

# University of Minnesota Nano Fabrication Center

## Standard Operating Procedure

**Equipment Name:** Surface Profiler IIA and 3030

**Coral Name:** surface-prof-d2a and d3030 **Revision Number:** 3

**Model:** Dektak IIA and  
Dektak 3030

**Revisionist:** Kevin Roberts

**Location:** Bay 3

**Date:** 9/17/2013

### 1 Description

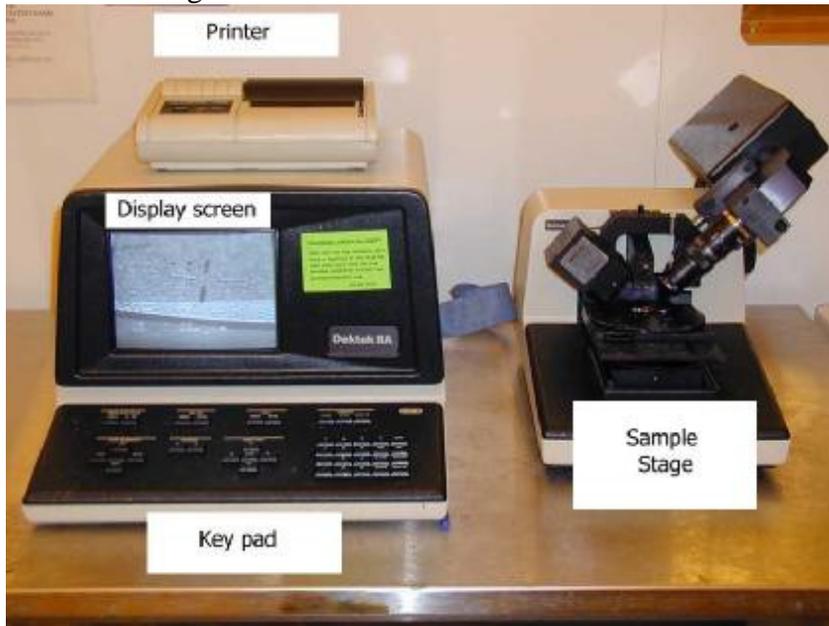
The Dektak Surface Profiler is a microprocessor-based instrument used for taking accurate measurements on small vertical features ranging in height from 100 angstroms to 655k angstroms. It obtains data by moving a sensitive diamond tipped stylus over the substrate. The data is recorded and sent to the transducer for digitization and future plot manipulation.

#### a Model IIA

Has a printer

The stylus down force is approx. 50mg and cannot be adjusted.

The maximum vertical travel or MEASURE measurement range is 655K Angstroms.



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### b Model 3030

The stylus down force can be set in the variable down force option set in the software setup section.

The stylus down force set in the software setup section, press the PROGRAM button. The useful setting range would from ~ 10 mg to 60 mg range. Use lower values for soft films like Al, Au, or photoresist films. The measurement range has three options, 65K Å, 655K Å and 1310K Å. Select the correct one for the thickness or step height that is being measured. The lower range you can use the better quality of data you will get.



### 2 Safety

- a Beware of all moving parts

### 3 Restrictions/Requirements

- a Must be a qualified user on the dektak.
- b Do not touch the stylus with your fingers.
- c Do not turn any knobs more than a few degrees at a time. Turn all knobs with care.
- d Do not use acetone to clean the chuck. If needed, use a towel with some IPA or methanol on it.

### 4 Required Facilities

- a Electrical Power

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### 5 Definitions

- a **Stage:** Where the substrate is to be placed.
- b **Stylus:** The stylus is the diamond coated point that actual makes contact with the surface to be measured.

### 6 Setup

- a The Dektak 3030 the power switch is located on the top of the system tower. Turn on the machine by flipping the power switch on.
- b The Dektak IIA power switch is located in the back on the left hand side.
- c Place your sample to be measured on the center of the stage. Make sure you can see the stage on the monitor. Press the video key once or twice.
- d Focus the feature by adjusting the knob found on the right side of the stage. This only needs to be done if there was a change in sample thickness from last sample measured.
- e Align your sample with the X-axis knob or by moving it with your tweezers. It is best to have your sample not setting in the center, but off to the front or back of center. So you do not scan across the center stage as it will cause your to be less accurate, due to it being a loose stage.
- f Push the stylus key to lower stylus and check where it will land on the substrate. You want the stylus to be pictured on the left of your desired area since the stylus travels left to right on the screen. If the stylus is not aligned properly, hit the stylus key again to raise it and reposition your sample with a tweezers.

### 7 Operating Instructions

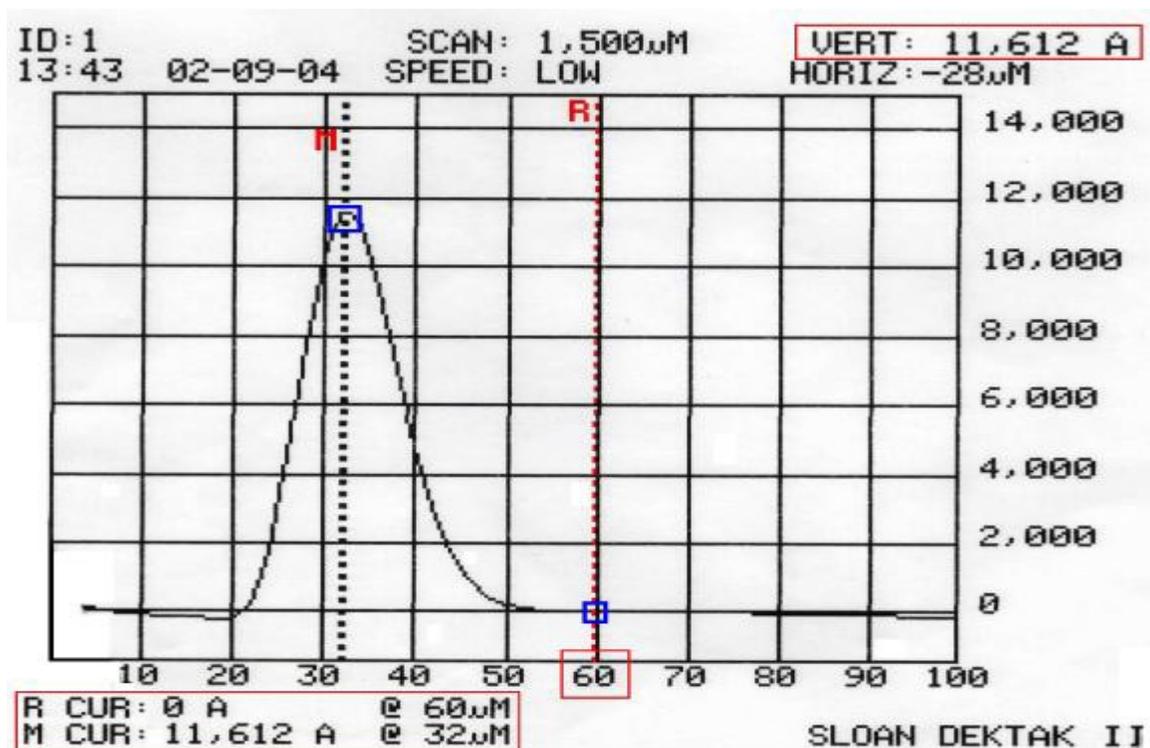
- a Press video until the screen shows both the programming and video picture.
- b Push the program key to setup the system parameters.
- c Arrow down to the scan length, speed, and profile and enter desired values using the numerical keypad. Press enter when finished. Slower the speed better the data sample will be. The speed is based on how much time the scan will take, slow is 50 seconds.
- d Press **SCAN** to measure sample.
- e When the Dektak finishes scanning, the stylus will return to the home position and you can now analyze the displayed graph.

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### f GRAPH ANALYSIS:

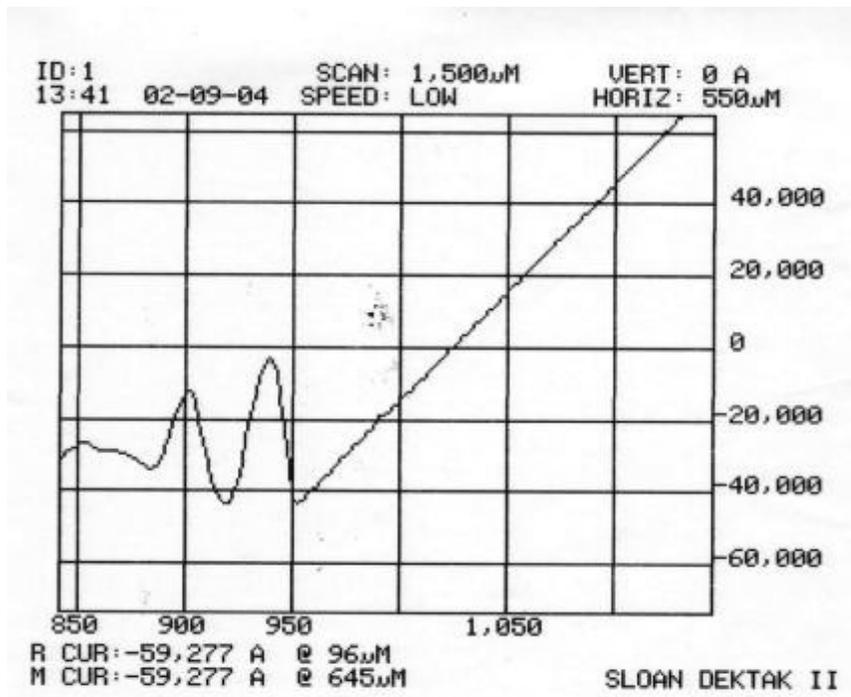
- a The image enlarged to your desired proportions. In doing so, keep in mind that any changes need to be within the **R** & **M** cursor boundaries such as if you were to analyze the average height, maximum height, and area.
  - 1 Push the **R** or **M** cursor keys and move them into position with the direction keys. Place them at the same levels for vertical values.
  - 2 Push the **LEVEL** key to level the screen between the **R** and **M** cursors. This translates the image so both **R** and **M** are on the same level.
  - 3 The screen will replot. After new plot has been displayed, press the **ZERO** key to zero the screen at the **R** cursor intersection.
  - 4 Move the **R** and **M** cursors to a place that needs to be measured, such as vertical distance from a peak to a valley, or from one side of a mesa to the other to find the horizontal distance. *See the graph 1 for a sample display.* Notice that the items to be noted were changed the in **red** or **blue** color. The top peak has a dashed line going through it labeled **M** and to the right is another line, a red dashed line labeled **R**. You must decide where to move the **R** and **M** cursors to get the information. Notice the top box in red listing the vertical delta between the **R** and **M** positions. At the bottom of the display there is another red box and this displays the vertical and horizontal values for each of the cursors where they intercept the graph.



Graph 1

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**Graph 2** A better scan can be obtained by changing vertical range in the program set up screen, or by manually leveling the stage.

- 5 Other features that can be useful: Area, Max HT, Avg HT, or Roughness Avg. This can be done by using the cursor positions and the buttons with the labeled feature.
- 6 When you want to enlarge your picture, or exclude an area, press one of the plot boundary keys (**LEFT**, **RIGHT**, **TOP**, or **BOTTOM** and then move it with the corresponding direction keys. then press **REPLOTT**.
- 7 To be precise, manually enter X/Y values by just pushing a plot boundary key and then entering a desired number followed by the **enter** key. (X-axis In microns: Y-axis in angstroms)
- 8 If a paper copy is needed, hen finished, press the print key only if the data on paper is need.
- 9 Unload sample, power down the system by flipping the power switch down to off.

## 7 Problems/Troubleshooting

- a Error during lowering of stylus. The stylus does not lower or gives an error. Make sure the stylus returns back and retry again, if it again gives same error, turn off power and try again.
- b The display line goes flat part way through the scan like Graph 2.

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The sample NOT being level, or the maximum vertical scan size was too low (on 3030 model only). Reduce the vertical scan size, or reposition your sample.