	Opens recently used files. Up to 50 files are stored here.
Import Data File	Imports the NC data (Numerical Control Data) of the pick and place machine to make an Inspection Program. Select the NC data file from the file dialog and import by selecting Open. You can select Matching, Histogram, Passive Component, Scratch and OCR function besides the previous three special stamps.
Save	Saves the Inspection Program. Up to three generations of backup data are stored in the Backup folder.
Save As	Saves the Inspection Program as a new file by changing its name.
Export...	Converts file format of program file created by version 6.x when you use the file with version 4.9.9 or older.
Export Data	Exports information such as NG, position and Stamps.
Information output	The output will be in a text format that can be used in spreadsheets and other applications.
Position output	This is used to export the numerical coordinates of the Inspection Frames.
Past out put	Outputs result data for each PCB in a text format.
Stamp information	Outputs information for Stamps used by Inspection Programs as a text data.
Snap Shot	Screen output, import and PCB image creation can be done.
Save	Saves the currently displayed Work Area as an image file.
Open	Opens pictures saved with **Save** or created in other applications.
Blend	Pictures imported will be blended with the picture currently displayed in the Work Area.
Open virtual PCB	Create PCB images be used in the Offline Teaching Software.

Menu	Description
Page Setup	You can set paper size and, if a color printer is connected, ink settings.
Print	The NG List or the defect locations in the Map View can be printed.
Preview	Disprays the print preview. The preview header will include the total number of inspected PCBs, the total number of defect areas and the total number of inspected areas.
Authorisation	Changes authorization. See [3-3 Authorization] for detail.
Shut down	Quits 22X and Shuts down Mac.

* Caution

- If you open program file created by software version 4.9.9 or older by 22X version 6.0.0 or greater, and save after modified, program file will be saved with version 6.0.0 format.

- When you save the program file with software version 4.9.9 or older, back up file will be created in the same directory of inspection file with same file name and prefix.

  File name: "_v4_backup_22X_<file name>"

  Example: _v4_backup_22X_fda350

- The characters below cannot be used for file name:

  / ¥ ? < > | : * ^
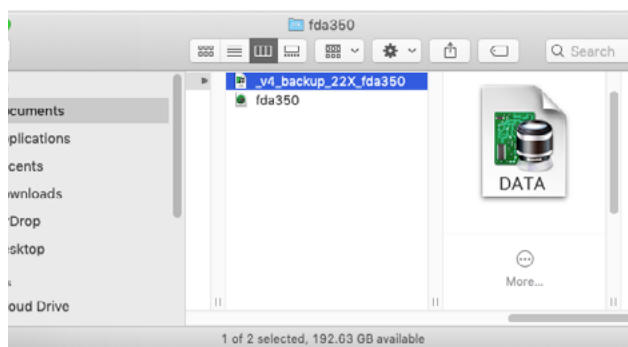
▼ Edit Menu

14-1	(Screen Edit Menu)

Menu	Description
Undo	Cancels the previous operation. Some actions cannot be undone.
Cut	Deletes the selected objects and stores it in memory (clipboard).
Copy	Stores the selected objects in memory (clipboard).
Paste	Pastes the objects stored in memory (clipboard).
Select All	Selects all Frames displayed in the Work Area.
Row Copy	Places multiple copies of the selected Frames at specified intervals in a row., used to place the same Frame, such as solder shorts between IC leads, in a row. Copies can be made across cells.
Duplicate selection	Copy selected Frames by cells. If nothing is selected, everything contained in the cell will be copied.
Arrange	Align selected Inspection Frames.
Auto Reposition	Automatically align Inspection Frame positions based on the Master Picture.
Flip/Turn	Rotates or flips selected Frames using the sub menu.
Initialize	Initializes the selected item below.
Delete Log Data	This command deletes the number of PCBs inspected, the number of total points inspected, the number of total NG points and the records of each Frame stored as Log Data. This command cannot be undone.
Clear Local / Master Pictures	Clear all Master Pictures stored in each Frame in the Work Area, or clear the Local Picture.
Clear Objects	All Frames will be deleted. Stamps on Stamp Lists and others will remain.
Automatic Positioning	Performs the same task as **Auto Reposition** to All Frames.
Side Edit	Selects the option below to switch the side.
Swap A/B side	Side A and side B can be switched.
Copy this side	Copys the selected side.
Assign Fiducial Mark	Sets the marker reading Frame.
Assign side marker	Allows one file to retain data for both A and B sides and automatically switch sides.
Make Coverage (Full)	This function is only for UV models. For details, please refer to the Capter "Conformal Coating Inspection".

171

▼ Settings

<table>
<tr><td>14-1</td><td></td></tr>
<tr><td></td><td>

Setting	Stamp	Window	Zoom	Help	
Calibrate					N
Configuration		▶	General		
Calibrate Pixel/cm			Object Frame		
Machine Setup		▶	For Supervisor		
			Tendency NG...		
Length Measurement Setting			Operator Account		
			Let 22X stay in this display mode		
NG marking set...					
NG mark point			Mode to start next time		▶
			Tact simulation		

</td></tr>
<tr><td>(Screen Setting Menu)</td><td></td></tr>
</table>
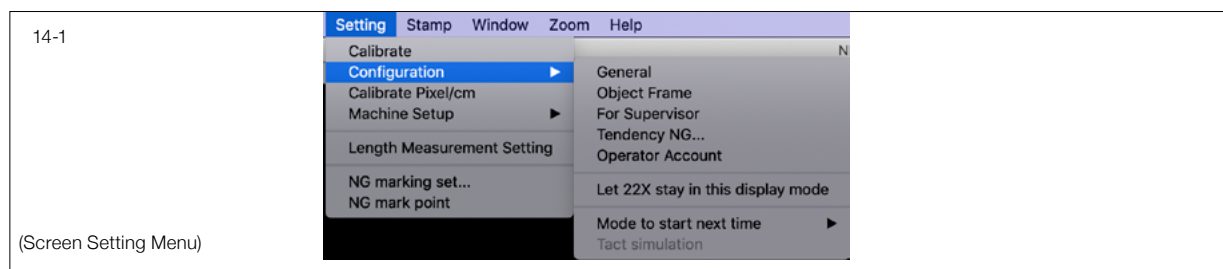
Menu	Description
Calibrate	Perform calibration to maintain a consistent display color.
Configuration	Edits settings and preferences below.
General	Set software's general preferences.
Object Frame	The Inspection Frame color and line thickness can be changed here.
For Supervisor	Set preferences for the inspection machine. In general, this does not need to be changed.
Tendency NG	Issues special warnings in the Map View for Frames that are continuously judged as NG or Frames that have many cumulative NGs.
Operator Account	Create operators account.
Mode to start next time	Enable to select UXGA (1600x1200), FHD (1920x1080), FHD2 (1920x1920), 5M (2400x2000).
Tact Simulation	Opens Tact Simulation window on OFF-Line Teaching. See 23-6 for details.
Calibrate Pixel/cm	Set the millimeter versus dot (how many dots 10 mm equals on the screen) on the screen. Display the measure on the screen, click on the two points and enter the mm width, then [For Supervisor] - [Movement] - [Pixels per 1cm] will be automatically adjusted.
Machine Setup	Sets parameters and movements below.
Parameters	Sets parameters for the machine. Change the setting value only when instructed by the dealer.
Mechanical Calibration	Reads Fiducial Points in the four corners to adjust the movement. See the Hardware Manual for details.
Machine Setup	Checks if configurations works well by using an optional testing plate.
Reset Camera	If signals from the digital camera could not be sent correctly and the image is distorted or deleted, this command resets the signal from the camera.
Keep Door/Table Closed	To kill door/table movement while debugging on Model U series with auto-table and Model DL/HDL-460/650. This menu is not displayed in the other models.
Length Measurement Setting	Enables the Length Measurement. See 16-13 for details.

▼ Stamp Menu

14-1
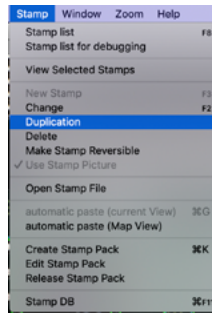
(Screen Stamp Menu)

Menu	Description
Stamp list	Opens the **Stamp list Window**.
Stamp list for debugging	Opens the stamp list to debug settings. See 8-6-1 for details.
View Selected Stamps	Displays only selected stamps.
New Stamp	Registers a new stamp.
Change	Applys the changes to all same Stamps.
Duplication	A new stamp duplicating the currently selected stamp will be added to the list. The default stamp name will inherit the name of the duplicated stamp.
Delete	Deletes a stamp.
Make Stamp Reversible	If only one Master Picture is registered, a 180-degree rotated version of the Master Picture of the currently selected stamp will be added. This is the same function as the [Make Stamp Reversible] in the Filter Settings screen.
Use Stamp Picture	Applies a Master Picture to the Stamp. This feature makes it easier to manage programs because each Inspection Frame does not need to have a Master Picture.
Open Stamp File	Opens Stamp file.
Automatic Paste (Current View)	Pastes stamps automatically in current view.
Automatic Paste (Map View)	Pastes stamp automatically in map view.
Create Stamp Pack	Makes selected Stamp Frames into a Stamp Pack.
Edit Stamp Pack	Makes the selected Pack Frame editable. You can resize and reposition each Inspection Frame.
Release Stamp Pack	Turns a packed Stamp into indivisual Stamps.
Stamp DB	Opens the Stamp DB window.

▼ Window Menu

14-1
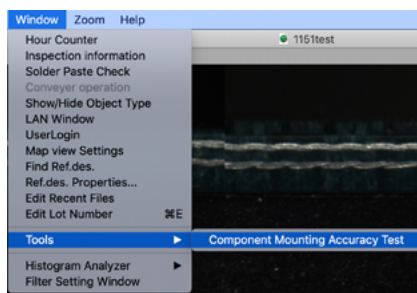
(Screen Window Menu)　　　　　(Screen 1)　　　　　(Screen 2)

Menu	Description
Hour Counter	Cumulative hours, operation hours, inspection hours and lamp hours are displayed in the Hour Counter. The colors of the numbers will change for each item. Ground total time (TTL) and clearable total time (TTL2) can be displayed. The Lamp Alarm can be set up using the pull-down menu (Screen 1). When TTL2 exceeds the time set here, the lamp display will change to red.
Inspection information	The total number of inspections, the number of OK, the number of NG, and the percentage of OK are displayed. The behavior of this screen varies depending on the authorization settings. (> P. 176)
Solder Paste Check	Open the **Area Edit Window** to convert Inspection Frames for solder paste inspection.
Conveyer operation	Display the Conveyer control panel for in-line machines.
Show/ Hide Object Type	Categorize Inspection Frames by type and set up whether each Frame should be shown or hidden. You can check the Inspection results by type, and you can also exclude Inspection Frames temporarily.
LAN Window	Displays the port on the PC where RC22x/CS-Center is used and the unsent inspection results upon connection failure. See next page for details.
UserLogin	Log in and Log out with registered operator.
Map view Settings	Opens Map view Settings window. See 12-5 for details.
Find Ref.des.	Opens Ref.des. list. See 8-9-2 for details.
Ref.des. Properties	Opens Ref.des. Properties window.
Edit Recent Files	Displays files which are opened recently. You can input the barcode number, lot number and NOTE.
Edit Lot Number	Input a Lot Number on the Lot Number Edit screen (screen 2) and click OK to register it. Only alphanumeric characters can be used and can be post up to 30 characters. An error message is displayed when more than 30 characters are inserted.
Component Mounting Accuracy Test	The amount of misalignment of each part is measured and a report is output. enter the value for Test Cycles, press Start, and after the entered number of inspections, report files are output in the inspection program folder.
Histogram Analyzer	Opens window for histogram method.
Filter Setting Window	Opens window for pattern matching method.

[Display of Unsent Inspection Results]

When there are inspection results that have not been sent to the production control software, the inspection date, time, barcode number, and inspection program file name are displayed in the message field at the bottom of the screen. Up to 4 unsent inspection results will be accumulated.

Click [Delete all unsent inspection results] on the right side of the screen to delete inspection results.

* Deleted results cannot be restored.
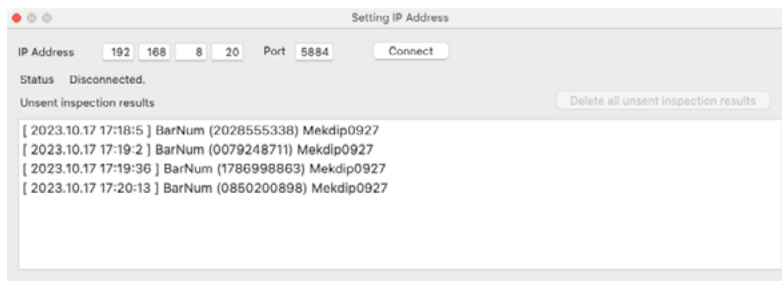
When an attempt is made to run an inspection with 4 unsent inspection results accumulated, the following warning is displayed before the inspection starts and the inspection is stopped.

Click [Cancel] to check the LAN connection and HUB, and confirm that the connection status has improved before executing the inspection again. Unsent inspection results will remain until you reconnect.

To continue the inspection, select [Delete all unsent inspection results] on the Network window.
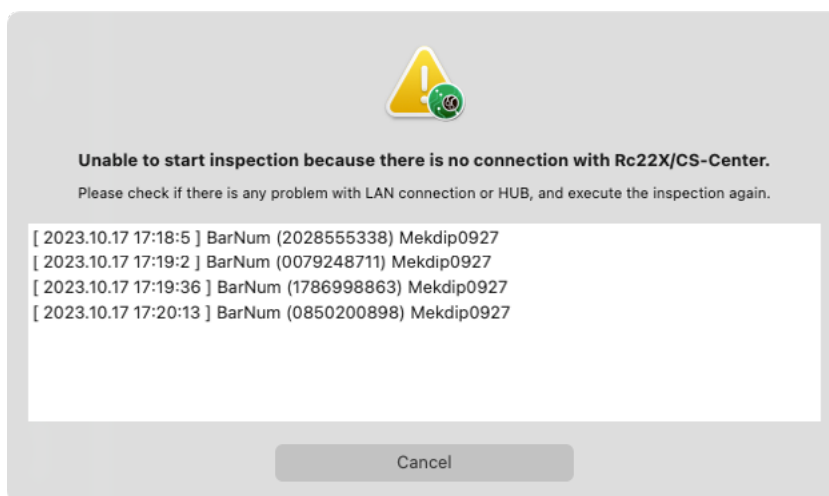
If [Enable LAN] is checked on [Settings For Supervisor], 22X will automatically attempt to reconnect to the LAN while the LAN is disconnected. To stop reconnection, uncheck [Enable LAN].
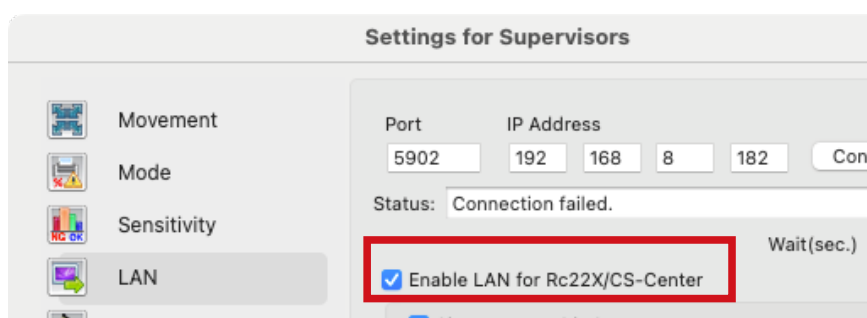
[Input a default as a Lot number when the field is blank] is enabled on [Plus] - [Input Lot Number with File Open]. (Refer to 13-3 [Setting for Supervisor] - [Plus])

Entered Lot Number will be registered on the inspection program and [Edit Recent Files].

The lot number of the inspection program will not be registered until the file is saved. If you enter a lot number and close the inspection program without saving it, the lot number will be registered only in [Edit Recent Files]. When [Input Lot Number with File Open] is enabled and a file is opened from [Edit Recent Files], the registered lot number will be displayed in the lot number entry field (Screen 3).
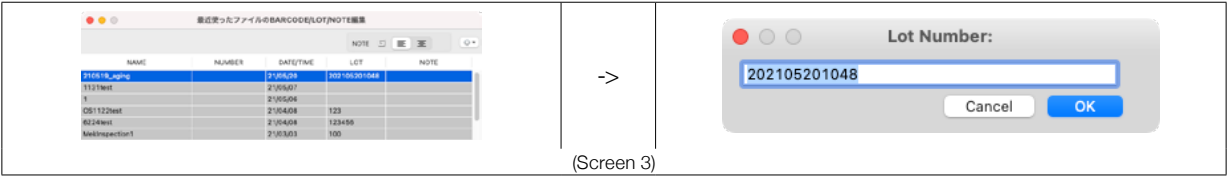
(Screen 3)

Other ways to display the lot number edit screen are as below;

- Shortcut: Command + E

- Tick **Imput Lot Number with File Open** on **Settings for Supervisors**

- Click the Lot Number display area on the upper right of the screen (Screen 4)
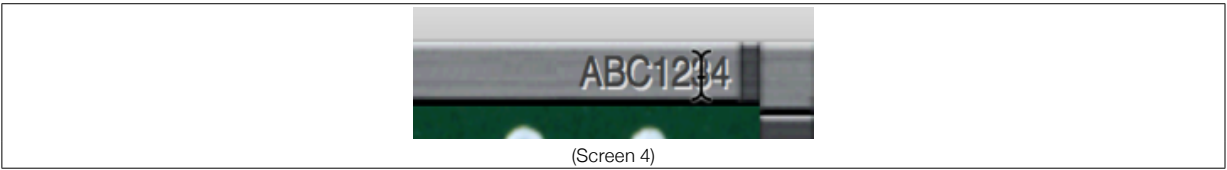
(Screen 4)

[Inspection information and the Authorization]

The inspection information screen operates differently depending on the protect mode.

In [Supervisor mode], the inspection information can be initialized with the Reset button. In [Operator Mode], the Inspection Information screen cannot be opened or closed directly. Open the inspection information screen in [Supervisor mode] or [Programmer mode], then switch to [Operator mode].

▼ Zoom Menu
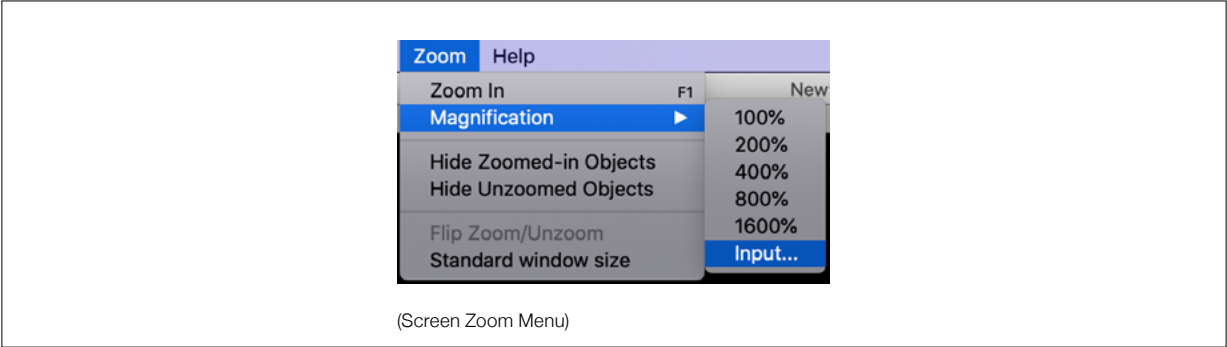
(Screen Zoom Menu)

Menu	Description
Zoom In	The Zoom mode can be switched between standard magnification and 2x magnification here.
Magnification	Changes magnification of the Work Area. It only affects the enlargement of the screen and does not affect the unzoom/zoom of the inspection frame.
Hide Zoomed-in Objects	Frames set with zoomed-In mode can be temporarily hidden.
Hide Unzoomed Objects	Frames set with standard mode can be temporarily hidden.
Flip Zoom/ Unzoom	The selected Inspection Frames will be changed to other mode. Standard mode will change to zoomed mode, and 2x mode will change to Standard mode.

14-2 Shortcut Key List

File Operation

Item	Operation
New	Command + N
Open	Command + O
Save	Command + S
Print	Command + P
Quit	Command + Q

Frame Operation

Item	Select	Make Frame	Free Movement	Cursor	Operation
Undo	√	√	√		Command + Z
Cut	√	√	√		Command + X
Copy	√	√	√		Command + C
Paste	√	√	√		Command + V
Select All	√	√	√		Command + A
Row Copy	√	√	√		Command + D
Automatic Stamp Paste	√	√			Command + G
Edit Lot Number	√	√			Command + E
Rotate Right	√	√	√	Select Frame	Command + R
Pack	√	√			Command + K
Edit Pack Position	√	√			Shift + Return
Histogram	√	√			Command + F
Rotate Left	√	√	√	Select Frame	Command + L
Rotate Right	√	√	√	Select Frame	Command + R
Move frame by pixel	√	√	√	Select Frame	Command + ←↑→↓
Move camera by pixel	√		√		Command + shift + ←↑→↓
Copy	√	√		+	Option + drag
Copy (X, Y directions only)	√	√		+	Option + drag + shift
Move Frame (Update Master Picture)	√	√		+	drag
Move Frame (Maintain Master Picture)	√	√		+	Command + drag
Change Frame Size	√	√		↘	drag
Rotate + Update Master Picture	√	√		↘	Option + drag
Rotate Frame by 45 degrees	√	√		↘	Option + Shift + drag
Set Search Range	√	√		✕	Control + drag
Set Offset Limit	√	√		↘	Command + drag
Save New Stamp with master pic.	√	√		Select Frame	F3
Add Master Picture	√	√		Select Frame	F7
Open Filter Setting	√	√		Select Frame	return (enter)
Change Stamp Name (Update stamp)	√	√		Select Frame	F2 (work to update stamp if golden stamp displayed)

Item	Select	Make Frame	Free Movement	Cursor	Operation
Offset All (all cells)		√			Command + Option + drag
Offset Selected Cells		√			Option + drag
Cell Optimization (Pitch area)	√				Control + click
Cell Optimization (drag by Control)	√				Control + drag
Hide frames temporarily	√	√	√		caps lock
Optimize selected Frame position	√	√	√		F4
Optimize position within cell	√	√	√		F9
Optimize cell import position within screen	√	√	√		F10

Operation

Item	Location	Operation
Zoom In/Out		F1
To Previous Position (_)		F5
To Next Position (_)		F6
Select Pointer Tool		1
Select Frame Tool		2
Select Move Tool		3
Force Flip A/B Side		Option + A/B Side Button (A/B)
Find Origin		Option + Eject
Output Map View to File	Map View	Close + Command + Shift
Re-create New Map View	Map View	Command + N
Output Filter Setting Screen to File	Filter Setting Screen	Stop + Command + Shift
Linear Encoder Setting	Message Column	Display Window + Option
Blend Snapshot Screen		Command + B
Stamp DB		Command + F11
Auto Add False Report Picture		Option + Start
Show/Hide in G/NG Confirmation Mode		Space key
Extra setting in G/NG Confirmation Mode		Option + Clock Icon
Add picture in G/NG Confirmation Mode		Shift + Good
Manually Enter Barcode Number		Space key
Show/Hide Stamp List		F8

Errors

Typical error messages are listed here. When there are OK/Cancel buttons in the dialog box, make your selection then take actions to fix the error based on the information below:

General

Message	Action
Cannot be completed because dots/cm value not defined	This message is displayed when dots per cm is not set up. Confirm Settings for Supervisor.
Imported data file incompatible.	This message is displayed when you try to import an unsupported format's NC data. Confirm that the data is Panaformat compatible.
Size is too small.	This message is displayed when the Inspection Frame size is too small. To create a small frame, uncheck **Warning frame Size** in **General Setting**.
Size is too large.	This message is displayed when the Inspection Frame size is too large. To create a large frame, uncheck **Warning frame Size** in **General Setting**.
Movement finished unsuccessfully.	This message is displayed when the camera movement could not be completed within the allotted time. The inspection machine may have been powered off, or the communication cable may have become loose.
Position beyond movement limits (Correct position within limits)	This message is displayed when Stamps are placed outside the inspection area. Delete those Stamps.
Attempt to copy beyond movement limits. Copying stopped.	This message is displayed when Stamps are copied outside the inspection area. The Stamp copy location may be too far away or there may be too many copies to be made.
There was an object that can not be distributed to a part.	This message is displayed when some areas can not optimized by Cell Optimization after NC data (Numerical Control Data) import.
No ID reply from controller.	This message is displayed when the PC cannot receive data from the machine due to the inspection machine being powered off during Inspection Software startup, or because the communication cable is disconnected. Check the power switch and communication cables.
When rotating, frames go out of the cell (screen).	This message is displayed when the Inspection Frame does not fit inside the Work Area after being rotated. Confirm the position of the Inspection Frames.
Not all positions assigned to a frame. Run again to complete.	This message is displayed when Cell Optimization is executed but not all of the Stamps are allocated coordinates. Allocate all Stamps before executing Cell Optimization.

Message	Action
Cannot store more than 25 Master Pictures.	This message is displayed when you try to add 25 or more Master Pictures to a Stamp. Delete unnecessary Master Pictures before adding new pictures.
Map View has not been created.	This message is displayed when you try to display the Map View when no Map View has been created. Create a Map View first.
Cannot copy to the same position.	This message is displayed if the Pitch for Duplicate is set to 0 when copying Inspection Frames. Make sure that the pitch is appropriate.
Side Marker already defined.	This message is displayed when you try to create multiple Side Recognition Markers. Delete old markers before creating new Side Recognition Markers.
Parameter for distortion is inappropriate.	This message is displayed when the value for correcting distortion, "**Top left carrier fiducial**" or "**Carrier fiducial distance**" is inappropriate. Confirm these values in **Settings for Supervisor**.
Frame too close to the edge of the cell (screen)	This message is displayed when you try to place an Inspection Frame at the edge of the screen. Make sure that the object is displayed near the center of the screen before placing the Inspection Frame.
There is no data for side A (B).	This message is displayed when sides are switched while only one side contains data.
There is no discrimination between side A(B).	This message is displayed when Side Recognition Markers have not been set up. To execute automatic recognition, set up side recognition markers first.
Cannot recognize board side	This message is displayed when side marker Recognition fails. Set the Side Recognition Markers in a more easily recognizable location or readjust the filter settings.

Marker Errors

Message	Action
Marker is not adjusted. Select marker and adjust B&W.	This message is displayed if binarisation level adjustment for markers is not performed. Double-click on the marker Inspection Frame and adjust the binarisation level of the object.
Size is too small. Redefine.	This message is displayed if the Fiducial Mark size is too small to perform center measurement after binarisation. If the center cannot be measured even after binarisation is adjusted, position cannot be corrected with that Fiducial Mark.
Size is too large. Redefine.	This message is displayed if the Fiducial Mark size is too large to perform center measurement after binarisation. If center cannot be measured even after binarisation, position cannot be corrected with that Fiducial Mark.
Main and Sub Marker both defined. Delete before creating a new one.	This message is displayed when you try to create a new Fiducial Mark after the Fiducial Mark has already been set up. Delete the old Fiducial Mark before creating a new Fiducial Mark.

Message	Action
Failed to find marker.	This message is displayed when there is no Fiducial Point to be found, or when binarisation and other adjustments are made inappropriately. Confirm the Fiducial Points position and double-click on the Fiducial Reading Frame to readjust the binarisation level.

Warning Query Dialog

Message	Action
Local picture(s) not stored. Continue copy?	This message is displayed when you try to copy the Frame even if there is no Master Picture contained in the Frame.Register Master Picture from a good PCB before copying.
Create Map	This message is displayed when the **Eyeglass Button** is clicked after Inspection Data has been created. Click **OK** to create the Map View Picture.
Save changes to the data before quitting?	This message is displayed when you try to close the inspection software without saving the program. Click Save to save the program.
Erase logged data? Cannot undo this operation.	This message is displayed when **Edit > Initialize > Delete Log Data** is selected. Since this operation cannot be undone, be careful when selecting OK/Cancel.
Erase all local Master Pictures? Cannot undo this operation	This message is displayed when **Edit > Initialize > Clear Local Master Pictures** is selected. Since this operation cannot be undone, be careful when selecting **OK/Cancel**.
Erase all objects? Cannot undo this operation	This message is displayed when **Edit > Initialize > Clear Objects** is selected. Since this operation cannot be undone, be careful when selecting **OK/Cancel**.
Mechanical calibration values renewed. Existing value will be lost.	This message is displayed when **Settings > Machine Setup > Mechanical Calibration > Update** is selected. When Mechanical Calibration has already been executed once, this does not need to be updated unless you move the machine.
Execute new mechanical calibration. Caution: Older data may need some adjustments.	This message is displayed when **Settings > Machine Setup > Mechanical Calibration > New** is selected. When Mechanical Calibration has already been executed once, you do not need to execute this function unless you need to create new, machine specific, preference data.
Ignore Marker and continue?	This message is displayed when Fiducial Mark Recognition fails. You can ignore and continue or manually adjust the position, but we recommend that you go back and readjust the Fiducial Mark settings.
Move to calibration position?	This message is displayed when **Calibrate** is selected from the **Settings** menu. Click **OK** to move the camera to the calibration position.
Move to measure position?	This message is displayed when **Calibrate Pixel/cm** is selected from the **Settings** menu. Click **OK** to move the camera to the scale position.
Pictures with NG results will be added automatically.	This message is displayed when inspection is executed while holding down the **Option key**. This message notifies you that the mode is currently set to automatically import the Master Picture from an Inspection Frame that will give false reports.

Macintosh to AOI connection

Message	Action
No.2000-0000 **Not responding or hot replug**	Communication with the camera is lost. If the following measures do not restore the communication, please contact your distributor. - Turn off the power to the PC and the equipment, and after 10 seconds, turn on the power to the equipment and then to the PC. - Turn off the PC and the equipment, unplug and plug the cables between the PC and the equipment, and then turn on the equipment and the PC in that order.
No.2001-0000 **Driver not installed or Grab card can't recognized.**	This message is displayed when the software and hardware for video capture are not functioning properly. The image cannot be displayed when this occurs. Make sure the following; - The machine switch is turned on. - Cables between the machine and PC are connected properly. - Video capture boards and driver software are installed properly. Video will not work properly if have an incompatible combination of capture board, video camera and driver softwares. If you are unsure of your configuration, please contact your sales agent or the manufacturer.
No.2002-0000 **Can't VideoInitialize**	Communication with the camera is lost. If the following measures do not restore the communication, please contact your distributor. - The machine switch is turned on. - Cables between the machine and PC are connected properly. - Video capture boards and driver software are installed properly. Video will not work properly if have an incompatible combination of capture board, video camera and driver softwares. If you are unsure of your configuration, please contact your sales agent or the manufacturer.
No.2003-0000 **Can't Open 232C**	This message is displayed when serial communication with the device is not possible. Please check the following: - The machine switch is turned on. - USB3 - USB-C Cable between the machine and PC are connected properly.

Machine Setup

Message	Action
Received a message of an unidentified error.	This is an error that has no specific error messages. This may be displayed when the inspection machine is turned ON/ OFF while the inspection software is running. If this message is displayed frequently in other circumstances, please contact the manufacturer.
A system error occurred in movement control device.	This is a system error in the internal controller board of the inspection machine. If this message is displayed frequently, please contact the manufacturer.
A command error occurred in movement control device.	This is a command error in the internal controller board of the inspection machine. If this message is displayed frequently, please contact the manufacturer.
Movement parameter error.	This is a parameter error in the internal controller of the inspection machine. If this message is displayed frequently, please contact the manufacturer.
Must set Origin Position. Continue?	This message is displayed when you try to move the position before setting the Origin Position, or when you try to move the position after activating emergency stop or the security system. Press the Origin Position button to set the Origin Position.

Message	Action
Servo error	This message is displayed when the motor RPM is slower than the preset value. This may happen when the upper camera hits an obstacle while moving, or when dust on moving parts has caused motor problems. This message will also be displayed when operating power for the motor is insufficient due to reduced power voltage or for other reasons. Pay attention if the unit is plugged into an extension cord with multiple outlets.
Movement attempt beyond minimum X value.	This message is displayed when the PC sends an instruction to move in the negative direction on the X axis from the origin position (a position that is physically impossible to move to). This will not generally happen with regular data creation, but you will need to be careful when data is created from imported NC data. When this error is displayed, please confirm the Frames Position.
Movement attempt beyond minimum Y value.	This message is displayed when the PC sends an instruction to move in the negative direction on the Y axis from the origin position (a position that is physically impossible to move to). This should not happen with regular data creation, but you will need to be careful when data is created from imported NC data. When this error is displayed, please confirm the Frames Position.
Movement attempt beyond maximum X value.	This message is displayed when the PC sends an instruction to move beyond the movement limit in the X axis direction from the origin position (a position that is physically impossible to move to). This should not happen with regular data creation, but you will need to be careful when data is created from imported NC data or when transferring data from a large inspection machine. When this error is displayed, please confirm the Inspection Frame position. In addition, this error may be displayed if the value for **Maximum Movement** has been changed in **Settings for Supervisor**. In this case, please confirm the **Maximum Movement settings**.
Movement attempt beyond maximum Y value.	This message is displayed when the PC sends an instruction to move beyond the movement limit in the X axis direction from the origin position (a position that is physically impossible to move to). This should not happen with regular data creation, but you will need to be careful when data is created from imported NC data or when transferring data from a large inspection machine. When this error is displayed, please confirm the Inspection Frame position. In addition, this error may be displayed if the value for **Maximum Movement** value has been changed in **Settings for Supervisor**. In this case, please confirm the **Maximum Movement settings**.
Security system activated.	This message is displayed when front cover, door cover or Area Sensors are activated. After canceling, you will need to set the origin position. If this warning is displayed unexpectedly, check the connection of the Limit Switches on the covers.

15. Export/Print data, Handle Similar PCB by One Program

This software can export various inspection programs' information in text format.

By using these files, you will be able to check the data in a spreadsheet and easily save the results of previous tests. This Chapter explains how to export inspection data (Refer to Chapter 5 CAD Data Application Guide for import).

15-1 Exporting Data

3 kinds of information can be exported from the **Export Data** of the **File** menu or **Info File** button in the Map View window. You can select **Information output**, **Position output**, **Past out put or Stamp Information**.

▼ 15-1-1 Information Output

The data of each frame (serial number or address, Ref.des. name, number of inspections, number of defects, date created, date updated) can be selected for export. Select the delimiter (Tab or comma), sort sequence and output items in the dialog that is displayed when Information Output is selected (Screen 1).

• No.

This is the serial number assigned automatically in the order of creation (excluding Marks for side recognition and Fiducial Marks). This number changes when frames are deleted or Marks for side recognition/Fiducial Mark/CellAidStamps are added. The newly added frame will be assigned the latest number. Fiducial Marks are handled differently, with the main marker being -1, and the sub-marker -2. Marks for side recognition will be number 0.

• Map

(Screen 1)
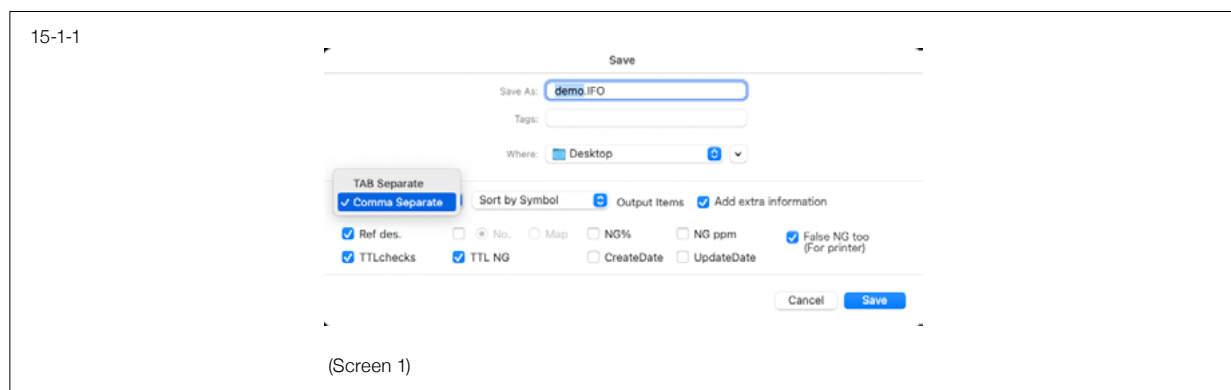
This is the Address displayed when the **Grid Button** on the top right corner of te Map View is clicked.

• Ref des.

If Ref des. names are assigned to Frames or Stamps, the Program will include Ref des. names. If Ref des. names are not assigned, this field will be left blank. If CAD Data has Ref des. names, frames will automatically have Ref des. names assigned to it.

• TTLchecks

The cumulative number of times the frame was inspected.

• TTL NG

The cumulative number of times the frame was judged as NG.

• CreateDate

The date that the frame was newly placed or copied will be entered. The format at file export will be YY/M/D.

• UpdateDate

The date that the Frame was updated, by size change, filter change, picture addition, etc.

• False NG too (For printer)

Print False NG points in addition to NG points on paper roll printer.

• Add extra information

Stamp name is also output. If there is pack stamp, the list and number of stamp contained in pack stamp is output. If there is stamp which original frame type is set, type name and error messages are listed.

■ **Export Format**

The file to be exported will have the name of the inspection program and the date of export in line 1, column headers in line 2, and details from line 3 onward.

(Ex.)

 newest / PCB TTL3/NG1 POINT TTL228/NG83 [06.11.2 4:52 AM]

SYM,% ,ppm,TTL,NG,Begin,Modify

,0.00,0,2,0,06/10/19,06/10/19

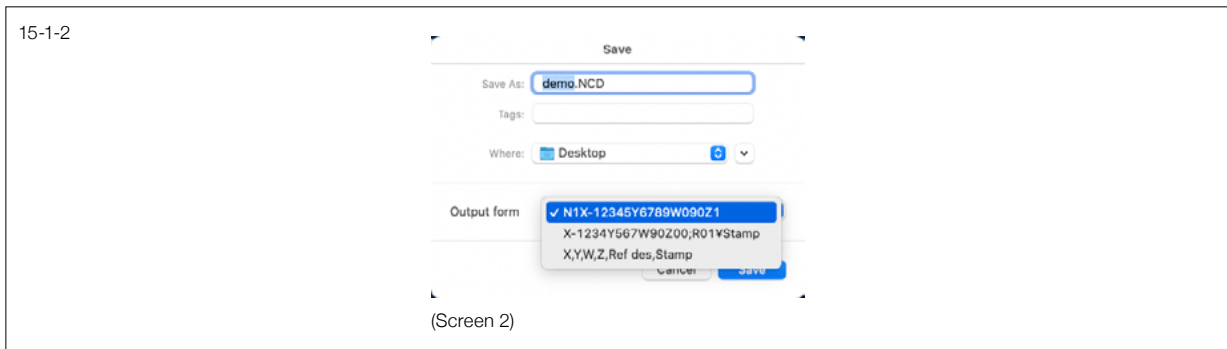,0.00,0,3,0,06/10/18,06/10/18

▼ **15-1-2 Position output**

This exports the coordinates of Inspection Frames as NC Data.

The output format will be available in 3 types from the pull-down menu (Screen 1):

Pana format (N1X-12345Y6789W090Z1)

22X Data Format (X-1234Y567W90Z00;R01 \Stamp)

CSV (Comma Separated Values) Format (X,Y,W,Z,Ref des,Stamp)

15-1-2

(Screen 2)

The opening line of the output format will be $, data will start from line 2, and the last line will be * (except CSV format, CSV format has no head line and end line). 22X Data Format and CSV format can be re-imported to 22X without editing as CAD data.

Data is sorted by stamp number, which is automatically set by this software. The coordinates start from the front left of the PCB and increase towards the back right corner, with the position units being fixed decimal points in 1/100mm increments. The position shows the center of the Frame.

(Ex.)
$
N1X-38189Y12378W000Z-1
N2X-37700Y11838W000Z0
....
....
*

■ **Note:**

1. If the ratio of actual dimensions and the displayed image (pixels per 1cm) is not accurate, the accuracy of the positioning in the exported file will be low.
2. The further away from the center position of the Work Area, the lower accuracy of position information will be.
3. There can be around a 0.1mm error, though it depends on the frame positioning accuracy.

▼ **15-1-3 Past out put**

The Inspection history can be exported for each Inspection Frame. The Export format will be tab separated. Rows (horizontal) will have Ref. des. names (these will be left blank if there are no Ref. des. names) sorted in descending order of total NGs, and columns (Vertical) will have the number of inspections displayed in descending order. OKs will be 0 and NGs will be 1.

15.Export/Print Data

▼ 15-1-4 Stamp information

When you select Stamp Information, the **Stamp information Window** will be displayed in list format (Screen 1).

■ Format of Stamp information

When Stamp information is selected, the **Stamp information Window** will appear.

Detailed information and the settings ranges are as follows:

Item	Contents	Type
name	Stamp Name	Text
type	Type of frame	Text (rect,oval,poly……)
zoom	Zoom property	Numeric (0=noZoom , 1=zoom)
group	Group ID	Numeric (0=no group)
sizeX	Horizontal Size	Numeric (Pixels)
sizeY	Vertical Size	Numeric (Pixels)
pics	Number of master pictures	Numeric (0=non, 1-24)
percent	Special %	Numeric (0 – 100)
resolution	Grid	Numeric (4 – 16 , 0= ∞)
lightness	Brightness	Numeric (-16 - 15)
contrast	Contrast	Numeric (-16 – 15 , 15=black and White)
hue	Hue	Numeric (-16 – 15 , -16=invalue hue)
saturation	Saturation	Numeric (-16 – 15 , -16=invalue saturation)
blur type	Blur Type	Numeric (0=Full , 1=horizontal , 2=vertical , 3=side side)
blur level	Blur Level	Numeric (0 - 4096)
edge	Edge	Numeric (0=off , 1=on
letter	Extract text	Numeric (0=off , 1=on)
NgIsOk	Judge NG as OK	Numeric (0=off , 1=on)
seek	Seeking range	Numeric (0-255< Pixels>)
findX	Seeking range X	Numeric (0-255< Pixels>)
findY	Seeking range Y	Numeric (0-255< Pixels>)
limitLong	Offset limit X	Numeric (0-255< Pixels>)
limitShort	Offset limit Y	Numeric (0-255< Pixels>)
fillet	Fillet	Numeric (1=Wave type)
waveLevel	Fillet waves	Numeric (1 – 3)
waveVolume	Fillet volume	Numeric (1 – 3)
waveDir.	Fillet direction	Text
cameraNo	Special camera setting	Numeric (0=non , 1 – 8)

■ Sort

Stamps can be sorted by item. Place the mouse pointer on the item that you would like to sort and hold down on the mouse button to select descending order or ascending order (Screen 2).

(Screen 1)   (Screen 2)

▼ 15-1-5 Stamp Information Export

Stamp information can be exported as text data. By using the exported data, Stamp Information can be managed offline. Click Export in the **Stamp information Window**. A comma separated (CSV format) file will be saved.

■ Format of Exported File

The output file will have headers in line 1, item names in line 2, data starting from line 3, and the terminal symbol at the last line.
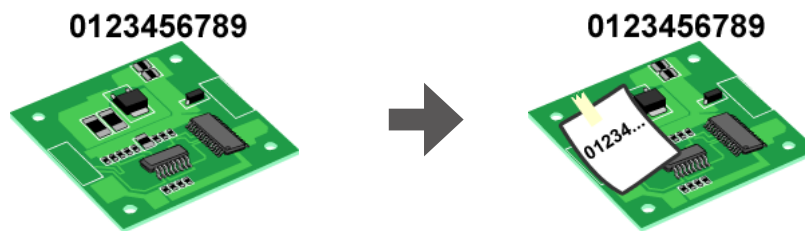
(Ex.)
 % STAMP_INFO_HEADER x.x
name,type……cameraNo
1005B,rect.,1,,28,50,1,60,10,0,0,0,-10,3,1,0,0,0,5,,,,,,,,,
....
% END_OF_STAMP_INFO

15-2

15-2 Print information by roll paper printer

If you use roll paper printer for AOI, you can print NG inspection points automatically soon after inspection.

Printed paper may be useful to confirm or repair NG points afterwards.

If you PCB has no barcode, 10 digit number is automatically given to each inspection result.

■ Applicable printer

Star Micronics TSP143GT (width 79.5mm, enable to print 2 byte character) USB communication.

Star Micronics TSP143GTIII (width 79.5mm, enable to print 2 byte character) USB communication.

* Star Micronics printer cannot be used on MacOS 10.14.

■ USB Printer Settings

1. Install printer driver for Mac from attached CD-ROM.

2. Connect power cable and USB cable to the printer. Connect the other side of USB cable to Mac's USB port. Power on the printer.

3. Start 22X software, select file menu then Print set (Screen 1). Change from Any printer to TSP*** in Format for setting (Screen 2), change Paper size from A4 to 72mm*20000mm (Screen 3).

4. If other printer is already used on this Mac, change default printer in Printer and Fax menu in System Preferences.

* The advantage of this USB printer is that this can print with Italic-bold if there is defective Pack Stamp component which contains more than one defect.

15-2

(Screen 1)   (Screen 2)   (Screen 3)
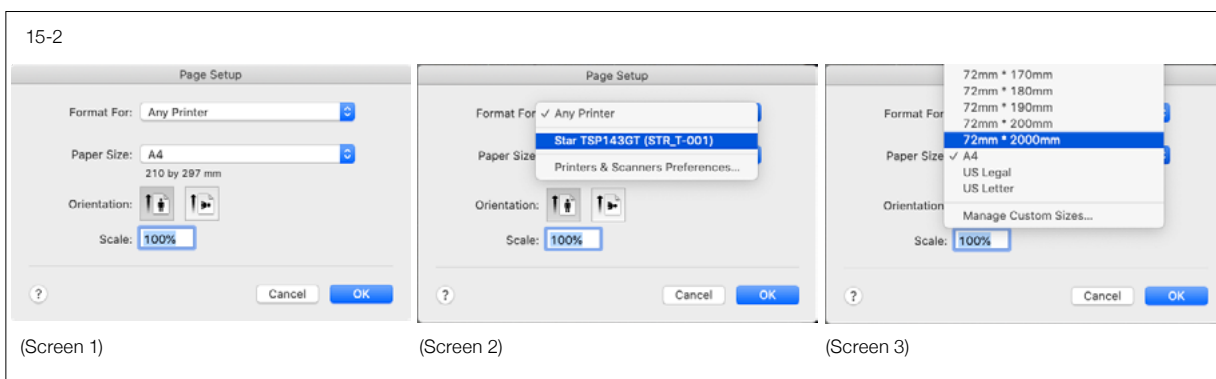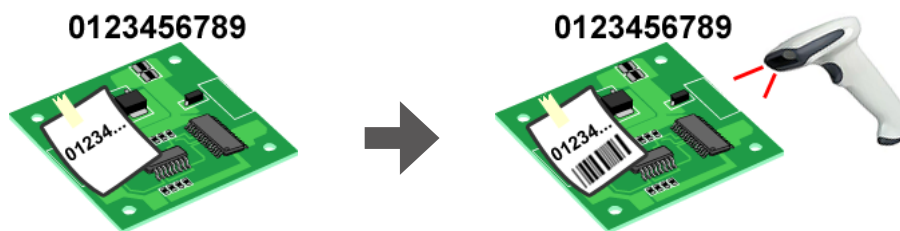
■ 22X Application Settings

1. Open Setting menu's For Supervisor, select Screen/Print tab, check on roll paper and set max. print.

2. To set auto-print, open Setting menu's General, check "Auto printing" on. If you print manually, select Print in File menu. When previewing, select Preview in File menu.

3. Set information to print. Select Information Output from Export Data in File menu. Or open Map View and select Information Output from File menu. File saving dialogue pops up. Check items on and quit this dialogue by Cancel. Please refer chapter 13-1 for details of each item.

■ Print False NG

You can also print out false defect points too by option. Activate this in case you want to check PCB after AOI inspection and human judgement if there is no mis-judgement.

Check on False NG too (For printer) option in Settings step 7. False NG point is marked ? on the head.

■ Print barcode number as scannable barcode on roll paper

By installing barcode font in Mac, code39 type of barcode can be printed on roll paper.Please contact your local reseller to get the font.

* This function is only for USB roll paper printer by STAR micronics. Mac OS must be greater than 10.7 to use barcode font.

■ Printing format

General inspection information is written on header, NG (and False NG) points follows.

```
M22XDL-350
 MacPro
TEST [ 2008.8.1 10:33:41 ]
Total PCBs checked[35] block<0> (Thomas)
Total NG PCBs [3] block<0>
Current result (check 455 NG 2/3) Spent time 11

BarNum 1234567890

SYM ADRS TTL NG Begin NG_ID
C3   B 02  35  4   06/04/25 3
?C5  B 05  35  1   06/04/25 -
R41  C 01  35  2   06/04/25 0
```
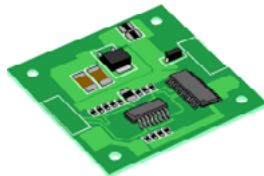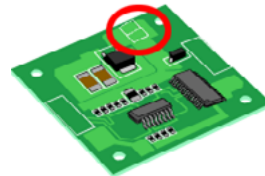
| PCB: Model A | PCB: Model B (not mounted) |

15-3 Handling Similar PCB by One Inspection Program

Some of you may handle PCBs which are almost the same but a few components are 'not mounted' or 'different components are mounted'. You can manage these PCB by one inspection program with Model Variation function. Model Variation function is like link files to the inspection program and you define the difference of each PCB in these link files (named variation files).

▼ 15-3-1 How to create Variation Files

1. Create an inspection program to be a basis of all similar PCBs. What you do in variation files is to define "**Inspection skipped component(s)**". Therefore all necessary stamps must be located in this inspection program.

 * Of course you can add stamps later at any timing. It is OK not to locate stamps for all kind of PCB now.

2. Next, create variation files. Select Model Variation from File menu. Select Create/Edit Variation File (Screen 1). A window "Welcome to Model Variation menu!" will be displayed. Create the first variation file by following the description and click OK (Screen 2).
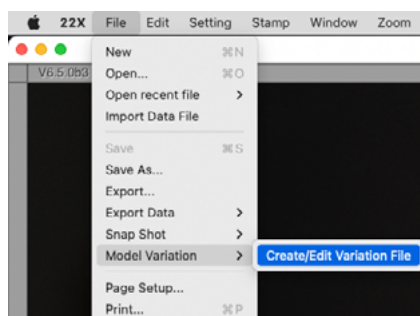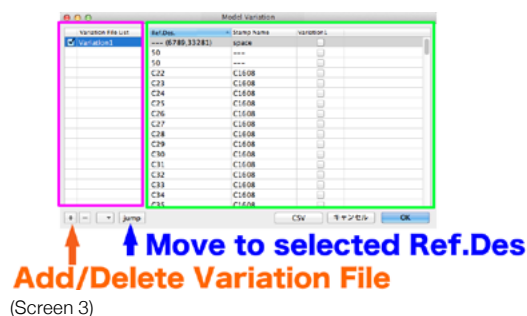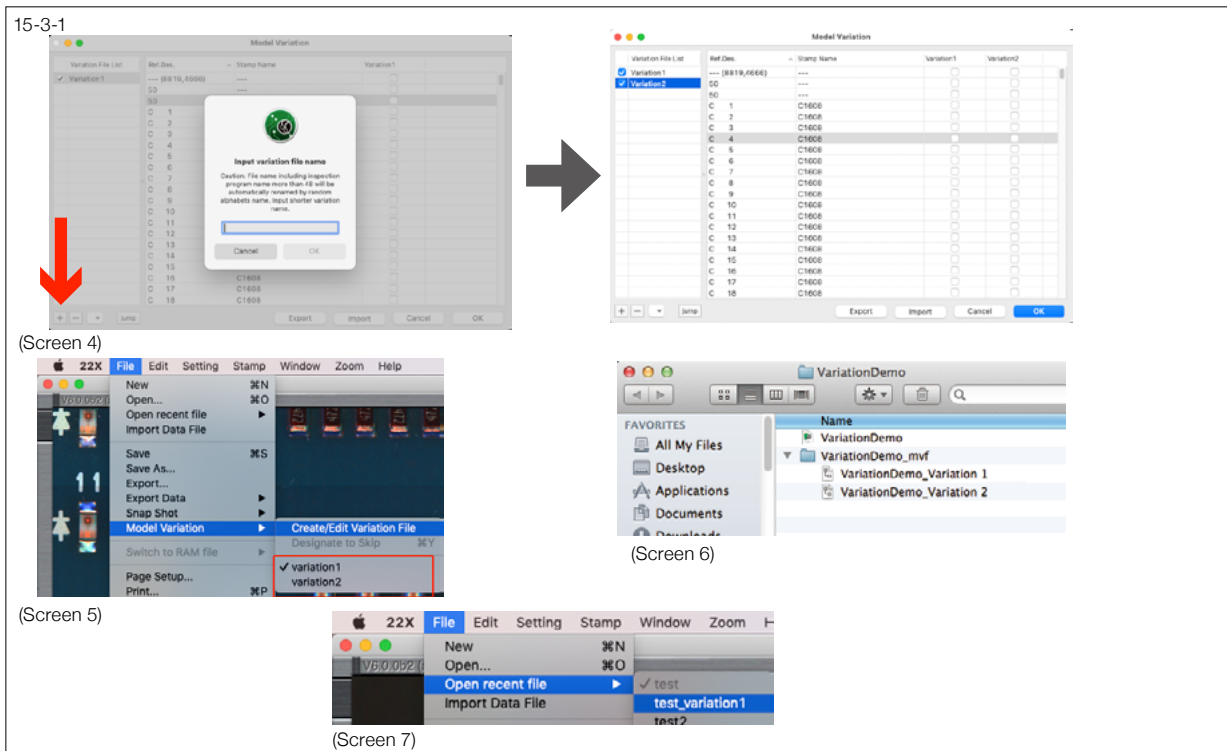

(Screen 1)

(Screen 2)

(Screen 3)

Move to selected Ref.Des

Add/Delete Variation File

15-3-1

(Screen 4)

(Screen 5)

(Screen 6)

(Screen 7)

3. Model Variation window will be displayed (Screen 3). The left side is **Variation File list**, and the right side is the **Reference Designator list**. You can designate the skipped location, however now we are on the way to create variation files, so we move to next operation. Please read the following pages to learn how to skip.

* Maximum 400 variation files are possible to create.

4. The second and more variation files can be added by + button (Screen 4).

5. Press OK button and close the window. You can open variations from Model Variation in File menu (Screen 5).

6. Variation files are saved in the folder which is automatically created at the same directory as inspection program. Do not move/delete/change name the variation files from Finder (Screen 6).

7. The variation file is virtually treated as an inspection program. File name is displayed "**Inspection Program name _ Variation File name**". The variation file opened once can be opened by "Open recent file" from next time (Screen 7).

* The inspection file name sent to Production Management Software (Rc22X or CS-Center), is also "Inspection Program name _ Variation File name".

8. After editing variation file, you will be asked to save the file. The file name being confirmed here is **Inspection Program name**, not variation name. Please save file.

▼ 15-3-2 Designate to skip

You can designate the stamps to skip in 2 ways.

Stamp Direct Operation

1. Open variation file. Move to the stamp to be skipped.
2. Select the stamp by mouse.
3. Select "**Designate to skip**" from Model Variation. The skip mark is displayed on the stamp frame, and the frame will be skipped from inspection (Screen 1).
4. There is shortcut key "**command + y**" to do the same operation.
5. Skip can be reset by "**Revert**" from Model Variation.

Designate in Model Variation window

1. Open Model Variation window.
2. Check on the variation file name on left list (Screen 2).

 * You can select all variation files by Check on All from pull-down at bottom left.

3. Check boxes for all Reference Designators will be shown on right. Check on the Reference Designators which you want to skip the inspection (Screen 2).
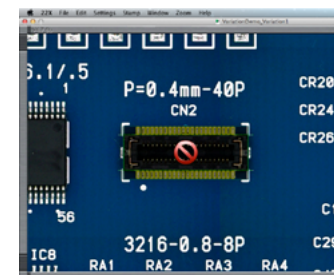4. As same as Stamp Direct Operation, the stamp will be designated to be skipped (Screen 3).
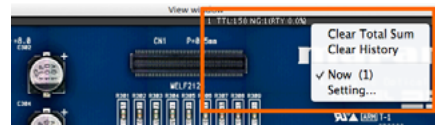

15-3-2

(Screen 1)
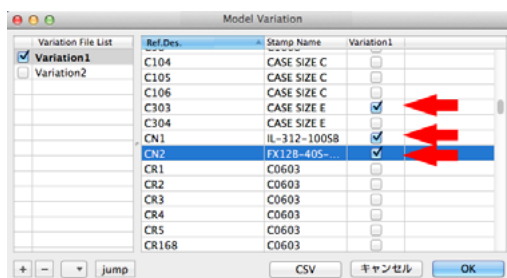
(Screen 2)

(Screen 3)

15.Export/Print Data

15-3-3

(Screen 1)

(Screen 2)

▼ **15-3-3 Information that you can define in Variation Files**

Even the PCBs are quite similar, there are some informations must be independent from the others. In variation file, you can define below informations individually:

- PCB Number (barcode to open program) / LOT / NOTE [In Recently used programs]
- Inspection history [in Map View]

* It is not possible to have Map View or Virtual PCB map in variation file.

▼ **15-3-4 Export skip setting in CSV file**

You can export the skip setting to CSV file.

1. Open Model Variation window.

2. Check on the variation file name on left list.

3. Press Export button at bottom. CSV file will be output.

4. In CSV file, 0 represents Skip and 1 represents Not Skip.

* Only the Variation you had checked in Variation list will be exported.

▼ 15-3-5 Import skip setting in CSV file

You can import the setting contents of Model Variation which is edited by external editor.

1. Open Model Variation window.

2. Click "Import" button in bottom screen, and select the file (.csv) which you want to import.

3. File contents will be imported to the setting window of Model Variation.

4. Setting will be applied when clicking "OK".

* All setting will be overwrote and displayed after import. If you want to keep the setting, please export the file previously, and create the file for restoration.

* This function is available from V4.9.6r2 or greater. CSV file which is created with prior version cannot be imported.

## ▼ 15-3-6 Practical Application

Model Variation is a function to designate the components to skip from inspection. However, you can apply Model Variation to PCB on which "different component" is mounted.

On below example PCBs, the capacitors of different capacity are mounted. In such case, create inspection program based on PCB A. Then paste the stamp for PCB C's capacitors: overlap stamp for grey capacitor onto stamp for brown capacitor. (Below example image is slightly not overlapping, but it is for easier to understand. Actually, you should paste stamp C exactly on stamp A.)

After pasting stamps overlapped, it is difficult to designate to skip by direct operation. It is better to designate from Model Variation window by check box.

15-3-6
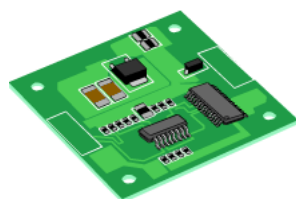
PCB: Model A
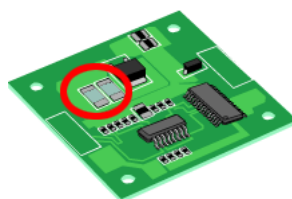
PCB: Model C
(Different components mounted)

Paste stamp C
on stamp A

▼ 15-3-7 Limitations

* Model Variation is a function to define stamps to skip. Therefore, if you delete/add stamps in variation file, it is reflected to the inspection program. By same reason, the file name to be displayed to confirm the file save, is also the inspection program name (not variation file name.)

* This function is not possible to use if "Save all files at quitting (Enable RAM) is active.

* Saving inspection program as different name will duplicate variation files too.

* Variation file will be swaped also when executing A/B side sswap, however model variation will not copied when executing Copy this side.

* Please be careful that Model Variation will be saved automatically. For the detail please refer to "Save" menu in Chapter 14 "Menu and Shortcut List".

16. Special Stamps and Functions

Some Stamps are called Special Stamps, and have special features. Special Stamps are displayed in outline type in the Stamp list. Special Stamps are included in Installer named as StampLibVxxx.

### Activate/Deactivate "Use Master Picture"

Normal stamps (pattern matching or histogram) always uses master pictures. Only stamp in Stamp List has master pictures and the stamps pasted in Work Area are referring the master pictuers.

But there is an exception. Some special stamps (BlockMark, PanelBlockMark, TagetFrame, CellAid, NewCellAid, Doughnut, SlitWidth, Scratch, AngleCheck, KadoSta) can deactivate "Use Master Picture", and also is possible to activate. The default condition is deactive, because often these stamps are better not to use master pictures. When "Use Master Picture" is deactive, each stamp pasted in Work Area has individual master pictures.

To switch active/deactive "Use Master Picture", please click the small picture in Stamp List. When the picture is fine, "Use Master Picture" is active. When the picture is blur, "Use Master Picture" is deactive.

16-1 CellAidStamp for Location Correction

(Since NewCellAid Stamp was introduced, CellAidStamp is now less used.) The fundamental concept of PCB inspection is to compare the PCB with the Master PCB, but when the comparison sensitivity is too high, slight warping or misalignments may be judged as NG. Therefore, this program has a special Stamp called the CellAidStamp. When this Stamp is used, the characteristic points within the PCB are found first, and the overall inspection screen (Cell) position will be given offset, then the inspection will start. With this Stamp, PWBs (Printed Wired Board) can be inspected efficiently in one Inspection Program.
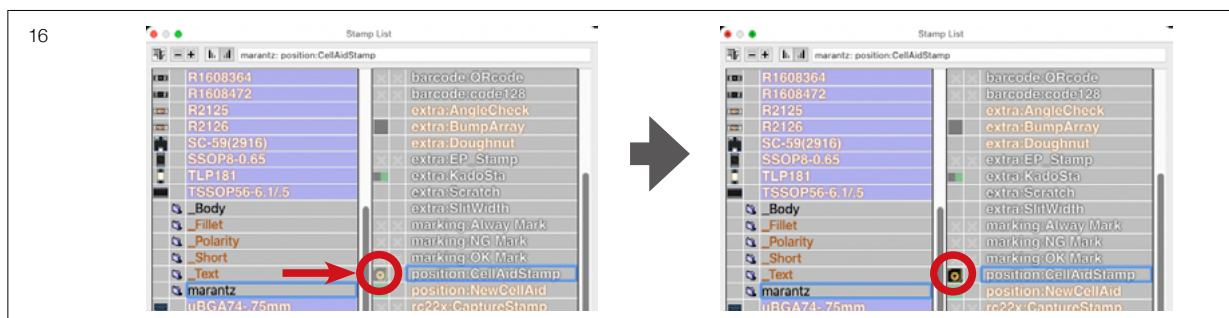
16-1-1
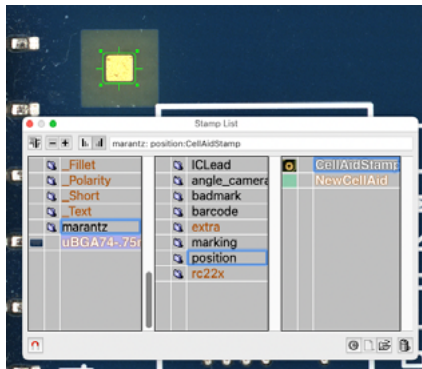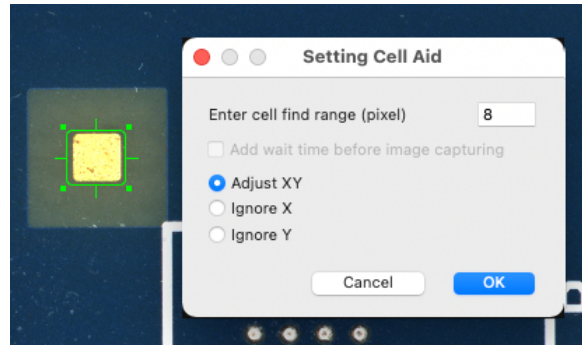
(Screen 1)   (Screen 2)

* CellAidStamp is used to adjust the offset by Cell units (in order to adjust the offset of the entire PCB, use NewCellAidStamp).

* If there is a variance in light reflections, do not use this stamp because matching will not be stable.

▼ 16-1-1 Using CellAidStamps

1. Place the CellAidStamp in a place that will be the reference point of the inspection screen (Screen 1). The line surrounding the rectangle shows the range for Find. Images inside the frame will be searched for within this range and they will become the reference point to provide offset for the entire cell.

2. Double-click on the frame to open settings. The range for Find is defined by "Enter cell find range" (default value is 8 pixels).

3. For screens containing the CellAidStamp, the CellAidStamp will be verified first before inspection. The CellAidStamp searches for a picture that matches the Master Picture. The position will be corrected by taking the gap between the position of the picture found and the master's position, providing this as an offset to the frame positioned in the screen to be inspected. Offset can be made inactive in the settings screen.

The CellAidStamp has a different shape than regular Inspection Frames. The line surrounding the rectangle designates the range for Search. This area can be changed by pixels in the dialog that is displayed when you double-click on the Frame (normal value is 8 pixels) (Screen 2).

16.Special Stamps and Functions

16-2 NewCellAidStamp for Location Correction with Flexible PCBs

NewCellAidStamp is an extended version of CellAidStamp. It does not depend only on a characteristic point image like the CellAidStamp. It provides offset for the entire PCB based on the initially stored characteristics, which makes it capable of handling stability problems when setting PCBs (Screen 1). A cross mark in the center of the frame when positioning the Stamp indicates that NewCellAidStamp is in use (this will not be displayed with a CellAidStamp).

## ▼ 16-2-1 The principle of NewCellAidStamp

NewCellAidStamp executes the offset by the following procedure.

- If there is a CellAidStamp, positioning will be corrected first using the Cell Aid Stamp, then the NewCellAidStamp will be activated).
- The whole cell image is checked, and if offset is necessary, the correction amount, in pixels, is obtained.
- If it differs greatly from the original image (for example, if the PCB type is different), it will fail for position alignment.
- If the Stamp contains a characteristic point, it is possible to adjust the position only using the Stamp picture in the NewCellAidStamp. In this case, the overall image will not be used.
- Store images includes a silk screen image. In order to correct the relative misalignment amounts between the silk screen image and the pattern, further tuning will be made using Inspection Frames contained in the cell (more than 3 Inspection Frames with special characteristics and the appropriate size will be necessary). If there are no silk screen images, or this adjustment is not necessary, this process can be skipped.

To use these procedures efficiently, you may skip Fiducial Mark inspection, which may result in improved tact time, and you may get virtual zero mechanical position differences, which may result in stable inspection results.

* If large corrections are made with this Stamp, the frames located at the edge of the screen may be cut off from the offset and be judged as NG during inspection.

* This feature is screen-size dependent. Since data formats are different, there is no compatibility be-
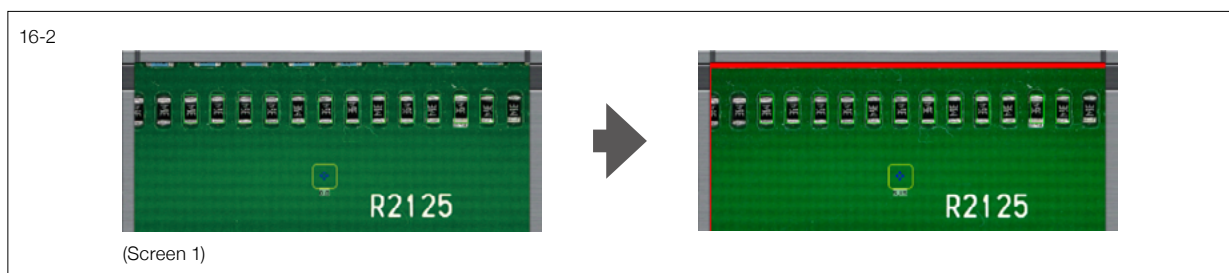
16-2

(Screen 1)

▼ 16-2-2 Use NewCellAidStamp

1. Load Stamp Library from **Open Stamp File** from the Stamp menu.

2. Place PCB to be the master. This Stamp should be positioned somewhere on a cell that does not have Fiducial Marks or Marks for side recognitions on a completed Inspection Program

When a characteristic part is surrounded by a frame, you can use this Stamp as the characteristic point (similar to the CellAidStamp) (however, when correction by Stamp is used, correction by overall image will not be executed).

3. Select the **NewCellAidStamp** Frame and double-click on it. A pop-up menu will appear, so select the appropriate menu (Screen 2).

• When Use Stamp picture is checked, correction will be made only by the characteristic points within the NewCellAidStamp frame.
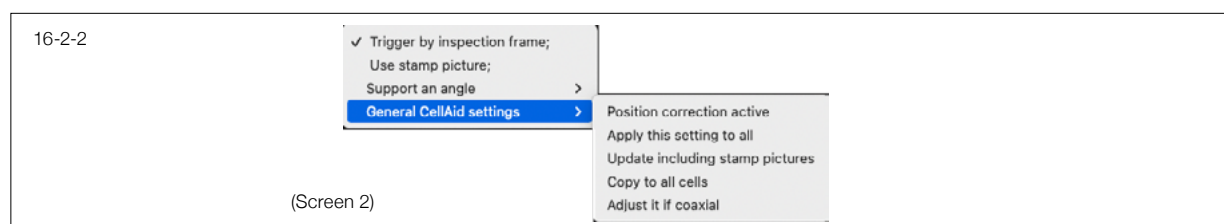
• When you activate "Correct Angle too with AngleCheck stamp", shifting of component during the inspection is corrected with X-Y direction and rotating direction. Corrected value will be shown in NweCellAid Stamp by the order of X, Y, θ after inspection. Please create the Stamp with follwing procedure before activating this function.

- Move the camera to the position which the offset center of the rotation will be placed in the center of the screen.

- Place AngleCheck Stamp, and place NewCellAid Stamp surrounding AngleCheck Stamp (Screen 3). Please use AngleCheck Stamp with no angle shifting since the image in AngleCheck Stamp is used for offset value.

- After placing, select and put check mark on "Correct Angle too with AngleCheck stamp" in the setting of NewCellAid Stamp.

• When Apply to all cells is selected, the same NewCellAidStamp Frame will be positioned to all cells

16-2-2

✓ Trigger by inspection frame;
Use stamp picture;
Support an angle >
General CellAid settings >
　　Position correction active
　　Apply this setting to all
　　Update including stamp pictures
　　Copy to all cells
　　Adjust it if coaxial

(Screen 2)

(Screen 3)
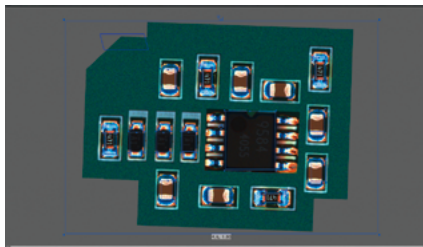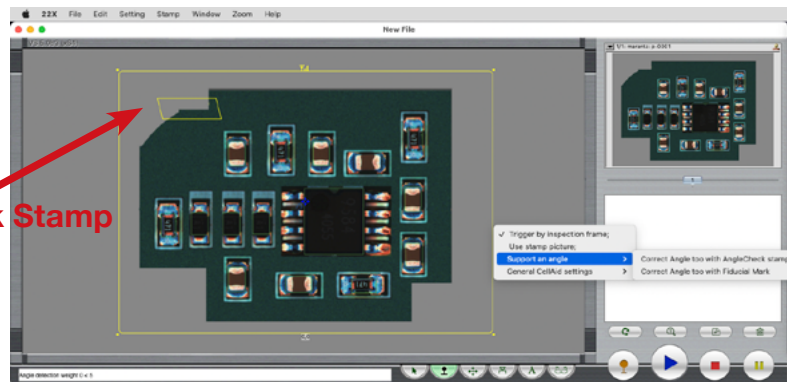
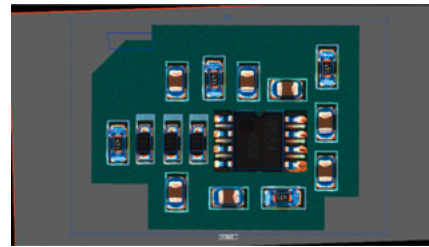**Angle Check Stamp**

Correct Angle too with AngleCheck Stamp (No correction)

Correct Angle too with AngleCheck Stamp (After correction)

except cells with CellAidStamp, Fiducial Marks and Marks for side recognition.

• Correction by positioned Inspection Frame (**Trigger by inspection frame**) and correction by Stamp picture (**Use stamp picture**) can be all set at once from **Trigger by inspection frames** and **Use stamp pictures**.

4. Press the **stop button** on the machine or on the screen, and then press the inspection start button. Characteristic Data will be extracted while inspection is being run. When **Speed Priority** is selected in the configuration, this setting will be removed temporarily, making the process extremely slow. This is because it attempts to obtain an accurate image by waiting for the machine to completely stop vibrating. The actual data creation does not take very much time.

5. During Characteristic Data extraction, an error message, "Insufficient positioning triggers required correction" may be displayed, causing the software to pause. You can ignore this and press start, but if possible, move the frame to a distinguishable place before starting. In this case, avoid silk screen areas. If overall adjustments do not work well, the picture in the Stamp will be used for recovery (this feature can be utilized effectively if Stamps are set up to include characteristic points).

6. The process is complete if inspection can be executed. Just in case, make sure that the New-CellAidStamp is placed in an appropriate position for correction.

▼ 16-2-3 Appearance

The NewCellAidStamp Frames will differ in appearance depending on the status.

Menu	Description
❶	When the center icon is gray, there is no picture stored in this frame. This is how the Frame will look when **Update including stamp picture** is selected.
❷	When the center icon is blue, the frame stores picture data. Since the picture inside of the frame is not characteristic, corrections cannot be made by the picture in the Stamp.
❸	Since the frame contains a characteristic point, an antenna icon is shown on the upper part of the frame. Correction by Stamp pictures is possible (however, turning this feature ON will disable correction by the overall picture). Even if there are characteristics, if the frame size is too small, it will be considered unstable, thus the antenna will not appear, and corrections to Stamp pictures cannot be made.
0mm	The antenna mark in the upper part of the frame designates the characteristics level. This figure is a "bad" example since it is a picture of silk screen characters, but since the picture is characteristic, the characteristic level is 3.
❹	The rounded corners indicate that **Trigger by inspection frames** is active. Normally, correction by overall characteristic detection will be sufficiently accurate, but the relative position of the silk screen image (white letters printed on the PCB) will be misaligned in many cases. By selecting **Trigger by inspection frames**, the Inspection Frames will be actively adjusted by the saved Master Picture, avoiding this problem.
❺	After inspection. The background of the letters of the corrected values will be shown in red. This means that since overall characteristic detection was not good enough, it was inspected more strictly. If you see this often, move the frame position a little. By doing so, the Characteristic Data will be updated. However, it is not recommended to frequently update Characteristic Data by moving or changing sizes.
❻	This status is after inspection. The background of the corrected value letters will be shown in green. This means that since the overall correction was not good enough, correction was made by the picture of the NewCellAidStamp.
❼	This status is after inspection. This shows that position correction was attempted using various methods, but the process failed. This means that the PCB is totally different, or the characteristic points are not found.
❽	When positional correction has failed, the component(s) that are out of alignment will be shown with a red line.
❾	When the center icon turns yellow, it means that the NewCellAidStamp is turned off . You can toggle on/off all NewCellAidStamps at once by checking on/off **Position correction active**. This is generally used to confirm the effects of the NewCellAidStamp.

▼ 16-2-4 Other Functions

When you press the Command key while the NewCellAidStamp Frame is displayed and placed the mouse pointer on the frame, the status of this Stamp can be confirmed in real-time.

16-3 ICLeadGap Stamp

ICLeadGap Stamp is a Special Stamp for Detection of Solder Shorts/bridges between IC leads (ICLead-Gap Stamp) This Stamp does not search for locations or compare with pictures. To change settings, after positioning ICLeadGap Stamp (Screen 1), double-click on the frame and display the Lead gap inspection setting window.

* Can't use for the component with 2 leads (more than 3 leads required).

▼ 16-3-1 Lead gap inspection setting Window

The following items can be set in the Lead gap inspection setting window (Screen 2).

■ Short detection

This is a level setting for the binarisation of the lead gaps area.

■ Lead detection

This is a level setting for the binarisation of the lead area. The lever should be set so that white will be the lead and black will be the gap.

■ 2 pixel pass

A green line passes through the gap between leads. This line can pass through a 1 dot (pixel) gap. When the lead gaps have been binarised in black and white and there is a 1 dot gap, this can be filled to prevent the green line from passing and judging as a defect with the **2 pixel pass** check box. You can detect Solder shorts more strictly with this feature.

■ Blur leads

Leads and lead gaps contain a lot of noise, causing false reports. By blurring leads, the noise can be reduced using software processing.

(Screen 1)　　(Screen 2)
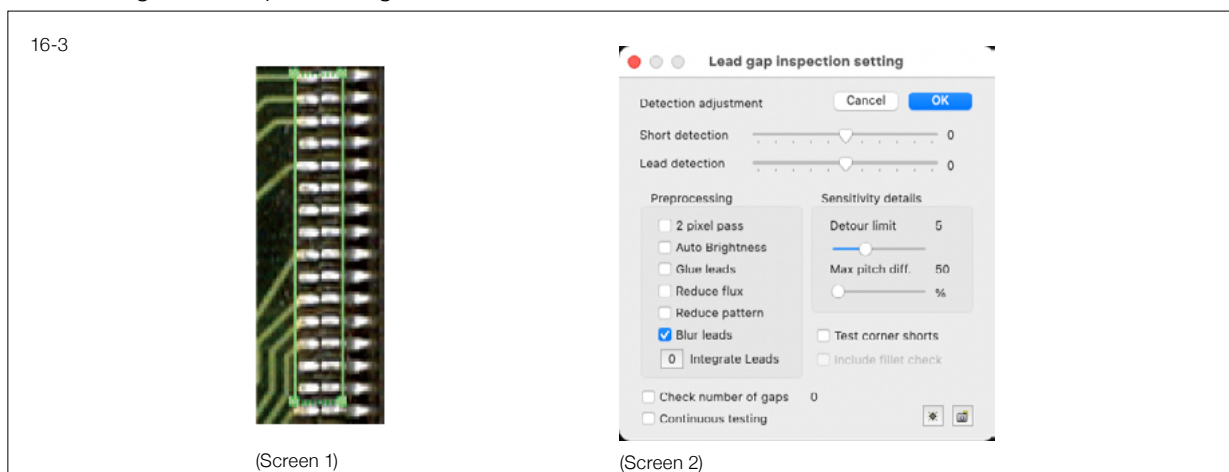
■ **Auto Brightness**

There will be differences in brightness in the overall inspection area at set up time and at actual inspection time, which may affect the detection level and make it unstable. Auto Brightness will stabilize the brightness of the Inspection Area, thus reducing variances in detection level. Since the detection level differs significantly when this setting is applied, check this item first before moving on to other settings.

■ **Glue leads**

When setting the intensity of stripes (the leads and the lead gaps), the lead may split into two parts. This happens because the entire lead does not shine, and the center is projected as a black shadow. This feature unites split leads and deletes fine white lines shown as a noise.

■ **Reduce flux**

If there remains much flux on the PCB, the Stamp recognizes the flux's white reflection as a lead. In such cases, check this on. Reduce flux recognizes the flux and subtracts it. However, it will increase the inspection tolerance and, as a result, the solder dust between the leads can be passed over.

■ **Reduce pattern**

If there are patterns in IC lead gaps, the pattern color will be eliminated to improve detection accuracy. Do not use this setting for PCBs without patterns.
This option has one more function, when component color is white (bright), IC Lead Gap stamp tends to detects the white area as short when component is slightly shifted. By activating this option, this false detection is prevented. Activate this for white body color components.

■ **Integrate Lead**

Dirt or roughness on the surface of IC leads may cause 1 lead to appear as if it is split into 2, this increases the blur level. However, increasing this too much will prevent lead detection, resulting in false reports.

■ **Detour limit**

Even though there may be some white spots (solder or noise) on the green line passing through leads, if there is enough space for the line to pass through, it can detour such spots. Normally, it will be judged as good area if the line can reach from the starting point to the end point even with detours. It is also possible to judge the area as bad if a straight line cannot pass without detours. It is also possible to judge as good if there is any gap whatsoever. These settings can be defined here. The default value is 5 (up to 5 direction changes). The minimum value is 0 (straight line only) and the maximum is F (no limit).

■ Max pitch diff.

Since a solder bridge is detected by lead gaps and their positions, if the lead gap is completely filled with solder, the lead gap cannot be detected. In such cases, judgment can be made by distinguishing a lead gap pitch that clearly differs from an average lead gap pitch. The default value is 50% (ex: if average pitch is 12, with pitch 18 and higher or 6 and lower set as NG), and the range is from 50 to 20.

■ Test corner shorts

Inspection can be executed even if the leads at both ends have completely bridged and may appear to be 1 lead.

■ Include fillet check

In order to execute solder bridge detection and fillet check simultaneously, it is not necessary to set a Fillet Inspection Frame to every lead. Check this box and it will find 1 Fillet Inspection Frame contained in the ICLeadGapStamp Stamp, apply that to all leads to run inspection. Only 1 fillet inspection frame needs to be positioned, and the zoom property must be the same.

■ Count gaps

Check this to count the number of gaps after setting the Stamp. The number will also be checked constantly during inspection. For example, if 2 leads bridge and appear to be 1 lead, the number will be different, and be judged as NG.

■ Continuous testing

The moment the picture was taken is not necessarily the best condition. Even with the same area, the image changes gradually. By checking this box, an average setting can be applied to the gradually changing conditions, enabling the optimum settings at inspection time.

■ Camera Special Setting

For leads and flux reflections varies, the defect can be seen easier when capturing the image by changing camera conditions by using camera special settings. See chapter 20-2. You can also switch lighting by pressing this button with option key if your AOI has lighting selection. This will be effective specially for white PCB by using DOAL light.

* Since this is designed for IC lead gap inspection, it cannot be used for other purposes.

* If there are NGs in this Stamps, solder bridge areas will be shown on the screen in red circles in Map View. You cannot compare the picture with Master Picture

* If the component's body color is light, activate Reduce Pattern for preventing false detection.

* A complete bridge (lead gap filled up) will be detected as a lead pitch error (+/- 50%). Therefore, de-

tection accuracy will be lower than the conventional matching method.

* If silk screen is printed in the IC lead gaps area, detection by ICLeadGapStamp may be difficult.

* When the Stamp is positioned at a slanted angle, the solder bridge of the inspection result and the displayed Fillet Inspection Frames may appear different from the actual components. In this case, the bridge display can be corrected using the arrow button which may be added in the Lead gap inspection setting window when rotated. The Fillet Inspection Frame can be corrected using the Re-inspection Button.

16-4 Stamp for Solder Bridge detection

Solder bridge detection stamp is a stamp specialized in the bridge detection. It is effective for the following cases.

- False calls with ICLeadGap Stamp and Doughnut Stamp when silk screen is printed around through hole or between the leads of SOP , QFP, etc.

- **False calls with Doughnut Stamp when inspecting bridged through hole.**

- When you want to detect solder bridge between the components which cannot handle with Doughnut Stamp.

▼ 16-4-1 How to use

Draw the frame with pointer tool, and start Stamp Creation Wizard for Beginners. "SolderBridge Settings" window will appear when you select "Solder bridge detection". Place long and narrow window in the center between two points for making the frame. It is detected as bridge when the solder exist across the shorter side of the window.

▼ 16-4-2 Description of window

■ Settings
1. Light selection
    Set the lighting for inspection. Need to select the different color for solder and its surrounding.
2. Less sensitive
    Decrease sensor for detecting solder. Default value 16% is the most strict setting.
    If you do not want to detect too small solder, increase this value.
3. Target color
    Designate the color of solder for inspection. Red is selected for AOI model which has "White main lighting + Red side lighting + DOAL lighting" configuration which uses Red lighting as side lighting. Blue is selected for AOI model which has "RGB lighting + DOAL lighting" configuration which uses Blue lighting.

■ Color Reduction
1. Light selection

Set the lighting for inspection. Select the lighting which is easy to see the point which you do not want to recognize as solder.

2. Color pickup

Designate the exclusion color for inspection. Press color selection button, and the mouse cursor becomes color picker. Drag the mouse onto the color in the stamp frame. By dragging, the selected color will be painted in blue. Tolerance increases with more painted area if you drag wide area. Exclusion color and tolerance will be shown at right side in Advanced setting window.

You can select maximum of 100 colors for exclusion color. If you have unnecessary color, click trash can icon to delete.

By selecting exception color edit button on the lower right, color panel is displayed. It enables edit of extracted color.

3. Pixel expansion

You can extend the painted area by increasing the minimum number of pixels for painting.

You can use this function if the tolerance is too wide for color reduction variance, and failed to detect the bridge.

4. Test

Check the present condition. Point with Bridge is displayed in red color, and other target color is displayed in blue or green.

* Thin Bridge cannot be detected with actual size for few numbers of pixels. Zoom the Stamp when you detect the thin Bridge. To zoom the Stamp, you need to register new Stamp by clicking Revising Stamps button after selecting inspection frame, and click "Flip zoom/un-zoom" from Zoom menu.

16-4-2
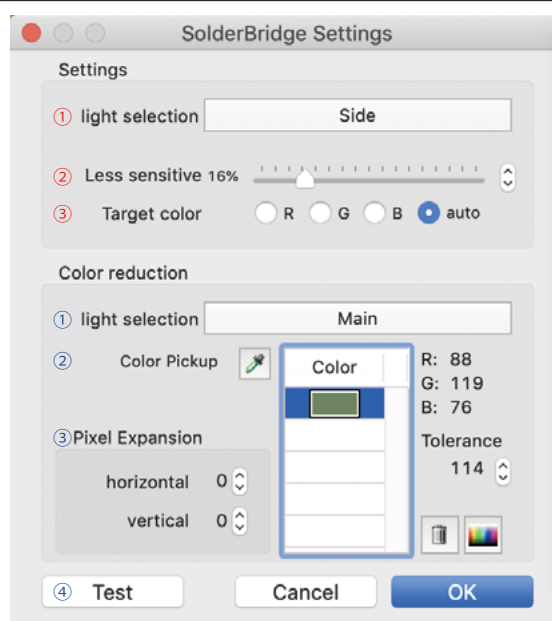
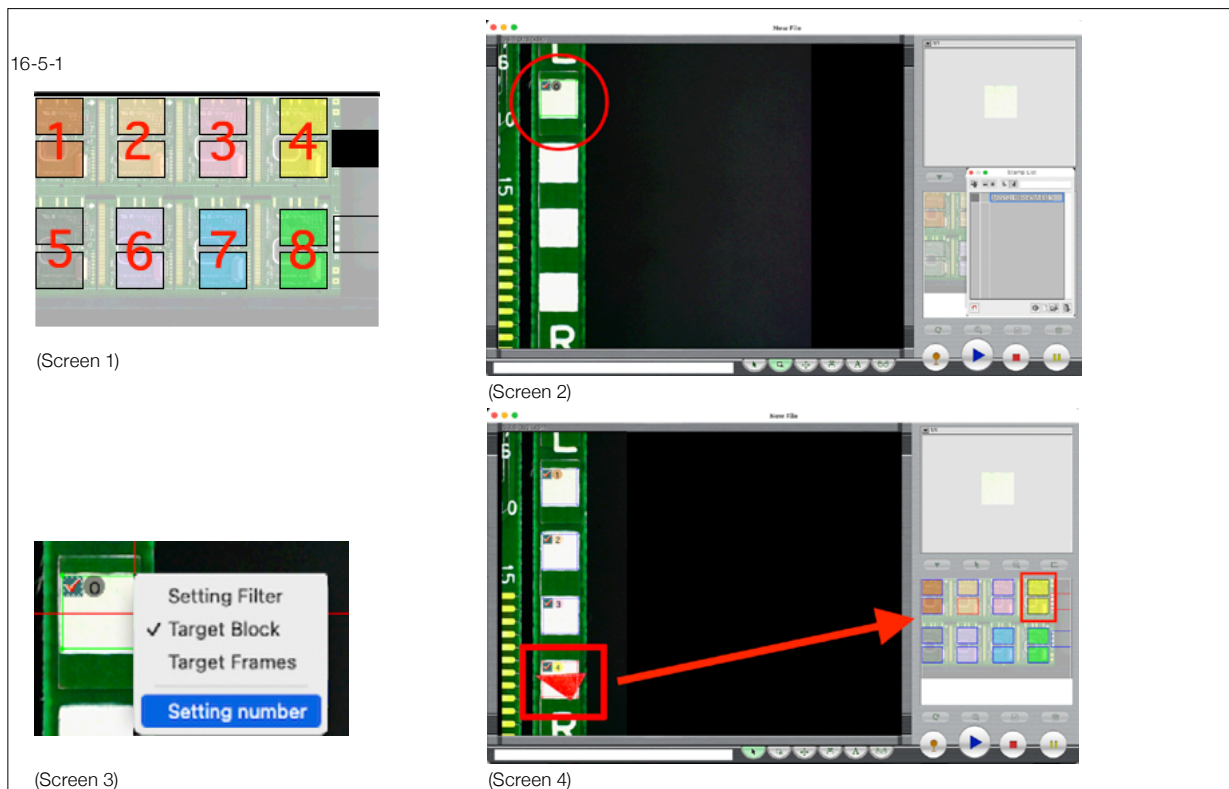# 16-5 Special Blockmark Stamp

PanelBlockMark stamp

Stamp for handling bad mark to skip the inspection of useless panel(s) on PCB.
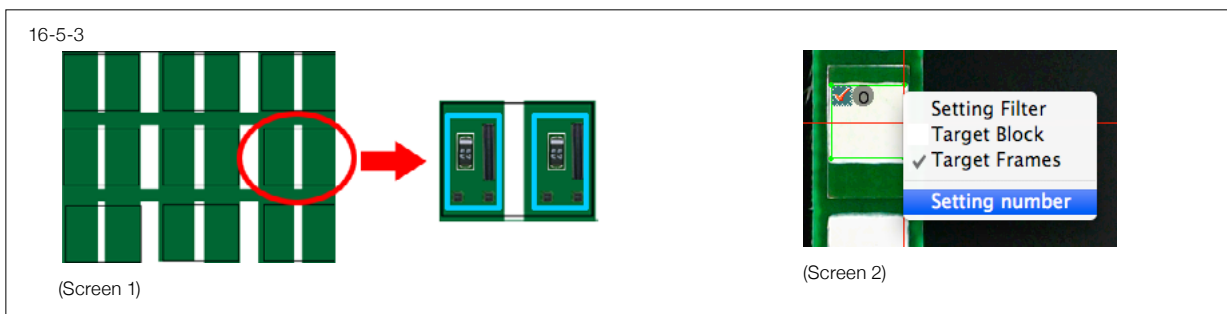
▼ 16-5-1 How to use PanelBlockMark stamp

1. Create Block Cells. When the Cells are grouped in Block, the Block is automatically set number from 1,2...(Screen 1)

2. Place **PanelBlockMark** stamp at the point where to check bad mark. Save master picture in the stamp (Screen 2).

3. Double-click on **PanelBlockMark** stamp and open sub-menu. Confirm if TargetBlock is checked, then input applicable Block number by selecting Setting Number (Screen 3).
   * Set filter if necessary by selecting Setting Filter.

4. Start inspection. Block (s) that is checked as bad will not be inspected. (In Screen 4, No.4 yellow Block was not inspected because red bad seal was marked so that PanelBlockMark was judged as NG)

▼ 16-5-2 TargetFrame stamp

When there are more than 1 panels in a Cell (FoV), it is effective to use **TargetFrame** togather with **PanelBlockMark**.

16-5-1

(Screen 1)

(Screen 2)

(Screen 3)

(Screen 4)

16-5-3

(Screen 1)

(Screen 2)

Setting Filter
Target Block
✓ Target Frames

Setting number

▼ **16-5-3 How to use TargetFrame stamp**

1. Place **TargetFrame** in Work Area, and resize to fit the panel size (see blue frames in below picture). If the panel lies in multiple Cells, place TargetFrame in each Cell (Screen 1). Double-click on **TargetFrame**, then sub-menu as TargetFrameNumber is displayed. Input number other than 0 (Screen 2). If you place multiple **TargetFrames** for one panel, set them all the same number.

2. Place **PanelBlockMark** on bad marking point. Save master picture in the stamp.

3. Double-click on **PanelBlockMark** stamp and open sub-menu. Switch the check of TargetBlock to TargetFrame by clicking, then input applicable TargetFrame number by selecting Setting Number.

   * Set filter of PanelBlockMark stamp if necessary by selecting Setting Filter.

4. Start inspection. Within TargetFrame (s) is not inspected if the corresponding PanelBlockMark is judged as NG.

16-6 Stamp for Measuring Angle to Check Theta Rotation

AngleCheck stamp

Stamp for detecting components' position shifting and rotating. This stamp can obviously catch slight rotation of components that used to be difficult to find by pattern matching or histogram algorithm.
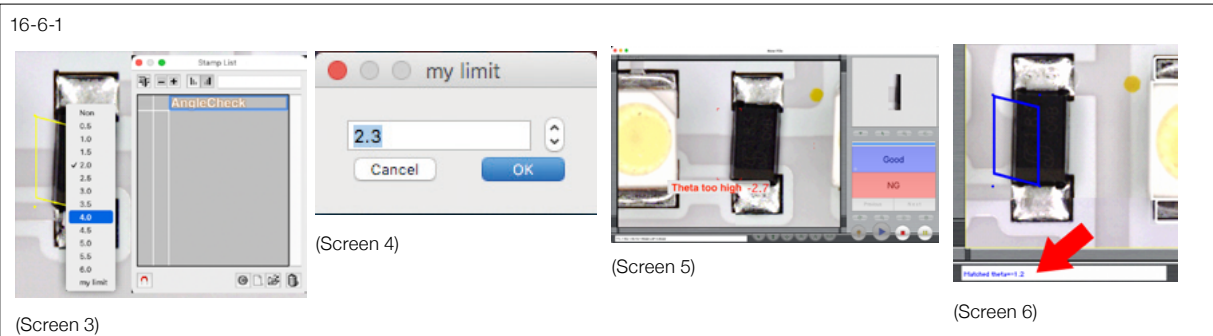
* NG points can not be confirmed in NG Cell View mode.

* Without using this stamp, you can measure angle by new function in Pack stamp too. For detail, please refer **8-7-6 Extra Settings No.2 Measure/offset Angle**.

(Screen 1)

(Screen 2)

▼ **16-6-1 How to use**

1. Load **AngleCheck** stamp (Screen 1).

2. Place the stamp on area where you want to detect angle.

16-6-1

(Screen 3)

(Screen 4)

(Screen 5)

(Screen 6)

Resize the stamp to fit the target area. When resizing, the direction to measure angle should be longer than the other side (Screen 2). This stamp measures the angle of <u>longer side of rectangle</u>.

3. Double-click the stamp, list of the limit of angle from **Non (no measurement), 0.5, 1.0...6.0** degrees will be shown. Select the limit (Screen 3). If you select "mylimit" function, voluntary angle setup window will appear, and you can set the angle in 0.1 steps from 0.1 to 6.0 (Screen 4). For the machine with DOAL lighting, DOAL is displayed for selection. When you select DOAL, switching of main lighting and DOAL lighting is possible, so please use the function depend on the place and parts. Then, start inspection.

4. The component which exceeds angle limit is judged Not Good and angle is shown (Screen 5). Angle is shown with minus (-) when component rotates in clock-wise.

5. You can even know the angle of good component by executing re-inspect or analyze. Result will be displayed in message bar (Screen 6).

▼ **16-6-2 Include in Pack Stamp**

If AngleCheck stamp is in Pack stamp (Screen 1), the list of angle limit can be selected from Pack window (Screen 2). In addition, option settings for detecting angle can be selectable (Screen 3). For detail of this option settings, please refer the chapter 10-10.


16-6-2

(Screen 1)

(Screen 2)

(Screen 3)
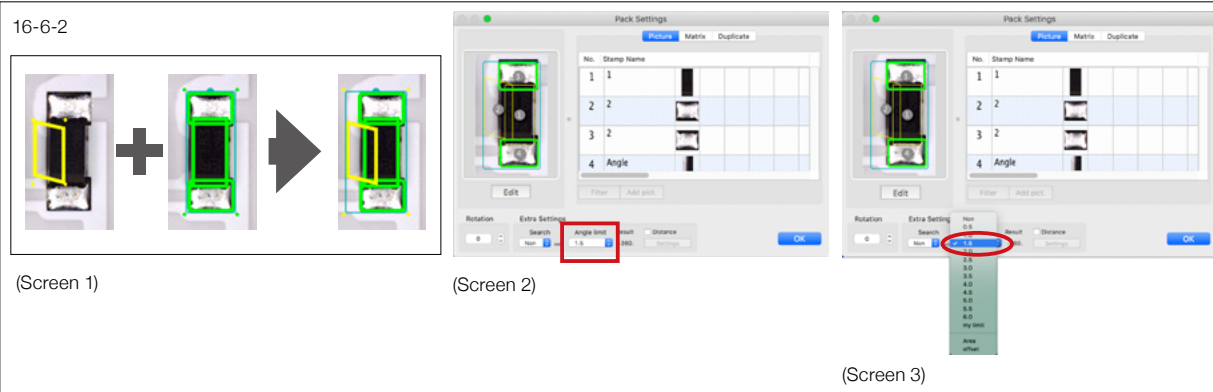
▼ 16-6-3 Notice

- If the size of AngleCheck stamp is too small, it can't be measured. When stamp size is too small, the line color of the stamp will **be faint**.

  If inspection starts in this condition, the angle limiti will **compulsory be Non**, and inspection result will be "**Could not detect angle**"(Screen 1).

  Enlarge stamp, then set angle limit again.

- Angle is result from measuring line which is abstracted the difference of brightness in the frame. If there is no difference found, the result will be "**Could not detect angle**". You can confirm the failure reason by analyzing stamp (Screen 2).

- If AngleCheck stamp can detect more than one line to measure, the line more bright and clear will be the measurement target (Screen 3). Resize the stamp for correct inspection.

- AngleCheck stamp requires **15 Ms** per inspection point. However, the calculation is carried out in the other thread. Therefore, this will not affect to inspection speed much. (Our experiment shows, when 87 inspection points required 6.92 seconds, added AngleCheck stamp on each point, the inspection speed for total 174 points was 7.32 seconds.)

- It is possible to include more than one AngleCheck stamp in Pack stamp. Only **one voluntary stamp** will be the measurement target.

- Angle limit can be set in 0.5 steps, however actual measurement accuracy is 0.08 degree.

16-6-3

(Screen 1)

analyze

(Screen 2)

analyze

analyze

(Screen 3)
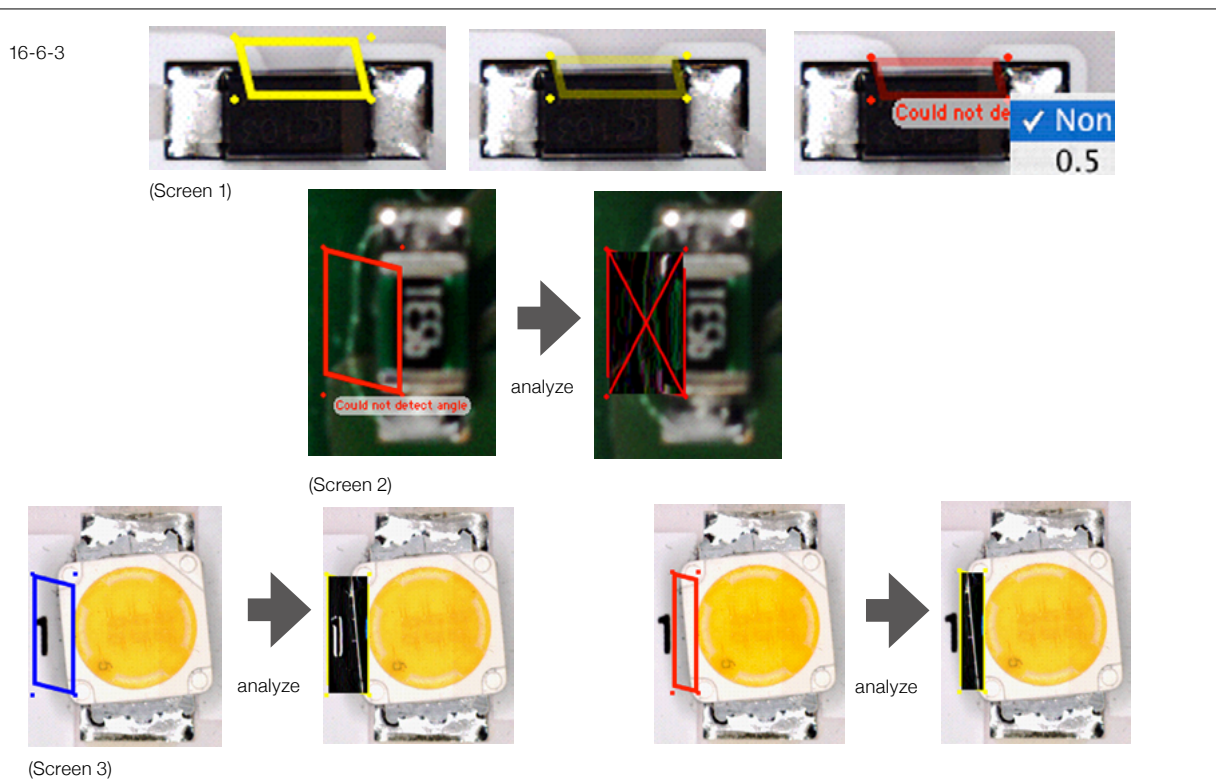
▼ 16-6-4 Caution

This stamp is slightly different from the ordinary stamp.

- Does not adjust the position by master picture.
- Does not search position with master picture, does not have more than one master picture, does not have reversing picture, because this stamp is not using pattern matching algorithm.
- Unable to set Search Area / Area Limit / Mask.
- Does not follow Pack Master in Pack Stamp.
- **NG pictures of AngleStamp are not sent** to CS-Center when using **NG Cell View** or **Auto send for all NG in faster mode**.

16-7 Doughnut: Stamp for Wave Soldering Through Hole

Doughnut stamp

Exclusive stamp for detecting **solder bridging** between through-holes or leads, and **detecting no solder area** on the pad, or **inspecting solder fillet and existance of lead** for wave soldering PCB without complex settings.

* This stump cannot be used on AOI with W lighting and Conform corting inspection machine.

▼ 16-7-1 Detect bridging

1. Paste **Doughnut** stamp on through hole. Resize the stamp to fit the hole size (Screen 1).
2. If the stamp escapes defects or too many false calls, double-click the stamp and adjust settings (Screen 2).


16-7-1
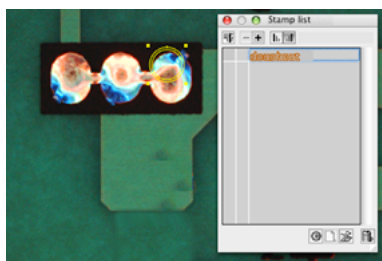
(Screen 1)
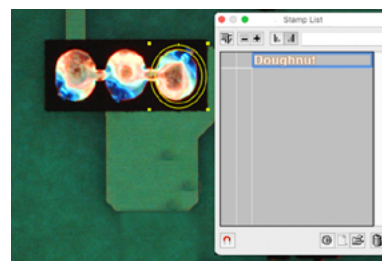
(Screen 2)

Menu	Description
Test button	Show how solder is detected. Solder area is colored in Blue or Red (depend on model). White area is no solder area 'Screen 3).
Detection Area	By moving lever up, detection area is increased (Screen 4). (Ring of detection area becomes wider.)
Less Sensitive	Decrease sensor for detecting solder. Default value 16% is the most strict setting. If you do not want to detect too small solder, increase this.
Area threshold	Represent % of solder area to be NG out of total area. Default value 1% is the most strict setting. If you increase %, more solder is necessary to be NG, as a result, detecting setting will be tolerant.
Target color	Normally this is automatically selected according to AOI's type. Red will be selected for DL/HDL models, and Blue will be selected for HML model. However, if your AOI's illumination is special model, change color to fit your AOI.
Detect stable bridge only	This is an option when you just want to detect bridge which is making two through holes be definete short circuit. This is useful in case solder amount/ shape is unstable but still good, or in case flux is reflecting as solder (Screen 5).

16-7-1
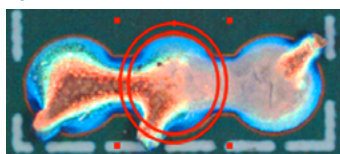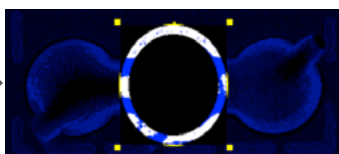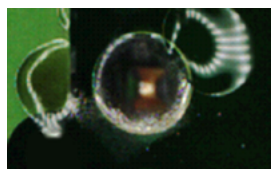
(Screen 3)

(Screen 4)

Flux refrects as solder, however red solder area does not go through the ring. Thus inspection result is Good.

Too much flux

Red area (solder) goes completely through the ring. The line is shown in green.
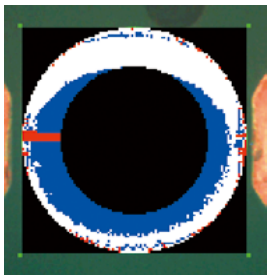
Bridge to next hole

(Screen 5)

Menu	Description
Detect all bridge	If you put check and activate the function, all status which lead from the periphery to an inner periphery is detectable as bridge (NG). (Screen 6) * This "Detect all bridge" function cannot be used with "Detect stable bridge only" function. You can only set either function.
Detect solder excess	Detect both bridge and excess of solder paste at same time. The detection area can be adjusted by 10% between 50 - 100%. This option can be used with **Detect stable bridge only** or **Detect all bridge**.
Deactivate bridge detection	Detection for short of leads is not executed. Check this on when you only want to detect **No Solder Area** and execute **Inspect solder fillet and pin**.
Inspect solder fillet and pin	Inspect the solder fillet of through hole and existance of lead. Detail is described in Chapter 16-6-3.
Position	This option enables to search and adjust area for solder inspection. The sensitivity of color which is recognized as a solder paste area can be adjusted by using a slider bar on the right of the item.
Solder area	The result % is shown when pressing **Test** button. If the result is good, shown in blue color, if not good, shown in red color.
Mask1 / Mask2	You can set mask (non inspection area) to the direction of pin. Mask can be set 2 directions (Screen 6).
Angle	Selectable from 0 (no mask) to 180 degrees.
Direction	Set direction to mask. Selectable from -180 to +180 degrees. The picture shows the example of masking when pin is down to the direction of 12 o'clock.
No Solder	The detail is described on 16-7-2.
Exclusion color	You can detect short of leads by treating silk as exceptional color.
Default	Clear setting and get back to the default value.
Edit Mask	Put mask anywhere on the stamp. The mask created here is applied on ICLeadGap and No solder.

16-7-1

Detect stable bridge only : **OK**

Detect all bridge : **OK**
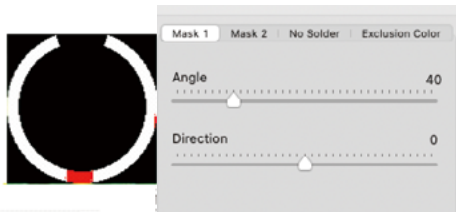
Detect stable bridge only : **OK**

Detect all bridge : **NG**

Detect stable bridge only : **NG**

Detect all bridge : **NG**

(Screen 6)

(Screen 7)

16.Special Stamps and Functions

▼ 16-7-2 Detect No Solder

By this function, no solder area is easily detected without complicated tune-up (Screen 1).

This stamp is effective on RGB lighting AOI, as Histogram Stamp may give a false NG under the lighting.

The setting procedure is as below:

1. Place Doughnut stamp on a through-hole. Resize to fit the through-hole.

2. Select **No Solder** tab, check **Enable** on.

3. Place this stamp to all through-holes on the PCB and start inspection.

4. If lead passes through straightly in the center, and the edge of the lead is not wet, this will be detected as no solder area. If you want to exclude this, activate **Exclude red colored area in master pictures** (Screen 3). If AOI has ML lighting, tick **High detection** to increase sensitivity.

5. If there is missing defect or false NG, see **[How to treat escaping defects / false calls].**

* The smallest detection size is 4 pixels.

* When "Exclude red colored area in master picture" is active, if there is real no solder area, this will be escapiing from detection. Thus be careful when activating this function.

[How to treat escaping defects / false calls]

1. When escaping large area of no solder on the pad, Doughnut may not detect the color of the pad successfully. Slide the **contrast lever** next to Enable check-box from 0 to 5 - 10 (Screen 4). (This adjustment solves escaping problem especially when the pad color is not bright red, instead dark or rather beige.)

   If no solder area is still not detected, change **Level** of sensitivity from 65% to 70-80%.

   When no solder area is slightly found by increasing any of contrast or sensitivity, increase the effective lever until no solder area is clearly detected.

* Some models do not have contrast lever. Adjust settings by sensitivity Level.
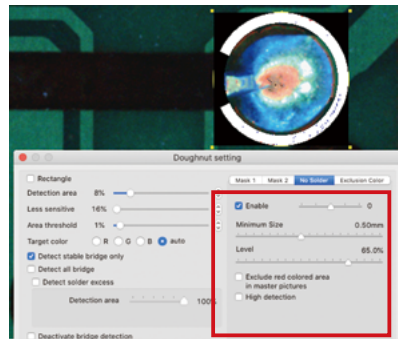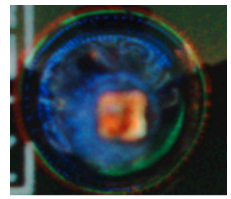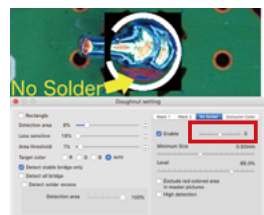

16-7-2

Analyze

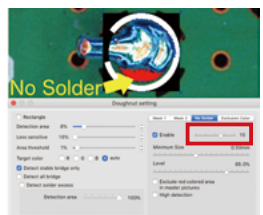Area colored in red is no solder on pad
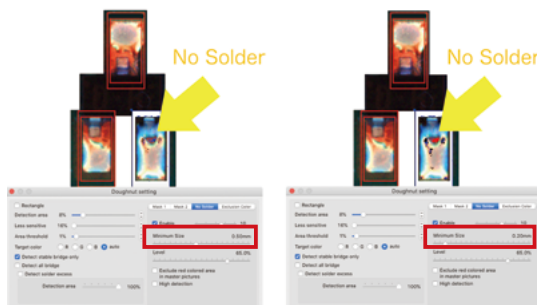
(Screen 1)

(Screen 2)

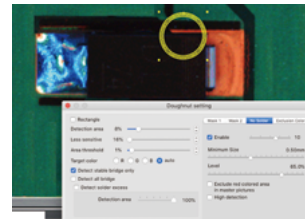**Lead edge not wet**
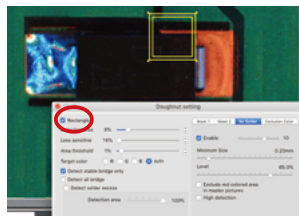
(Screen 3)

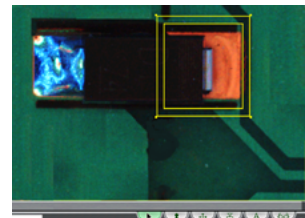(Screen 4)

16-7-2

No Solder

No Solder

(Screen 5)

(Screen 6)

(Screen 7)

(Screen 8)

2. When <u>escaping small area of no solder</u>, change **Minimum size** from 0.5 to 0.4-0.2mm. Then small non soldering area will be detected as well (Screen 5).

3. On the other hand, if the line allows slight no solder area, expand the Minimum size.

4. When <u>there are false calls</u> caused by detecting thin soldered area, decrease **contrast lever** next to Enable check-box from 0 to -5 or -10. If this does not improve the false calls, decrease sensitivity **Level** from 65% to 55-50%.

[Extending usage]

The area other than through-hole pad can be also insufficient soldered in the wave soldering process. Here we show to apply Doughnut stamp to detect the no solder of component's fillet.

1. Normally Doughnut stamp is Oval shape (Screen 6), but you can change its shape to square by checking **Rectangle** on (Screen 7).

2. Resize the frame to fit the fillet size (Screen 8).

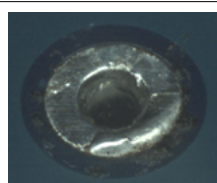3. If the bridging detection is unnecessary, check **Deactivate bridge detection**.

▼ **16-7-3 Solder fillet and lead inspection**

The obvious defects such as below samples can now be detected by doughnut stamp.
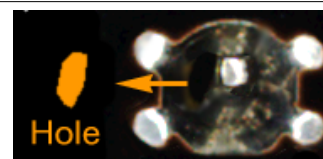

16-7-3
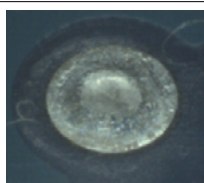
(No Lead)

(No Lead and No Solder)

Hole

(Blowhole)

[How to use]

1. Place Doughnut stamp on a through-hole. Resize to fit the through-hole (Screen 1).

2. Double-click the stamp, and open the settings window. Check on "**Inspect solder fillet and pin**". The "**solder fillet area**" and "**lead area**" will be painted (in the sample picture, they are painted in dark pink and blue). (Screen 2)

* Shrink the bridge "Detection area" as less as possible when enabling Solder fillet and Lead inspection. Also, resize the stamp size as close as to be the TH size. If unnecessary area is included, the inspection result may be incorrect.

3. Assign the master picture (Screen 3). Update stamp and save in new name.

* Master picture was not necessary for doughnut stamp in previous version. But for solder fillet and lead inspection, the criterion is depend on the RGB color elements of master picture, therefore master picture must be used and it is important factor.

4. Paste doughnut stamp to all holes. Start inspection.

5. There will be many false calls after inspection, because the shape of TH solder fillet varies. Debug them in following procedure.

[Debugging]

For killing false calls, **add a few master pictures**. The reason is because criterion is made by RGB colors of master picture (Screen 4)

Doughnut stamp is using master picture, however, it is not copying pattern matching algorithm. Our pattern matching algorithm is, to divide frame by grid and make small squares of pixels, then compare the squares to the ones of good master pictures. In doughnut stamp, area is not divided by grid, therefore false calls will be improved by adding less pictures than pattern matching stamp.
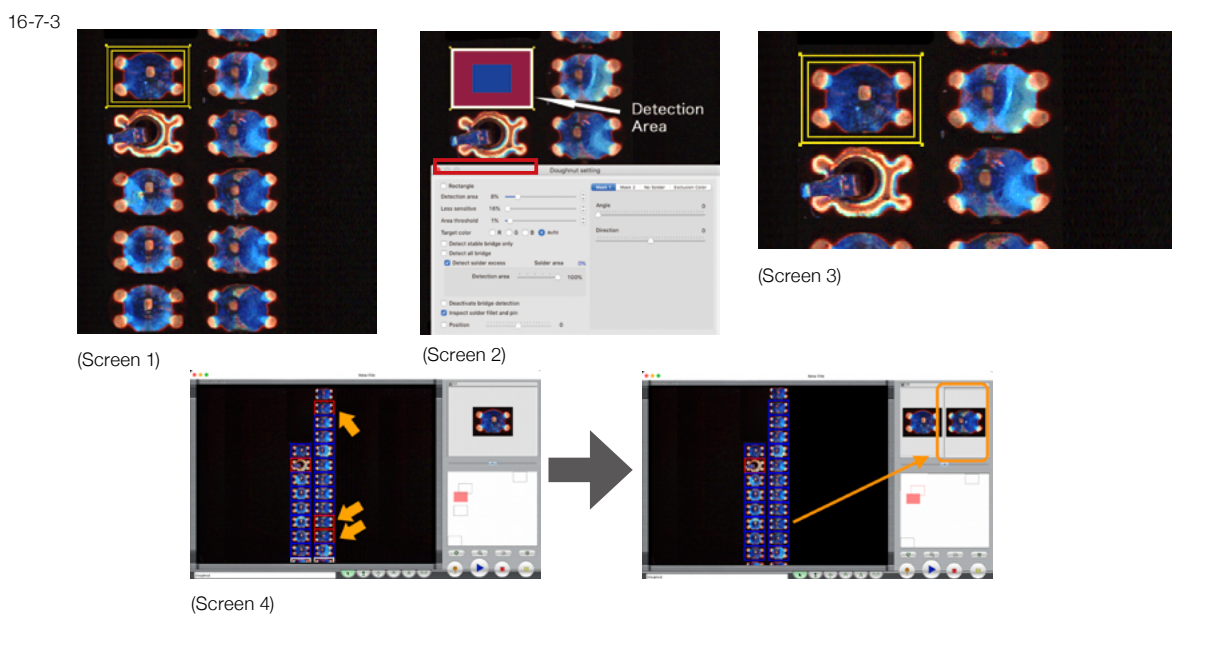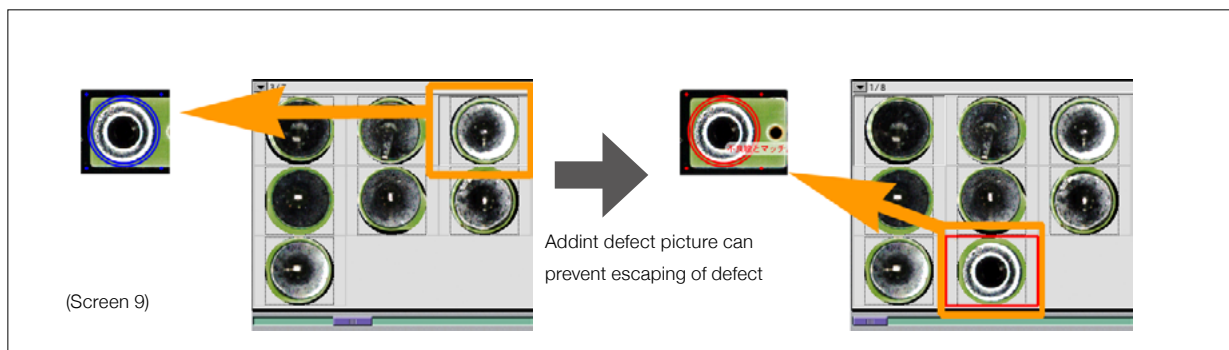
16-7-3

(Screen 1)

(Screen 2)

Detection Area

(Screen 3)

(Screen 4)

You can also use **NG master picture** (Screen 5). By adding NG master picture, the similar defect can be certainly found. When creating the inspection program, use the PCB with defects so that better inspection program will be made.

[Explanations in detail]

- Solder fillet and lead **is not inspected** if the TH is detected NG by "bridge".

- When executing analyze/re-inspection, the inspection result of "No Solder" is shown and the result of "Solder fillet and lead" can't be shown. If "No Solder" inspection is inactive, the result of "Solder fillet and lead" will be shown (Screen 6). Nevertheless, the inspection result of "Solder fillet and lead" just shows the tendency of color, means the color does not represent the status of OK/NG.

- With HDL type illumination, the detection algorithm is different. Therefore when showing the result of "Solder fillet and lead", the shapes of solder is shown by edge filter, too (Screen 7).

- There is a way to see the inspection process of "Solder filet and lead" even "No Solder" is enabled. Open settings window, select **Mask 1** or **Mask 2** tab and press Test button. If you are in **No Solder** tab, the inspection process of "No Solder" will be shown.

- When the lead is not straight-up in the center, is bent, in such case the fillet shape would be even vary and can be similar to the defect one. If you use "Solder fillet and lead inspection" on such lead-bent TH, there is possibility that defect can escape (Screen 8).

16-7-3

(Screen 5)

Analyze

Result of "No Solder" is shown

(Screen 6)

Result of "Fillet and Lead" is shown when "No Solder" is inactive

(Screen 7)

(Screen 8) Good Bad

(Screen 9)

Addint defect picture can prevent escaping of defect

- With HDL type illumination, if the brightness of the combination of fillet area and lead area is similar, even the obvious defect can escape. Test those defects by debugging with defect PCB, and if any defect escapes, add as NG master picture (Screen 9).

▼ 16-7-4 Caution

This stamp is slightly different from the ordinary stamp.

- Does not search position with master picture.
- Does not have more than one master picture and does not have reversing picture, because this stamp is not using pattern matching algorithm.
- Unable to set Search Area /Area Limit in version 6.0.3 or prior.

Hidden Technique

If you like to apply the change to all Doughnut stamps created with **No Solder** tab or **Exclusion color** tab, press OK button with **option** key (Be careful, you must press OK button while opening No Solder tab or Silk tab). Then, a message appears and the change will be applied to all Doughnut stamps created with same tab.


Do you apply the copper foil detection value to all of these types?

Cancel   OK
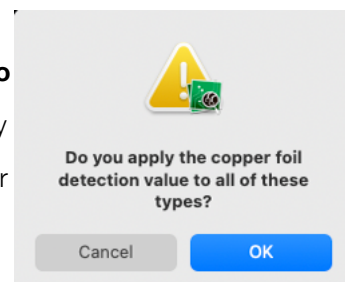
16-8 Scratch: Stamp for Detecting Scratch/Stain/Crack

Scratch Stamp

Exclusive stamp for detecting stain/solder balls on ceramic board or pad, insufficient of gold pattern, or scratch/crack of package components without complex settings.
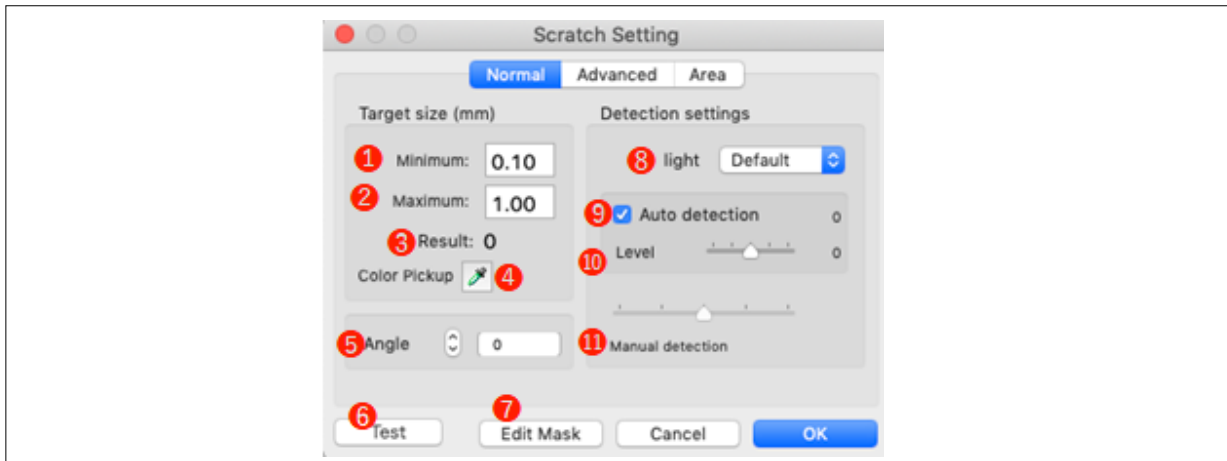
There are 2 approaches; Detect foreign object by automatic binarizing in the frame, or detect foreign object in selection color area. In case the area in the frame is mono color, automatic binarizing method is recommended for its setting is easier.

Automatic binarizing and color selection

(PCB color is false detected)   (PCB color ignored)
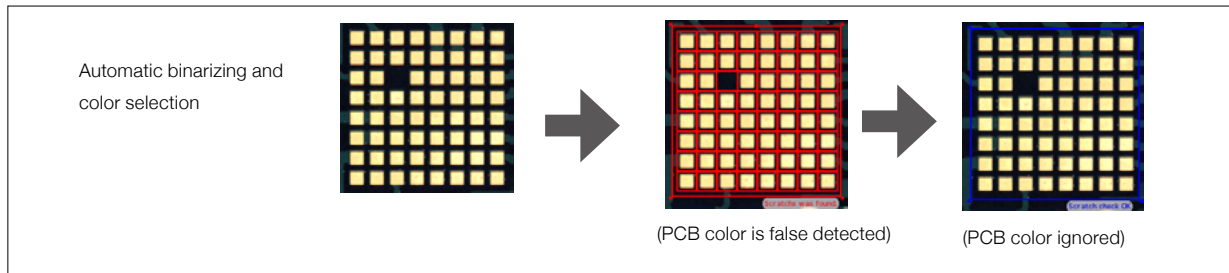
In case the area in the frame is including more than one color or the area is tend to shift position, selection color method is recommended. Selection color method has [Normal], [Advanced], and [Area] mode.
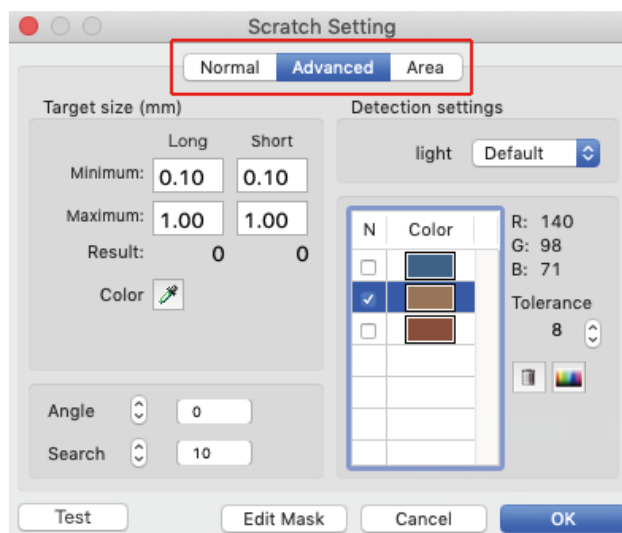
▼ 16-8-1 Normal

A simple mode to find a scratch. The meaning of each parameter is as below.

Menu	Description
1. Minimum	Set minimum size to be detected (either height or width). The size less than this value will be ignored.
2. Maximum	Set maximum size to be detected (either height or width). The size more than this value will be ignored.
3. Result	Result of test or analyzing is shown. If the result is Good, shown in blue color, and if the result is Not Good, shown in red color.
4. Color Selection	Select color when detecting by Color Selection Method.
5. Angle	Enable to rotate frame from -180 to +180 degrees. By pressing up/down button, rotate by 15 degrees step.
6. test	Executes inspection. The analyzing process is shown for 1 or 2 seconds.
7. Edit Mask	Mask edit screen is displayed.
8. Light	AOI with multiple lighting models can change lighting.
9. Auto detection	Checked on default. Detect scratch/stain automatically. Current detection level is shown on the right after inspection.
10. Level	Auto detection level can up/down a little by sliding Level from 0 to +/-2.In Automatic Binarizing method, detection is more tolerant by -, and is less tolerant by +. In Color Selection method, colored area is larger by -, and smaller by +.
11. Manual detection	Check off auto detect, then this will be activated. Level can be selected from 16 to 240. In Automatic Binarizing method, his level does not represent the sensor of detection, this represents black/white level. In Color Selection method, you can manually change the allowance of area to be painted, larger than Auto detection (Color gradation allowance fixed)

[Automatic Binarizing Method]

1. Place the stamp on target. Resize the stamp to fit the target size (Screen 1).

   It is better that target has real defect, so that adjustment will be easier.
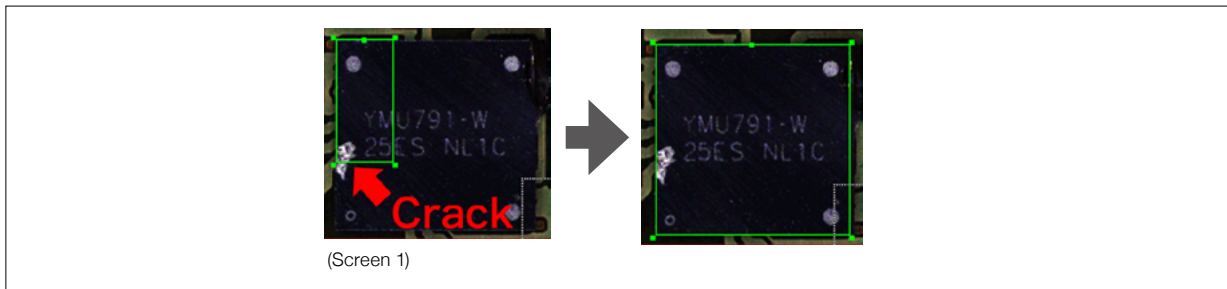
(Screen 1)

2. Mask the area which will affect to the inspection (Screen 2).

   Scratch stamp detects defects by comparing brightness per pixel, thus black text on white

   ceramics or white text/polarity on black package component should be masked.

3. Double-click stamp's frame, setting window will be open. Input minimum and maximum size to

   be found as defect. Press test button to confirm if the scratch is found. Start inspection (Screen

   3). Area found as scratch/stain is shown with red frame.

(Screen 2)
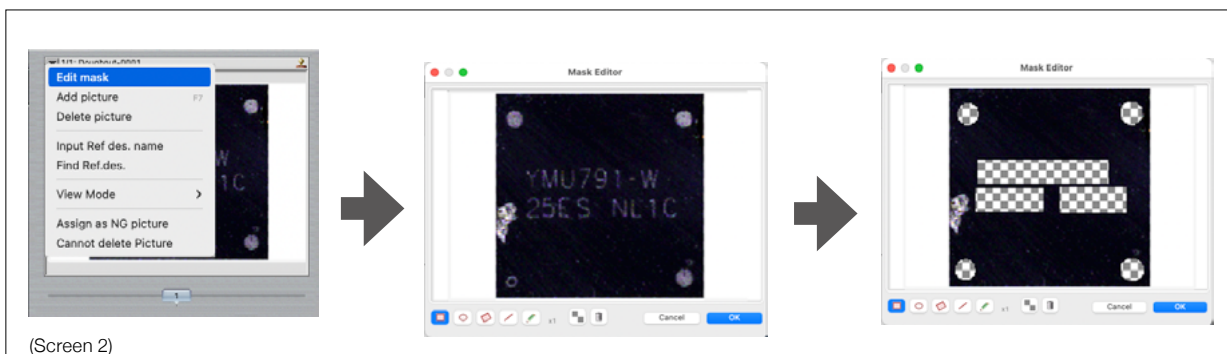
4. If the target is not found or too many false calls, switch detection mode from Auto to Manual.

   Check-off **Auto detection**, then you can slide bar for **Manual detection**. Find the best level by

   sliding the bar right to left.

(Screen 3)

[Color Selection Method (Normal)]

1. Press color selection button, the mouse cursor becomes color picker. Drag the mouse onto the color in the stamp frame. By dragging, the selected color will be painted in blue. The painted area is the target to measure.


(Not Evenly)　　　　　　　　　　(Evenly)
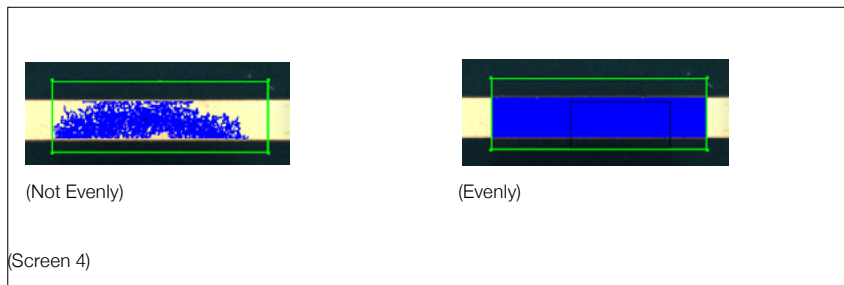
(Screen 4)

2. Please pay attention to select color; target area must be painted evenly without including unnecessary color. (Screen 4) By dragging mouse larger, the area painted in blue will be increased. (If it is not possible to paint the target in blue evenly, the inspection result will be unstable. In such case, Scratch stamp may not be optimum method for your inspection)

3. To reset the color, click in the area other than inside stamp's frame by color picker. After color selection is reset, the inspection method reverts to binarizing method.

4. In color selection mode, if you switch illumination other than Default, "**Auto detection" is <u>not possible to use</u>**. With other illumination such as DOAL or Side Lighting, the edge between PCB and pad is tend to be blurred or have more color gradation, and it is too difficult to find good balance by automatic. Thus, you need to adjust manually (Screen 5).

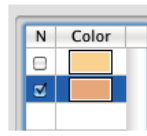(Screen 5)

[Color Selection Method (Advanced)]
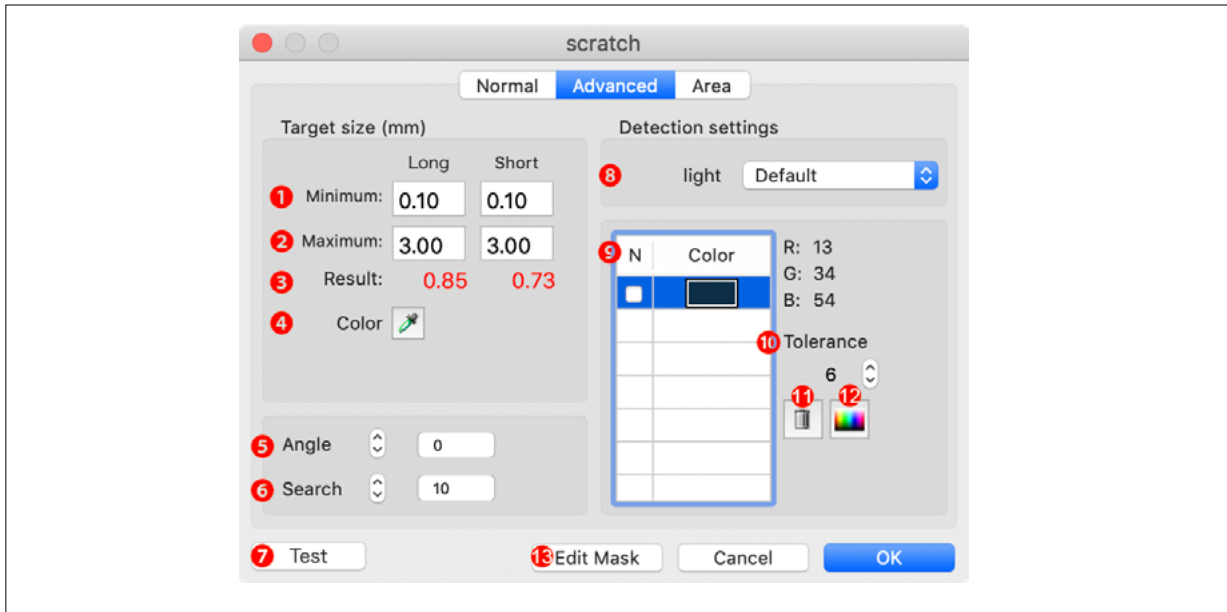
With Advanced mode, you can enter long/short side length. Also, maximum 100 colors and exception colors are available. If defect area is at the edge of the inspection target area, comparing inspection with Master Picture is executed.

Menu	Description
1. Minimum	Set minimum size to be detected. The size less than this value will be ignored.
2. Maximum	Set maximum size to be detected. The size more than this value will be ignored.
3. Result	Result of test or analyzing is shown. If the result is Good, shown in blue color, and if the result is Not Good, shown in red color.
4. Color Selection	Select color when detecting by Color Selection Method.
5. Angle	Enable to rotate frame from -180 to +180 degrees. By pressing up/down button, rotate by 15 degrees step.
6. Search	The angle can be set in the range of -180 to +180 degrees. Pressing the up/down button will input the angle in 15-degree increments.
7. Test	Executes inspection. The analyzing process is shown for 1 or 2 seconds.
8. Light	AOI with multiple lighting models can change lighting.
9. Selected color/ Exception color	Selected color is displayed. Check [N] to set the color as an [Exception color]. See the next page for detail.
10. Tolerance	Extends the recognition range of the selected color. If the value exceeds 25, the text color will change to warn of missed colors.
11. Delete	Deletes a selected color.
12. Color chart	Edits a selected color using a color chart.
13. Edit Mask	Mask edit screen is displayed.

16-8-1

(Screen 6)

(Screen 7)

1. Switch to Advanced tab (Screen 6). Press color selection button, the mouse cursor becomes color picker. Drag the mouse onto the color in the stamp frame. By dragging, the selected color will be painted in blue. The painted area is the target to measure.

   * When tolerance exceeds 25 to 30, tiny object or object in similar color won't be detected. Do not increase tolerance instead add color.

2. By checking on 'N', you can designate sampled color as exclusion color. Inspection target color will be painted in blue, and exclusion color will be painted in red (Screen 7).

   * Because area painted by exclusion color is as same as masked area (non-inspection area), defect in this area is not detected.

[Notes]

By activating "N checkbox for color list in Scratch designates NG color" in Action tab of For Supervisors menu will change Exclusion color to NG color. Designating NG color will be useful when you already know the defective color such as detecting the splash of bond on pad.

When using Advanced method, the stamp should be applied "Use Master Picture". Without applying "Use Master Picture", inspection will be less strict.

If the tolerance of color is too wide, defect will escape. The text color of tolerance becomes brown at over 25, and becomes red at over 40. Confirm the risk of escaping by text color, and it is better to add new color than increasing color tolerance.

If there is color difference between the current PCB and master PCB, false calls will occur. In such case, open settings window and press "Test" button. Confirm if there isn't area not painted in blue. If there is non painted area, sample the area and add as new color.

16.Special Stamps and Functions

[Color Selection Method (Area)]
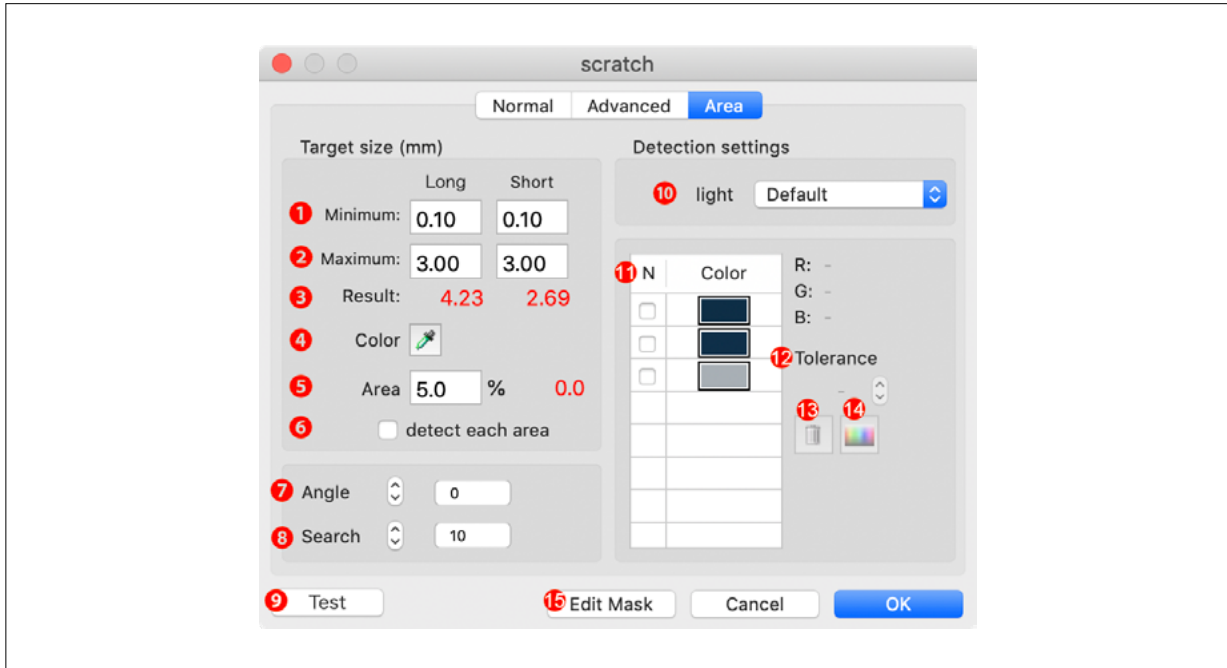
This inspection has a function to determine if the area of an area filled with a specified color is greater than or equal to a set value (%) in addition to the [Advanced] inspection.

Menu	Description
1. Minimum	Set minimum size to be detected. The size less than this value will be ignored.
2. Maximum	Set maximum size to be detected. The size more than this value will be ignored.
3. Result	Result of test or analyzing is shown. If the result is Good, shown in blue color, and if the result is Not Good, shown in red color.
4. Color Selection	Select color when detecting by Color Selection Method.
5. Area	Enter the area percentage of the specified color. If the value is greater than or equal to the entered value, it is judged as Good.
6. detect each area	An option to detect the specified color percentage for each detected area.
7. Angle	Enable to rotate frame from -180 to +180 degrees. By pressing up/down button, rotate by 15 degrees step.
8. Search	The angle can be set in the range of -180 to +180 degrees. Pressing the up/down button will input the angle in 15-degree increments.
9. Test	Executes inspection. The analyzing process is shown for 1 or 2 seconds.
10. Light	AOI with multiple lighting models can change lighting.
11. Selected color/ Exception color	Selected color is displayed. Check [N] to set the color as an [Exception color]. See the next page for detail.
12. Tolerance	Extends the recognition range of the selected color. If the value exceeds 25, the text color will change to warn of missed colors.
13. Delete	Deletes a selected color.
14. Color chart	Edits a selected color using a color chart.
15. Edit Mask	Mask edit screen is displayed.

Usage

Input the setting value in percent (%) for "Area". Click "Color Pickup" button, and display color picker. Drag the mouse on target color within inspection frame. Colored area will be the inspection target.

When you specify the color of target component, and if there is more area than set value, it is possible to set the judgment result as Good. Function can be used for large area inspection. (Screen 1)
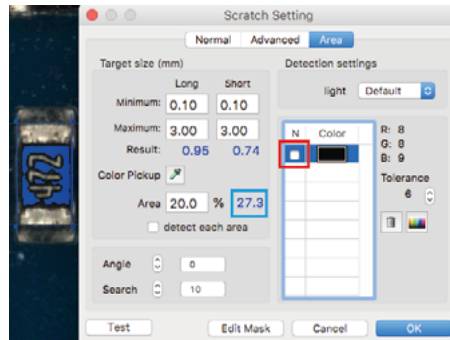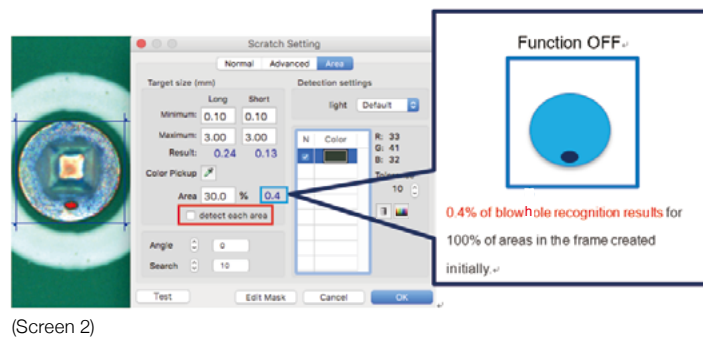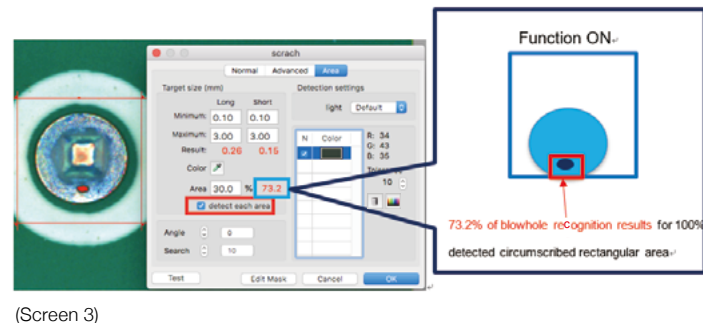

(Screen 1)

Practical application

Activate "detect each area" when you want to inspect smaller inspection area, such as stain and crack at the surface of ceramics or blow hole, and splash of solder on pad before solder coating. You can also execute the inspection by NG color when you activate "N" (NG is OK) of specified color. (Screen 2)

You can refer to following image as example to detect small NG point from wide inspection area. If you do not activate "detect each area", the detection area will be small and causes escape.

Please select appropriate setting depend on the target to inspect. (Screen 3)

(Screen 2)

(Screen 3)

229

▼ 16-8-4 Notice

- Set search area when PCB tends to shift position.

- Use zoomed frame if tiny defective object is escaped. non-zoomed frame has less resolution.

- Inputting too small/big value in minimum/maximum fields will give bad influence to inspection because this can cause many false calls.

- Scratch stamp finds all defective foreign object, however **maximum 100 points** can be displayed with red NG frames. If there are more than 100 objects, some may not be displayed with red NG frame.

- In Normal color selection mode, software tries to detect "**foreign object**" in the selected color area. Therefore, **"Large splash (more than the half of pad area)", "Mark made by paint", or "Symmetric object"** won't be detected.
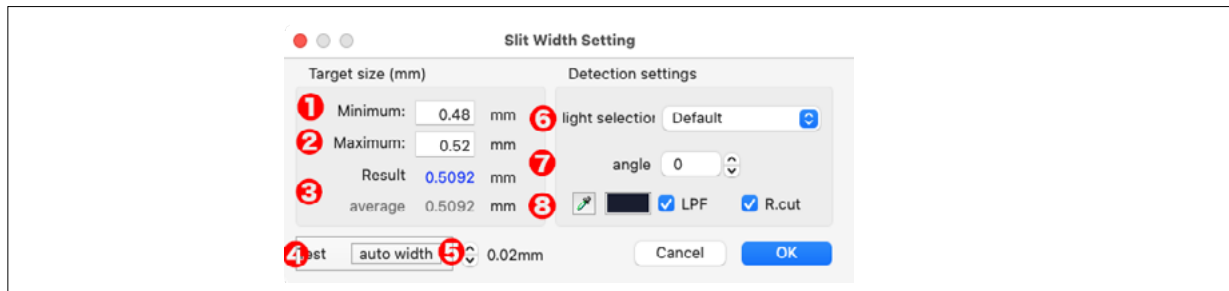

▼ 16-8-5 Caution

This stamp is slightly different from the ordinary stamp.

- Does not adjust the position by master picture in Color Selection Method (Normal).

- Unable to set Search Area /Area Limit in version 6.0.3 or prior.

- Does not search position with master picture, does not have more than one master picture, does not have reversing picture, because this stamp is not using pattern matching algorithm.

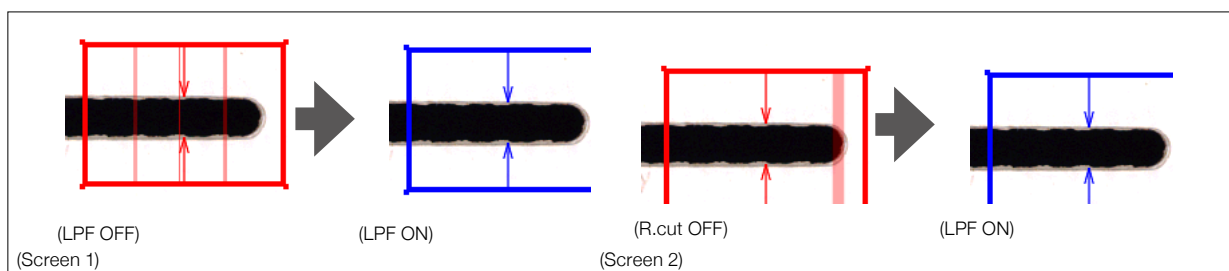- Does not follow the Pack Master in Pack Stamp in Color Selection Method (Normal).
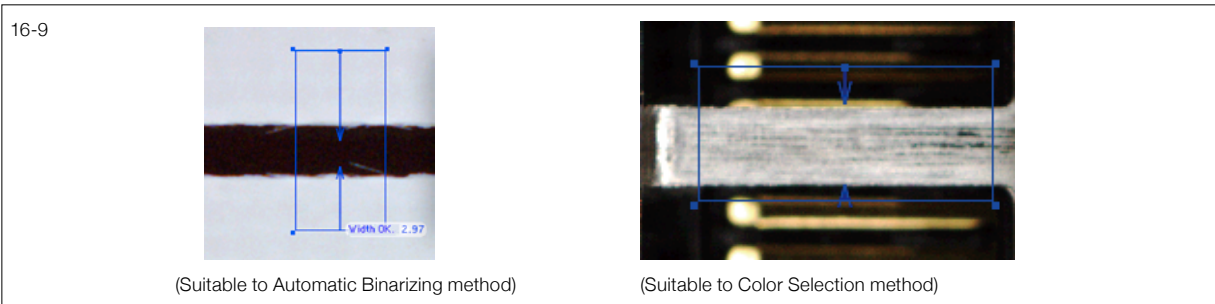
16-9 SlitWidth: Stamp for Measuring Slit Width

SlitWidth stamp

Exclusive stamp for measuring slit width to detect insufficient Ni/Au printing or scratch on printing.

| Menu	Description
1. Minimum	Set minimum size to be judged Good. The size less than this value is judged Not Good.
2. Maximum	Set maximum size to be judged Good. The size more than this value is judged Not Good.
3. Result / Average	Result of Test or analyzing is shown. If the result is Good, shown in blue color, and if the result is Not Good, shown in red color. If the measurement is failed, result is shown in red with minus value. Average shows the average of area in the frame.
4. Test / auto width	Show the result of current settings. By pressing auto width button, Minimum/Maximum target size is automatically input. Place SlitWidth stamp on the target (not defective sample), press this button. Minimum/Maximum size will be input based on the sample.
5. Allowance for auto width	The allowance for automatic Minimum/Maximum target size input. The default allowance is 0.02mm. By pressing up/down button, you can increase/decrease allowance per 0.02 step. Our recommendation is 0.04mm allowance.
6. light	AOI with multiple lighting models can change lighting.
7. angle	Enable to rotate frame from -180 to +180 degrees. By pressing up/down button, rotate by 15 degrees step.
8. Color Selection tool, Low Path Filter and R.cut	Use Color Selection tool when you want to measure width by Color Selection method. Low Path Filter is the filter to ignore a little noise (Screen 1), selectable only in color selection method. In case if you like to detect even tiny difference, please deactivate this option. R.cut means "Round Cut" option to ignore the shape difference at edge (Screen 2)

(LPF OFF)
(Screen 1)

(LPF ON)

(R.cut OFF)
(Screen 2)

(LPF ON)

16-9

(Suitable to Automatic Binarizing method)   (Suitable to Color Selection method)
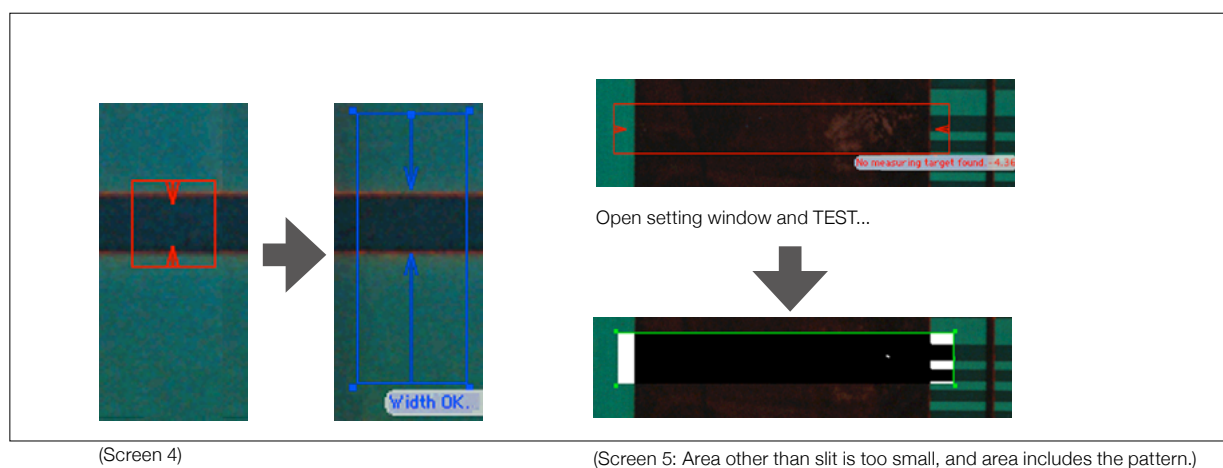
▼ **16-9-1 How to use**
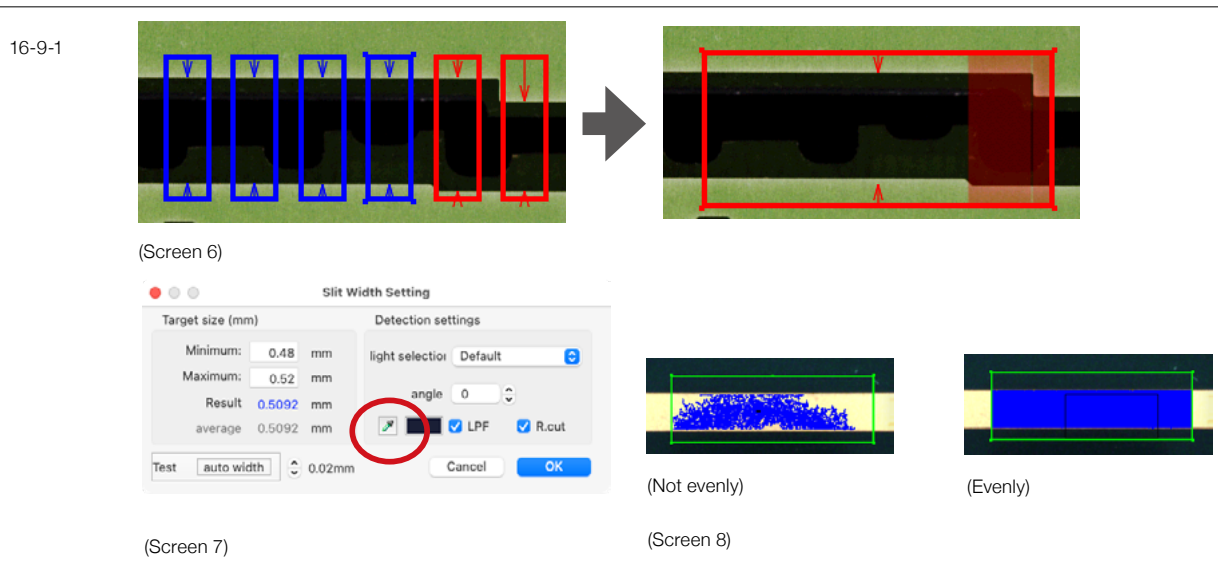
[Automatic Binarizing Method]

1. Place **SlitWidth** stamp on the target (Screen 1).

2. Open setting window, and set the threshold of width (Screen 2).

3. You can start inspection (Screen 3).

   * **When placing stamp, pay attention by reading Notice on below.**

16-9-1

(Screen 1)   (Screen 2)   (Screen 3)
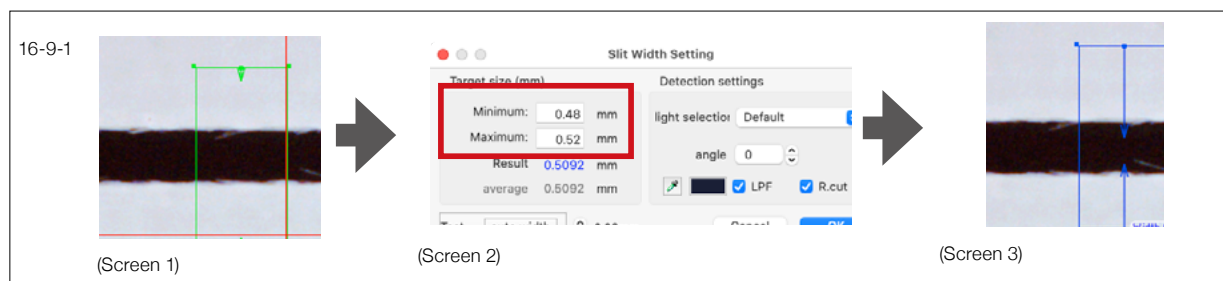
- If the area other than slit is small, detection may fail (Screen 4). Enlarge stamp to increase area.

- If stamp is including silk print, pattern or components, color is not uniform, or color of slit and non-slit area is very similar, detection may fail. An error message "No Measurement target found" will be shown with minus result value (Screen 5).

Open setting window and TEST...

(Screen 4)   (Screen 5: Area other than slit is too small, and area includes the pattern.)

16-9-1

(Screen 6)

Slit Width Setting

Target size (mm)

Minimum: 0.48 mm
Maximum: 0.52 mm
Result 0.5092 mm
average 0.5092 mm

Detection settings

light selection Default

angle 0

LPF R.cut

Test auto width 0.02mm Cancel OK

(Screen 7)

(Not evenly)   (Evenly)

(Screen 8)

- Width is calculated by averaging measuring several points in stamp. If the stamp size is too big, the result will be more standardized, and you can not get precise result. If you measure long shape, do not enlarge stamp, but place many stamps (Screen 6)

[Color Selection Method]

1. Press Color Selection button, select the color of target in the frame. By pressing this button, the mouse cursor becomes color picker. Drag the mouse onto the color in the stamp frame. By dragging, the selected color will be painted in blue. The painted area is the target to measure.
   * When selecting color, pay attention by reading Notice on below.

- Target area must be painted evenly without including unnecessary color (Screen 8). By dragging mouse larger, the area painted in blue will be increased. (If it is not possible to paint the target in blue evenly, the inspection result will be unstable. In such case, SlitWidth stamp may not be optimum method for your inspection)
- To reset the color, click in the area other than inside stamp's frame by color picker. After color selection is reset, the inspection method reverts to binarizing method.
- By binarizing method, the width is measured along the longer side of frame, on the other hand, the shorter side of frame is measured by color selection method.

▼ 16-9-3 Caution

This stamp is slightly different from the ordinary stamp.

- Does not adjust the position by master picture.

- Unable to set Search Area / Area Limit in version 6.0.3 or prior.

- Unable to set mask.

- Does not search position with master picture, does not have more than one master picture, does not have reversing picture, because this stamp is not using pattern matching algorithm.

16-10 KadoSta: PCB stop position adjustment stamp for inline

If your PCB's shape is somewhat like below sample PCB (Image 1), and unable to stop PCB on accurate position because your PCB's top left corner is not square or component like connector exists there, as a result the stopper does not work well on inline AOI, you should try KadoSta

KadoSta detects the edge of PCB and give offset.

▼ 16-10-1 How to use KadoSta

1. First, move camera by Move tool in order the PCB edge to be at the center (Screen 1), place KadoSta to be in the center (Screen 2). In case using KadoSta for giving offset to Y direction, resize KadoSta to be longer to Y direction. If it is resized, the mark <-- X--> changes into <--Y-->.

* When placing KadoSta, select PCB area where no pattern or white silk printing exists near the edge.
 If a straight white silk line is runnning near the edge, AOI mis-detect the white line as the edge.

2. Press Analyze button. When the edge is detected correctly, the green line is displayed on the edge, and red line graph which represents the difference is peaked on the edge (Screen 3). If detection fails, the green line is not displayed and orange line graph is displayed in stead of red graph.

3. If detection fails, error messages as "Not enough blank space" or "Image has too few characteristic area." pop up. In such case, please adjust KadoSta by following 16-10-3 Adjustment.

16-10-1

(Image 1)   (Screen 1)   (Screen 2)   (Screen 3)
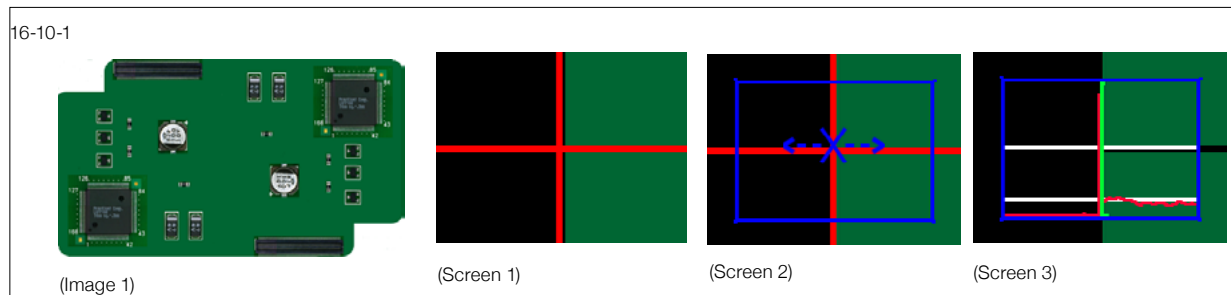
16-10-2

(Screen 1)
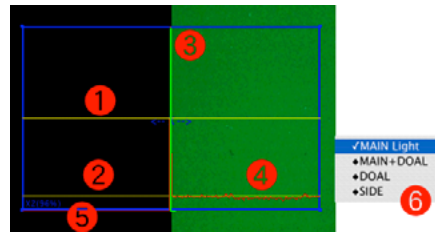
▼ 16-10-2 Display explanation

1. Red graph's peak (at edge) should be above this yellow line.

2. Blank area (where no PCB) should be below this yellow line. Also KadoSta should have at least 1/5 blank area.

3. This green graph is displayed where PCB edge is detected.

4. Red line graph represents the barometer of color difference.

5. Value of position offset. If the result is for example X2(96%) then 2 pixel position missalignment to X direction and the position is 96% correct.

6. If AOI has multi lighting, you can switch lighting by clicking on the frame of KadoSta.

▼ 16-10-3 Adjustment

1. Enlarge KadoSta frame size. Especially enlarge blank (non-PCB) area.

2. If white straight silk printing is running near the PCB edge, resize KadoSta smaller to exclude the white color.

3. If PCB color is too dark and can not detect, select DOAL illunimation if your AOI is multi lighting type.

16-11 BumpArray: Solder Bumps and Pad inspection

"BumpArray" stamp is an exclusive stamp for inspecting solder bumps, and pad before pasting solder. This stamp can detect scratch or unexpected object on pad, and detects of the bump (size, no solder, bridge and shape). In addition, BumpArray stamp can detect scratch or unexpected objects (such as dust or solder balls) on the neighboring pad.

* Because the bumps are quite small, please select AOI with high resolution lens.

* For ML illumination model only. Can't be active on the other model.

* Detection is not possible on the models which RGB lighting position is reversing.

▼ 16-11-1 How to use

At first, sampling PCB position, bump numbers and bump position from master PCB. Master PCB must be the good one without defect.

1. Set PCB on AOI, load StampLibrary.

2. Move camera onto the target, paste BumpArray stamp.

3. You can resize the frame to fit the target size. This operation is different from case 1 "Bump only" and case 2 "Not only Bump also neighboring Pad".

[Case 1 (Bump only)]

3-1. Enlarge stamp size to include all bumps, large enough to include all bumps, but small enough to exclude Pad area.

   Caution: Select the best piece (target), because this is going to be the master. All bumps must be in good shape, good size, correct number and in accurate position.

3-2. Open settings window by double-clicking the frame. When the inspection target is solder bump, select **Bump**. When the inspection target is pad (before printing solder), select **Pattern**. Press re-inspect button, and confirm the result to be OK. Mouse over the frame of BumpArray stamp (Screen 1). A message "Bump OK 0/225" will be shown (225 is the total bump number here). Confirm the last number (225 here) is as same as the number of bumps that you count with your eyes.

16-11-1

(Screen 1) (Screen 2) (Screen 3)
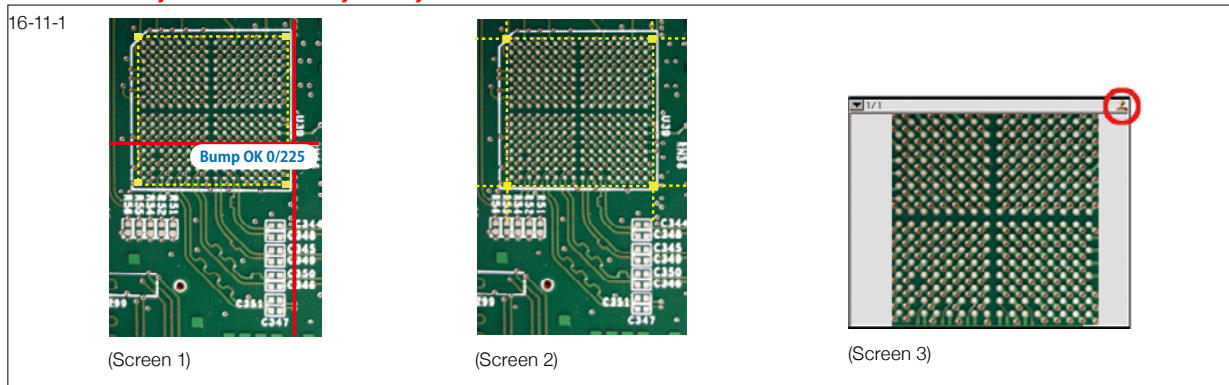
* If the number of bumps differs, change the piece and re-take the master picture.

3-3. Next, set the Search Area. Move mouse cursor on the bottom-right corner of the frame, drag the frame with pressing **control** key (Screen 2). Press the golden stamp button in Master Picture Area and update the BumpArray stamp (Screen 3).

[Case 2 (Not only Bump also neighboring Pad)]

3-1. Enlarge stamp size to include not only bumps but also pad (Screen 4).

3-2. Let's separate Bump area and Pad area. Drag the bottom-right corner of the frame to inside (toward diagnostic side), shrink the frame until the mouse cursor comes to the bottom-right corner of Bump area. Release the mouse button. A message "Resizing a stamp..." will be s hown (Screen 5), press OK. Continuously, a selection menu pops up. Select "**Bump and Pad inspection**".

3-3. As well as 3-2, shrink the top-left conrner of the frame to fit the Bump area. Now the frame for Bump inspection is created inside the frame for neighboring Pad inspection.

3-4. Open settings window by double-clicking the frame. When the inspection target is solder bump, select **Bump**. When the inspection target is pad (before printing solder), select **Pattern**. Press re-inspect button, and confirm the result to be OK. Mouse over the frame of BumpArray stamp. A message "Bump OK 0/225" will be shown (225 is the total bump number here). Confirm the last number (225 here) is as same as the number of bumps that you count with your eyes.

3-5. Next, set the Search Area. Move mouse cursor on the bottom-right corner of the frame, drag the frame with pressing **control** key. Press the golden stamp button in Master Picture Area and update the BumpArray stamp.

16-11-1
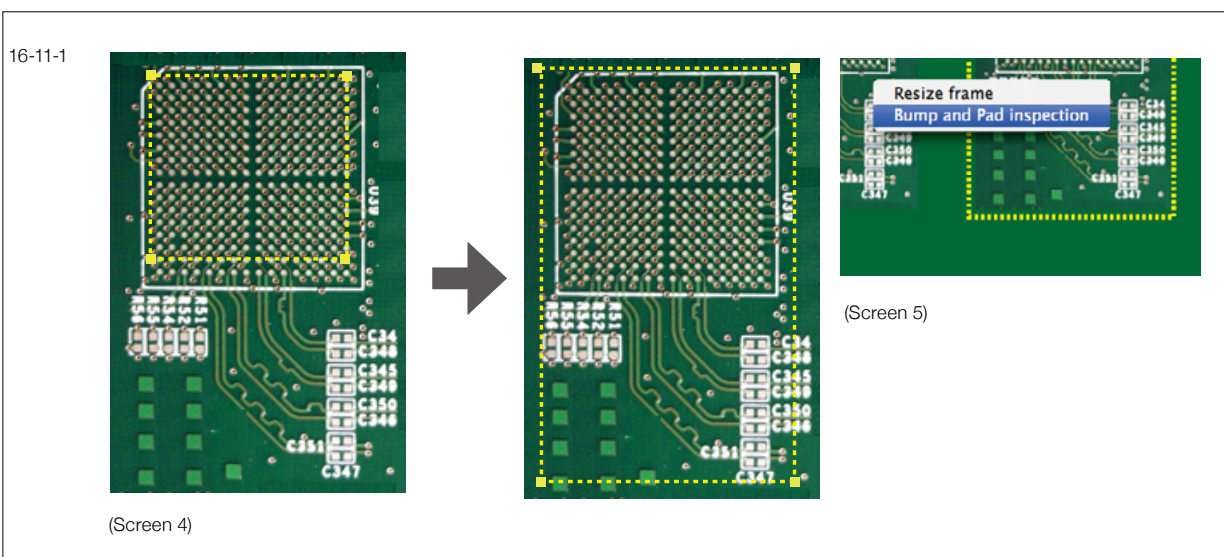
(Screen 4)

(Screen 5)

16-11-1
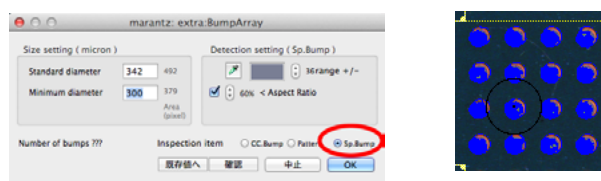
(Screen 6)

[Case 3 (Big BGA Bump)]

1. Set PCB on AOI, load StampLibrary.

2. Move camera onto the target, paste BumpArray stamp.

3. Select Sp.BUmp for Inspection Item. There will be Color selection tool in Detection setting. Sample the solder area to be painted blue. (Screen 6)

4. Input bump size and minimum allowanced bump size in Size setting.

5. Set allowance of insufficient solder area in percentage (default 60% means if 60% area is printed by solder, it is judged OK.)

16-11-2
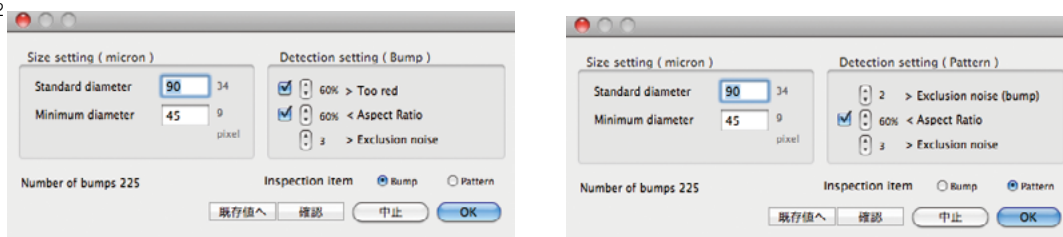
▼ 16-11-2 Settings Window

Settings Window is shown by double-clicking the frame of stamp.

Size setting (micron)

Standard diameter: The ideal size of a bump diameter in micron. The number on the right is the number converted to pixel.

Minimum diameter: The minimum size of a bump diameter to be OK. The number on the right is the number converted to pixel.

Detection settings (Menu differs whether **Bump** or **Pattern** is selected)
(CC.Bump: Solder Bump inspection after printing)

Too red: Detect "No Solder Area". When pad color is gold and solder color is grey, this will be effective. Enable to switch active/deactive.

Aspect Ratio: Detect the defect of bump by shape. Default 60% means, if the width's and height's length is differ more than 60%, should be NG. Enable to switch active/deactive.

Exclusion noise: Specify the minimum size of object to detect as unexpected object. (Also has affect to reduce noise). This setting influences also inspection of neighboring pad.

(Pattern: Bump Pad inspection before printing)

Exclusion noise (bump): Specify the minimum size of object to detect as unexpected object on pad of bump.

Aspect Ratio: Detect the defect of bump by shape. Default 60% means, if the width's and height's length is differ more than 60%, should be NG. Enable to switch active/deactive.

Exclusion noise: Same as selecting Bump, however the threshold is much more strict because it is pure pad inspection when selecting Pattern.

(Sp.Bump: Big Solder Bump inspection after printing)

Color Selection Tool: Select bump color

Aspect Ratio: Detect the defect of bump by shape. Default 60% means, if the width's and height's length is differ more than 60%, should be NG. Enable to switch active/deactive.

Default: Reset all settings

Test: Confirm the inspection result in current settings.
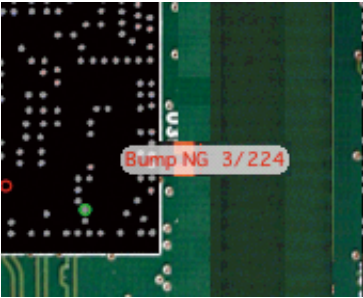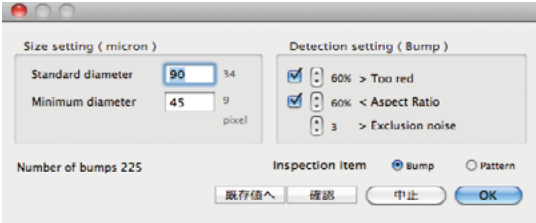
▼ 16-11-3 Inspection and Debugging

After the inspection, defects are marked by color circles. Mouse over on the frame line, an error message, e.g. "Bump NG 3/255" will be shown (Screen 1). This represents "NG number / Total number" of bump.

When there are false calls, change the tolerance according to the cause of NG. For example, if a false NG occurred by 'Bump area too small (yellow circle)', increase the value of "Minimum diameter" (Screen 2).

* In example, the minimum diameter is 45 microns (9 pixels). In 9 pixels, there is a margin of error of 1 or 2 pixels. Therefore, if you want to detect 45 microns bump, input 60 micron in practice.
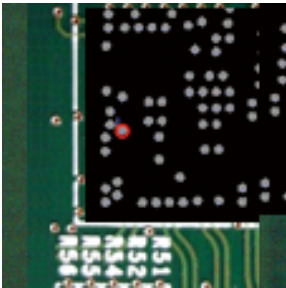
16-11-3
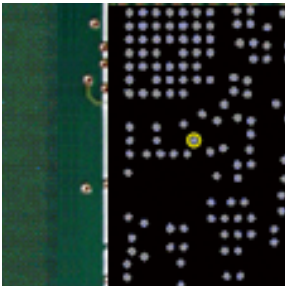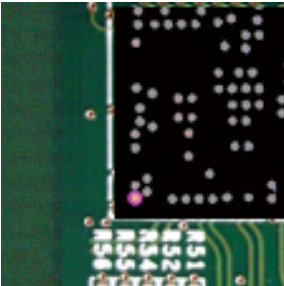
(Screen 1)

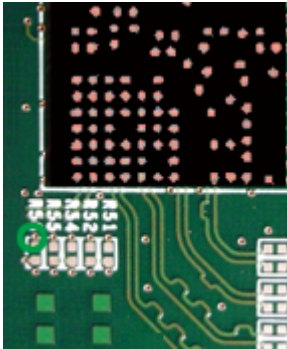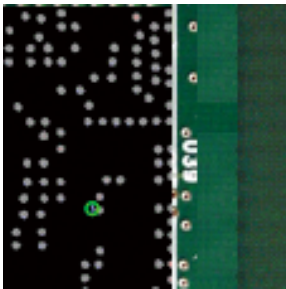(Screen 2)

Defects marked by color circles

Red: Bump not found

Rose: Insufficient (or No) Solder

Yellow: Bump Area too small

Green: Unexpected Object

Light Blue: Bridge or Shape incorrect

# 16-12 Length Measurement

Measure the distance between two objects by using pattern matching or Pack type stamp, the accuracy of 0.01mm. Suitable to inspect the components such as sensor or LED which are requested to mount on very accurate position.

▼ 16-12-1 How to use

Prepare the PCB to be master. (If you have CAD data and the distance is specified in the CAD, you can manually input the length.) Place pattern matching stamps or Pack stamps on the objects that you want to measure the distance.

1. Activate "Length Measurement Setting" in Settings menu (Screen 1).

2. Move mouse cursor near the center of the inspection frame. The cursor shape changes to pen shape (Screen 2).

3. Mouse down and drag the mouse to the other frame . Yellow arrow will be displayed. Release the mouse when reaching to the frame (Screen 3).

4. Setting window will be displayed. There are length and difference shown on the yellow arrow. The length is measured from the center of each frames. The difference is defined 0.00 here, because this will be the master (Screen 4).

16-12-1

(Screen 1)

(Screen 2)

(Screen 3)

(Screen 4)
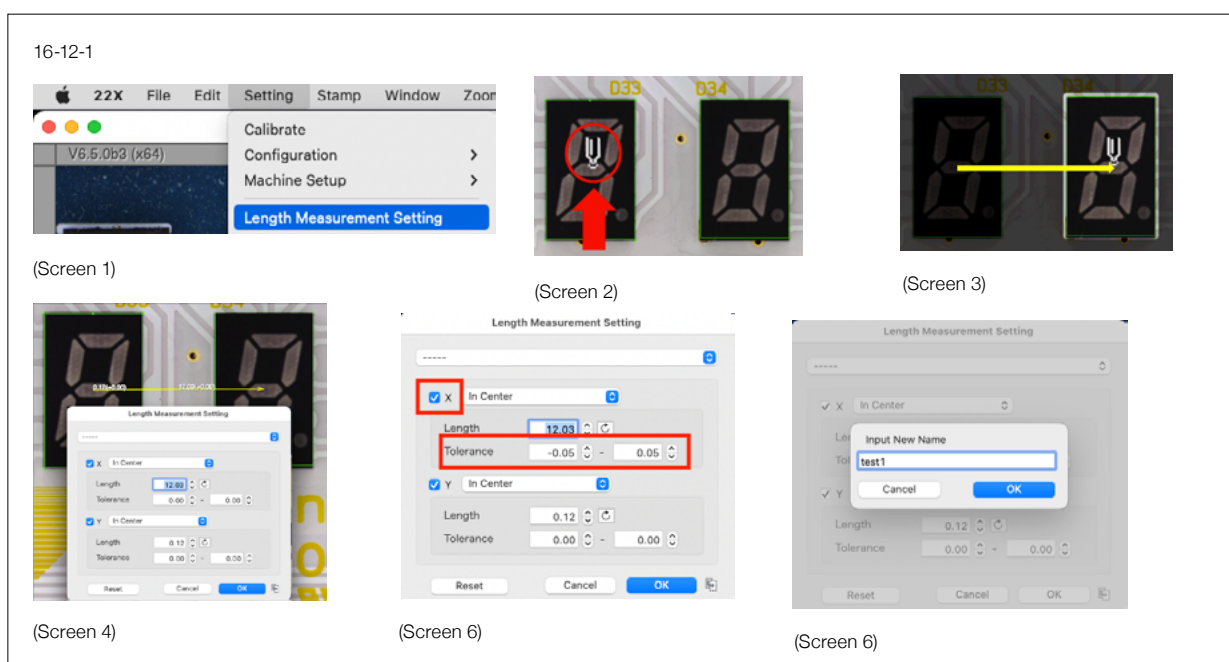
(Screen 6)

(Screen 6)

5. Select if you like to measure length X, length Y or both by checkbox. Then input tolerance from minus (shorter) to plus (longer) (Screen 5) .

  Do not change the pull down menu "In Center". Do not also change the "length", but if the length is regulated in CAD data, input the value from keyboard.

6. Click OK. The dialogue to input the name will be displayed. Input name for the measurement setting (Screen 6) you can't input the same name exist in the stamp list.

* The setting is saved, however this setting is not saved as stamp. It is saved in the inspection program and not possible to re-use in the other inspection program. In this program, you can re-use from top pull down menu (Screen 7).
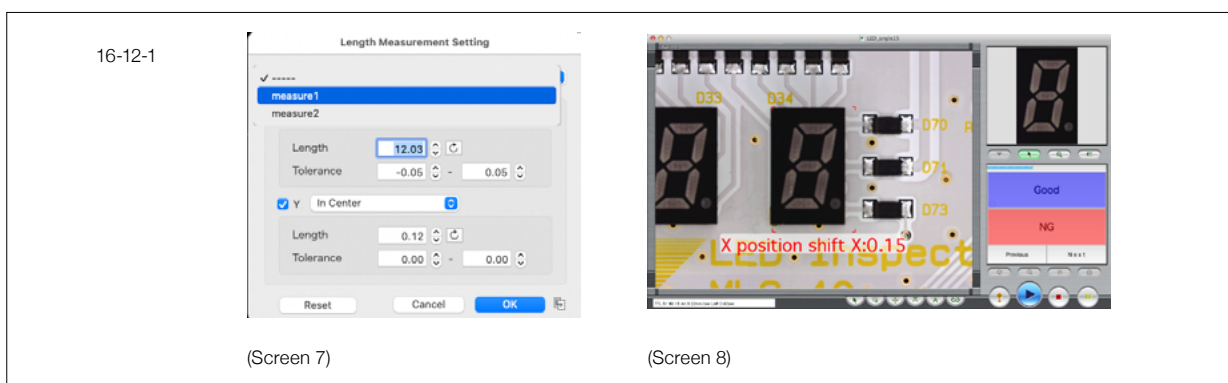
* Setting is not saved/linked to the stamp, e.g. Set length measurement between stamp A and B in a Cell. Then move to the other Cell and paste stamp A and B, but length measurement is not set between the stamps in the other Cell.
  If you want to duplicate the stamps and length settings simultaneously, please duplicate by Cell Duplication or select stamp A and B, copy and paste them in the other Cell.

7. Setting is completed. Start inspection.

8. Length error will be displayed while verification (Screen 8).
  * If stamp is NG by the other reason such as Mismatch or Mismatch by Hue, these error reasons are prior shown than the distance error. Therefore, the stamp setting should be tolerant for not to detected as NG by Mismatch or Mismatch by Hue.

16-12-1

Length Measurement Setting

measure1
measure2

Length 12.03
Tolerance -0.05 - 0.05

Y In Center
Length 0.12
Tolerance 0.00 - 0.00

Reset   Cancel   OK

(Screen 7)

X position shift X:0.15
Good
NG

(Screen 8)

▼ 16-12-2 How to debug

Please debug when there are escaping or false calls.

1. Measurement for escaping.

   Shrink the threshold. While Length Measurement Setting is checked (Screen 1), move mouse cursor near the center of the destination frame. The cursor shape changes to pen shape. Click the center of the destination frame (Screen 2), the setting window opens.
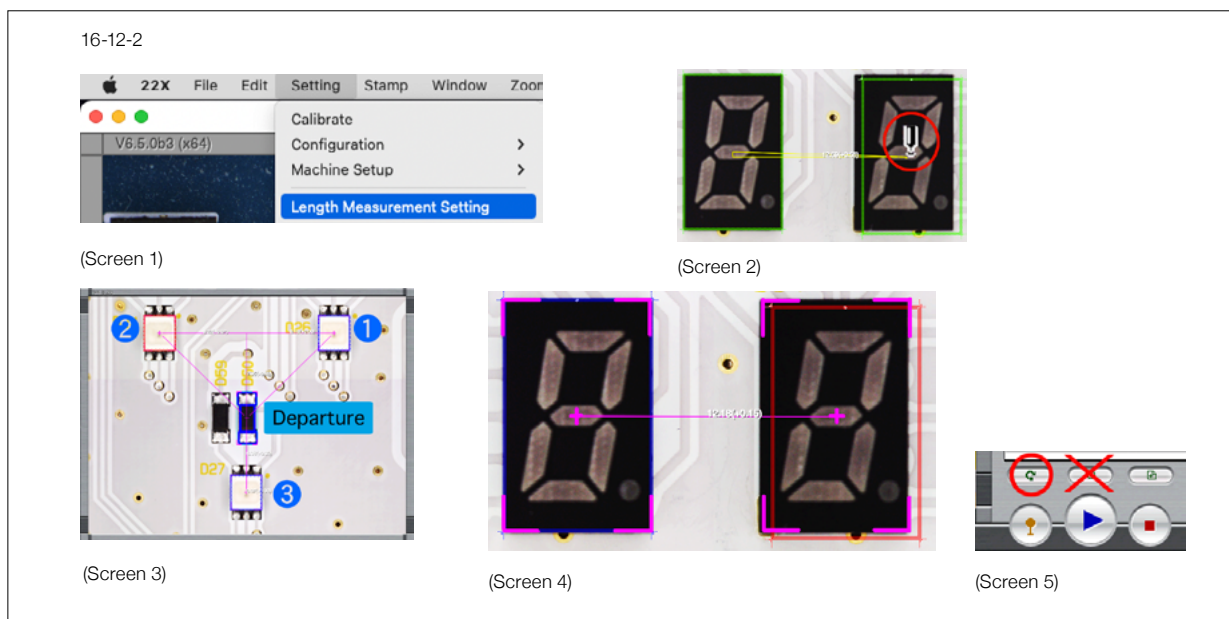
   * The cursor shape changes to pen shape even if it moves closer to the departure frame, however setting window will not open by double-click. In place you can create the 2nd setting to the other object. The multiple measurement settings are possible to create from one departure frame to multiple destination frames (Screen 3).

2. Measurement for false calls.

   Please observe the stamps. The stamps position after searching is shown by **rose lines at the 4 corners**. **The rose cross hair** is displayed in the center. Departure frame is linked to destination frame **by rose line**, and current length and difference is displayed (Screen 4).

   Confirm if **rose lines at the 4 corners** are in the correct positions. If positioning is not good, the color difference between object and PCB is too less and it is difficult to position, thus the object is not suitable for measuring distance. If tolerance is not wide enough, give more tolerance.

3. Confirming the result after changing value. Press re-confirm button to confirm in selecting both departure and destination stamps. Analysis button does not work for this function (Screen 5).

16-12-2

(Screen 1)

(Screen 2)

(Screen 3)

(Screen 4)

(Screen 5)

16-12-3

Length Measurement Setting

measure1

☑ X ❶ In Center ❷
Length 12.03
Tolerance -0.05 - 0.05

☑ Y In Center
Length 0.12
Tolerance 0.00 - 0.00

❸ Reset   Cancel   OK ❹

(Screen 1)   (Screen 2)

▼ 16-12-3 Window

Explains other window items which are not explained by here (Screen 1).

1. Selectable from "In Center", "Inside" or "Outside". Normally select "In Center", however if you like to measure between the inside edge of objects, select "Inside" and if you like to measure between the outside edge of objects, select "Outside" (Screen 2).
2. Reload the value by reading current value.
3. Reset (delete) the length measurement.
4. Save in the other name.

▼ 16-12-4 Limitations

- Not possible to use in **NG Cell View** or **Auto trace in faster mode**.
- Pattern matching type stamp or Pack stamp only.
- Measuring other than rectangle shape may result in incorrect value.
- Not possible to measure beyond the Cells.
- Measuring between rotated cell in free degrees (not 90 or 180 degrees) may result in incorrect value.
- Re-setting required after rotating Cell.

16-13 Inspection Program Splitting Function for More Than One AOI

In version 4.9.9 or later, you can inspect the PCB by splitting inspection area for more than one AOI.

The inspection program can be split up to 3 AOI's.

*Barcode setting is required to apply this function.

▼ 16-13-1 How to setup

1. Open "Settings for Supervisors" window from menu Settings > Configuration > For Supervisor.

    Open Plus tab. Put check mark on "Machine number of separation data".

    Assign the number to AOI's.

    First AOI: AOI #1

    Second AOI: AOI #2

2. Create the inspection frame.

3. Select the "AOI#1" from the menu displayed by clicking with pressing [Control] key on Cell Map Area. Next, with same procedure, select "AOI#2" from the menu.

4. Copy the inspection program you had created in first AOI to second AOI. Then open the file.

5. Execute inspection in first AOI. Then, execute inspection in second AOI.

6. In Catch System, split data will be combined and displayed.

▼ 16-13-2 Setting of CS-Center

*CS-Center V1235 is required to apply this function.

1. Set the address in CS-Center. Set IP Address and Port individually as same as usual. Be sure to set same AOI name if you use this function.

2. Go to menu Setting > General Settings. Put check on to "Use Combination" in Combination setting tab. Set same Group number for AOI's which uses splitting inspection program.
    For example, if you use splitting inspection function for two production lines, and each line has 2 AOI's, apply Group number 1 to the AOI in first line, and apply Group number 2 to the AOI in second line.

17. Extra Parts and Solder Balls

Normally the Inspection Frame must be pasted onto the part/component you want to inspect. However, in the actual production process, the PCB may become defective due to unexpected scratches and extra objects or solder balls. Therefore, this software has a special Stamps for inspecting the entire cell.

The stamp to detect extra objects and scratches is called the **Extra Parts Stamp** or **EP Stamp**. In a cell with the **EP Stamp**, a Master Image is created from several good PCBs to deal with the component's slight differences in position, shape and color. Then, the Master Image will be compared to the actual image to detect differences.

Extra Parts stamp is not suitable to detect small solder balls. There is Solder Ball Detection stamp for it.In this chapter, how to use Extra Parts stamp and Solder Ball Detection stamp is discribed.

17-1 How to Use Extra Parts Stamp

The **Extra Parts Stamp** can be used in following procedure:

1. Paste the **Extra Parts Stamp**. Because position alignment is done by the stamp's picture, paste the stamp on where characteristic and not tend to differ per each PCB. Change the stamp size if necessary to suite the target object (Screen 1).
2. Double-click on the frame and the **EP stamp setting** window will be displayed (Screen 2). At this stage, you do not need to change parameters. But, if you wish the stable inspection, change learning number from 10pcs to 30-50 pcs. The more PCB is learned, the more stable detection is possible.
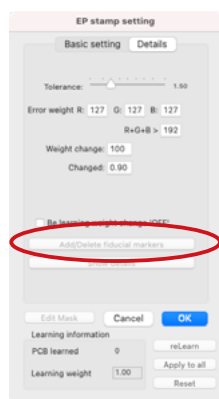
(Screen 1)

(Screen 2)
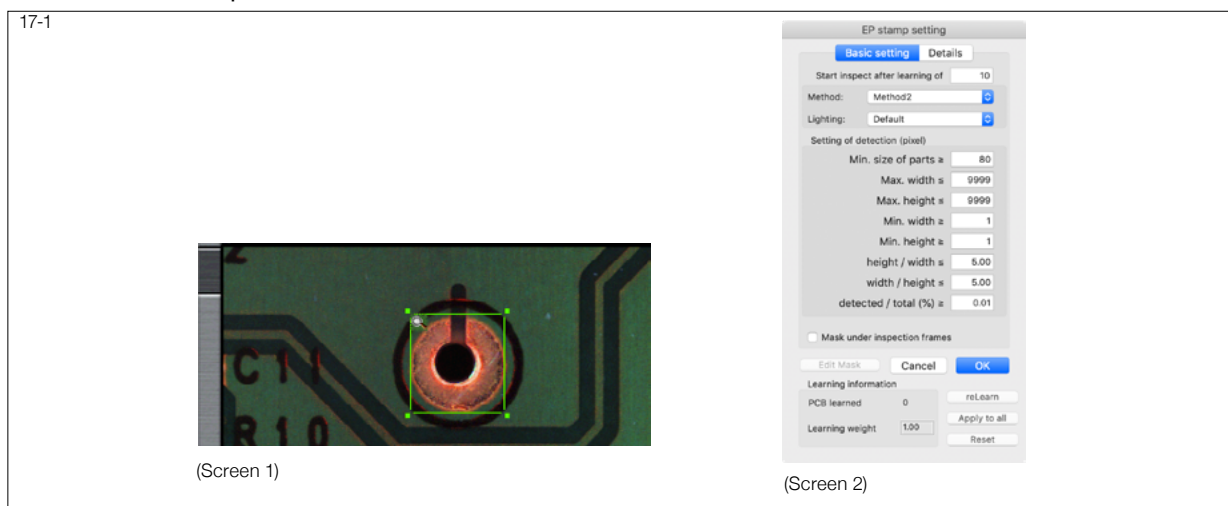
3. Set a good PCB and start Inspection This 1st PCB will be the master.

4. Inspect PCB of learning number, while inspecting after learning a few PCB, observe if position offset is working correctly and if the variation of PCB is absorbed.

5. To observe the position offset, click the Extra Parts stamp frame and open setting window. There is "Add/Delete fiducial markers" in Details tab (Screen 3). If one frame for offet is not enough, you can add more frames to offset (Screen 4). If searching is not working well, expand search area (Screen 5).

6. The solder area such as QFP leads can vary because of reflection, it is better to mask them. Open "Edit Mask", select "Mask to decrease sensitivity". Draw mask by edit tools. Sensitivity 100% means ignore inspection, sensitivity 30 means inspection is done but slight difference is ignored (Screen 6).

7. Continue learning.

8. When completing learning, you can start real inspection.

* This process requires huge memory.. We recommend to use Mac with large RAM memory. The consumption of memory is not depend on the learning number, it depends on the number of Cells where Extra Parts stamp exists. If Extra Parts stamp is pasted to all Cells on large PCB, memory will be lacked. Because Extra Parts stamp compares whole Cell image to learned image, it takes time to inspect than normal stamps.

* Depend on the combination of OS and Mac hardware, the number of PCB learned will not be up-count after the first inspection when opening the inspection program which contains Extra Parts stamps that were already inspected many times. Counter will be up on and after the second inspection.
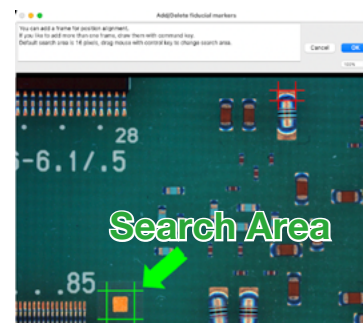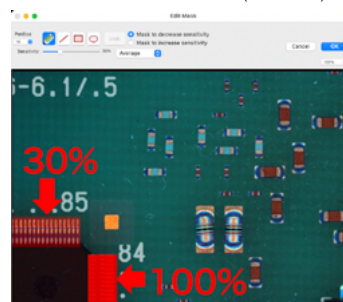
17-1

(Screen 3)
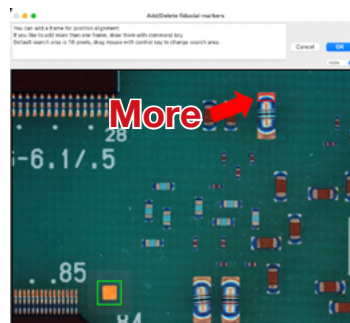
(Screen 4)

(Screen 5)

(Screen 6)

17-2 EP Stamp Setting Window

Items to be set up in the **EP stamp setting** window are as follows:

• Basic setting Tab (Screen 1-a)
■ Start inspect after learning of " " pcs

Set the number of PCBs to be learned. When 10 is entered here, the first PCB will be recorded as the Master PCB, and 10 PCBs starting with the next PCB will be used for learning.

■ Method

Selects a detection method. [Method 2] is faster than [Method 1].

■ Light

Change the lighting to be used. Changing this setting after learning will erase the learnt result.

<Setting of detection>
■ Min. size of parts<

Set the minimum pixel value by size. If 80 is set here, a block of NG pixels with less than 80 pixels will not be detected as an extra part. This setting prevents noise and minute dust from being detected.

■ Max. width >

Set the maximum pixel value for width. If 500 is set as the maximum, a block of NG pixels whose width exceeds 500 pixels will not be detected. The default value is 9999, which will detect all widths.

■ Max. height >

17-2

| EP stamp setting |
| **Basic setting** Details |
Start inspect after learning of	10
Method:	Method2
Lighting:	Default
Setting of detection (pixel)
Min. size of parts ≤	80
Max. width ≤	9999
Max. height ≤	9999
Min. width ≥	1
Min. height ≥	1
height / width ≤	5.00
width / height ≤	5.00
detected / total (%) ≤	0.01
☐ Mask under inspection frames
Edit Mask   Cancel   **OK**
Learning information
PCB learned	0	reLearn
		Apply to all
Learning weight	1.00	Reset

(Screen 1-a)

Set the maximum pixel value for height. If 500 is set as the maximum, a block of NG pixels whose height exceeds 500 pixels will not be detected. The default value is 9999, which will detect all heights.

■ Min. width <

Set the minimum pixel value for width. If 10 is set as the minimum, a block of NG pixels whose width is less than 10 pixels will not be detected as an extra part. The default value is 1, which will detect all widths.

■ Min. height <

Set the minimum pixel value for height. If 10 is set as the minimum, a block of NG pixels whose height is less than 10 pixels will not be detected as an extra part. The default value is 1, which will detect all heights.

■ height/width >   width/height >

Set the aspect ratio of a block of NG pixels. If 5 is set in **height/width**, a block of NG pixels whose aspect ratio (h/w) exceeds 5will not be detected as an extra part.

■ detected / total <

Set the rate of the area of a block of NG pixels in relation to the area of a circumscribed rectangle drawn around the NG block. If 0.10 is set, blocks less than 10% of all NG pixels in the area will not be detected.

■ Mask under inspection frames

By ticking this, arranged inspection frames are excepted from the inspection.

• Both in Basic setting Tab / Details Tab
■ Edit Mask Button

Display the editMask window.

<Learning information>
■ PCB learned

The total number of PCBs learned, including the number of PCBs judged as OK will be displayed. The first inspection will not be counted here since it is used for learning.

■ Learning weight

Sets the weight of PCBs learned. 1 is the maximum value and represents a learning weight of 100%. As the value moves closer to 0, the impact of learned PCBs is reduced, in turn increasing the impact of the original PCB.

■ reLearn

Click here to open the **reLearn** window (Screen 1-b). You will be able to set the additional number of PCBs to be learned after inspections, when you feel that more PCBs should be learned in order to standardize the Master Image. If you check [Apply to all] and select [OK], relearning will also be performed on the EP stamps other than the one currently selected.

■ Apply to all

This function changes all allocated Extra Parts Stamps in the program to the same values after changing the settings. Click on the **Apply to all** button, and click **OK** when the confirmation window is displayed. This function is valid only after inspection or if you have opened the **EP stamp setting** window at least once. This setting will not be applied to a stamp that has only been placed.

■ Reset

Delete all learned images and mask details. The setting values will not be reset.

• Details Tab (Screen 2)
■ Tolerance

Set the detection sensitivity here. When the value is set higher, the detection sensitivity will be reduced.

■ Error weight

This adjusts the degree of detection for each RGB element. Normally, you do not need to change this. When detecting by each RGB element, if the value calculated based on the set value exceeds the value set in R + G + B >, it will be detected as an extra part (when detected by each element, the set value + set value * rate of error (10%) will be the value assigned to R + G + B).

■ Weight change

Set the timing (number of PCBs) in which to change the weight of learning. The weight up to this number will be the value set in **Learning weight** in **Learning information**.

(Screen 1-b)　　　　　(Screen 2)
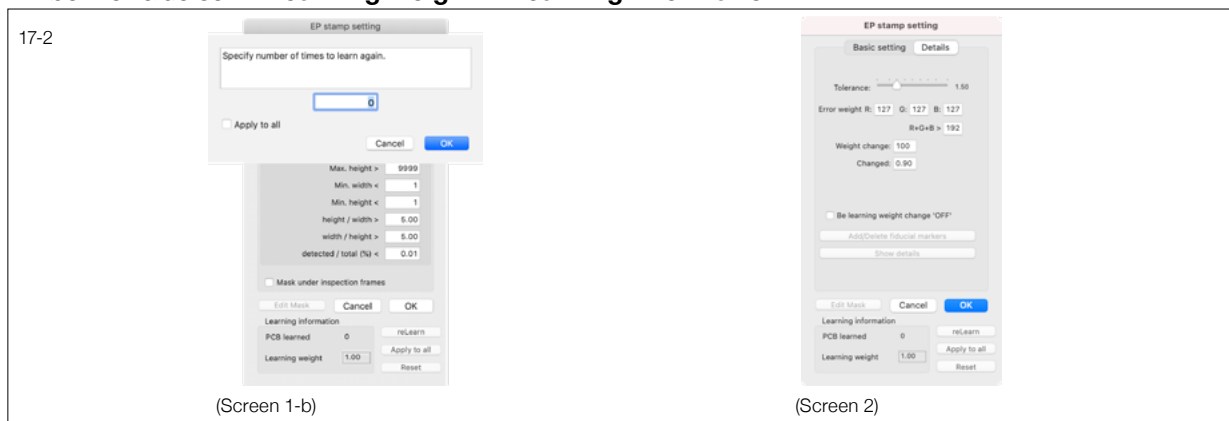
■ Changed Weight

Set the rate of how learning weight changes after it exceeds the number of **Weight change**. Once the number exceeds the value set in **Learning step**, the weight will be **Changed weight** in **Learning information * Learning Weight**. Set a value of 1 or less.

■ Add/Delete fiducial markers

During inspection, Extra Parts Stamp works like a Fiducial because it offsets the whole cell, but if the image is unstable, you can add **Fiducial Marks**. When adding the marker, use the **Add/Delete fiducial markers button**. Click on this button to display the **matching Rects** window. Drag the mouse over the area you wish to add, drawing a red rectangle. This will be the Marker, and it will enable you to apply offset even if Cell offset by the Extra Parts Stamp fails (Screen 3).

■ Show NG details

If the inspection result is NG, click here to display the **setupDetails** window for more detailed information. This window shows a differential Image between the actual image and the Learned Images.

- Disp. frame

If you activate this function, a rectangle showing the area and the arrow of the inspection result will be displayed.

- Clear

If you activate this function, the screen will black out all areas except for the NG area (Screen 4).
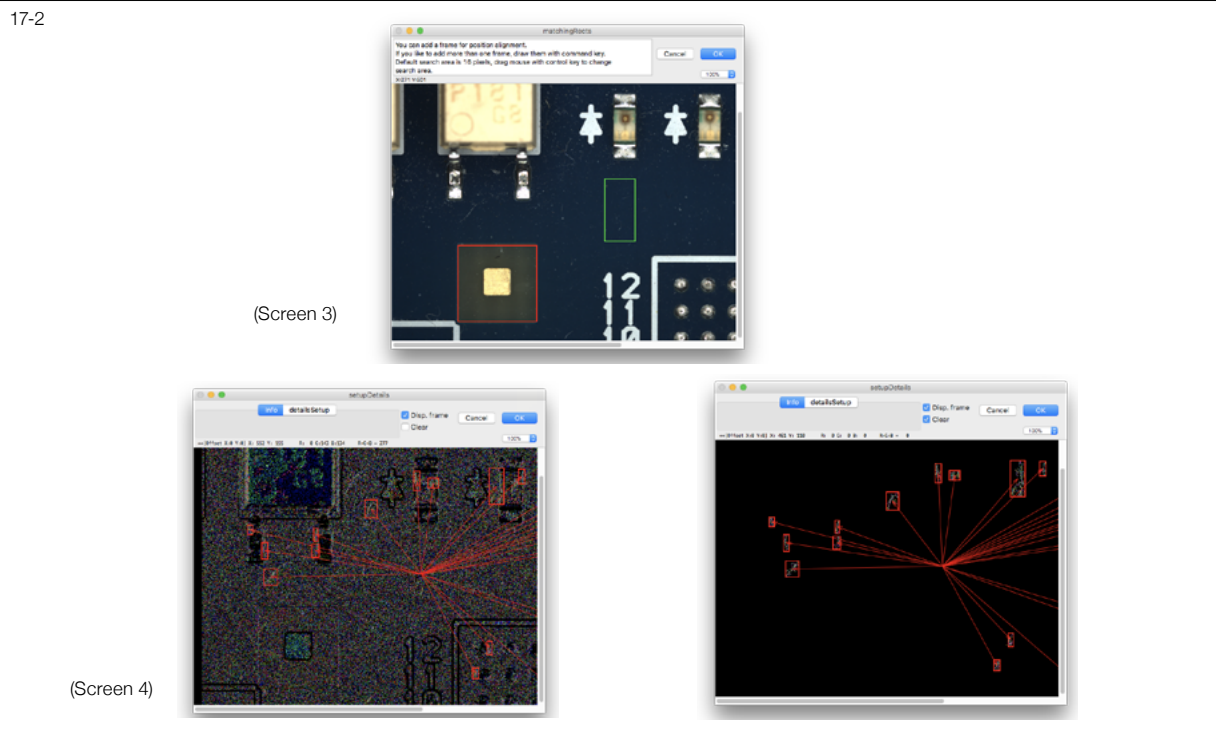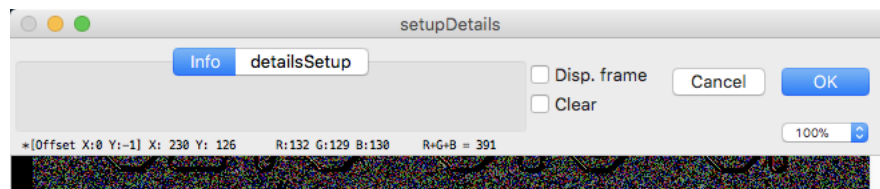
(Screen 3)

(Screen 4)

(Screen 5)

- **Place mouse pointer on the rectangle area of the NG point**

  Detail of the area will be displayed. The details include average values and maximum values of R/G/B, the end points of the rectangular area and the number of pixels. Offset of Marker and current position of the mouse are always displayed (Screen 5).

- **Indicate the point exceeds the setting of Error weight**

  This function shows the point which exceeds the Error weight set value. While pressing [option] key in "setupDetails" window, the point which exceeds the Error weight set value is shown in gray (RGB:127,127,127), and the point which is less than set value is shown in red between 0 – 255.

  * When the "Clear" is checked (activated), only the point which exceeds the Error weight set value is shown.

- **Indicate the value of "Red" "Green" "Blue" and "Red+Green+Blue"**

  The total value of Red "R", Green "G", Blue "B", and Red+Green+Blue "R+G+B" is displayed in "setupDetails" window by putting mouse pointer on differential Image between the actual image and the learned image (Screen 6). It is possible to set the value of Error weight referring this value.

  * Caution: In Mac OS, the position that mouse pointer shows is the black tip of the pointer. The value of "R", "G", "B", and "R+G+B" is the value of the black tip of the pointer position (Screen 7). It is not the white colored part of the pointer.

17-2

(Screen 6)

(Screen 7)

Value of black tip
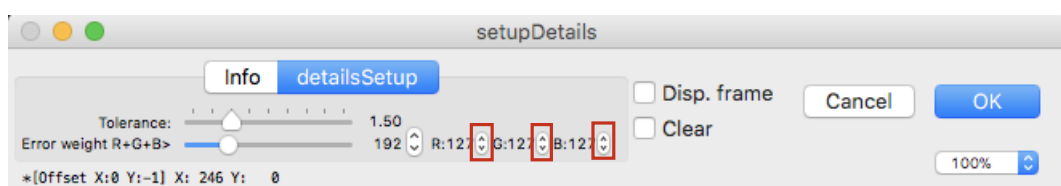
(Screen 8)

- **Adjustment of "R + G + B >"**

 In EP Stamp setting window, click "Show NG details", and "setupDetails" window will appear.
There you can confirm the result of "R+G+B>" while changing its value. You can change the value
by horizontal slider or vertical stepper. Changed value is reflected immediately to the image.
Possible set value range is from 100 to 500.

- Individual adjustment of "Red", "Green", and "Blue"

 As same as the adjustment of "R+G+B>", you can confirm the result by changing the value "Red",
"Green", "Blue" individually in "setupDetails" window. You can change each value using vertical stepper.
Changed value is reflected after a while that certain time is necessary for calculation. Possible set value
range is from 0 to 127 (Screen 8).

■ **Edit Mask**

Parts which have large differences between PCBs, such as components with text or glossy parts, can be
masked so that you can reduce false reports. It is grayed out at default, but will become active after an in-
spection.

17-3 Mask too sensitive area

In the **EP stamp setting** window, click on **Edit Mask** (which will become active once inspected) and the
edit Mask window will be displayed (Screen 1). You can edit masks here to reduce false reports.

■ **Pen Tool**

Create masks by free hand.
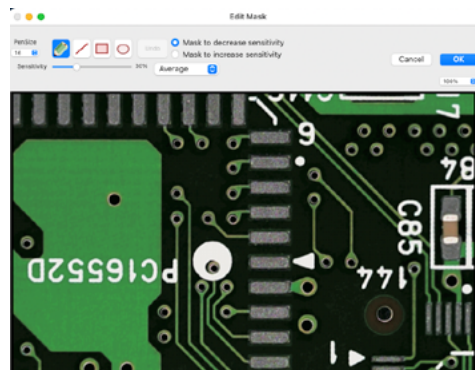
(Screen 1)

■ **Straight Line Tool**

Create masks with lines.

■ **Square Tool**

Create square shaped masks.

■ **Circle Tool**

Create Oval shaped masks.

■ **Undo**

The masks applied during the mask's frame edit will be undone at one task per click.

■ **Pen Size**

Sets the thickness of the masks made by the pen tool and the straight line tool.

■ **Sensitivity**

This sets the opacity of the mask. The larger the value, the higher the opacity of the mask will become, reducing the detection sensitivity. If it is set to 100%, the image underneath the mask will be completely hidden. This setting should be applied before drawing the mask. This setting cannot be applied to existing masks.

■ **Mask to decrease/increase sensitivity**

This switches the mask type. This should be set before drawing the mask.

■ **Average/ upper/ lower**

Average means the average of learned images. Upper/Lower are to show the insensitive area of learned results. The stronger the white is, the less sensitive it will be.

17-4 Tune-up Extra Parts Stamp

When performing inspection, false reports may occur. In this case, apply the following adjustments depending on the situation.

1. If the Extra Parts Stamp is judged as NG when inspected by **Re-inspection button**, make the current picture to be learned by pressing command+return keys.

2. Inspect the PCB using the current picture in the **G/NG Confirmation Mode**. When you come to the Extra Parts Stamp inspection result, click on the **Learn Extra part data** in **Work Area** or hold down the **Shift key + Good** to learn. By pressing Shift key in G/NG confirmation mode, you can see the image with NG detail filtering.

3. Learn several good PCBs using the Relearn button.

4. Apply masking to decrease sensitivity.

5. Adjust the tolerance with **Setting of detection** (**Min. size of parts, Max width, Max. height**…) in **Basic setting TAB**.

17-5 How to use Solder Ball Detection Stamp

Detect solder balls bigger than 80 micron.

* The solder ball size telling in this stamp is not the actual size. The size is calculated from the combinations of lightings, therefore the size maybe different from the size measured by ruler.

* Possible to use this algorithm from Stamp Creation Wizard.

* 10 micron resolution lens recommended. At least 18.75 micron lens required.

* Exclusive algorithm for AOI with Diffuse-On Axis LED (DL, HDL/HDA, HML/HMA, FDL/FDA, FML/ FDA) However, the Diffuse-On Axis LED for DL type is spot lighting type. Therefore the repeatability of detection may be worse than the other types. AOI with RGB lightings such as HML/HMA and FML/FMA may false detect white silk print.

* Not possible to detect solder balls on white PCB.

1. Select a PCB. Normally when create normal inspection program, we use "Champion PCB" (the PCB without detect). But here we better to use the defective PCB with solder balls, so that you can learn the tendency of solder ball shape/size while program creation and debugging.

2. Move camera to the area where solder balls exist. Create stamp at any place in the view, because Solder Ball stamp detects all solder balls in the view (cell), the place is not the matter.

3. Draw a frame with selection tool. Stamp Creation Wizard will be displayed, select "Detect Solder Balls" from pull down menu. Setting window will be displayed (Screen 1). Set the minimum and maximum solder ball size. Click OK and save as stamp.

4. Start inspection or press re-inspect button to confirm if the solder balls are detected (Screen 2).

* If solder balls are not detected or the other objects are false detected as solder ball, refer to the following pages to tune-up the settings.

5. If this work is at the end process of data creation, open the setting window, and press **Copy to all cells** button (Screen 3). If this work is at the beginning process of data creation, execute "Duplicate Selection" from Edit menu, and duplicate this stamp to all over the PCB.

Meantime, you can delete unnecessary solder ball stamps when more than one solder ball stamp exist accidentally in a Cell with **Delete duplication in cells** button. This is useful after Cell optimization (Screen 4).

17-6 Handling of Missing NGs and False NGs

The shape of solder balls differ depend on the mixture of solder agents or the condition of reflow oven. The shape can be almost round or can be a bit mashed. Therefore, you need to tune-up the settings when you face to the escaping or false defects.

17-5
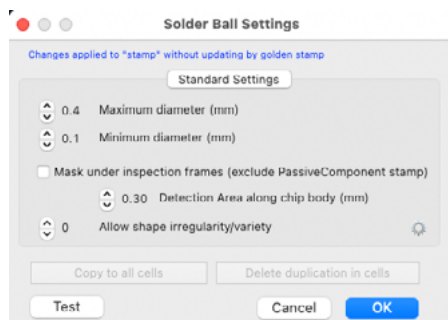
(Screen 1)

(Screen 2)
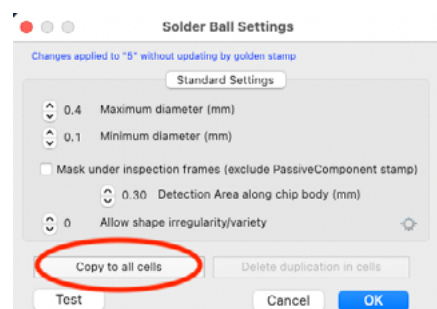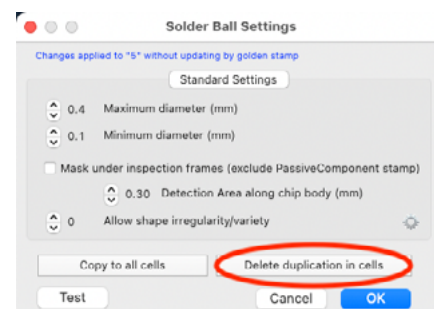
(Screen 3)

(Screen 4)

▼ 17-6-1 Missing NGs

1. Allow ball shape variation

On default setting, only the balls almost perfect round shape is possible to detect. In case, your solder balls are not detected even they are within minimum/maximum size, increase "Allow shape irregularity/ variety" level (Screen 1).

Increasing from 0 -> 1 -> 2 result in (Screen 2);
detect solder balls -> detect something like solder balls -> detect something looks like solder balls

After changing the level, press Test button and confirm the result.
      Circled by green: recognized as solder ball
      Circled by yellow: nearly recognized as solder ball (detection may be unstable)

However, the other objects than solder balls can be also detected by increasing the level (Screen 3). Please control these false calls by reading following pages. Nevertheless, false calls occur by level-up the "Allow shape irregularity/variety" and it is quite difficult to control this completely.
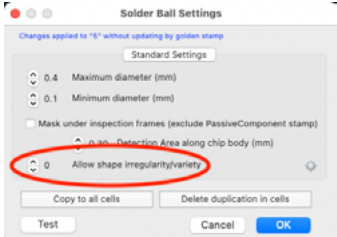
2. Change the sensitivity
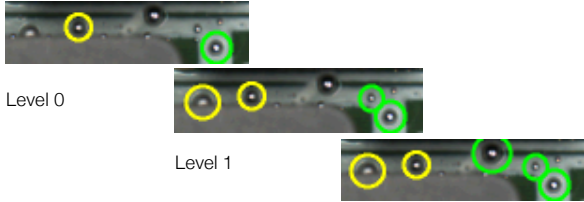
* This change will be saved in AOI settings (not possible to change per inspection programs).

Click the detail settings icon, the sensitivity adjust window will be shown (Screen 4).

17-6-1

(Screen 1)

Level 0

Level 1

Level 2
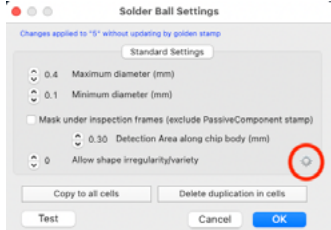
(Screen 2)

Pad of empty component

Fillet of diode

(Screen 3)

(Screen 4)

17-6-1
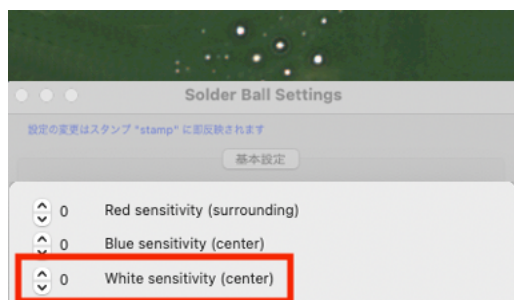
(Screen 5)

(Screen 6)

The most important condition to detect solder ball is to catch the brightness of solder. You can change the sensitivity of the brightness at the bottom item "White sensitivity (center)" (Screen 5).

Press up/down the button and find the most suitable sensitivity. When there is enough brightness, the solder ball is colored in green (Screen 6).

* The up/down button does not mean sensitivity up/down. So, without thinking moving to plus or minus, find the best level to detect the solder balls.

Next, adjust the blue and red sensitivities (Screen 7). There is a correlation between these sensitivities. Please adjust together by observing carefully.

In below example, there was no change seen by up/down blue sensitivity from -0.5 to + 0.5. Let's reset blue sensitivity to 0 and try red sensitivity.

By increasing red sensitivity, a solder ball is detected (Screen 8).
By increasing red sensitivity more, more solder balls are detected (Screen 9).
As this example, find the best sensitivities by observing the balance.

17-6-1
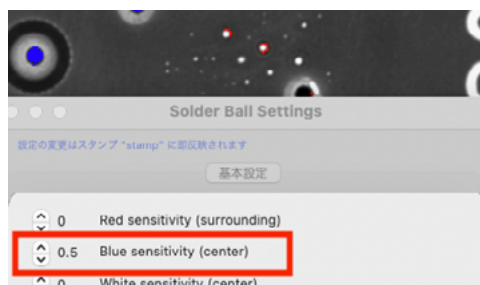
(Screen 7)

(Screen 8)

(Screen 9)

▼ 17-6-2 False NGs

1. Less tolerant to maximum size

If your setting is "Allow shape irregularity/variety" increased, and "maximum diameter" is bigger, software will detect the objects other than solder balls. (Screen 1)

To kill such false detections, set "maximum diameter" to as smaller as not to miss the solder balls.

2. Masking by inspection frame

There is an option named "**Mask under inspection frames...**" (Screen 2) If the part of fillet is detected as solder ball, activate this option. Then, the area where inspection frame is pasted is masked (invisible) and escaped from solder ball inspection (Screen 3).

For Doughnut stamp, inside area of the stamp is masked and escaped from solder ball inspection.
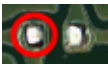
There is proviso in this option, "(exclude PassiveComponent stamp)", and you can set the "Detection Area along chip body". This proviso means;

Detect solder balls along the chip body on which Passive Component stamp is pasted

Solder balls are tend to attach to the capacitor/register chip body. In order not to miss these balls, Passive Component stamp has special masking function.

Even Passive Component stamp is packed, it works as well (Screen 4).

17-6-2

Pad of empty component | Fillet of diode

(Screen 1)

(Screen 2)

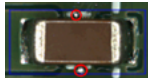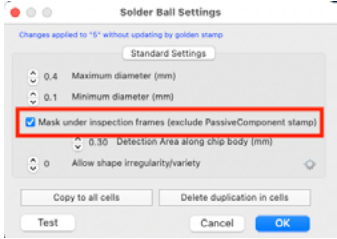(Screen 3) | False detection | Masked by frame

(Screen 4) | Passive Component stamp on capacitor | Press Test button in Solder Ball Detect stamp. Dark area is masked, red area is not masked. | Solder ball detected while inspection

# 17-7 Limitations for Solder Ball Detection Stamp

This stamp inspects the whole Work Area (Cell), therefore slightly different from the other stamps.

- Not possible to pack

- Not possible to have master picture

- Not possible to edit Reference Designator or Comment

- Not possible to verify in angular camera view

Memo: When Passive Component stamp is not used for chip inspection ...

If you use pattern matching + histogram algorithms for chip inspection, but you do not want to miss the solder balls on chip body, you can just use Passive Component stamp to detect solder balls.

- Check off all boxes.
- Input 0 to Angle and Rotation check

---
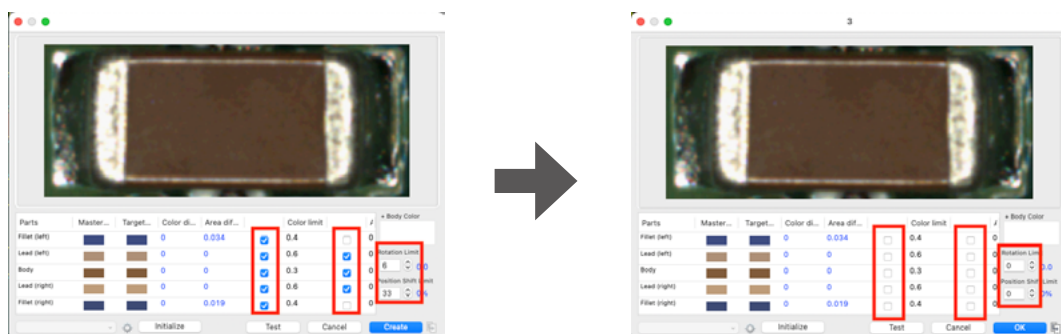
18. 2D Solder Paste Inspection

This machine is capable of inspecting the printed solder paste. By checking dimensions, positions and shapes, it is very easy to detect solder paste errors. The area to be inspected can be set manually or sampled automatically, and it can also be set up based on Gerber data (Gerber data must be converted using the special conversion software included on the CD-ROM).

Since this is an optional function, the detection accuracy is not as good as with 3D SPI machines, but extreme misprints can be detected with sufficient accuracy. It is also possible to inspect parts/components and solder paste in one Inspection Program.

18-1 Preparation

Confirm the following 2 points before data creation.

1. Check that the size ratio between the PCB and the screen is correct at the PCB surface height. If this ratio is not correct, size and position of frames may be misaligned when automatic cell optimization is performed after frame positions are generated from the Gerber data.
   Make the line width thinner with **Setting > Configuration > Object Frame** and create a frame matched to the pad. The frame color will turn white when the screen is moved. Then compare the position of the frame and the pad.
   If they become shifted when moved, go to Setting for **supervisor > Movement > Pixels per 1cm** and change the value little by little to correct the position and set the ratio between the PCB and the screen accurately (Screen 1).

2. Next, confirm the sensitivity to sample the solder paste area. When sampling with automatic sampling mode, you will not detect the proper size of the solder if you do not make adjustments to match the sensitivity to the solder condition.
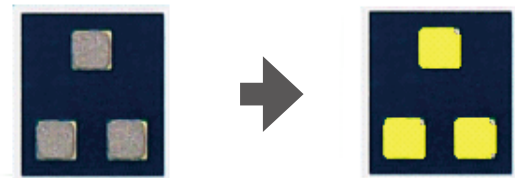   Set a good PCB on the machine and move the camera to the inspection area. Then select **Solder Paste Check** from the **Window** menu to display the **Area Edit Window** (Screen 2). The lever on the left is for **Sensitivity**, and the lever on the right is for Size. Set the area to 0 (zero) and slide the **Sensitivity** bar so that the paste area will be painted in yellow (the paint is displayed only while you are sliding the lever with the mouse). In addition, use the lever to set the image to be about 5% larger than the actual paste area (Screen 3). The values set here will become the default values for Area Edit Window.
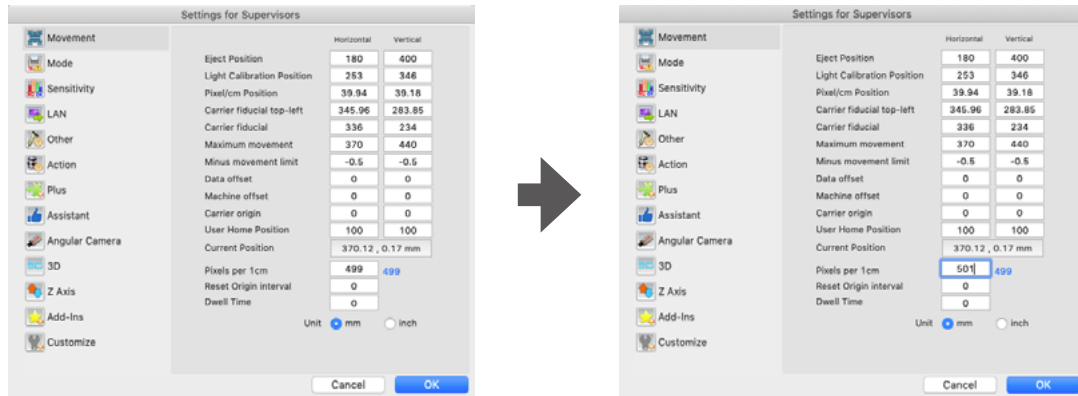
(Screen 1)
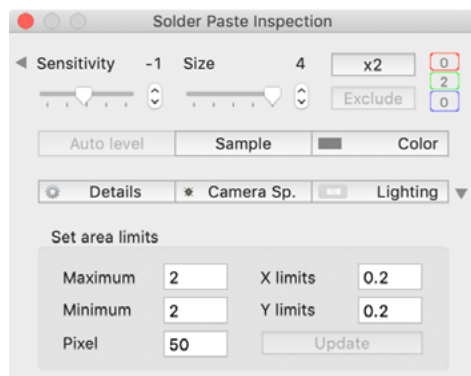
(Screen 2)

(Screen 3)

18-2 Creating Data

■ Manual Settings

With this method, you will create a standard Inspection Frame and change that frame to a Solder Paste Inspection (SPI) Frame.

1. Set a good PCB and move the camera to the inspection area.
2. Draw an Inspection Frame on a solder pad. After selecting the Inspection Frame, select Solder Paste Check from the Window menu and click the **Assign button**.

* When an Inspection Frame is selected, the **Sample** button will become the **Assign button** (Screen 1). After changes have been applied, it will become the **Resample** button.

3. Now, this inspection Frame has been set as the Solder Paste Inspection Frame. It can also be registered as a Stamp.

■ Automatic Sampling

With this method, all of the solder paste areas will be detected automatically and be converted to the Solder Paste Inspection Frame at the same time.

1. Set a good PCB and move the camera to the inspection area.
2. Open the **Area Edit Window** and click on **setup of details** to display the **Recognition details setting**. Make sure that **Restore split frames** has been checked (Screen 2) and press **OK**. This feature will make the shapes of Inspection Frames created by automatic sampling smooth. However, it doesn't work for frames with some shapes.

3. Confirm that the print area will be painted yellow using the **Sensitivity** lever and the **Size** lever in the Area Edit Window.
4. If no Inspection Frames are selected, the button in the center will be shown as the **Sample** button. When you click on **Sample** here, all the yellow areas will be set as Solder Paste Inspection Frames.
5. The Inspection Frame is now created, but lightness may differ depending on the area on the screen, so you may need to change the sensitivity by frames. The **Auto level button** will allow you to automatically adjust sensitivity for each frame. Select Inspection Frames and click the **Auto level button**. Adjusted frames will be displayed in blue, and those that could not be adjusted will be displayed in red. If the red frame is a false report, you will need to make further adjustments (refer to 18-3, Frame Adjustment).

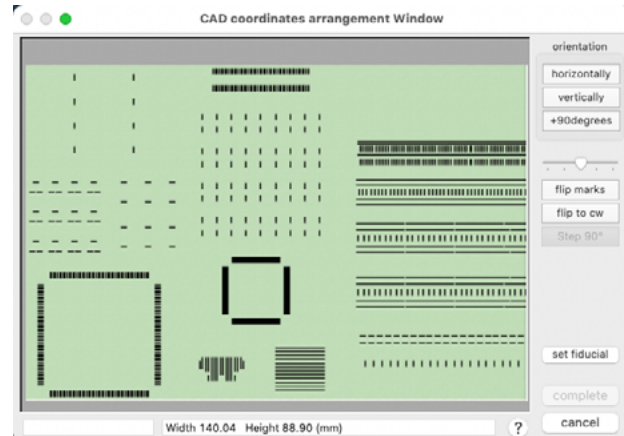* **Auto level** is valid only for Inspection Frames with the same lighting and for the same target color.
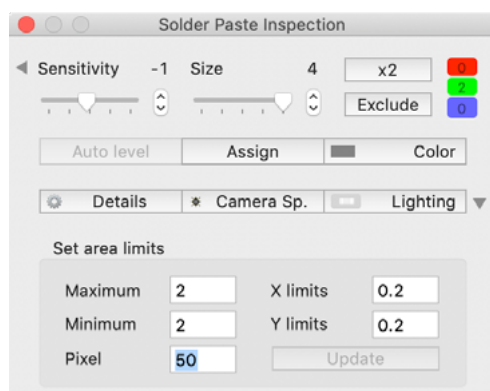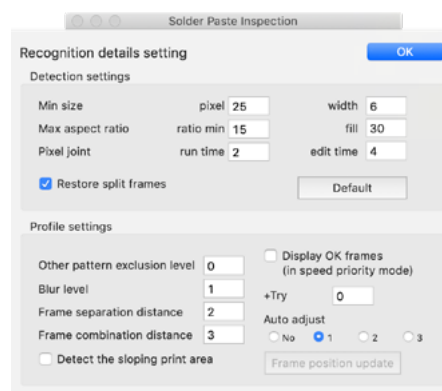
(Screen 1)
(Screen 2)

(Screen 3)

(Screen 4)

■ Using Gerber Data

1. The Gerber data should be converted using the conversion software before setting the PCB.

2. When you import the converted data by selecting **Import Data File** in the **File** menu, it will automatically be recognized that it is the data for Solder Paste Inspection, and the **Position adjustment Window** will appear. Make sure that the button at the upper right is the **Solder Paste Inspection Frame button** before adjusting the position (Screen 3). The **Solder Paste Inspection Frame button** will automatically adjust all frames as Solder Paste Inspection Frames. Stamps will be created here for each size (Screen 4).

3. Select **Auto Reposition** from the **Edit** menu and the procedure is complete. If you would like to reduce the number of cells, combine the frames in the screen into one cell by selecting Inspection Frames with the Control key. The screen cannot be rotated or flipped here.

* See 6-7, Cell Optimization and 6-8, Merging cells for details.

18-3 Adjustment

Once you have completed preparation for the Solder Paste Inspection Frame, start inspection (this task is not necessary for Frames created with automatic sampling). When you place the cursor near the Solder Paste Inspection Frame after inspection, area/position/shape results will be displayed.
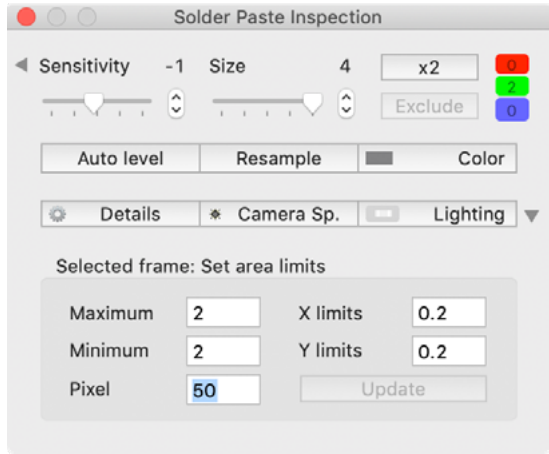
If the results are shown in red, it means that the value has exceeded the tolerance limit (Screen 1). If you get false reports, you will need to adjust the values in the **Area Edit Window**. The procedure is as follows:

1. Select the **Inspection Frame**, and double-click to display the **Area Edit Window**.
2. Adjust the values in **Set up area limits**. The **maximum limit** represents the limit for solder excess, and the **minimum limit** represents the threshold for solder insufficiency. **X limit** and Y **limit** refers to the misalignment of the solder paste area from the center, which is defined in mm. **shape limit** is used to define the tolerance level for the difference between the shapes of frames and detected shapes in percentages (Screen 2). Enter values in the items you wish to change and click **Update**.
3. If you wish to exclude the non solder paste area, select that area with a standard Inspection Frame and press the **Exclude** button. Excluded frames will become shaded (Screen 3).
4. If you would like to change multiple Solder Paste Inspection Frames to the same status, select those frames before applying the settings.
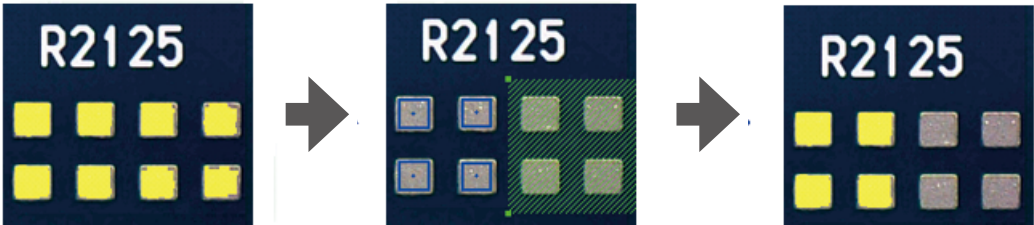

(Screen 1)

(Screen 2)

(Screen 3)

■ Reducing Shape Limit Depending on Frame Size

The shape limits of frames are automatically set when you create the data from Gerber data. For each frame: The smaller the size, the lower the shape limit will be. This will save you the trouble of adjusting sensitivity by varying frame sizes. However, since this is just an estimate, make adjustments as needed. Even when Solder Paste Inspection Frames are set up by other procedures, it is common to reduce the shape limit if the frame is small.

■ Color Emphasis

During solder paste inspection, false reports may occur on printed patterns misjudged as solder paste area. In these cases, it is possible to make adjustments in **Other pattern exclusion Level**, but it is also possible to emphasize the Green/Red/Blue colors to highlight the differences between patterns and solder paste. Hold down the mouse on the color that should be emphasized and drag up or down to change the value (Screen 4).

■ Side Lamp

When inspecting solder printed on a solder-plated pad, you can improve the inspection accuracy by using the Side Lamp. Select **camera special** in the **Area Edit Window**, select one of the Custom 1 – 8 options and click **Side lamp** or **blink** (Screen 5). In general, **Side lamp** should be used for red colored

(Screen 4)   (Screen 5)
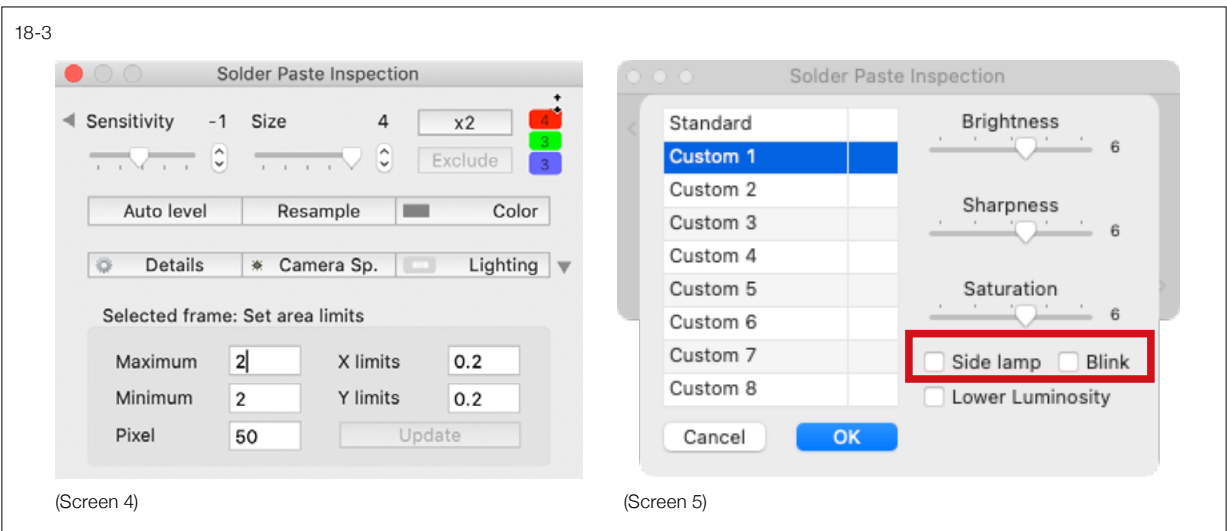
PCBs or pads that have bumps caused by printing, and **blink** should be used for PCBs with colors other than red. Make sure to verify sensitivity after this setting has been applied.

* Refer to 20-3, Camera Special Setting, for details on the Camera Special Setting window.

* Camera special settings and Lighting are exclusive. If both settings are set, only the last one selected will be applied.

■ **DetectingText by Selecting Target Color**

Since gray is generally used for solder paste inspection, the default color is gray. You can also select white, black, red, blue and green, so you can use this Solder Paste Inspection when inspecting parts other than solder pastes (Screen 6). For example, it is useful to detect text by setting the color of the letters (such as white).

■ **Advanced Settings**

You may not be able to apply paint to judge the solder paste area by only adjusting **Sensitivity** and **Size**. In this case, click on **setup of details** to adjust the **Recognition details setting** (Screen 7) (normally, default values should be used here).

* These settings affect the entire system. They can not be set up for each frame.

\<A setup for the detection>

• Min size (pixel/width)

Set the minimum area and width required for inspection. Raise the pixel value in case small objects other than the solder are detected, and increase the width value in case thin objects such as silk are detected, so that they will not be recognized.

(Screen 6)   (Screen 7)
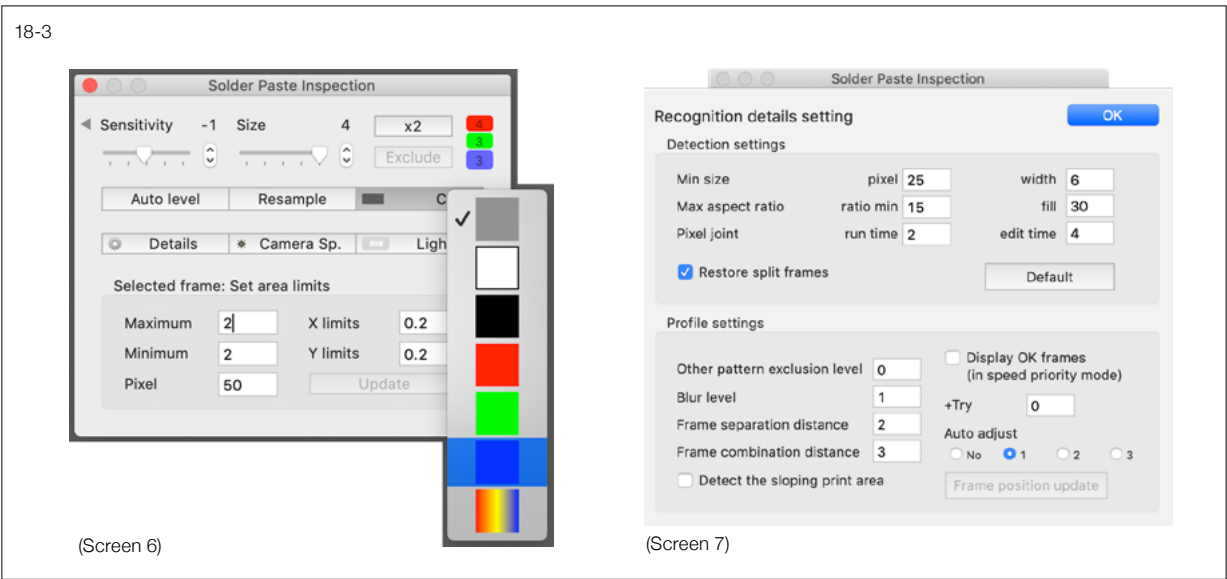
• Max aspect ratio (ratio min/fill)

This limits the maximum aspect ratio of the solder paste area. When long objects such as silk printed lines are detected, the value in **ratio min** should be smaller. The number in the **fill** means the maximum percentage. When you sample the solder paste area, it is possible that some points cannot be detected and left as gaps. If the ratio of the gaps is within this number, it will be filled in. If this cannot be sufficiently loaded due to roughness on the print surface, set a high value.

 • Dot joint (while running sampling)

This sets the pixel unit to fill the space when inspecting (running) and when sampling If inspection fails due to roughness on the print surface, set a high value.

• Restore split frames

When Automatic Sampling is performed, the solder paste area may not be displayed in the intended shape. This check box will put them together into the intended shape. This may not work depending on the shape.

• Defaults

All values will be set to default with this button.

<rendering settings>

• Other pattern exclusion level

Sets the saturation level other than the solder paste Area. For example, this can be used to exclude the green color of the PCBs from inspection before solder inspection.

• Blur level

If the solder paste surface is rough and sampling is unstable, raise this level for adjustment.

• Frame separation

• Frame combination

These values are used to either split or combine adjacent solder paste areas.

• Display OK frames (in speed priority mode)

Displays the solder paste area in blue when speed priority mode is applied.

• + Try

Sets frequency of additional re-inspections only for the solder paste inspection area.

• Auto adjust

The reflection can cause false NGs. To prevent such false NGs, this software has an Auto adjust function to compensate for the reflections.

The level can be changed in **Auto adjust**. The larger the value, the larger the compensation will be. This feature will be disabled when 0 is selected.

• Frame position update

This is used to correct the data created by the Gerber data to match the actual PCB position. Perform in-

18.2D Solder Paste Inspection

18-3
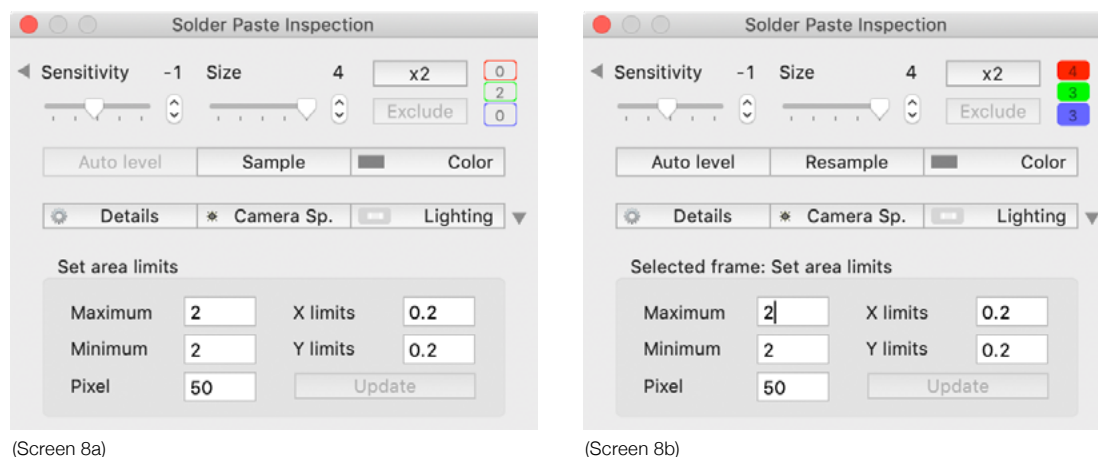
(Screen 8a)

(Screen 8b)

spection once, and then click on the button. Individual Inspection Frame positions will be adjusted based on the misalignment values from the previous inspection results.

■ Area Edit Window status

The values of the Area Edit Window will be immediately reflected in the Work Area.

When the Area Setting Window is opened without selecting a frame, all of the parameters will be set to the default values of the entire application, but when a Frame is selected, only values belonging to that frame will be displayed. It is very important to know whether this setting window is for the entire application or just for one frame. There are a few points to look for to make sure:

<Window for the entire application> (Frame is not selected)

(Screen 8-a)

• The Red/Blue/Green are shown as the frame color in the Color Emphasis field.

• The **Setup area limits** field only says **Setup area limits**.

• The button on the top center is **Sample** instead of **Resample**.

<Window for a Frame>

(Screen 8-b)

• The Red/Blue/Green in the Color Emphasis field is painted out.

• The **Setup area limits** field says **Selected frame** : **Set area limits** (when the selected frames are for solder paste inspection) .

• The button on the top center is **Resample** instead of **Sample** (when the selected frames are for solder paste inspection).

■ Apply changes on a frame to the other framess

While debugging Solder Paste Inspection frames, if you change settings of one frame, now you can apply

the change to all frames in the same area group. Area groups are basically organized by the similar area size frames. However, you can customize to split frames in many groups or in a few big group or even in one group.

How to use

1. Select a frame that you would like to change settings. Change parameters in Area Edit Window.
2. Click on the grey arrow button on the left-top of Area Edit Window.
New window opens. The window lists all the solder inspection frames in this program. The frames are grouped in simillar area pixel size automatically. The group colored in blue on the list is the group that selected frame is belonging. All frames belongs to blue colored group are also colored in blue in Work Area.
3. The number of groups can be increase/decrease by pressing up/down arrow buttons on the left-bottom corner of the window.
4. Press Appl. button. Then, the frame setting change is applied to all frames which belong to the same area group.

Set Area Limits

Set Area Limits menu (the lower half of the Area Edit Window) can be hidden by arrow key on the right-middle. When changing items in Set Area Limits menu, if you press Appli. button with Set Area Limits menu opens, the changes in Set Area Limits menu are also applied to frames in the blue group.
But, if you close Set Area Limits menu after changing some of its items, and press Appl. button, these changes are not applied to the frames.

* Press grey arrow button on top-left without selecting a frame, the Apply Same Area window does not open.

(Screen 9)

271
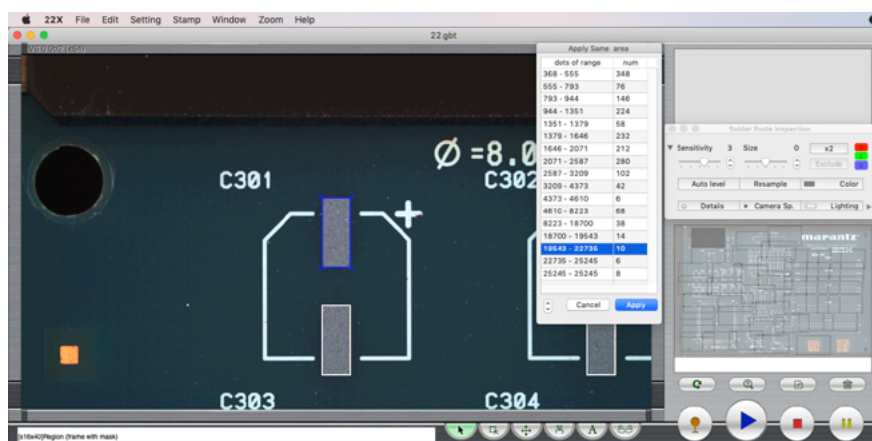
19. Auto Program Creation Guide

This function is useful for creating simple component inspection such as missing, reversing, wrong in few minutes without any stamp library, Create inspection frames for components automatically from CAD data, if the data contains components' size X and Y. With this function, user can start component inspection immediately because frame creation, saving frame as stamp and Cell optimization work is done automatically.
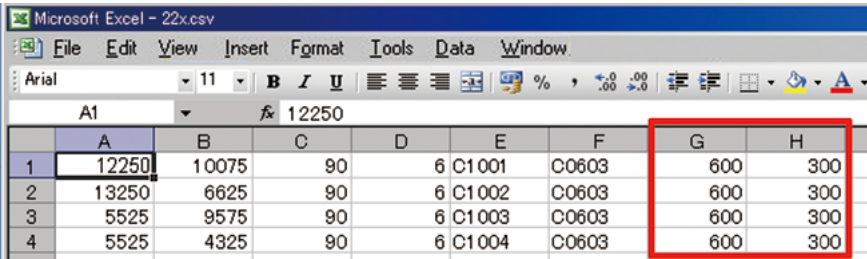
19-1 CAD Data Format

Should be CSV or TXT format with comma or tab separators. Order of each information should be as;

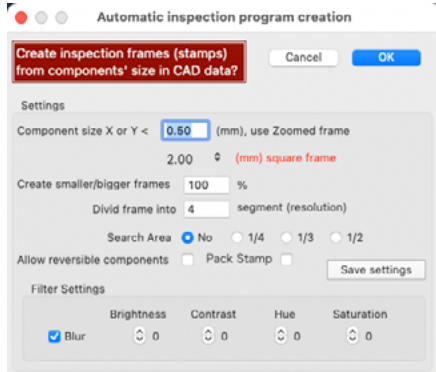coordinate X, coordinate Y, angle, casette No., reference designator, component name, size X, size Y

* Even if there is no data of casette No., please input any text or number (for example, copying component name).
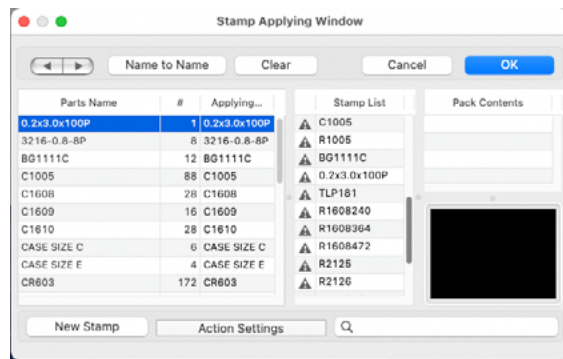
19-1

(Screen 1)   (Screen 2)

19-2 Work Flow

1. Set a PCB on AOI. Import CAD data from Import Data File in File menu. If the data has component size X and Y in column 7 and 8, Automatic inspection program creation window pops up (Screen 1).

2. Press OK button. If you want to change the filter settings or want to create smaller frames, change settings value.

3. CAD coordinates arrangement window pops up. Arrange coordinates to components. Press complete button, then Stamp Applying window pops up (Screen 2). Confirm that new stamps are created in Stamp List, and they are all applied to components (Parts Name list). Press OK button.

4. In Main screen, inspection frames (stamps) are placed on components. Start inspection for teaching. Create Main/Sub fiducial reading frames.

5. Execute inspection again with same PCB for verification.

* If some components have no size information, no stamp is created for them. Draw inspection frames by yourself while teaching.

* If you already loading stamp libraries for some components, new stamps are not created for these components.
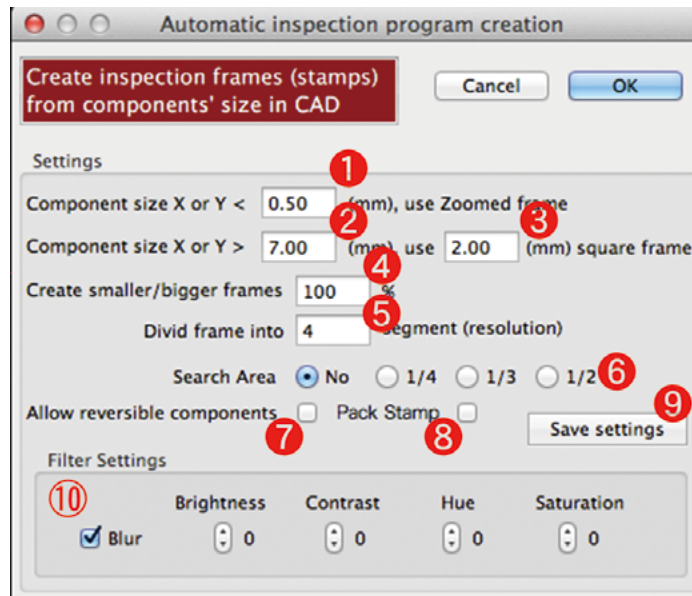
19-3 Setting Window

All stamps created from X and Y size information have the same settings.

1. If X or Y size of component is less than input value, Zoomed (High Resolution) stamp is created. Default value is less than 0.5mm, then components such as 0402 or 0201 will be zoomed stamps. Value can be input from 0.20 to 2.00.

2. If X or Y size of component is more than input value, the square stamp is created instead of actual XY size. QFP or SOP is often too big than FoV and if the frame is too big, the resolution will be lowered and it will loose accuracy. To prevent these inconveniences, a smaller square frame is placed. Value can be input from 1.00 to infinity.

3. Size of square frame to be created as replacement. Value can be input from 0.20 to 5.00.

4. Input ratio if you want to create smaller or bigger size frame than actual size. For example, to make a bit smaller stamps, input 95 (%).

5. Specify how small a frame should be divided into segments. Default value is 4, means a frame is divided into 4 segments. If the frame shape is rectangle, then it can be divided into 8 segments. Value can be input from 2 to 16. This value is the number to divid, thus it has no relation with the value of resolution(grid) in Filter setting window. (In Filter setting window, if you set resolution 4, then a frame is divided per 4 pixels segments.)

6. Set searching area. The area can be set by frame size ratio. If you set 1/4, then component is searched around its 1/4 outer area. No setting still search 5 pixels around.

7. Check on if all components can disregard polarity. By checking on this option, all master pictures has also 180 degrees reversing pictures when saving.

8. Create Pack Stamp.

9. Save the change to a setting file. Without saving, the change is applied to only current inspection program.

10. By checking on Blur option, stamps are set level 1 blur. Brightness, Contrast, Hue, Saturation level can be changed between -4 to +4.

19-4 One minute Tune Up for Better inspection

In case, you have some time, pleae do these additional tune-up. The inspection will be more stable and accurate.

1. Resize frame to fit text or polarity of odd components such as QFP or SOP (Screen1).
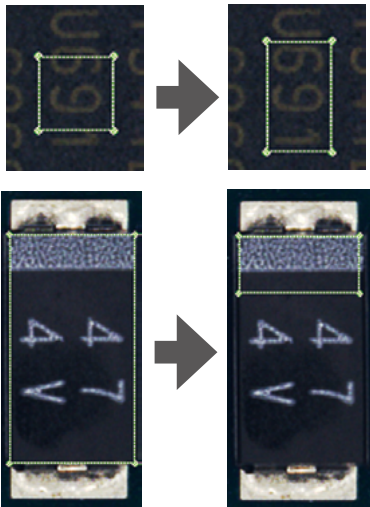2. Check on Letter if the text is not clear (Screen 2).

 * Do not forget to press Golden Stamp to apply change (Screen 3).

19-5 Create Stamps Automatically even without Size information

This is the mode to create the square shape stamps automatically without component size information in CAD data.

1. Open ForSupervisors menu, move to Plus tab. Check on "Create square stamps automatically from CAD data". (Screen 1)
2. At importing CAD data, the window for Automatic inspection program creation will be displayed. In the center of the window, there is a field to input square size. Set the stamp size that you like to create.
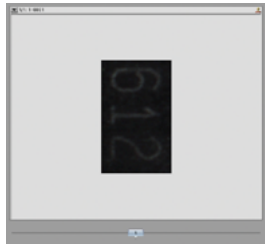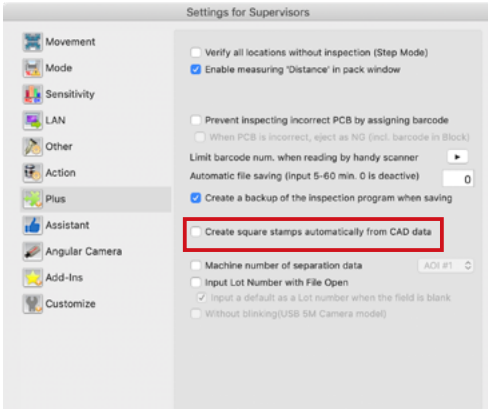
19-4
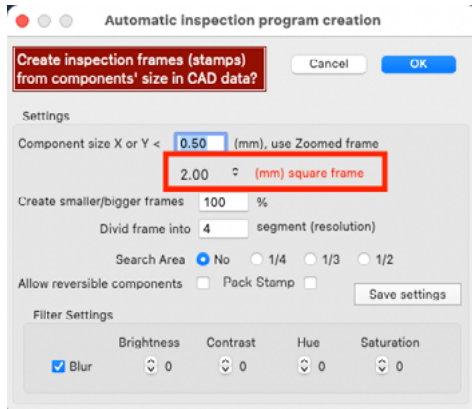
(Screen 2)

(Screen 1)

(Screen 3)

19-5

(Screen 1)

(Screen 2)

20. Whole Pattern Matching Settings

This chapter explains settings in pattern matching filter which are not mentioned in Chapter 8. Some items are not used on all models. Also some are old functions and seldom used in today's inspection. Please select and use functions only valuable for your production.

20-1 Camera Special Setting

Machines with digital cameras, camera gain, sharpness and saturation can be controlled to emphasize the color differences when capturing the image, facilitating stable inspection.

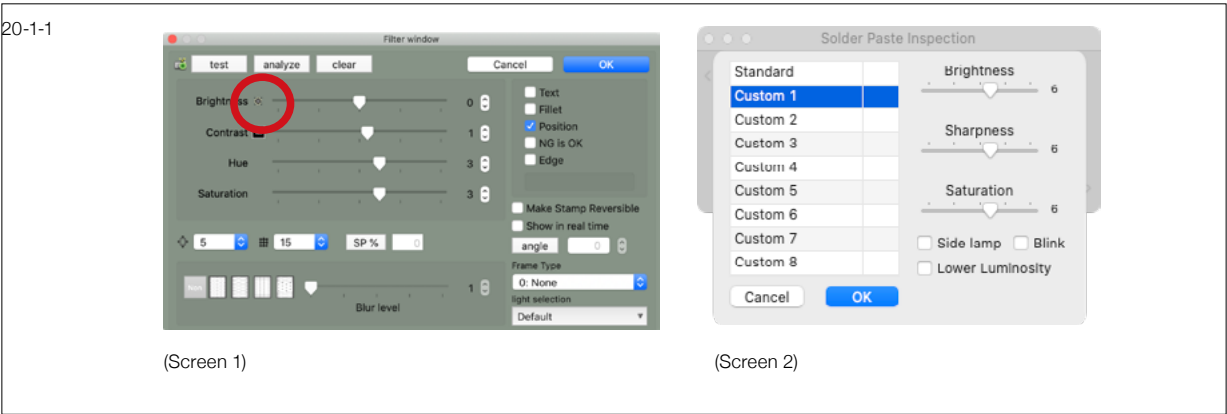### ▼ 20-1-1 Camera Special Setting Window

In the filter setting window, press the **Special setup** button to the right of Brightness (Screen 1) to display the Camera Special Setting Window (Screen 2). Default is Standard, but 8 different settings from Custom 1 to Custom 8 can be saved here. The selected setting will be recorded with each stamp (if the Inspection Frame does not use a stamp, with each frame). However, on machines with a side lamp, Custom 8 will be used only for solder fillet inspection, and cannot be used with regular Inspection Frames.

■ Selection Button

Standard is selected by default, but to create your own settings, select one of the Custom items and move the levers to change the settings. Use the Switch button to change from Custom 1 – 4 and Custom 5 – 8.

■ Levers

From top to bottom, the levers are for gain, sharpness and saturation. All ranges are from 0 to 10.
Default is 2 for gain, 3 for sharpness, and 5 for saturation.

(Screen 1)   (Screen 2)

20-1-1	☐ Side lamp	☑ Side lamp	⊟ Side lamp
	White main light only	White main light + side light	Side light only

(Screen 3)
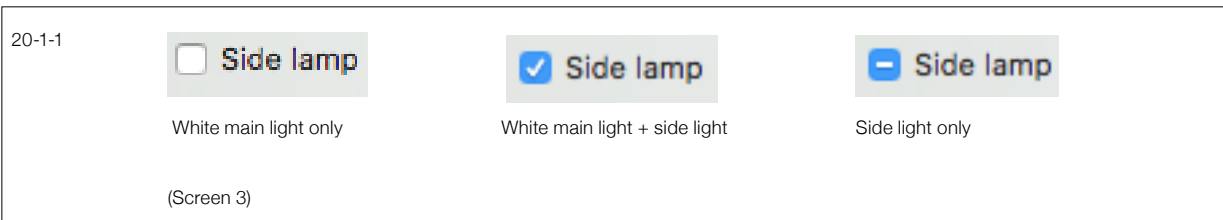
■ Side lamp

If the machine is equipped with a side lamp, the **Side lamp** check box will be displayed.

If you put check, "White main light + side light " is activated. If you do not put check, only White main light is activated. If machine has "White main light + side light + DOAL" construction, light setting can be selected from 3 types among "White main light only", "White main light + side light", and "Side light only" by changing the status of check box of "Side lamp" (Screen 3).

■ Lower Luminosity

A check box to reduce luminance by 25% will be displayed when the function is available.

■ R G B Selection

With ML lighting AOI, R, G and B check boxes appear. You can only light each lighting or complex lightings. With ML and DOAL lighting, D box appears. Lighting D is special light for detecting "no solder". Useful for detecting wave soldering.

For stamps with master picture, these settings will be memorized in stamp. If the Inspection Frame does not use a stamp, it will be memorized by each Inspection Frame.

▼ 20-1-2 Camera Special Setting Procedures

1. Confirm calibration.

2. Double-click on the **Inspection Frame** to display the Set filter Window.

3. Press the **Camera Sp. button** to display the Camera Special Setting Window.

4. Select the **Custom No.** to make adjustments.

5. Once adjustment is complete, enter the setting name for the Custom No. box.

6. Click **OK**. A warning dialog will appear. Click **OK** and close the dialog.

7. Click **the Capture again** button in the Set filter Window. This replaces the Master picture.

8. Click OK to close the filter setting screen. Modify or save the stamp to complete this procedure.

▼ 20-1-3 Camera Special Setting in Solder Paste Inspection

Camera Special Setup in solder paste inspection is done according to the following procedures:

1. Select **Solder Paste Check** from the Window menu to display the Area Edit Window while the Inspection Frame is selected (Screen 1).
2. Press the **Camera sp. button** (Screen 2) in the Area Edit Window, and the Camera Special Setting Window will appear. Make adjustments here.
3. Inspection will not be affected even if the Master picture is not replaced after adjustment.

When you start inspection, it will start from the Inspection Frame that has no special settings, execute all the way to re-inspection and then move on to Custom 1, 2, 3, and so on. Even if the Inspection Frames are in the same cell, if the Camera Special Settings are not the same, they will not be inspected at the same time. Therefore, the more settings there are, the longer the inspection will take. When a frame with Camera Special Settings is being inspected, the entire screen will be in Special Setting mode.

(Screen 1)

(Screen 2)
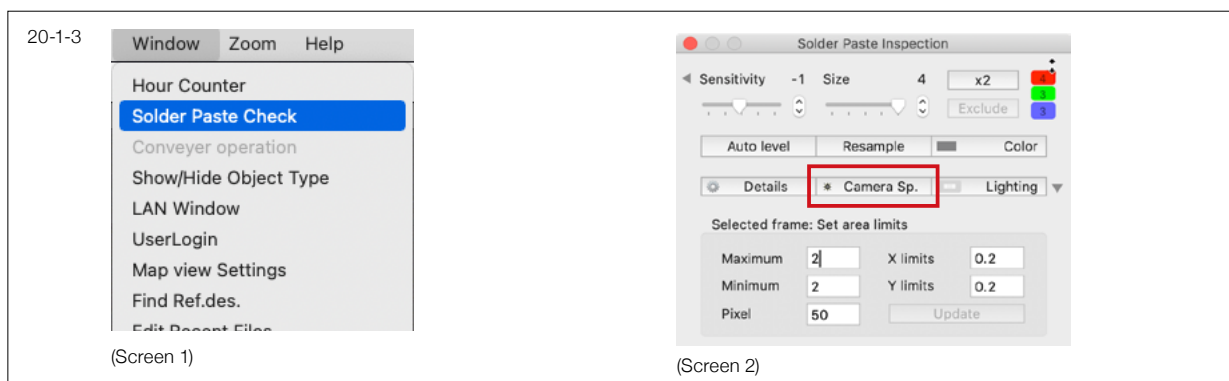
▼ 20-1-4 Calibration

Calibration standard values need to be set for saved Special Camera Settings. This setting will be recorded in the inspection program file, so once the standard value is set, it will be corrected regularly even if the tool or lighting conditions change, and inspection can be executed under the same conditions.

    1. Select **Calibration Settings** in the Settings menu.

    2. Press the **Auto Cal.** button in the Calibration Setting window to set normal calibration.

    3. If a Special Camera Setting is set, press the **Special Setup** button and select the registered setting from the pull-down menu. The screen will change, and the position of the meters will move (Screen 1). The position of the brightness meter will be recorded here and become the standard value. The reference position will be shown as a red dot on the brightness meter.
       (The red dot will be displayed the next time)
       Confirm the meters here, and if they are off, click on the meters or adjust using the Gain lever.

When you have set a Camera Special Setting, make sure to set calibration and define the standard value. If the standard value is not set, a warning message "The brightness calibration standard value is not defined" will appear. Click **Calibrate Now** to start calibration. However, if the program has been transferred from another device, the conditions will be different. In that case, click **Cancel** to terminate calibration, confirm Special Camera Setting values in the device that the setting was performed on, enter that value in the bottom left field of the warning window and then click **Calibrate Now**.

20-1-4
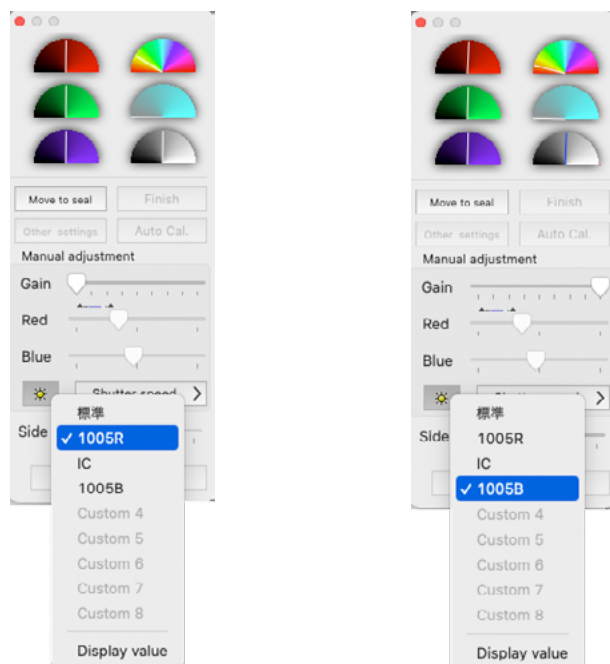
(Screen 1)

20-2 White or Black PCB/Components Inspection

If the PCB or the component's colors are close to white, normal lighting may cause overexposure, making it difficult to inspect. In this case, Luminance can be reduced to obtain an image that is easier to see and to inspect. On the other hand, if PCB color is too dark, the filter setting for black components such as SOT will be difficult, in this case, luminance can be increased.

This feature is available only on AOI with digital camera.

▼ 20-2-1 Setting

If the PCB is white, check **Reduce/Enhance light** in General Settings. This setting will be effective for each Inspection Program (Screen 1). If PCB is dark, click Reduce Light twice, then it will change into Decrease Light (Screen 2).If the components/parts are white, check **Lower Luminosity** in Special Camera Settings in the Filter Settings. This setting will be effective for each Inspection Frame (Screen 3).

In order to avoid minor differences between machines, calibration will be executed for when Luminance is reduced in addition to normal Luminance calibration.
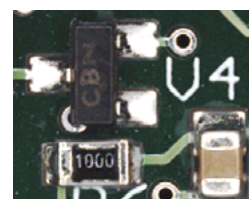

20-2-1
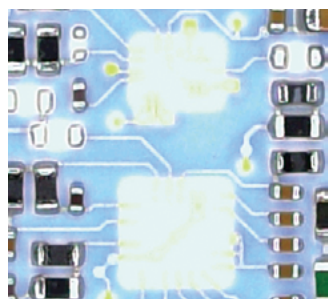
(Screen 1)
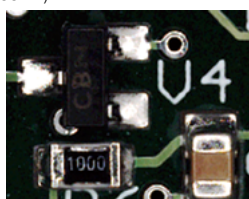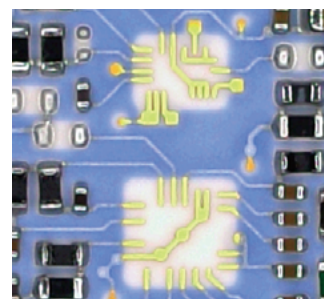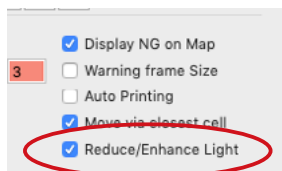
(Screen 2)
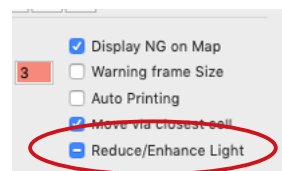
(Screen 3)
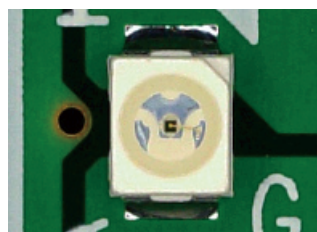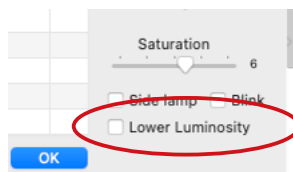
20-3 Text filter for AOI with RGB LED

Models with RGB lighting can sometimes not detect text well because of position or component's height. This is caused by Layer structure of RGB light.

We developed new text detection filter only for RGB light model. This filter will decrease the difference of RGB lighting ratio in stamp area. When normal filter setting can not detect text well, try this new option.

* Limited to AOI with RGB LED models. The button is not displayed in the other models.

* This is effective only to normal lighting, will not be much effective to lightings created by lighting selection.

■ **How to set**

Check **Text** box on. A new button will be shown next to Text box. Press this button. The color of button will turn in grey. Now new text detection filter is activated. Sensitivity Level will be set AT (Automatic).

(Normal condition)   (With RGB text filter)
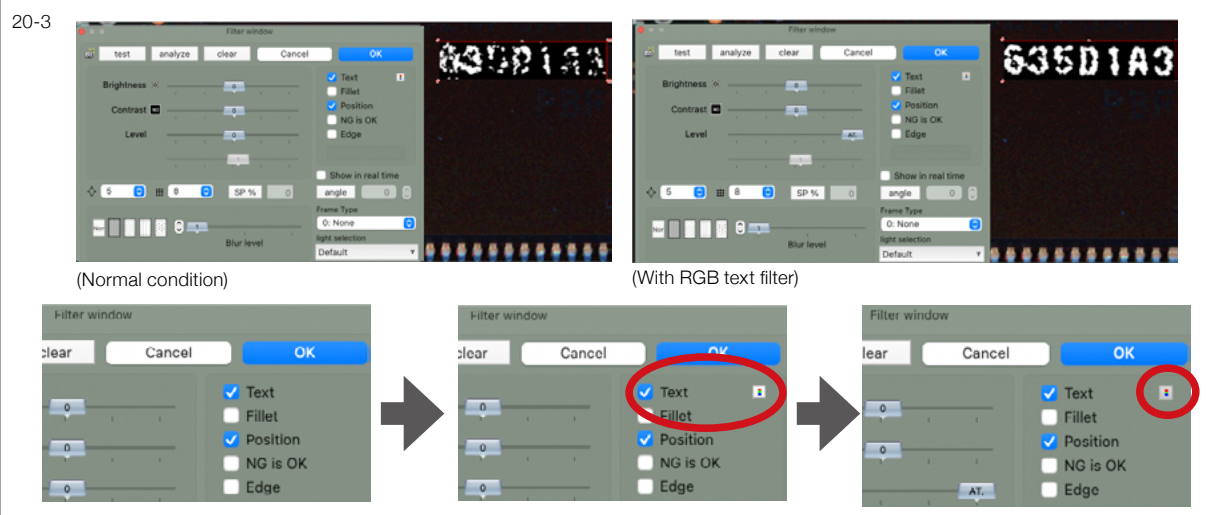
21. Fillet Inspection (old method)

As old method, you can inspect fillet by Pattern Matching or Wave Form methods. These old methods are not often used because Histogram method is better nowadays.

* These features are available only on machines with red side LED lamps.

■ The machine casts a red LED light on the PCB surface at an angle to emphasize the components/parts on the curved surface of the solder in red and make the forms stand out. A high-speed rendering process will be applied to the image and only the fillet will be extracted for matching judgment against an OK or NG (Screen 1).

LED flashing synchronizes with image capture, capturing images when the LED is both on and off, allowing simultaneous inspection of parts and fillets. In addition, with the machine red LED can be always on, enabling inspection for areas such as laser markers that are difficult to extract with only the main lighting.

■ When closing the Setting screen, a warning message, "Reflection from side light too low/high", may be displayed with fillet Inspection Frame's for QFP and SOP leads (Screen 2). This means that the red area is either insufficient or nonexistent. With the pattern matching method, the red area is insufficient when inspecting small fillets, making it very difficult to get stable inspection results.

Therefore, this software is equipped with Waveform Inspection in addition to Pattern Matching Inspection. Waveform Inspection takes the sections that are picked up in red within the Inspection Frame and displays the red sensitivity of both the horizontal and vertical waveforms. The intensity of red sensitivity is determined by the angle at which the angled LED light (Side light) is reflected. In other words, if the fillet

21

(Screen 1)

Reflection from side light too low (Fillet volume defect)
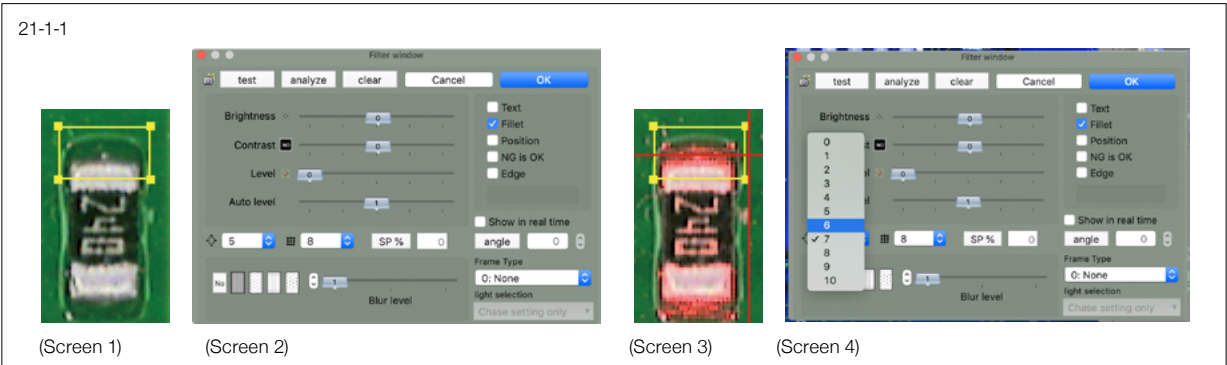
(Screen 2)

72

(Screen 3)
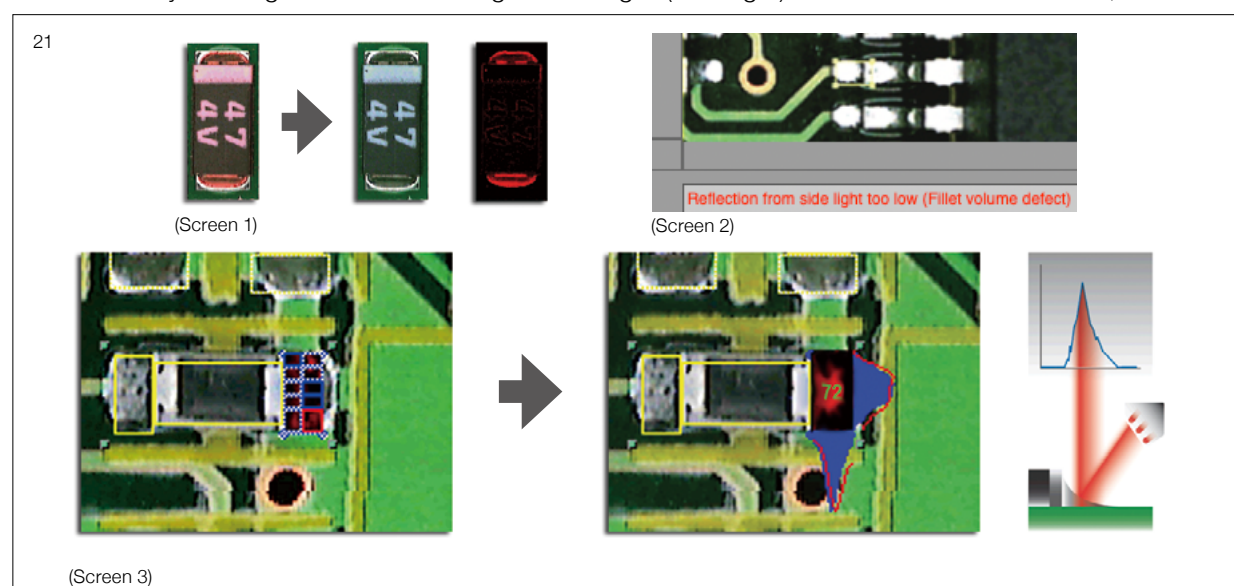
has round edges, a mountain-shaped waveform will be displayed with a certain point being the peak. The Waveform Inspection compares this waveform to the waveform of the Master Picture. This method is less likely to be affected by variances in fillet forms and volume, and inspection is possible even with only a few master pictures (Screen 3).

21-1 Pattern Matching

In this chapter, the programming of Components and IC Leads are described separately.

▼ 21-1-1 Passive Component

1. Draw an Inspection Frame on the fillet. It is better to include not just the fillet but also the PCB so that the red form will stand out inside the black Frame (Screen 1). If only the fillet is in the frame, it is difficult to judge the difference in appearance between other parts, making it difficult to adjust the filter. For 0402 size components, draw a Frame on the entire part.

2. Select the Inspection Frame, open the Set Filter Window and check the **Fillet** button. Hue Sensitivity and Saturation Sensitivity will be hidden and Red level and Auto Adjust levers will be displayed (Screen 2). The picture will be colored red as it is illuminated by the LED (Screen 3). Red Level is used to adjust sensitivity when extracting red parts from the captured image, and Automatic Correction is used to set acceptable tolerances of the red color in the Master Picture.

3. Adjust the red sensitivity lever so that the fillet becomes more/less red. If the red area is too small, a warning, "Reflection from side light too low", will be displayed.

21-1-1

(Screen 1)　(Screen 2)　(Screen 3)　(Screen 4)

21.Fillet Inspection (old method)
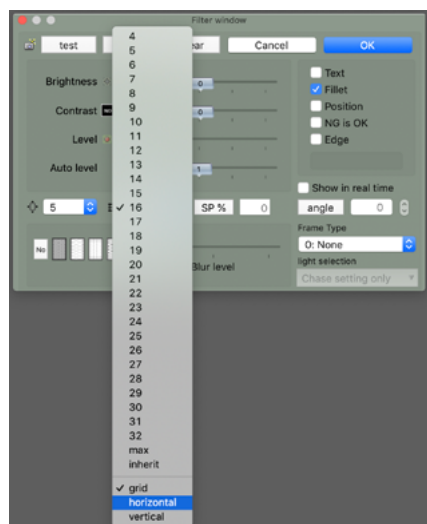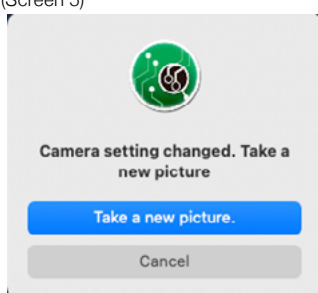
(Screen 5)
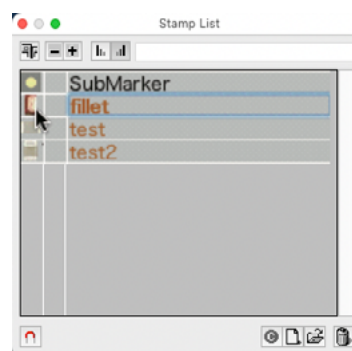
(Screen 6)

(Screen 7)

(Screen 8)

4. Adjust the **Track** button according to the size of the fillet and pads. The default value is 3, but change this to a value between 5 and 7 for components larger than 0603 size (S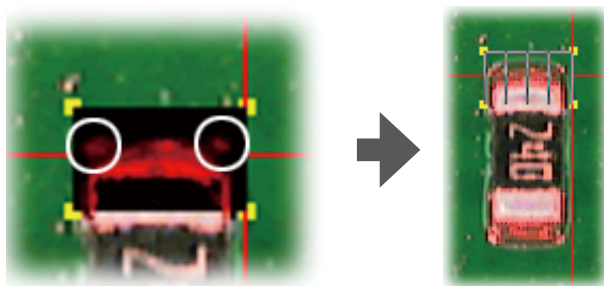creen 4). Likewise, set the **Resolution** button. The default will split the Frame in grids, which can be changed to stripes (Screen 5). If a red part is displayed at the edge, it may cause false reports, and stripes are effective in this case (Screen 6).

5. If the shapes are varied, check **Blur**. The type of blur can be selected in the **Blur area** at the bottom, dragging the mouse to the selected type, or use the ▲ ▼ buttons on the right to adjust the level.

6. Once the filters have been adjusted, click **OK**, and if an alert dialog to replace the Master Picture appears, click on "**Capture again**" and replace the picture (Screen 7). If the Fillet check box is checked, the picture will be taken with the LED on. The Master Picture must be replaced even if no changes are made to the parameters. You should make a habit of always replacing the Master Picture with the **capture again** Button (the camera icon).

7. Once all settings are complete, register the frame as a Stamp. After registration, you should double-click on the icon in the Stamp List Window to apply the picture (Stamps with master pictures will be displayed in bold letters). (Screen 8).

▼ 21-1-2 IC Lead

With IC leads, Inspection Frame's can be placed effectively by using the standard ICLeadGap Stamp.

1. First, create one fillet Inspection Frame for each IC lead. The procedure is the same as with components (Screen 1).

2. Place the ICLeadGap stamps to include the fillet Inspection Frame's that you have just created (Screen 2).

3. Double-click on the **ICLeadGap stamp Frame** and the Lead gap inspection setting IV window will appear. Check **Include Fillet check** (Screen 3).

4. Once the ICLeadGap stamp is adjusted, close the window. When the ICLeadGap Stamp is inspected, the Bridge Inspection and the Lead Fillet Inspection of the Stamp will be executed simultaneously (Screen 4).

* When adjusting **Lead detection** in the ICLeadGap Stamp, the white part will be considered as the Lead. If the center of Lead is reflected in white, or if the silk and patterns in between Leads are displayed white, IC Lead inspection will not be performed correctly.

▼ 21-1-3 Cautions on Adjustment
■ Adding Master Pictures

• Understanding the Characteristics of components/parts

When you have expanded the tolerance to reduce false reports, make sure you check to see that defect will be judged NG. Points that still cause false reports may be fixed by adding Master Pictures.

One thing to be careful about when adding Master Pictures is to add them in the order of those that are

21-1-2

(Screen 1)

(Screen 3)

Fillet Inspection Frame

IC Lead Frame

(Screen 2)

(Screen 4)

Lead gap inspection setting

Detection adjustment   Cancel   OK

Short detection   0
Lead detection   0

Preprocessing   Sensitivity details

☐ 2 pixel pass   Detour limit   5
☐ Auto Brightness
☑ Glue leads   Max pitch diff.   50
☐ Reduce flux
☐ Reduce pattern
☑ Blur leads   ☑ Test corner shorts
☐ Integrate Leads   ☑ Include fillet check

☐ Check number of gaps   0
☐ Continuous testing

21.Fillet Inspection (old method)

most likely to be in the majority (an average OK picture). You may be able to resolve 100 false reports by adding an appropriate Master Picture,, but you may also be able to resolve only 1 false report by adding an inappropriate Master Picture. Needless to say, the more Master Pictures you have, the more inspection time it will take, so it will be important to know the Characteristics of components/parts before inspection.

• Limit number of used picture

When many Master Pictures are selected, the inspection time will increase. To speed up inspection time, you can compare only Master Pictures with a high frequency of matches. Perform inspections on a couple of PCBs, and once you have learned the trend, designate the number of pictures by choosing **Limit number of used picture** in **Sensitivity** from the **Settings for supervisor window** (Screen 1). This value designates how many Master Pictures will be used for comparison, in order of highest matching frequency, and 0 will select all Master Pictures.

■ **Filter Settings**

• Level of Brightness

When Brightness levels are raised, points that should be judged NG may be judged OK. In this case, you will need to verify the points that should be judged NG.

• Red level

For points where red reflections are too small, you may have to skip inspection of the point and inspect manually, or you may have to include it in the inspection knowing that it will be a false report depending on the level of red insufficiency. If you increase Brightness too much due to filter adjustment, this may cause NGs to be judged as OK.

• Resolution grid

By splitting the Inspection Frame into Stripes, you can handle false reports caused by small parts at the corner of the Frame. Click on the **resolution** button in the Set filter Window, and select **Stripe-short/long** from the pull-down menu (Refer to 21-2-1 Passive Component).

• Auto Adjust

Auto Adjust (**Red auto adjust range**) is set at 20% maximum by default, which can be changed in **Red auto adjust range** in **Sensitivity** in the Settings for supervisor window (Screen 2). 2 is equivalent to 20%.

21-1-3

(Screen 1)   (Screen 2)

21.Fillet Inspection (old method)
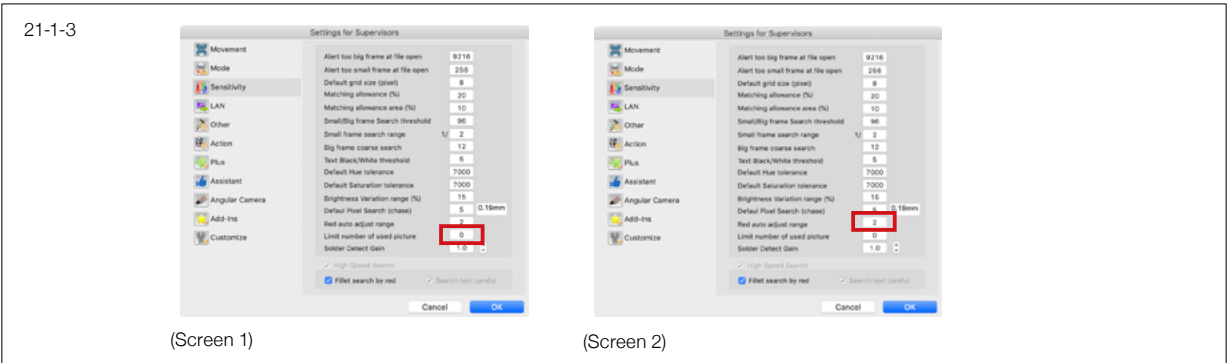
22. Options for G/NG Confirmation Mode

22-1 Prevent operator's mis-judgement

When using the mouse, you/operator may unintentionally judge an Inspection Frame as Good by clicking continuously. In order to avoid such operational errors, you can set it not to allow the continuous Good clicking "unless a certain amount of time past", "Move mouse pointer away from Good button", or "Unable to click Good button under certain conditions". The procedure is as follows:

▼ 22-1-1 Set and activate

1. Select "Extra settings for G/NG Mode" in Map View setting window, or press the Option key while Good/NG is displayed in the Cell Map menu. A clock icon will appear. Click on the icon to display a setting window. Click on the icon to display a setting window (Screen 1).
2. Set to prevent Good button clicking.
3. If the click interval is set, the Minimum click Interval will be displayed dimly on the bottom left corner of the Good button.
4. To set to unable to click Good button, select "Unable to click Good button" tab, a warning message is displayed on screen, and it becomes not possible to press Good button (Screen 2).

* This minimum click interval is valid only for the Good Button.

* Normally when there are multiple NG stamps in a Pack Stamp, the voluntary NG error message is displayed, but if "Unable to click Good button" is set, warning messages of all NG are displayed. This can assist you strongly not to let escape any defects.

* Good button click interval and Unable to click Good button can also be used in NG Cell View.

22-1-1

(Screen 1)

(Screen 2)
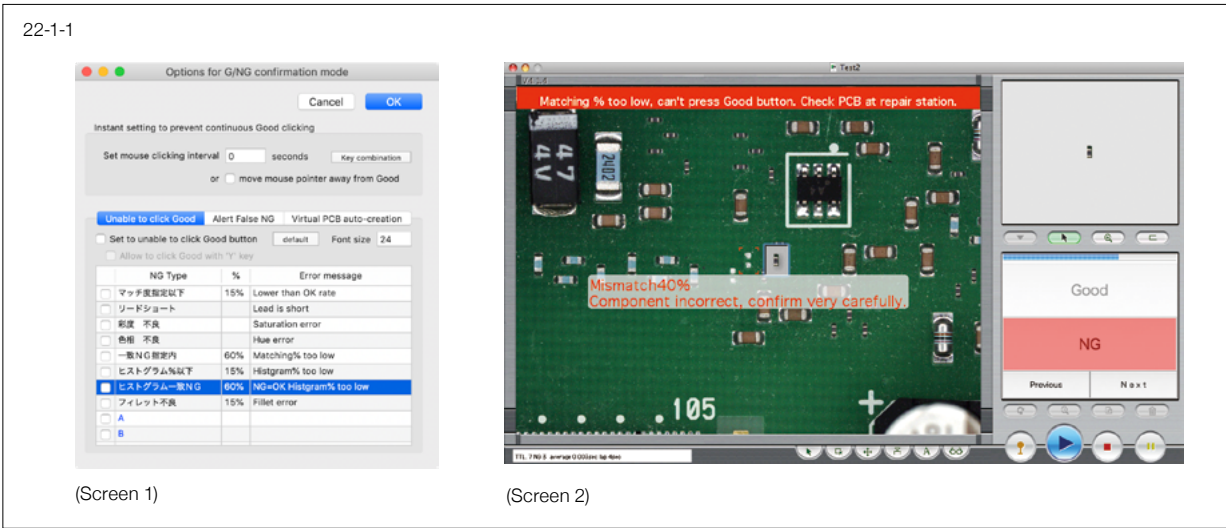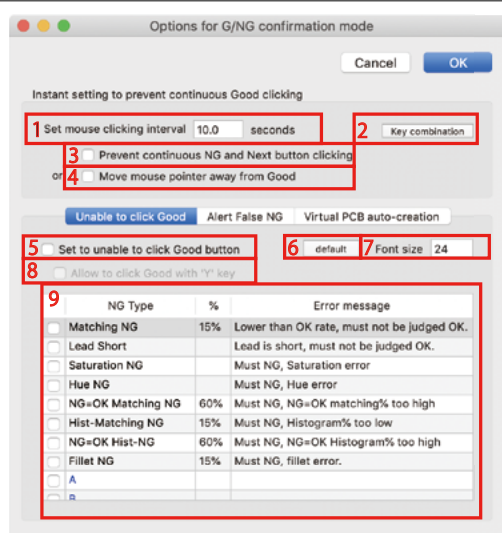
▼ **22-1-2 Setting Window**

Each function is described below.

1. If a number other than 0 is entered in the field, the Good button cannot be pressed until the set number of seconds has elapsed. A minimum of 0.1 seconds and a maximum of 10 seconds.

2. If set to ON, O and K input on the keyboard is required to press the Good button. Similarly, to press the NG judgment button, N and G input on the keyboard is required.

3. If set to ON, the NG and Next buttons cannot be pressed until the set number of seconds entered in [1] has elapsed.

4. If this check box is checked, mouse pointer always comes back on NG button after clicking. This helps operator to click Good button unexpectedly. Interval time set in [1] becomes invalid.

5. If this check box is checked, operator can not press Good button, when classifying NG which corresponds to NG condition set on [9].

6. Recovers settings to default status.

7. Changes the character size of Error message.

8. By activating this, Good button is activated while pressing Y key.

9. Operator can not press Good button when types of NG checked here appear.

   NGs written in black in NG Type column are NG types that this machine defined.

   NGs written in blue in NG Type column are original NG message that user defined in Hide/Show Object of Window menu. When the detected NG is corresponded to both machine defined NG and your original defined NG, machine NG has priority and displayed.

    For example, if the condition is just like above picture, and original frame type set to be text, and judged matching NG, the error message is [Lower than OK rate] instead of [Must NG].

22-2 Alert too many false NG

Even AOI detects a defect, operator can classify it as Good by keep pressing Good button carelessly. This option is, if an operator keeps classifying Good on where AOI classified NG, an alerting message is displayed after exceeding certain number of Good classification, and after exceeding final alert limitation, operator can not press Good button anymore.

▼ 22-2-1 Set and activate

1. Press the Option key while Good/NG is displayed in the Cell Map Area. A clock icon will appear. Click on the icon to display a setting window. Or click Extra setting for G/NG mode in Map view settings.

2. Select Alert False NG tab, check Set alert for too many false NG, and set accumulate false NG number, alert message, etc (Screen 1).

3. If any of inspection frame exceeds the limit of alerting accumulative number, an alerting message is displayed in Work Area from next inspection (Screen 2). If any of inspection frame exceed the limit of final alerting accumulative number, a warning message is displayed in Work Area and the operator can not press Good button from next inspection (Screen 3). If Good not allowed is checked and any of inspection frame exceeds the limit of alerting number, a window to request program improvement pops up every time after classification (Screen 4).

4. When the operator can not press Good button anymore, he should call the programmer to ask improving inspection data.
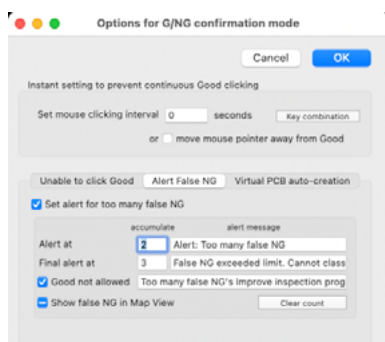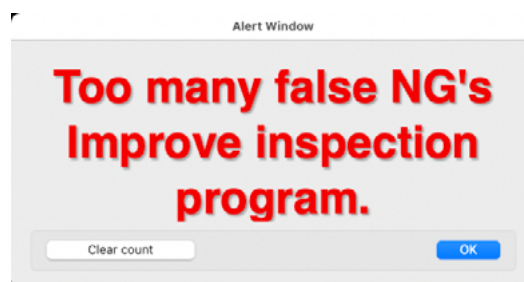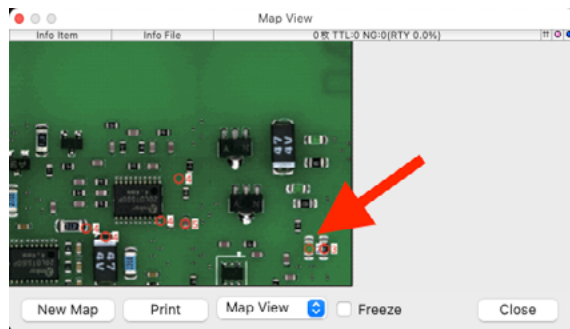

(Screen 1)

(Screen 2)

(Screen 3)

(Screen 4)

(Screen 5)

(Screen 6)

5. The programmer debugs inspection frames with too many false NG. (For comfort debugging, the program setting should be as followings: check on "Display NG on Map" in Configuration General of Settings menu in order to display NG and false NG points in Map View after inspection.) Double click on an orange circle of false NG in Map View (Screen 5). Then Map View slides to right side and target frame is displayed in Work Area (Screen 6).

6. If the inspection frame is improved, the count of accumulative false NG for the frame is cleared, and the operator can classify the frame again Good. To reset count for **Good not allowed** message, press **Clear false NG count** button, and input password for releasing.

* Accumulate number and alert message can be customized freely.

* Map View slided to aside on procedure step 5 is disappeared when starting to edit inspection frame in Work Area unless Freeze is checked on.

* When Show false NG in Map View is checked and false NG is displayed with orange circle mark, number is shown on next. The number is accumulative number of NG and not of false NG.
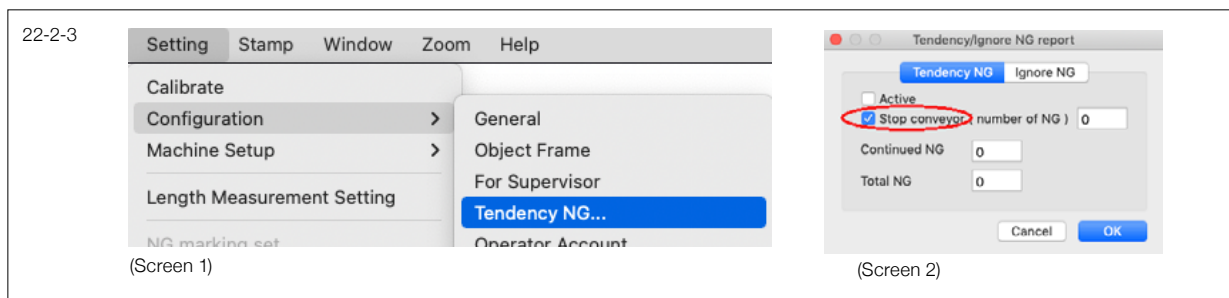
(Screen 1)
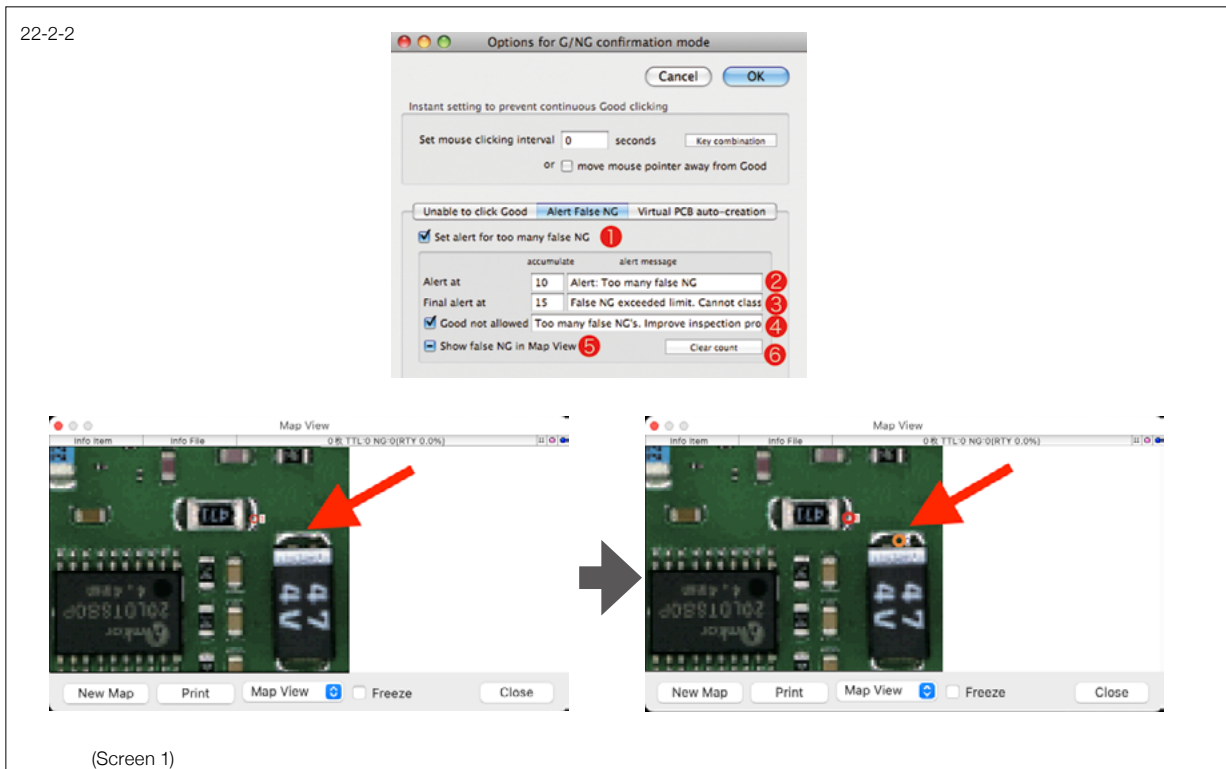
▼ **22-2-2 Setting Window**

Each function is described below.

1. Activate this function.

2. Accumulative false NG number to start alerting, and alerting message.

3. Accumulative false NG number and alerting message to start alerting and unable to click Good.

4. After accumulative false NG number for Final alert exceeds setting number, a window to request program improvement is always displayed after Good/NG classification. On inline AOI, patlight blinks.

5. By single click, it is checked with bar. In this case, false NG inspection points which are ever been classified as false NG are displayed in Map View after classification in orange circles togather with NG red circles. By double click, it is checked and false NG points of the previous inspection result are displayed in Map View in orange circles (Screen 1).

6. Clear all accumulative false NGs. When you press this button for the first time, you will be asked to input a password. Because this button is protected by password in purpose of avoiding dishonest count clear by the operator. If you check **Good not allow** on, you must set password.

* Even if you do not activate this function, false NG points are displayed in Map view by checking on Show false NG in Map View.

Setting	Stamp	Window	Zoom	Help

Calibrate
Configuration >
Machine Setup >
Length Measurement Setting
~~NG marking set~~

General
Object Frame
For Supervisor
Tendency NG...
Operator Account

(Screen 1)

● ○ ○   Tendency/Ignore NG report

Tendency NG Ignore NG
☐ Active
☑ Stop conveyer (number of NG) 0
Continued NG   0
Total NG   0

Cancel   **OK**

(Screen 2)

▼ **22-2-3 For inline AOI: Stop convey when Good not allowed message is displayed**

To strongly alert the operator to improve inspection program when too many false NG, programmer can set to stop AOI's convey when improvement request window pops up. Select **Tendency NG...** from **Configuration** in **Settings** menu (Screen 1). Check **Stop conveyer** on (Screen 2).

22-3 Auto saving PCB image and debugging afterward

In factory, if there are too many false calls while inspecting by in-line AOI, operator calls programmer for debugging. While debugging, the PCB production line stops.

This function enables "If false NG / NG is too many, then create virtual PCB map automatically".
Later, the programmer can debug inspection program with PCB images of false calls created by this function on OLT (Off-line Teaching software), and get inspection program back to in-line AOI.
It is not necessary to stop the production line for long, because time spent on in-line AOI is only replacing (over-writing) inspection program.
In addition, this function is not only effective for false NG debugging, but also effective for collecting NG PCB pictures.

You can also save all PCB's virtual PCB map (PCB image) no matter it has defect or not. The PCB map can be converted to jpeg format. For viewing PCB map, you do not need Off-Line Teaching Software.

* This function is available only in G/NG confirmation mode.

First, function "If false NG / NG is too many, then create virtual PCB map automatically".is explained, then "save all virtual PCB's map automatically" is explained

(Screen 1)
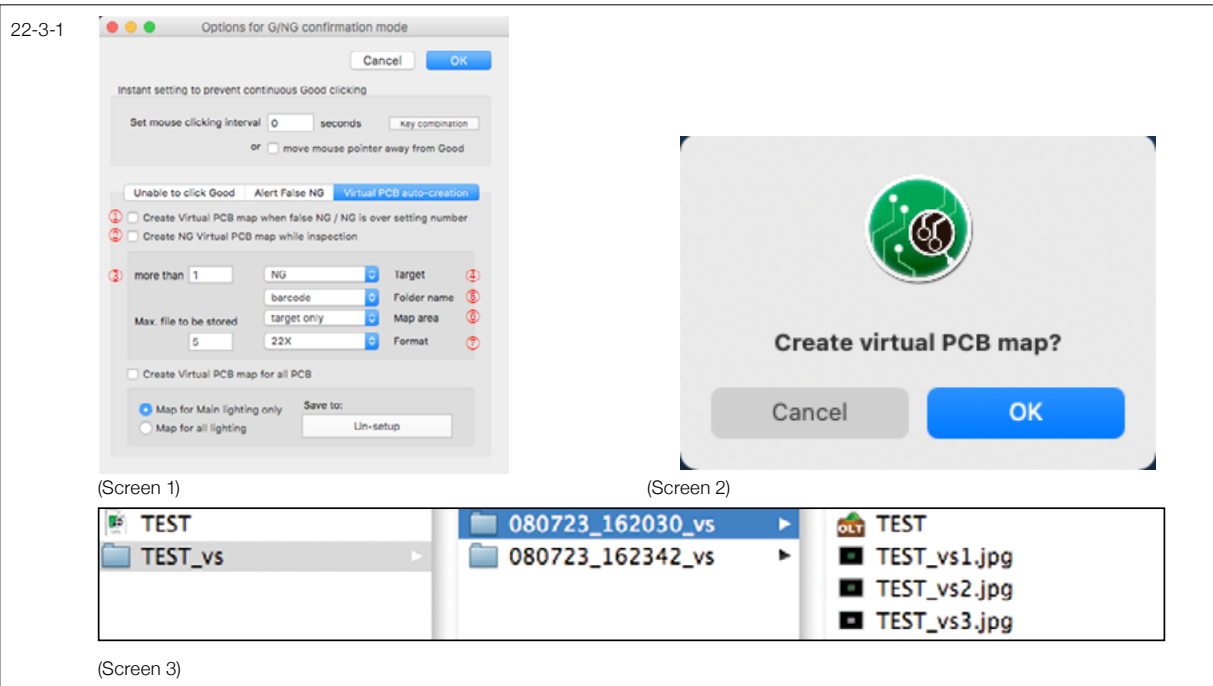
(Screen 2)

(Screen 3)

▼ **22-3-1 Save PCB map when too many false NG or NG**

1. Select "Extra settings for G/NG Mode" in Map View setting window.

2. Setting window is displayed (Screen 1).

3. Select Virtual PCB auto-creation tab. Check "Create Virtual PCB map when false NG / NG is over setting number".

4. After inspection, if False NG / NG is more than setting number, a message pops up (Screen 2).

5. Select OK to start creating virtual PCB map. A folder named "program _vs" is created in the same directory as inspection program. In the folder, sub folders are also created in specified

name (date_time is set here). In the sub folder, a master virtual file and vs virtual files (there can be vs1 to vs3 files depending on your AOI illuminations) are created (Screen 3).
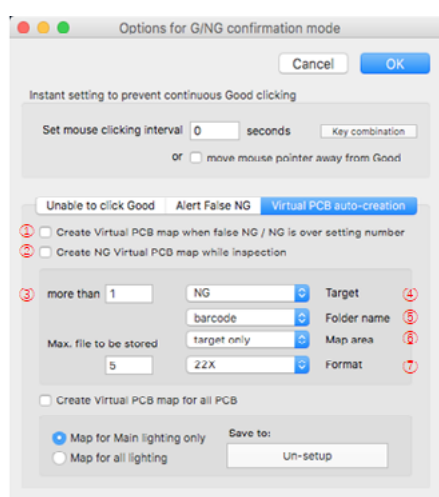
22-3-2

▼ **22-3-2 Setting Window**

Each function is as following;

1. Check on to activate this function.

2. Check on if you want to create NG Virtual Map while inspection.

3. Set limit of false NG / NG number from 1 to 99999. Set limit of file to be stored, number can be input from 1 to 9999, if the file exceeds 9999, the oldest file is overwritten by the latest.

4. Set target for creating virtual PCB map from [**false NG**], [**NG**], [**false NG + NG**] or [**all**].

5. Set sub folder name from [**date_time**], [**number**] or [**barcode**]. [number] is the historical inspection number memorized in the inspection program, you can see it as TTL on top bar in map view. For the detail, please refer Manual Chapter 13-1 Map View Mode.

6. Set Map Area. If you select [**target**], only false NG or NG area is captured. If you select [**with fiducials**], in addition to false NG or NG area, fiducial markers are also captured. If you select [**all**], all Cells are captured.

7. Set image format. If you select [**22x**], PCB map is created in non-compressed / high resolution / big file size. If you select [**JPEG**], PCB map is created in compressed / low resolution /small file size.

* If you select sub folder name to be barcode, barcode should be readable and AOI should be connected to optional CS-Center software. If barcode is failed to be read, the sub folder is created in date_time name.

* The less camera captures False NG (NG) area, the less virtual files' size will be in JPEG format. But if you select 22x format, the file size will be the same how many screens camera captures.

* When creating virtual map in JPEG format, it requires more RAM memory than 22x format because of compressing operation.

▼ 22-3-3 Off-line debugging of false NGs

Procedure for debugging virtual PCB data on OLT.

1. Start OLT (Off-line Teaching software).
2. Select inspection program from **Open**... in the **File** menu. In the example Screen 3, **TEST** (with inspection data icon) is selected.
3. **Open virtual PCB** map from **Snap Shot** in the **File** menu. In the example Screen3, the master virtual file **TEST** (with OLT brown folder icon) in [080723_162030_vs] in [TEST_vs] is selected.
4. Debug the inspection stamps for false NG components (False NG points are marked by red as same as NG points.
5. Open next virtual file.

   Open virtual PCB map from **Snap Shot** in the **File** menu. In the example Screen3, the master virtual file **TEST** (with OLT folder icon) in [080723_162342_vs] in [TEST_vs] is selected.
6. Debug the inspection stamps for false NG components. Open next virtual file and so on... At last, save the inspection program and shut down OLT.
7. Copy (over-write) the inspection program in in-line AOI.

* If you open virtual PCB files by NOT selecting virtual file master , false NG or NG is not displayed in red.

Next explanation is how to save and view all PCB's virtual PCB map.

Different from "Create Virtual PCB map when false NG /NG is over setting number" function, Virtual PCB maps must be stored in the exclusive HDD. Data can not be saved in the HDD where OS is installed.

This is because Virtual PCB map is full size and many.

▼ 22-3-4 Create Virtual PCB map for all PCB

1. In Virtual PCB auto creation tab, check "Create Virtual PCB map for all PCB" on (Screen 1).

2. Selecting "Map for Main lighting only" will create only one PCB image taken by main light.

   Selecting "Map for all lighting" will create also PCB images by side light or DOAL light on AOI

   with those lighting.

* We recommend to select "Map for Main lightin only", because it takes time to take many _vs files.

3. Press Save to button (written as Un-setup), select HDD from the list (Screen 2). Even if you

   forget to select the target disk, you will be asked to select a disk after the 1st inspection.

4. Start inspection. When inspection has finished, a message "Data sampling for debugging" is

   displayed, and PCB images are saved.

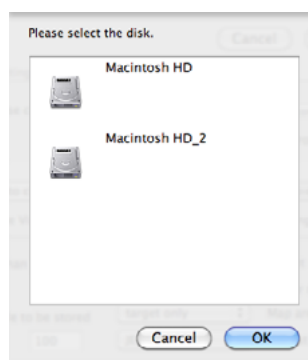**Function "Create NG Virtual PCB map while inspection"**

If you put check to "Create NG Virtual PCB map while inspection " function, you can prevent the
lowering of inspection speed by saving the Cell image detected as NG. Also smaller disk space is
necessary with saving only NG Cell image. Furthermore debug is possible when NG is detected in the
Cell using Z axis.

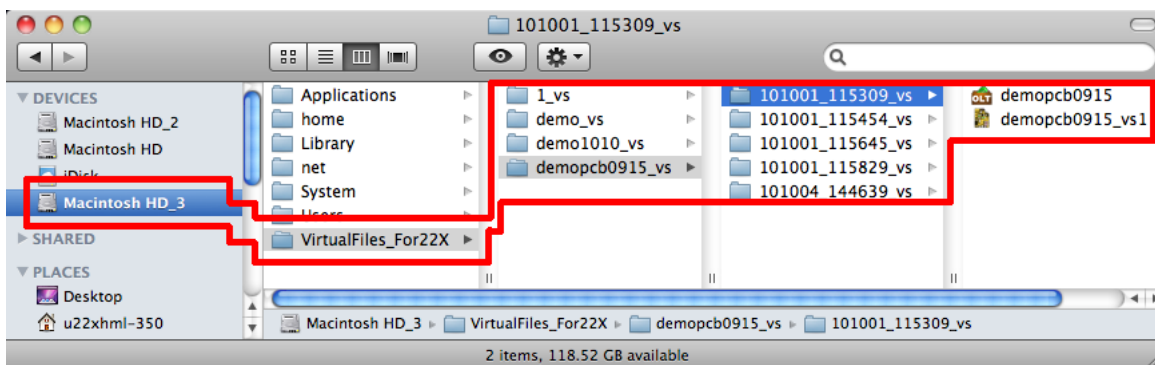* Off-Line Teaching software is necessary for this function.
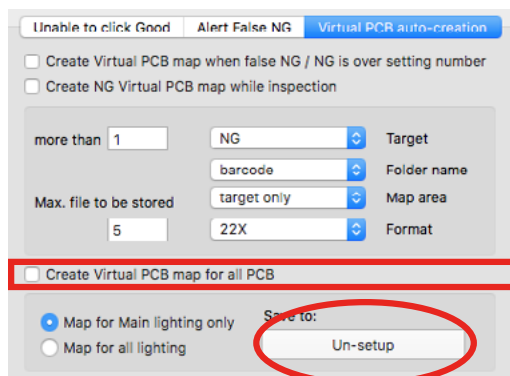
(Screen 1)

(Screen 2)

(Screen 3)

22-3-4

Screen 4

How to setup

Put check to "Create NG Virtual PCB map while inspection " (Screen 4). This function is only for following setting: "more than: 1, Target: NG, Folder name: date_time, Map area: target only, Format: 22X". You can only change the number of maximum file to be stored.

You cannot use this function together with "Create Virtual PCB map when false NG / NG is over setting number" function.
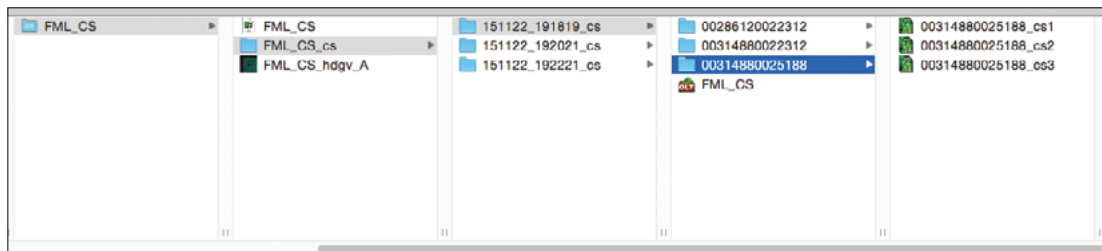
Operation of 22X software

1. Load the inspection program, and create the virtual map of whole Map view. This function creates the Virtual map for each Cell based on virtual map of whole Map view.
2. Start inspection.
3. Create the virtual map for each Cell if it has NG. Folder [Inspection program name_cs] is created automatically in the same directory of inspection program. Cell virtual map is created in this folder with Master virtual file and Cell folder (folder only with numbers).

Operation of Off-line Teaching software

Load the inspection program, and load the master virtual file from "Open virtual PCB map" in File menu.

* This function is not available with Special Camera Settings. Cell virtual map is not created even the inspection frame with Special Camera Settings is detected as NG.

▼ 22-3-5 Display false NG point in Virtual PCB Map for each Cell

In Cell Map area, red colored frame indicates the cell which contains NG points & Cell which contains both NG points and false NG points. Blue colored frame indicates the cell which contains false NG points. In Work area, red colored frame indicates the inspection frame of NG point, and blue colored frame indicates the inspection frame of false NG point. False NG points of inspection frame inside the Pack is shown by blue colored frame.

* Setting of Virtual PCB Map for each Cell should be completed to use the function for false NG confirmation.
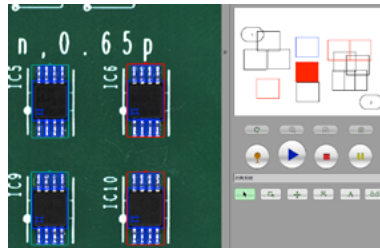
▼ 22-3-6 View Virtual PCB map

A directory named "**VirtualFiles_For22X**" is created at root of HDD. PCB images are saved under this directory in different folder "**Inspection Program name + _vs**". Under this directory, each PCB image is named "**Inspection Program name + _vs**" and saved in "**Date_Hour_vs**" folder (Screen 3)

* In the folder, the master virtual file is always created together with _vs files. The master virtual file created here does not include the inspection result like the master virtual file created by "Create Virtual PCB map when false NG / NG is over setting number".

1. Start "vs_converter " software (Screen 1).

2. Select Open... from File menu (Screen 2), a Finder to open file will be shown. Select _vs file (Screen 3). Or you can drag & drop a _vs file on software in Dock.

3. PCB image file will be opened (Screen 4). Window size is resizable. As well as Map view on 22X software, you can zoom the area by dragging mouse (Screen 5). Zoom can be reset by pressing mouse longer.

4. PCB image file can convert to jpeg file. Select Convert... from File menu (Screen 6).

5. A dialogue to save file will be shown. Select jpeg format (Screen 7). You can select format other than jpeg, however only jpeg is possibly to save.

* It takes time to open and to convert PCB image more than 2GB.
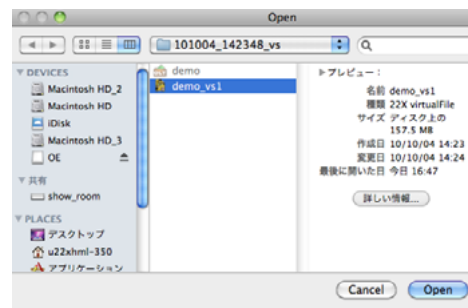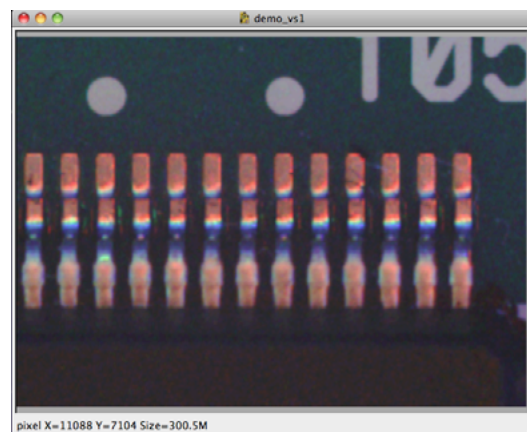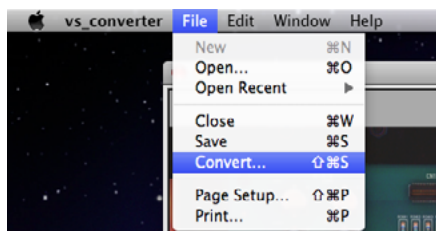

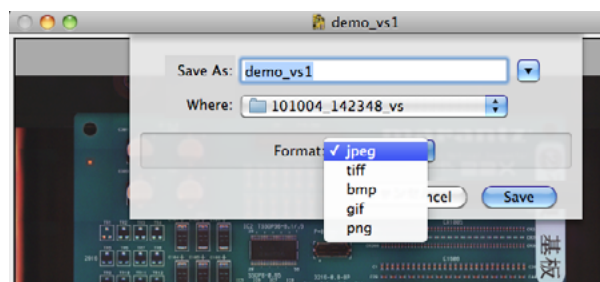
22-3-6

(Screen 1)
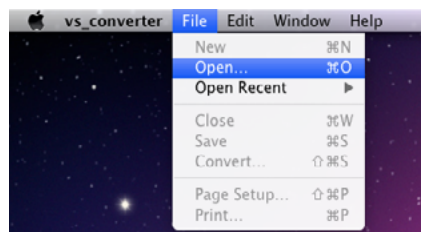
(Screen 2)

(Screen 3)

(Screen 4)

(Screen 5)

(Screen 6)

(Screen 7)

299

23. OFF-Line Teaching Software

This software is for programming data of Marantz Model 22X series Automated Optical Inspection machines, without connecting PC to the machine.

23-1 Features

■ Inspection program can be created as if the machine has being connected. Therefore if you have knowledge of machine's operation software, you do not need any additional study for this software.

■ Virtual PCB map (image data) from the machine is used for creating inspection program, thus there is high compatibility between data created on this software and data created on operation software connected to the machine. After creating data in office, you can immediately start inspection in the line by copying the data.

■ This software has a function named "Tact Simulator" to simulate/analyze inspection time.

23-2 Conditions and Cautions

■ This software can be installed on Mac PC.

■ The size of virtual PCB map is very big. When creating and opening image data, it requires large memory. At least 16GB RAM memory should be installed in Mac PC for this software. The required memory for AOI's Mac is different from PCB size and lens resolution (ex. 1).

■ Virtual PCB map is created by jointing small pictures, "mm versus pixel" setting on the machine should be accurate enough. The pictures of jointing area can be imperfect, if the component is in the area, you may not able to create the good inspection frame. On the machine without telecentric lens, the joints of small pictures does not become accurate when high components exist at the joint (ex. 2).

■ This software is applied a protection system against illegal copy. USB key is required while running.

ex. 1

	with 20 micron lens	with 18.7 micron lens	with 10 micron lens
PCB size 650x550	8GB	10GB	20GB
PCB size 350x250	3.5GB	2.5GB	5GB

Images created by normal lens and telecentric lens

| ex. 2 | Actual image | By normal lens | By Telecentric lens |
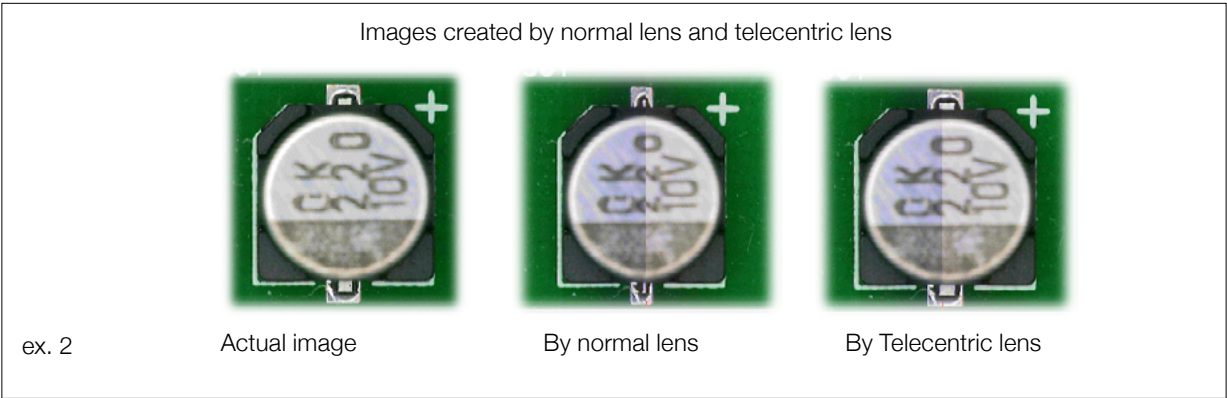
23-3 Installation

1. Install the driver for USB key following instruction in attached CD-ROM..
2. Install "22xx_OLT" application from CD-ROM onto Mac PC. Put USB key in USB port.

23-4 Procedure for creating inspection program

Creating virtual PCB map (operation at PC connected to the machine)

1. Set PCB and execute calibration.
2. Move to the position where PCB top-left corner is displayed. Create a frame. (Screen 1)
3. Move to the position where PCB bottom-right corner is displayed. Create a frame. (Screen 2)
4. Save the program. Here we name the program, for example ABCD.
5. Select **File -> Snap shot -> Create Virtual PCB** (Screen 3)
6. A dialogue for creating virtual PCB map is displayed. If you would like to create high resolution picture (big file size), press GO. If you would like to create low resolution picture (small file size), check **JPEG File** on, then press GO.

    In the dialogue, these are displayed: size of sampled virtual PCB in mm, available RAM memory, required RAM memory, memory bar which represents the ratio of required RAM memory versus available RAM memory. (Screen 4)
7. If there is not enough available RAM memory, Go button is not active, and you can not press it. On OS10.6, a warning message to inform insufficient memory is shown. In such case, create smaller area of virtual PCB map by replacing 2 frames on top-left and bottom-right, or install more RAM memory onto Mac PC.
8. When checking JPEG File on, operation requires more RAM memory for compressing file, and the image file's quality is not good, but file size is approximately 1/10.

    * According to Mac OS's bug, if big size PCB virtual map is created in JPEG File, the picture will be broken.
9. After pressing GO button, the machine starts to create virtual PCB map. If the machine mounts SIDE light, firstly PCB image is taken by MAIN light, then secondary PCB image is taken by SIDE light. If the machine mounts DOAL light too, thirdly PCB image is taken by DOAL light. While taking pictures, the status is displayed in the message bar.

Screen 1

Screen 2

Screen 4

Screen 3
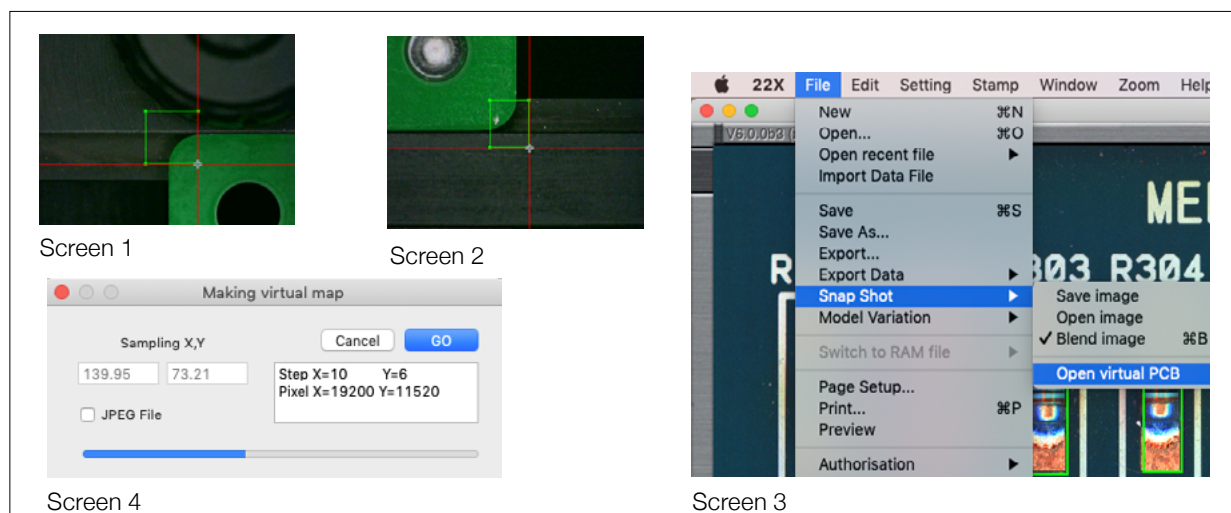
10. After taking pictures, PCB image map(s) is automatically created. Each file name is, if it is taken by MAIN light, ABCD_vs1, if it is taken by SIDE light, ABCD_vs2,
When JPEG File is checked on, each file has JPEG file extension

* There are two types of virtual maps. Small virtual map (one file size is less than 3.4GB and file length/width is less than 3 million pixels: Screen 5), and Big virtual map (one file size is more than 3.4GB or file length/width is more than 3 million pixels: Screen 6).

23-5 Work on the inspection program + virtual PCB map(s)

(Operation at PC which OFF-Line Teaching Software is installed)

Startup and settings

Double click the icon of OFF-Line Teaching software. Adjust monitor resolution to be same as its of AOI's PC (ex. 3). To apply the resolution change, quite and restart software.

Screen 5

Screen 6

ex. 3
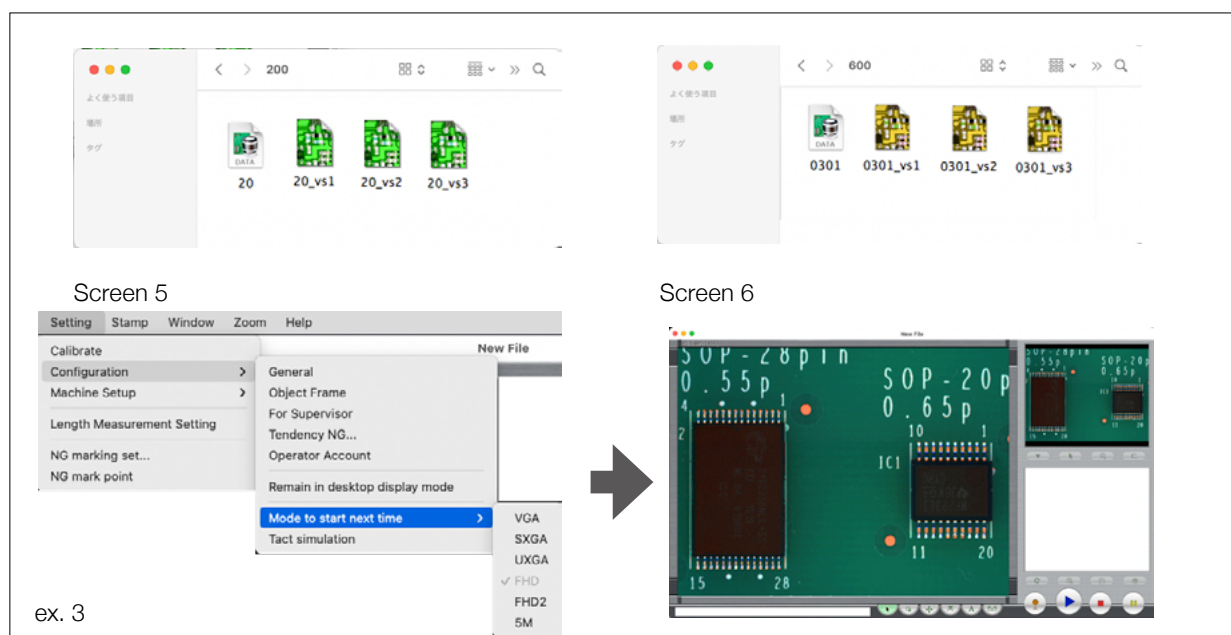
Loading

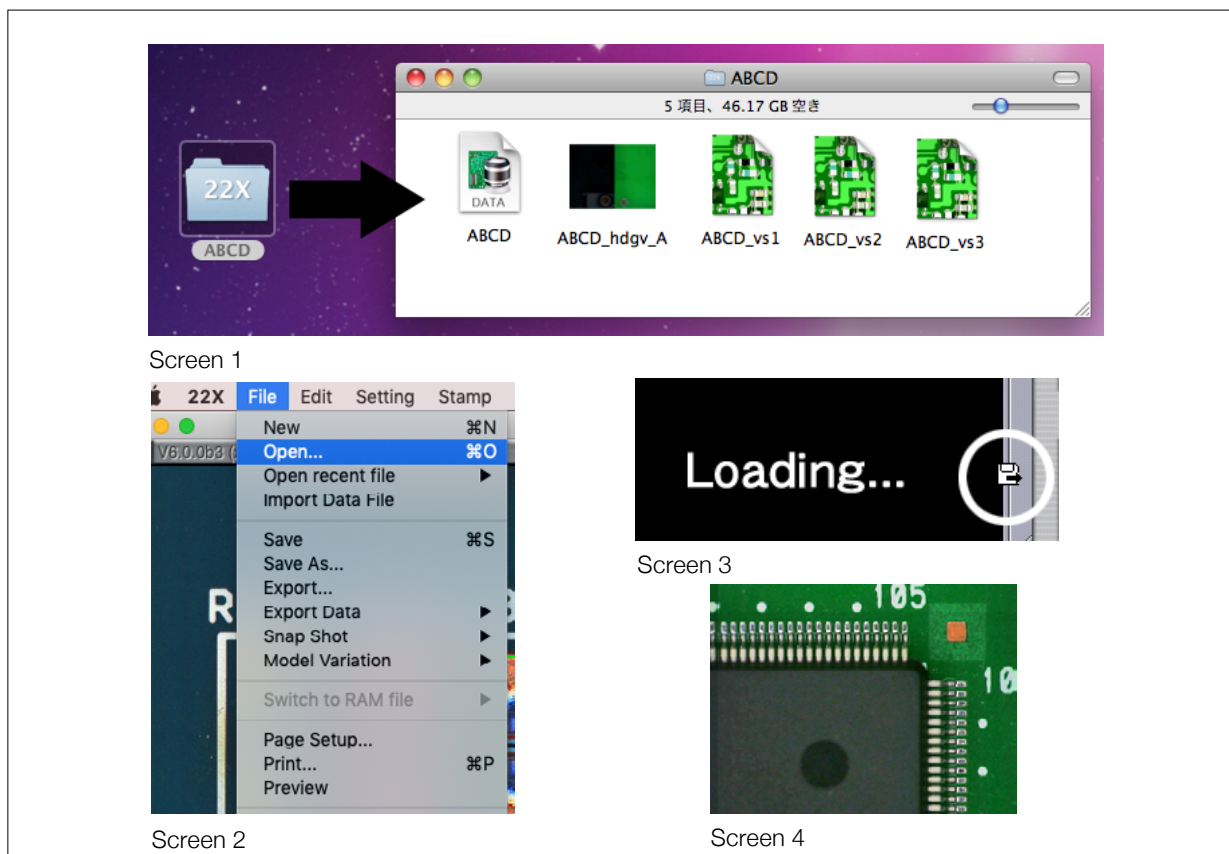1. Load inspection program and virtual PCB map(s). It is recommended to create a new folder named ABCD_folder and input them. (Screen 1) .
2. Open ABCD from menu -> **File** -> **Open...** Simultaneously virtual PCB map(s) is open. (Screen 2)
3. While loading files (Screen 3), the specification data (Size, offset, mm versus pixel settings of the machine where virtual PCB map(s) is created.) is also loaded, and PC where OFF-Line Teaching Software is installed becomes same conditions as PC where virtual PCB map(s) is created.
4. Move to one of the frame which you drew during creating virtual PCB map(s) procedure. Confirm that the screen displayed is exactly same as the screen you have seen while creating (Screen 4). If moving to the area out of virtual PCB map, the screen is black out.

* If RAM memory is short for PCB size, inspection speed and display response will be extremely slow.

Programming and Saving data

- Programming using these files is possible without any difference from programming by using the machine.
- However, camera special settings, calibration, etc the operations related to the machine are not possible.
- After programming, save the ABCD inspection program, and get the ABCD program back to PC which the machine is connected. It is not necessary to get virtual PCB map(s) back.

Screen 1

Screen 2

Screen 3

Screen 4

Create program for PCB which needs to inspect surface and back

Create inspection program and virtual PCB maps for both surface (side A) and backface (side B) in different name. Program these data on Off-Line Teaching software. On 22X software, open inspection program of side A, then switch to side B by side switching button. Open inspection program of side B. A message "Reading B-Side data..." is shown, click OK. Save the inspetion program. Now the program has both side A and B.

23-6 Tact Simulator

Tact Simulator is a support tool for simulating inspection time on OFF-Line Teaching Software. Also it can divide an inspection program into two. The divided programs can be used in two inspection machines, as a result it can decrease total time spent in factory's production line.

Normally inspection time on OFF-Line Teaching Software does not count movement of camera and carrier, therefore it is shorter than the time spent on when inspection with the machine.
But, Tact Simulator calculates the movement time, and inspection time will be as close as real inspection time.
After simulating, if inspection time is slower than expectation, Tact Simulator can divide a program into A and B sides, and enable to share the inspection of one PCB.
(Normally A and B sides are used as surface and back.)

Limitation
1. When dividing a program into two programs, do not use the program which has Side B.
2. Group stamp can not be placed in Side B.
3. NewCellAid stamp or CellAid stamp will automatically be deleted when cells in Side A contains no inspection frame after dividing.
4. Stamps like Fiducials or barcode stamp are copied to Side B too, in order to retain Side B program to be as a complete program.
5. The technique of dividing a program is based on dividing stamps whether they belong to Side A or Side B. Therefore you may not decrease inspection time with PCB which same stamps are placed on many area. In such case, make cells into blocks instead of divide PCB into Side A and B, (Screen 1) (Screen 2)

Screen 1   Screen 2
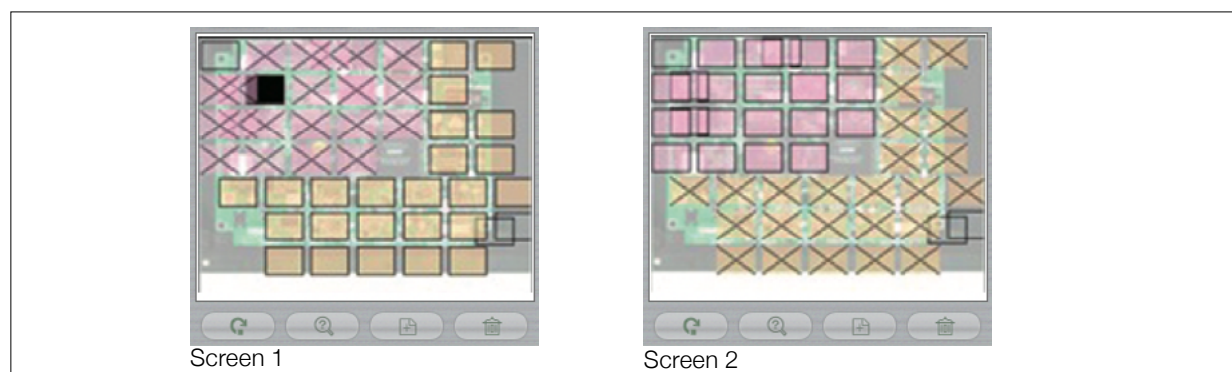
Tact Simulator Window (Screen 3)

1. Controller Panel

   NON: Simulate inspection time for the whole program

   A: Simulate inspection time for Side A program

   B: Simulate inspection time for Side B program

   　　　　　　 * After selecting radio button, press Appl. button

   Reset: Undo distribution of stamps (All stamps are back to Side A.)

2. Stamp List

   STAMP: All stamps are listed

   N: Total number of each stamp

   Tim: Time spent for inspecting the stamp in second

   A/B: Checked stamp does not exist on that Side.

   　　　　　　 * Child stamp in Pack stamp is not listed. Pack stamp is listed as one stamp.

   　　　　　　 * When check is on B, and then switch it on A, the check on B is automatically
   　　　　　　 　 unchecked. On the other hand, if A is checked and switched the check on B,
   　　　　　　 　 the check on A is not automatically unchecked.

3. Opens [Parameter settings of virtual machine] (Screen 4).

4. maximum speed (mm/sec)

   Maximum speed of movement. Enable to input from 100 to 1000.

5. accelerator (sec/max speed)

   Acceleration speed. Enable to input from 0.01 to 1.

6. others overhead (sec)

   Time spend except machine movement. It is mainly time spent for capturing images. Enable to input
   from 0 to 3. This is the most of time required when inspecting with real machine.

7. Reset the value to default.

8. Apply the change on each value, and write new value into ParaPreference file.

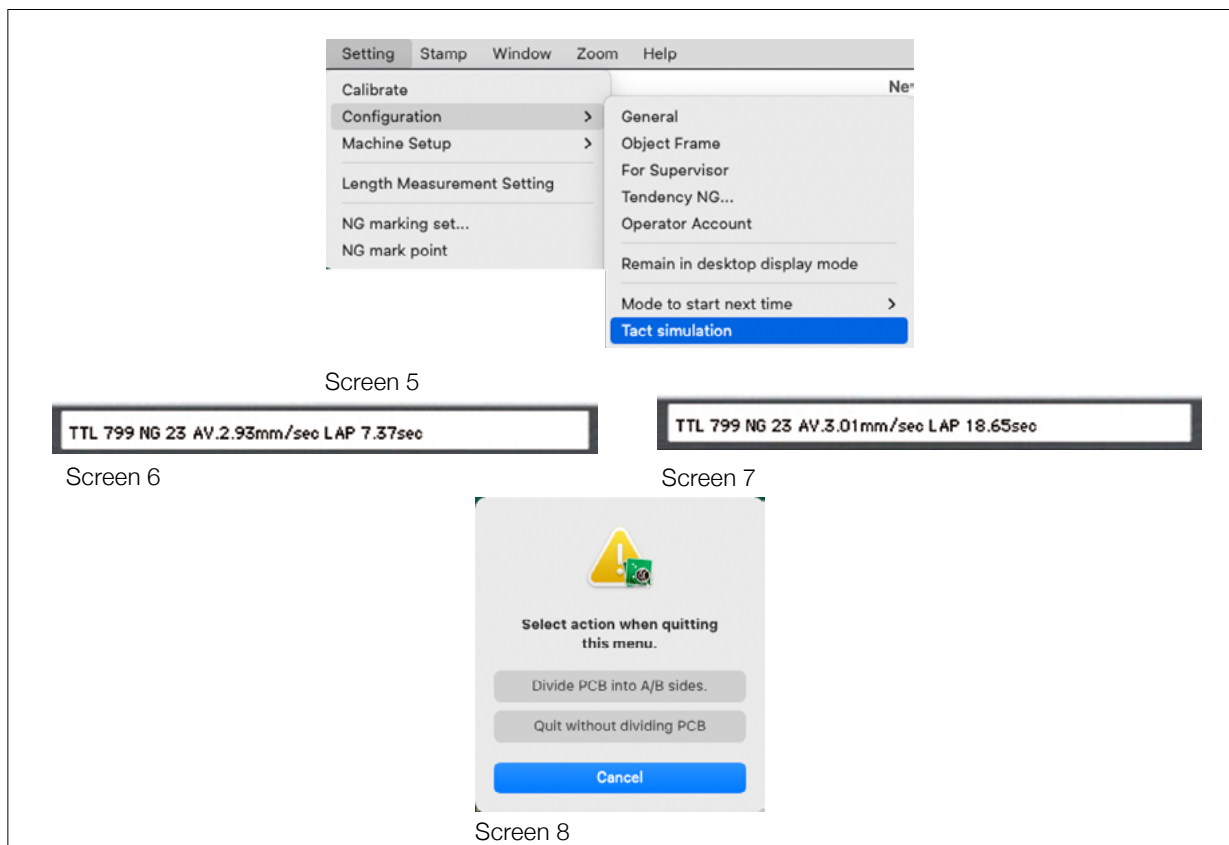Screen 3   Screen 4

23. Off-Line Teaching Software
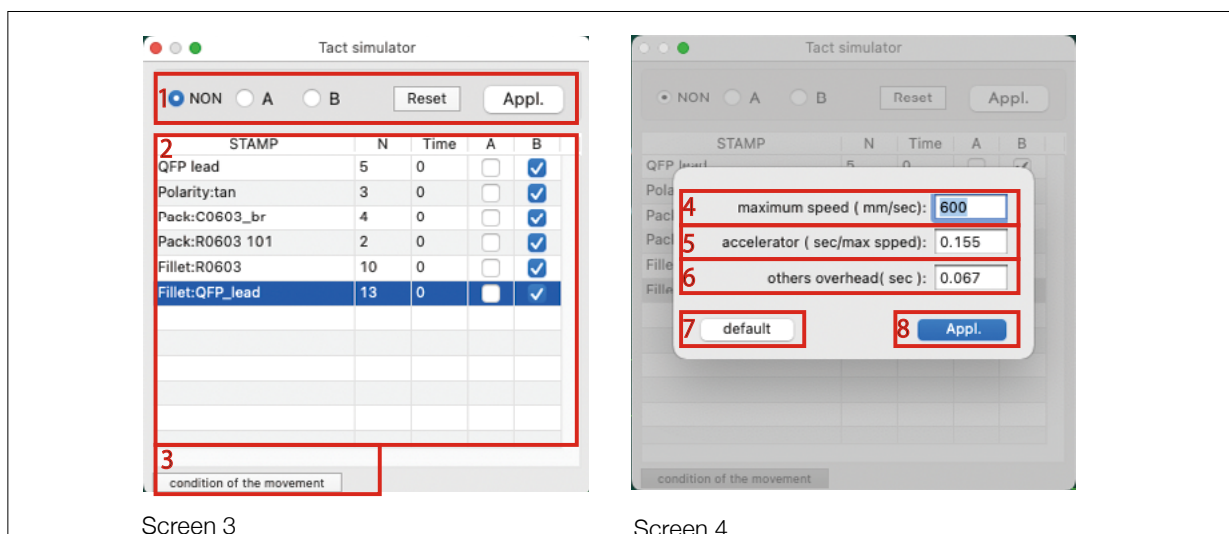
Work Flow for Simulating inspection time

1. Open an inspection program by OFF-Line Teaching Software.
2. Select **Tact simulation** from **Configuration** in **Settings** menu. (Screen 5)
   Tact simulator window opens.
3. Keep opening the window, start inspection. The inspection time displayed in the message bar will be
   very close to the inspection with real machine. (Screen 6 "Normal inspection time")
   (Screen 7 "Inspection time by Tact Simulator")

Work Flow for dividing inspection program

1. After simulation, divide stamps into Side A and Side B by referring time spent for inspecting each
   stamp.
2. Simulate Side A and Side B by switching A and B buttons on the Control Panel.
3. If the result does not match to your expectation, adjust stamps to which side they belong.
4. If the result matches to your expectation, quit the window by pressing red button on the top-left.
   Then, a dialogue pops up. (Screen 8). Selecting **Quit without dividing PCB** will just quit Tact
   Simulator. Selecting **Divide PCB into A/B sides** will divide the program into A and B sides. Selecting
   Cancel will be back to Tact Simulator window.
   * When dividing PCB into A/B sides, save the divided programs in new names. Otherwise, the
     original data will be replaced.
5. After dividing the program, use Side A program on one inspection machine, and use Side B program
   on the other inspection machine.

Screen 5

TTL 799 NG 23 AV.2.93mm/sec LAP 7.37sec

Screen 6

TTL 799 NG 23 AV.3.01mm/sec LAP 18.65sec

Screen 7

Select action when quitting
this menu.

Divide PCB into A/B sides.

Quit without dividing PCB

Cancel

Screen 8

24. Scanning barcode and Tracing PCB

You can scan the barcode on the PCB using the camera on the machine. The barcode scanned is attached to the inspection result. You can also use external barcode scanner to read barcode.

The inspection result can be output on roll paper printer, or sent to the optional Production Management software (Rc22x/CS-Center) via LAN. How to set and work is described in this chapter.

24-1 Scan barcode with AOI's camera

Paste special stamp onto the barcode on PCB. Barcode will be captured automatically during inspection.

▼ 24-1-1 Compatible Barcodes

Barcode must be smaller than Work Area (If it is larger than Work Area, AOI's camera can't scan.) Resolution is 0.1mm for any barcode. Maximum 256 characters can be handled. Below is the table to show the list of barcode enable to decode by AOI and by Production Management software CS-Center.

Decode-able barcode	By AOI	By Rc22X or CS-Center
QR Code (model 2)	√	√
Data Matrix (ECC200)	√	√
Code 39	√	√
Code 128	√	√
Interleaved 2 of 5	×	√
Micro QR Code	Δ (optional, charged)	Δ (optional, charged)

▼ 24-1-2 Setting Stamp for Barcode

1. Place the Special Stamp for scanning barcode such as **DataMatrix**.
2. Adjust the size to be slightly larger than the barcode, and press the **Re-inspection button**.
3. Once scanning is complete, the details will be displayed at the bottom of the screen. A "**read Error**" will be displayed if reading fails.
4. Double click the stamp's frame and open settings. Decide whether keeping inspection without barcode "Ignore" or inputting manually "Manual" when failing to scan barcode.

▼ 24-1-3 Adjustment

Adjust barcode stamp settings when a "**read Error**" is displayed. Double-click on the Inspection Frame to display the setting window. While adjusting setting, you can see changes in real-time. Press **Re-inspection button** when you get a clear image.

* Setting items differ depend on model.

- Color reduction will exclude checked color.

- Camera Special button (lamp icon) will enable to use Special lighting to read barcode.

- Negative will reverse black and white.

- Lighting Selection will enable to use other lighting than main light.

* Camera special settings and Lighting are exclusive. If both settings are set, only the last one selected will be applied.

- Erode is used when reading barcode printed with not enough ink. This emphasizes black color.

- Dilate is used when reading barcode printed with too much ink. Or to sharpen lines when Erode works too much.

- AutoBW judges the borderline of white and black, and converts to optimal image.

- Use search area when barcode sticker is not always pasted at the same place. Select frame by pressing Control key. You can set Search Area.

▼ 24-1-4 Use Barcode Stamp as parts number

You can use barcode as part number by activating "Use for parts number" function at setting window of Barcode Stamp (Screen 1). Possible to send the data to production management software not only as PCB serial code, but as part lot number.
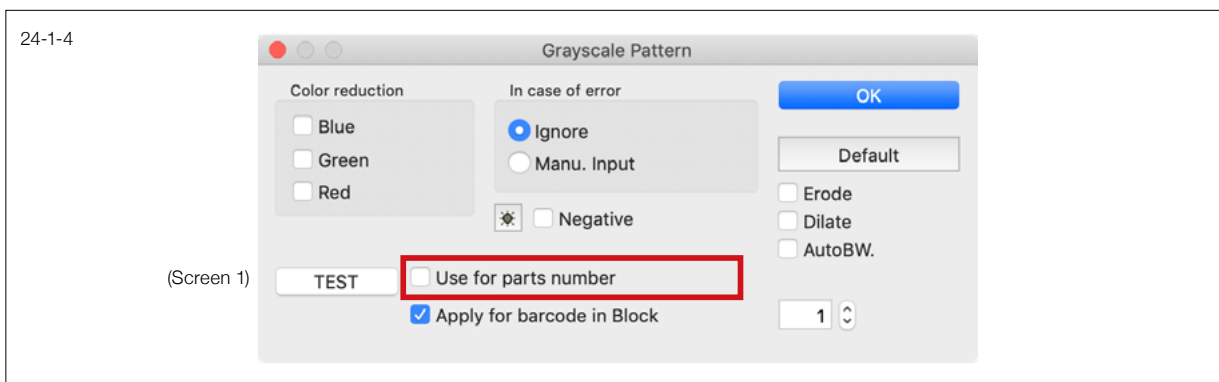
[2017..4.19 13:47:53]

Total PCBs checked[4] block<0>

Total NG PCBs [0] block<0>

Current result (check 0 NG 0/0) Spent time 3 (check2 2)[0/0/1]

BarNum (123456789)

plist 1,35700,30000,0,0,0,0,0,0,1920,1920,266

SYM	TTL	NG	NG_ID	_X	_Y...	_NOTE
	0	0	-	14444	13065...	(* *) ^BCD123456789^/BCD

{QRcode}

Read contents will be outputted between "^BCD" and "^/BCD" in "_NOTE".

▼ 24-1-5 Block assignment

Possible to assign Block number to Barcode Stamp from setting window. If you make Block with the Cell which contains Barcode Stamp, the inspection is executed by Block. Therefore inspection took time when Barcode and inspection frame in same Block were located far apart (Screen 1). Barcode inspection frame will be inspected before Blocked Cell with this function, so the tact time will improve compared to the status when disactivate the function.

How to setup

1. Create inspection frame for Barcode.

2. In setting window, put check mark and activate "Apply for barcode in Block". Set the Block number (Screen 2).

Operation

- If you activate the frame of Block number, minimum value is set automatically.

- Value is cleared when the check of "Apply for barcode in Block" is removed (deactivated the function).

(Screen 1)

(Screen 2)

24-1-5

barcode stamp	A	B	C	D	E
block number	1	2	3	5	unset

barcode name	A	B	C	D	E
block number	1	2	3	5	6

↓

↓

barcode stamp	A	B	C	D	E
block number	2	3	4	5	1

barcode name	A	B	C	D	E
block number	6	2	3	5	1

Example: Activate Block number of Barcode Stamp E, and set value "1". (Screen 3)

Example: Change Block number of Barcode Stamp E from "6" to "1". (Screen 4)

- Block number cannot be used together with another Barcode Stamp. If you set the duplicated value, operation will be following.

- If "Apply for barcode in Block" is not valid, put check, and set duplicated Block number. Duplicated Barcode Stamp and Block number of Barcode Stamp which has greater and consecutive value will increase by 1 (Screen 3).

- If "Apply for barcode in Block" is valid, adjust the duplicated Block number. Duplicated Barcode Stamp and Block number is exchanged (Screen 4).

- Block assignment function becomes invalid when assigning Block to Barcode Stamp which already assigned the Block.

- If you want to copy the Cell with Block assigned Barcode Stamp, open Copying window, and click "OK" with pressing [option] key. Block number is assigned automatically to the copied Barcode Stamp.

* If another Stamp is applied inside the same Cell with Barcode Stamp, copied Cell will become Block.

  When you copy the Cell, please operate with the Cell which only Barcode Stamp is located.

▼ 24-1-6 Barcode stamps in Pack

 The same kind of barcode stamps can be in Pack. The packed barcode stamps behave "If one of the barcode stamp can read, the Pack is judged OK".

Start inspection. The barcode stamps in Pack is decoded in voluntary order; decode the 1st stamp, if it is failed, decode the 2nd stamp and so on … until any stamp is successfully decoded. When one stamp is decoded, the rest of stamps are not decoded.

If all stamps fail to be decoded, it is result in Read Error. If any barcode in Pack is decoded successfully, the Pack is colored in blue and so is the decoded stamp, but the other stamps (failed to decode and not decoded) are colored in red.

- Only **barcode of same type** can be in a Pack. For example, QRcode and Datamatrix stamps can't be in a Pack. As same, the other kinds of stamps such as pattern matching or histogram can't be in a Pack together.

- The barcode stamps in Pack are in OR condition, therefore the **Matrix tab in Pack setting is not possible to change**.

- Barcode Pack frame is **not possible to rotate**.

- When any barcode stamp in Pack is decoded, the inspection of rest of barcode stamps is aborted. For this reason, the barcode stamps in Pack after inspection is **colored in red except the decoded one (colored in blue)**.

- Pack Master function not possible to use.

▼ 24-1-7 Read Error

When Manual Input is selected for error settings in this window, a Barcode Input dialog will be displayed for key input when reading fails. No barcode number will be input if you press Cancel

.

At this timing, if you press "STOP" button on AOI, inspection will be paused and you can move camera freely. This function is useful when barcode number is written out of the FoV. After confirming barcode number, press START button. While inspecting, the Barcode Input dialog will be displayed again.

* Settings -> General -> NG Re-inspect must be active

* If barcode is inspected at the end of all inspection frames, this doesn't function.

The same window will appear when you press the Space bar while waiting for barcode Data, and you can input the barcode number from your keyboard (Screen 1).

24-1-7

Barcode number manual input

Cancel   OK

(Screen 1)
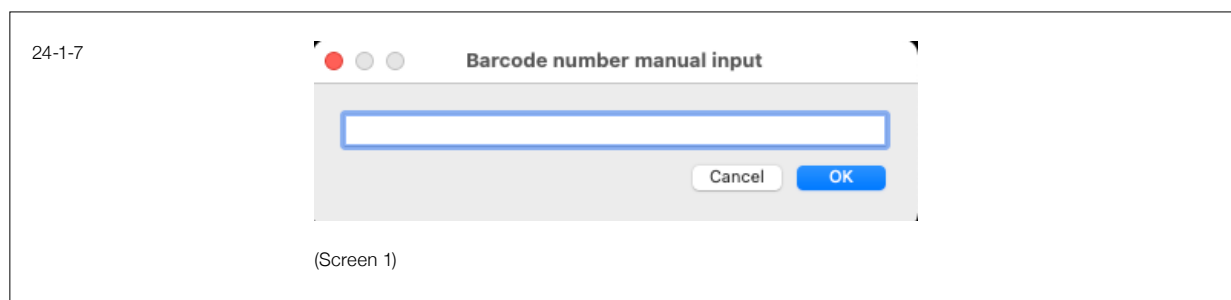
24-2 Scan Barcode with Handy Scanner, Open File by Barcode

By connecting a barcode scanner to Mac, the barcode on the PCB can be scanned. The barcode which is not possible to scan by AOI can be decoded by using external scanner. In addition, by using external scanner, you can memorize barcode number to the inspection program and call it by scanning barcode.

▼ 24-2-1 Connecting a Barcode Scanner

The barcode scanner should be connected by the USB or RS232C (Fig. 1).

When using USB, connect via a USB HUB that has a power supply due to high power consumption. Avoid connecting directly into USB port of PC.

When using the RS232C interface, Buffalo RS232C-USB converter (the recommended model) is required, and serial spec should be set for each barcode scanner. These settings can be made in **Setting for supervisor > Other > Barcode reader > Setup button** (Screen 2).

The barcode scanner can be used for **Open file** and/or **LAN output**. This can be selected in the **Other** Tab in **Setting for supervisor**.

•Open file… Assign the barcode to an inspection program, when scanning the barcode, the corresponding file will automatically open.

•LAN…… When the barcode is scanned, the barcode number is added to the inspection results and sent to the Rc22x.
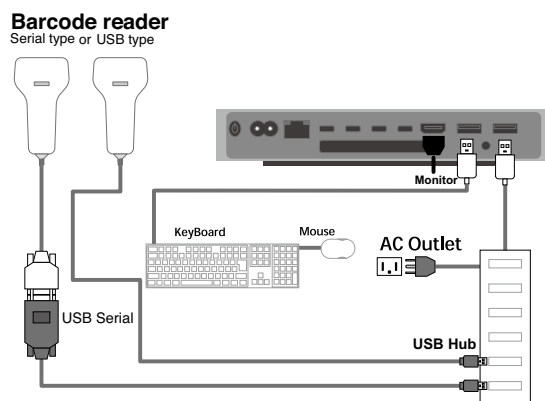

(Fig. 1)
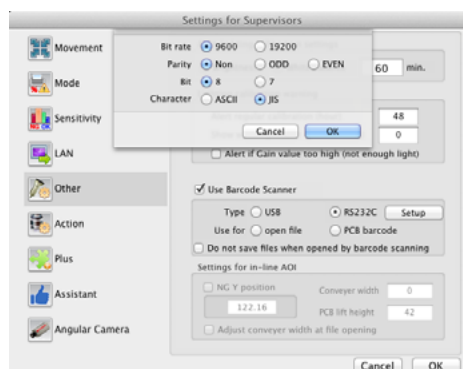
(Screen 2)

▼ 24-2-2 LAN (Identify PCB by barcode)

1. Select **Setting for supervisor > Other > Barcode Reader > LAN**.

2. Check **Setting for supervisor > LAN > Send result after reading bar code**. This will add the barcode number scanned by the barcode scanner to the inspection results and send it to the Rc22x after inspection (Screen 1). If **Send bar code before inspection** is checked, inspection start after reading barcode. This barcode number can be used as a reference number for matching the PCB and the inspected data when using repair software(Rep22x).

3. When the machine is in standby status, a standby message will flash. Standby will be aborted after 1 hour. If you wish to abort standby, click the **Stop button** on the screen, the **Stop button** on the machine, or press the **Esc key**. Key input can be enabled with the Space key.

▼ 24-2-3 Open file (Open inspection program by barcodes)

1. The **File** menu contains an item **Open recent file**, and the files used recently will be listed here. Usually, only the location of the file is linked to this file name.
   Check **Setting for supervisor > Other > Barcode Reader** and select **Open File**, and the barcode number will be linked to this list.

2. If a file containing a barcode number is opened after you make this setting, the file will be displayed in italics in the **Open recent file** (Screen 1).

3. When the barcode scanner scans a number, that number and the barcode numbers stored in the italicized files will be matched, and the corresponding file will open.

4. If no corresponding number is found for the number read by the barcode reader, a warning will be displayed. Please check the settings in the [Edit Recent files] screen (Screen 2).

5. By using optional "Do not save files when opened by barcode scanning", the file is opened by read-only mode and you will not be asked to save or not save file.

* By pressing START button in 60 seconds after reading barcode for switching the inspection program, the barcode is attached to the inspection result of the 1st PCB.

24-2-2

(Screen 1)

24-2-3
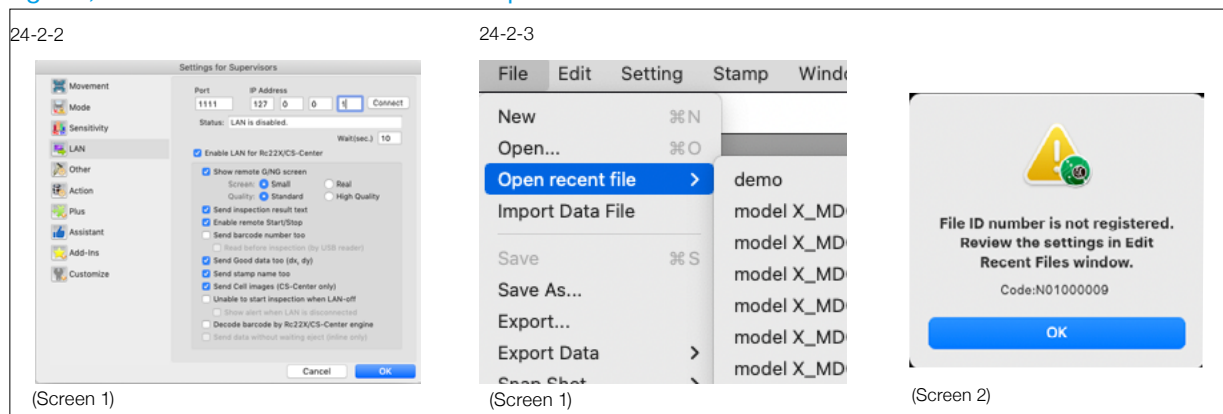
(Screen 1)

(Screen 2)

■ Edit Recent Files

When you select **Edit Recent Files** from the **Window** menu, a window to edit the barcode numbers, lot numbers and notes of recent files will be displayed (Screen 3). Click on the item name at the top, to sort files by item.

- Files that have been moved or deleted are displayed in red text. You can delete a file from the list by selecting it and clicking the "Delete" button or double-clicking NAME column. Multiple files can be deleted from the list simultaneously by selecting some files and clicking the [Delete] button.

- Barcodes can be edited in the **NUMBER** column. You can use the Wild character (*) here, wild card can replace more than one number, e.g. 123* will correspond to 123456 or 123789, but if you want to use wild card between numbers such as 123**7, you must use one wild card for one number.
- In version 4.9.9 and later, more than one barcode can be set by separating them with "," (comma). Input barcode number to "BARCODE" in the edit window.
  Example) a00001,b002,c00*

* Maximum number of text to set for barcode is 127 to prevent inspection of incorrect PCB. Comma is included in the number of text.

- To add **LOT** information, click on the cell in the **LOT** column. Up to 31 single-byte letters can be entered. Once the cell has been edited, select **LAN Window** from the **Window** menu and press **connect** to update the information.

* The recent files can store up to 9999 files. If the capacity is exceeded, older files will be deleted.

24-2-3

Count:	9 /9999			Delete	NOTE		
NAME	NUMBER	DATE/TIME	LOT	NOTE			
1151test		23/05/17					
210924test		23/05/17 14:17:51					
test		21/09/24					
P4-5804PK0		19/01/29					
P4-5804B4		19/01/29					
P4-5804PKB		19/01/29					
DJKdemo		19/01/24 17:23:11					
P2		18/12/11 18:06:44					
20181120_olt_499v_test3		18/11/20					

(Screen 3)
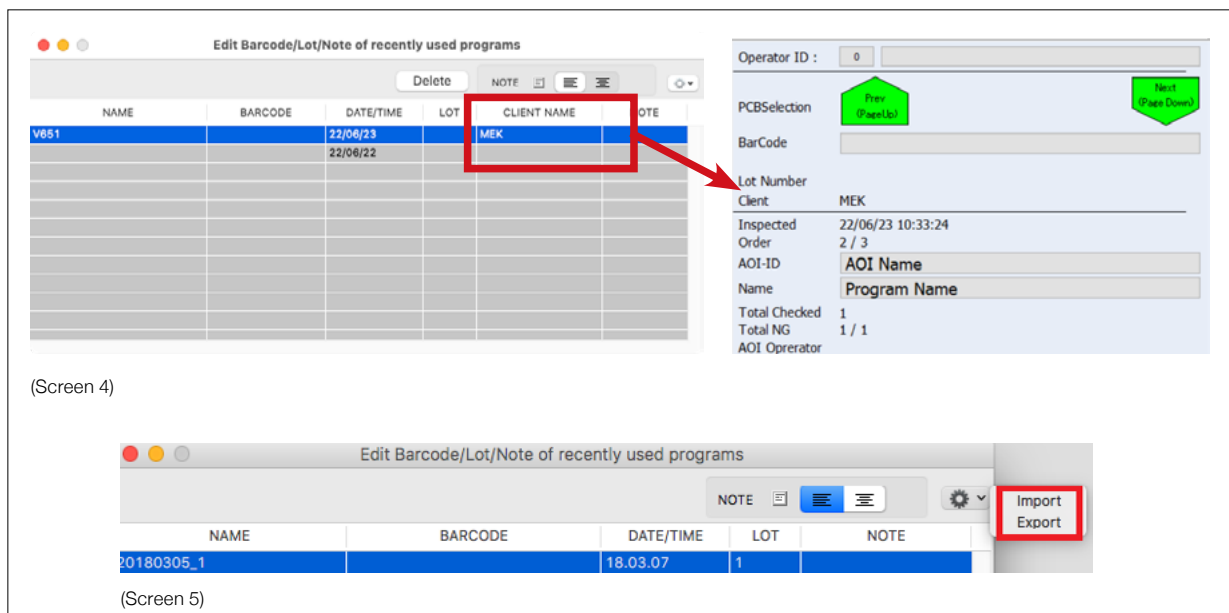
(Screen 4)

(Screen 5)

- [CLIENT] column is displayed when [Send client name] option is activated on [For Supervisor].

  The CLIENT name entered here is imported into CS-Repair.

- Possible to import/export the resent file list (Screen 5). Exported file is editable by text format.

  Information of each file is in order from file pass, NUMBER, date, LOT, NOTE, and output by a line. Each

  item is separated by Tab.

* Please use text editor or Excel for editing exported file.

24-3

(Screen 1)

(Screen 2)

(Screen 3)

(Screen 4)
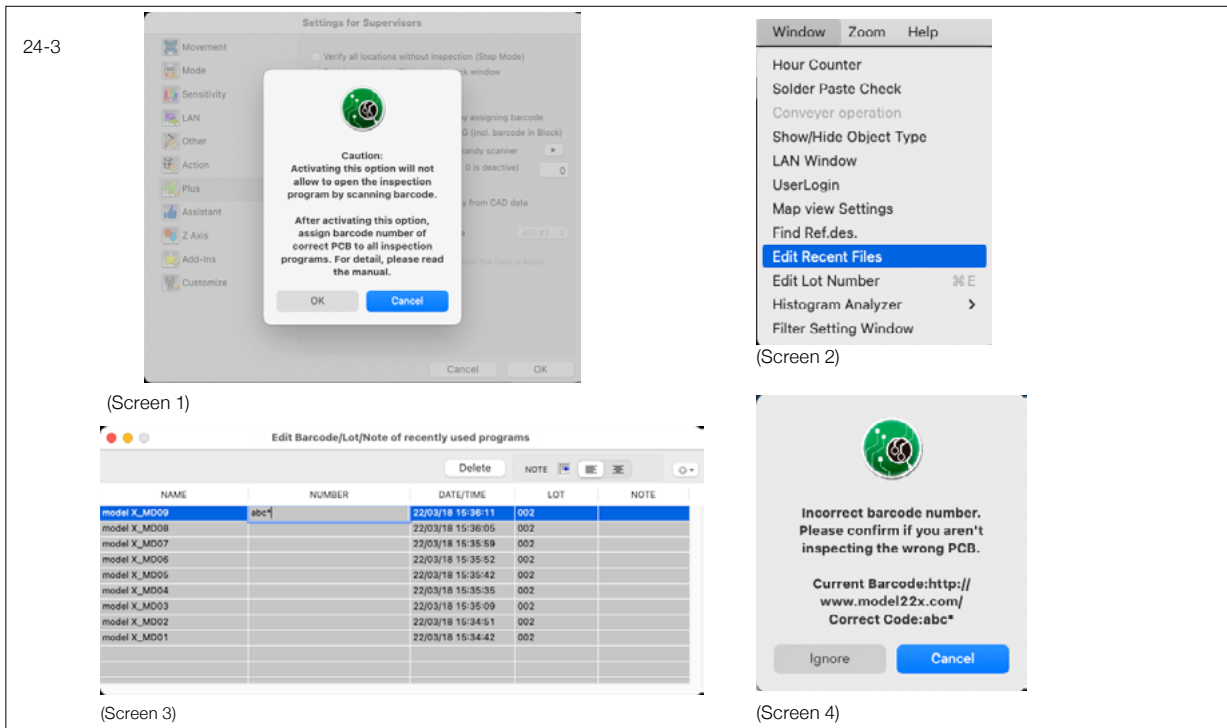
24-3 Prevent inspecting incorrect PCB by assigning barcode

In a factory, sometimes operator opens incorrect inspection program or inspects incorrect PCB. This option may prevent such human mistakes by using barcode on PCB.

* By activating this option, you can't use the function "Open File by barcode".

* Barcode in Block is not applicable.

▼ 24-3-1 How to use

1. Open **For Supervisors** menu from **Configuration** in **Settings** menu. Move to **Action** tab, check on " **Prevent inspecting incorrect PCB by assigning barcode**" (Screen 1)
2. A caution message will be displayed, click OK and activate this option.
3. Next step is assigning barcode to the inspection program. Open "**Edit Recent Files**" in Window menu (Screen 2).
4. Input barcode number in **BARCODE** field. For example, if your PCB has barcode such as abc001, abc002 ..., input abc*. (Screen 3)

▼ 24-3-2 Running

After changing PCB model, when the first PCB arrives to AOI, the barcode on PCB is scanned. If the barcode is other than the assigned numer, an error message will be displayed (Screen 4).

 * This also works in case using USB handy scanner.

24-4 Connect to Production Management Software

This chapter describes how to connect to Production Management Software CS-Center via LAN. Select **Setting for supervisor** from **Configuration** in the **Settings** menu and move to the **LAN** tab. Set the Port and IP Address to that of CS-Center, check **Enable LAN** for CS-Center, and check at least the following items. (Screen 1)

■ Show remote G/NG screen

■ Send inspection result text

■ Enable remote Start/Stop

If a LAN connection is enabled and CS-Center is activated, it will be connected automatically and the connection icon will be displayed next to Eyeglass button. When disconnected, the center of the icon will turn red. Click this icon to connect again.

* If you start 22x with LAN connect on, and if CS-Center is not started, 22x re-tries for 10 seconds, to terminate this connection, press Esc key.

Send barcode number too	Attach numbers from barcode to inspection result.
Read before inspection (by USB reader)	Inspection starts after reading barcode. * This option is only valid when using external barcode scanner to read barcode
Send Good data too (dx, dy)	When this is checked on, 22X sends not only NG data but also OK data to the management software. When checking up position shifting of components, check this on.
Send Stamp name too	Output inspection result includes stamp names too.
Send Cell images (CS-Center only)	This is an option for Catch System. If this is checked on, 22X sends Cell images, too. * When machine is not connected to CS-Center via LAN, this menu is inactive.
Send client name	Adds [CLIENT] column on [Edit Recent File].

24-4

(Screen 1)

24-5 Remarks

▼ 24-5-1 Send OK Data

■ Check **Setting for Supervisor > LAN > Results include OK data** to send OK data as well as NG data to the Rc22x/CS-Center.

■ When this setting is activated, the result data transferred to the Rc22x has shift information in the NOTES column in X/Y coordinates (mm).

> Ex: (-0.014 0.02)

The shift information is calculated from the Frame position to the inspection target. With wide tolerance frames that match even if they are imperfect, accurate misalignment figures cannot be obtained, and this should be used only as a guide. This data will be sent via LAN and be checked in the Rc22X.

* Since values cannot be obtained with Inspection Frames that do not use matching algorithms, the value will be (* *).

* In a package, the center misalignment of the pack master will be displayed. If there are no pack masters, the value will be (* *).

▼ 24-5-2 Limitations when using Rc22X/CS-Center

- When sending data to CS-Center, you must select G/NG Confirmation mode or NG Cell View. Otherwise NG pictures are not sent.

- When sending data from multiple AOI to CS-Center, do not use Auto Trace with bar check in G/NG Confirmation mode. Because in this mode, all NG pictures are sent simultaneously and the software can not operate these enormous pictures.

- When Esc/clear keys are pressed during verification in G/NG confirmation mode, log is output to Log22x.log, you can confirm from Console.

- On AOI with angular cameras, images from angular cameras are not sent to CS-Center if Auto Trace is active.

▼ 24-5-3 Cut LAN connection during data transmission

When sending data to optional software Rc22X or CS-Center, if you press STOP button before data transmission is completed, "Wait for the transmitting completion. Do you cut LAN?" message appears.

Data transmission is **not** cut even pressing OK button in the dialogue. This is because of preventing mis-operation by operators. If you must stop transmission immediately, press OK button with **option** key.

Note: Hints when data output is too slower than inspection

First treatment is to send machine inspection result without confirming by operator. It is very useful especially with in-line machine, because it can not be stopped. Later operator can confirm and classify inspection result on CS-Repair.

To set this, open **Map View Setting**, and check **Auto send for all NG** in G/NG Confirmation Mode. (For details, please refer chapter 13-8.) By the way, if you set Screen mode in Small and image Quality in Standard, the time may be reduced.
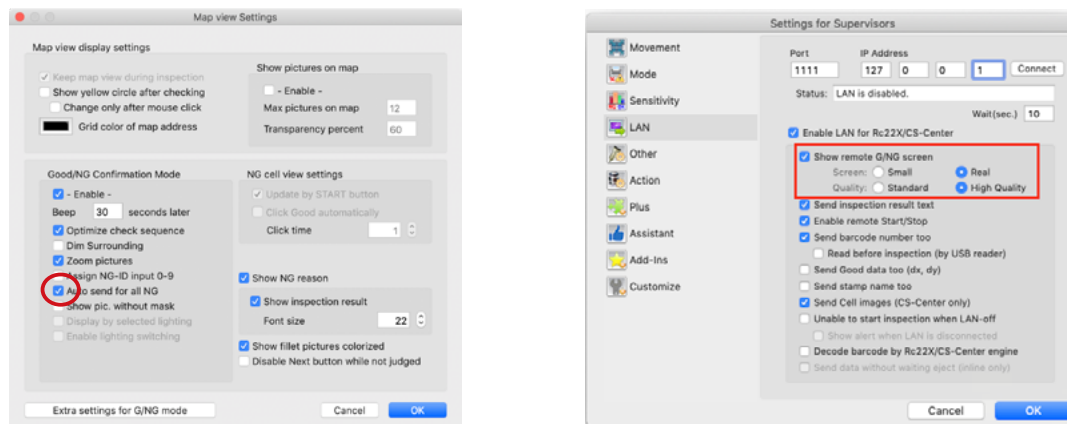
Faster mode is also available. As NG images are sent continuously. This mode may be useful when your network is high-speed.

To set this, open **Map View Setting**, and click **Auto send for all NG** twice in G/NG Confirmation Mode. The check mark turns into bar mark. The NG images transferred in this mode is. if there is empty space, colored in green.

This faster mode is only available when connecting with CatchSystem.

319
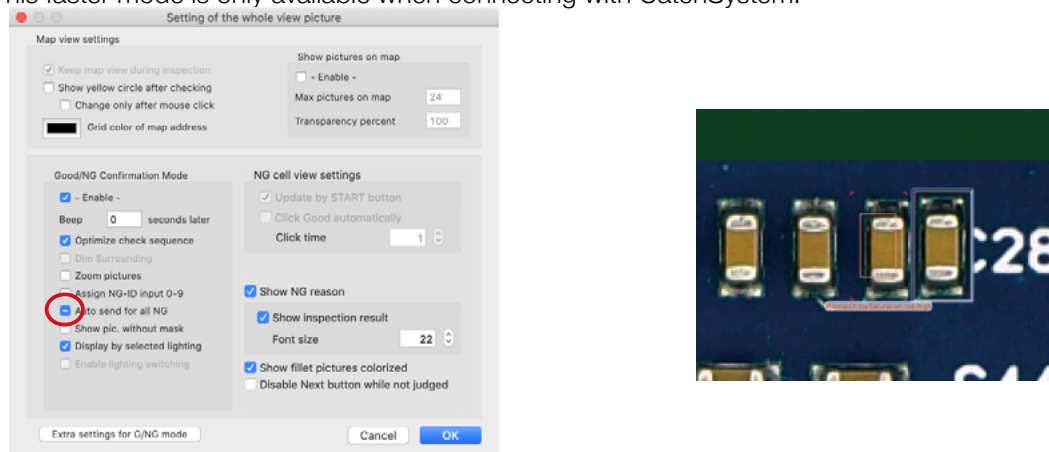
25. PC SetUp and Installation

The PC (Macintosh) must be set up properly before using AOI.

* Some items may have different names depending on the OS version, but their function is generally
  the same.

25-1 Accounts

Accounts are set up when starting up the PC for the first time. Set up your user name, computer name
and password. Be sure to remember the password since it will be needed when you install the software.

(Screen 1)
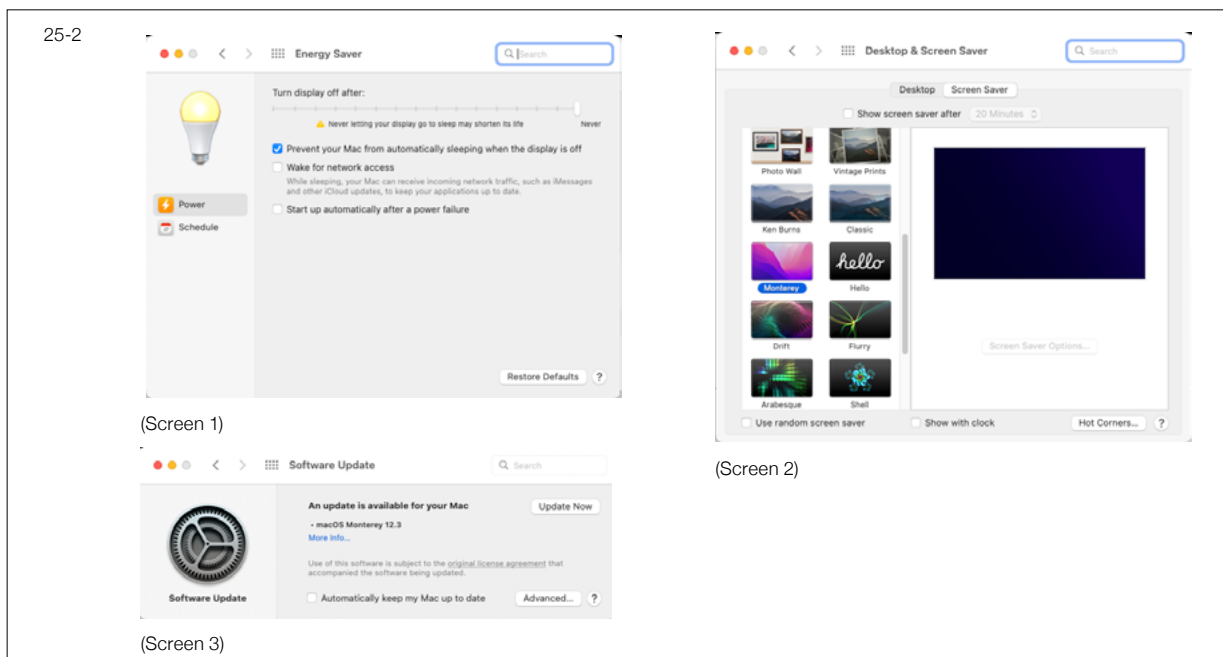
(Screen 2)

(Screen 3)

25-2 System Preferences

Set up the following items in system preferences.

• Energy Saver

Set **Never** for **Computer sleep** and **Display sleep**. Uncheck **Put the hard disks to sleep when possible** (Screen 1).

• Desktop & Screen Savor

Click on the **Screen Saver tab** and select **Never** from pull down (Screen 2).

If Screensaver is active, the connection between PC and AOI may be cut.

• Software Update

Uncheck **Automatically check for updates** (Screen 3).

• Keyboard

Aluminum keyboard (July 2007 on sale) has a check option "Use all F1, F2, etc. keys..."

If you do not check on this box, shortcut keys for 22x are not available.

• General

On Mac OS10.5, we recommend to change a font setting in Appearance of System Preference.

Change the value of "Turn off text smoothing for font sizes about 8. Without changing this,

there is no influence on software, but some small text is not smoothly displayed.

Prohibited

Never activate Screen Sharing or install 3rd party's screen share software. Screen sharing is heavy task as a result the synchronization of illumination and camera capturing will be incorrect.

(Screen 1)

(Screen 2)   (Screen 3)   (Screen 4)
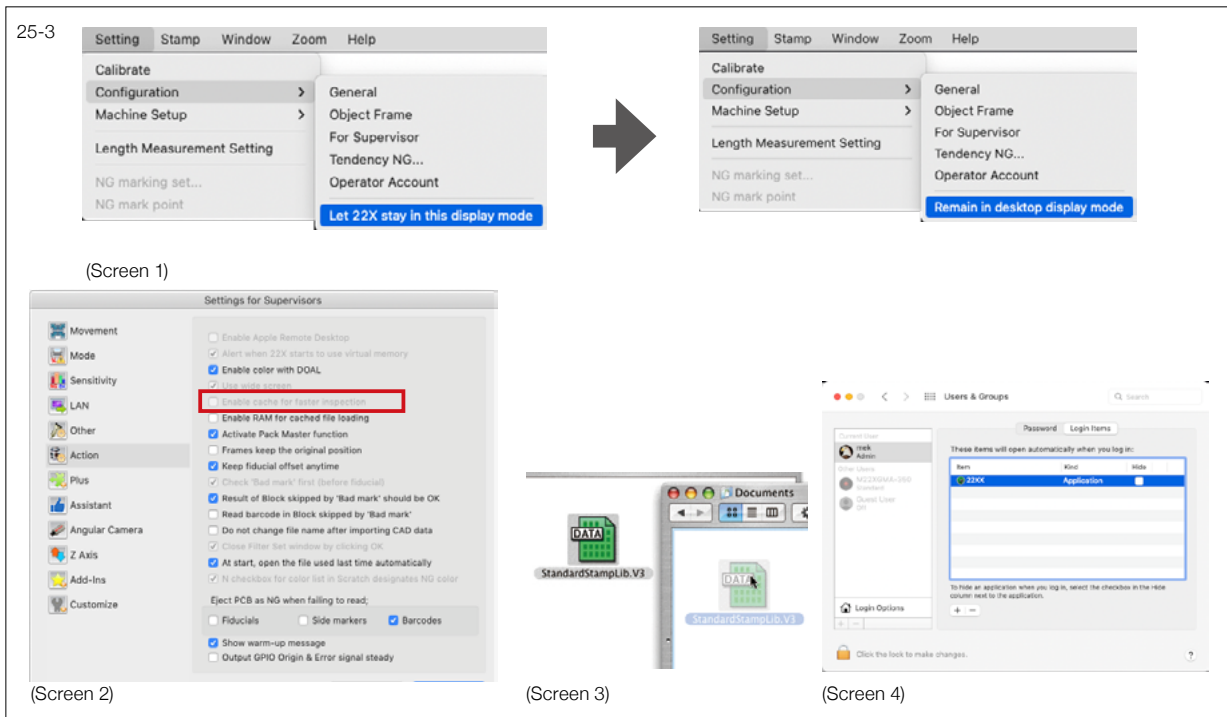
25-3 Software Installation

1. Double-click on **Installer-1(.pkg)** and follow the instructions (you will need the password that you setup in Accounts).

2. The PC will reboot and the installation will be complete.

3. When the software starts up, the screen size will automatically be optimized regardless of the System's Screen Resolution (screen size) settings. If you would like to use a different screen resolution, set the **Resolution in System Preferences > Displays** and then go to **Settings > Configuration > Let 22X stay in this display mode** in the software. This will link the current display mode to software startup, and the screen size will always change to this resolution at software startup. After saving this setting, the menu will change to the **Remain in desktop display mode** menu to remove the startup link. (Screen 1)

4. Select **Settings > Configuration > Settings for Supervisor > Other**. Confirm that **Enable cache** is selected here (Screen 2).

5. Copy the Stamp Library to the hard disk. Copy the library on the USB to User/ User name/ Documents for example (Screen 3).Feel free to copy this library to a location that is convenient for you, we are sure you will find the various stamps useful.

6. To automatically start this software on system startup, add 22X to Accounts > Login Items in System Preferences (Screen 4).

25-4 Connect Mac to LAN

Inspection programs are very important, confidential information for your company. Therefore AOI's operational PC should not be connect to open network like office LAN, which has connection with outside. You should create private network exclusive for AOI, Stamp Database or Management software Catch System.

How to make private network with fixed IP address is discribed in this chapter. For settings of Catch System, please refer to their instruction manual.

.

■ Equipments

- LAN cables for each Mac

- Switch Hub (if you dare connect to office LAN, this is not necessary)

- Each Mac should have ethernet board inside.

* LAN cable should be greater than category 5e for 1Gbps speed, straight cable. Less than category 5 is 100Mbps speed.

* Switch Hub can be called Ethernet Hub or just Hub. Select product for 1000Base-T or greater.

* Even LAN cable and Switch Hub is 1Gbps, Mac except Mac Pro (such as Power Mac G5, iMac) can have ethernet card for 100Base, then access speed will be decreased.

■ Setting 1 [Physical Connection]

1. Connect LAN cable to ethernet port on the rear panel of Mac. Mac Pro has 2 ports, connect to Ethernet 1 (Screen 1).
2. Connect the other side of LAN cable to Hub. Any port of Hub is fine. Setting is completed.

25-4
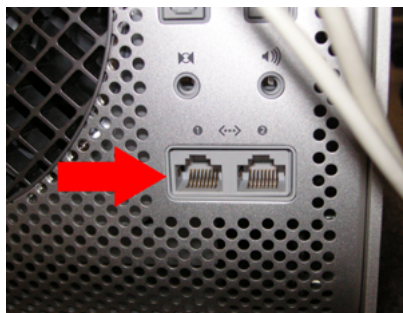
(Screen 1)

■ Setting 2 [Setting on Mac]

1. Open System Preferences (Screen 2), click Network (Screen 3).

2. Select Ethernet1 (Screen 4)

* If you log in by non administrator account, key on left bottom is locked. Input administrator password and release lock.

3. Change configuration to Manually, input 192.168.1.1 for **IP Address**, and 255.255.255.0 for **Subnet Mask** (Screen 4).

4. If your Mac has AirPort, turn it off.

5. Press **Apply** button, close System Preference window. Setting is done.

6. For another Mac, assign 2,3,4...for the last digit of IP Address (ex. 192.168.1.2). Subnetmask should be all the same, 255.255.255.0.

7. When connecting PC where stamp database or Rc22X/CS-Center is installed, assign IP address as same rule. IP address must be unique.

* If you dare connect Mac to office LAN, ask IP Address, subnetmask, router setting will differ, please ask administration. However, IP Address should be fixed address.

25-4

(Screen 2)

(Screen 3)

(Screen 4)

25. PC Settings and Installation
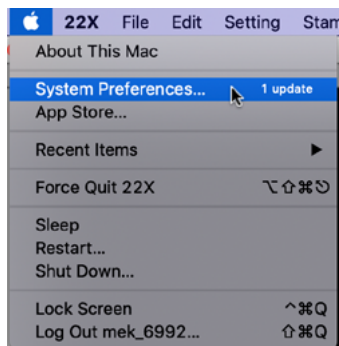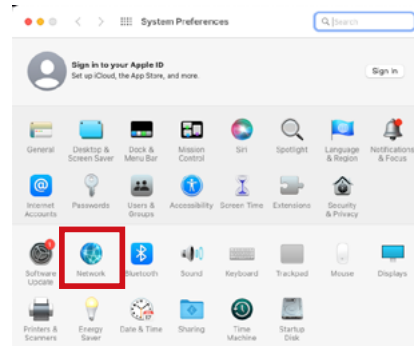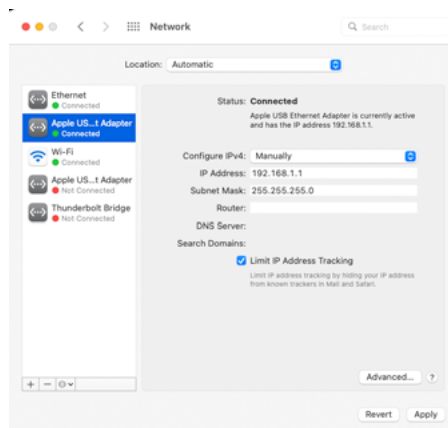
26. Initial Settings

Usually, these initial settings are already set by the suppliers, but if you are in need please refer each item.

26-1 Authorisation

Before setup, select **File > Authorisation > Supervisor mode**. This will give you access to all the functions of the machine and software (Screen 1).

* See chapter 3 Startup, Shut Down and Authorisation for details on the Authorisation Mode.

26-2 Lighting Stabilization and Warm-up

After the software has started up, a message **Waiting for illumination to stabilize** may appear. Illumination stabilization is not necessary for AOI with LED. During stabilization, a warm-up for the drive unit (heat run) can be executed. Warm-up operation will first set the Origin Position, then it moves around to the Fiducial Points in the 4 corners of the PCB carrier. After the heat run, the machine will confirm the Origin Position again and go to the Eject Position.

26-3 Camera Calibration

Calibration is an important task to set up a standard for the displayed image color. The calibration position

26-1

(Screen 1)

26-3-1

(Screen 1)
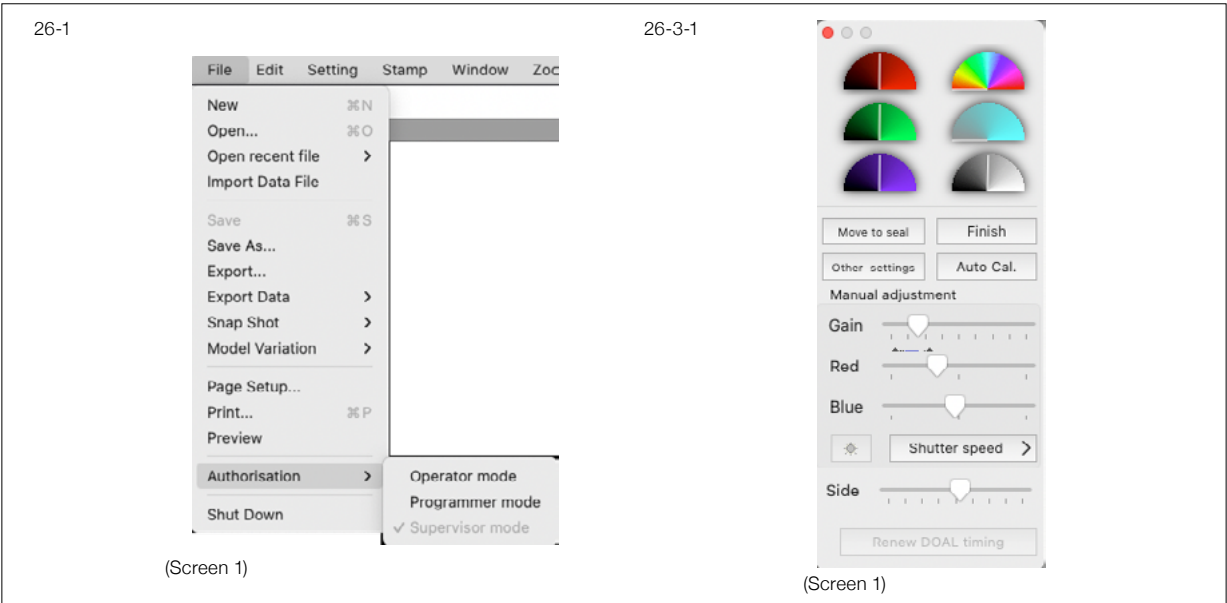
is not preset, so when using this device for the first time, you must set the calibration position.

▼ **26-3-1 Calibration Setting**

1. Select **Calibrate** from the **Settings menu**. Click **OK** when the message "**Move to calibration position?**" is displayed. A gray seal will be displayed on the screen, and the **Calibrate window** will be displayed (Screen 1).

2. Press the Auto Cal button to adjust the level.

3. If the meters for Red, Green, Blue and Brightness are pointing straight up and the saturation level is set to the far left (0), it does not matter what level the hue is set to.

4. On some types, calibration executed not only with standard lighting, also with Reduced Light.

5. Confirm that the manual adjustment Gain level is within the range of the arrow under the **Gain** slider bar.

6. Press Renew DOAL timing if your AOI has Diffuse-On-Axis LED.

7. Once adjustment is complete, press the **Auto Cal**. button and end the calibration adjustment process.

26-4 Mechanical Calibration

There is a plate attached for correcting position and compensate for distortion of the drive. By reading these 4 Fiducials on the plate, the physical position can be converted into a logical position.

Please confirm Mechanical Calibration after un-packing AOI or after moving place.

▼ **26-4-1 Confirming Mechanical Calibration**

Select **Settings > Machine Setup > Mechanical Calibration > Check**.

Make sure that each Fiducial is close to the center of the screen. If they are not in the center, execute "Update". Even they are not in the center, you need to create new Mechanical Calibration by reading the following chapter. After new Mechanical Calibration is created, the coordinates of inspection programs made in old Mechanical Calibration value will be shifted.

* In order to update (change) the Mechanical Calibration Value set here, hold down the **Option key** while selecting **Machine Setup > Mechanical Calibration > Update** to change the offset value.

▼ 26-4-2 Creating New Carrier Fiducial Marks

1. **Select Setting > Machine Setup >Mechanical Calibration > New**. A message window "Execute new mechanical calibration." will be displayed. Click OK.

2. Go to the top left Carrier Fiducial, and the Marker will be displayed in the Work area along with the center line. At the same time, the Marker Setup Bar will be displayed underneath the window.

3. Select the **Inspection Frame Tool** and select the Fiducial at a size roughly twice the size of the marker (Screen 1).

4. Binarise the Fiducial Mark to black and white. Use the **Black and White Adjustment Lever** in the Marker Setting window (displayed when you double-click on the border line of the Inspection Frame) to clearly distinguish the black and white inside the marker (Screen 2). Do not press the **Center Correction Button**.

5. Once Binarisation is complete, click on the **Start Inspection Button**. To stop inspection, press the **Stop Button**.

6. Follow the same procedure to adjust markers from top right --> bottom right to bottom left.

7. After all 4 corners have been adjusted, the Mechanical Calibration Value will be displayed. Click **OK**.

This Mechanical Calibration Value will be stored in the file and can be used for Mechanical Calibrations in the future.

26-4-2

(Screen 1)   (Screen 2)
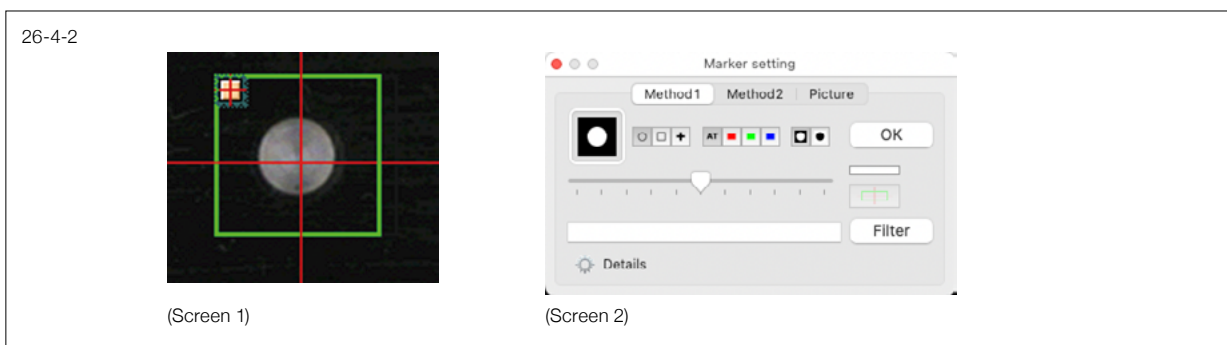
27. Stamp Database

This software has stamp library in each program file. This method is simple and easy because user does not need to have another stamp library file and manage it. However, if you want to use same stamps for all programs or to use stamps between different AOI, it will be efficient to use Stamp Database.

This database can be used in 2 styles. One is **alone style**: Use stamps for 1 AOI, install database in Mac which is controlling the AOI. The other is **share style**: Share stamps with multiple AOI, install database in Mac which is prepared exclusive for database, and every AOI access to it via LAN.

Before starting up database, you should first install "Database Management Software **DB22X**", while first set-up of DB22X, database is automatically installed. For installation and set-up of DB22X, refer to its Help Manual. This chapter only describes operations of **StampDB** which is a tool to access database on 22X.

27-1 Limitations

- OS should be greater than macOS 10.14, and 22X software should be greater than V6.0.0.
- Network should be 1000 Base eithernet connected via cables. Database response will be slower under 100 Base environment. Wireless network is not guaranteed.
- Due to the update of 22x operation software to V6.0.0, DB22X can be used with V3.0.0 or greater. Stamp you had been created and used with operation software V4.9.9 or older cannot be used with DB22X V3.0.0 or greater. File conversion work is necessary to apply the Stamp created by older software version to new version.

27-2 First Start-up

Start-up the DB after installation.

If you use database in **alone style**, StampDB automatically search and connect to database.

In **share style,** make connection to shared database by yourself as following;

1. Open StampDB by clicking **Stamp DB** on **Stamp** menu or **Folder Open** icon in the right bottom of **Stamp List** (Screen 1). A window "**StampDB**" opens, and message "**No DB is set, please set DB first**." is displayed (Screen 2).

2. Click OK, then click **Please set DB** and select **DB settings...** (Screen 3)

3. DB setting window opens. Press **Select...**button to set DB preference file (Screen 4). Select shared directory of Mac for DB, select **DB22X.plist** in user's public folder (Screen 5).

4. After proper DB preference file is set, database will be listed on Database List. Click OK to finish setup. From the next time, DB is connected automatically. If the auto connection does not work well, check **27-6 Troubleshooting**.

27-2

(Screen 1)　　　(Screen 2)　　　(Screen 3)

(Screen 4)　　　(Screen 5)

Status Symbols

Copy stamp in DB to 22X program	← (green)
Update stamp in 22X program by latest stamp in DB	⇐ (green hatched)
Add stamp in 22X program to DB	→ (red)
Update stamp in DB by latest stamp in 22X program	⇒ (red hatched)
Stamp not listing on current category, but existing in DB (Add this stamp to current category, and update stamps in DB.)	→ (gray)
Stamps in DB current category when pressing Home	●
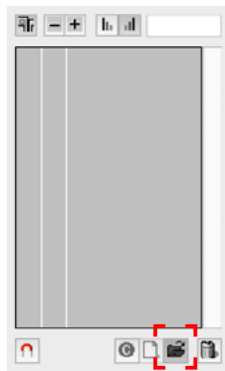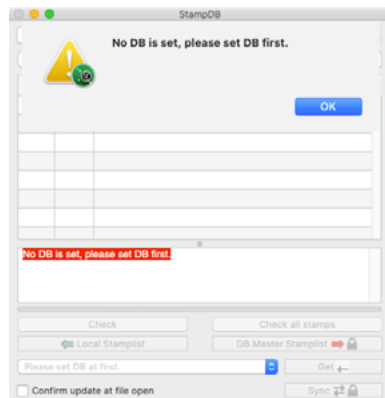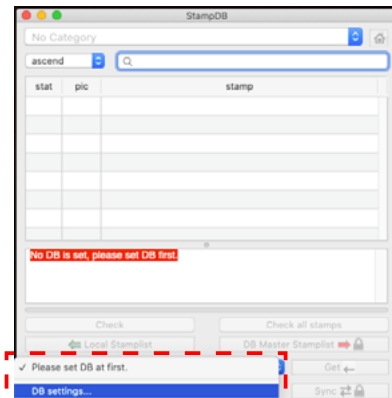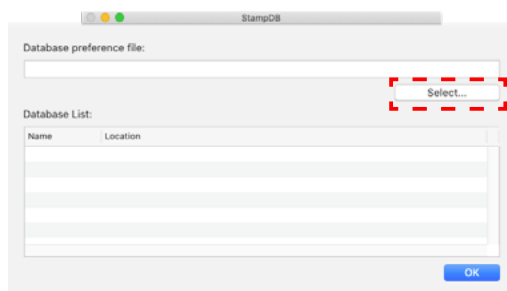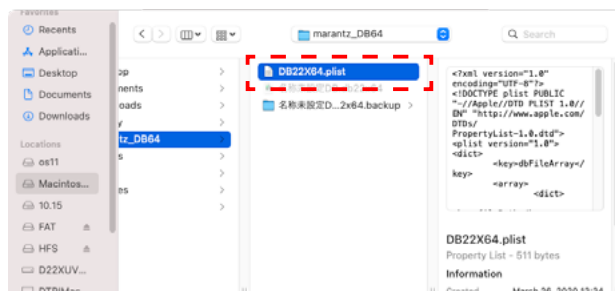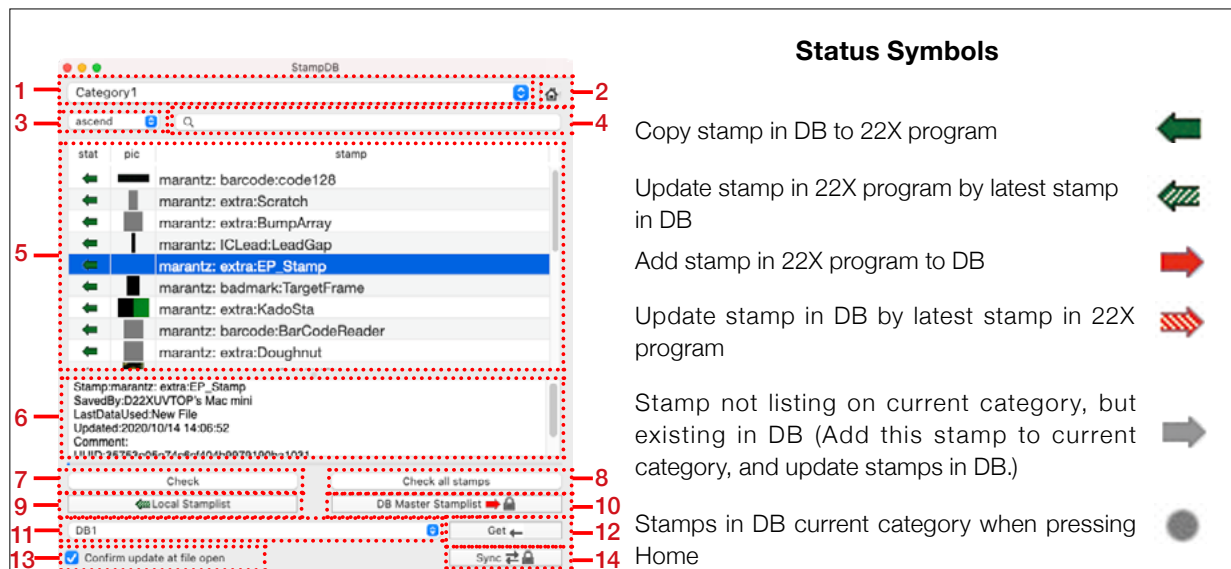
27-3 StampDB Interface

Here describes interface and functions of StampDB. The numbers below correspond to the image above.

1. Current **category**.

2. All stamps in current category is displayed by pressing this **Home** button.

3. Changes stamp list order: **Ascending**, **Descending**, **Pack Prior** or **Status** order.

4. **Search** stamp button in current category.

5. **Stamp list**. Displaying status, master picture and stamp name. Pack stamp is colored in purple.

6. Information navigator;

   Selecting 1 stamp: show information of the stamp, if Pack Stamp, configured stamps listed

   Selecting multiple stamps: show number of the selected stamps

   Operation result: show message after updating stamps, etc

7. **Check** button to compare stamps used in 22X program with stamps in DB.

8. **Check all stamps** button to compare all stamps in 22X program with stamps in DB.

9. **Copy** selected stamp(s) **from database to inspection program**.

10. **Copy** selected stamp(s) **from inspection program to database**. Writing is protected when the key icon is displyed. Click the icon and enter password to unlock.

11. Selects database.

12. **Get**s selected stamp(s) from DB and updates stamp(s) in the inspection program.

13. By checking this option, confirms stamp update while opening the file and save the changed item(s) automatically.

14. **Syncronize**s all stamps in the inspection program and DB. Writing is protected when the key icon is displyed. Click the icon and enter password to unlock.

* The inspection program is automatically saved when stamp(s) is saved/loaded by **Sync**, or saved by **DB Master stamplist**.

27-4 Work Flow

A general procedure is shown as sample.

```
Open program and StampDB
          ▼
     Compare stamps
          ▼
Update stamps in program (Get)
          ▼
Start programming and finish
          ▼
Update stamps in DB (syncronize)
          ▼
       Complete
```
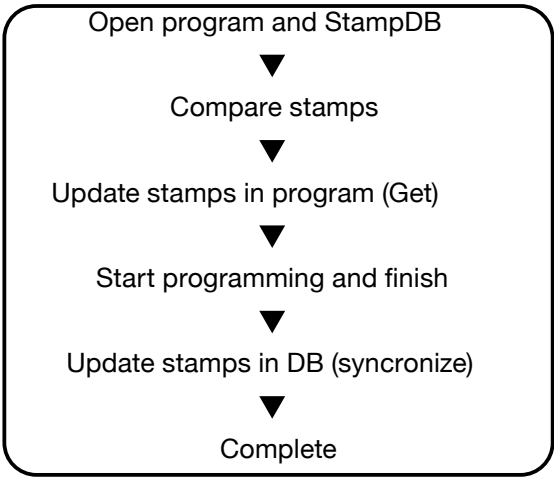
▼ 27-4-1 Open StampDB

Start 22X software and open an inspection program. Open DB from Stamp menu or right bottom of Stamp List (See Screen 1 of 27-2).

▼ 27-4-2 Compare stamps

Press **Check** button to compare stamps between the inspection program and database. In case you create new inspection program, click **Check all stamps**. You can load all stamps in cactegory.
After comparing, if there are updated (latest) stamps on database, a **green left arrow** is displayed on stat column (Screen 1). If there is no change between stamps in program and database, no stamp is displayed on list.

▼ 27-4-3 Update stamps in program (Get)

Update stamps. Select stamps and Press **Local Stamplist** button, or update all by **Get** button.

* While **confirm update at file open** is checked, stamp(s) on the inspection program and DB is automatically compared and changed stamp information are gotten after displaying a message (Screen 2).

27-4

(Screen 1)

▼ 27-4-4 Start programming and finish

Create or debug the inspection program.

▼ 27-4-5 Update stamps in DB (syncronize)

Press **Check** button and compare if any stamps in the program are changed. After comparing, a **red right arrow** is displayed on stat column (Screen 3). (If you are using DB in **share mode**, green left arrow may be displayed because other operators can be updating stamps while you are working.)

Press **DB Master Stamplist** button or **Sync** button and enter password to update DB (Screen 4).

* When you want to confirm if stamp is surely updated, press home button and display stamps in current category. Select any updated stamp and see information.

▼ 27-4-6 Complete

Save inspection program and exit 22X software.

27-4
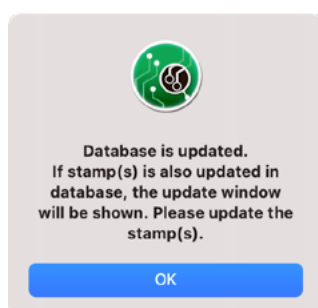
(Screen 2)
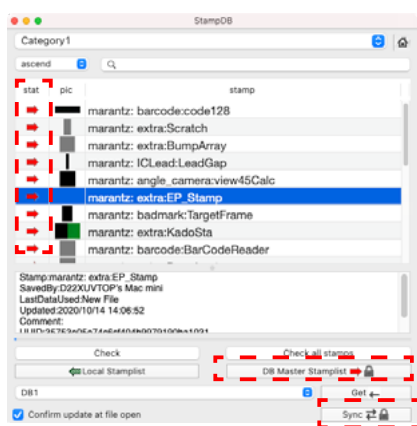
(Screen 3)
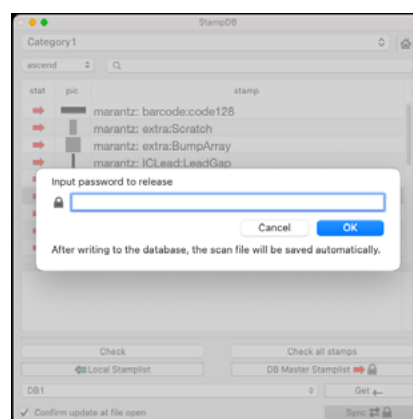
(Screen 4)

27-5 About Stamps and Protection

Stamps once saved in DB has unique ID (UUID), for the detail of UUID please refer to the instruction manual of DB22X Chapter 7-3.

On StampDB, user can handle Pack stamp without caring that it is Pack stamp. When updating or copying Pack stamp, just select Pack stamp, you do not need to care for stamps inside Pack stamp, because they automatically follows Pack stamp.

▼ 27-5-1 Stamps with same name

Because stamp is given an unique ID, you can add a stamp with same name on DB. However the category can not have stamps with same name. If you try to add, a dialogue to allow or not allow overwriting current stamp is displayed (Screen 1). Select which stamp to use, and click OK. Then the stamp to overwrite the other one is displayed on StampDB. (Screen 2) Press **Get**/**Sync** or **Local Stamplist**/**DB Master Stamplist** button to update (overwrite).
The sample screen is an example to overwrite the stamp in DB by the stamp in the inspection program.

On 22X software, if you load stamp with same name, a dialogue to select whether overwriting current stamp or not is always displayed. The dialogue is also displayed even the stamp has same unique ID in order for user to pay attention (Screen 3).

(Screen 1)

(Screen 2)

(Screen 3)

▼ 27-5-2 Database protection

Database is usually protected from writing. It is because of avoiding careless stamp update by operator in

share mode. To unlock protection, click Key icon and input password.

If you are using database in **alone mode** and you are the only operator to access database, check

Verify password only when first access on DB22X. If this is checked, after inputting password once,

protection is always released.

27-6 Network Troubleshooting

1. Network icon does not exist on left menu in Finder.

   Confirm Finder's Preference if Network is checked in Slidebar tab (Screen 1).

2. No PC is listed on SHARE menu.

   Confirm Finder's Preference if Connected Servers and Bonjour Computers are checked (Screen 2).

   Or network settings can be incorrect. Refer to DB22X manual, Appendix A, and confirm settings.

3. No PC is listed when clicking Network icon.

   Depending on network environment, it takes time to show network computers. Please wait for a

   while. If still nothing is shown, network settings can be incorrect. Refer to DB22X manual Appendix A,

   and confirm settings.

4. Logged in the Mac where DB is installed, however no volume is listed on Volume to mount.

   - Confirm if you surely log in by right account (not wrong account nor guest account).

   - Folder share setting can be incorrect. Refer to DB22X manual Appendix B and confirm share

     setting.

27-6
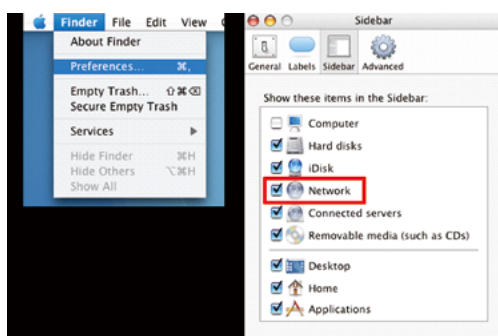
(Screen 1)   (Screen 2)
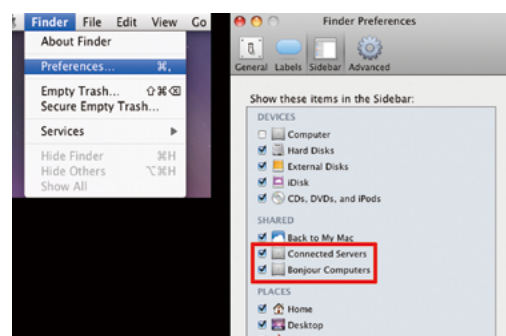
27. Stamp Database

5. When I try to update database, "Database is locked" message is shown.

   - In case of other operator is writing, wait for a while and try again.

   - If you are using database in share mode, and access to database from local StampDB, other

     network users can not write in database.

   - Guest user has no permission to write.

6. In share mode, when I open StampDB next time after first setup, StampDB can not

   automatically connect to DB.

   - Confirm if you can find Mac for DB in network. If you cannot find it, there is something wrong with

     network or network settings.

   - If you change PC name, DB can not be connected. In this case, set DB again by following 27-2-2.

   - Confirm if Mac for DB is powered on.

7. **Connect to Server** dialogue is always displayed when opening StampDB.

   If no password is set for the user account, the dialogue is displayed because Mac can not remember

   password in Keychain.

28. Angular Cameras (for Compatible Models)

Angular camera unit is for inspecting and viewing defective components from 8 angles each 45 degrees in 360 degrees. V22X and UV models are not supported. This chapter only describes the operation of Angular Camera. For setup, installation, or troubleshooting, please refer the Chapter "Angular Camera Unit" on the Hardware Manual.

28-1 Limitations

- Verification mode is available in G/NG confirmation mode and NG Cell View mode. On NG Cell View mode, some menus are unavailable.
- Power on AOI before PC. If PC is powered on at first, recognition of angular cameras may fail.

28-2 Settings Menu

There are settings for Angular Cameras in For Supervisors menu, **Angular Camera** tab (Screen 1).

■ **Enable angular cameras (require restarting)**

Activate / Deactivate angular cameras.

■ **Use angular camera screen for verification**

If you want to always verify with angular cameras, check this on. If this is not activated, operator verifies in normal G/NG confirmation mode view, and when the operator wants to check with angular cameras, he should switch the view manually by clicking mouse or pressing slash (/) key.

28-2
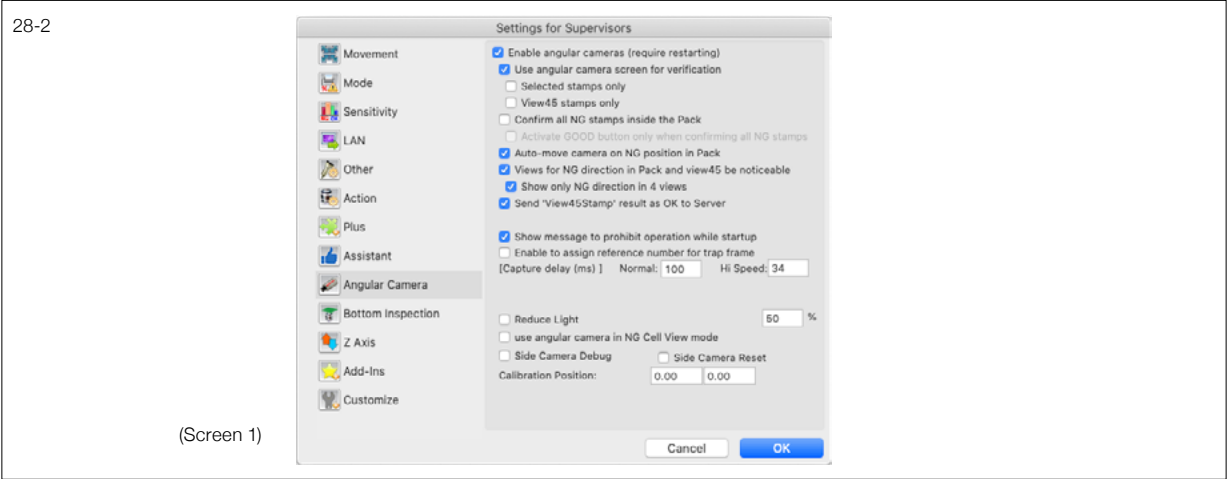
(Screen 1)

■ Selected stamps only

Normally angular camera screen is used for verification, however if this option is active, only selected stamp are displayed in angular camera view.

* By activating this option, automatically view45 stamps only option is activated also.

Stamps can be selected by following procedure. open Show/Hide Object Type window. Here you decide which ID should use angular camera view (Screen 2). Select the stamps you want to display in the angular camera screen by checking the checkbox in the [Show/Hide] window (Screen 2).

 * Beforehand, you need to assign ID to stamps. Please refer the manual chapter 8-10 to know how to assign ID to stamps.

* Angular camera view of view45 stamps are only sent to CS-Center. The other stamps verified after switching to angular camera view are also sent.

■ View45 stamps only

Normally angular camera screen is used for verification, however if this option is active, only View45Stamp and View45Calc stamp is displayed in angular camera view. Of course while verifying the other stamps, by pressing / or pressing screen switch button, the other stamps are also able to be confirmed by angular camera view.

* Angular camera view of view45 stamps are only sent to CS-Center. The other stamps verified after switching to angular camera view are also sent.

■ Auto-move camera on NG position in Pack

Check this on, if you want angular cameras to show the defect stamp in the center in case of pack stamp. For example, if there is a lifted lead detected in a QFP pack stamp, angular cameras show the lifted lead in the center (Screen 3).
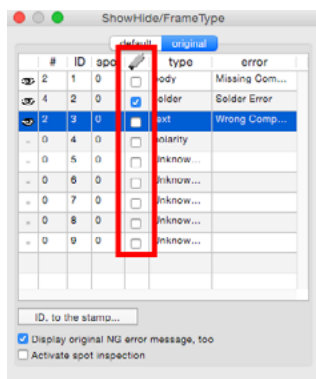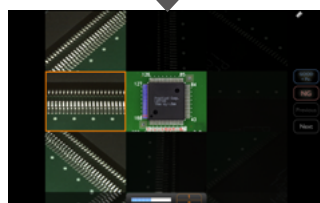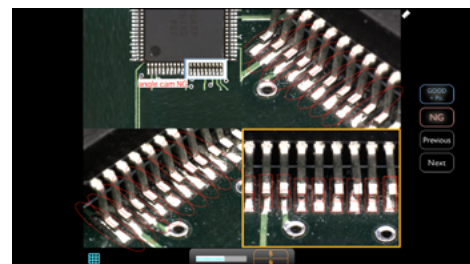
(Screen 2)

(Screen 3)

(Screen 4)

■ Views for NG direction in Pack be noticeable

If this option is checked, the views except NG direction are hidden on Pack Stamp. This effect is made for operators to find NG location as fast as possible (Screen 2 is the example, the 3 views on NG direction are shown, but the rest of 5 views are hidden).

* For the same display in CS-Center, please enable [Views for NG direction in Pack be noticeable] in [Settings] - [Side Camera] in CS-Center.

■ Show only NG direction in 4 views

Show NG area even bigger in 4 views. You can still switch to normal 9 views by pressing "view switching button" at the bottom left (Screen 4).

* If there are defects in multiple views, you can't switch to 4 views.

* For the same display in CS-Center, please enable [Show only NG direction in 4 views] in [Settings] - [Side Camera] in CS-Center.

■ Send 'View45Stamp' result as OK to Server

View45Stamp is an exclusive stamp for angular cameras. The stamp let the operator confirm the specified location with eyes by angular camera view.

When running AOI in auto tracing mode, operator does not verify PCB right after inspection, in stead all inspection results and NG pictures are sent to server, then after while, confirmed on Repair software with buffered PCB. Normally, the location where View45Stamp is pasted are sent to Server as NG.

However, if you check on "**Send 'View45Stamp' result as OK to Server**", the result is sent to Server as OK. If you pay attention on the production status such as RTY rate, please check this option on.

■ Show message to prohibit operation while startup

Show full screen startup message.

■ Enable to assign reference number for trap frame

This option is assigning reference number to trap frame for tracing. The reference number is attached to inspection result and sent to our optional production management software. The number is added from setting window on view45calc stamp trap frame. On CS-Center, ID information is added on CYM column.

* By activating this option, there are multiple results for one reference designator. This influences the statistics on the management software.

■ Capture delay(ms)

Set the display time for image for auto trace with G/NG confirmation by angular camra. Initial value is 100.

If the image of angular camera is blurred with G/NG confirmation, you can adjust by setting greater value.

■ Reduce Light

If this value is changed and then the lighting is suppressed in the General Settings under [Reduce/En-hance Light], the illumination will dim according to the changed value. Due to hardware limitations, the value when the illuminance is brightened cannot be changed.

■ use angular camera in NG Cell View mode

Switching main screen and angular camera screen is enabled on NG Cell View mode by pressing slash key or clicking angular camera icon. Under NG Cell View mode, some menus are grayed out on **For Supervisor** and **Map View** settings.

■ Side Camera Debug

Image of NG result is displayed in the window of View45Calc Stamp when we want to debug false NG point with View45Calc Stamp after inspection. You can switch the screen to current image by clicking lower left button in the window, so you can check the latest image (Screen 5). Icon will be displayed at Message Bar in Main Window when this function is activated (Screen 6).

* Inspection image is deleted when you clear the inspection result with pressing "STOP" button.

28-2

(Screen 5)

(Screen 6)

(Screen 7)

(Screen 8)
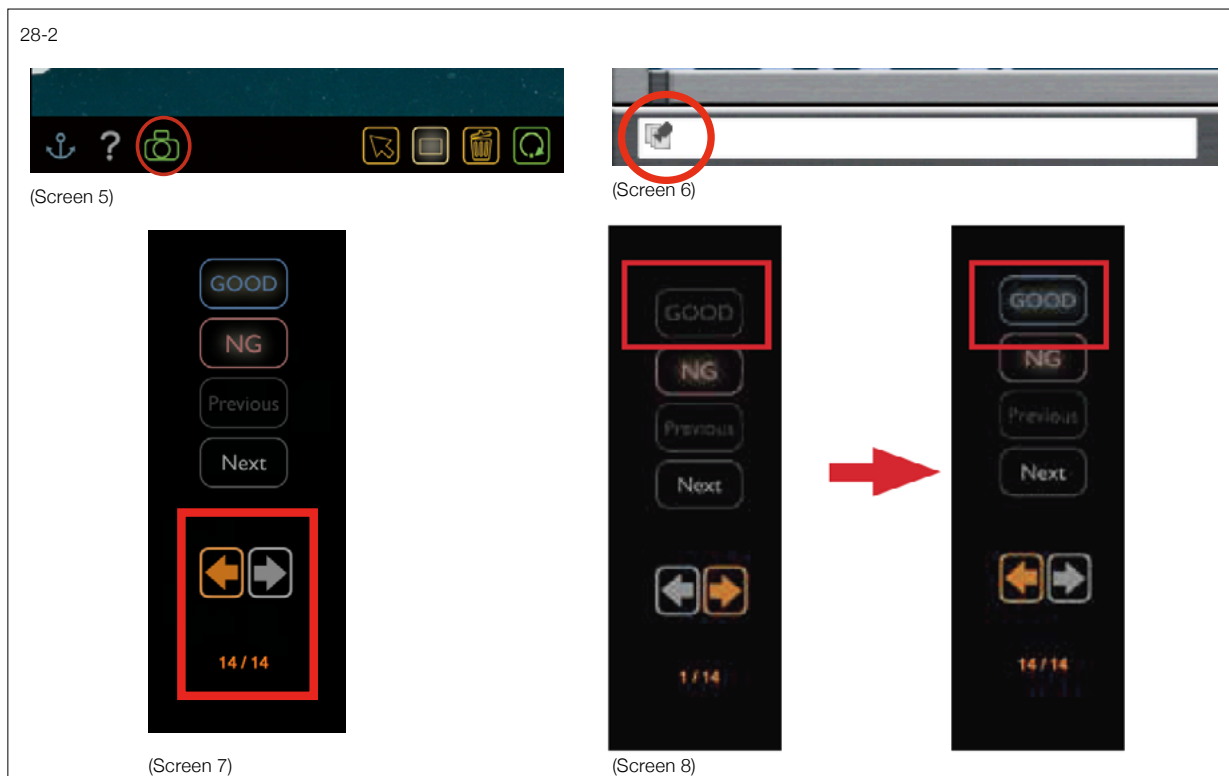
■ Confirm all NG stamps inside the Pack

If there are several NG in Pack, you can check each NG point by angular camera in G/NG confirmation. Right and left arrow is displayed under the GOOD/NG button in the right side of angular camera window. You can move to other NG point by clicking arrows (Screen7). Numbers shown below arrow buttons are NG number and quantity inside the Pack. Display order of NG points in Pack will be order of Pack Stamp which had been judged as NG first.

Regardless of displayed NG position, point moves to another NG point by clicking GOOD/NG or Next/ Prev button. It is not possible to judge GOOD/NG for individual NG points inside the Pack.

* Camera displays NG position of short and fillet for ICLead Stamp.

* Possible to display NG points inside the Pack with Auto trace mode, and send the result to Catch System. Also remote control operation with CS-Center is possible.

* Function is available with following version for CS-Center and Cs-Repair.

    - CS-Center: Version 1.2.2.9 or greater

    - CS-Repair: Version 1.2.2.6 or greater

■ Activate GOOD button only when confirming all NG stamps

If you activate this function, you cannot click GOOD button until you confirm all NG's inside the Pack. GOOD button is activated only when confirming all NG with right and left arrow displayed under the GOOD/NG button in the right side of angular camera window (Screen 8).

* You need to activate "Confirm all NG stamps inside the Pack" to select this function.

Below menu is only shown with Angular Cameras for U22X Series.
■ Information

Show information of Angular Cameras, and enable to save the information file on desktop for investigation when trouble occurs.

■ Angular Camera Settings

Menu to confirm and re-position angular cameras. Settings menu will not be used unless trouble happens. Please refer Error and Troubleshooting in Angular Camera Unit for U22X Series manual.

■ Enable Histogram Inspection

Show editing window for F series will be displayed in place of existent pattern matching window. Please read next chapter 28-3 for usage.

(Screen 1)

(Screen 2)

Frame Creation Tool
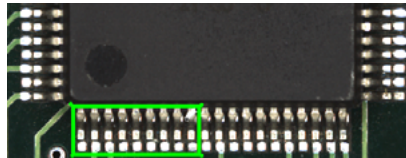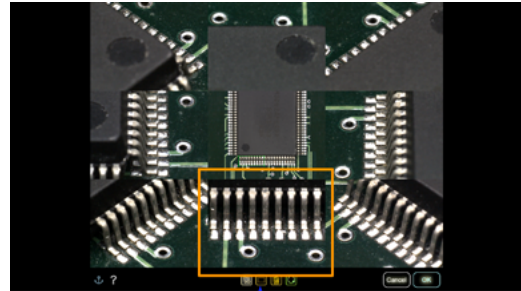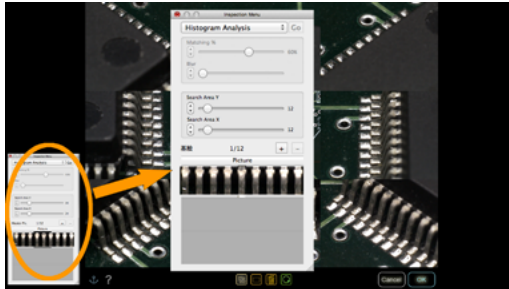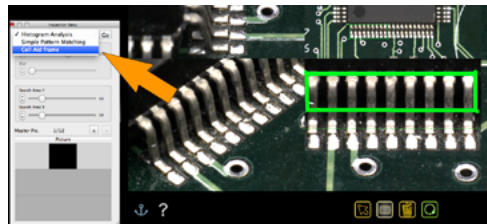
(Screen 3)

(Screen 4)

28-3 Creating Inspection Programs [for 22X F Series]

There is a special stamp named "View45Calc" for inspecting by angular cameras. The inspection method is simple pattern matching and histogram analysis. By simple pattern matchig, first check the matching of whole image (tolerant), if passed, image is inspected in detail (less tolerant). Histogram analysis is the same analysis process as original.

Here is the example workflow to create a program to detect QFP lifted lead.

▼ Load view45Calc stamp

Load View45Calc stamp. Place the stamp where you want to inspect by angular cameras (Screen 1). The stamp may possible to resize, however resizing stamp size does not change the view size to be captured by angular cameras.

▼ Setting view45Calc stamp

1. By double-clicking the frame of View45Stamp, the angular camera screen opens (Screen 2). Look at 8 views, and examine on which view you can see the lead the best. Here we use the bottom center view where leads are seen from front.

2. At first, we recommend to place a frame for compansating the position shifting because angular cameras are very high resolution, a slight position shifting may influence to inspection. Draw a frame on a object which color is distinguishable to surrounding area. Here we draw a frame on

the lead leg. Select frame creation tool at bottom and draw a frame. Inspection menu window will open (Screen 3).

3. Select Cell Aid Frame from pull down menu (Screen 4). Frame color changes from green into purple. This frame is now for position offset.

4. Next, draw a frame where you want to inspect. Here we like to detect the lifting lead, as a first step draw a frame on one of the leg. Because lead joint is solder, select Histogram Analysis. Press Go button or double click the frame. Histogram Analysis window opens (Screen 5).

5. Create trap frames and complete the histogram analysis settings (for the detail of Histogram Analysis, please read the Chapter about Histogram Analysis Method.)

6. Copy the histogram frame to the other legs by pressing option key and dragging (Screen 6). The copied frames have same settings as original, and have same number.

* If you resize the copy frame, the frame will be re-numbered.
* Copy to the different view is not possible.

7. Close the window by pressing OK.

8. Paste to all the legs of QFP.

28-3
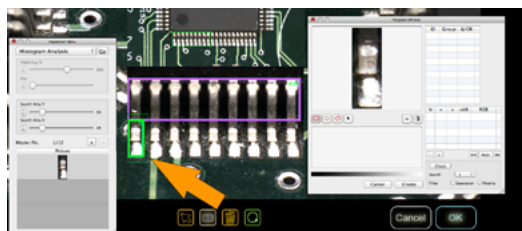
(Screen 5)
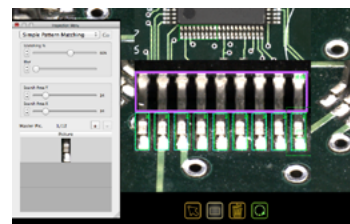
(Screen 6)
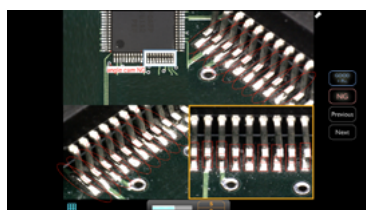
(Screen 7)

9. Start inspection. When lifted lead is detected, show in angular camera view while verification (Screen 7).

▼ Tune-Up and Adjustment

View45Calc stamp for angular camera inspection does not show the inspection result by pressing Re-inspect or Analyze button in Cell Map Area. To confirm the criterion, press Start button and inspect whole PCB or press Re-inspect button in angular camera view.

▼ Window

1. Release Anchor   When there is Cell Aid frame, the frame position is with offset. By pressing this anchor icon, the offset is released.

2. Help   Explainign operation keys possible to use in these views

3. Selection Tool   Select frame. Selected frame opens/shows settings window.

4. Frame Creation Tool Specify the area to be inspected by angular camera by creating trap frames. After creation, settings window opens and can adjust settings.

4. Delete   Delete frames. Also possible to delete frames by **delete** key.

5. Re-inspect Button Re-inspect all frames.

▼ Inspection Menu

1. Inspection Selection   Selection from Simple Pattern Matching, Histogram Analysis or Cell Aid

28-3

① Release Anchor
② Help
③ Selection Tool
④ Frame Creation
⑤ Delete
⑥ Re-inspect

Frame. Press Go button for Histogram Analysis to open Histogram setting window.

2. Matching Blur Level   Set matching level of selected trap frame. Default level is 60% matching.

3. Search Area   Searching area for selected trap frame in pixels. Set to X or Y direction by sliding levers. Area is shown by dotted line around trap frame. Default size is 1/2 of short side of width or length.

4. Add/Delete Picture   Add (+) or Delete (-) master picture. Master picture can be added maximum 12.

5. Number   Assign ID to trap frame. (when Enable to assign reference number is active.)

▼ Inspection Method

There are 3 inspection method available.

Histogram Analysis:

Major method for inspection. Setting and creterion is the same as normal histogram analysis by top camera. However some functions are missing such as sampling debugging.

Simple Pattern Matching:

Simplified pattern matching method.

Cell Aid Frame:

This frame is not for inspection. This frame is for compensating position shifting. Placing a Cell Aid Frame in one of the 8 views, offset is common in all 8 views. When more than one view has Cell Aid Frame in its view, the offset is applied to individual view.

(Screen 1)

Select draw tool
by clicking

Create trap frame by mouse   Duplicate with option key

(Screen 2)
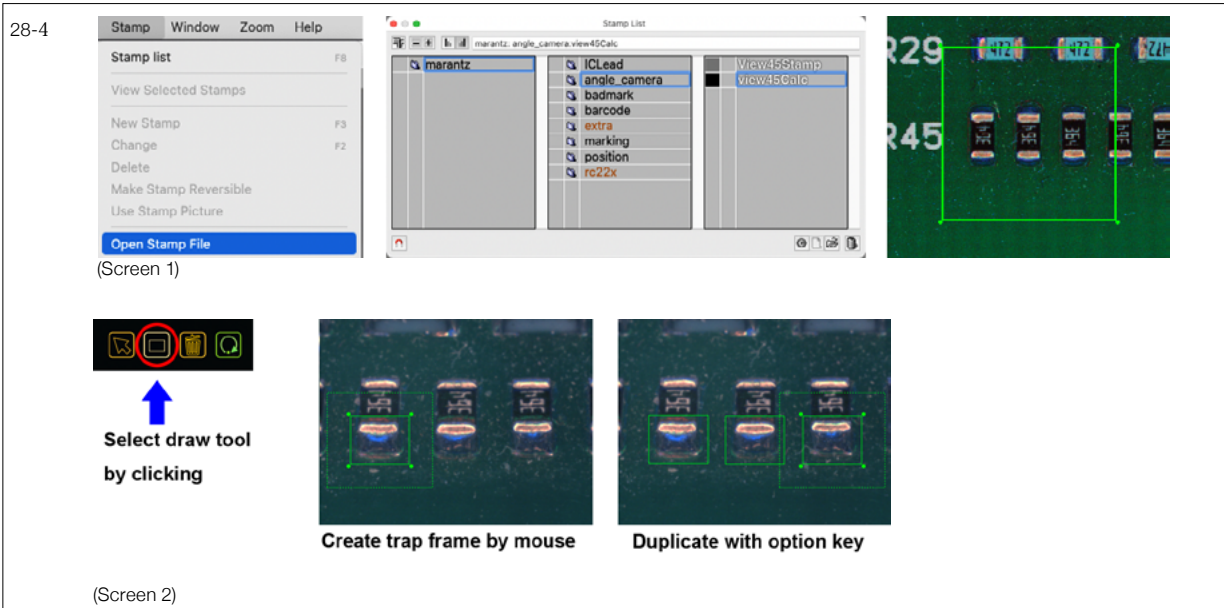
28-4 Creating Inspection Programs [for 22X U Series]

There is a special stamp named "View45Calc" for inspecting by angular cameras. The inspection method is matching. First check the matching of whole image (tolerant), if passed, image is inspected in detail (less tolerant).

▼ **How to use**

   1. Load View45Calc stamp

   2. Place the stamp where you want to inspect by angular cameras (Screen 1).

* The stamp's default size is same as the size to be seen by Angular Camera (8 angular camera's FoV is smaller than 22X main camera). By resizing the stamp size, the FoV by angular camera does not change.

* This stamp can't be included in Pack Stamp.

▼ **Data Creation**

By double-clicking the frame of View45Stamp, the angular camera screen with drawing tools opens Create frames by drawing tools. You can draw many frames. Dragging mouse by pressing **option** key, you can copy the frame. Copied frame keeps the same setting, for example, if you add new master picture, the copied frames also have the new picture (screen 2).

After setting is finished, close the window by pressing OK button.

(Screen 3)

▼ Window (Screen 3)

1. Selection Tool   Select trap frame. Selected trap frame opens/shows settings window.

2. Frame Drawing Tool Specify the area to be inspected by angular camera by creating trap frames.

After creation, settings window opens and can adjust settings.

3. Trash   Delete trap frames. Also possible to delete trap frames by **delete** key.

4. Re-inspect Button Re-inspect all trap frames.

▼ Settings Window (Screen 3)

1. Master Picture List Show master pictures of selected trap frame.

2. Add/Delete Picture Add (+) or Delete (-) master picture. Master picture can be added maximum 12.

3. Search Area   Searching area for selected trap frame in pixels. Set to X or Y direction by sliding

levers. Area is shown by dotted line around trap frame. Default size is 1/2 of short

side of width or length.

4. Matching Level   Set matching level of selected trap frame. Default level is 60% matching.

5. Blur Level   Add blur effect to decrease false calls..

▼ Tune-Up and Adjustment

View45Calc stamp does not show the inspection result by pressing Re-inspect or Analyze button in Cell

Map Area. To confirm the criterion, press Start button and inspect whole PCB or press Re-inspect but-

ton in angular camera view (Screen 4). After inspection, the passed frames are colored in blue and failed

frames are colored in red. Matching % and NG reason (in case of NG) will be shown by mouse over the

trap frames (Screen 5).

If there are false calls, you can adjust by 1. Adding master picture 2. Decrease matching level or 3. In-

creasing Search Area.

If NG reason is **Matching (Detail) NG **%**, adding master picture is the most recommended method.

Not Working

(Screen 4)

Re-inspect

Good Picture

(Screen 5)

OK　　　　　　　　NG　　　　　　Detail NG
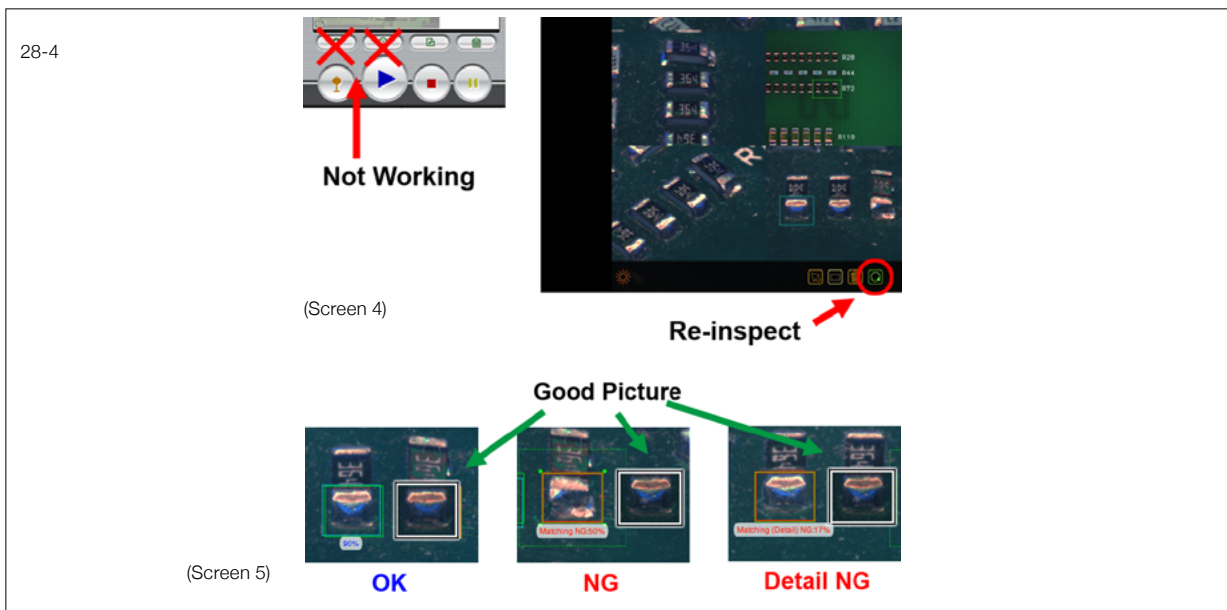
28-5 Inspection with White Side Light

Function to brighten the angular camera image by lighting the components from sideway is available with white side light mounted model. It is effective if main light from the top has difficulty to reach the inspection point. Please refer to "28-3 Creating Inspection Programs [for 22X F Series] for data creation procedure.

▼ **Applicable model**

Model with white side lighting (S or GTAz series)

▼ **Setting of Stamp for auto inspection (view45Calc)**

Display window by double clicking "view45Calc" Stamp. You can ON/OFF the side LED by clicking the button in lower left of the window. For the inspection with side LED, set the trap frame after turn on LED.

* When you change the setting in one inspection frame, the setting will be reflected to other inspection frame.

28-5

Power OFF   Power ON
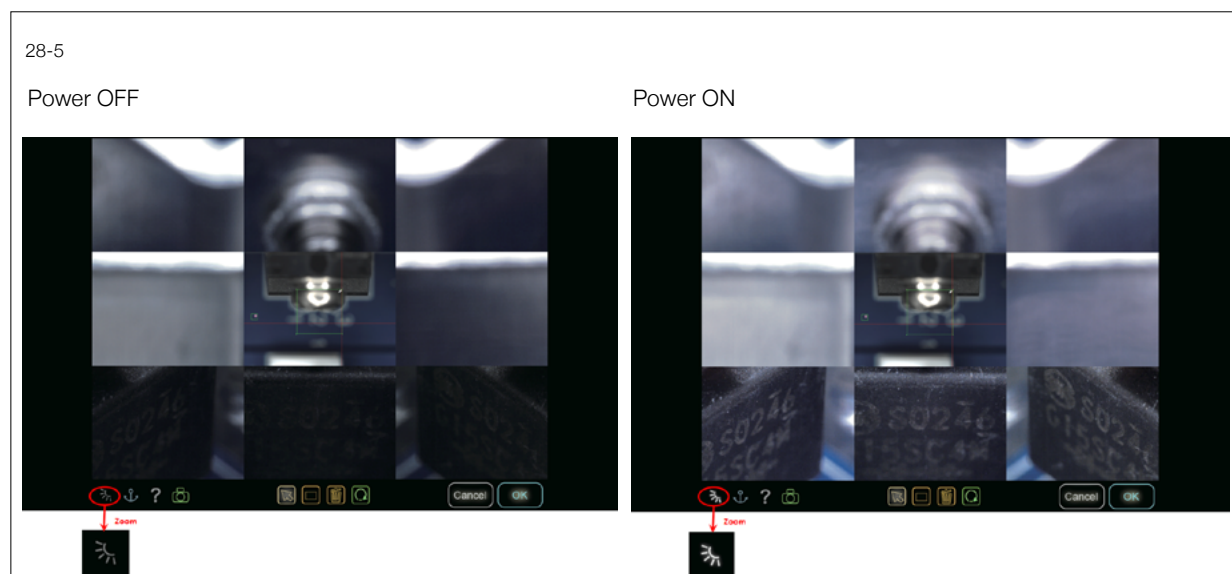
28-6 Viewing Operation

▼ Switch 22X main screen to angular camera screen

Switching from 22X main screen to angular camera screen;

Press **slash** "**/**" key on keyboard (including tenkey), or press **switch button** at the top-right corner of the 22X main window (Screen 1). Do the same operation for getting back to 22X main screen.

* Switching screen is not possible when the camera is at Eject/Home position.

▼ Operation while verification

Various operation to recognize NG more clearly is possible from G/NG confirmation window of angular camra.

- Verify the defective components by pressing Good/NG buttons by mouse or arrow keys on keyboard.
- While verifying, if the image is difficult to see, click each picture to enlarge or press * (asterisk) key (Screen 2).
- While verifying, if it is difficult to find the target component, press "**+**" key and display red cross-hair in the center (Screen 3).
- If the area that you want to see is not seen by angular cameras well, double-click the desired position in the center picture (by 22X top camera) with pressing **control** key, the angular cameras move to the clicked position.

28-6

(Screen 1)   (Screen 2)
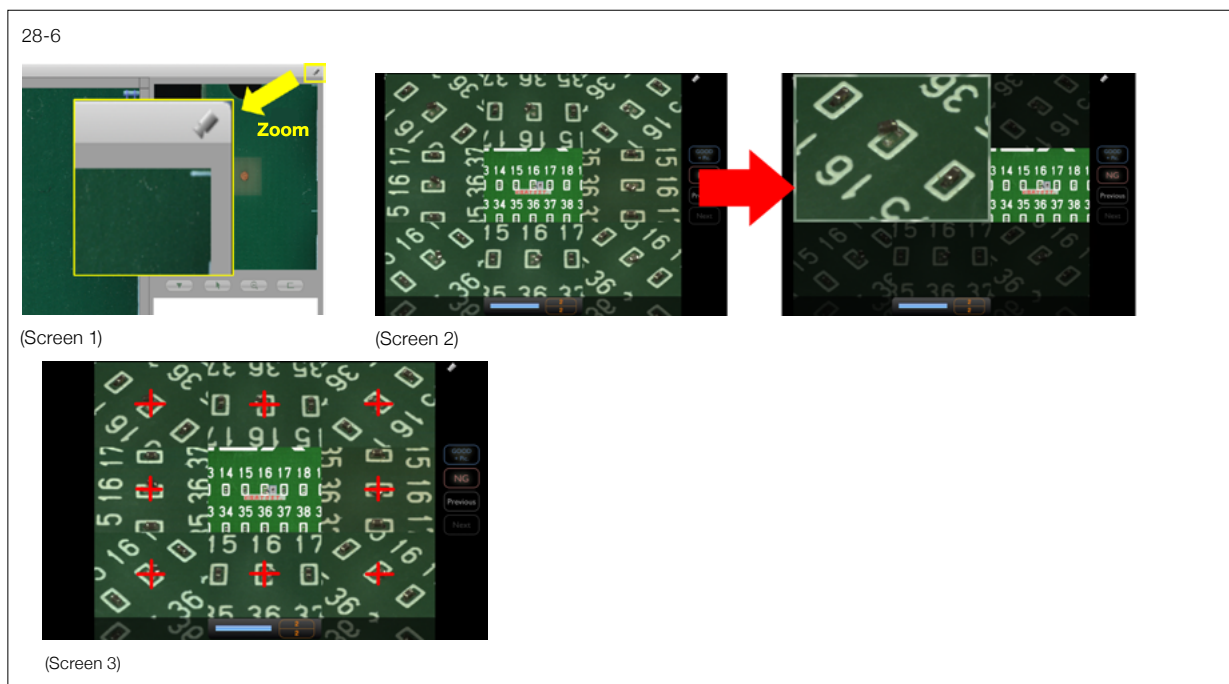
(Screen 3)

- When you click the icon in the lower left corner of the side camera screen, orange borders are displayed between each image (Screen 4). This function is available in G/NG Confirmation Mode, NG Cell View Mode, and View45Calc. If the lines are displayed on one of these modes, they will continue to be displayed in the other modes. This setting has no effect on CatchSystem.

- When you click the red colored camera icon in bottom right of G/NG Confirmation window, red colored camera icon appears on NG Stamp in main screen. You can confirm the position of NG stamp currently displayed (Screen 5). Icon in NG Stamp disappears when you click the red colored icon again at bottom right of screen. The status of display the icon is saved for each machine.

* This function is available when "Confirm all NG stamp inside the Pack" is activated in Angular Camera tab from Settings for Supervisors menu.
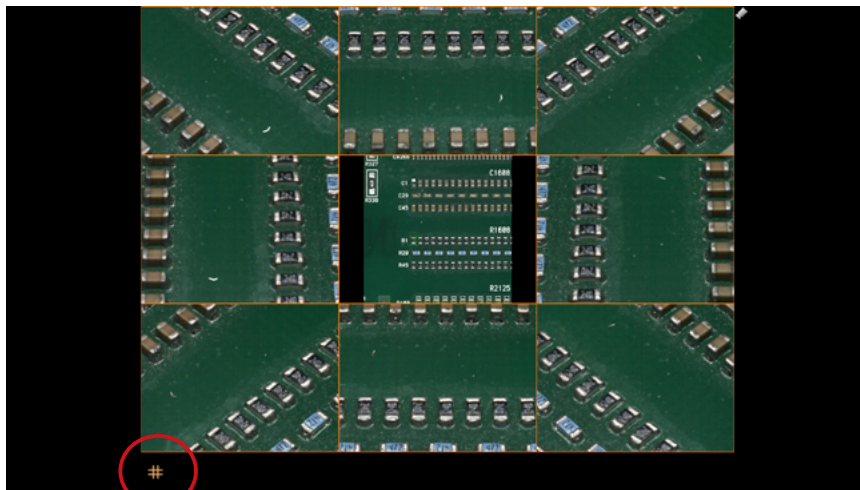
(Screen 4)

(Screen 5)
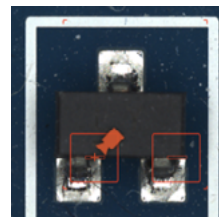
▼ Operation while debugging

You can also use angular cameras for efficient debugging. While creating the inspection program, you can use the angular cameras to confirm if the component/fillet is defect or not by pressing "/" key or clicking switch button.

- If you are selecting the pointer tool or the frame creation tool (Screen 6), you can zoom the center picture by clicking (Screen 7).
- If you are selecting the move tool, you can freely move the camera position (Screen 8), but <u>can not zoom the center picture</u>.
- If you click each picture, you can zoom the image (Screen 9). You can also zoom the image by pressing "*" key.
- You can display the cross-hair by pressing "+ " key (Screen 10).

28-6

(Screen 6)

(Screen 7)
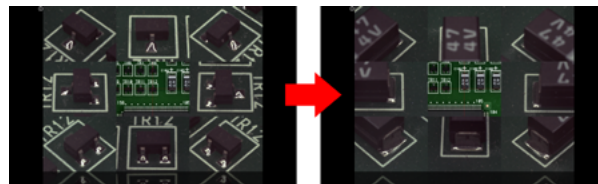
(Screen 8) Move to the right, views from angular cameras are also refreshed together with top camera)
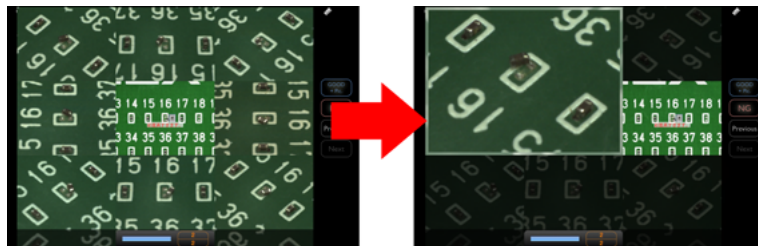
(Screen 9)
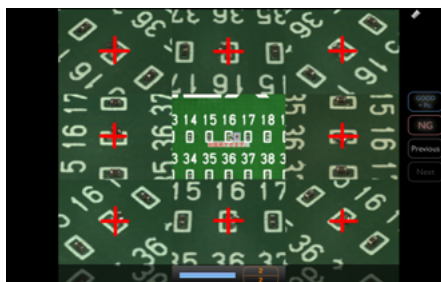
(Screen 10)

28-7 Viewer Stamp

There is a speical stamp named "View45Stamp" for angular cameras. The area where View45Stamp is placed, is not inspected by AOI, but when confirming AOI's inspection result, the area is shown by Angulara Cameras. This stamp let operator to verify by his eyes.

▼ **How to use**

1. Place the stamp where you want to confirm after inspection (Screen 1).
2. Start inspection. After inspection, the screen will be in G/NG confirmation mode. Camera stops the area where View45Stamp is placed, and wait for human verification (Screen 2).

▼ **Setting**

By double-clicking the frame of View45Stamp, the setting window opens (Screen 3). In this window, you can set the direction to high-light while verification. Enable [Multiple] to select 3 directions to high-light.

▼ **Caution about this stamp**

View45Stamp is a special stamp. This stamp is not for inspection. Therefore you can not set Search Area, having Master picture or the other setting which ordinary stamps can do.

28-8 Connect to CS-Center

The pictures taken by angular cameras can be sent to CS-Center as well as the inspection result, and reconfirm by the CS-Repair. The remote vefirication in angular camera screen is also possible on CS-Center. Below or greater version of software is required to receive pictures of angular cameras;

CS-Center: Version 1.1.3.0   CS-Repair: Version 1.1.3.0

To know the angular camera operation on each software, please read manual of each software.

28-7

(Screen 1)   (Screen 2)   (Screen 3)
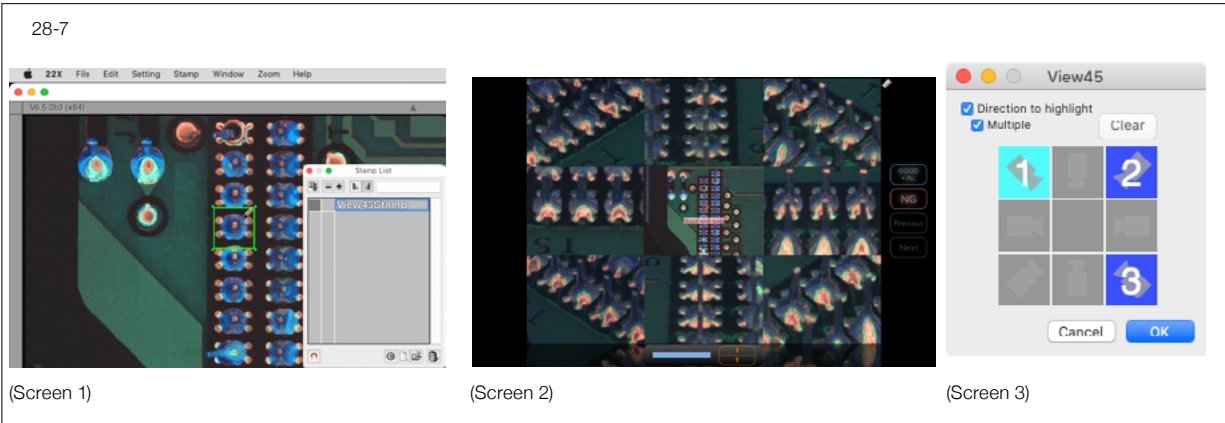
Z Axis Unit for 22X

Z axis unit is an optional unit enables to customize focus for inspecting high components.

Conditions

- Maximum movement is 28mm to upper and 2mm to down.

- Possible to move up/down in 0.1mm digit.

- Not possible to confirm the PCB picture of customized focus on Off-Line Teaching software.

For Supervisor: Z axis

Change Height on Calibration Seal

Performs calibration at the set height.

Pull in Z axis while moving

To avoid collisions between parts and the camera, the camera is raised to the highest point on the Z-axis when moving from and to the standby position. i22X has this enabled by default.

Display focus height in actual (1.6mm in place of '0')

PCB surface height is displayed at the bottom of Z Axis icon, and current height is displayed at the top.

Inspect by Z-height order

Performs inspections in order of height along the Z-axis to reduce the inspection time.

(Screen 1)

Operation

The purpose of Z axis is "To get best focus from thick/thin PCB" and "Inspect the text on high component". In this manual, the procedures are described depend on purpose.

To get best focus from thick/thin PCB

The camera maybe not on focus when treating PCB on jig or in palette, or AOI with non bottom-up clamping carrier. Wtih Z axis, you can assign height offset to PCB for getting the best focus.

1. Set PCB.

2. Press blue arrow key at the top-right corner of Work Area, select "Customize standard".

3. Setting window is displayed. Move the slide bar up and down and select the best height.

4. The setting height is saved in the inspection program and inspection is always executed at the height.
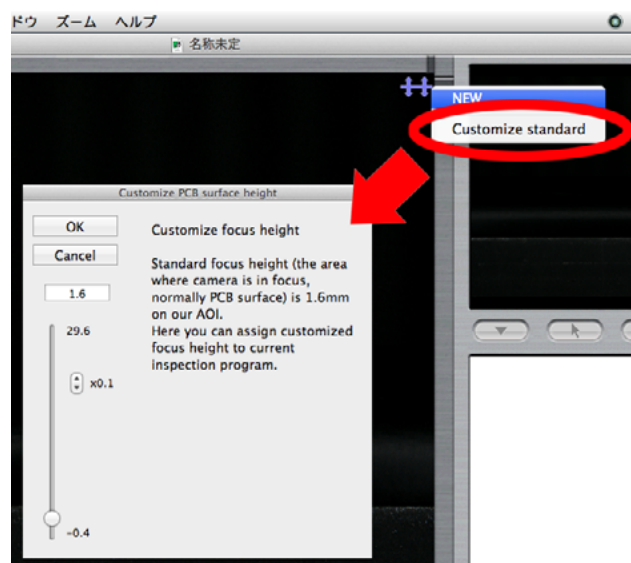
Inspect the text on high component

To inspect high components, there are special 2 stamps for Z axis; one is Z Axis stamp which change the camera focus to setting height, and the other is Z Axis Auto Focus stamp which automatically gets the best camera focus.

How to use Z Axis stamp

Suitable to use for inspecting the text on height components such as aluminum capacitors or relays.

1. Set PCB. Move camera on the component. Draw a frame by selection tool at any place in the Work Area (Any size is OK for drawing frame, because size will be uniform when saving as stamp). Select **Z Axis** from pull down menu at the bottom (Screen 2).

   * You can place Z Axis stamp at any place in the Work Area, because it is not used for inspection or criterion.

2. Setting window will be displayed. Move the sliding bar and find the best height for the target object (Screen 3).

3. Click OK button and save as stamp. Automatically stamp name suggestion is input for fast programming (Screen 4).

4. Create frames for the inspection targets in the Work Area.

5. Start inspection. The Cell with Z Axis stamp will be inspected after normal Cells. After inspection, the defect will be shown by Z Axis stamp setting height while verification.

* The Cell shape is triangle which Z Axis stamp is assigned.

(Screen 2)

(Screen 3)

(Screen 4)

Input New Name

zFocus_10.2

中止　　　OK
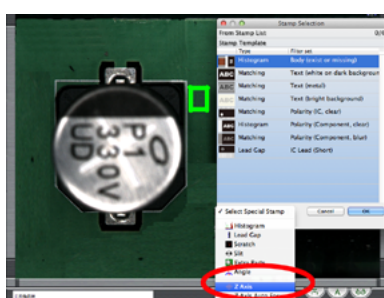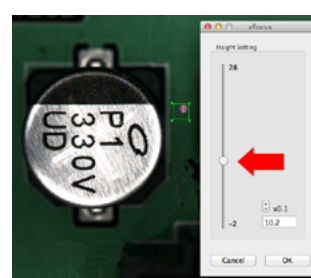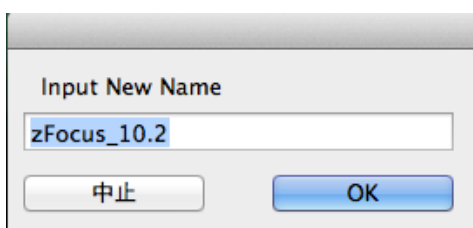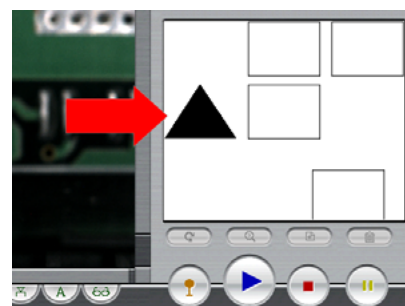
(Screen 5)

How to use Z Axis Auto Focus stamp

Suitable for inspecting the PCB which warps random. Place this stamp in the area where tends to warp. However, Auto Focus stamps takes double time for inspection to compare with normal Z Axis stamp. We recommend to use normal Z Axis stamp if warping is not random but regularity.

1. Move camera on the component. Draw a frame by selection tool on the area where you want to get the best focus. Stamp Creation Wizard will be shown up. Select **Z Axis Auto Focus** from pull down menu at the bottom (Screen 1).

* Please select the area carefully when creating Auto Focus stamp. The area must be characteristic. Do not select the area where mono-color or no text. Auto Focus does not work well. As well, do not include high object and low object together. Auto focus may fail.

2. Setting window will be displayed. You may quit this window without doing anything, but it is time consuming to find the best focus between 0 to 30 mm in every inspection. Therefore, it is better to set Maximum and Minimum movement allowance. Press **Sampling** (Screen 2). Automatically the Maximum and Minimum allowance is input (Screen 3).

3. Click OK button and frame will be saved as stamp. Automatically stamp name suggestion is input for fast programming.

4. Create frames for the components in the Work Area.

5. Start inspection. The Cell with Z Axis Auto Focus stamp will be inspected after normal Cells. After inspection, the defect will be shown by height selected by Auto Focus stamp while verification.

* The Cell is diamond shape which Z Axis Auto Focus stamp is assigned.
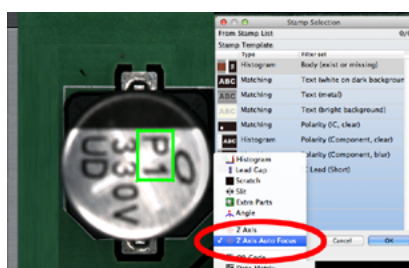
(Screen 1)
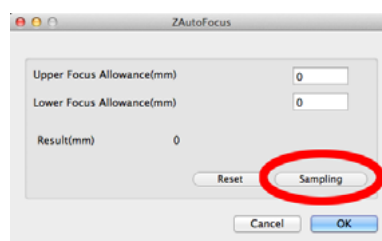
(Screen 2)
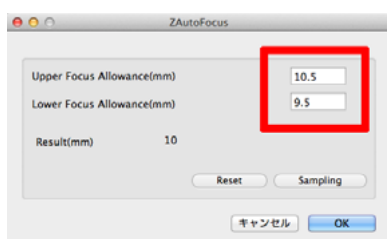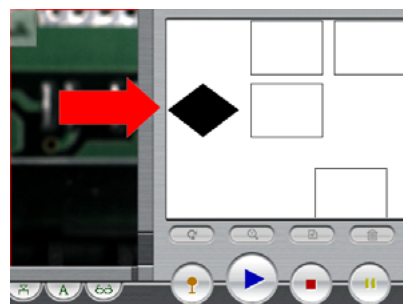
(Screen 3)

(Screen 4)

Change standard focus height (Change default value)

Normally, camera is focused to see PCB surface most clearly. However, by the position change of Z axis chassis, you may need to assign different height (other than PCB surface). In such case, you can change the standard focus height.

Press blue arrow key, Select "Customize standard". Setting window appears, press Cancel button with control and option keys. Window changes. Move camera up to desired height and press OK button.
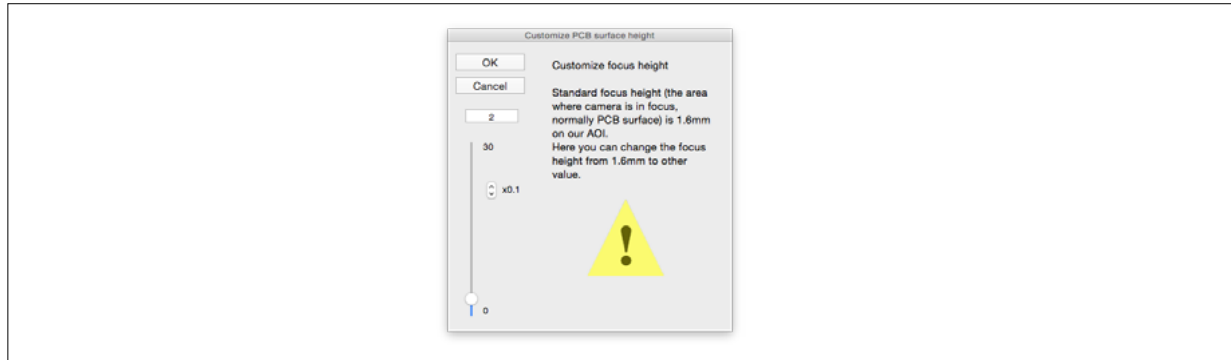
Limitations

- It takes 2 to 3.5 times more cycle time to use Z Axis stamp than normal inspection. And it takes 4 to 5 times more cycle time to use Z Axis Auto Focus stamp.
- Z Axis Auto Focus stamp is not possible to use for the Cell where fiducial marker, Side recognition frame or Block Mark stamp exist. Z Axis stamp is possible to use any Cell.
- Bus Stop function is not possible to use.
- Not possible to be Pack stamp.
- Z Axis Auto Focus stamp is not possible to switch illumination or use camera special setting.
- Not possible to use in the program in which Block type Z assigned Cell exists.
- If you place more than one Z Axis or Z Axis Auto Focus stamp, voluntary one of the stamp is selected and height is assigned.
- Z Axis and Z Axis Auto Focus stamp is out of offset target of CellAid or NewCellAid stamps.
- Picture in Work Area warps AOI with non telecentric lens. The center is better and the outer is worse. Therefore, please move the camera for the target component to be in the center of Work Area with non telecentric lens AOI. As well, please place Auto Focus stamp as center as possible in Work Area.

Assign Height by Cell Block (old method)

This method is used before Z axis stamps were developed on software older than version 4.9.0. This method is not possible to use with Z axis stamps. And you can create maximum 20 height in an inspection program.

How to use

1. Set PCB.

2. First, make stamps for components at normal focus.

3. Move camera to where high component is. Click **blue arrows** at the top-right in Work Area. Select **New** (Screen 1).

4. A window to change height appears, move slide-bar until the component can be seen clearly (Screen 2). If you like to adjust minutely, use step button next to slide-bar.

5. Press OK button, the color of arrow is **red i**n customized focus.

6. Start to create stamps.

7. After finishing to assign stamps to components, make the Cells be Block which must be inspected at customized height. The Cells' shape will change to triangle (Screen 3).

8. Repeat step 3 to 7 if you like to assign more customized focus.

To revert to the default height, click the arrows, then camera will be lifted down. When completed, the color of arrows reverts to blue.

Update customized focus

If you like to change the focus afterwards, press mouse down the arrow icon at the top-right of Work Area, keep pressing for 1.5 seconds, then setting window appears and you can modify the height.
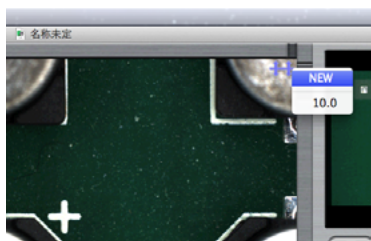
(Screen 1)
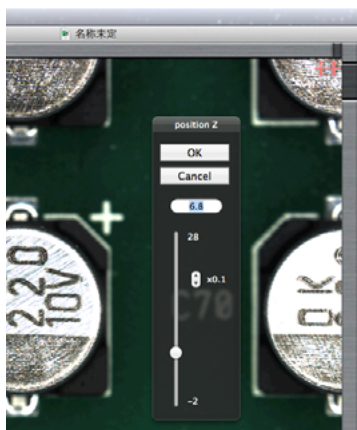
(Screen 2)
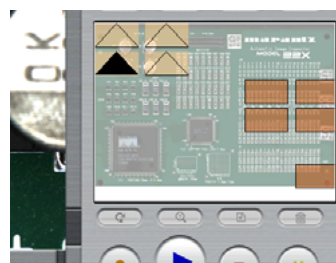
(Screen 3)

Conformal Coating Inspection

Inspecting whether coating agent is applied to designated area or detecting splash to prohibited area by using special Stamp. Detect coating coverage and non-coverage to designated area with Coverage Stamp. Detect splash to prohibited area with Splashes Stamp. These special Stamps are displayed in Stamp template as special Stamp when conformal coating inspection function is active.

* In order to perform the inspection, the moisture-proof coating must contain a fluorescent agent.

* Two types of master picture are added from Ver.6.4.0: side lighting (UV lighting) + white lighting (main lighting). The master picture is added in the order of side lighting image, then white lighting image.

1 Coverage Stamp

Special Stamp for coating coverage inspection whether the coating solvent is applied to designated area. Detect non-coverage point in designated area and judge by setting.

* This special Stamp is displayed in special Stamp list in Stamp template when you are operating conformal coating inspection function.

■   How to setup

1. Specify the area of inspection by pointer tool.

2. Select Coverage from special Stamp list. (Screen 1)

3. Coverage Setting window appears. Inspection Cell will change to the screen with UV lighting (Screen 2).

4. If coating solvent is applied correctly, covered area is displayed in blue color by reacting to UV lighting. However, considering the unevenness of the judgement from brightness difference of coating solvent, inspect black colored area, which does not react to UV lighting, for coverage/non-coverage inspection.

    Click Color Pickup button. Move cursor to the area with no coating solvent. Drag and select black colored area with no coating solvent by pressing the mouse button. (Selected area can be outside the inspection frame)
   Tolerance for extracted color will increase if you drag wide area. Indication for dragging area is that non-covered area inside the screen turns to yellow color (Screen 3).

5. After picking up the color, click "N" at the left of "Color" and put check mark. For tolerance

to judge non-coverage, input minimum and maximum value of longer and shorter side. Also input the ratio of area for judgement as NG (Screen 3).

6. Confirm by clicking Test button to see whether the result will not become false NG. After confirmation, click OK button and apply the Stamp with name.

7. When you start inspection and detect non-covered area, message "Non coverage areas were found" is displayed. (If the result is OK, the message is "Coverage is OK".) (Screen 4)

Conformal Coating Inspection-1
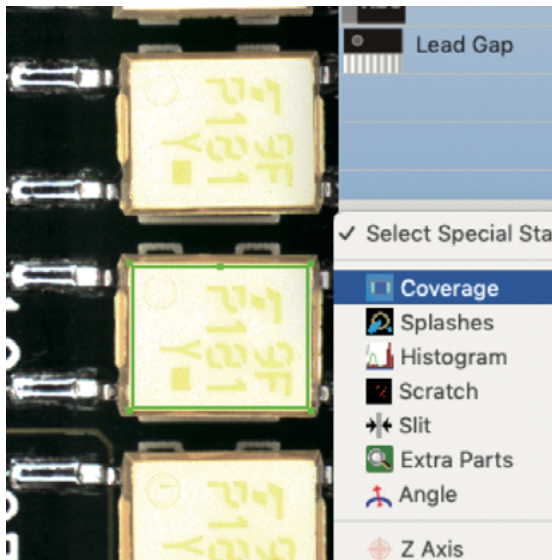
(Screen 1)
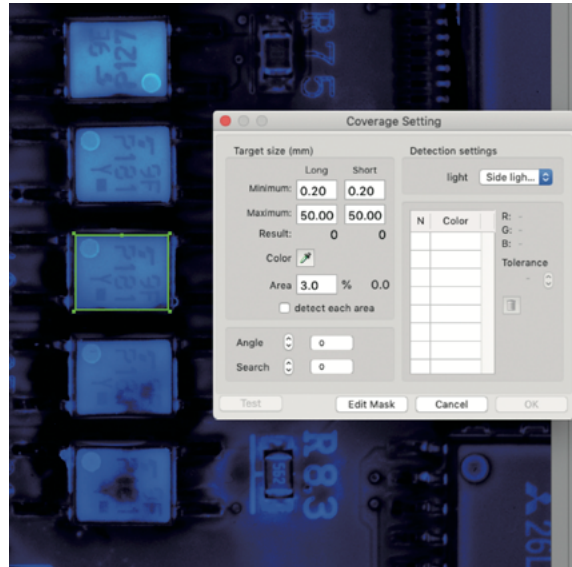
(Screen 2)

Yellow: Designated color area (After dragging)   Tolerance
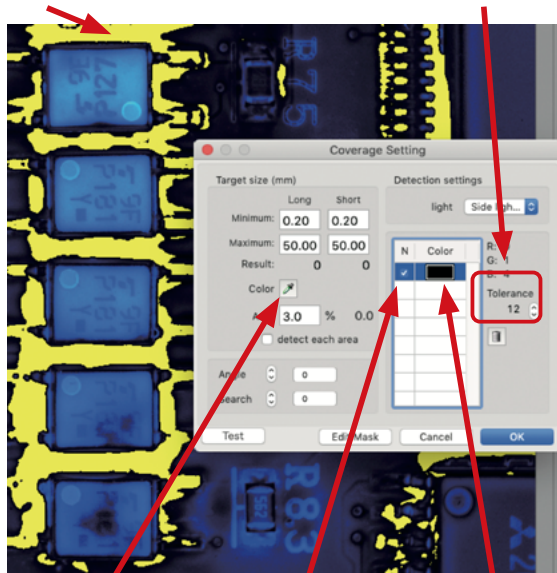
Color pickup   NG is OK   Color extracted
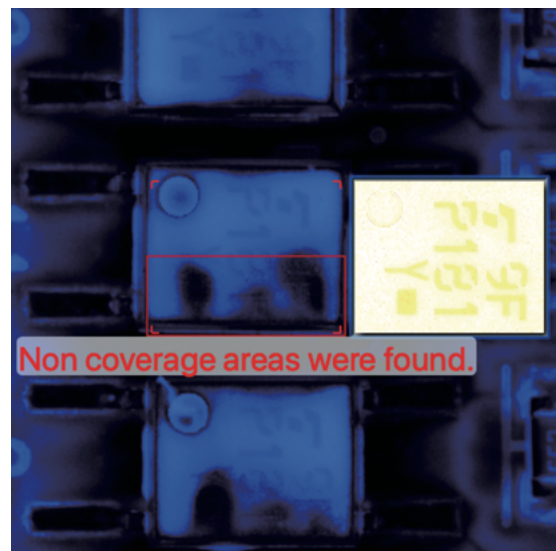
(Screen 3)

(Screen 4)

Detection result by coating thickness

If you set black color for judgement standard for non-covered area, software recognizes the coating solvent even if small amount is applied. In case you want to detect small amount of coating solvent, do not select black color for judgement but select blue color which is for status with coating solvent is applied. If brightness of blue color varies with the solvent amount, increase the sample of blue color selection or expand the tolerance.

Area with selected color

All area with selected color   Variety of color samples
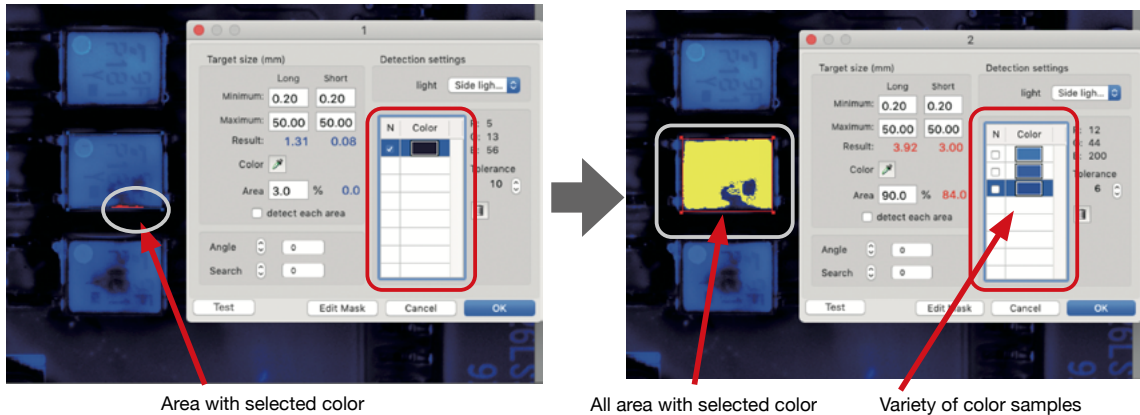
■ Difficult to detect the point with thinly applied solvent if inspecting with black color for non-coverage is selected.

■ When you select the colors of solvent with different brightness, you can detect NG color which is not included to selected color.

■ Color selection is up to 100 colors.

2 Splashes Stamp

Special Stamp for inspecting splashes of coating solvent to prohibited area. Detect the solvent in designated area and judge by setting.

* This special Stamp is displayed in special Stamp list in Stamp template when you are operating conformal coating inspection function.

■ How to setup

1. Specify the area of inspection by pointer tool.

2. Select Splashes from special Stamp list (Screen 1).

3. Splashes Setting window appears. Inspection Cell will change to the screen with UV lighting (Screen 2).

4. If there is no splash of coating solvent, area is displayed in black color not reacting to UV lighting. However, considering the unevenness of the judgement from brightness difference of black colored part, inspect blue colored area, which reacts to UV lighting for splashes.
   Click Color Pickup button. Move cursor to the area with coating solvent. Drag and select blue colored area with coating solvent by pressing the mouse button. (Selected area can be outside the inspection frame)
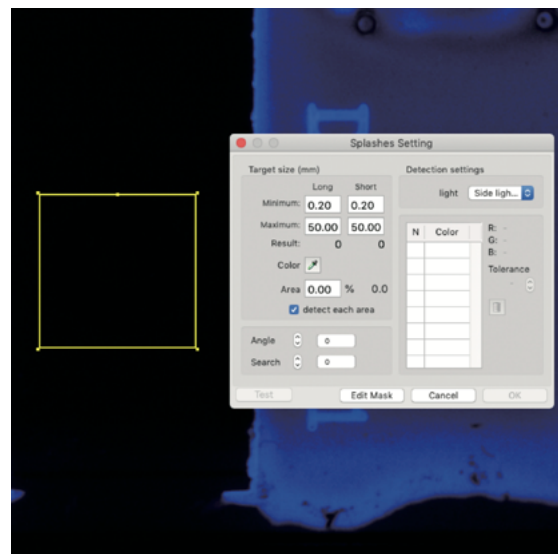   Tolerance for extracted color will increase if you drag wide area. Indication for dragging area is that covered area inside the screen turns to yellow color (Screen 3).

5. After picking up the color, click "N" at the left of "Color" and put check mark.
    For tolerance to judge non-coverage, input minimum and maximum value of longer and shorter side. Also input 0% for the ratio of area for judgement as NG by detecting even small amount of coating solvent (Screen 3).

6. For inspection of splashes, software does not inspect primary created inspection frame for 100% but judges the detected circumscribed rectangle area as 100% so it can detect even small amount of splashes by putting check and activate "detect each area" function (Screen 4).

Conformal Coating Inspection -2

（Screen 1）   （Screen 2）

Yellow: Designated color area (After dragging)

Color pickup button   NG is OK   Color extracted
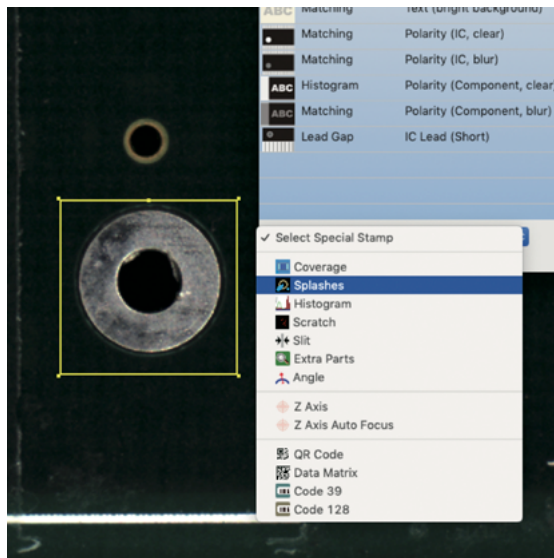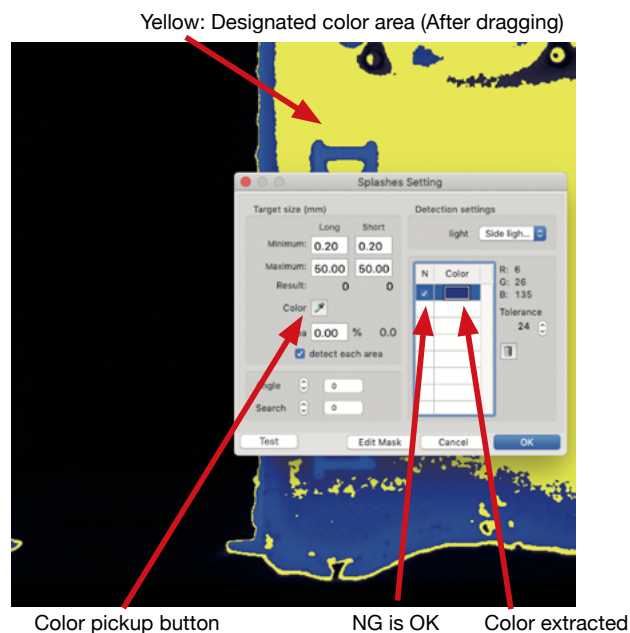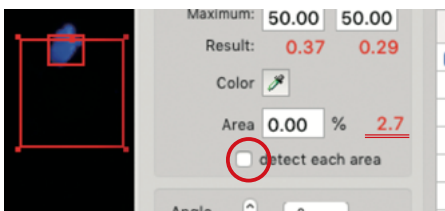
（Screen 3）

7. Confirm by clicking Test button to see whether the result will not become false NG. After confirmation, click OK button and apply the Stamp with name.

8. When you start inspection and detect splashes in prohibited area, message "Splashes were found" is displayed. (If the result is OK, the message is "There were no Splashes".) (Screen 5)
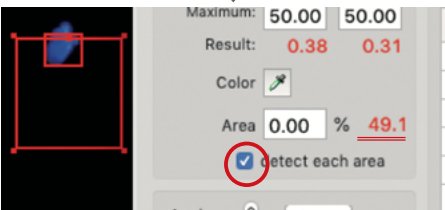
3 Notice

-   Resolution of 10 micron lens is required to detect object less than 0.2mm.
-   Create the Stamp not by actual size but by zoomed size if you cannot detect small splashes. There is possibility that small splashes are not detected by actual size with less resolution.
-   Inputting too small/big value in minimum/maximum fields will give bad influence for inspection because this can cause many false calls.
-   Up to 100 points of Splashes will be displayed. If there are more than 100 points to inspect, some may not be displayed with red NG frame.

Conformal Coating Inspection -2

Ratio of the area will increase if you activate "detect each area".

(Screen 4)

(Screen 5)

4 Setting Menu

1. Minimum

Set minimum size to be detected (either height or width). The size less than this value will be ignored.

2. Maximum

Set maximum size to be detected (either height or width). The size more than this value will be ignored.

3. Result

Result of test or analyzing is shown. If more than one result is detected, maximum size will be shown.

If the result is Good, shown in blue color, and if the result is Not Good, shown in red color.

4. Color pickup button

Select color with this tool.

5. Area

Judges whether the area painted with the specified color has more area than set value (%).

6. Angle

Enable to set the direction by rotating the frame from -180 to +180 degrees. By clicking up/down

button, it rotates by 15 degrees step.

Conformal Coating Inspection -4
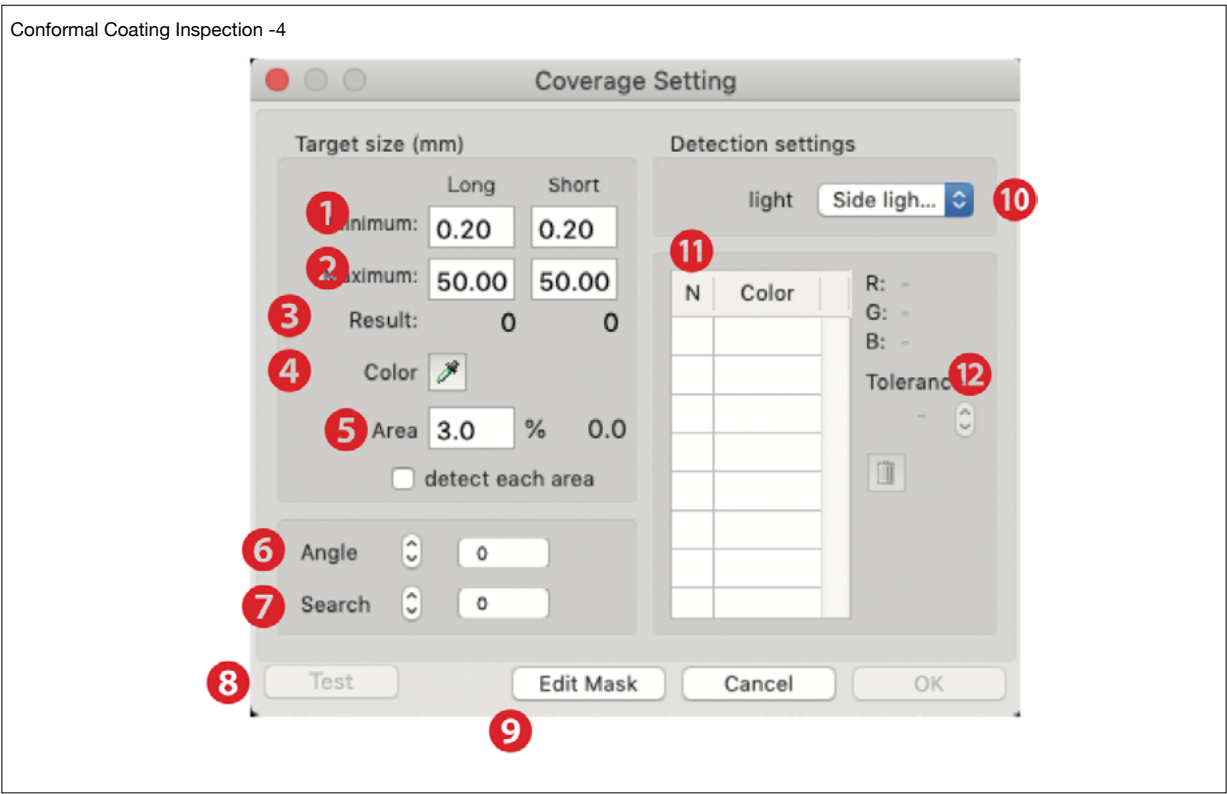
7. Search

Set the search area by pixel.

8. Test

Execute the inspection and check current status. Analyzing process is shown for 1 or 2 seconds.

9. Edit Mask

You can mask the area which you do not want to inspect.

10. Light

You can change the lighting. Side lighting (UV lighting) is applied for conformal coating inspection.

11. NG is OK and Color extracted

List of colors which you selected by Color pickup button. If you set the NG color, put check and activate "N" for specified color. On the right side of the list, RGB value and tolerance is shown. You can select maximum of 100 colors. If you have unnecessary color, you can delete it from the list by clicking trash bin icon while selecting the color.

12. Tolerance

Show the value of tolerance for selected color.

If you set the color for Good result, defect will escape if the tolerance of color is too wide. The text color of tolerance becomes brown at over 25, and becomes red at over 40. Confirm the risk of escaping by text color, and it is better to add new color than increasing color tolerance.

5 Map View

Conformal Coating AOI creates Map View by lighting both UV lighting and White lighting. This makes easier recognition of both component inspection and conformal coating inspection.

6 Others

Inspection using white lighting is also available with Conformal Coating AOI. It can inspect such as component presence/absence and fiducial or polarity offset by using pattern matching and histogram algorithm.

* Please refer to each chapter in the instruction manual for the setting of each inspection function.

* Function which requires Diffuse-On-Axis LED and Red or Blue side lighting is not available
  with Conformal Coating AOI.

Conformal Coating Inspection -5
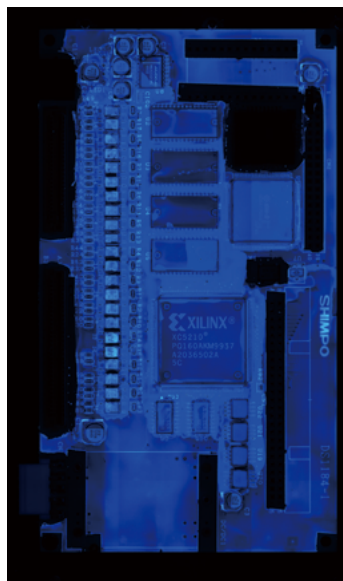
Map View only with UV lighting

Map View with both UV lighting and White Lighting

7 UV Auto Teaching function

7-1 Initial setup

When using this function for the first time, set the starting position for creation. No further setting is required from the next time.

Set PCB on the AOI. If you want to continue scanning after the setting, please set the good sample. Select [Edit] - [Make coverage (Full)] from top menu to display the corner position setting menu. If you want to edit position, [Move to start position?] message is displayed. Select [No (Set position)] to open the setting menu.
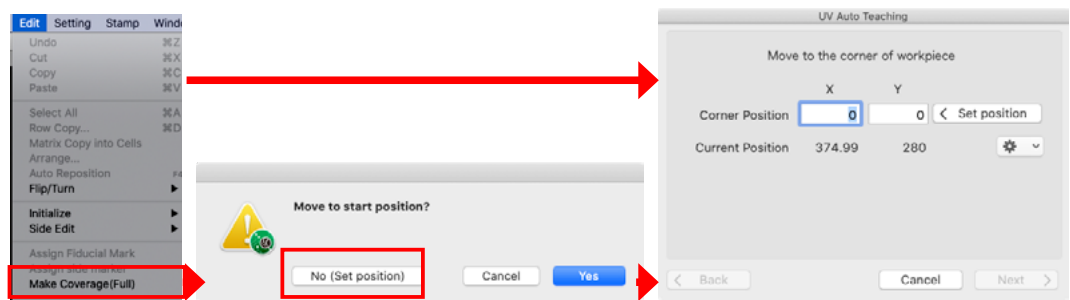

Use the Free Move tool to align the corners of the PCB with the center of the camera.

The setting position differs according to machine type and the loading direction.

Inline (direction: left-to-right)	Center the lower right corner of the PCB.
Inline (direction: right-to-left) / Desktop	Center the lower left corner of the PCB.
Top of the Dual Inspection	In the case of left-to-right, center the bottom right corner of the PCB; in the case of right-to-left, center the bottom left corner of the PCB.
Bottom of the Dual Inspection / Bottom Inspection	In the case of left-to-right, center the bottom left corner of the PCB; in the case of right-to-left, center the bottom right corner of the PCB.

ex) In case of Dual Inspection machine and the loading direction is left-to-right:
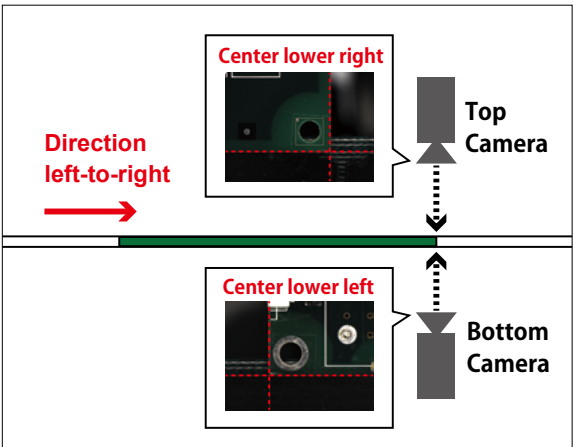
Select [Set position] to register the corner, then select [Update start position] from the Gear icon.
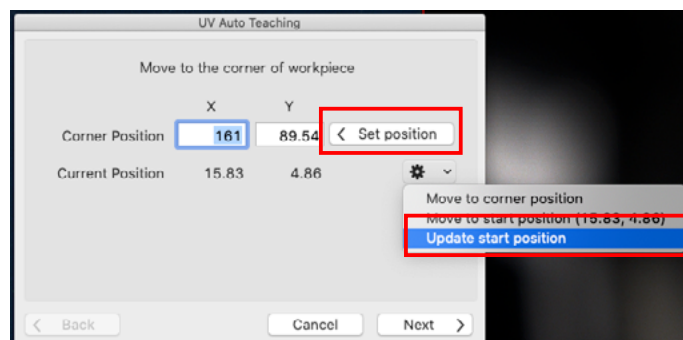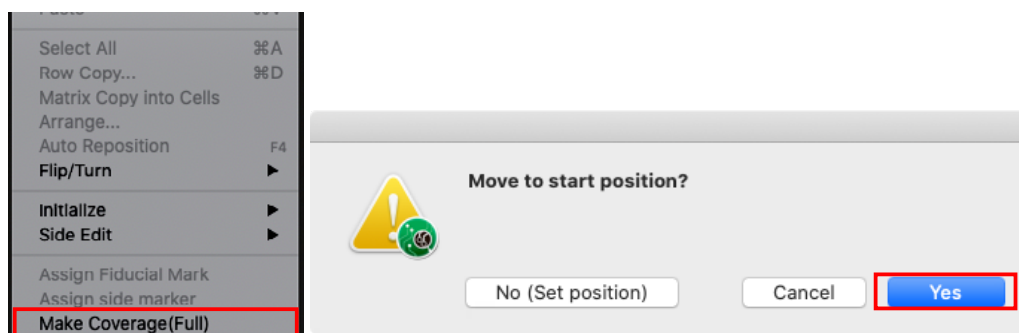

7-2 Data creation

This step is to scan a good sample to create an inspection program. Set the Fiducial Marks before creating the program.

Select [Edit] - [Make coverage (Full)] from top menu, then select [Yes].

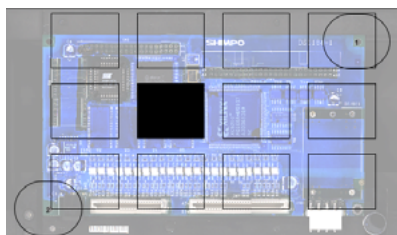Camera moves to the registered corner position which is set on the initial settings.

Set PCB Lengths, Loading Direction, Overlap Width and execution of uncoated areas.

Select [Next] when you finish the setting.

|		
	PCB Length(X)	Enter the length of PCB. If you are unsure of the size, enter a larger number than the actual size, because you can exclude areas outside the range from being inspected using the settings described below.
	PCB Length(Y)	
	Loading Direction	This setting is for OLT only. For the Desktop machine, set [Left to Right]. For the Inline machine, select the direction according to the machine.
	Overlap Width	Widens the inspection area. This setting is used to adjust the separation of the inspection area or to inspect a high part.
	Remove no-coated areas	When this setting is enabled, cells in uncoated areas will be excluded from inspection during scanning. It is recommended that this setting be enabled.

Conformal Coating Inspection

Select the coated cell on the Cell Map Area to move the camera.

Set the inspection conditions. Select [Start] when you finish the setting.

	Ref.Des.	Select Ref.Des. and numerical sequence numbers are automatically entered on the created cells.
	Frame Type	Select NG-ID.
	Number of Grids	Set the number of grids per side.
	Detection Level	Adjusts the binarization level between the coated area (blue) and the uncoated area (black). Press Caps Lock key on your keyboard to show/hide the grid.
	Threshold	Set the application percentage to be OK, using the area of one grid as 100%. Grids below the threshold are treated as masks on the first scan.
	Tolerance	Tolerance to the threshold value that serves as a passing criterion. In the case of the setting shown in the image on the left, the threshold is 60% and the tolerance is 3%, so 57% or more is OK. It is effective for dealing with variations at the edge of the application area.

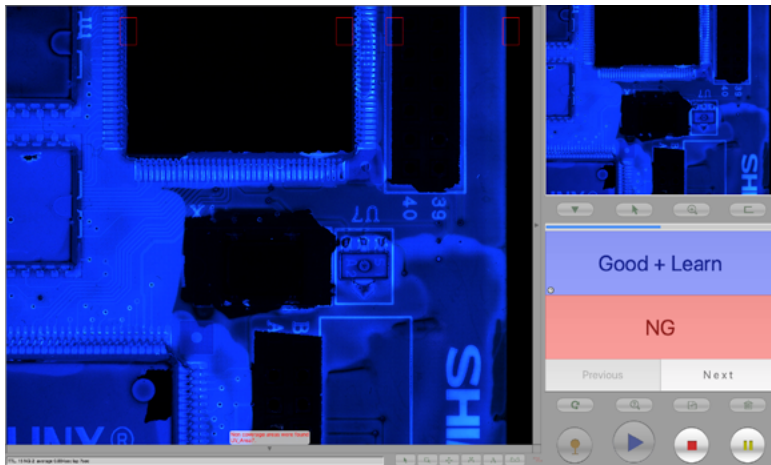Example of changing the Number of Grids

Number of Grids: 6	Number of Grids: 30	Number of Grids: 60
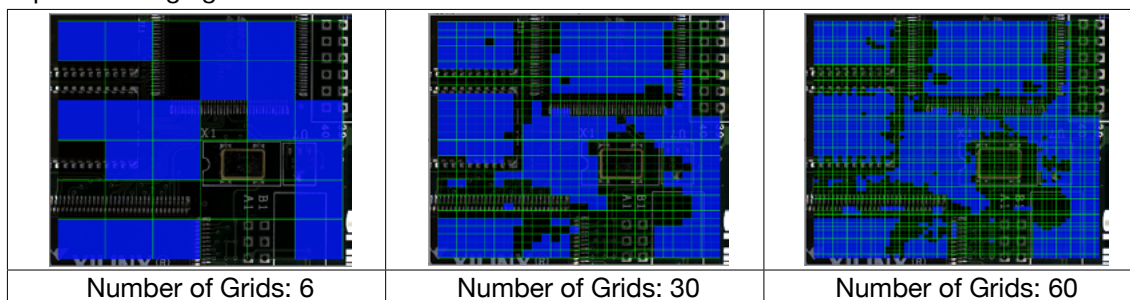
Example of changing the Detection Level

Detection Level: 1	Detection Level: 100	Detection Level: 200
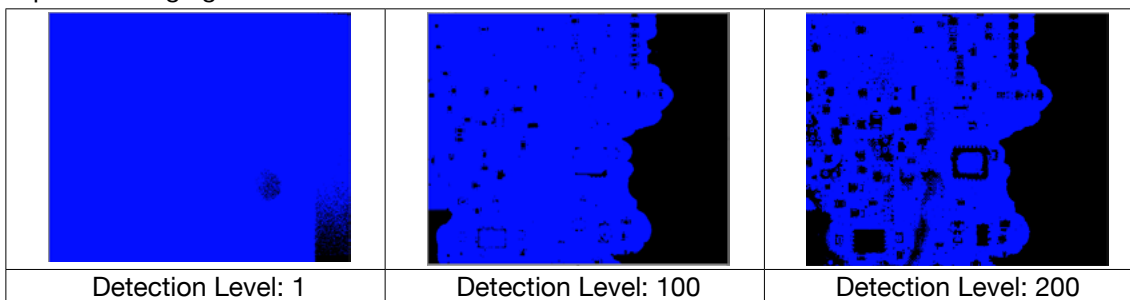
7-3 Automatic debug function

This function adjusts the threshold value of each NG grid in the G/NG confirmation mode to stabilize the inspection accuracy.
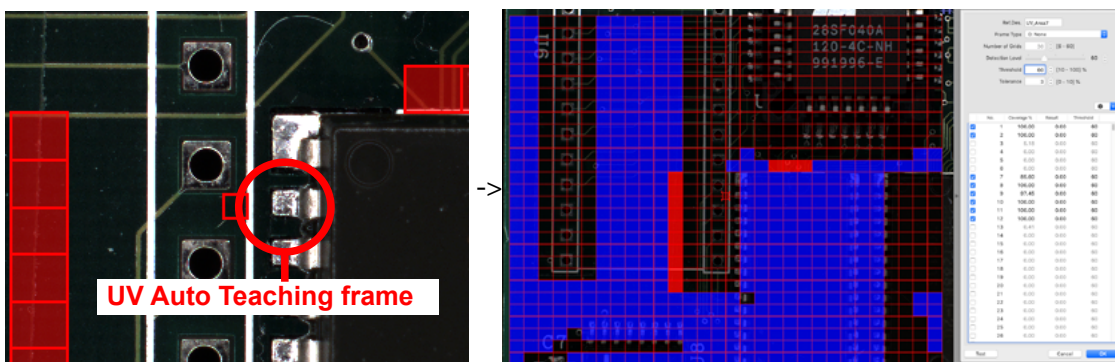

If you hold down the Shift key in G/NG confirmation mode, the Good button will change to [Good + Learn]. Pressing the [Good + Learn] button reflects the inspection result % of the NG grid to the threshold. Decimal point values are rounded down.

Ex) If you press [Good + Learn] with a threshold of 60% and a test result of 42.8%, the threshold will be changed to 42%.

7-4 Debugging of each grid

After setting the UV Auto Teaching, a rectangular inspection frame will be placed in the center of the screen. Double-click on it or select it and press Enter to open the settings window and display the grid in the work area.


UV Auto Teaching frame

->
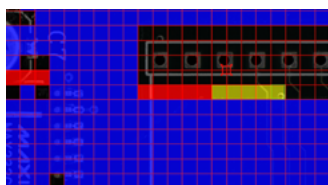
The meanings of the grid colors are as follows:

Blue	Good
Red	NG
Yellow	The area where Coverage % is less than Threshold when the masked grid is changed to the inspection target. The color will change to blue when it is judged as Good in the subsequent inspection.
No color	Masked area: not subject to inspection. Grids with Coverage % less than the threshold will be automatically masked after scanning.
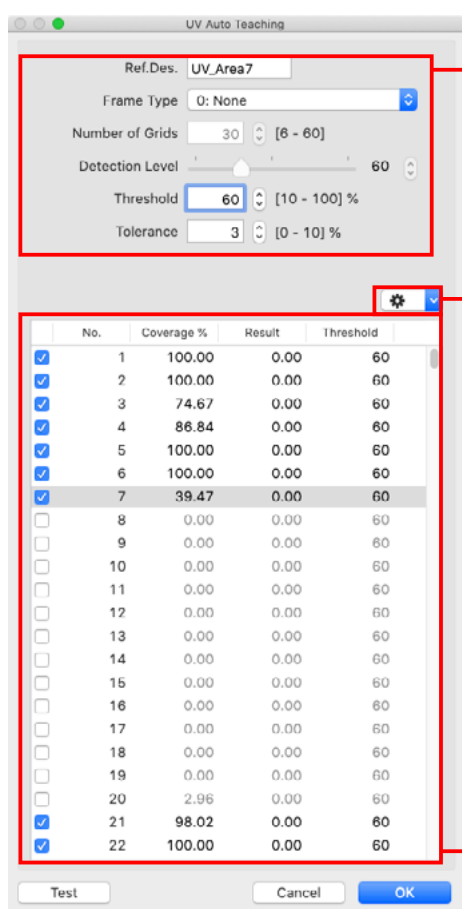
The items in the setting window are as follows:

Ref.Des.	Edits Ref.Des.
Frame Type	Select NG-ID.
Number of Grids	Value fixed. (Cannot edit)
Detection Level	Adjusts the binarization level between the coated area (blue) and the uncoated area (black).
Threshold	Changes the threshold value of the selected grid.
Tolerance	Changes the tolerance of the selected grid.

From here, the grid information displayed at the bottom of the window can be changed, and the settings can be changed in bulk.

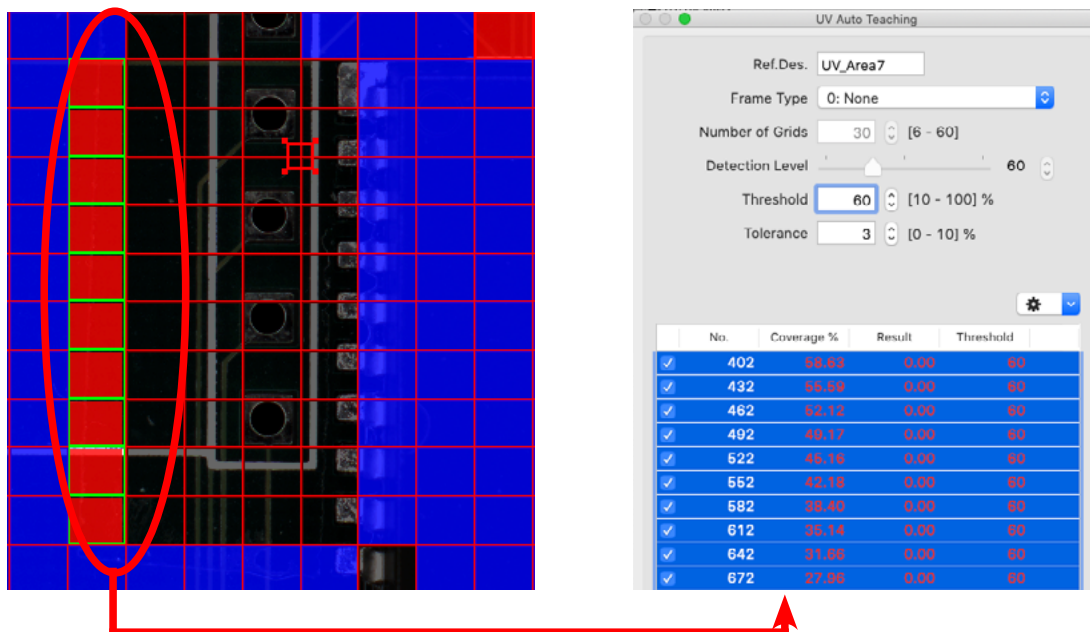| Show all	Lists the information of all grids.
Show only OK	Lists the information of OK grids.
Show only NG	Lists the information of NG grids.
Set Inspection Grid	Add a check mark to all selected grids to make them subjects to inspection.
Set Mask Grid	Remove a check mark to all selected grids to make them masks.
Set Threshold to all frames	The thresholds entered in the input field at the top of the window are reflected in all grids.
Set Tolerance to all frames	The tolerance entered in the input field at the top of the window are reflected in all grids.

A list of the currently selected grids will be displayed at the bottom of the setting window. The items are as follows:

Checkbox	Checked grids are for inspection, unchecked grids are masked.
No.	A number of the grid. They are assigned in order from the top left to the right.
Coverage %	The percentage of the application area detected during scanning.
Result	The percentage of the application area detected in this inspection.
Threshold	This is the percentage of the coverage that is the standard for passing inspections.

Conformal Coating Inspection

The grid you want to edit can be selected in the work area.

Multiple target grids can be selected at the same time and their settings can be changed at once.

Conformal Coating Inspection

Height Inspection

This inspection method uses a CLASS2 laser to measure the height of two points. Only available on laser-equipped models.

* CLASS 2 lasers are a class of lasers that emit visible light (400 nm to 700 nm). Do not look directly into the laser emission port, although there is no danger to the eyes if you only look at it momentarily.
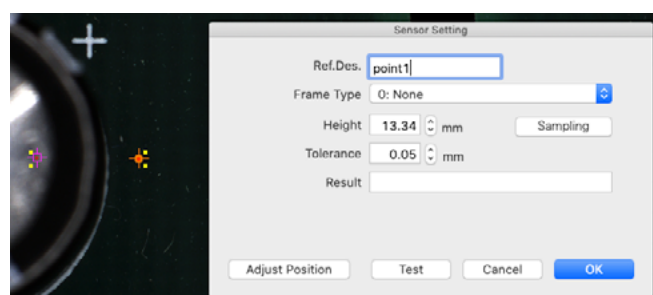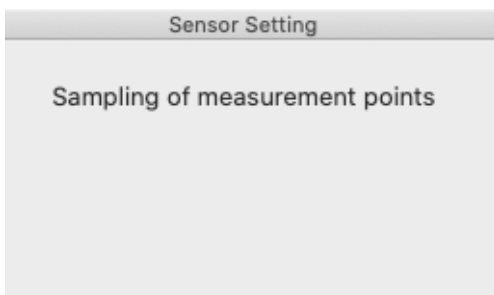
1. How to inspect

Hold down the Control key and click the mouse to select [Create height measurement position].
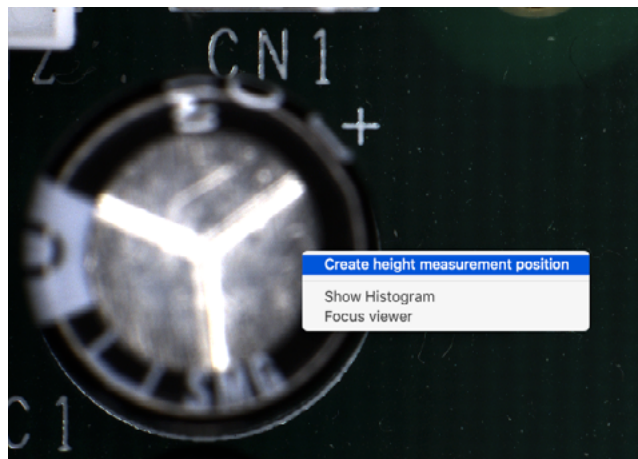
The reference position is indicated by an orange dot and the measurement position by a pink dot. Adjust each position by dragging and click [OK].
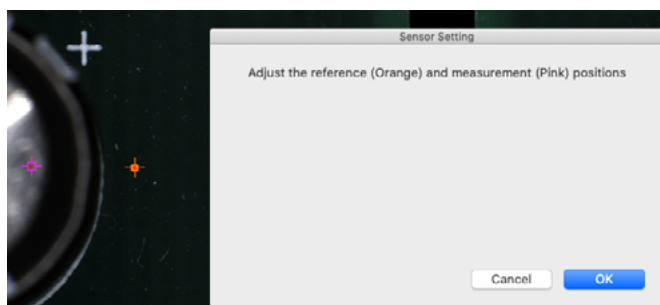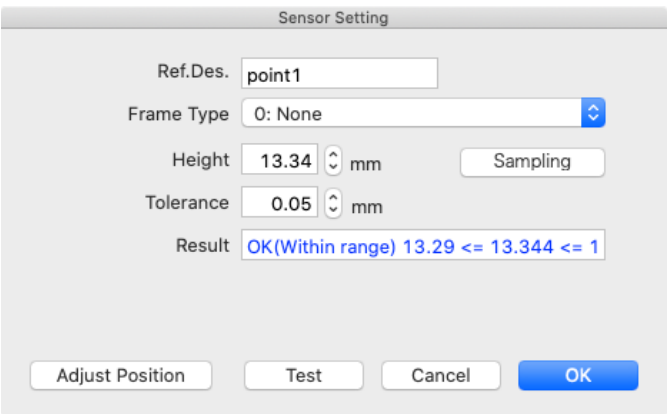

Sampling to measure height is performed and the settings screen opens.

* During sampling, height measurements are performed multiple times. If you see variations in the set height, press the Sampling button multiple times to detect the height.

Conformal Coating Inspection

2. Setting Screen

The contents of the settings screen are as follows:

| 1	Ref.Des.	Edits Ref.Des.
2	Frame Type	Sets the inspection frame type.
3	Height	The height threshold at which to judge OK. The value detected by sampling is automatically entered.
4	Sampling	Run sampling and auto-detect height values.
5	Tolerance	The value of the range within which the product is judged as good if the height is different from the set value.
6	Result	Result is displayed here. Good items are indicated in blue, while defective items are indicated in red.
7	Adjust Position	Set the reference and measurement positions again.
8	Test	Judges OK/NG.
9	Cancel	Cancels height measurement.
10	OK	Determine the measurement settings and close the screen.

If OK, the reference and measurement positions turn blue. If NG, they turn red.
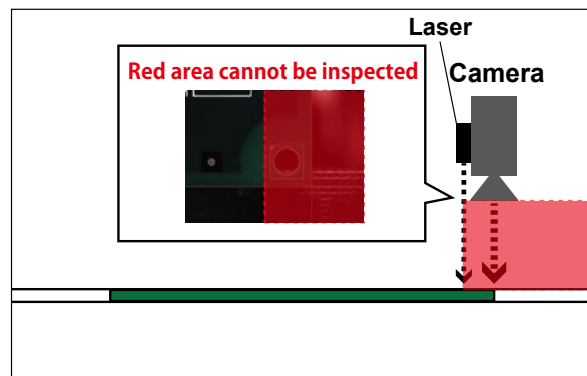
Conformal Coating Inspection
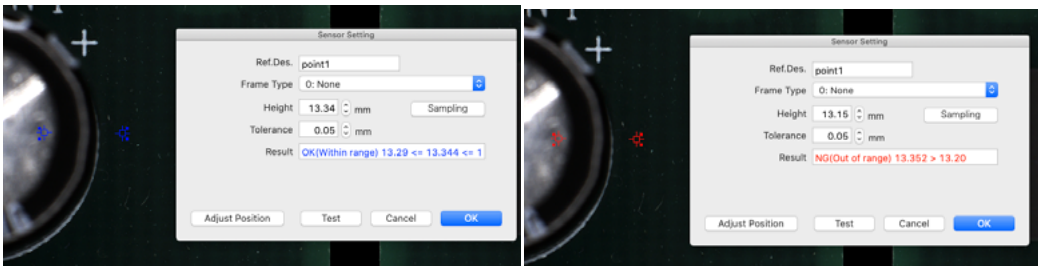
3. Remarks

- Height measurements can be used as a stamp. To make it a stamp, select [New Stamp] from [Stamp] menu or press F3 key as a shortcut.
- It can be rotated by Command + L and Command + R.
- Height inspection is performed after the usual inspection. The result is automatically sent to Catch System.
- When one of the reference or measurement position is positioned within the inspection frame, the height measurement follows the Packmaster and automatically adjusts position in case of misalignment (like the image bottom-left). If neither the reference position nor the measurement position are NOT on the inspection frame, it will not be tracked (like the image bottom-right).
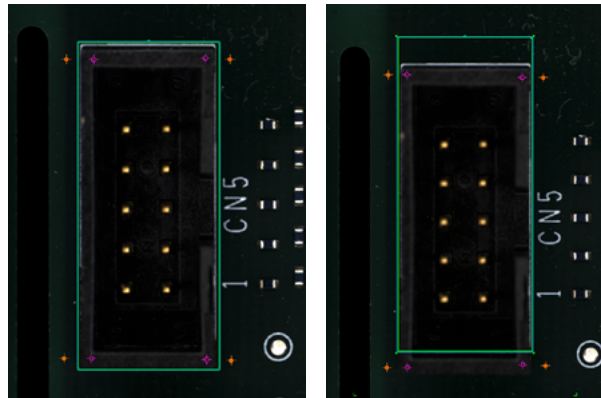
- Due to the difference between the center of the camera and the laser mounting position, there may be areas where height measurements cannot be placed if the camera reaches its travel limit. Please check the specification sheet for details and whether there are areas where placement is not possible, as these vary by model.

Conformal Coating Inspection

mek®

marantz electronics,ltd