

Bruker Dimension Icon AFM

Quick User's Guide

August 2012

GLA Contacts

Teddy Huang (zhuang@caltech.edu 404-697-3216)

Noah Plymale (nplymale@caltech.edu 330-357-1204)

- 1) Read about “How to avoid breaking the instrument” on the hood or on the cover of the logbook if you are not a frequent user.
- 2) Ensure that the computer and controller are both on. If one or both are off, contact a GLA for assistance. Fill out the logbook before you begin.
- 3) Launch the NanoScope 8.15 software program. Select which experiment you want to perform and load the program. This turns on the laser in the scanner head. Click on “Setup” at the top of the menu on the left.
- 4) Put on gloves and open the instrument hood. Verify the stage is clear of debris and the scanner head is resting in its dovetail mount. If you need to clean the stage, use only a paper towel or KimWipe moistened with isopropanol. **DO NOT** use compressed air, acetone, or other methods to clean the stage and do not directly apply any solvent to the stage.
- 5) Follow the instructions in the software. First is to load the probe. The probe holder should be in the black cylindrical case or in a clear plastic case on the desk. Load the desired probe into the probe holder by withdrawing the metal clip, using tweezers to transfer your probe, and replacing the clip. Hold the probe holder securely between your fingers when you withdraw and replace the clip. Let the software know which type of probe you are using. If the probe is not found in the database, select “unknown.”
- 6) Unlock the scanner head by loosening the screw to the right of the head. The scanner head should always be in the dovetail unless you are loading the probe holder. If it is not, contact a GLA.
- 7) Transfer the probe holder to the scanner head, using the utmost **CAUTION**. Unintentionally bumping the scanner head can result in a broken scanner. Hold the scanner head carefully and securely; it is **EXTREMELY** delicate and costly. It's recommended to use your right hand to hold the scanner, placing your thumb under the protrusion on the left of the head. If the orientation of the probe holder is incorrect, simply place the holder down, adjust your grip, and try again. Make sure the scanner head rests securely in the dovetail mount before you release your grip on the scanner head. Tighten the screw on the right of the scanner head to lock it in place.

- 8) Move the scanner head to the alignment station by clicking on the button in the software. The alignment station is simply a mirror that allows you to see the laser in the camera.
- 9) Align the laser on the cantilever and maximize the sum of the signal on the detector using the knobs on the top of the scanner head. A video is available in the software to help you if need be. Do not turn the knobs too far in one direction, as this can break the mechanism. **NEVER FORCE THE KNOBS.**
- 10) Align the laser on the detector by adjusting the knobs on the left of the scanner head until the vertical and horizontal deflection are both 0 ± 0.1 V. Again, a video is available in the software to assist you. Do not turn the knobs too far in one direction, as this can break the mechanism. **NEVER FORCE THE KNOBS.**
- 11) Focus the optics on the cantilever by using the buttons in the software and click on the cantilever to align the red cross with the tip of the cantilever. This helps you locate the exact position of the cantilever when the camera is not focused on it.
- 12) Depending on the mode you are using, you may have to tune the cantilever at this point. To do this, the auto tune option is usually sufficient, but some users may prefer to tune manually. Make sure the cantilever tunes to a frequency within the range specified on the probe box.
- 13) Select “Navigate” from the menu on the left.
- 14) The next step in the software is to move to the “Sample Load Position.” This is only necessary if you are loading a large sample that will cover a good portion of the stage. In most cases, this step can be skipped and the sample can be loaded without the use of the “Sample Load Position.” Load your sample with the vacuum (covering all required parts of the stage) or mount your sample with tape or paste on a puck and use the magnet to mount your sample. When mounting, keep in mind that you can rotate the stage like a turntable.
- 15) Make sure there is sufficient clearance between the sample and the scanner head before proceeding. If necessary, use the software to raise the scanner head. Move the stage using the buttons in the software, the track ball, or rotation so the scanner head is positioned directly above your sample.
- 16) Use the software to find the surface of your sample. The “find surface” button available in some modes is convenient but may dull your tip with repeated use. To manually find the surface, select whether you want to focus on the sample surface or tip reflection. Only use the tip reflection focusing option if your samples are reflective. Then, watch the scanner head as you move it as close to the surface as possible without crashing the tip (crash protection will help, but you may still dull the tip if you aren’t careful). Use a slow speed to move the scanner head until it is focused on the sample, or, if you are using tip reflection mode, on the reflection of the tip.

- 17) Find the part of the surface you want to scan using the buttons in the software or the trackball and select the “Check Parameters” option in the menu on the left.
- 18) Enter in the parameters you would like to start with. Depending on which mode you are running and the characteristics of your surface, the parameters you need will vary. To get a feeling for the parameters, it is best to read the instrument manual, which is available by pressing F1. Additional parameters can be made available by clicking on the “Expanded Mode” button.
- 19) Close the hood carefully following instruction from your training. Be careful with the instrument since the tip is very close to the sample.
- 20) Select “Engage” from the menu on the left. The instrument will engage and automatically proceed to “Scan.”
- 21) In the event of a software crash or instrument malfunction, an emergency withdraw button is located on the back left-hand side of the instrument. This will withdraw the tip 100 nm.
- 22) The image should appear on the screen with the trace and retrace plots shown below. Adjust the appropriate parameters until the trace and retrace lines are as close together as possible. Use the error plot to gauge the magnitude of the error and reduce high frequency noise (bright white spots).
- 23) Select the directory for saving your files by clicking on the “Select Capture Directory” button. Name your file.
- 24) When you are ready to save your image, select one of the capture options (“Capture,” “Capture Continuous,” or “Capture Now”). The image should save in your directory with the file name you gave it.
- 25) When you are done collecting data, click “Withdraw” in the menu on the left. Select “Navigate” and raise the scanner head so it is visibly clear of the surface. If the scanner is too close to the surface there is a risk of damaging the scanner during disassembly.
- 26) Remembering to wear gloves, open the hood and remove your sample. You may need to move the stage with the software or the trackball. For very large samples, you may want to use the sample loading position.
- 27) Loosen the screw on the right of the scanner head, using the Allen key if necessary. Grasp the scanner carefully and lift it out of the dovetail, again taking the utmost **CAUTION**. Remove the tip holder and replace the scanner head, making sure it is securely in the dovetail mount. Tighten the screw holding it in place.
- 28) If necessary, clean the stage. Only use isopropanol and never wet the stage directly with the solvent. Do not use compressed air or acetone.

29) Close the hood carefully following instruction from your training, and close the software.
Sign out of the logbook.