

P6 Profilometer Operating Procedure



I. Introduction

The KLA-Tencor P-6 profiler is a highly sensitive surface profiler that measures step height. The key features of P-6 include:

- A vertical range of 326 μm (Do NOT exceed).
- Substrates up to 6 inches, with maximum thickness of 20 mm
- 5 μm of diamond stylus tip with 60° cone angle
- Top-down view with a camera

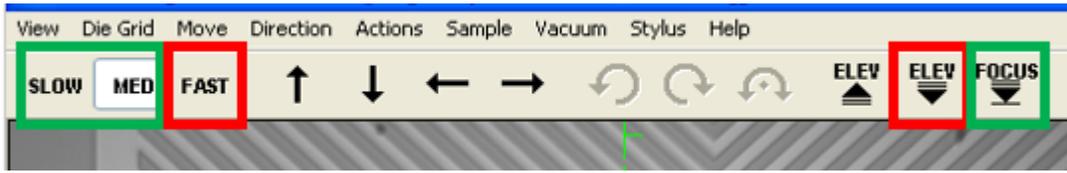
There are three operation screens: **Catalog screen**, **X-Y screen**, and **Analysis screen**. The highest level is the catalog screen where you pick up the measurement tasks, either profiler or stress measure. If you are on the other screen, you need go back to the catalog screen by closing others.

II. Cautions:

1. Users MUST always know the location of the tip prior to moving the stage.

2. NEVER use the Elevator down Button – ONLY Use the Auto FOCUS. Elevator down will move the elevator down this complete disregard to the location of the stylus. Damage WILL result.

3. NEVER use FAST for stage speed, Medium is fast enough



4. – The software does not like to multitask - Do not use multiple programs while in operation as it causes the system to lockup. If scanning – let the system scan. Please practice patience when changing between screens. Allow the system to complete its action before changing services/software.

5. – When possible, scan from HIGH to LOW to prevent shock to the stylus.

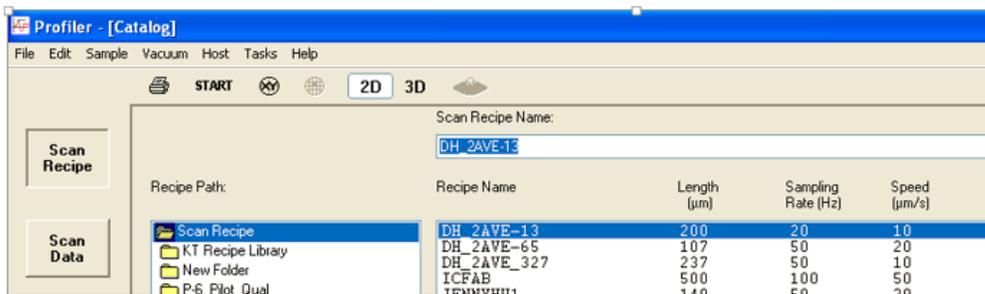
6. – **Scan Speeds (um/sec) should never exceed 100 µm/sec**

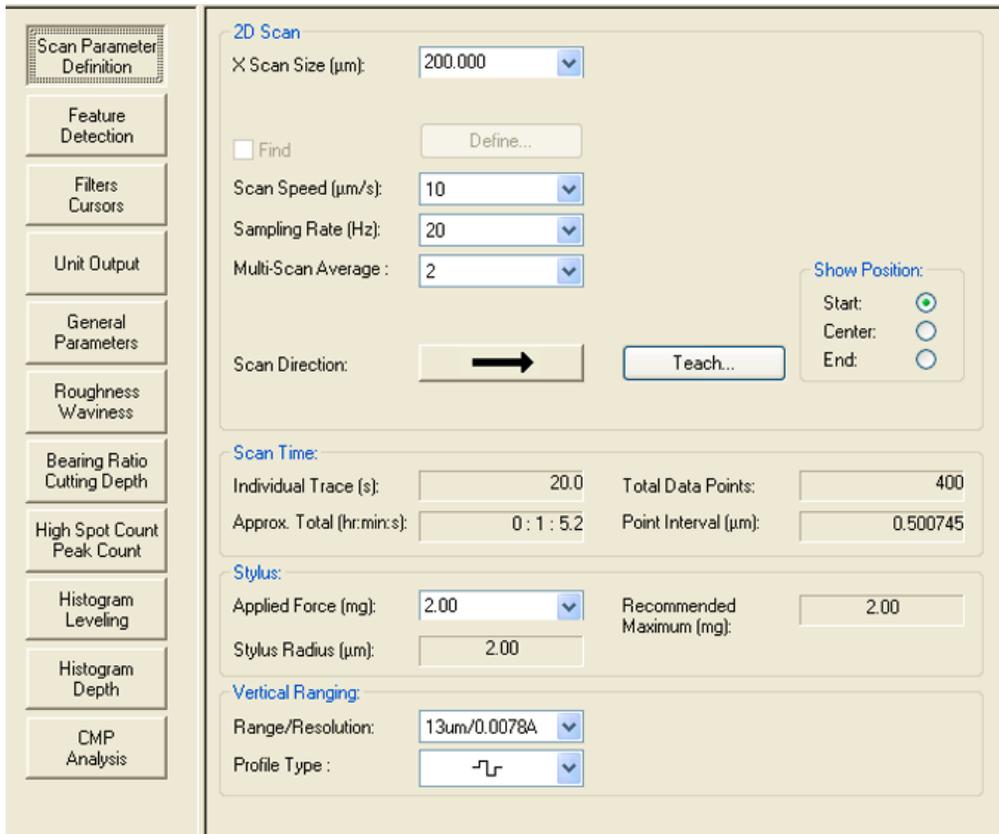
7. – Bumping the table or platform that the system is located on can transfer noise to the system. This can cause spikes in the data collected. While the system is scanning – please keep hands/feet/chairs off of the system and table.

III. Operating Instructions: Profile Measurement

Recipe

1. At the profiler catalog screen, click “Scan Recipe”, highlight and **double click** the recipe you want to use. If you don't have one, open an existing recipe and save it as yours. (If you are not sure which recipe to use, the General Use recipes are good starting recipes.)





- Set the scan parameters to appropriate values. The scan recipe may be saved in your personal folder for future use. See table below for recommended settings. When setting sampling rate, choose a rate that corresponds to a resolution that is no less than $\frac{1}{4}$ of the tip radius ($0.5 \mu\text{m}/\text{sample}$ for $2 \mu\text{m}$ tip radius). **Don't scan > 100 $\mu\text{m}/\text{s}$ without consulting cleanroom staff first. Don't apply force > 2mg without consulting cleanroom staff first.**

<u>Material</u>	<u>Force (μg)</u>	<u>Speed ($\mu\text{m}/\text{s}$)</u>	<u>Resolution</u>
Soft (resists)	0.5-1.0	2-10	$0.5 \mu\text{m}/\text{sample}$
Hard (most metals, oxides, nitrides, etc.)	2.0	20 (not to exceed 20)	$0.5 \mu\text{m}/\text{sample}$

Select a vertical range that is greater than your highest feature. If you are not sure, choose $324 \mu\text{m}$.

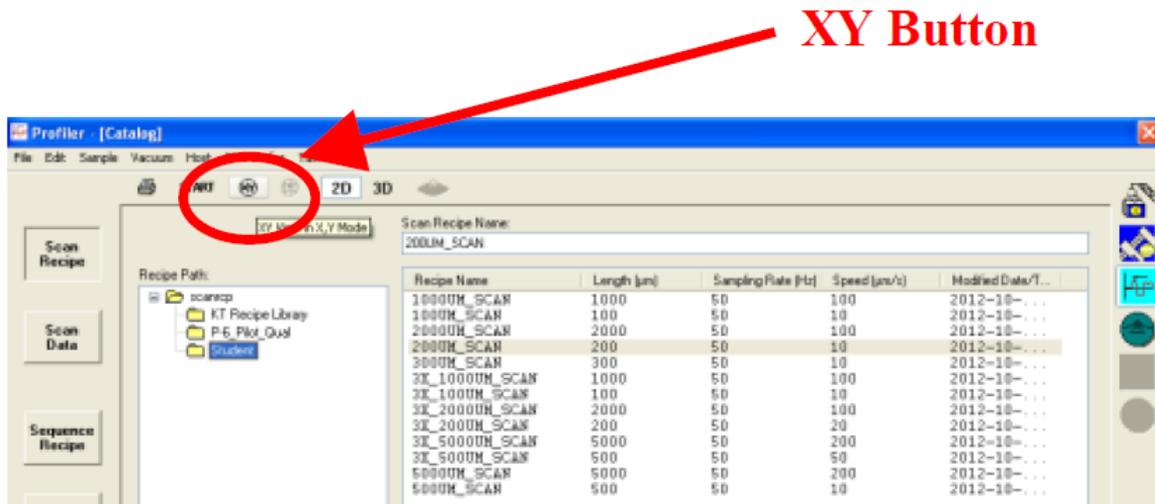


- i. 13 um setting – 6.5 μm above/below contact point
- ii. 65 um setting – 32 μm above/below contact point
- iii. 327 um setting – 163 μm above/below contact point

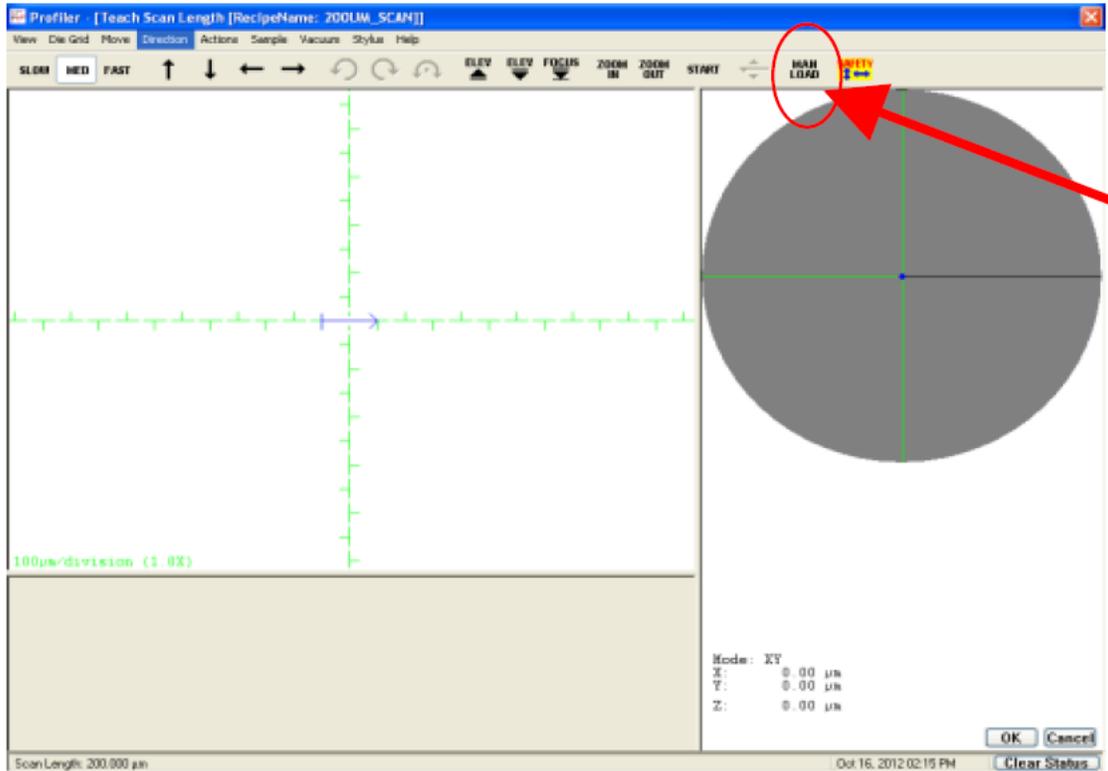
3. To go back to previous screens, the ESC key may be used.

Loading

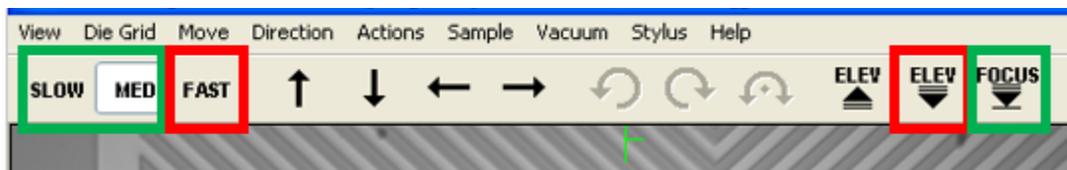
1. Open the X-Y screen by clicking the **X-Y** icon on the top menu.



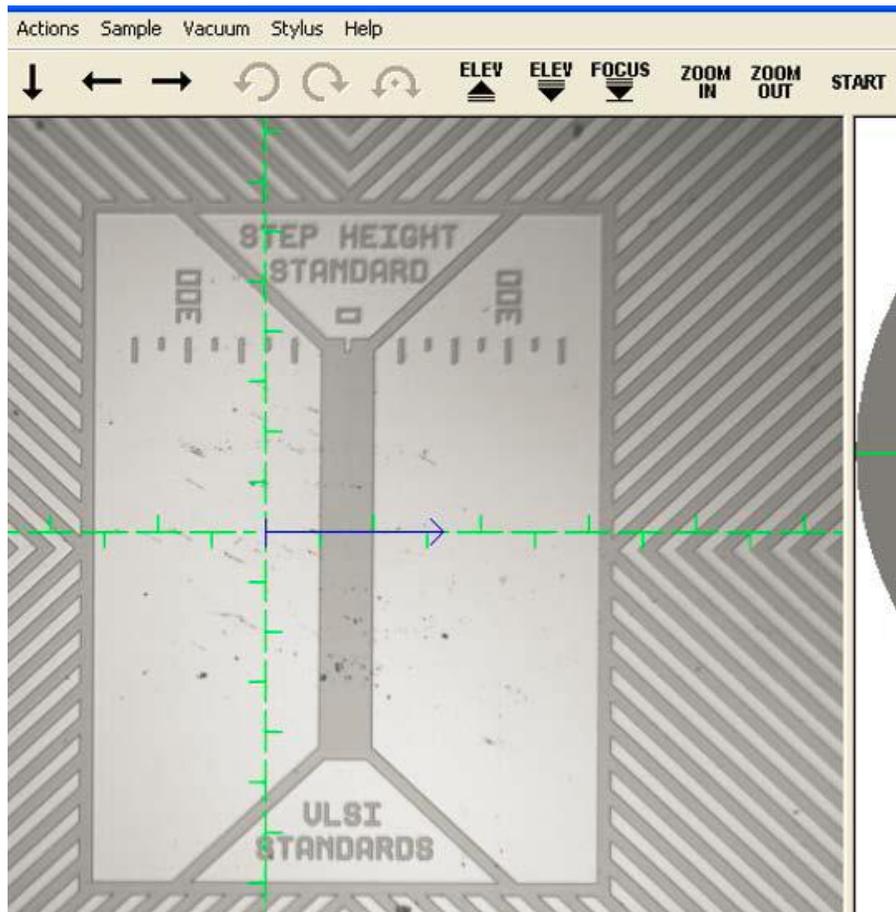
2. Press **MAN LOAD** button to move the stage close to the door.



3. Once the stage has moved to the door, open the door and load your sample on the center of stage. Small sample **MUST** be placed at the very center!
4. Press **MAN LOAD** button again to move the stage back under the stylus head.
5. Click **FOCUS** button to bring the stylus head down to the sample surface. The stylus head will move down, touch the sample surface, and lift up automatically.



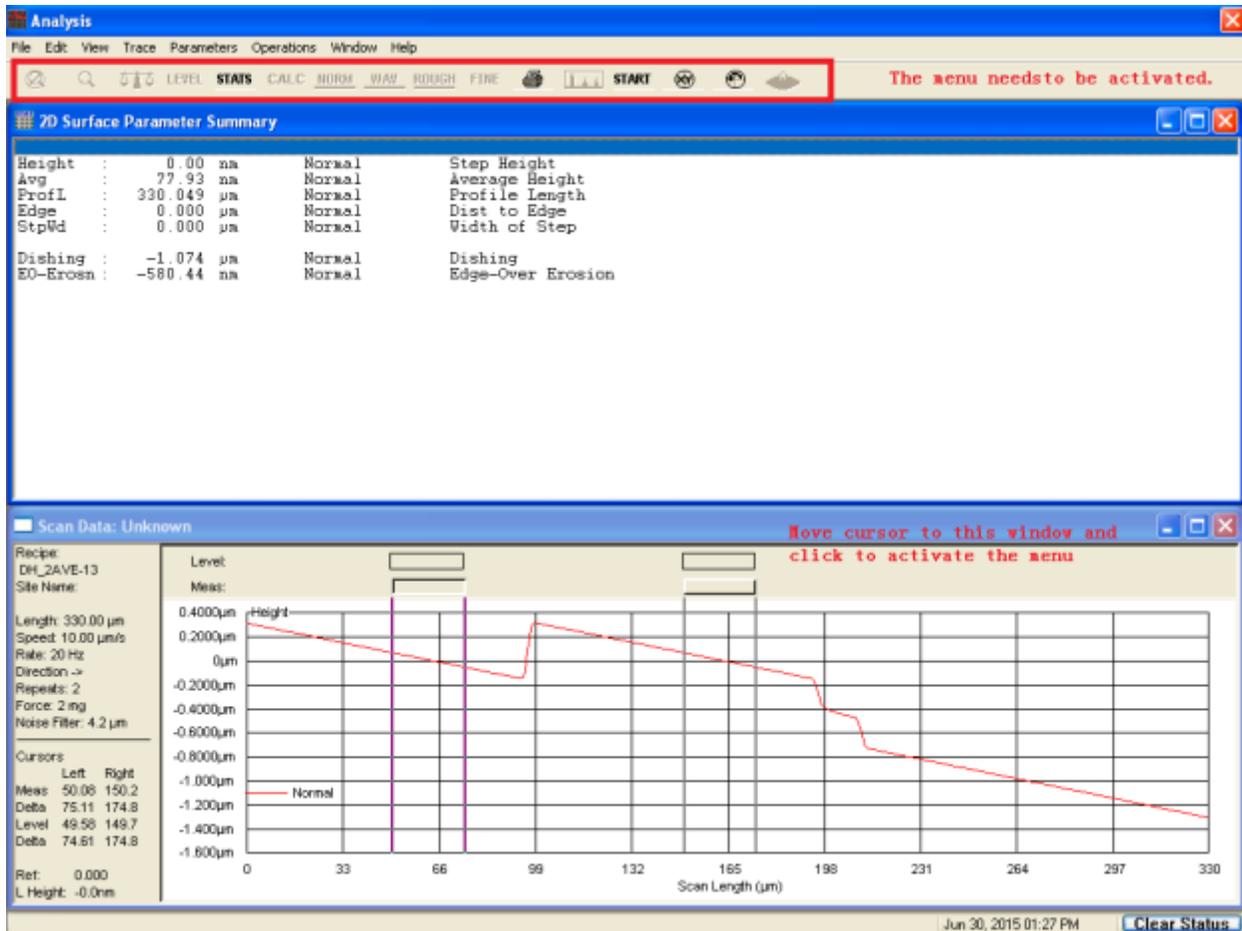
6. Move stage to find the feature you want to scan by using the arrows (left, right, up, down) or pointing to a location within the circle. The stage moving speed can be Slow, Med, and Fast, but normally at the medium. Zoom in or out if needed, but be sure that the stylus is above your sample.
7. The blue arrow on the sample screen indicates the scan length on the sample. It can be lengthened or shortened to change the scan length by clicking and dragging the blue arrow that shows up on the sample image.



8. **Note:** If at any time you want to move your sample manually, you MUST press **MAN LOAD** again. Failure to do this may ruin the stylus tip. The only allowable movement of the sample once the stylus has lowered is with the arrow icons at the top of the screen.

Scan and Data Analysis

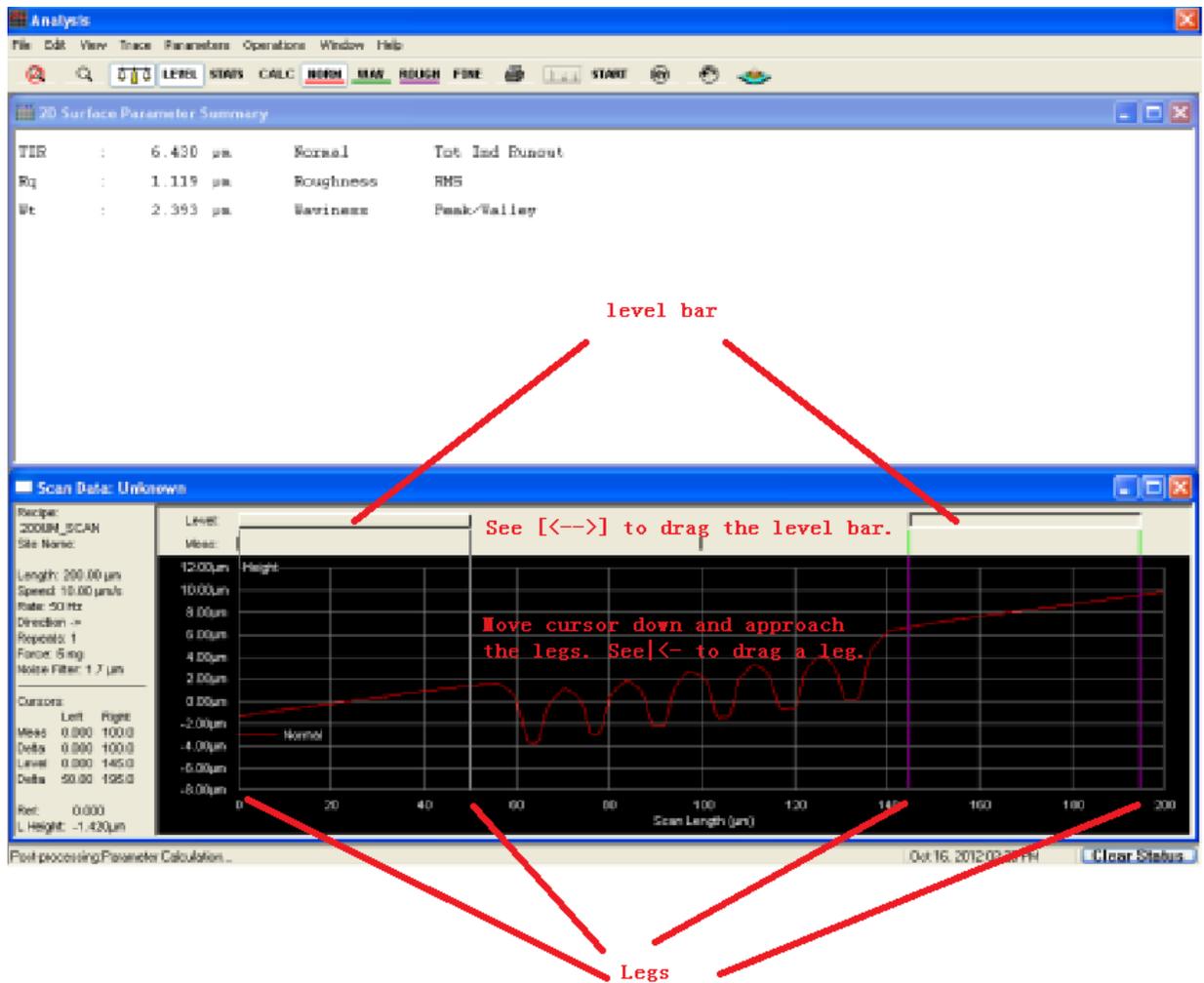
1. Click the **START** button if you are ready to scan a feature. Avoid extra vibrations at this moment. The analysis screen will automatically pop up once the scan is complete.
2. Note that during the scan, the image on the monitor does not show where the scan is being performed. The camera is moved away from the area while the scan is done.
3. You are now at the “Analysis Screen”. First you must get the top menu activated, you do this by moving the arrow to the “Scan Data” window at the bottom and clicking on it. This will activate the upper menu.



Most of times, you need to level the trace. Click **LEVEL** button to activate the level function, then move right and left cursors to appropriate positions, and adjust top Level Bars to encompass desired data to level.

- Widths are adjustable
- Select data which is known to be at same height on the sample

When you move right and left cursors, if you see a [\leftarrow \rightarrow] cursor, the cursor will move both legs. If you move your cursor down into the black area and approach a leg, you will see a \leftarrow or \rightarrow cursor, the cursor will move only one leg.



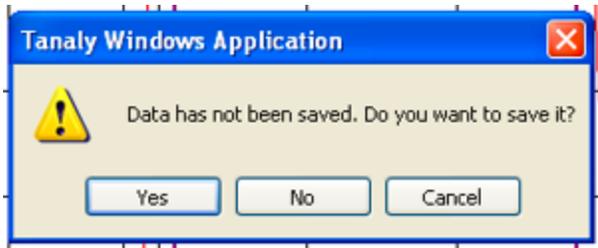
and finally click LEVEL button again to finish the leveling process.

4. Measure the step height by positioning cursors to appropriate locations. The step height and locations are shown on the left side of the window screen. Click on this screen to expand the view so all measurements can be seen to the left of the scan. Expanding the cursors by dragging and pulling a line of the cursor will take an average height measurement over the cursor range.
5. When done, you will be prompted as to whether you want to save the recipe and/or data. If the data is saved, it will be available later in the "Scan Data" choice below "Scan Recipe" icon of the profiler catalog screen. Recipes will be saved in the "Scan Recipe" folder you choose.
6. Return to X-Y screen by closing the analysis screen.
7. Repeat the above steps if you want to measure a second feature. Otherwise, go to unloading procedure.

Unloading

1. On the **X-Y** screen, press the **MAN LOAD** button to move the stage to the door.
2. Wait till the stage is set, open the door, and remove the sample.
3. Close the door and log off the tool.

Save data

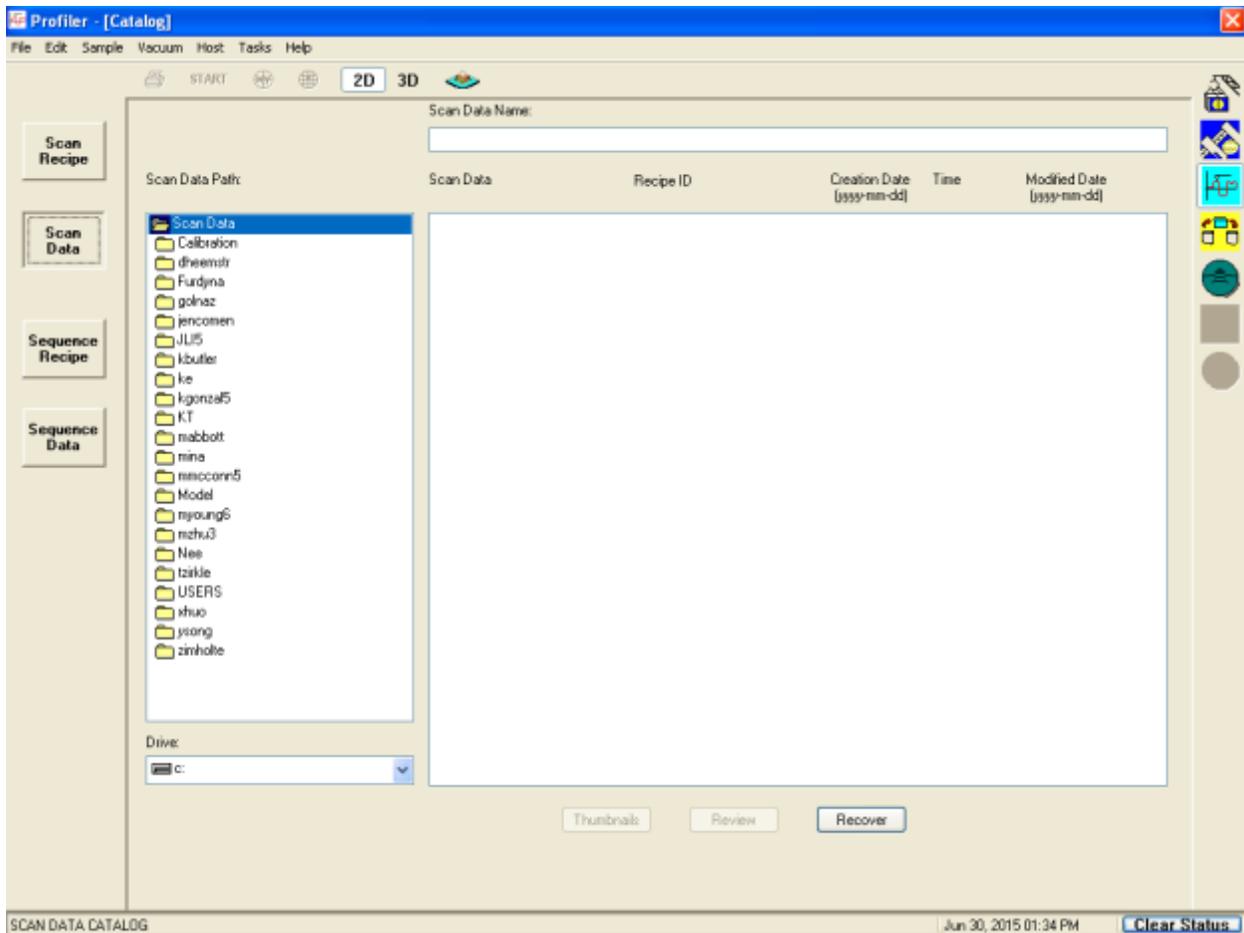


Click Yes and follow the instruction

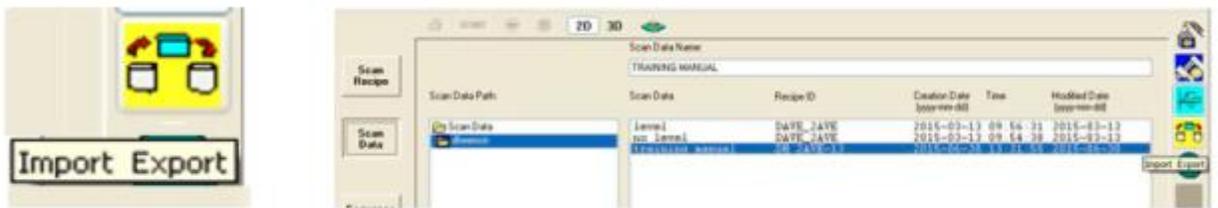
Export data

Users can export data that has been saved in the “scandata” folder (.dat data type).

1. Close (X) windows until reaching the Scan Recipe List
2. Select The “Scan Data” tab on the left
3. Find the user specific file



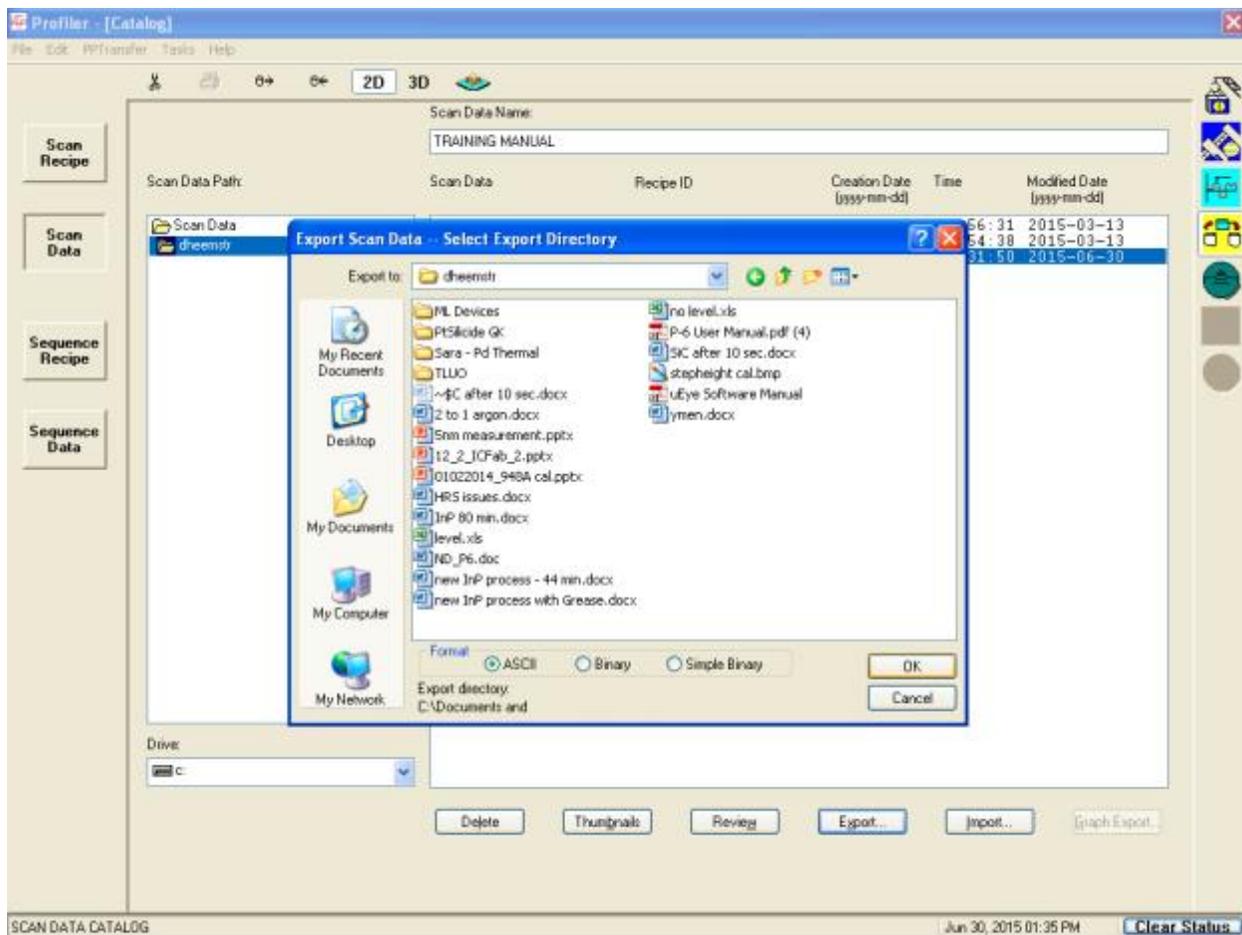
4. Select the “Import Export” tab on the right side



5. Select the File to Export and then select “Export” at the bottom

6. Save the Exported file as ASCII in the Desktop □ Users □ User Specific Folder

7. Data can then be saved (USB) and opened in Excel using Tab Delimited



This document is an edited version of the “Operation Instructions for the KLA Tencor P-6 Surface Profilometer” @ https://www3.nd.edu/~ndnf/facilities/manuals/ND_P6_operations_manual.pdf