Stitch.app

This booklet is a quick reference; it assumes that you are familiar with MetroPro and the instrument. Information on MetroPro is provided in the *MetroPro Quick-Start Guide*, OMP-0469, and the *MetroPro Reference Guide*, OMP-0347. For information on the instrument, please refer to the applicable Zygo Corporation manual. Information herein is applicable as of MetroPro version 8.0.2.

The Stitching Application

The MetroPro Stitching Application is designed to measure and analyze surface areas much larger than possible with a single measurement. Stitching makes several measurements of the test part as it is moved by a motorized stage and then combines or stitches the multiple data sets into one. Effectively, it increases the field of view without compromising lateral or vertical resolution. The graphics and results displayed on screen are based on the entire measured area.

Individual Measurement

Stitching combines many measurements into one data set

Stitched Image
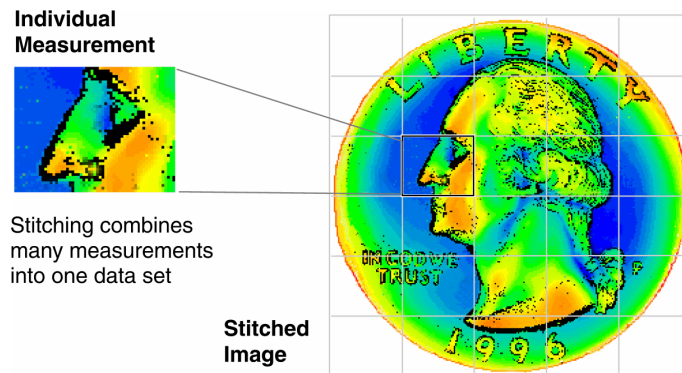
After you define the test area, a stage pattern is created that breaks the larger area into a number of smaller sub-regions. Each sub-region is equal to the field of view of the microscope's objective and zoom setting, minus a small percentage for overlap. After software parameters are entered the process is automatic.

A number of factors determine the maximum size of the stitched area. These include: the objective magnification, the zoom setting (microscopes with Image Zoom option only), the camera resolution (determined by the Camera Mode control), and the amount of computer RAM.

The Stitching Application supports Zygo Corporation's microscopes, including the NewView and Maxim, as long as they are equipped with programmable motorized stages. A motorized z-drive (focus) is optional; however, it is required for extended scans or the auto focus option. The stitching application is licensed as part of standard MetroPro.

Stitch.app

To open the application, click on the Stitch.app icon. If the icon is not on the MetroPro base window, then use the Load Application command from the MetroPro Window menu to first load the application icon.
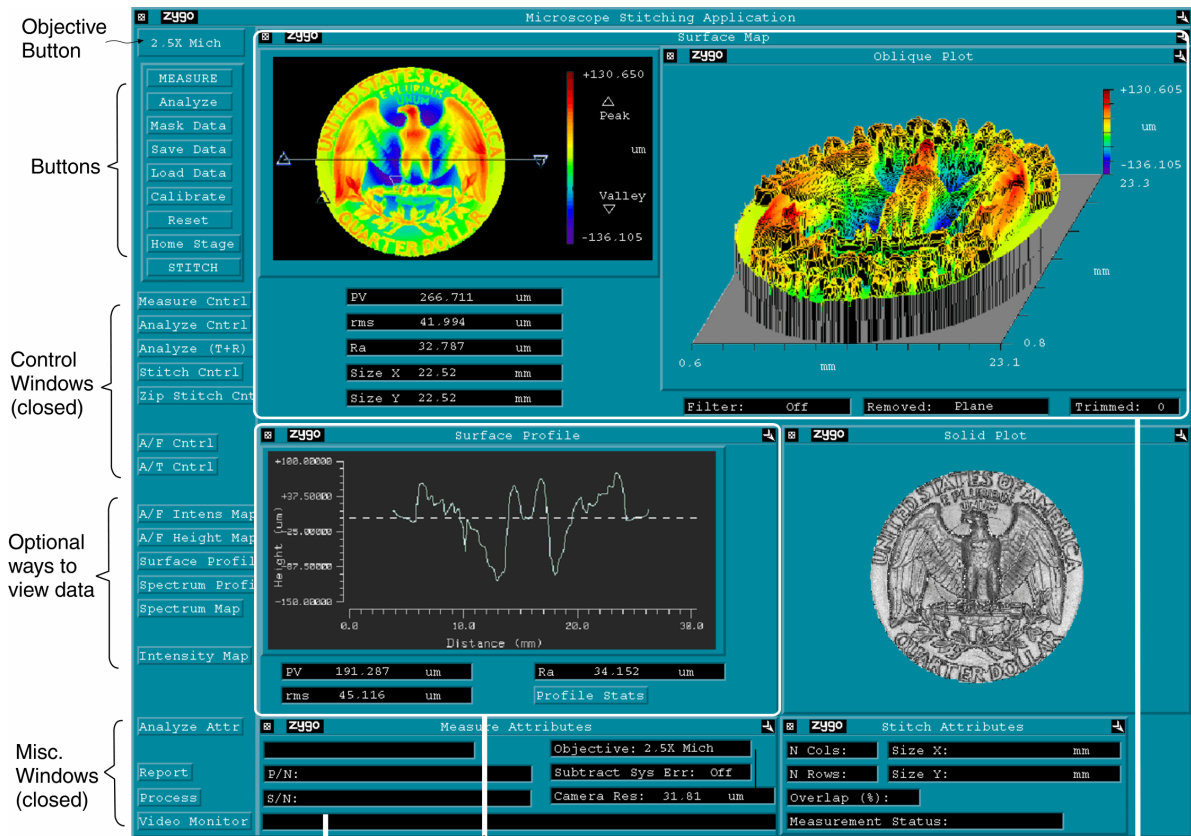
Measure Attributes displays information about the measurement and settings of controls.

Surface Profile shows results based on a cross section through the Filled plot (above).

Surface Map Shows three dimensional graphics (Filled plot and Oblique plot) and results on the test part surface.

Guidelines

- *Use a System Error File* - It is recommended that you create a system reference file for the objective in use and then subtract this file from the measurement.

- *Lateral Calibration* - The microscope must be calibrated for accurate results; inaccurate pixel size causes misplacement of each measurement with respect to the surrounding measurements. Objectives supplied with an original system are factory calibrated; calibration is required when other objectives are used or when using the "free" zoom setting. For optimum performance, calibrate the objective and zoom setting before making a stitch sequence. For calibration procedures refer to the *MetroPro Reference Guide*.

- *Align the X/Y Stage Before Making Measurement*s - The stage x and y axes must be precisely aligned so each measurement is properly stitched to the surrounding measurements. This is covered in the Stage Alignment Procedure.

Guidelines (continued)

- *Computer Recommendations* - The speed and capability of the Stitching software is linked to computer resources. A fast computer processor, large hard drive, and a large amount of RAM improve performance. For best performance, ZYGO recommends to maximize the amount of RAM. It is also recommended to set the Windows virtual memory paging file size to the maximum. To do this, point to the Windows Start button and select Settings → Control Panel; open the System icon and select the Performance tab; click the Change button under Virtual Memory; set the paging file Maximum Size (MB) as large as possible.

- *MetroPro Control Settings* - The speed of the measurement also relates to the Camera Mode and the Scan Length control settings; the larger the Camera Mode and Scan Length settings, the longer each measurement cycle. Note that a very large stitching measurement can take hours to acquire and process data.

Stage Alignment Procedure

Typical Microscope Controls

1. Power-up the instrument, start MetroPro, and open the application. Click the Objective button so it displays the objective in use and set the Image Zoom control to match the zoom setting of the instrument. Set the Camera Mode control to 640x480.

2. Click the Home Stage and Home Z Axis buttons to re-establish the motorized stage home positions.

3. Place the test part on the stage under the objective. Position the objective at its working distance from the part. *Don't crash the objective into the part or the stage.*

4. Put the filter tray to FOCUS. Press F5 to adjust the light level. Focus the microscope for a sharp image; there should be visible fringes.

5. If there are not visible fringes, adjust for tilt in the part. To do this, press the F4 key to open the Light Level window, adjust the stage tip and tilt until the Peak Intensity readout is maximized, and press Enter to close the window.

6. Adjust the stage to center the area of interest in view. Place the filter tray to MEAS, press F5 again to adjust the light level. Fine-tune focus and stage tilt for surface detail, to null or minimize the number of fringes, and to center the darkest fringe.

5. In the Stitch Controls window, set the Type control to Align Stage, then click the Stitch button. The software takes two measurements and then displays the composite image. Examine the area along the intersection of the two measurements. If pixels are offset and there is a noticeable shift greater than ±1 pixel, align the stage as described in step 7.

7. Slightly loosen the three capscrews securing the x-y stage to the theta plate. Slightly rotate the x-y stage clockwise, if the left side of the pixel intersection is higher than the right; rotate it counter-clockwise if the right side of the intersection is higher than the left.

8. Repeat steps 6 and 7 until the intersection of the two images is within one pixel. After proper alignment is achieved, tighten the three capscrews securing the x-y stage.
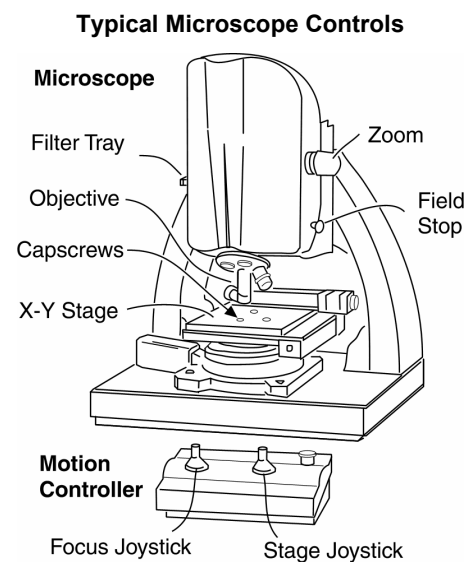
Making Measurements

1. Power-up the instrument, start MetroPro, and open the application by clicking on the Stitch.app icon.

2. Make sure the stage is properly aligned. See the previous procedure.

3. Click the Objective button until it displays the objective in use. Place the test part on the stage under the objective. Position the objective at its working distance from the part. *Don't crash the objective into the part or the stage*

4. Set the Zoom knob to the desired setting; ensure that the software Image Zoom control is set to match. Set the Camera Mode, and Scan Length (NewView) controls within the Measure Cntrl icon to the desired settings.

5. Press the **F5** key to adjust the light level. Adjust the microscope for focus and adjust the stage tilt to null or minimize the number of fringes.

6. Make a trial measurement of the test part by clicking the Measure button. The goal is to acquire the maximum number of data points. If necessary to control data loss, adjust measure controls (usually Min Mod (%) and Scan Length) and analyze controls (filtering).

7. Measure the test part in other locations to ensure that data can be obtained at all locations during the stitch measurement. Make software control adjustments if needed.

   If the microscope has the scan auto focus and tilt option, set the Focus control to On.
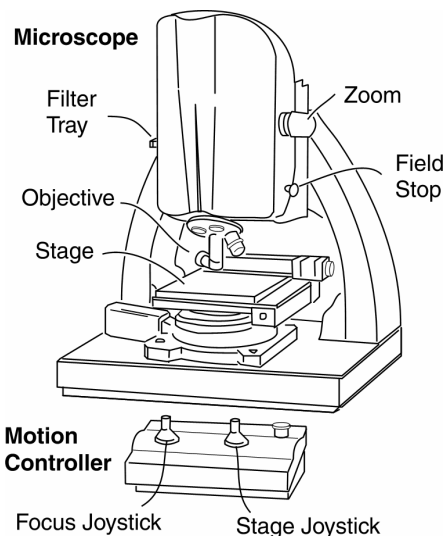
8. Select the desired stitching method with the Type control. See the next page for descriptions of the stitching methods. Enter values in the stitching controls if necessary. To start the stitch sequence, click the Stitch button and follow the on-line instructions.

Objective Button

2.5X Mich

MEASURE
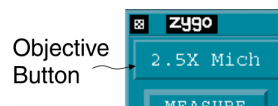
Objective Working Distance

2.5X	5X	10X	20X	50X
10.3 mm	9.3 mm	7.4 mm	4.7 mm	3.4 mm

Microscope Controls - NewView 5000

Microscope

Filter Tray

Zoom

Objective

Field Stop

Stage

Motion Controller

Focus Joystick

Stage Joystick

Stitch Control Window (partial)

Stitch Controls

STITCH

Type: Column & Row

N Cols: 2   N Rows: 1
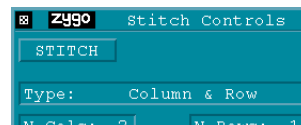
Stitching Methods

Terms used to describe stitching are shown here.

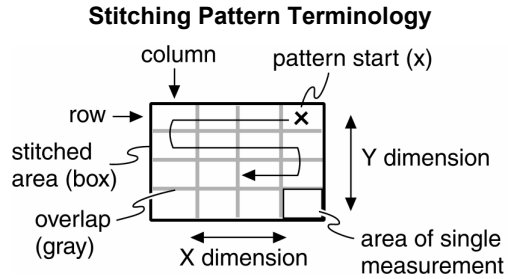There are many ways to define the stitching area. These are summarized below. They are selected with the Type control.

Stitching Pattern Terminology

Before running a stitch measurement it is recommended to click the Home Stage and Home Z Axis buttons to establish the motorized stage home positions.

Method	Description
Manual Position Stitch	The user teaches the software the location of all measurement positions. Useful for measuring odd shaped parts, like an S-curve. It is the user's responsibility to ensure that the overlap is sufficient between measurement positions. The pattern starts at the first saved location.
Column & Row Stitch	The stitched area is determined by the number of rows and columns. Requires entries in N Cols, N Rows, and Overlap (%) controls. The pattern always starts in the upper right.
X & Y Size Stitch	The stitched area is determined by entered dimensions. Useful when the size of the measurement area is known. The number of rows and columns to cover the area is automatically calculated. Requires entries in Size X, Size Y, and Overlap (%) controls. The pattern always starts in the upper right.
Start & End Position Stitch	The user teaches the software the starting position (upper right) and the ending position (lower left) of the stitched area. The number of measurements needed is automatically calculated. Requires an entry in the Overlap (%) control. The pattern always starts in the upper right.
Annulus Stitch	The stitched area is circular or ring shaped. The measurement locations are automatically determined. Requires entries in the Inner Radius, Outer Radius, and Overlap (%) controls. The pattern starts at the 12 o'clock position on the outer radius.
Run Sequence File	The Sequence file as specified in the Seq File control is used for measurement locations. The pattern starts at the first saved location.

Improving Stitching Measurements

- **Accurate Lateral Calibration.**   The quality of lateral calibration is a key factor as this determines stage positioning. The stitching software relies on accurately taking data at exact locations. The most accurate procedure for lateral calibration is to use the Automatic Lateral Calibration application, AutoLatCal.app, and the ZYGO Calibration Standard, P/N 6300-2198-01.

- **Good System Error File.** The technique used to create the system error data file can influence a stitched measurement. A very good, flat surface should be measured for the system error file, such as the ZYGO SiC Reference Flat, P/N 1776-666-012. Secondly, use the system error generation application, SysErrGen.app. This application translates the stages while creating the system error file. The number of measurements should be sufficient to average features of the reference sample. The row and column spacing should be larger than the correlation length. It is recommended to use spacing at least one-half of the aperture.

- **Stable Environment.**   Environmental influences can cause slight changes in the instrument over time. Reducing these influences is recommended for stitching applications. Also, the system error file should be made under the same conditions as the stitching measurement. Therefore, the SysErr.dat file should be created directly before the stitching measurement for optimal minimization of environmental influences.

Zip Stitch Feature

The Zip Stitch function allows you to make two groups of measurements separated by a vertical distance. Note that the lower and upper surfaces are not joined together in the analysis. Zip Stitch is ideal for measuring larger areas at the top and bottom of a vertical step.

To make a measurement using Zip Stitch, enter values in the Zip Stitch controls, set the microscope focus and stage position on the lower surface area and press the Zip Stitch button. Zip stitching requires the user to enter x and y dimensions of the lower and upper surface areas. Zip Stitch controls are explained under "Software Controls".

Software Controls

Some of the controls of interest for the Stitching Application are listed below. For controls not listed, refer to the *MetroPro Reference Guide*.

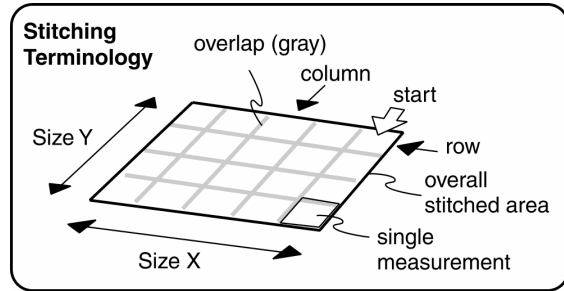| Control	Function	
Controls in Measure Cntrl		
Acquisition Mode	Selects the technique used to acquire data. Settings are Scan or Phase. Scan is for the NewView. Phase is for the Maxim.	
Camera Mode	Selects the effective camera size or resolution in pixels and the speed of frame captures. Lower settings mean less pixels in each measurement, so larger areas can be stitched. More pixels resolve smaller details, but increase processing time.	
Extended Scan Length	For NewView with extended scan option only. Specifies the length of the scan. The Scan Length control must be set to Extended. The value entered should be the vertical range of detail in the part plus 10%.	
FDA Res	NewView. Selects the resolution used during analysis. Settings are Normal or High. Use Normal when measuring rough surfaces; use High when measuring smooth surfaces and steps.	
Image Zoom	For microscopes with image zoom option only. Set the control to match the setting selected on the zoom thumbwheel on the microscope. This ensures that lateral type results are calibrated.	
Min Area Size	Specifies the number of data points in a valid region. Decrease to allow smaller areas. Increase to accept larger areas and reject smaller.	
Min Mod (%)	Specifies the minimum modulation necessary for a valid data point. Decrease to accept areas with poor fringe contrast or low reflectivity. Increase to exclude unwanted data points.	
Scan Length	NewView. Selects the vertical scan length. The longer the scan, the greater the height measuring capability, and the longer the time required to make a measurement.	
Subtract Sys Err	Activates a system error correction function to improve measurement accuracy. An error file must exist for the specific objective in use.	
Sys Err File	Specifies the name of a data file to subtract from measurements when the Subtract Sys Err control is On.	
Controls in Analyze Cntrl		
Data Fill	When On, holes or missing data points are filled, based on the setting of the Fill Max control. When Off (default), missing data points are not filled. The Fill Max control specifies the maximum size of a data hole (in pixels) to fill.	
Filter...	For detail on filtering options and controls refer to the *MetroPro Reference Guide*.	
Remove	Specifies the surface to subtract from measurements to minimize form. Settings are Plane, Piston, Sphere, and Cylinder.	
Remove Spikes	When On, spikes are removed from the data based on the setting of the Spike Height control. When Off, data spikes are not removed.	

Software Controls (continued)

Control	Function	
Controls in Analyze Cntrl (continued)		
Spike Height (xRMS)	For each point, the rms height of the surrounding points is calculated; if the point height is greater than the entered value times the rms it is removed. An entry is ignored unless the Remove Spikes control is On.	data point 3x3 window out of range spike removed rms of points in window
Trim	Specifies the number of pixel layers to remove from edges and from isolated obscurations. The Trim Mode control selects where trimming is applied.	
Controls in Stitch Cntrl		
Auto Focus	Selects how to use auto focus in the stitch sequence. Settings are Off, First Measurement Only, All Measurements. Off disables auto focus. First Measurement Only uses auto focus only on the first measurement of the stitching sequence. All Measurements enables auto focus for all measurements of the stitch sequence.	
Auto Load Masks	Specifies whether to load a mask after loading the completed stitched image. The mask filename is defined by the Masks File control.	
Auto Save Seq	Activates the automatic saving of a sequence file. When On, the sequence file named by the Seq File control is saved to file.	
Auto Tilt	Selects how to use auto tilt in the stitch sequence. Settings are Off, First Measurement Only. First Measurement Only uses auto tilt only on the first measurement of the stitching sequence.	
Average Overlap Regions	Selects if the stitching algorithm averages overlap regions. Settings are On or Off. It is recommended that this control be On. Averaging the overlap regions results in a stitched image with less discontinuity.	
Diagnostics	Selects if diagnostic information from the stitch algorithm is provided. Settings are On or Off.	
Display Measurements	Selects whether individual measurements are displayed on screen during the stitch sequence. Settings are On or Off.	
Failure Action	Selects the action to take if there is a measurement error during a stitch sequence. Settings are Abort, Retry, or Continue. Abort will stop the stitching sequence. Retry repeats the measurement and aborts the sequence if it fails again. Continue ignores the error and goes to the next location.	
Inner Radius	Specifies the radius of an internal circular area in which there is no data. Applicable when the Type control is set to Annulus. If zero, the entire area as specified by the Outer Radius control is used.	
Log Reports	When On, the final results of the loaded stitched image are logged or added to the report file.	

Software Controls (continued)

Control	Function	
Controls in Stitch Cntrl (continued)		

Masks File — Specifies the name of the mask file to apply to the completed stitched image when Auto Load Masks is On.

Measurement Status — Displays the measurement number and total number of measurements during a stitch sequence. Attribute only.

N Cols — Specifies the number of vertical columns in the stitch stage pattern. Requires a programmable stage.

Stitching Terminology

overlap (gray)

column

start

Size Y

row

overall stitched area

single measurement

Size X

N Rows — Specifies the number of horizontal rows in the stitch stage pattern. Requires a programmable stage.

Outer Radius — Specifies the radius of a circular area in which there is data. Applicable when the Type control is set to Annulus.

Overlap (%) — Specifies the overlap of the columns and rows in the stitched image. 15 to 20% is recommended, 10% is the minimum. When the Stitch Type is Start & End Pos or the X & Y Dimension, it is the minimum overlap percent.

Remove Intensity Data — Selects if intensity data is used in the stitched data file. When Off (default), both phase and intensity data are included in the resulting data file. When On, only phase data is included and intensity is removed.

Scanning Seq — Selects whether to traverse the part rows in a serpentine or raster fashion. Settings are Serp or Rast. It is recommended that Rast be used for more accurate stage movement.

Seq File — Name of the file that contains all relative locations of a stitching sequence. When a stitch sequence is run and the Auto Save Seq control is set to On, the relative locations are saved into the file specified by this control. When the Type control is set to Run Sequence File, the stitching sequence defined by the file specified, is run. This way multiple stitching sequences may be defined, saved, and loaded.

Size X — Specifies the size of the overall stitched image in the x-axis. Requires a programmable stage.

Size Y — Specifies the size of the overall stitched image in the y-axis. Requires a programmable stage.

Stitch button — Invokes a stitch measurement sequence based on the settings of the stitch controls. Requires a programmable stage.

Stitch File — Specifies the name of the final stitched data set.

Software Controls (continued)

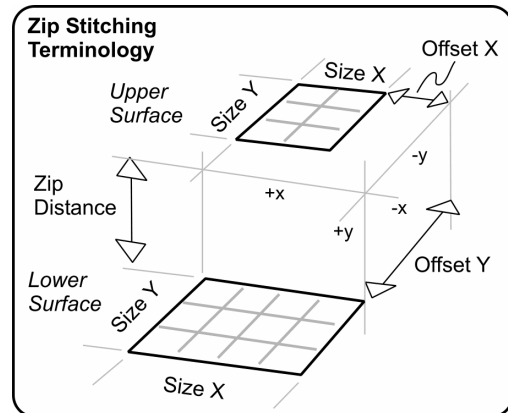| Control	Function	
Controls in Stitch Cntrl (continued)		
Stitch Processed Data	Selects whether to pass raw data or processed data to the stitch algorithm. Settings are On or Off. It is recommended that this control be Off. The stitching of processed data is only recommended in rare cases.	
Store Process Stats	Selects whether to store the stitched image into Process Stats. If On, the final overall stitched measurement results are stored.	
Type	Selects the type of stitch measurement. Stitching makes several measurements of the test part as it is moved by a motorized stage and then combines the multiple data sets into one. *Manual Position.* The user teaches the software the location of all measurement positions. Useful for measuring odd shaped parts, like an S-curve. It is advisable to have overlap between measurement positions. *Column & Row. T*he stitched area is determined by the number of rows and columns. Requires entries in N Cols, N Rows, and Overlap (%) controls. The pattern always starts in the upper right. *X & Y Size.* The stitched area is determined by entered dimensions. Useful when the size of the measurement area is known. The number of rows and columns to cover the area is automatically calculated. Requires entries in Size X, Size Y, and Overlap (%) controls. The pattern always starts in the upper right. *Start & End Position.* The user teaches the software the starting position (upper right) and the ending position (lower left) of the stitched area. The number of measurements needed is automatically calculated. Requires an entry in the Overlap (%) control. *Annulus.* The stitched area is circular or ring shaped. The measurement locations are automatically determined. Requires entries in the Inner radius, Outer Radius, and Overlap (%) controls. *Run Sequence File.* Runs the stitching sequence defined by the Seq File control at the current position. *Align Stage.* Used when checking stage alignment; two measurements of adjacent areas are taken and stitched together.	
Controls in Zip Cntrl		
Auto Load Masks	Specifies whether to load a mask after loading the completed stitched image. The mask filename is defined by the Masks File control.	
Display Stitched Surfaces	Specifies whether individual stitched surfaces are displayed. Settings are On, Off.	
Lower Light Level Offset	Specifies the percentage to add to the current measurement light level for the lower surface in a zip stitch measurement.	
Lower Overlap (%)	Specifies the overlap of the measured sections in the lower measurement region in a zip stitch measurement. 15 to 20% is recommended, 10% is the minimum. Requires a motorized z-axis and a programmable stage.	
Lower Seq File	Specifies the filename of the stitching sequence file to use for the lower surface when the Use Lower Seq File control is On.	

Software Controls (continued)

Control	Function
Controls in Zip Cntrl (continued)	
Lower Size X	Specifies the size of the lower stitched image in the x-axis, in a zip stitch measurement. Requires a motorized z-axis and a programmable stage.
Lower Size Y	Specifies the size of the lower stitched image in the y-axis, in a zip stitch measurement. Requires a motorized z-axis and a programmable stage.
Masks File	Specifies the name of the mask file to apply to the completed stitched image when Auto Load Masks is On.
Remove Intensity Data	Selects if intensity data is used in the zip stitched data file. When Off (default), both phase and intensity data are included in the resulting data file. When On, only phase data is included and intensity is removed.
Store Process Stats	Selects whether to store the zipped image into Process Stats. Settings are On or Off. If On, the final overall measurement results are stored.
Upper Light Level Offset	Specifies the percentage to add to the current measurement light level for the upper surface in a zip stitch measurement.
Upper Offset X	Specifies the dimension in the x-axis that the upper right corner of the lower stitched area is offset from the upper right corner of the upper stitched area. One of many controls used when making a zip stitch measurement.
Upper Offset Y	Specifies the dimension in the y-axis that the upper right corner of the lower stitched area is offset from the upper right corner of the upper stitched area. One of many controls used when making a zip stitch measurement.
Upper Overlap (%)	Specifies the overlap of the measured sections in the upper measurement region, in a zip stitch measurement. 15 to 20% is recommended, 10% is the minimum. Requires a motorized z-axis and a programmable stage.
Upper Seq File	Specifies the filename of the stitching sequence file to use for the lower surface when the Use Upper Seq File control is On.
Upper Size X	Specifies the size of the upper stitched image in the x-axis, in a zip stitch measurement. Requires a motorized z-axis and a programmable stage.
Upper Size Y	Specifies the size of the upper stitched image in the y-axis, in a zip stitch measurement. Requires a motorized z-axis and a programmable stage.
Use Lower Seq File	Specifies whether the locations to measure for the lower surface, are specified from a stitching sequence file, or from the Lower X and Y Sizes. Settings are On or Off.
Use Upper Seq File	Specifies whether the locations to measure for the upper surface, are specified from a stitching sequence file, or from the Lower X and Y Sizes. Settings are On or Off.

Software Controls (continued)

Control	Function	
Controls in Zip Cntrl (continued)		
Zip Distance	Specifies the vertical distance between the upper and lower surface areas or measure-ment regions in a zip stitch measure-ment. A zip stitch measurement consists of two groups of measure-ments separated by a vertical distance. When the Phase Res control is set to High, the vertical range is limited to 20 millimeters. Zip Stitch requires a motorized z-axis and a programmable stage.	**Zip Stitching Terminology** — *Upper Surface*, Size X, Size Y, Offset X, -y, +x, -x, +y, Offset Y, Zip Distance, *Lower Surface*, Size Y, Size X
Zip File	Specifies the name of the final zip stitch data set.	
Zip Scan button	Invokes a zip scan measurement sequence. Zip scan is two measurements taken in the same location, without stage movement in the x and y axes, but with vertical movement in the z-axis. The vertical dimension is specified by the Zip Distance control.	
Zip Stitch button	Invokes a zip stitch measurement sequence based on settings of the zip stitch controls.	

Results

The results shown in the main window are explained below. For results not listed, or for greater detail, refer to the *MetroPro Reference Guide*.

Result	Description	
PV	The height between the lowest and the highest point on the test part surface.	PV
rms	The root-mean-square deviation of all points from a plane fit to the test part surface.	rms
Ra	The average roughness, or the average deviation, of all points from a plane fit to the test part surface.	
Size X	The dimension of the data set in the X-axis.	
Size Y	The dimension of the data set in the Y-axis.	

Troubleshooting

Symptom	Possible Cause and Fix
Application not functional.	MetroPro is not licensed; contact Zygo Corporation for licensing information.
	The hardware key or ID module is not installed. Install the hardware key and restart the computer.
No data error or graphic displays appear incomplete or with holes.	The instrument is not properly focused or the fringes are not nulled. Focus the instrument and null the fringes.
	The Min Mod (%) control is set too high; decrease the value.
	NewView scan length may be too short. Increase length with Scan length control.
	Improper light level. Press F4 to open the Light Level window and manually adjust the light level to maximize intensity without saturation.
Poor repeatability of results.	Improper light level. Press F4 to open the Light Level window and manually adjust the light level to maximize intensity without saturation.
	Parts moving during measurement. Check the support stage and fixturing.
	Noisy environment. Look at the video monitor for fringe drift or vibration; these signs indicate a noisy environment. Check for air drafts; ensure that the computer is not contributing noise to the vibration isolation system.
Plots appear very flat and in one color.	Improper light level. Press F4 to open the Light Level window and manually adjust the light level to maximize intensity without saturation.
	Spikes in data. Things to try: raise the Min Mod (%) control to try to remove poorly modulating points; turn on the Remove Spikes control; use fixed scaling in the plots to clip spikes; or use filtering controls.
Error Message- "Error in Stitch Algorithm"	The software has detected that the single measurements do not match up correctly for stitching. Common causes for this error message are: 1) Incorrect zoom or objective setting. This makes the stage move the wrong distance between stitches. 2) Stage not aligned. Select Align Stitch with the Type control and ensure that the stage is aligned. There should be smooth transitions in the overlap area. 3) Lateral calibration not done. Perform calibration. 4) Improper setting for Min Mod (%) makes single measurements on the same area not repeatable. 5) Turret or objective not mounted properly. Remove and reinstall the objective or turret. 6) Manual stitch used and measurements do not overlap. Ensure that the measurements overlap. 7) The part is moving during measurements. Check that the part is properly secured, not moving or flexing.

The Coords.crd File

The coords.crd file is used by the stitching software when combining multiple measurements. It should not be necessary to view or modify this file. This file is shown, as opened with a text editor, for information only.

```
* Zygo Stitching Coord File Version 3
12  #   number of input files
1   #   diagnostic flag
0   #   average overlap flag
1   #   fit surfaces flag
0   #   remove Intensity data flag
C:\users\zygo\stch_tmp\stch1.dat
-1.92937 -0.267575 2.05464
  #   x y and z position in inches
C:\users\zygo\stch_tmp\stch2.dat
-1.50268 -0.267575 2.05464
  #   x y and z position in inches
…
Stitch.dat
```

Line1: version of the coordinate file.

Line2: Number of data files.

Line3: Diagnostics on (1) or off (0).

Line4: Average overlap regions on (1) or off (0).

Line 5: Fit surfaces on (1) or off (0).

Line 6: Skip intensity data on (1) or off (0).

Data file name (for 1st file) followed by X, Y, Z position values in inches of the upper right corner.

Data file name (for 2nd file) followed by X, Y, Z position values in inches of the upper right corner.

Last Line: name of stitched data file.

Other Operations

Operation	How to
Save data	Click the Save Data button. In the File Handler, click the Current Selection box, enter a name for the file, ending with ".dat", and press Enter, then click Done.
Print results	Click the word "zygo" in the window you want to print or select the Print command from the window's menu. In the Print Panel, click the Print button.
Save changes made to controls, plots, results, and windows	You must save the application under a new name. Select the Save Application command from the Application Window menu. In the File Handler, click the Current Selection box, enter a name for the file, ending with ".app" and press Enter, then click Done.
Define a mask	Click the Mask Data button. Use the Mask Editor to define areas to include or exclude from the test part measurement. See "Mask Editor" in the *MetroPro Reference Guide*.
Turn off the system	Warning! *Improper shutdown may damage the instrument.* Select the Quit command from the MetroPro menu; turn off power after you have shut down from within Windows.