Quick Start – ATOMIC FORCE MICROSCOPE
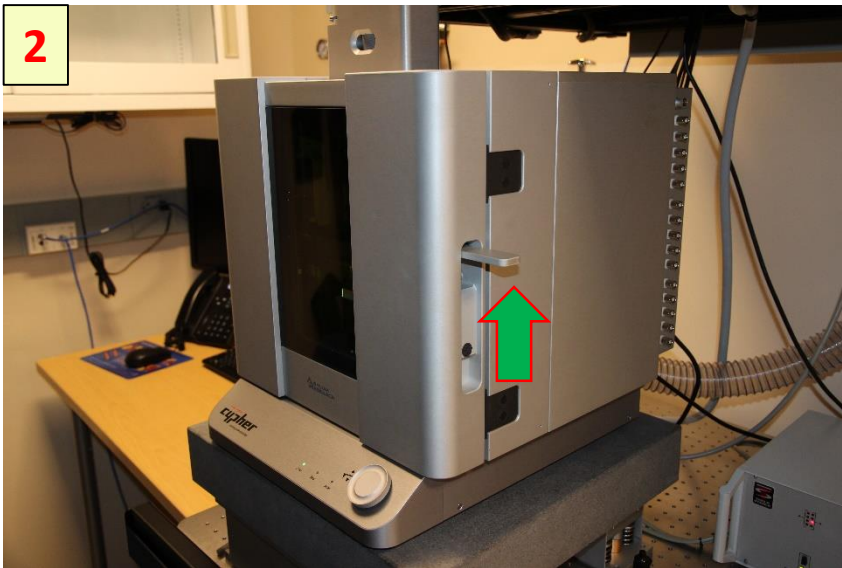## West Campus Imaging Core
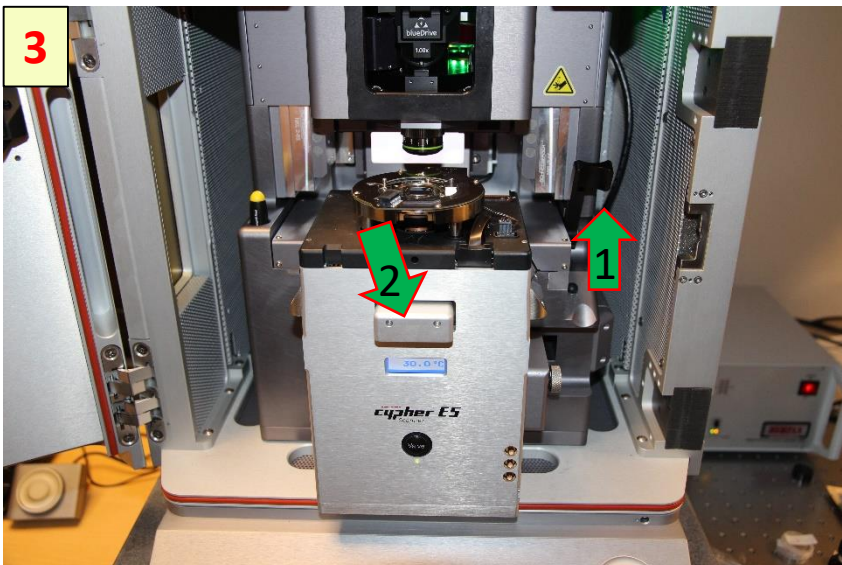
1

Turn On the laser power

2

Open enclosure:
- lift the door latch and open the enclosure door.

3

1.Unlock scanner:
Lift the lever to the right of the scanner.
2.Pull the scanner forward:
Pull the scanner forward gently and stop when it is about halfway out.

Install a cantilever.
Be careful when reattaching the cantilever clip to not crack the glass.
• Anytime the cantilever clip has been completely removed - for cleaning - care must be taken when reattaching the clip.
• Do not tighten the screw until you are sure that the clip is aligned correctly and has dropped into the pocket in the glass body.
Warning: Pay attention! Failure to align the cantilever clip with the pocket before tightening the clip will break the cantilever holder glass.
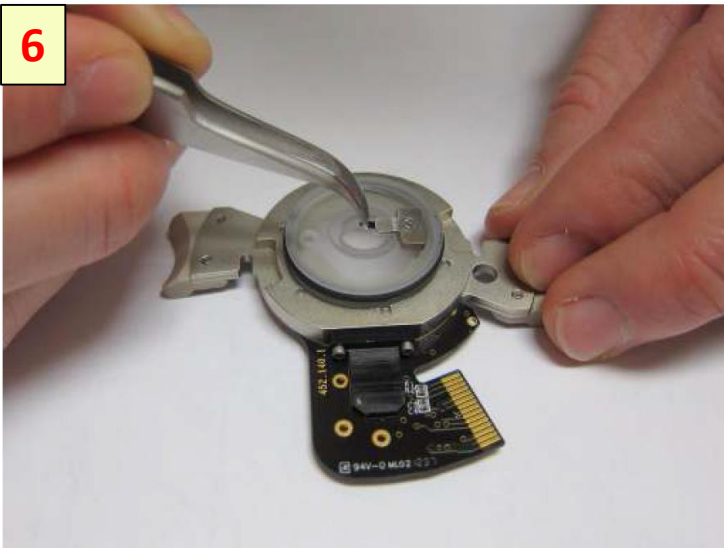
5
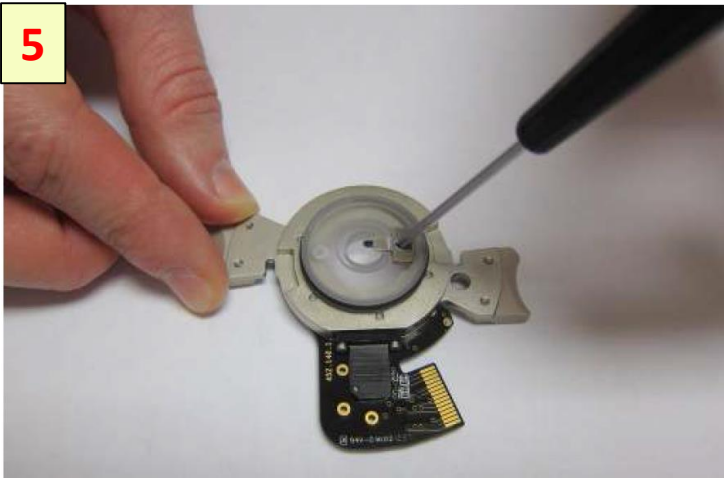
Loosen the cantilever clip:
• Unscrew the clamping screws by onehalf turn.
• Do not unthread the screw completely.
If you accidentally do, please refer tothe cantilever holder chapter.
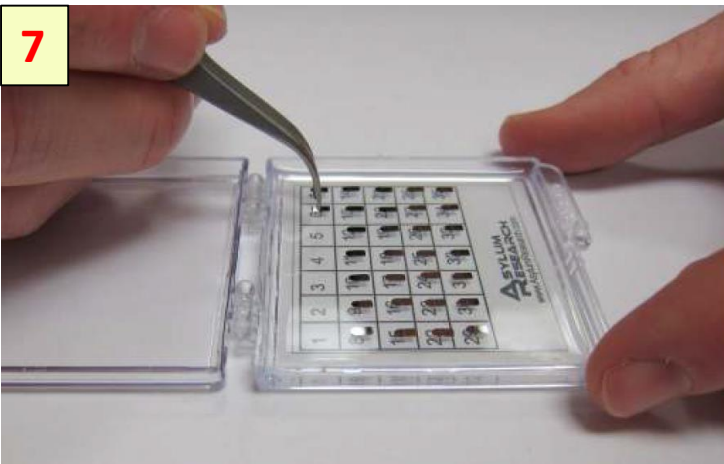
6

Remove the old cantilever:
• If a cantilever has already been loaded,
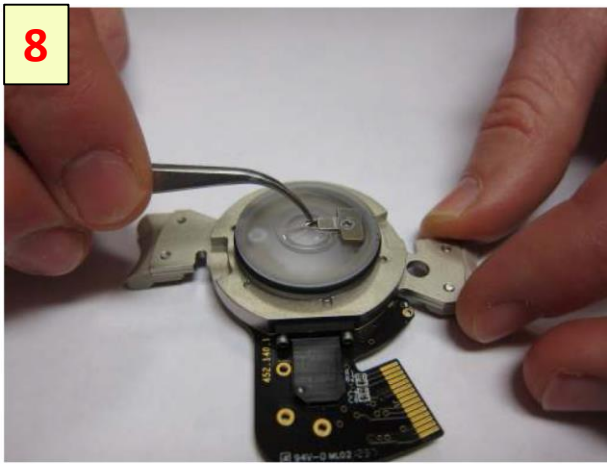use tweezers to remove it from the
cantilever holder.

7

Select new cantilever:
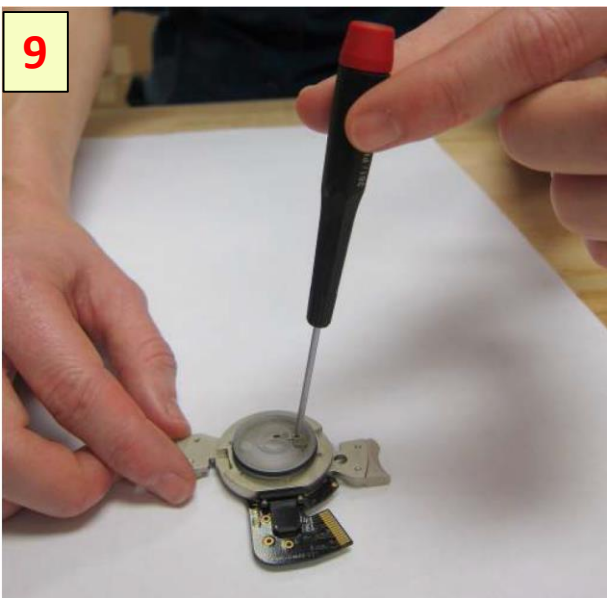• Use tweezers to pick up new cantilever.

8

Load new cantilever:
• Use tweezers to slide the new cantilever under the clip. You can "push" or "pull" the cantilever into place as you find comfortable.
• Position the cantilever so that the tip is approximately centered in the cantilever holder window.

9

Secure the new cantilever:
• Using *fingertip pressure only*, lightly tighten the screw securing the cantilever to the cantilever holder.
• The clip should be just tight enough to secure the cantilever chip when it is pushed from the side.

10 To load or unload a sample, you will need to lower the coarse engage stage so that
you can access the sample stage.
• Rotate the Engage Control Knob *counterclockwise* until it reaches its lower limit of travel.

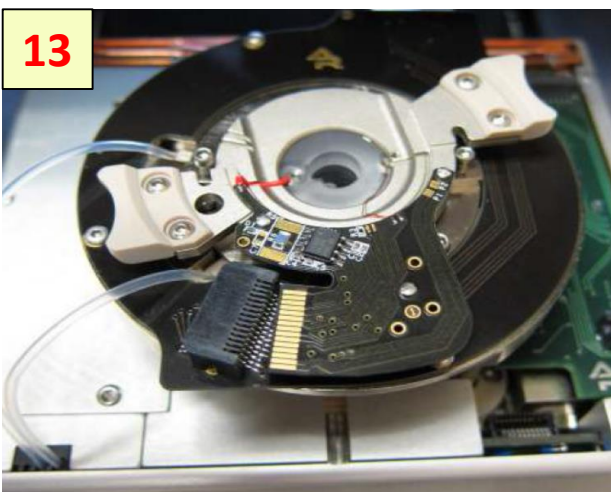**11** Use "Platypus" tweezers (Asylum Part #290.165) to place new sample on sample stage.
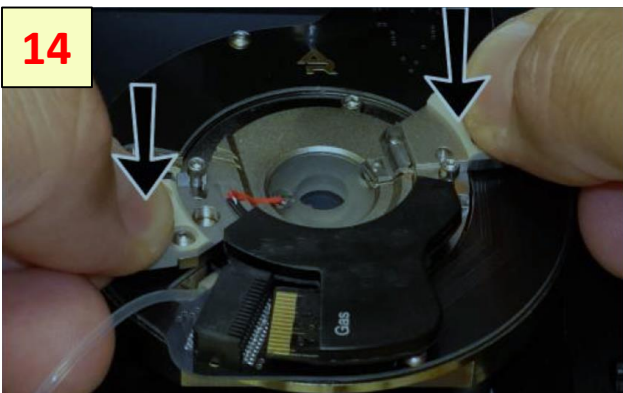

12 RAISE THE COARSE ENGAGE STAGE by turning the Engage Control Knob *clockwise.* Raise the stage until it reaches its upper limit of travel.

13 **Place cantilever holder:** The cantilever holder should sit level and be rotationally aligned so that the cantilever holder board is almost touching its mating connector.
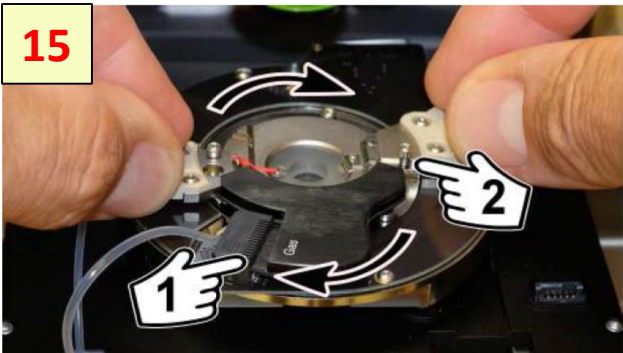
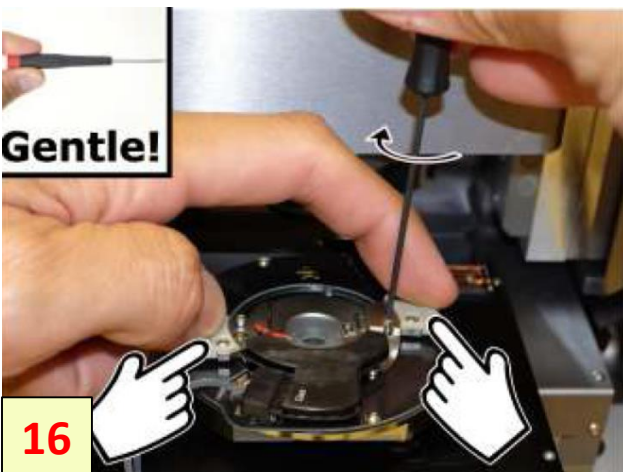|	
14	**Press the cantilever holder down:** With fingers on both handles of the cantilever holder, use firm pressure to wiggle the cantilever down into the cell body. The O-ring will offer some resistance. When the cantilever holder is firmly seated, you will feel a hard stopas metal parts make contact.
15	**Rotate:** • Rotate the cantilever holder *clockwise* until you feel a hard stop. **1** The cantilever holder contacts slip into the mating connector. **2** Notice the screws cause the hard stop as they slip into the matching metal cutouts.
16	**Tighten the screws:** • Place pressure on the cantilever holder handles as shown. Make sure it's firmly seated. • Finger tighten one of the screws **and stop as soon as you feel any resistance**.

17

Slide scanner into chassis:

• Slide the scanner back into the chassis. Use firm pressure until you feel a hard stop. Before you feel a hard stop you will feel a spring-like resistance. You are making thermal contact between the scanner and the chassis.

• Maintain pressure on scanner and press the lever at the right downward to lock the scanner into place.

18
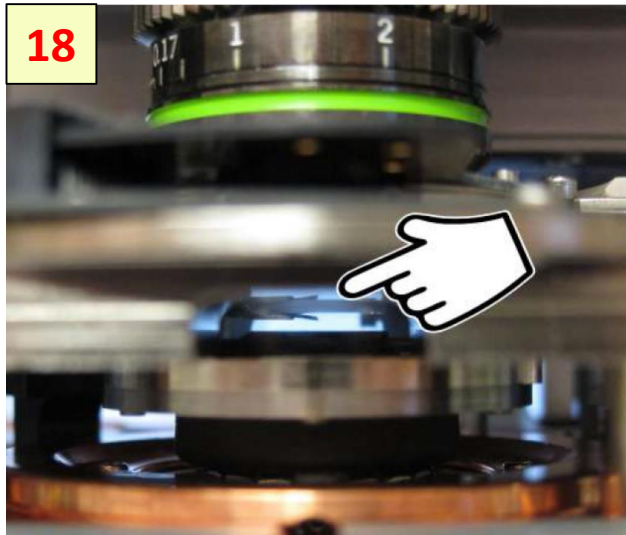
Motor cantilever toward sample:
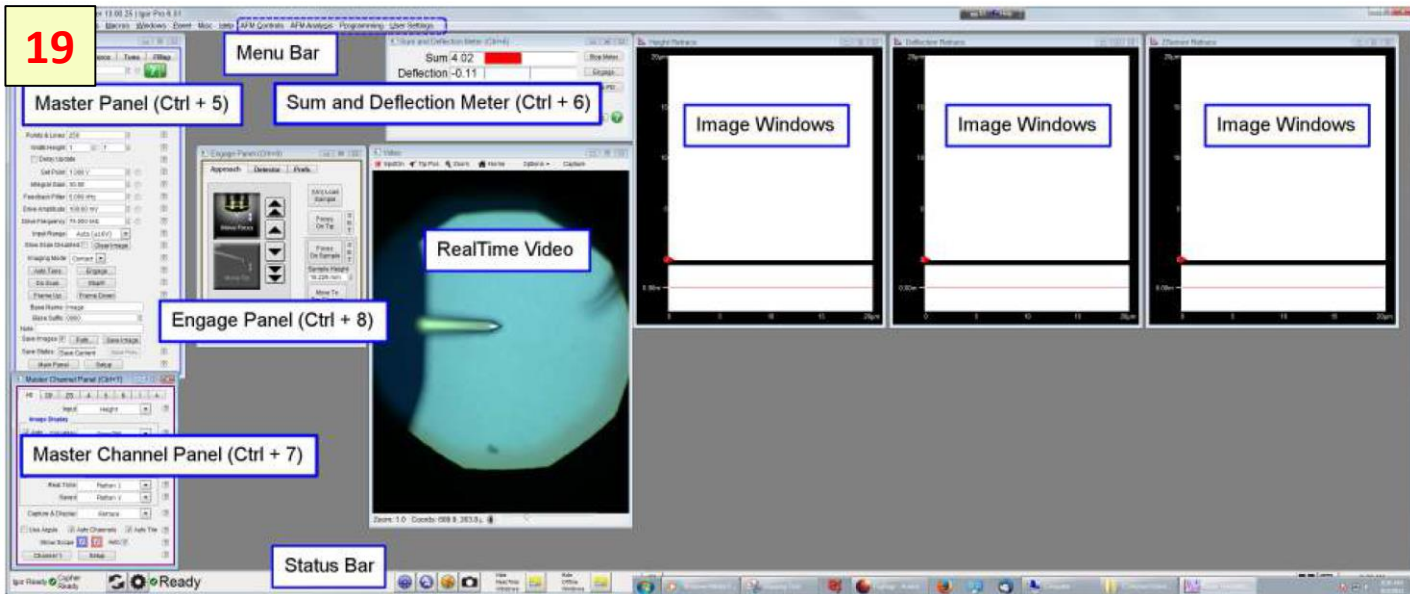
• Place your eyes level with the cantilever and sample, so you can clearly see the gap between cantilever and sample.

• Slowly turn the 'Engage Control Knob' on the AFM enclosure *counterclockwise*. This will lower the cantilever holder and objective toward the sample. The more you turn, the faster the stage moves.

• Close the gap between tip and sample toabout 1 millimeter.

19

Menu Bar

Master Panel (Ctrl + 5)

Sum and Deflection Meter (Ctrl + 6)

Sum 4.02
Deflection -0.11

Image Windows

Image Windows

Image Windows

RealTime Video

Engage Panel (Ctrl + 8)

Master Channel Panel (Ctrl + 7)

Status Bar

When you launched the software you opened an Igor Pro "Experiment" in which extra software
specific to the operation of the AFM has been loaded. An Igor pro experiment is the file that saves the
state of Igor Pro.

- **Master Channel Panel** (Ctrl + 7) During imaging, multiple data streams, such as height, cantilever amplitude and phase, return from the AFM to the computer. This panel contains information about those data streams and allows for some real time scaling and processing

- Sum and Deflection Meter (Ctrl + 6) This is a real time display of various channels such as cantilever
sum and deflection, piezo voltage, amplitude, and phase.

- **Engage Panel** (Ctrl + 8) This panel controls the entire process of the cantilever approach to the sample.

Real Time Image Display This is an example of an image window, in this case displaying the individual
lines of the sample topography as the cantilever moves left to right over the sample.

20
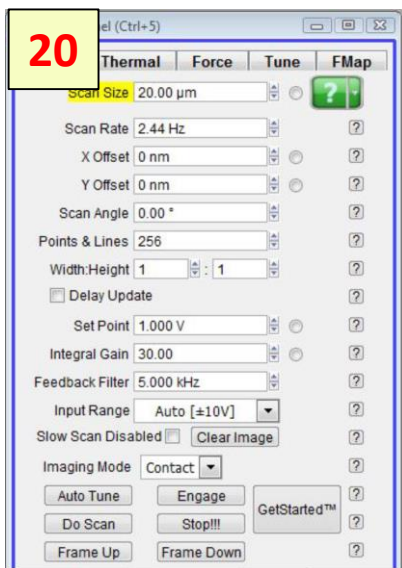
Activate the software by pressing the GetStarted button on the lower right side of the Master Panel. You will be prompted through the steps by the text in the "Status" area of the panel. Follow those instructions and work your way down the panel by pushing each button at each step.

21
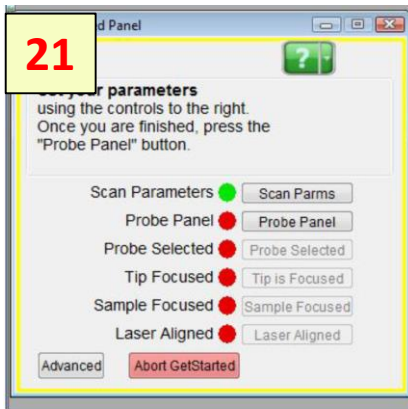
The status area of the panel will ask you to set your parameters using the "step 0" box. Input your desired scan size, pixel size, and approximate sample roughness. If you do not know your roughness, a good starting value is 100nm.
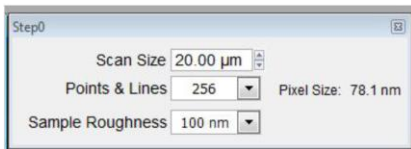
22
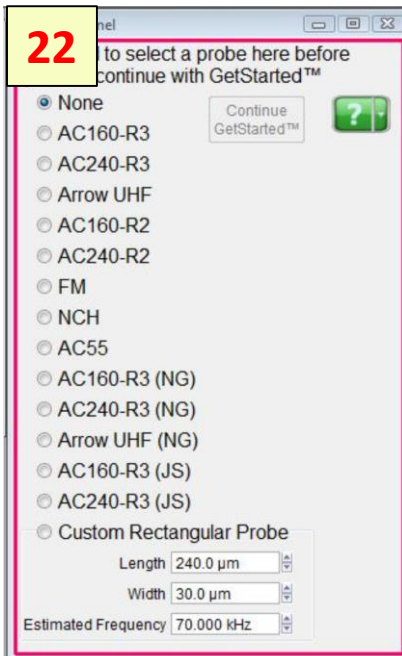
Press the 'Lever Panel' to show the list of supported cantilevers. If your probe is not on the panel, then you will not be able to use GetStarted unless it is rectangular. Once you select your cantilever, continue the procedure by pressing the 'Probe Selected' or the "Continue GetStarted™" button.

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Panel (Ctrl+8)

ach | Detector | Prefs

Move Focus
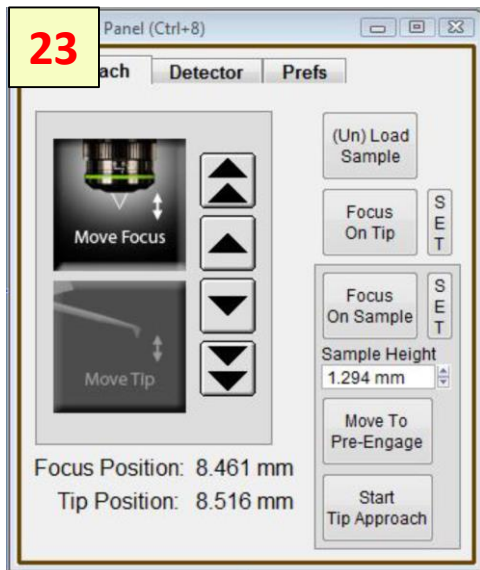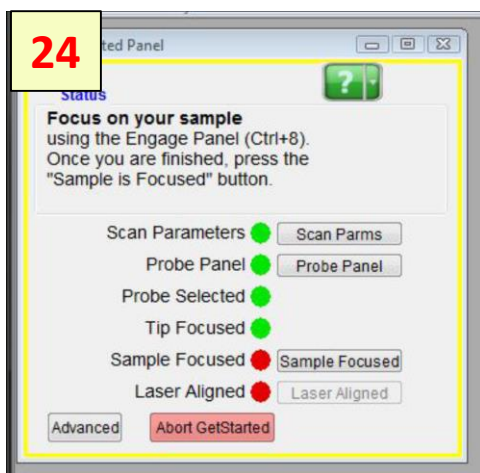
Move Tip

(Un) Load Sample

Focus On Tip — SET

Focus On Sample — SET

Sample Height
1.294 mm

Move To Pre-Engage

Start Tip Approach

Focus Position: 8.461 mm
Tip Position: 8.516 mm

You will now be prompted to focus on your tip. Use the engage panel to move the focus up or down with the arrows. The single arrow produces small movements and the double-arrows produce larger ones. When you are satisfied with the focus, press the "tip is focused" button on the GetStarted Panel.

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ted Panel

Status
Focus on your sample
using the Engage Panel (Ctrl+8).
Once you are finished, press the
"Sample is Focused" button.

Scan Parameters 🟢 | Scan Parms
Probe Panel 🟢 | Probe Panel
Probe Selected 🟢
Tip Focused 🟢
Sample Focused 🔴 | Sample Focused
Laser Aligned 🔴 | Laser Aligned
Advanced | Abort GetStarted

Next, the software will prompt you to focus on your sample. Again you can do this with the focus arrows on the engage panel (CTRL + 8). Note that if your probe is very far away from the surface you may not be able to focus it- if this is the case, you can use the knob on the front of the Cypher enclosure to lower the probe to within a few mm of your sample.

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Tip Pos 🔍 Zoom 🏠 Home Options ▾ Capture

Next, you will be prompted to align the laser onto the cantilever. You can do this with either SpotOn™ or by clicking the laser control arrows at the top of the video image. Once you are happy with the laser position, press the "laser aligned" button.

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Status

Set your parameters
using the controls to the right.
Once you are finished, press the
"Probe Panel" button.

Scan Parameters ● [Scan Parms]
Probe Panel ● [Probe Panel]
Probe Selected ● [Probe Selected]
Tip Focused ● [Tip is Focused]
Sample Focused ● [Sample Focused]
At GetReal Height ●
Laser Aligned ● [Laser Aligned]
Photodetector Zeroed ●
Sader Thermal Complete ● [Thermal Fit Done] Use ☐
Pre-Engage Height ●
Photodetector Zeroed ●
AutoTune Complete ●
Motor Engage Finished ●
Photodetector Zeroed ●
AutoTune Complete ●
Scanning Started ●

[Standard] [Abort GetStarted]

At this point, GetStarted will perform a series of automated tasks that will end with the AFM scanning your sample. You can follow the progress by watching the text in the status box of the GetStarted panel. If you would like to follow along, you can press the "advanced" button at the bottom left of the GetStarted Panel. Briefly:

- The tip is raised a specific distance above the sample and 256 thermals are measured and averaged. The thermals are fitted to a model for the specified cantilever and the InvOLS and spring constant are computed.
- The cantilever is moved to the pre-engage height, an autotune is performed, and the tip is approached to the surface until it makes contact.
- The Z piezo retracts the tip and one last autotune is performed.
- The tip is engaged and scanning starts.

Turn Off:
- Close the AFM software
- Remove the cantilever holder
- Remove sample from the microscope stage
- Clean stage and holder
- Turn Off the laser power