

# A total guide for Dimension 5000 - a total guide

Created by Antti Soininen, 2.7.2012

Updated by Ville Liljeström, 20.11.2019

## Notes

The controller units should never be on if the computer is off. This is known to cause trouble. Switch off the controller before shutting down/rebooting the computer.

The Initialize Stage-process does not work.. DO NOT TRY TO INITIALIZE THE STAGE, as it will cause the system to crash. Skip stage initialization by pressing "Ctrl+C" and "No".

Never touch the power switch on the computer's power in the backside of the computer. This may blow a fuse in an electronics board.

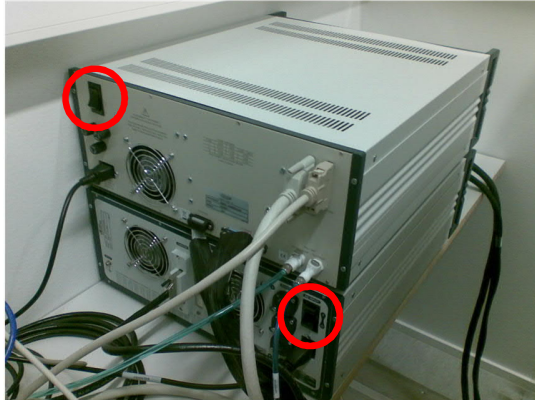
Do not try to capture video from the optical microscope. It will hang the computer.

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## 1 Check that everything is on

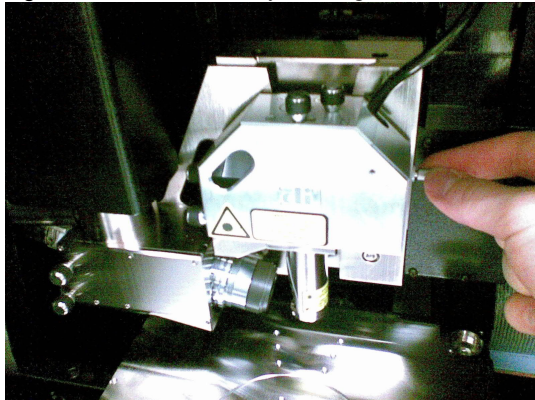
1. Check that the computer is on.
2. Check that the Multimode 5 controller units are on. There are two power switches:



3. Switch on the LCD monitors and log in if needed. No password is needed.

## 2 Install a tip

1. Install a tip in the tip holder.
2. Tighten the lock screw (by rotating it clockwise) on the left side of the head:



3. Note: Try not to touch the laser window!
4. Lift the head carefully and put the tip holder in its place.

5. Make laser alignment easier by loosening the lock screw.
6. Put the head back to the supports.

### 3 Start the software and go real time

1. Start the Nanoscope software by double clicking the yellow microscope



icon on the desktop.

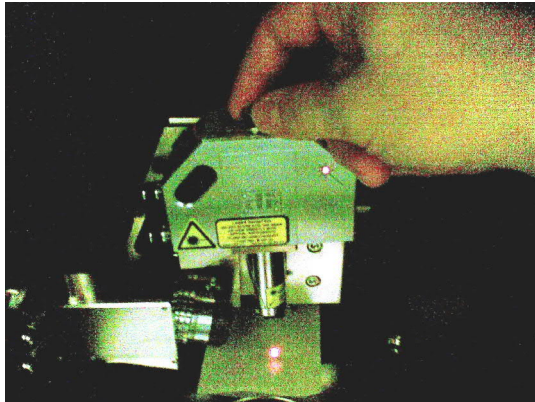
2. Open your own workspace or if you do not have one yet, open one of the predefined workspaces (File → Open Workspace...). Tapping mode users should use D:\Workspaces\veeco-tm.wks. In contact mode, use D:\Workspaces\veeco-cn.wks. For force displacement measurements use D:\Workspaces\veeco-fdc.wks.
3. Go to real time by clicking the yellow microscope icon on the toolbar (top left).
4. **If the program asks to Initialize stage, do not answer the question yet. It will be done in section 6. It is OK if the software does not ask this question.**

### 4 Align the laser

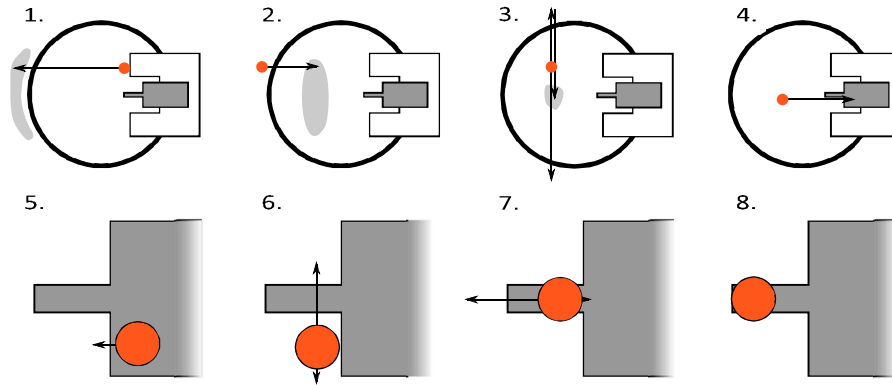
**The laser needs to be aligned for the stage to be functional.**

**Troubleshooting:** If at any point you feel you're lost, go back to step 1 in the alignment procedure.

1. Align the laser by the two knobs on top of the head:



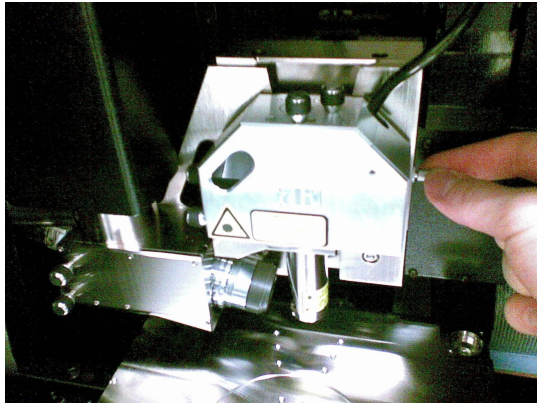
2. Basic procedure for laser alignment:



1. Move the laser to the left until it is shadowed by the scanner ring.
2. Move somewhat back to the right .
3. Find the center of the scanner ring by moving the tip up and down.
4. Move the laser to the right until it is shadowed by the chip (you may see the back reflection).
5. Move the laser back to left until it is just over the edge of the chip.
6. Move the laser up and down until it crosses the cantilever.
7. Move the laser again to left until it is at the free end of the cantilever.
8. That's it!

## 5 Install the head properly

1. Lift the head, tighten the lock screw



and put the head properly in its mount.

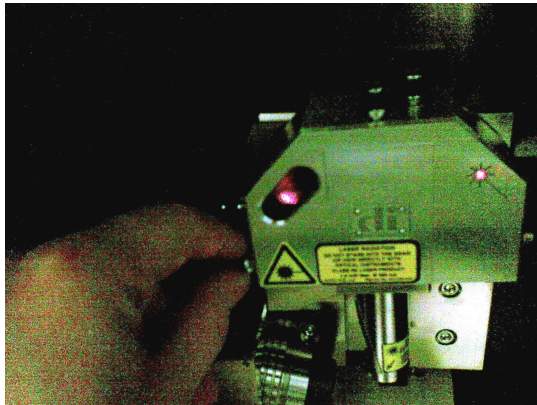
2. Loosen the lock screw until it loosens.
3. Check that the head does not move.

## 6 Initialize stage dialog

1. If the software wants to initialize the stage, **DO NOT CLICK "Yes"**. You need to skip this step by pressing "Ctrl+C" and then clicking "No"

## 7 Adjust the photo detector

1. Adjust the photo detector by the two knobs on the left side of the head:



First, use the window on the head for rough adjustment, then use the Meter window in the software.

2. Tapping mode: Set the laser in the center of the meter both horizontally and vertically. Contact mode: Set horizontal deflection to 0 V and vertical deflection to -2 V.
3. If using aluminum coated tips (for example NSC15), check that the Signal sum > 4 V. Note: Don't try to maximize the Signal sum.

## 8 Tapping mode: tune the tip



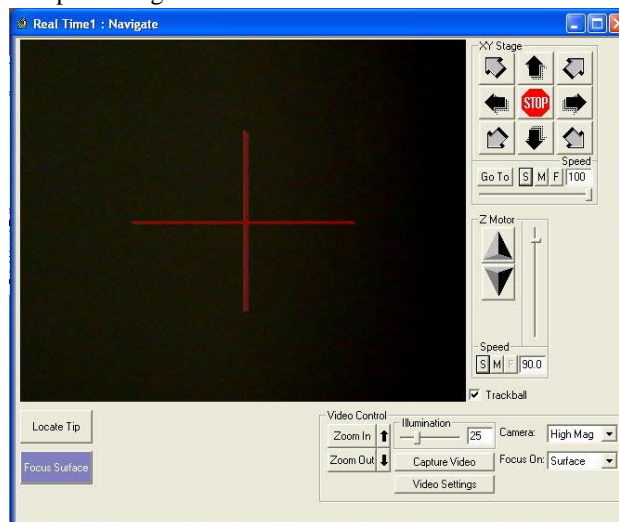
1. Open the Cantilever Tune window from the Tune button.
2. Click Auto Tune.
3. A single resonance peak without extra peaks or shoulders should be found.
4. Check that Drive Amplitude < 600 mV, if using standard tapping mode tips.
5. If the peak is found and looks OK, click Exit.

## 9 Insert sample

1. Insert your sample on the stage. Use vacuum or one of the two magnets to anchor your sample.

## 10 Move sample below the tip

1. Open Navigate window:



2. Use the trackball to move the sample below the tip.

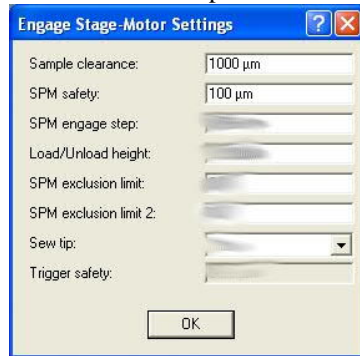


3. Lower the tip to about 1 mm from the sample surface.



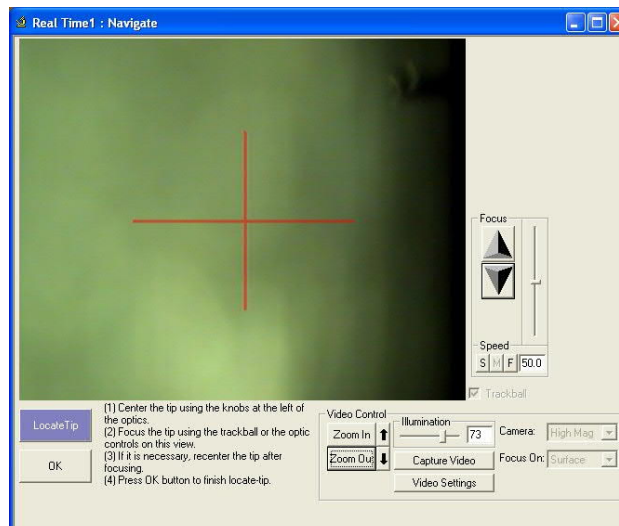
## 11 Check the motor settings

1. Open the Engage Stage-Motor Settings dialog from Tools → Engage Settings → General... and check that Sample clearance and SPM safety are as here:



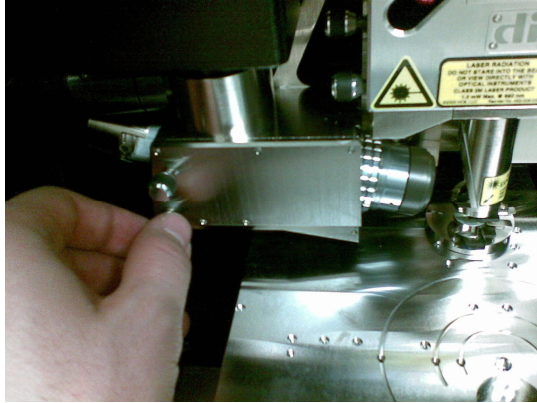
## 12 Locate tip

1. Click the Locate Tip button on the lower left corner of the Navigate window. The window should now look like this:

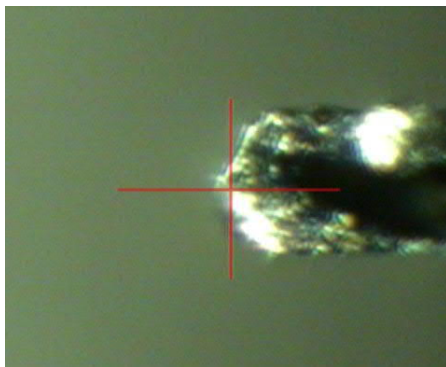


2. Click Zoom Out.

3. Center the tip roughly in the camera view by the two knobs on the optical microscope optics:



4. Click Zoom In.
5. Focus on the tip by the Focus controls on the Navigate window.
6. Fine tune the optical microscope image until the red cross hair is centered on the tip:



7. Click OK.

## 13 Focus on the surface

Be careful when you approach the sample surface! You may break the tip, its holder and the scanner and it is going to cost you a lot!

1. Set the Z Motor speed to 20 in the Navigate window.

2. Use the Z Motor controls to focus on the surface of your sample or the reflection of the tip.

If it is difficult to focus on the sample (e.g. you have transparent substrate or very clean and smooth surface), you can try to focus on the shadow of the tip that should be found when the focus is below the sample surface. If you focused on the shadow, you need to add 500  $\mu\text{m}$  to the current z coordinate and move the focus there.

## 14 Close the hood door

1. The locking mechanism needs some love.

## 15 Find the region of interest

1. Use the XY controls in the Navigate window to find the place you want to image.

## 16 Check initial scan parameters

1. Integral gain is usually around 0.5-3.
2. Proportional gain should be the same as Integral gain.
3. Starting scan size should be small, for example 1  $\mu\text{m}$ .
4. X and Y offsets should be 0.
5. Scan rate around 1 Hz.
6. Z Limit should be at its maximum, which is slightly less than 6  $\mu\text{m}$ .

## 17 Engage

1. Click the Engage  button on the toolbar.

## 18 Image

1. Optimize the scan parameters.

2. The SPM images are saved in the D:\user images folder. You can change the file name from Real Time → Capture Filename...

## 19 Finish measurements

1. Withdraw.
2. Fill the AFM Log spreadsheet.
3. Remove your sample.
4. Take your tip from the tip holder and leave the holder on the mount. No need to loosen the lock screw.
5. Remember to switch off the vacuum pump if it was used.
6. If you messed with the Engage Stage Motor Settings dialog, please, revert it to the default values shown in section 11.
7. Do not overwrite the default Veeco workspaces. If you have modified the workspace, you may want to save it under your own name.
8. You can move your images from the computer by ssh or memory stick. Remember to delete images you do not need anymore.
9. Log out.
10. Leave the computer and controller units on.
11. Let's keep the room tidy: clean up the tables and do not leave your samples in the room when you leave.

## 20 Troubleshooting

Signal sum below 4 V, Drive amplitude over 600 mV, strange frequency response.

1. Check laser alignment.
2. Remove the tip from the tip holder and put it back
3. Try another tip

Stage initialization does not work

1. Check that the laser is aligned
2. Press Ctrl-C before clicking "No". Note: This may prevent using Programmed move.

If computer hangs

1. Reboot the computer.

**Something else?** Please write your AFM related troubleshooting related problems or solutions here (+ contact staff). The solution will be included in the next updated version of this user guide. Thank you!

Your comments: