Trimmed Pole Tip Recession

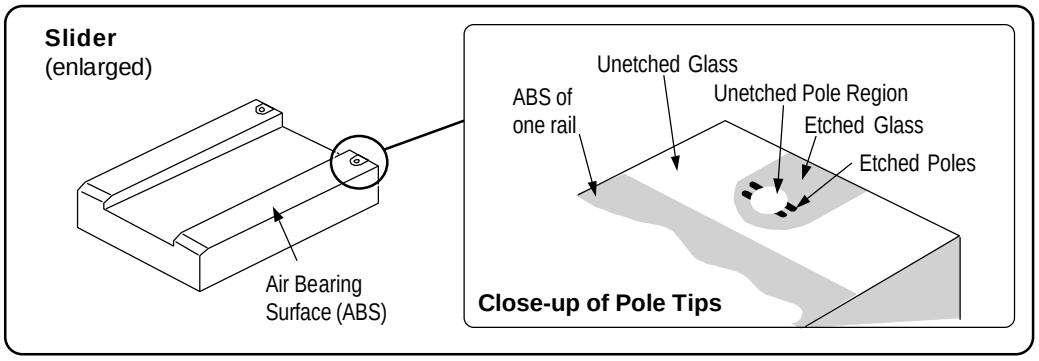
OMP-0367C

MetroPro Application

This booklet is a quick reference; it assumes that you are familiar with MetroPro™ and the instrument. Information on MetroPro is provided in *Getting Started With MetroPro*, OMP-0346 or OMP-0398, and the *MetroPro Reference Guide*, OMP-0347. For information on the instrument, please refer to the Zygo manual(s) included with your instrument. Information herein is applicable as of MetroPro version 6.4.3.

The Trimmed Pole Tip Recession Application

The MetroPro Trimmed Pole Tip Recession (PTR) Application is designed to measure the characteristics of trimmed or etched pole tip read/write heads. The application measures the recession of the pole tips to the etched and unetched glass regions, wall angle, and other related parameters.



The Trimmed PTR Application is for use with the high resolution version of the Zygo NewView with a 40X or 50X Mirau objective. The application requires licensing to take measurements or load data. It is licensed as option "Trimmed PTR" in the Edit/View Licenses window. For information on licensing, see the *Getting Started With MetroPro* manual.

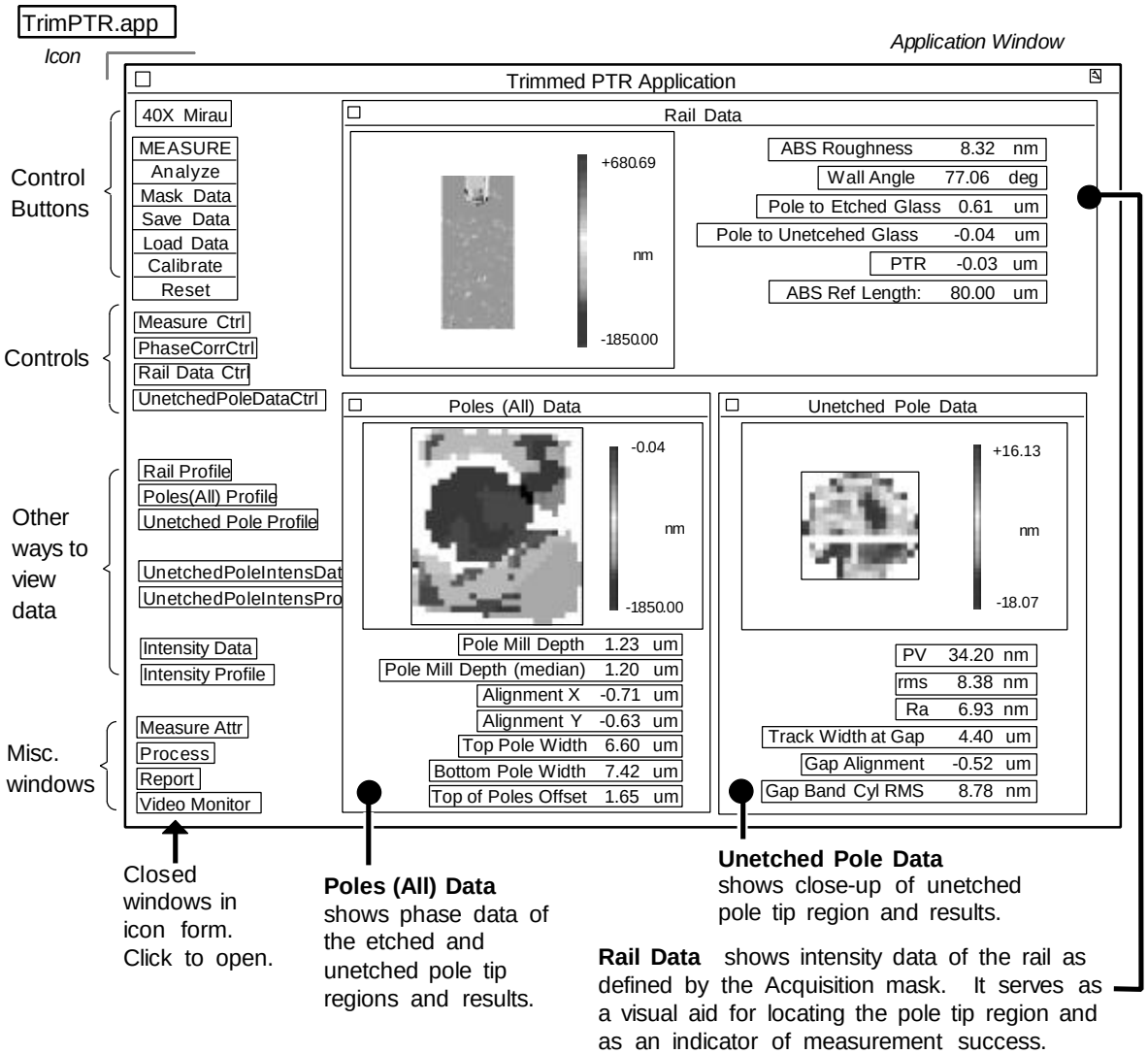
The Trimmed PTR Application:

- Automatically finds each region (etched and unetched pole tips and glass).
- Measures pole tip recession, glass recession, and other parameters simultaneously.
- Supplies numerous PTR results.
- Provides two modes of correction for the phase change due to dissimilar materials of the pole tips, glass, and the ABS.

Other Zygo applications related to sliders are available to measure 2 and 3 rail ABS geometry, TPC head geometry, taper, edge blend, and pole tip recession.

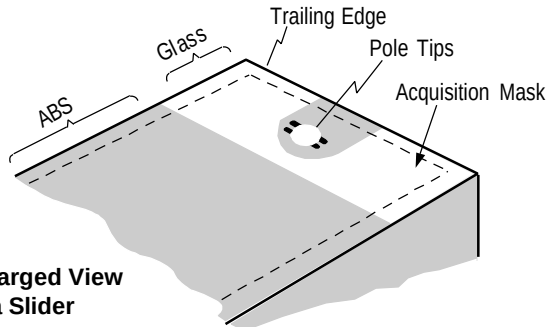
The Application Screen

To open the application, click on the TrimPTR.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.



Guidelines

- *Use a 40X or 50X Objective and a High Resolution Detector* - Measure the pole tips with a 40X or 50X objective for the proper field of view. A high resolution detector ensures that there is enough data for analysis. Set the Camera Mode control to 320 x 240 Zoom.
- *Position the Slider Vertically* - orient the slider so the rail appears vertical or along the y-axis on the video monitor.
- *Set Light Level with Several Fringes in View* - For the most accurate measurements, set the light level (press F5) when there are several fringes in the field of view.
- *Use Masks* - The Trimmed PTR Application requires the use of an Acquisition mask. When the application is opened, a mask file named "TrimPTR.mas" is automatically loaded. Use the mask editor to correct the alignment of the mask over the slider. The top of the mask should be below the rolloff area of the trailing edge, and no part of the mask should extend beyond the surface of the magnetic head. The mask may need to be resized as well. For information on masks, see "Mask Editor" in the *MetroPro Reference Guide*.

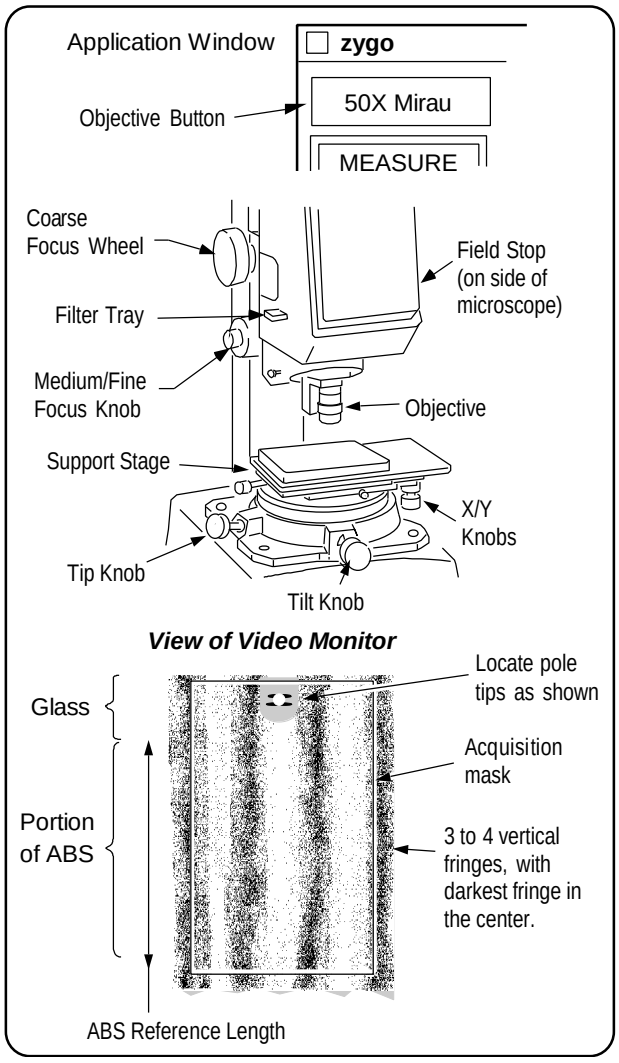


Enlarged View of a Slider

- *Use a System Error File* - It is recommended that you create a system reference file for the objective and then subtract this file from the measurement. For more information, see the *Microscope System Error Application* booklet, OMP-0361.
- Starting point for some software controls:

Measure Ctrl icon	window
	Acquisition Mode: Scan Camera Mode: 320 x 240 Zoom Min Mod (%): 5 Min Area Size: 7 FDA Res: High Remove Fringes: On

Making Measurements



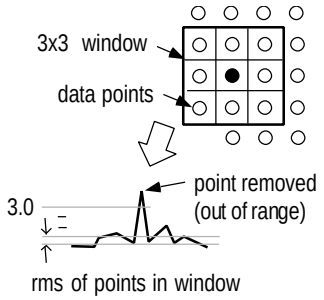
1. Power-up the instrument, start MetroPro, and open the application by clicking on the TrimPTR.app icon.
2. Click the Objective button until it displays the objective in use. Set the applicable controls within the Measure Cntrl and Analyze Cntrl icons.
3. Place the slider on the support stage under the objective. Position the rail so it appears vertical on the video monitor. Position the objective at its working distance from the part. *Don't crash the objective into the slider or the stage.*
4. Position the Field Stop (formerly Focus knob) so the aperture is in place, and put the filter tray to FOCUS. Press the **F5** key to adjust the light level. Focus the microscope for a sharp aperture image; there should be visible fringes. Adjust the stage location to position the rail so the pole tips are located as shown.
5. Position the Field Stop for full aperture and put the filter tray to MEAS, and Press **F5** again. Fine-tune focus and stage tilt for surface detail, to null or minimize the number of fringes, and to center the darkest fringe.
6. Press **F1** or click the MEASURE button to measure.

Software Controls

Some software controls are listed in the following table. For controls not listed, or for greater detail, refer to the *MetroPro Reference Guide*.

Control	*Function*
Controls in Measure Ctrl	
Acquisition Mode	Selects the technique used to acquire data. Settings are Scan or Phase. Scan is for the NewView.
Camera Mode	Selects the effective camera size in pixels. High resolution instruments offer multiple selections. More pixels resolve smaller details, but increase processing time. 320 x 240 Zoom is required for measuring trimmed PTR.

Software Controls (continued)

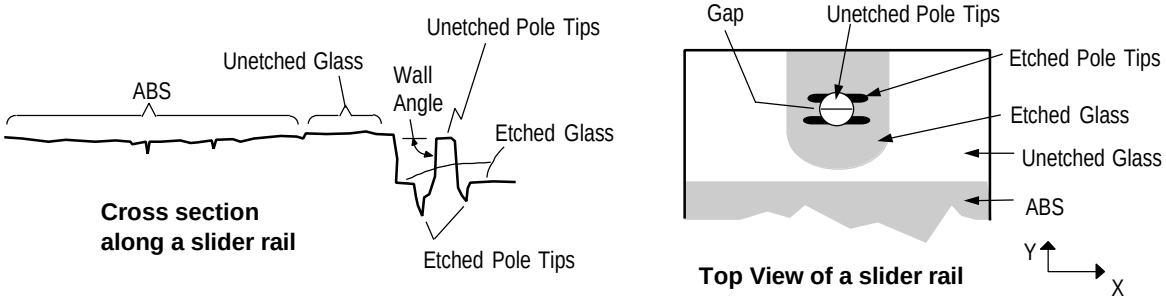
Control	*Function*
Subtract Sys Err	Activates a system error correction function to improve measurement accuracy. An error file must exist for the specific objective in use. See the *Microscope System Error Application* booklet, OMP-0361.
Sys Err File	Specifies the name of a data file to subtract from measurements.
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.
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.
FDA Res	NewView. Selects the resolution used during analysis. Settings are Normal or High. Use High when measuring trimmed PTR.
Controls in Rail Data Ctrl and Unetched Pole Data Ctrl	
Remove Spikes	Determines if spikes are removed from the data. When On, spikes are removed based on the setting of the Spike Height control.
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. 
Trim	Specifies the number of pixel layers to remove from data edges and/or from isolated obscurations. Works in conjunction with the Trim Mode control.
Trim Mode	Selects where the trimming is applied; settings are Outside or All.
Controls in Rail Data Ctrl	
ABS Reference Length	Specifies the length of the ABS surface. It is used to separate the ABS from the unetched glass region. Slice the head vertically in the Filled Plot in the Surface Data window to determine a valid distance.
Nominal Pole Width	Specifies the nominal width in the x-axis of the pole tips. It is used to help find the pole tip region more accurately.
Trim PTR Search	Selects the data and method used to establish the different trimmed PTR regions. Settings are Phase Data (default) or Intensity Data. Intensity Data utilizes the Unetched Pole (%) and Etched Pole Cutoff controls.

Software Controls (continued)

Control	*Function*
Unetched Pole (%)	When the Trim PTR Search control is set to Intensity Data, this control determines how much of the entire pole area (etched and unetched) is defined as the unetched pole region. The percent is applied to the highest/brightest points in the intensity data to determine the unetched pole region. This control is initially set to 50; values may range from 0 to 99.9. To establish the correct setting, look at the pole region in the Intensity plot to determine the amount of area that is the unetched pole.
Etched Pole Cutoff	When the Trim PTR Search control is set to Intensity Data, this control is used to determine how much of the pole area to define as the etched pole region after removing the unetched pole region from the pole area. This control is initially set to 4; values may range from 0 to 25. Increase the value to delete more data; decrease the value to retain data.
PTR (%)	Specifies how much of the unetched pole region to use when calculating the PTR (%) result. When set to 100 (%), PTR and PTR (%) results are the same.

Trimmed PTR Results

Some Trimmed PTR results are explained in the following table. For results not listed, or for related information, refer to the *MetroPro Reference Guide*.

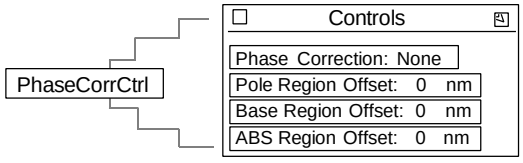


Result	*Description*
ABS Roughness	The roughness of the ABS region. The area of the ABS is specified by the ABS Reference Length control.
Alignment X	An indicator of the alignment of the etched pole in relation to the unetched pole in the X-axis.
Alignment Y	An indicator of the alignment of the etched pole in relation to the unetched pole in the Y-axis.
Bottom Pole Width	Length (width in x-axis) of the unetched lower pole.
Gap Alignment	An indicator of the vertical centration of the gap within the unetched pole tip area.

Trimmed PTR Results (continued)

Result	*Description*
Gap Band Cyl RMS	The rms of the row of pixels immediately above and below the gap. Form is removed from this area before calculating rms.
Pole Mill Depth	The mean vertical distance between the unetched pole tip and the etched pole tips.
Pole Mill Depth (median)	The median vertical distance between the unetched pole tip and the etched pole tips.
Pole to Etched Glass	The vertical distance from the unetched pole to the etched glass.
Pole to Unetched Glass	The vertical distance from the unetched pole to the unetched glass.
PTR	The vertical distance from unetched pole tip region to a reference surface determined by a best fit cylinder to the ABS.
PTR (%)	The PTR calculated using the data specified by the PTR (%) control.
PV	The height between the lowest and highest point.
Ra	The average roughness.
rms	The root-mean-square deviation of all points from a plane fit to the unetched pole tip area.
Top of Poles Offset	The lateral offset between the top of the unetched pole tip and the etched pole area.
Top Pole Width	Length (width in x-axis) of the unetched upper pole.
Track Width at Gap	The width of the etched pole gap in the X-axis.
Wall Angle	The wall angle of the unetched pole tip to the etched area.

Correcting for Phase Shift Errors



The accuracy of surface measuring interferometers is limited due to the dissimilar materials in the head. Each material has different optical properties which cause a reflection phase shift. This shift makes the pole tips appear recessed more than actual and the glass to appear recessed less. In the Trimmed PTR Application, offset correction values can be entered to minimize these affects. Click the PhaseCorrCtrl icon for access to the controls.

The offset values are obtained by measuring a number of heads, coating them with aluminum, and remeasuring them. Zygo offers a coating and testing service for determining exact offset values. Contact Zygo for more information on correcting for phase shift errors.

Other Operations

Operation	*How to*
Save data	Click the Save Data button. In the File Handler, enter a name for the file, ending with ".dat", then click Done.
Print	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.
Saving 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, enter a name for the file, ending with ".app" and click the Done button.
Turn off the system	**Warning!** *Improper shutdown may damage the instrument.* For instruments running under UNIX, select the Shutdown command from the MetroPro menu; turn off power after the system halted message appears. For instruments running under Windows, select the Quit command from the MetroPro menu; turn off power after you have shut down from within Windows.

Troubleshooting

Symptom	*Possible Cause and Fix*
Application not functional.	The application is not licensed; contact Zygo 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 high; decrease the value. NewView scan length may be too short. Increase length with Scan Length control.
Poor repeatability of results.	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.

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