Agilent Medalist SP50

SP50 Manual
Version 3.1.6, December 2008

Agilent Technologies

Notices

Release Notes

SP50 Software

Version

Version 3.1.6, December 2008

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Agilent Technologies Microwave Products (Malaysia) Sdn. Bhd.
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11900 Penang, Malaysia

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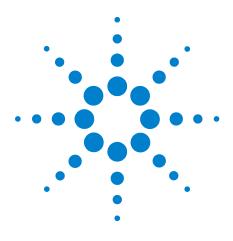# Legal Information

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	Canada	(877) 894-4414
Americas	Latin America	305 269 7500
	United States	(800) 829-4444
	Australia	1 800 629 485
	China	800 810 0189
	Hong Kong	800 938 693
	India	1 800 112 929
	Japan	0120 (421) 345
Asia Pacific	Korea	080 769 0800
	Malaysia	1 800 888 848
	Singapore	1 800 375 8100
	Taiwan	0800 047 866
	Thailand	1 800 226 008
	Austria	01 36027 71571
Europe & Middle East	Belgium	32 (0) 2 404 93 40
	Denmark	45 70 13 15 15

	Finland	358 (0) 10 855 2100
	France	0825 010 700* *0.125 €/minute
	Germany	07031 464 6333** **0.14 €/minute
	Ireland	1890 924 204
	Israel	972-3-9288-504/544
Europe & Middle East	Italy	39 02 92 60 8484
	Netherlands	31 (0) 20 547 2111
	Spain	34 (91) 631 3300
	Sweden	0200-88 22 55
	Switzerland	0800 80 53 53
	United Kingdom	44 (0) 118 9276201
	Other European Countries:	www.agilent.com/find/contactus

Manufacturing Address

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11900 Penang,

Malaysia.

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Version 3.1.6 Release Notes

Agilent Technologies

Overview of Ease of Calibration

Users often encounter difficulties in performing laser calibration steps which may result in "Bad Calibration" during the calibration testing.

Common mistakes and problems faced by users during laser calibration are:

- The laser is not at the HOME position while performing laser setup.

- Users forget to clamp the board and start calibrating the laser.

- Laser is not in the correct position within the WOI.

- Users do not refer to the user manual to obtain the passing criteria for laser setup (centroids, laser width).

- Users forget to home the Z-Axis after completing the laser setup.

- When a bad calibration occurs, error details are not displayed to the user. Users will not be able to identify the errors properly.

For this release, three areas have been identified whereby improvements will be made to the software to further assist users in performing proper laser calibrations:

- New GUI: Tools - Laser Setup

- New Laser Setup Window

- New Calibration Result Window

Overview of Ease of Programming

Updates and enhancements included in the software (version 3.1.6) assists the user in setting up the program. The enhancements include:

• Ability to inspect all deposit of single algorithm type and get summarized inspection results by algorithm type.

• Run 5.15 sigma repeatability tests on deposits of an algorithm type as guidance to set best thresholds.

• Algorithm (Device) Editor will automatically log changes made to database file at CPI's log directory.

• New Database Management window allows user to backup database file and delete database file from GUI.

Improve Small Deposit Measurement

The current software has difficulty reporting H, A and V within the expected range for small deposits. The reasons for this are

• Regularly it is seen that small deposits print in an approximately conical shape.

• For a conical deposit the systems default/recommended setting for the user defined parameter, Paste Threshold, is not correct.

• Existing software reports the average height. The user requires a height result that is in accordance with the stencil height.

Enhancement included in the improved software:

• Software changes allow the user to reduce the Paste Threshold to the minimum possible value to achieve an accurate A and V measurement while Reported Height is calculated from the peak height region only.

• Peak Height is a user defined percentage (specified in the InspUnitConfig.XML) of the pixels that correspond to paste. This feature may be turned on/off per deposit type in the algorithm editor.

• Paste Volume is calculated from Area and Average Height as in previous versions of software.

Copper Thickness

The copper thickness can be measures from a scan image and entered into the system to compensate for height and volume exaggeration.

Example:

Copper thickness = (Pad Gray Level – Background Gray Level) * H/G Ratio

Copper thickness = (76 – 68) * 3.5 = 28μm

Defect Prioritization on the SP50 Inspection Report

- All the defect items for a deposit will be list at the end of the deposit result line and will only list one fail item according to the preset defect priority.

- There will be an interface for the user to select the defect priority and those setting will be saved in the InspUnitConfig.XML.

Display Min, Max, Mean, ± 3 Sigma values to Area, Volume & Height Chart on Result Views

After an inspection is completed, the result view on the Engineer level displays

- Min values to the charts for Height, Area and Volume.

- Max .values to the charts for Height, Area and Volume.

- ±3 sigma values to the charts for Height, Area and Volume.

ART to Display Paste Limits

After an inspection is completed, the ART displays

- Value of the height, area, volume, x and y offset of the fail deposit.

- Min and Max values of the height, area, volume, x and y offset.

- Based on these measurements the operator can easily say false call.

Using Barcode to Trigger AWA

This is a feature that used barcode to trigger the AWA.

When a barcode is read by the machine it tries to find a match in the barcode_list.txt file, if no match is found the system does nothing. If a match is found the software then tries to get the board's width from the corresponding *.plx* (or *.pls*) file. If a width is found the system will try to change the conveyor's width, but it will wait until the machine is empty - there must be no board in the machine.

Improvement in Z-Axis Compensation

For each scan line, an average pixel will be used as the height data for Z-Axis compensation. This new method is now more stable and is seen to behave robustly for the large variation of board surfaces, shapes, geometries, etc.

Added Information on Run Summary in Operator GUI

In the operator GUI (Graphic User Interface), the Run Summary column contains more information on the number of boards tested. The added information:

- Passed - show the number of pass boards by operator
- Failed - show the number of fail boards by operator
- FTQ (First Time Quality) - show the number of pass boards by the system and operator

Ease of Calibration

User often encounters difficulties in performing laser calibration steps which may be resulted in "Bad Calibration" during the calibration testing.

Following are the commonly found issues and mistakes done by user during the laser calibration process:

- The laser is not at the home position while performing laser setup.

- Users forget to clamp the board and start calibrating the laser.

- Laser is not in the correct position within the WOI.

- Users need to refer to the user manual to get the passing criteria for laser setup (centroids, laser width).

- Users forget to home the Z-Axis after completing the laser setup.

- When a bad calibration occurs, error details are not displayed to the user. Users will not be able to identify the errors properly.

Three areas have been identified which required enhancement from the software to help up user in performing laser calibration:

- GUI: Tools - Laser Setup

- Laser Setup Window

- Calibration Result Window

Please refer to the document: **SP50 Laser Setup and Calibration Procedure Rev A**.

GUI: Tools - Laser Setup

Changes on the GUI: Tools - Laser Setup:

- New GUI for Laser Setup
- Laser Calibration Steps and Passing Criteria
- Auto Z-Axis Home
- Laser Position in WOI

New GUI for Laser Setup

Graphical User Interface (GUI)

Tools for Laser Setup

Redundant button, to be removed in version 3.1.6.

Figure 2-1 Existing GUI

New feature: When checked, the integration time will be updated automatically.

Two new buttons have been added to accommodate laser calibration.

This area has been left blank for second laser implementation in the near future.

Figure 2-2 New GUI

Laser Calibration Steps and Passing Criteria

The following message will be displayed to guide the user in performing the subsequent laser calibration steps. Guidance on getting a good laser setup is shown as well. This will appear after clicking on the "Enter Calibration" button.

Figure 2-3 Laser Setup Guide message

NOTE	The "Automatic Integration Time" algorithm can only calculate a GOOD integration time if there is a **Valid Laser Line** present (the laser line stays within the WOI).

Automatic Z-Axis Homing

After clicking on the "Enter Calibration" button, the wizard will home the Z-Axis automatically as shown below.
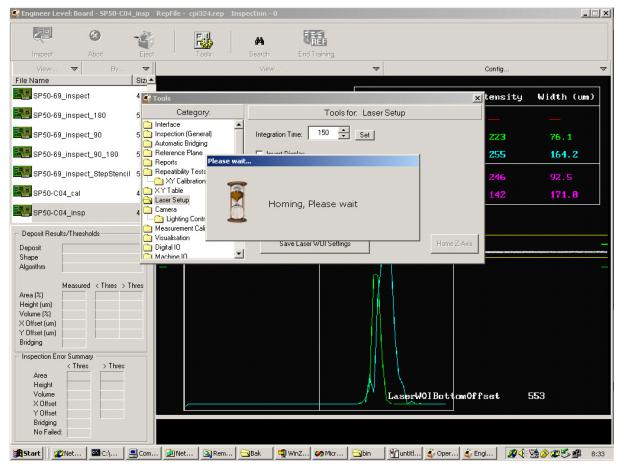
Figure 2-4 Z-Axis Homing Process

After completing the laser calibration, user will click the "Exit Calibration" button. This will again home the Z-Axis automatically and restore the typical value of "Laser Integration Time" if the "Automatic Integration Time" is unchecked. User will be prompted for saving the laser parameters into the "*Paste_3D_Calibration.txt*" file.

Figure 2-5 Laser Integration Time

Laser Position in WOI

The checking that will be done in the Laser Setup Tool is to ensure that the laser is staying within the Laser WOI. If the Laser Position in WOI is > ½ of the Laser Window Height, the following message will pop up when user is trying to save the settings. User is required to continue the saving step or cancel the action.
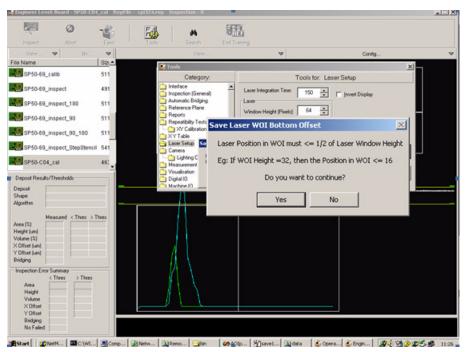
Figure 2-6 Laser Position in WOI message

NOTE	The "Laser Window Height" and "Laser Position in WOI" will be set according to which camera type is used on the machine.

Table 2-2 Laser Window Height and Laser Position in WOI

Machine	Laser Window Height	Laser Position in WOI
SP Series II	64	16
SP Series III	32	16

Laser Setup Window

Existing Laser Setup Window

Drawbacks of the existing software interface:

- Some information/data shown are redundant, (example: left/middle/right values for centroids, intensity and width).

- No indication of the results of the laser setup (GOOD/BAD).

- No guidance on how to achieve a GOOD laser setup, users have to refer to the manual to identify the passing criteria.
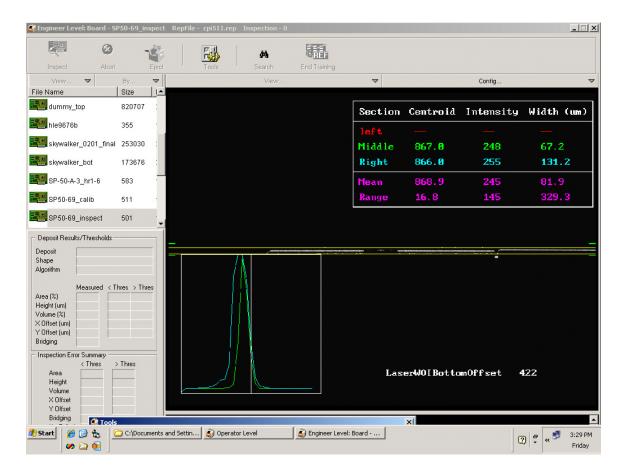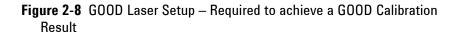
Figure 2-7 Existing Laser Setup Screen

New Laser Setup Window

New improvements:

- The displays of the laser setup results are redesigned. Only the Mean values of Centroids, Width and Intensity are displayed.

- There are two new parameters which are the "Laser Skew" and the "Min Width". These two parameters are used to determine the status of laser setup and they can be configured through InspUnitConfig.xml.

- The laser setup status will be shown in a three-coloured scheme, whether is it GOOD, MODERATE or BAD.

- When the status of Skew is MODERATE/BAD, users will be guided in adjusting the goniometer thumb screw to achieve a GOOD laser skew.

Figure 2-8 GOOD Laser Setup – Required to achieve a GOOD Calibration Result

Figure 2-9 MODERATE Laser Setup - May not achieve a GOOD
            Calibration Result
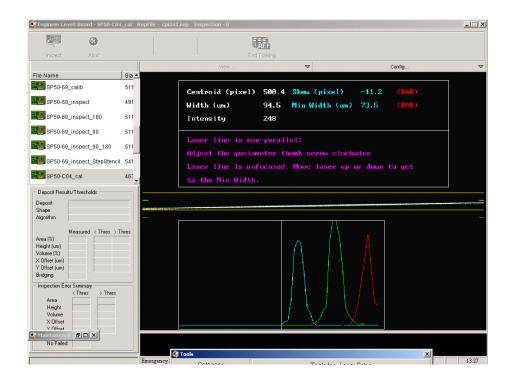
Figure 2-10 BAD Laser Setup - Will lead to BAD Calibration Result
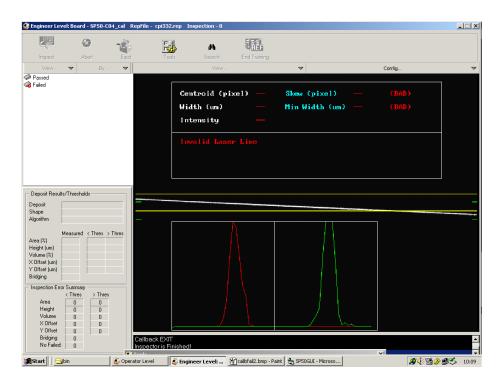
Figure 2-11 INVALID Laser Line - Laser Line is OUR of Laser WOI

Calibration Result Window

Existing Calibration Result Window

Drawbacks of the existing interface:

- No indication on failed parameters when BAD Calibration occurs.

- Only the last calibration result is shown in the end of inspection. If there is a BAD Calibration on Off Mode or Scan Mode and GOOD Calibration on ROI Mode result, users may miss those results and assume that it is a GOOD Calibration result for all Modes.

- Information displayed on the range tolerances for Laser Angle and H/G Range which determines a GOOD/BAD calibration result.

- No indicators or information on what has gone wrong when BAD Calibration occurs.

Figure 2-12 Screenshot of GOOD CALIBRATION
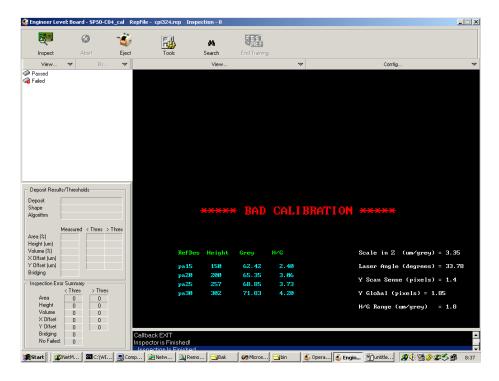
Figure 2-13 Screenshot of BAD CALIBRATION

New Calibration Result Window

Improvements of the new interface:

- Failed parameters will be highlighted in RED and shown in the table when a BAD Calibration result is obtained.
- At the end of inspection, the calibration results of each inspection mode will be displayed in a table.
- Possible root cause of BAD Calibration will be shown in a message box.

Figure 2-14 Screenshot of GOOD CALIBRATION
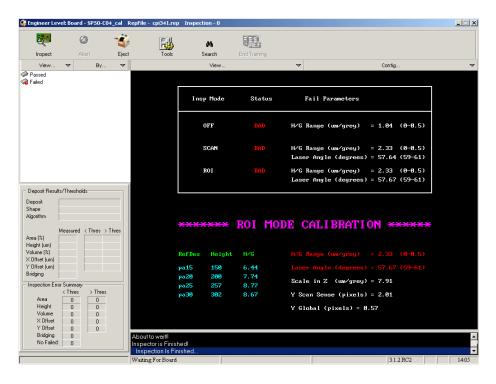
Figure 2-15 Screenshot of BAD CALIBRATION

Figure 2-16 More screenshots of BAD CALIBRATION

A message box will appear to provide users with some of the possible root causes of bad calibration, as seen below.

Figure 2-17 Possible root causes of BAD CALIBRATION

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Ease of Programming

In order to achieve this goal, users will have the ability to inspect all deposits of single algorithm types and get summarized inspection results by algorithm type. Furthermore, user will be able to run 5.15 sigma repeatability tests on deposits of an algorithm types as a guidance to obtain and set the best thresholds.
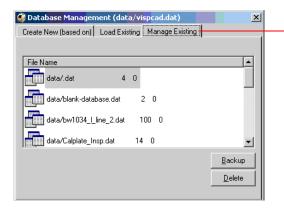
Besides that, the new Database Management window allows users to backup database files and deletes database files from the GUI and the Algorithm (Device) Editor will automatically log changes made to database files into CPI's log directory, for easier reference.

The enhancements include:

- Database Management
- Inspect All
- Device Editor's Log File
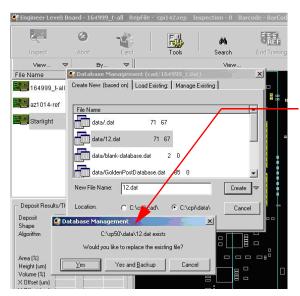
Database Management

Manage Existing

An option in the 'Manage Existing' tab for users to backup and delete from GUI

Figure 3-18 'Manage Existing' tab

New confirmation message appears if the new database name attempts to overwrite the existing database name

Figure 3-19 New 'Confirmation' message

Inspect All
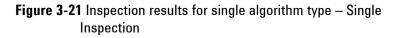
New "Inspect All" functions in Algorithm Editor (Device Editor) with Repeatability option.

Single Inspect

Summarized inspection results by algorithm type

Repeatability

Run 5.15 sigma repeatability tests on deposits of an algorithm type

Option to choose 'Single Inspect' or 'Repeatability'

Figure 3-20 'Inspect All' function

Single Algorithm Type

Figure 3-21 Inspection results for single algorithm type – Single Inspection

Figure 3-22 Inspection results for single algorithm type – Repeatability

Global Paste

Figure 3-23 Inspection results for Global Paste – Single Inspection

Figure 3-24 Inspection results for Global Paste — Repeatability

Device Editor Log File

Algorithm (Device) Editor will automatically log changes made to database file at CPI's log directory.
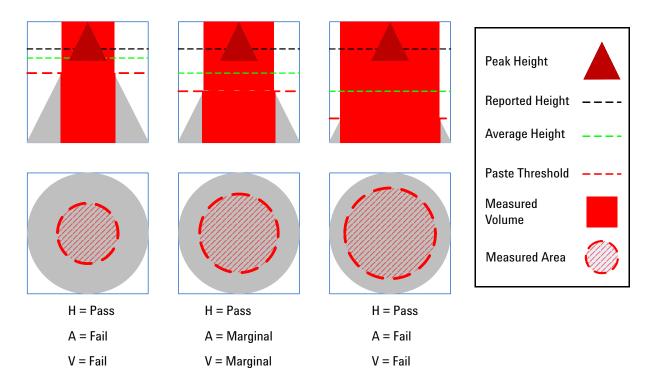
Improve Small Deposit Measurement

The improvement that had been done for small deposit measure:

- Software changes allow the user to reduce the Paste Threshold to the minimum possible value to achieve an accurate A and V measurement while Reported Height is calculated from the peak height region only.

- Peak Height is a user defined percentage (specified in the *InspUnitConfig.xml*) of the pixels that correspond to paste. This feature may be turned on/off per deposit type in the algorithm editor.

- Paste Volume is calculated from Area and Average Height as in previous versions of software.

Improvement on A,H & V Measurement

H = Pass	H = Pass	H = Pass
A = Fail	A = Marginal	A = Fail
V = Fail	V = Marginal	V = Fail

Please proceed to "Setting Up Report Peak Height".

Setting Up Report Peak Height

To report peak height, this can be turn on in the algorithm editor:

Activate the Report Height Peak for particular packages by selecting = 1 – On

Figure 3-25 Algorithm Editor

To set the range of the report peak height, this can be done in the *InspUnitConfig.xml* under the *c:\cpi\data* folder:

InspUnitConfig.xml

<ComputePeakHeight>

<Active>false</Active>

<HistogramStartRangePercent>N</HistogramStartRangePercent>

<HistogramEndRangePercent>M</HistogramEndRangePercent>

</ComputePeakHeight>
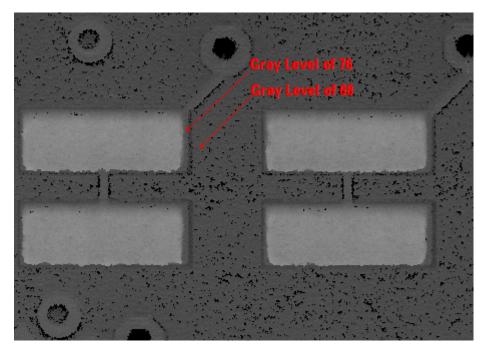
Where:

$0\% \le N \le M$

$N \le M \le 100\%$

Default values 80% (Start) and 95% (End)

Copper Thickness

The copper thickness can be measures from a scan image and entered into the system to compensate for height and volume exaggeration.

Download the ImageJ software from this website **http://rsb.info.nih.gov/ij/index.html**.

This software calculates the gray level of the image taken.

Copper thickness = (Pad Gray Level – Background Gray Level) * H/G Ratio

Example:

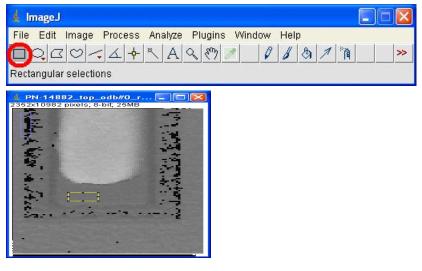Copper thickness = (76 – 68) * 3.5 = 28μm

For further information, please refer to section "Using ImageJ" on page 11.

Using ImageJ
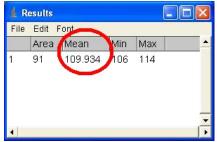
1 Open up the scan image from *c:\cpi\img\scans* by using the ImageJ software.

2 Enlarge the image by pressing the ctrl & + at the same time.

3 Go to the specified pad that is not totally cover by deposit by scrolling through the image.

4 Draw a rectangle around the pad that is not covered by the deposit using the **Rectangular selections** tool.

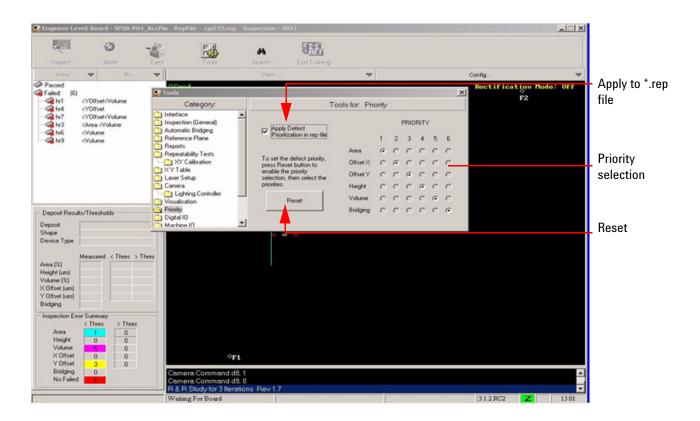5 Under the Analyze tabs, choose measure. The result will appear as shown below.

6 The mean pad grey value will be used in the calculation.

7 Repeat the same steps for the substrate grey value.

8 By using the H/G Ratio value to calculate the Copper Thickness. This value can be found in the *c:\cpi\data\ Paste_3D_Calibration_Data_ROI.txt*.

Defect Prioritization on the SP50 Inspection Report

Defect prioritization option give the user an option to choose the one type of defect to be reported out in the *.rep* file rather than all the failure for that particular deposit.

The current software behavior:

- All the defect items for a deposit will be list at the end of the deposit result line and will only list one fail item according to the preset defect priority.
- There will be an interface for the user to select the defect priority and those setting will be saved in the *InspUnitConfig.xml*.
- User can revert back to previous reporting type by disabling this function in the Tools menu.

The *.rep file where only one failed item in the top of the priority list will be displayed

Display Min, Max, Mean, ± 3 Sigma values to Area, Volume & Height Chart on Result Views

After an inspection is completed, the charts view on the Engineer level will be displayed.

- Min values to the charts for Height, Area and Volume.

- Max .values to the charts for Height, Area and Volume.

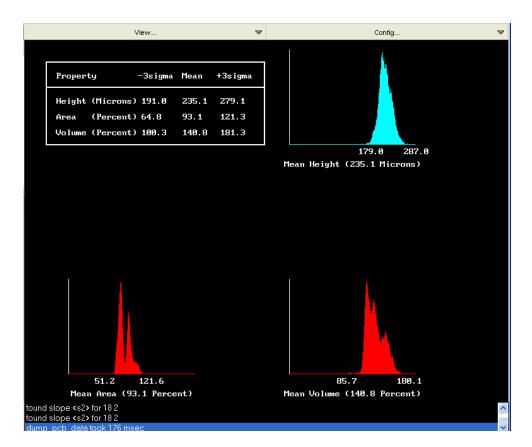- ±3 sigma values to the charts for Height, Area and Volume.

Figure 3-26 Charts view on the Engineer level

ART to Display Paste Limits

This is a new feature added to the error images to include the result and thresholds.

After an inspection is completed, the ART displays

- Min, Max and actual values of the height, area, volume, x and y offset.

- This feature can only be turn on in the *c:\cpi\data\ config.txt* file by setting the image_save feature to Image_save **4** 100 500000 1 1 0 **1**.

The first value force it to save into the AQT server and the last value is to render the image to include the value of the height, area, volume, x and y offset of the fail deposit. Plus, the thresholds value will be include into the error images. The last value can be set to **0** to disable this feature.
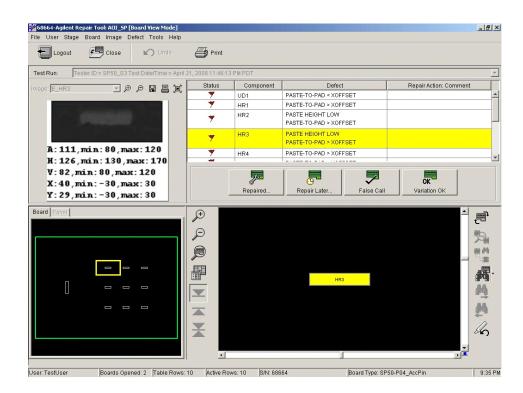
Figure 3-27 Based on these measurements, the operator can easily determine its status : False Call

Using Barcode to Trigger AWA

This is a feature that uses the barcode to trigger the AWA.

When a barcode is read by the machine it tries to find a match in the *barcode_list.txt* file and if there is no matching barcode found, the system does not proceed. If a match is found the software then tries to get the board's width from the corresponding *.plx* (or *.pls*) file. If a width is found the system will try to change the conveyor's width, but it will wait until the machine is empty – there must be no board in the machine.

Steps to Setup Barcode Triggers AWA
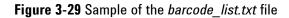
1 Ensured there's a *barcode_list.txt* in *c:\cpi\data folder* (as shown in Figure 3-28).

Figure 3-28 The *barcode_list.txt* file

Below is a sample of the *barcode_list.txt* file.

Figure 3-29 Sample of the *barcode_list.txt* file

2 Open the *config.txt* file which is located in the *C:\cpi\data* folder.

3 In the *config.txt* file, change the number of the barcode to 1 in the barcode field as shown in Figure 3-30 below.

Figure 3-30 Changing the barcode number

4 Check the **Registry** at '*HKEY_LOCAL_MACHINE\ SOFTWARE\MV Technology\GS-1\Barcode*'.

Create the **BarcodeTriggersAWA** if it is not in the list. This can be done by right clicking and choosing New, followed by choosing DWORD Value and then name it as '**BarcodeTriggersAWA**'. Set it to (1) to enable Barcode Triggers AWA, or set to (0) to disable the function as shown in the figure below.

5 Set Active and Type to 'datalogic' or 'intermec', depending on the type of barcode that is in use.

Name	Type	Data
(Default)	REG_SZ	(value not set)
ACTIVE	REG_SZ	intermec
BarcodeTriggersAWA	REG_DWORD	0x00000001 (1)
BlockSkip	REG_DWORD	0x00000000 (0)
CountIncrement	REG_SZ	0
CountMask	REG_SZ	nnnnnnnnnnnnnnnnnnnnnnnnnnnnnn
CountOffset	REG_SZ	0
LoadInReverse	REG_DWORD	0x00000000 (0)
Mode	REG_DWORD	0x00000000 (0)
Source	REG_DWORD	0x00000001 (1)
TopBottomPerLane	REG_DWORD	0x00000000 (0)
TopBottomPerLine	REG_DWORD	0x00000000 (0)
Type	REG_SZ	intermec
WriteBarcodeComponents	REG_DWORD	0x00000000 (0)

Figure 3-31 Example of both Active and Type set to 'intermec'

6 Go to '*\HKEY_LOCAL_MACHINE\SOFTWARE\MV Technology\GS-1\Barcode\Datalogic or Intermec*' and set the **LOGENABLED** and **LOGFILE** as shown below.

Name	Type	Data
(Default)	REG_SZ	(value not set)
BarcodeDelay	REG_DWORD	0x00000000 (0)
BARCODEREADERS	REG_DWORD	0x00000001 (1)
BarcodeSeperator	REG_SZ	
BARCODESPERCLUSTER	REG_DWORD	0x00000002 (2)
BAUDRATE	REG_DWORD	0x00002580 (9600)
BYTESIZE	REG_DWORD	0x00000008 (8)
EXPECTEDMAXCLUSTERDURATION	REG_DWORD	0x00000005 (5)
INITSTRING	REG_SZ	
LINES	REG_DWORD	0x00000001 (1)
LOGENABLED	REG_DWORD	0x00000001 (1)
LOGFILE	REG_SZ	c:\cpi\log\barcode.log
MAXSTOREDCLUSTERS	REG_DWORD	0x0000000a (10)
PARITY	REG_DWORD	0x00000000 (0)
SERIALPORT	REG_DWORD	0x00000004 (4)
STOPBITS	REG_DWORD	0x00000000 (0)

If the barcode function was **enabled**, the title bar on top of the window will also display "Barcode - Barcode" as shown in Figure 3-32).
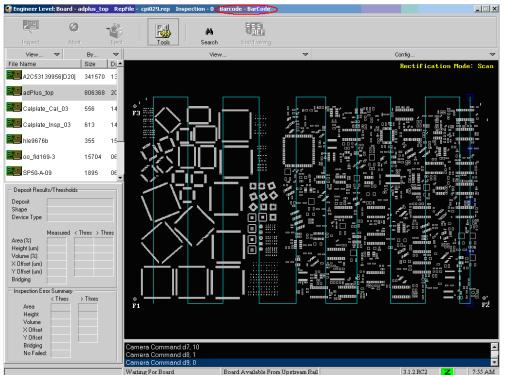

Figure 3-32 Barcode – Barcode displayed on the title bar

Also, if the **BarcodeTriggersAWA** function was **enabled** in the **Tools > Machine IO**, the '**Waiting for Good BC signal**' is active as shown in Figure 3-33. Now, the machine is ready for Inspection.

Figure 3-33 '**Waiting for Good BC signal**' highlighted

7 Switch **ON** the upstream SMEMA signal; then the barcode reader will be triggered to read the barcode. After an audible beep, the barcode reader should turn **OFF**.

If the barcode read was not in the *barcode_list.txt*, a warning message will appear on the screen as shown in Figure 3-34. In this case, the user need to **reset the PLC** (refer to "PLC Reset Procedure" on page 24) and make appropriate changes in the *barcode_list.txt*.
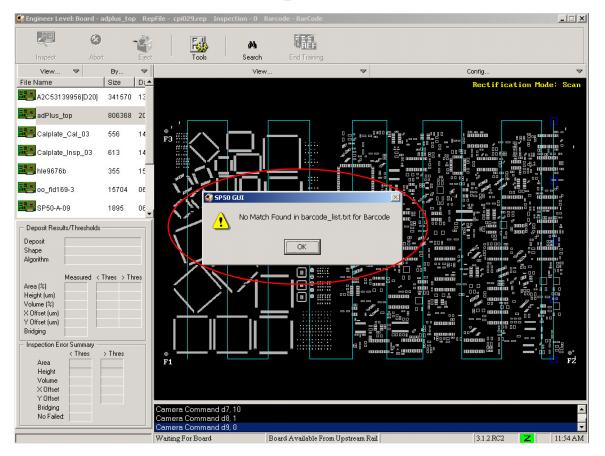

Figure 3-34 Match Not Found message

8 If the barcode read was in the *barcode_list.txt* but the **.plx* file is not in the CAD folder, there will be another warning message as shown below in Figure 3-35. In this case, create or copy the file needed into the CAD folder and click the Retry button. If the users choose to click the cancel button to abort the function, the user needs to reset the PLC (refer to "PLC Reset Procedure" on page 24).

Figure 3-35 Error message

9 Below is a screenshot of the Barcode Triggers AWA function running. Users will see the message "AWA GUI ON" shown in the status bar at the lower part of the window.
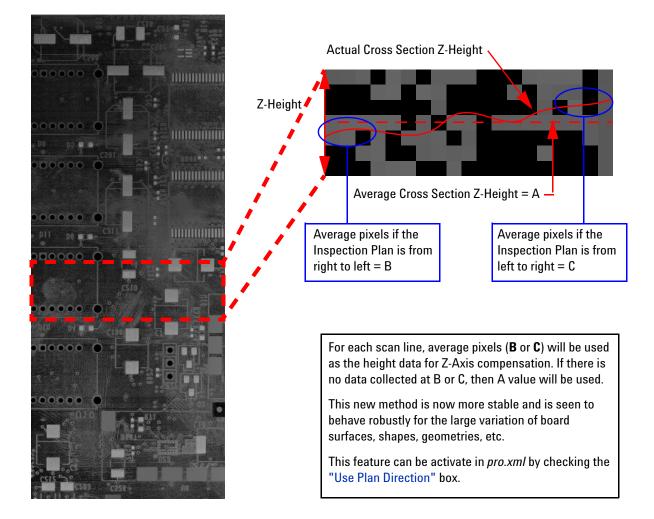

Figure 3-36 Screenshot of Barcode Triggers AWA

10 After the Inspection, the *.rep* file will contain the scanned barcode as shown in the figure below.

PLC Reset Procedure

1 Ensure that the upstream board available SMEMA signal is off, and then press the PLC Reset Button on the control panel.

2 Wait for a few seconds for the PLC to reboot.

3 During this process, the barcode reader will turn on. Wait until the barcode reader is off.

4 Now, the user can proceed with the test.

Improvement on Z-Axis Compensation

Current Z-Axis Compensation

Actual Cross Section Z-Height

Z-Height

Average Cross Section Z-Height = A

Average pixels if the Inspection Plan is from right to left = B

Average pixels if the Inspection Plan is from left to right = C

For each scan line, average pixels (**B** or **C**) will be used as the height data for Z-Axis compensation. If there is no data collected at B or C, then A value will be used.

This new method is now more stable and is seen to behave robustly for the large variation of board surfaces, shapes, geometries, etc.

This feature can be activate in *pro.xml* by checking the "Use Plan Direction" box.

Use Plan Direction

This feature can be activated in the *pro.xml* by checking the **Use Plan Direction** box under the Z-Axis Configuration.

Figure 3-37 Use Plan Direction checkbox

Added Information on Run Summary in Operator GUI

In the operator GUI (Graphic User Interface), the Run Summary column contains more information on the number of boards tested. The added information are:

- Passed – shows the number of pass boards by operator
- Failed – shows the number of fail boards by operator
- FTQ (First Time Quality) – shows the number of pass boards by the system and operator

Figure 3-38 Added information in Run Summary

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