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## **Introducing Plane5**

Hamar Laser's Plane5 software analyzes almost any layout for flatness, squareness and parallelism. Surface shapes, such as squares, rectangles, frames, circles, rings, and up to five sets of ways can be easily analyzed and plotted using 3-D graphs. The software is compatible with all of Hamar Laser's old and new continuously-rotating lasers, and several different target/interface combinations can be used to download data.

By using the Moody Method layout for surface plate measurement, the Plane5 software provides a direct comparison to existing methods of measuring surface plates, such as electronic levels, interferometers and autocollimators. Up to three surfaces (one horizontal and two vertical) can be graphed and analyzed in the same file. The plots show the least-squares, best-fit plane with shaded graphs to indicate high and low points, grid lines and the slope high point of the best-fit plane.

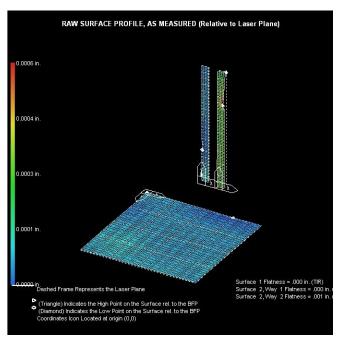


Figure 1 – Raw Surface Profile, as measured

Variable zooming and rotation capabilities allow small sections of surface plots to be analyzed in either coarse or fine mode. The *Surface Elevation Scale* is displayed as two walls behind the plotted surface, with a color scale indicating the relative values of each color on the plot. The *Surface Annotation Feature* displays X, Y and Z dimensions to any measured point on the plot surface. Multiple plot presentation methods, such as *Raw Surface Flatness* (as measured), which shows data relative to the laser plane and best fit plane, *Surface-to-Best-Fit Plane*, which shows how far each data point is from the best-fit plane (after performing the Least-Squares, Best-Fit analysis) and *Best-Fit to Laser Plane*, which shows how far out of parallel the best-fit plane is from the laser plane are included in the program.

The program automatically checks for and loads information for the connected target and interface. A random data mode is available for running the program without hardware, which is useful for training or software familiarization before performing an actual alignment. In addition, Plane5 generates reports that may be saved and printed. These reports can include graphs of the plot, data tables for single or multiple surfaces, and comparisons of multiple surfaces.

## **Installing and Running Plane5 in Windows7**

Plane5 may have difficulty accessing certain folders in Window7. To prevent these difficulties, install and configure Plane5 as follows.

- 1. Install the Plane5 software.
- 2. From the Windows Start Menu, click All Programs.
- 3. Locate and click on the Plane5 Version II folder to display the contents (*Plane5* and *Update Utility*).
- 4. Right-click *Plane5* and select **Properties** from the pop-up menu. Note that other items in your program menu will differ.
- 5. When the Plane5 properties display, click the **Compatibility** tab.
- 6. Set the following options:
  - Run this program in compatibility mode for Windows XP (Service Pack 3).
  - Run this program as an administrator.
- 7. Click **Apply** to save the settings.

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NVIDIA Corpo	Norton File Insight
Plane5 version	Properties N
😍 Plane5 🛛 🗕	3
😫 Update Utility	

lane5 Propertie:	5	k
Security	Details	Previous Versions
General	Shortcut	Compatibility
	Windows, select the	nd it worked correctly on compatibility mode that
lelp me choose t		
Compatibility mod	e	
Run this prog	gram in compatibility n	node for:
Windows XP (S	Service Pack 3)	•
Settings		
🕅 Run in 256 c	colors	
🕅 Run in 640 x	480 screen resolution	n
Disable visua	al themes	
Disable desk	top composition	
Disable displ	ay scaling on high DF	PI settings
Privilege Level		
Run this prog	gram as an administra	tor
🚱 Change setti	ngs for all users	
	ОК	Cancel Apply

## **Using Plane5**

Plane5 consists of five main steps: selecting program options, defining a project, taking data, plotting data and generating reports. When Plane5 opens, the **Program Options** menu displays, allowing changes to how the program works.

## **Selecting Program Options**

#### The General Tab

Click the **General** tab to set preferences for displaying messages and saving backup files. In addition, this menu contains a slider bar to set program performance in relation to background applications that are running on the computer.

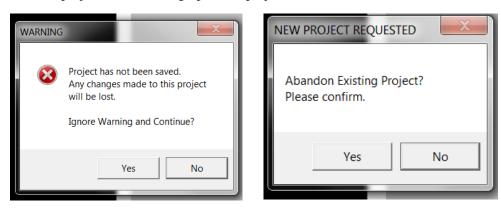
Display message to confim inten	tion to Exit program
Backup Data Files (DISABLE IF	LOW ON DISK SPACE)
Backup Folder name: BACKUP	
CAUTION: Existing files in the Ba replaced every time data is save	
Plane5 Performance Setting vs. E	
•	•
Fastest	Slowest
EDIT DEFAULT PRINTOUT USER I	NFORMATION HEADER

#### The Alignment Steps Button Toolbar

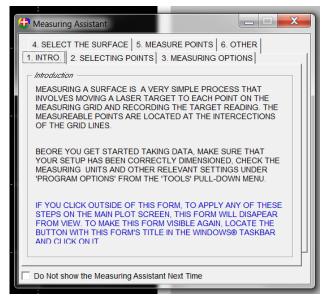
Check **Enable Alignment Steps Button Toolbar** to enable or disable the alignment toolbar. This toolbar provides a convenient way to access program features.

E SETUP PROJECT & MEASURE SURFACE(S) - PLOT (DISPLA	AY) SURFACE(S) 📓 REVIEW / PF	INT DATA
-----------------------------------------------------	------------------------------	----------

• Click **Setup Project** to set up a new project. Messages are displayed prompting to either save or abandon the current project before setting up a new project.



Click Measure Surfaces to display the • Measuring Assistant. This is a help screen, providing step-by-step instructions for selecting and measuring points, measuring options and selecting surfaces. Click Do Not Show the Measuring Assistant Next Time to disable Measuring Assistant and display the Surface 1 Data Taking Screen.



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Click the down arrow next to **Measure Surfaces** to select the surface to be measured. •

<b>3</b> H	HAMAR LASER - Plane 5, Project Folder= C:\Program Files (x86)\F	Plane5 ve	rsion II\l	DATA\COMMO	N\24-Jan-1	4@09	h39m	
File	Reports Presentation Plot Measure Tools							
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	Click <b>Plot (Display) Surface(s)</b> to display the Iso Surfaces plot, showing all surfaces that have been			(Demonds Indicates 9	en en en el este este este este este este este e			81/1 a (196) 2001 s. (19-
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) (	Click <b>Review/Print Data</b> to review the data and	X distance	Y distance	Raw Flatness Data	As Configured/Plotte	d* 🚺	X ∠ .0099 X ∠ .001294/FT	din a
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		•					Do Not Print Graphics	close this window and
					Data Presentation Option figured & Shown on the F		Print graphics in B&W on color printers	re-configure the plot on the main window.
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		.00	99 Surface	1 - 27		-		-

COMPARE to:

12 N/A

13 N/A

Also located on the **General** tab is **Edit Default Printout User Information Header** to customize plot printouts.

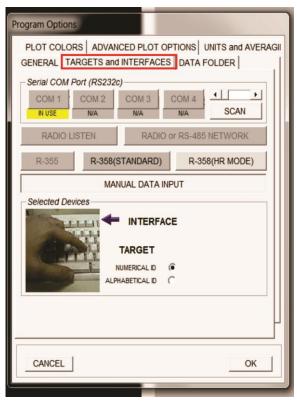
	Printout Title	and a with proper with an extract 1
pgram Options   PLOT COLORS   ADVANCED PLOT OPTIONS   UNITS and AVERAGE GENERAL   TARGETS and INTERFACES   DATA FOLDER	HAMAR LASER - Plane 5 Report	
Display message to confirm intention to Exit program		
Backup Data Files (DISABLE IF LOW ON DISK SPACE)     Backup Folder name: BACKUP     CAUTION: Existing files in the Backup folder will be		<ul> <li>✓</li> </ul>
replaced every time data is saved.	Optional Header Information	
I Enable Alignment Steps Button Toolbar	Company Name:	
Plane5 Performance Setting vs. Background Applications	Address:	✓
•	City:	¥
Fastest Slowest	State/ Province / Zip:	¥
EDIT DEFAULT PRINTOUT USER INFORMATION HEADER	Country:	
	User Name:	
	Station / Location:	
ŕ	Comments:	
	CANCEL	SAVE AS DEFAULT APPLY and CONTINUE

### The Targets and Interfaces Tab

When Plane5 starts, it scans for the target and interface connected to the computer and automatically selects the detected items when the Program Options screen displays. If an interface is *not* detected, the program automatically sets the data acquisition default to *Manual Data Input*. This is designated by a keyboard picture as the selected device.

The following procedure can be used to reconfigure the interface and target manually. You may skip these steps if the target and interface were identified correctly.

- If you know the COM port (serial port) used by your computer to connect to the Hamar Laser interface, click on the COM port button to initialize it
- Connect the Interface. If the interface has a power switch, turn it on. Click **Scan** to attempt to locate and identify an interface connected to any available serial port. If an interface is not recognized automatically because it is not connected to the computer, click on the appropriate interface selection button.



#### **Selecting an Interface**

#### **Radio Listen**

Select **Radio Listen** to use the R-1310 Receiver on a handheld PDA. The R-1310 transmits to the target(s) and Plane5 will "listen" for the data.

#### Radio or RS-485 Network

When this selection is made and COM 1 is the active COM port, a picture of the R-910 Radio Interface displays. Compatible targets for this selection are the A-1519-2.4ZB\A-1519-2.4XBE and the A-1520-2.4ZB\A-1520-2.4XBE. If the interface is connected to a COM port other than COM 1, select the appropriate COM port.

Program Options					
PLOT COLORS GENERAL TAI		ICED PLOT OPTI			
COM 1	COM 2 N/A		COM 4	• SCAN	
RADIO LIS	TEN	RADIO	or RS-485	NETWORK	
R-355	R-358(	STANDARD)	R-35	8(HR MODE)	
	MA	NUAL DATA INF	UT		
Selected Devi	-	TARGET	•		
CANCEL				ок	

#### R-358 Interface/R-358 HR Mode

This selection displays an image of the R-358 Interface. Ensure that you have selected the correct interface, or no data will display on the screen. These interfaces are used with the A-517 Target.



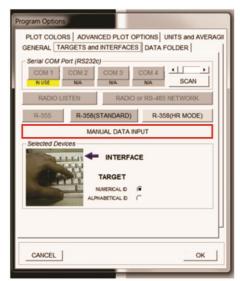
#### Selecting an Interface for Infrared Targets

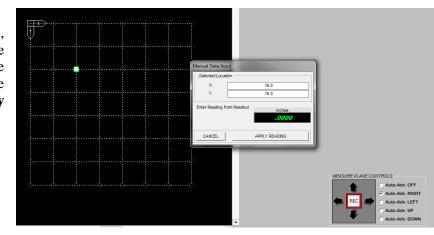
When using Hamar Laser's older A-1519 IR targets, select the R-358 (Standard) Interface. These targets are identified *alphabetically*, so ensure that the Alphabetical ID box is checked when using these targets.

#### **Manual Data Input Mode**

Select **Manual Data Input** mode to run Plane5 without targets or interfaces. This is useful for training purposes, to become familiar with the program, or to enter data from a readout.

Before using **Manual Data Input** mode, a new project must be set up. See *Setting up a New Project* beginning on Page 10 for further information.

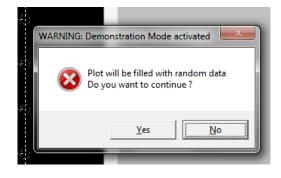


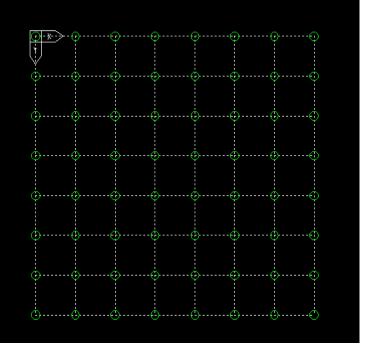


When the measuring screen displays, double-click on any point on the surface. Press the spacebar or click the **REC** (Record) button to bring up the **Manual Data Input** box. Click **Apply Reading** when the data is entered.

#### **Random Data Mode**

A plot may also be filled with *random* data when using **Manual Data Input** mode by doubleclicking any point on the surface and hitting the **R** key. Click **Yes** to fill the plot with random data.





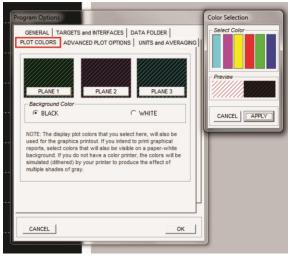
#### The Data Folder Tab

Select **Data Folder** to specify the folder where Plane5 saves collected data.

#### rogram Options PLOT COLORS ADVANCED PLOT OPTIONS UNITS and AVERAGE GENERAL TARGETS and INTERFACES DATA FOLDER Select root folder where data will be stored C: [OS] -C: Program Files (x86) Plane5 version II BACKUP COMMON CONFIGS Ø Data will be stored within the following folder, or a Sub-Folder within this folder. C:\Program Files (x86)\Plane5 version II\DATA CANCEL OK

#### **The Plot Colors Tab**

Select **Plot Colors** to change the background used when printing plots (black or white) or to change the line color for each plane. Click on the *label* for a plane (Plane 1, Plane 2, Plane 3) to open the Color Selection menu. Click **Apply** when the selection has been made.

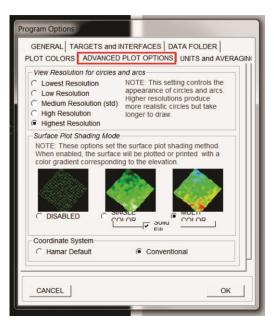


#### The Advanced Plot Options Tab

Select **Advanced Plot Options** to change the graphic resolution for circles and arcs for faster drawing. Circles and arcs will not be defined with lower resolution settings.

Select an option in **Surface Plot Shading** to disable or select single or multiple colors for shading plots.

**Coordinate System (Hamar Default)** places the X-zero and Y-zero coordinates in the upper left hand corner of Surface 1, the lower left corner of Surface 2, and the lower right corner of Surface 3 on the plot screen.



#### The Units and Averaging Tab

Select **Units and Averaging** to select measurement units, the number of readings to average and the number of decimal places to be displayed when using Plane5.

- Select the **Measurement units** (English or Metric). Note: If data is loaded from a saved project, the program will not allow the measurement units to be changed unless a new project is started. This is intended to prevent mixing measurement units within a project.
- Select the Number of Decimal Places using the Display Resolution scroll bar.

Note: Selecting fewer decimal places than what the interface or target resolution allows does not limit the accuracy of the measurements. The program processes data internally at the measuring device's full resolution. The number of decimal places only determines how many zeroes are displayed to the right of the decimal point. For example, to display data showing measurement data rounded off to the nearest .001 in., set the number of decimal places to 3.

rogram Options	
GENERAL TARGETS and INTE PLOT COLORS ADVANCED PL	ERFACES DATA FOLDER
Measurement Units Num ENGLISH UNITS (in)	Display Resolution.
Averaging 1 # of Samples NOTE: Use to 'dampen' air turbu Laser Beam stability. Each Rear average of all the last # of samp of Samples to one, effectively di	ding becomes a running bles' defined here. Setting the #
CANCEL	ок

• Select **Number of Samples** using the **Averaging** scroll bar. The live target reading displays the running average of the last number of reading samples. For example, if using five samples, the reading displayed is a running average of the last five readings received. The running average works as follows. As each new reading is received, the oldest reading sample is discarded, and the new reading sample takes its place. A new average is calculated consisting of the four oldest reading plus the new reading divided by 5.

#### **Project Selection**

Once the **Program Options** have been selected, click **OK.** You will be prompted to:

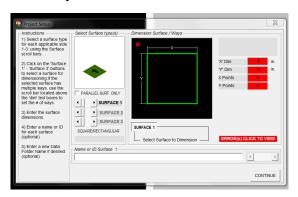
- Set up a new project
- Start a new project using a previously saved file as a template (a template contains setup information only— no data)
- Load an existing project that has been previously saved.



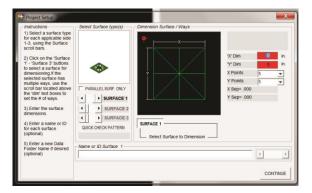
### Setting up a New Project

#### **Selecting Surface Type(s)**

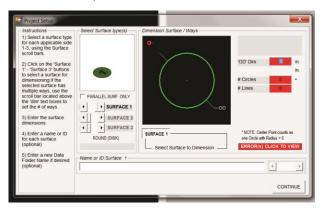
To begin setting up a new project, select a surface type that reflects the alignment being performed. Three orthogonal surfaces may be selected. Using the scrollbar or arrow key next to each **Surface** number, select one of the following choices:



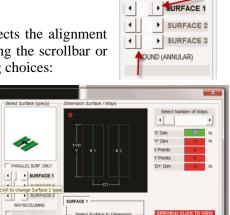
**Square/Rectangular** – surface plates, machinery tables or any surface that has a square or rectangular shape



**Moody Method** – this represents the Moody Method of measuring the flatness of a square or rectangular surface, which is typically used with autocollimators, interferometers, and electronic levels



**Round Surface (Disk)** -- used to measure the flatness of the table of a Vertical Turning Center or similar round surface

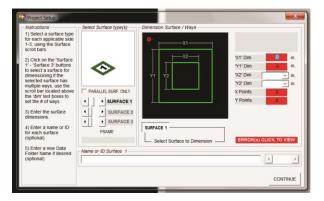


PARALLEL SURF. ONLY

•

CONTINUE

**Ways/Columns** – up to five machine ways or columns can be measured simultaneously





Square Flange (Frame) - this represents a square

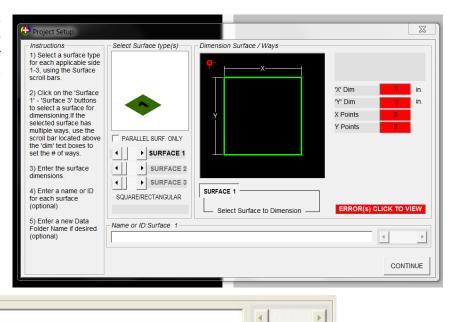
Project Setup				×
Instructions 1) Select a surface type for each applicable side 1-3, using the Surface scril bars. 2) Cick on the "Surface 1' - Surface or buildons to select a surface for dimensioning if the selected surface has multiple ways, use the selected surface has multiple ways, use the selected surface has multiple ways, use the selected surface has multiple ways. 3) Enter the surface dimensions. 4) Enter a name or ID for each surface (optional)	PARALLEL SURF. ONLY  PARALLEL SURF. ONLY  PARALLEL SURF. ONLY   SURFACE 2  SURFACE 2  SURFACE 3  ROUND (ANNULAR)	Dimension Surface / Ways	'OD' Dim 10' Dim # Circles # Lines ERROR(s) CLI	0 in. 0 0 0 0
5) Enter a new Data Folder Name if desired (optional)	Name or ID:Surface 1			

**Round Flange (Annulus)** -- used to measure large flanges, such as windmill tower flanges or crane bearing surfaces

In the following example, the project is comprised of two surfaces: a simple square or rectangular plane on Surface 1 and two columns on Surface 2.

- 1. Select the Surface 1 type using the **Surface 1** scrollbar. In this example, a simple square/rectangular surface was selected.
- 2. Enter a name to identify the surface (optional). Surface 1, Surface 2 and Surface 3 are the default names.

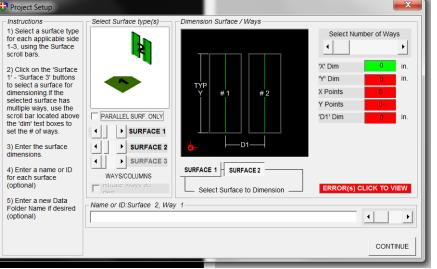
Name or ID:Surface 1



- Select the Surface 2 type using the Surface 2 scrollbar. In this example multiple ways/columns were selected.
- 4. Select the number of ways/columns for Surface 2 using the scrollbar. This scrollbar is enabled for ways/columns surface types only.

Select Number of Ways

4



- Enter a name for Surface 2 (for example, Surface 2, Way 1). Use the scrollbar to select the Way/Column to name.
- 6. When surface selection is complete, click **Continue.**



**NOTE:** After selecting and naming the surfaces, do not use the surface type selection scroll bars unless you intend to change the surface type. You will lose the settings previously entered. Use the **SURFACE 1** ... **SURFACE 3** buttons to select the surface to name and dimension (see Figure 2).

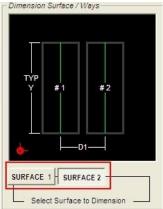


Figure 2 – Surface selection buttons

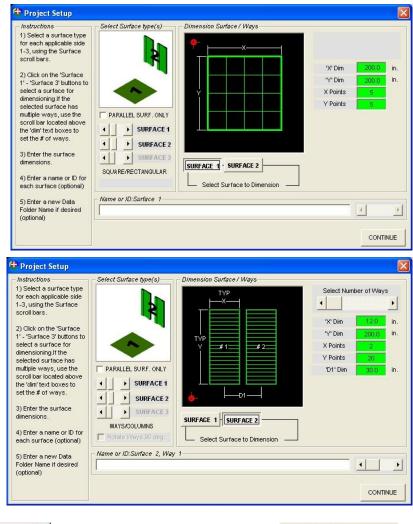
#### **Entering Dimensions**

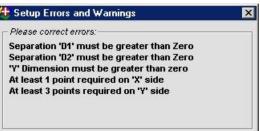
- 1. Select Surface 1 for dimensioning by clicking on the **SURFACE 1** button.
- 2. Enter the dimensions for Surface 1 in the dimension fields. Press ENTER after entering a value in a dimension field.
- 3. Select Surface 2 for dimensioning by clicking the **SURFACE 2** button.
- Enter the dimensions for Surface
   2 in the dimension text fields.
   Press ENTER after entering a

value in a dimension field.

5. Click **Error(s)** Click to View to display missing data or parameters that are outside of the allowable range. *This bar is only visible when setup errors exist.* 

ERROR(s) CLICK TO VIEW





SURFACE 1 . 'X' Dim 200.0 in. 'Y' Dim in. 200.0 X Points Y Points 'X' Dim in. 'Y' Dim in. X Points Y Points 'D1' Dim 30.0 in.

*Note: Green text fields indicate that the values entered are valid. Click* **CONTINUE** *when finished.* 

#### Measuring a Surface and Taking Data

- 1. From the **Measure** menu, select the surface to be measured. The main plot area displays a grid representing the surface's plane view to be measured.
- 2. If the measuring target has not been selected, select it by pressing one of the buttons on the lower right of each target display. The selected measuring target is identified by an arrow pointing to the target number (see Figure 3).
- 3. Surface measurements are taken at any intersection of two lines on the measuring grid. To measure a point on the surface, move the mouse cursor to an intersection on the grid. Note that the cursor changes from a cross to a target icon to indicate that the cursor is located at a measurable location. Double-click on the measurable location to mark the starting point. A solid dot (measurement cursor) displays to make the selected measurement location easy to identify, and

Auto Advance and Record buttons are available on the **Record** screen.

4. To advance to the next point of the grid after recording a measurement, select Auto-Advance mode under *Measurement Options*. For example, to auto-advance to

right of the previous point, select *Auto-Advance Right*. The measurement cursor moves in the selected direction until it is overridden with an arrow key on the computer keyboard or Auto-Advance is disabled.

5. To record the target measurement at the selected location, ensure that the target is physically located at the selected point on the computer screen. After moving a target to a new location, allow the target reading to stabilize, especially when averaging is set to a high number of samples.

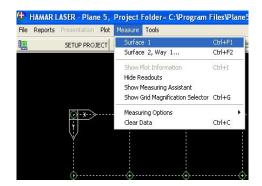
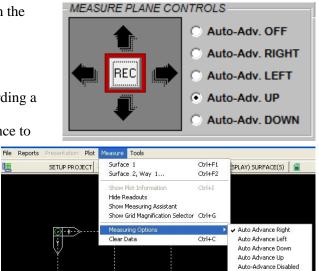




Figure 3 – Selecting the Measuring Target



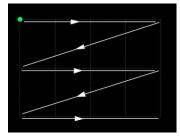


Figure 4 – Path of data points when Auto-Advance Right is selected

Press the **SPACEBAR** or click **REC** to record data. If a point is recorded with the target at the wrong location, retake the data.

6. Points that have already been measured are identified by a circle, about half the size of the measurement cursor. If the measurement cursor is placed over a point that has already been measured, the shape changes from square to round.



Auto-Adv. OFF
Auto-Adv. RIGHT

Auto-Adv. UP
 Auto-Adv. DOWN

Auto-Adv. LEFT

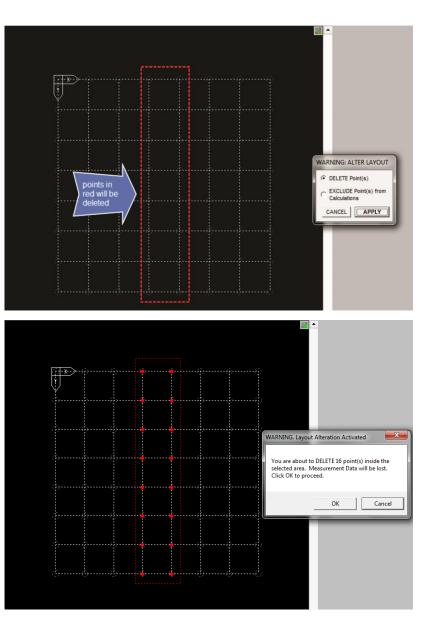
MEASURE PLANE CONTROLS

- 7. Repeat Steps 1-5 until all surfaces are measured. It is advisable to save the data after measuring each row/column of points. Data may be saved as frequently as desired during a measurement session.
- If more than one surface needs to be measured, click MEASURE and select the next surface to be measured.

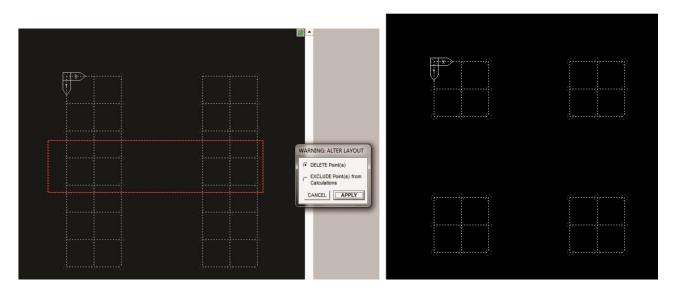
File	Reports	Presentation	Plot	Measure	Tools		
		SETUP PRO	DECT	Surface Surface	e 1 e 2, Way 1	Ctrl+F1 Ctrl+F2	SPLAY) SURFACE(S)
				Hide Re Show M	lot Information eadouts leasuring Assistant irid Magnification Selector	Ctrl+I Ctrl+G	
		<u>⊙-*-</u> >		Measur Clear D	ing Options ata	Ctrl+C	<ul> <li>Auto Advance Right</li> <li>Auto Advance Left</li> </ul>
							Auto Advance Down Auto Advance Up Auto-Advance Disabled

#### **Deleting Points from a Measurement Surface**

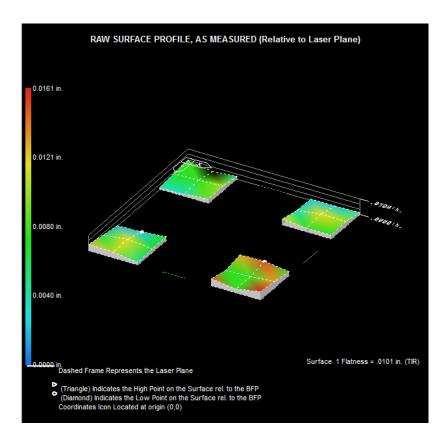
- 1. From the **Measure** menu, select the surface to be altered.
- 2. Move the cursor to a point above and to the left of the point(s) to be deleted. Hold the **Ctrl** key and left mouse button down together and pull the cursor down and to the right. A dotted red line will form around the point(s) to be deleted.
- 3. Release the left mouse button and the **Ctrl** key. A popup window displays.
- Select either DELETE Point(s) or Exclude Point(s) from Calculations and click Apply. Selecting DELETE Point(s) deletes the point(s). If EXCLUDE Point(s) from the Calculations is selected, the points will remain on the plot but will not be calculated in the results.
- 5. Confirm the action by clicking **OK**.



6. To delete or exclude additional points, repeat Steps 2-5.

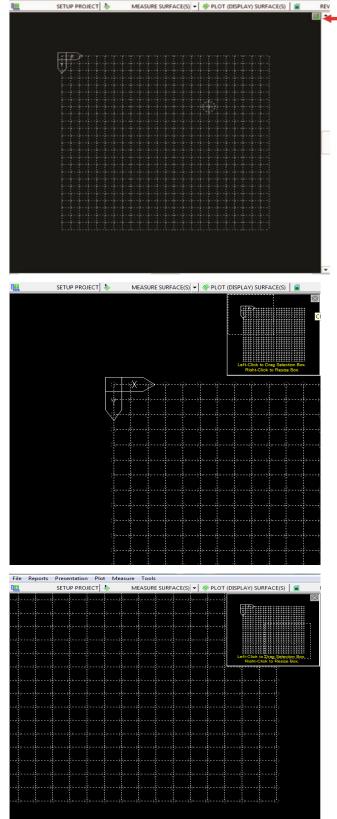


7. After taking data, click **Plot Surface(s)**. The flatness plot displays, as shown below. Note that the flatness data specified is the *overall* flatness of all the points recorded in the Measure Screen.



#### Zooming in on a Surface

If there are many points to be measured on a surface, it is often difficult to identify a measurement location on the grid. Click the icon in the upper right corner of the Measure Screen to enable the **Zoom** feature.

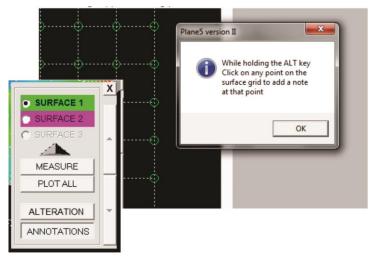


A representation of the screen displays with a box highlighting the X-zero and Y-zero coordinates. Left-click on this box with the mouse and drag to any area of the grid to zoom in. File Reports Preser

#### **Annotating a Surface**

Right-click anywhere on a measured grid or plotted surface to display a menu to annotate the surface. The specific surface may be selected from this menu and a plot may be generated from a measured grid.

- 1. Double-click Annotations.
- 2. Hold the **Alt** key and click on any point of the surface to display the **Surface Annotations** screen (see Figure 5).



- 3. Select an annotation to add to the point from the list or click **Other** to add a new annotation. Click **Apply** to add the annotation to the surface. In the example, *Start Point* is added.
- 4. Other selections from the **Surface Annotations** screen include specifying the text direction for the annotation, editing annotations, and clearing all annotations from the surface.

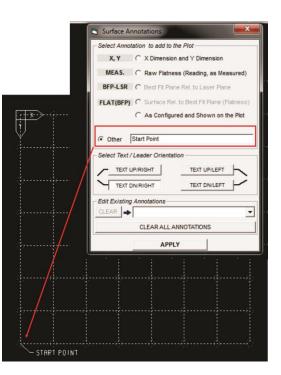


Figure 5 – Annotating a Surface

#### **Measuring and Plotting Parallel Surfaces**

Plane5 provides an option for measuring the parallelism of two surfaces. The parallelism options are two horizontal rectangular surfaces, two vertical rectangular surfaces, or two vertical, round flange-type surfaces.

1. To set up a parallel surface project, click the **PARALLEL SURF. ONLY** box in the Project Setup Screen.

😌 Project Setup		
<ul> <li>Instructions</li> <li>Select a surface type for each applicable side</li> <li>1.3, using the Surface scroll bars.</li> <li>2) Click on the 'Surface 1'- 'Surface 3' buttons to select a surface for dimensioning! the selected surface has multiple ways, use the scroll bar located above the 'dm' text boxes to set the # of ways.</li> <li>3) Enter the surface dimensions.</li> <li>4) Enter a name or ID for each surface (optional)</li> </ul>	Select Surface type(s)	Dimension Surface / Ways X <sup>*</sup> Dim 0 in. Y <sup>*</sup> Dim 0 in. Y <sup>*</sup> Dim 0 in. Y <sup>*</sup> Dim 0 in. X <sup>*</sup> Dim 0 in. Y <sup>*</sup> Dim 1 in. Y <sup>*</sup>
5) Enter a new Data Folder Name if desired (optional)	Name or ID:Surface 1	CONTINUE

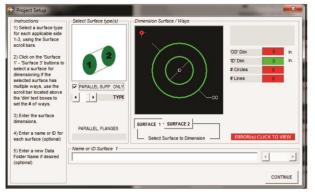
2. When **Parallel Surf. Only** is clicked, the Setup Screen displays two horizontal surfaces. Click **Type** to scroll through the options for parallel surfaces and select the one that is applicable to your project.

Project Setup				Project Setup		and the second se	×
Instructions 1) Select a surface type for each applicable safe sorial bars. 2) Click on the "Surface r - Surface 3 buttons to select a surface for dimensioning if the safeticed surface hah- scrib far located above the 'stir fact boxes to set the # of vays. 3) Enter an same or D for each surface (optional)	Select Surface type(3)	Dimension Surface / Ways	20 Dm Para Para 10 Dm S Para 10 Points Para 11 Points Para 12 Points Para	<ul> <li>Instructions</li> </ul>	ParaLLEL SURF COLV	- Dimension Surface / Ways	X: Dim         0         in.           Y* Dim         0         in.           X: Points         0         in.           Y Points         0         in.
5) Enter a new Data Folder Name If desired (optional)	Name or ID:Surface 1			5) Enter a new Data Folder Name if desired (optional)	Name or ID:Surface 1	17	• •
			CONTINUE				CONTINUE

Parallel Surfaces Only Types

Two Horizontal Planes





**Round Vertical Flange-Type Surfaces** 

- 3. Enter the dimensions for Surface 1 as described in Dt Measure Tools Entering Dimensions on Page 12.
- 4. Click Surface 2 and enter the dimensions for the second surface.
- 5. Click Measure and select either Surface 1 or Su 2.

or the	Show Plot Information	Ctrl+1	
	Hide Readouts		
	Show Measuring Assistant		
ırface	 Show Grid Magnification Selector	Ctrl+G	-62
	Measuring Options	+	
	 Clear Data	Ctrl+C	
		Ч.	7

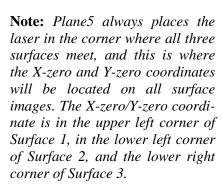
ð

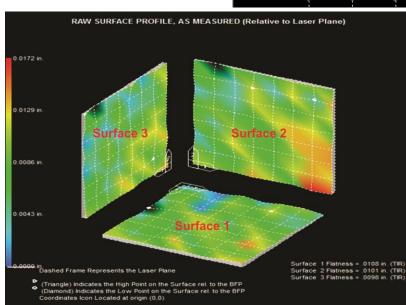
Surface 1

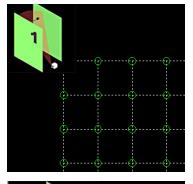
Surface 2

The Measure screen displays with the parallel surfaces image in the 6. upper left corner. The surface to be measured is labeled. Take measurements at each measurement point as described in Measuring a Surface beginning on Page 13.

7. Click Measure, select the other surface, and repeat the process for measuring a surface.



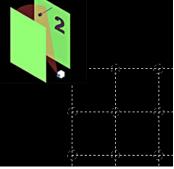




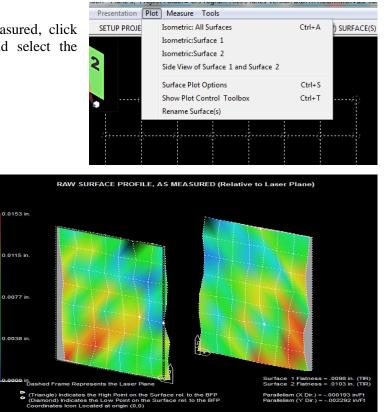
Ctrl+F1

Ctrl+F2

IRFACE(S)



8. After both surfaces have been measured, click **Plot** at the top of the screen and select the surface(s) to be plotted.



### **Plotting Data**

1. Click **Plot** to display a menu for selecting the surface(s) to be plotted. Each surface can be plotted individually, or all surfaces can be plotted in a single view by selecting Isometric All Surfaces. Surface selections can be changed at any time by clicking Plot and making a different selection.

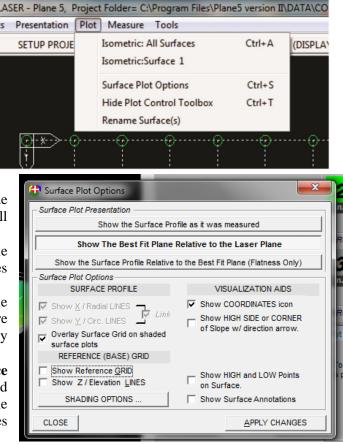
5

- 2. Click Surface Plot Options to define the options to display in the plot.
  - Show X/Radial Lines displays the radial lines through a circle when the selected surface is round. The X lines will intersect the Y lines.
  - Show Y/Circ. Lines displays the circle lines when a surface is round. The X lines will intersect the Y lines.

Note: The X Radial Lines and the Y Circle Lines are normally linked so both are viewed. They may be unlinked by unchecking the Linked Box.

- **Overlav Surface Grid on Shaded Surface** Plots displays a measurement on shaded plots, making it easier to determine measurement points on the plot. This does not apply when shading is disabled.
- Show Reference Grid displays the reference grid under the plot.
- Show Z/Elevation Lines displays elevation lines from the reference grid to the surface plot.
- 3. Click Shading Options to change the graphic resolution for faster drawing. Circles and arcs will not be defined with lower resolution settings. Shading may be disabled, and single or multiple colors may be selected.

Coordinate System (Hamar Default) places the X-zero and Y-zero coordinates in the upper left hand corner of Surface 1, the lower left corner of Surface 2, and the lower right corner of Surface 3 on the plot screen.

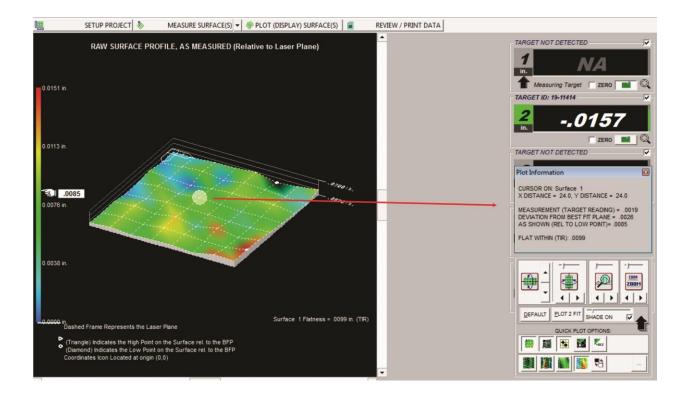


Program Options
GENERAL TARGETS and INTERFACES DATA FOLDER PLOT COLORS ADVANCED PLOT OPTIONS UNITS and AVERAGING
View Resolution for circles and arcs           C         Lowest Resolution         NOTE: This setting controls the           C         Low Resolution         appearance of circles and arcs.           C         Medium Resolution (std)         Higher resolutions produce more realistic circles but take longer to draw.
Surface Plot Shading Mode NOTE: These options set the surface plot shading method. When enabled, the surface will be plotted or printed with a color gradient corresponding to the elevation.  O DISABLED O SINGLE COLOR O MULTI COLOR O MULTI COLOR
Coordinate System C Hamar Default C Conventional

- 4. Visualization Aids contains options for viewing the plots.
  - Click **Show Coordinates icon** to turn the X-zero and Y-zero coordinates icon on or off for each plot.
  - Click Show High Side or Corner of Slope w/direction arrow
  - Click **Show HIGH and LOW points on Surface** to activate or deactivate the high and low point icons on the plot.
  - Click Show Surface Annotations to display the name of the surface on the plot.

#### Identifying Data for a Measured Point on a Plot

Moving the cursor over a measured point displays the measurement reading for that point on the left side of the screen. In addition, a Plot Information box appears on the right side of the screen identifying the X-Y coordinates of the measured point, the target reading value, the deviation from the Best Fit Plane, the "As Shown" reading and the flatness of the surface.



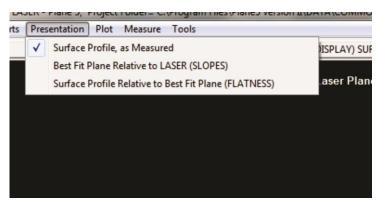
#### **Changing How the Plot is Presented**

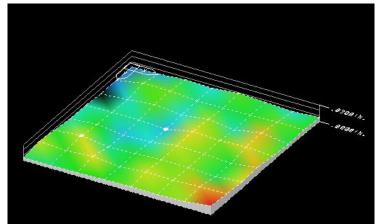
Click **Presentation** in the Action Bar to list the options for displaying a plot.

#### • Surface Profile as Measured (Default presentation)

Selecting **Surface Plot as Measured** displays a plot showing the measured points' deviation from the laser plane. If any measured points are a negative number (below the laser plane), the program detects the most negative point and adds that number to all the other measured points. The most negative point then becomes zero, so all measured points are either zero or positive numbers and all points will either be displayed at or above the laser plane.

When **Review/Print Data** is selected, the Raw Flatness data displays the actual measurement at each location and the **As Configured/Plotted Data** will display as positive numbers since Plane5 adds the most negative number to all of the **Raw Flatness Data** numbers.





EXPORT DA	Surface	Surface 1 (	Surface 1) 1 2	3 Selected Surface
PRINT REPOR	RT		4	
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0	8.0	0073	.0007	'Best Fit' Slopes
0	16.0	0081	.0000	Y∠ .001103/FT
0	24.0	0041	.0040	Printout Configuration NOTE: The
0	32.0	0038	.0042	Do Not Print Data Tables. graphic that
0	40.0	0012	.0069	Print summary only. De printed is
0	48.0	.0033	.0114	C Print Data Table for main window
0	56.0	0023	.0057	Selected Surface Only change the
8.0	0	0063	.0017	Surfaces graphic prin
d f	I			Do Not Print Graphics close this window and
			<u> </u>	Print graphics in re-configure
			Data Presentation Options	B&W on color plot on the n
		As	Configured & Shown on the Plot	<ul> <li>printers</li> <li>window.</li> </ul>
Surface1 Flat	ness and Squaren	ess Surfac	e 2, Flatness / Squareness	Surface 3, Flatness / Squareness
	99 Surface			
COMPA	RE to: 🕄	\$ (	COMPARE to: 😌	COMPARE to: 😌
⊥ 2 N/	A	- - -		▼ 1 1 N/A
	A	 		▼ 12 N/A

• Best Fit Plane Relative to LASER (SLOPES) Selecting Best Fit Plane Relative to LASER (SLOPES) plots the Best-Fit Plane relative to the laser plane. This is a representation of the slope of the Best-Fit Plane relative to the laser plane with no deviation in the surface from point to point. The only deviation will be a slope between the two planes. This is useful when measuring levelness of a surface or measuring the parallelism of one surface to another.

The **Raw Flatness Data** in the report is the data that was recorded at each measured point and the **As Configured/Plotted Data** column in the report is the corrected data.

• Surface Profile Relative to Best Fit Plane (FLATNESS)

Selecting **Surface Profile Relative to Best Fit Plane (Flatness)** displays a plot of the true flatness of the measured surface. This plot shows the deviation of each point relative to the best fit plane.

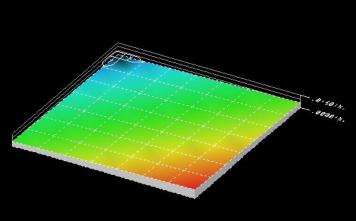
 rts
 Presentation
 Plot
 Measure
 Tools

 a
 Surface Profile, as Measured
 JISPLA

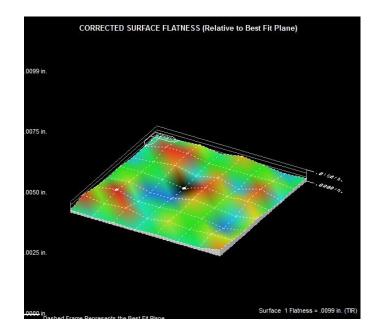
 a
 ✓
 Best Fit Plane Relative to LASER (SLOPES)

 o
 Selected Datum = LASER
 ✓

 Surface Profile Relative to Best Fit Plane (FLATNESS)

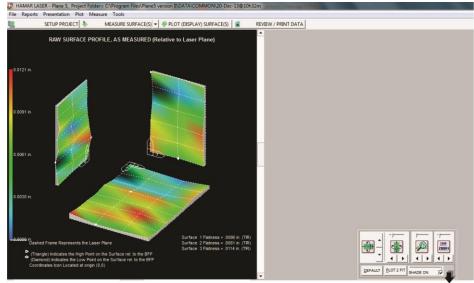


	Pre	sentation Plot Measure Tools
		Surface Profile, as Measured
Ī		Best Fit Plane Relative to LASER (SLOPES)
	$\checkmark$	Surface Profile Relative to Best Fit Plane (FLATNESS)



#### **Plot Viewing and Shading Options**

Plot Viewing Options are located in the lower right corner of the Plot screen. Click the down arrow to display the **Quick Plot Options**. Hover the mouse over any option to determine its purpose.



**Plot Viewing Options** allow the plot view to be adjusted. The view may be rotated, zoomed in or out, or the surface distortion may be magnified. Experiment with the plot view to best illustrate the alignment relationship.

The viewing options are as follows (from left to right):

**Pitch** – rolls the image vertically.

Yaw – rolls the image clockwise and counterclockwise.

**Magnify** – magnifies the image to better display the high and low points.

**Zoom** – zooms in or out on the *entire* image. To *selectively* zoom into an area of any surface:

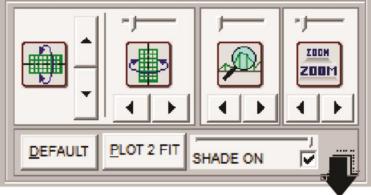
- 1. Hold down the **SHIFT** key.
- 2. Left-click on the plot around the area to zoom.
- 3. Drag the mouse to draw a box around the area.
- 4. Release the mouse and the SHIFT key
- 5. To restore the full view, click on the DEFAULT or PLOT 2 FIT buttons in the control box.

**Default** – returns the image to the default size if an area has been enlarged.

Plot 2 Fit – resizes an image to fit the screen.

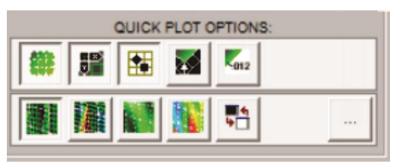
**Shade** – turns shading on or off when the arrow is used to bring up the Quick Plot Options for shading. **Up/Down Arrow** – opens/closes the Quick Plot Options panel for shading options.





#### **Quick Plot Options**

The Quick Plot options provide a variety of shading schemes for a plot. The **Shade On** box must be enabled in the **Plot Viewing Options** to perform shading of a plot. To determine the purpose of a Quick Plot Option, hover the mouse cursor over any box to display an explanation. Experiment with these shading options to display the plot in a way that is most participation.



satisfactory. Some examples are shown below.

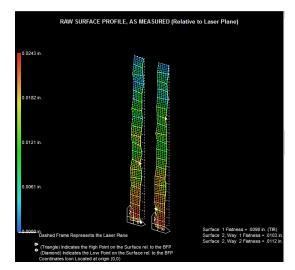
The shading options are as follows (from left to right):

#### Upper row (Display)

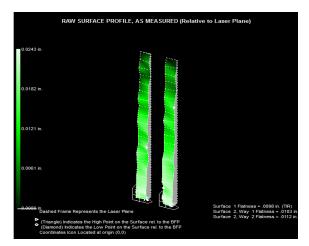
- 1. Displays/hides the overlay grid
- 2. Displays/hides the X=0, Y=0 icon
- 3. Displays/hides the low and high point markers
- 4. Displays/hides the corner arrow marker
- 5. Displays/hides annotations

#### **Bottom row (Coloring)**

- 1. Single-color gradient mesh
- 2. Multi-color gradient mesh
- 3. Single-color gradient shade
- 4. Multi-color gradient shade
- 5. Changes background white or black



Multi-color gradient mesh



Single-color gradient shade

## **Reporting Data**

When plotting is completed, click **Reports** to save the plot area image and to review/print data.

**Review/Print Data** is also an option on the **Alignment Steps Button Toolbar**.

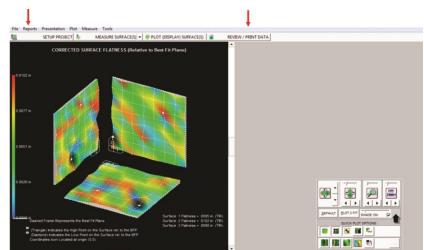


Figure 6 – Reports and Review/Print data shown on the toolbars

## **Exporting Data**

Select **Export Data** to save the data to a user-specified folder. Data is saved in a format suitable for importing into an Excel file. Graphics are not exported.

🔂 Data Report	★ Favorites Name     ■ Desktop	st.dat	ita Report		Date modified T	lype Size	22	1	
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	File name: exported dat Save as type: Raw Data Files (".dat)							1	

Before printing, a window displays allowing changes to be made to the Printout Header.

🔁 Data Report							
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X distance	HAMAR LASER - Plane 5	Report					
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0	Prepared on 1/28/2014 a	4-25-30 PM					graphic that will be printed is the
0	Frepared on 1/20/2014 a	1.25.50 PM					plot shown in the
0	Optional Header Information						main window. To change the
8.0	Company Name:					•	graphic printout,
•	Address:						close this window and
	City:						re-configure the
	State/ Province / Zip:						plot on the main window.
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<u>1300014</u>					-		

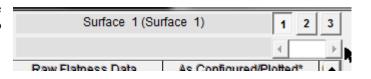
### The Data Report Screen

When the **Data Report** screen displays, in addition to the X and Y distances, the **Raw Flatness Data** indicates the measurement taken at each point. The **As Configured/Plotted** data is the deviation of each measured point from the Best-Fit Plane. The program finds the most negative deviation point on the surface and makes this point zero. All other points will be positive numbers.

😌 Data Report							×
EXPORT DAT		Surface 1	1 (Surface 1)	1 2 3	3	Selected Surface	
PRINT REPOR	RT Surface:			4	F.	'Best Fit' Flatness ?	A 🖿
X distance	Y distance	Raw Flatness Data	a As Configured/Pl	otted* (	77	.0095	
0	0	0085	.0013			X∠ .001131/FT	
0	8.0	0016	.0075			'Best Fit' Slopes	
0	16.0	0074	.0011			Y∠ .000993/FT	202.22
0	24.0	.0004	.0082			Printout Configuration	NOTE: The
0	32.0	0069	.0002			Do Not Print Data Tables.	graphic that will
0	40.0	0028	.0037			Print summary only.	be printed is the
0	48.0	.0009	.0067			C Print Data Table for	plot shown in the main window. To
0	56.0	0034	.0018			Selected Surface Only Print Data Table for All	change the
8.0	0	0079	.0012		-	<ul> <li>Print Data Table for All Surfaces</li> </ul>	graphic printout,
•					-1	Do Not Print Graphics	close this window and
		þ	Data Presentation Op As Configured & Shown on th		- -	Print graphics in B&W on color printers	re-configure the plot on the main window.
Surface1,Flat	ness and Squaren	ess Surf	face2,Flatness and Squarene	ss		Surface3, Flatness and Squar	eness
.00	95 Surface	1 🚽 📿	7 .0102 Surface 2	-	-	0098 Surfac	e 3 🔻
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#### Surface

Select the surface for which to generate data in the table. Use the slider bar to select Surface 1, Surface 2 or Surface 3.



#### **Surface Flatness and Squareness**

The **Surface Flatness/Squareness** for each measured surface is displayed at the bottom of the **Data Report** screen. The Flatness data is the true flatness of each surface as calculated with the Least-Squares-Best-Fit Algorithm. **COMPARE to:** shows the Best-Fit Plane squareness of each surface to the Best-Fit Plane of other measured surfaces.

Surface1,Flatness and Squareness	Surface2, Flatness and Squareness	Surface3, Flatness and Squareness
.0100 Surface 1	.0102 Surface 2 💌	0104 Surface 3 v
COMPARE to:	COMPARE to:	COMPARE to:
1 2 .000291/FT Surface 2	1 .000291/FT Surface 1	1 .000677/FT Surface 1
1 3 .000086/FT Surface 3	1 3 .000861/FT Surface 3	1 2 .000861/FT Surface 2

#### **Selected Surface**

The **Selected Surface** data displays the true flatness of the selected surface, the slope of the Best-Fit Plane in the X direction and the slope of the Best-Fit Plane in the Y Direction.

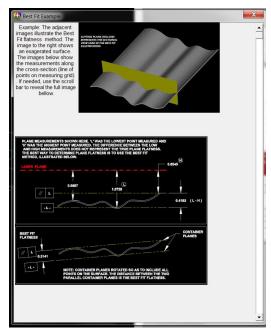
The Plot in the upper right corner is the current plot displayed on the screen. This plot does not change when selecting different surfaces as explained in the note below the plot representation.

NOTE: The graphic that will be printed is the plot shown in the main window. To change the graphic printout, close this window and re-configure the plot on the main window.

**Best-Fit Flatness** is the maximum deviation of all the recorded data points from the Best-Fit Plane (the plane that "best fits" the recorded data using the least-squares, best-fit algorithm). It is the true measure of flatness. Click the question mark (?) next to **Best Fit** to display an example of Best-Fit Flatness.

**Best-Fit Slopes** is the deviation in angle of the Best-Fit Plane from the laser plane. This shows how close the reference points used on the surface are to the other points on the surface. For example, if one or two reference points are used that are very far off the rest of the points, the laser plane will be tilted relative to all the other points. These slopes are commonly used when measuring parallelism, as a comparison of the best-fit slopes from one surface to the other is needed.

Best-Fit Slopes can also indicate if the reference points were not bucked in carefully. A large flatness error, as well as a large slope error, could mean that setup was not performed carefully.



Selected Surface

'Best Fit'

X 🗠

?

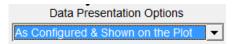
000

.00000/FT 'Best Fit' Slopes

Best-Fit Slopes can also indicate how far from earth level the surface is. If the laser is leveled and used as a reference, and then the surface is measured, these slopes will indicate how far out of level the surface is.

#### **Data Presentation Options**

Changing the **Data Presentation Options** from the dropdown menu (shown in Figure 7) also changes the heading for the last column on the right in the Data Report and the data for each point is corrected for the option selected.



Selecting **As Configured & Shown on the Plot** prints the data and the plot that was displayed on the screen when **REVIEW/PRINT DATA** was selected.

Data Presentation Options
Surface Relative to B.F. Plane(Flatne: 🔻

Selecting **Surface Relative to BF Plane** (**Flatness**) displays the deviation of the measured points from a best-fit plane. This is the true *flatness* of the measured plane.

Data Presentation Options
B.F. Plane Relative to LASER (Slopes 🔻

Selecting **BF Plane Relative to LASER** (Slopes) displays the data for a best-fit plane relative to the laser plane. The laser plane and the best fit plane are absolutely flat planes, so this represents the *slope* between the best fit plane and the laser plane. There is no surface deviation.

ta	As Configured/Plotted*					
	.0013	_				
	.0075	T				
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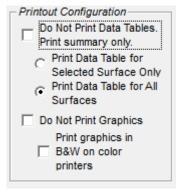
Figure 7 – Data Presentation Options

EXPORT DA	TA Selected Surface	Surface 1 (S	Burface 1) 1 2	3	Selected Surface	
PRINT REPOR	RT Surface.		4	-	Best Fit Flatness ?	
X distance	Y distance	Raw Flatness Data	Best Fit Plane-Laser Plane*	-		
0	0	-,0065	0057		X 2 .001064/FT	
0	8.0	0019	0049		'Best Fit' Slopes	1997 - B
0	16.0	0039	0041		Y∠ .001182/FT	Part Part
0	24.0	0079	0033		Printout Configuration	NOTE: The
0	32.0	.0019	0025		Do Not Print Data Tables.	graphic that wi
0	40.0	0010	0018		Print summary only.	be printed is th
0	48.0	.0007	0010		C Print Data Table for	plot shown in t main window.
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•L [ ]					Do Not Print Graphics	close this window and
Data Report	_		Ī		printers	window.
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EXPORT DAT PRINT REPOR X distance 0 0 0	X Selected Surface: Y distance 0 8.0 16.0	Surface 1 (S Raw Flatness Data 0065 0019 0039	urface 1) 1 2 Corrected Flathess* -0008 .0030 .0002	3	Selected Surface Best Fir Flatness ? 2 0100 X 2 001064/FT Best Ff Slopes Y 2 001182/FT Printout Configuration	
EXPORT DAT PRINT REPOR X distance 0 0 0 0 0 0	A         Selected           T         Surface:           Y distance         0           8.0         16.0           24.0         10	Surface 1 (S Raw Flatness Data 0065 0019 0039 0079	Urface 1) 1 2 Corrected Flatness* -0008 -0002 -0046		Selected Surface Best Fit Flatness ? O100 Set Fit Slopes Y O1182/FT Printout Configuration Fit summary only.	NOTE The graphic that will be printed is th
EXPORT DAT PRINT REPOR X distance 0 0 0 0 0 0 0 0 0	A         Selected           T         Surface:           Y distance         0           8.0         16.0           24.0         32.0	Surface 1 (S Raw Flathess Data 0065 0019 0039 0079 .0019	Unface 1) 1 2 Corrected Flatness* -0008 -0008 -0002 -0046 -0044		Selected Surface Best Fit Flatness 7 Dot 1010 Configuration Printbuc Configuration Do Not Find Data Tables Print summary only. Print But Table To	NOTE The graphic that will be printed is the pits shown in th
EXPORT DAT PRINT REPOR X distance 0 0 0 0 0 0 0 0 0 0 0 0	A         Selected Surface:           Y distance         0           0         8.0           16.0         24.0           32.0         40.0	Surface 1 (S Raw Flatness Data 0065 0019 0039 0079 .0019 0010	Uurface 1) 1 2 Corrected Flatness* -0008 -0046 -0046 -0044 -0008		Selected Surface       Best Fit Flatness ?       0100       X _ 001064/FT       Dest Fit Slopes       Y _ 00182/FT       Printout Configuration       Print Summary only.       Print Data Tables for Selected Surface for	NOTE The graphic that will be printed is th
EXPORT DAT PRINT REPOR X distance 0 0 0 0 0 0 0 0 0 0 0 0 0 0	A.         Selected Surface:           Y distance         0           8.0         16.0           24.0         32.0           40.0         48.0           56.0         0	Surface 1 (S Raw Flatness Data - 0065 - 0019 - 0039 - 0079 - 0019 - 0010 - 00010 - 0007 - 0067	urface 1) 1 2 - 0008 - 0008 - 0002 - 0046 - 0044 - 0044 - 0008 - 0016 - 0019 - 0017		Selected Surface Best Fit Flatness 7 Dot 1010 Configuration Printbuc Configuration Do Not Find Data Tables Print summary only. Print But Table To	NOTE: The graphic that will be printed is the plot shown in II main window. 1 change the graphic printou
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#### **Printout Configuration**

**Note:** Only the graph that is plotted will be printed in the report. If additional graphs are needed, separate reports must be printed for each graph.

Checking **Do Not Print Data Tables. Print summary only** prints only a summary table. If this option is left *unchecked*, a data table for the selected surface only or a data table for all surfaces may be printed.



Enable **Do Not Print Graphics** to prevent graphics from being printed in

the report. **Print graphics in B&W on color printers** will print only in black and white if using a color printer.

### **Plane5 Sample Report**

HAMAR LASER - Plane 5 Report

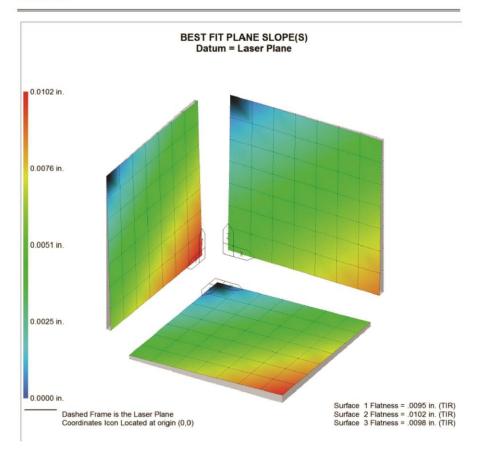
Project: 28-Jan-14@13h17m Prepared on 1/28/2014 at 1:25:30 PM Alignment Summary Page 1

Page 2

Surface 1	
Surface 2	0102 In (TIR)
Surface 3	0098 In (TIR)
Slope of Best Fit Plane relative to Laser Plane	
Surface 1 (X Slope)	
Surface 1 (Y Slope)	
Surface 2 (X Slope)	000873 In/Ft, 15.0 arc secs.
Surface 2 (Z Slope)	001016 In/Ft, -17.5 arc secs.
Surface 3 (Y Slope)	000904 In/Ft15.5 arc secs.
Surface 3 (Z Slope)	
NOTE: Slope is positive when the surface rises away from the origin	

HAMAR LASER - Plane 5 Report

Project: 28-Jan-14@13h17m Prepared on 1/28/2014 at 1:25:30 PM Surface Plot



Project: 28-Jan-14@13h17m Prepared on 1/28/2014 at 1:25:30 PM Surface 1 (Surface 1)

X distance	Y distance	Raw Flatness Data	As Configured/Plotted*	Comments
0	0	0085	.0000	
0	8.0	0016	.0007	
0	16.0	0074	.0013	
0	24.0	.0004	.0020	
0	32.0	0069	.0026	
0	40.0	0028	.0033	
0	48.0	.0009	.0040	
0	56.0	0034	.0046	
8.0	0	0079	.0008	
8.0	8.0	0007	.0014	
8.0	16.0	0025	.0021	
8.0	24.0	0012	.0027	
8.0	32.0	0052	.0034	
8.0	40.0	0034	.0041	
8.0	48.0	.0044	.0047	
8.0	56.0	0035	.0054	
16.0	0	0033	.0015	
16.0	8.0	0016	.0022	
16.0	16.0	0026	.0028	
16.0	24.0	.0032	.0035	
16.0	32.0	0054	.0042	
16.0	40.0	.0045	.0048	
16.0	48.0	.0044	.0055	
16.0	56.0	.0009	.0061	
24.0	0	0038 0022	.0023	
24.0	8.0	0022	.0029	
24.0	24.0	.0035	.0042	
24.0	32.0	0028	.0042	
24.0	40.0	.0017	.0049	
24.0	48.0	.0037	.0062	
24.0	56.0	.0064	.0069	
32.0	0	0045	.0030	
32.0	8.0	0043	.0037	
32.0	16.0	.0013	.0043	
32.0	24.0	.0044	.0050	
32.0	32.0	.0037	.0057	
32.0	40.0	0003	.0063	
32.0	48.0	.0026	.0070	
32.0	56.0	.0068	.0077	
40.0	0	0017	.0038	
40.0	8.0	0029	.0044	
40.0	16.0	.0022	.0051	
40.0	24.0	.0001	.0058	
40.0	32.0	0032	.0064	
40.0	40.0	.0058	.0071	
40.0	48.0	.0042	.0077	
40.0	56.0	.0080	.0084	
48.0	0	.0023	.0045	
48.0	8.0	.0046	.0052	
48.0	16.0	.0025	.0058	
48.0		0008	.0065	
	24.0			
48.0	24.0	.0054	.0072	
48.0	32.0	.0054	.0072	

(table continued on next page)

Notes: 'As Configured/Plotted' = User Customized Data, as shown on the Surface Plot 'Raw Flatness Data' = Target measurements, as recorded \*Surface Data Shifted Up. Low Point=0, all other points Positive

#### HAMAR LASER - Plane 5 Report

Project: 28-Jan-14@13h17m Prepared on 1/28/2014 at 1:25:30 PM Surface 1 (Surface 1)

X distance	Y distance	Raw Flatness Data	As Configured/Plotted*	Comments
56.0	0	.0039	.0053	
56.0	8.0	0016	.0059	
56.0	16.0	.0010	.0066	
56.0	24.0	.0000	.0073	
56.0	32.0	0002	.0079	
56.0	40.0	.0004	.0086	
56.0	48.0	.0013	.0093	
56.0	56.0	.0057	.0099	

Notes: 'As Configured/Plotted' = User Customized Data, as shown on the Surface Plot 'Raw Flatness Data' = Target measurements, as recorded \*Surface Data Shifted Up. Low Point=0, all other points Positive

Page 3

Page 4

# Appendix A – Using the A-910 Radio Utility

## Pre-installing the Common USB Port Driver

This driver is required for the A-910-2.4ZB/A-910-2.4XBE Transceiver and to communicate with targets via the computer's USB port. The driver creates a virtual COM Port that is recognized by the applications as a standard serial port.

*Note:* You must pre-install this driver prior to connecting the device(s) to the computer through the USB port.

#### **Installing the Driver**

- 1. Insert the flash drive into the target computer.
- 2. Open the flash drive and locate the driver installation executable (e.g., CP210xVCPInstaller.exe).
- 3. Double-click the executable to run the installer.. Follow the on-screen instructions to complete the installation..



Figure 8 - USB Common Driver Install

## **Installing the A-910 Utility Software**

- 1. Insert the flash drive into the target computer
- 2. Open the flash drive and locate the driver installation executable
- 3. Locate the **Setup** icon and click to initiate the installation process. Click **NEXT** to continue.
- 4. Click **Browse** to select an installation folder different from the default folder (optional).
- 5. Click **Next** to continue. Once the installation is complete, the **Installation Complete** message displays. Select **Close.**

## **Configuring the Hardware and Utility Settings**

- 1. Insert the A-910 ZB dongle into any unused USB Port (see Figure 9). The computer should automatically assign a COM port number to the dongle.
- 2. Start the A-910 Utility Software. The software should display the COM port assigned to the Zigbee Dongle (see Figure 10). If the utility does not automatically detect the COM port, it must be manually selected (see **Manually Selecting a COM Port** on Page 37).
- 3. The Target System ID or R-1307 CH (channel) is the number associated with the A-1519/1520 targets or R-1307 Readout. If using both the A-1519/1520 targets and an R-1307 Readout, both need to be set to the same system ID and channel (see Figure 11).



Figure 10 – A-910 Utility showing the COM Port, System ID and Channel settings

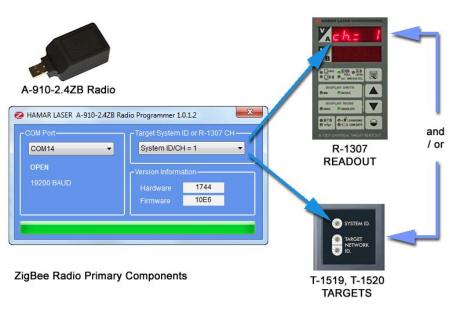


Figure 11 – System ID Setup



**Figure 9** – A-910 Zigbee Dongle

## Manually Selecting the COM Port

The A-910 Utility should automatically detect the COM Port upon startup. If not, use the following steps to locate the correct COM Port.

### For Windows 10 and Windows 11:

- 1. **Open Device Manager:** 
  - Press Win + X and select Device Manager from the menu.
  - Alternatively, you can search for "Device Manager" in the Start menu.

#### 2. Locate the Device:

- In the Device Manager window, expand the Ports (COM & LPT) section.
- Find the device for which you want to change the COM port (e.g., "Silicon Labs CP210x USB to UART Bridge").

#### 3. **Open Device Properties:**

- Right-click the device and select Properties.
- In the Properties window, go to the Port Settings tab.

#### 4. Advanced Settings:

- Click on the Advanced button.
- In the Advanced Settings window, you'll see a section labeled COM Port Number.

#### 5. Change the COM Port:

- Click the drop-down menu next to COM Port Number and select an available COM port number from the list.
- Click OK to save the changes.
- 6. Apply and Close:
  - Click OK in the Properties window to apply the changes.
  - Close the Device Manager.

#### Notes:

• Note the COM Port listed and select that COM Port in the A-910 Radio Utility software using the drop-down arrow (see Figure 12).

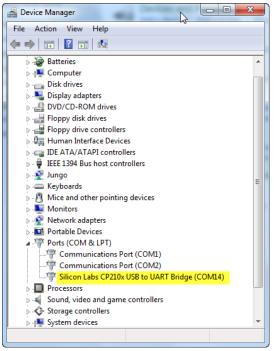


Figure 12 – Device Manager showing COM Port for A-910 Dongle

## Setting the Target System ID and Target Network ID

The System ID is a Radio Network Address that is used by the Radio Communications Protocol to filter unwanted data from other radio transceivers and targets using a different address. Only targets and radio transceivers that are set to a matching System ID can communicate with each other.

Because no two targets with the same System ID can transmit simultaneously, it is necessary for each target to be programmed to respond only when it is being addressed. The Target Network ID is the target address on the communications network. Under Host (computer) control, the radio transceiver transmits a message called a *polling request* that contains the Target Network ID of one specific target. All targets receive all polling requests, but only the target with a Network ID matching the ID contained in the polling message will reply (Transmit Data to the Host).

There are three rotary DIP switches located on the right side of the target, shown in Figure 13:

- The uppermost switch sets the System ID.
- The two lower switches are used to set the target network ID.

#### Setting the System ID

*Note:* Before selecting a System ID, ensure that it is not already in use by another system within the radio coverage area.

Using a small screwdriver, rotate Switch 1 to align the arrowhead with the System ID number (0-9). Figure 13 shows the System ID switch set to 1.

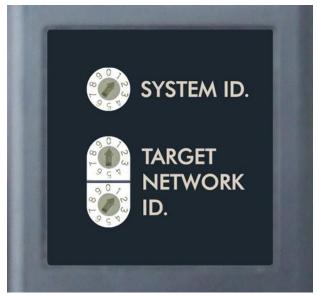


Figure 13 – Unitarget ID Switch set to1

### Setting the Target Network ID and System ID for the R-1307 Readout

To make the unit visible to all other radioenabled devices, you must set the Target Network ID and the System ID for the readout.

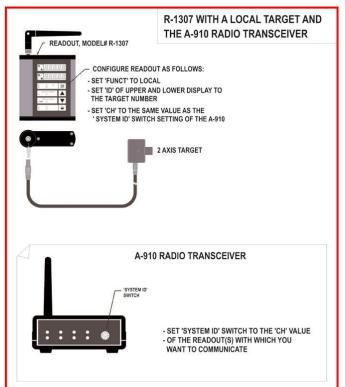
1. Set the Local Readout/Target Network ID Press the **MENU** button until the *upper* display shows identication (nn is also equal to the R-1307 number) and the matching target number with the current target ID (nn) blinking. Use the UP and DOWN arrow keys to set the Target ID.

Press the MENU button again until the lower display shows deno, with the current target ID (nn) blinking. Use the UP and DOWN arrow keys to set the Target ID to the same value as that of the upper display's Target ID.

#### Set the System ID (Radio Channel) 2.

Press the MENU button until the upper display shows ch = nn, with the current System ID (nn) blinking. Use the UP and DOWN arrow keys to set the System ID.

Note that **nn** must be set to the same number Figure 14– R-1307 with Cabled (Local) Target and A-910 Radio as the channel switch setting of the A-910 radio transceiver (see Figure 14).



Transceiver

#### **Miscellaneous Display Messages**

- HLI -	
r 1_00	Startup Message. Lower Display shows firmware Revision Number.
	3 moving dots. Wireless target is not responding to a polling request from Readout. Check ID and Channel settings. Check Target(s).
	3 dashes. Target detected but the laser is not on target. Check laser.
ch_tno	
r Ad io	Radio channel cannot be selected because no Radio is present or detected.
	Standard message for R-1307C. For Models R-1307 or R-1307W, this message indicates a fault in the radio module.
FAult	
PSd	Indicates a problem with the connection to the Cabled (Local) Target's Position Sensing Device (PSD). Check plugs and cable(s).
£6£_n	
UncAL	Target 'n' descriptor does not contain target calibration data.