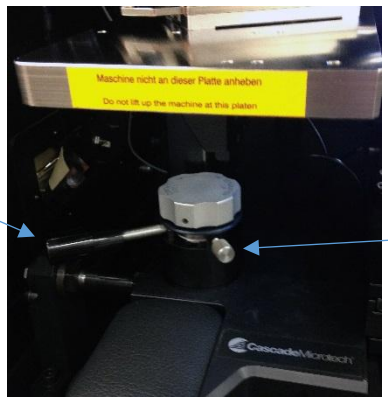
Operation Procedure for PROBE2

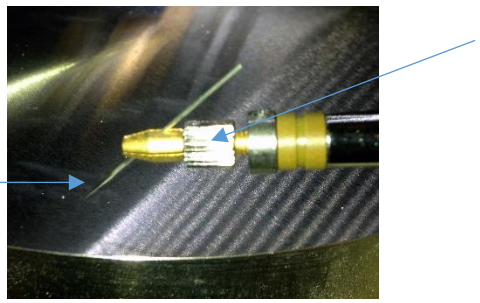
*** Accompanying videos have no sound ***

CascadeEPS150TRIAX Probe Station

1. Ensure you have a PROBE2 reservation in iLab
2. Open the light enclosure **[Video: PROBE2-02-05]**
3. The cables are already properly connected from the probes to the bulkhead connections on the light control box. DO NOT disconnect or move any cables inside the light control box. Users MAY move cable positions on the OUTSIDE of the bulkhead to suit their needs (depending on which instrument is in use, either the Keithley 2450 or the LCR meter)
4. Turn on the light for the probe station microscope
5. Ensure that the lever arm on the left of the probe station is in the full "separation" position (the platform that the probes are on should be in the up position) and that the set screw is tightened.



6. Insert your probe tips into the probe tip holders **[Video: PROBE2-06]**
    a. Release the magnet on the probe holders by toggling the switch to the off (left) position
    b. Move the probe holder so the end is in front of the stage, away from the stage surface
    c. Loosen the nut at the end of the probe holder by turning it clockwise
    d. Insert your probe tip
    e. Tighten the nut at the end of the probe holder by turning it counter-clockwise



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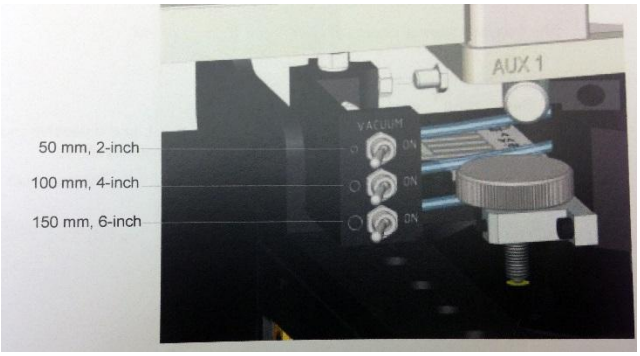
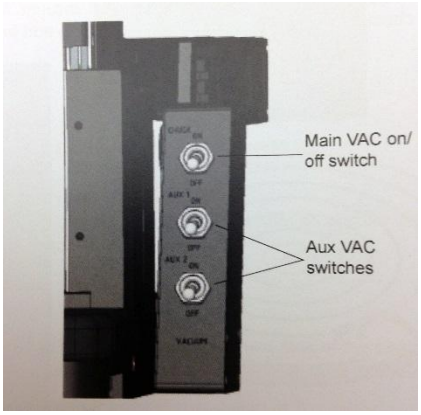
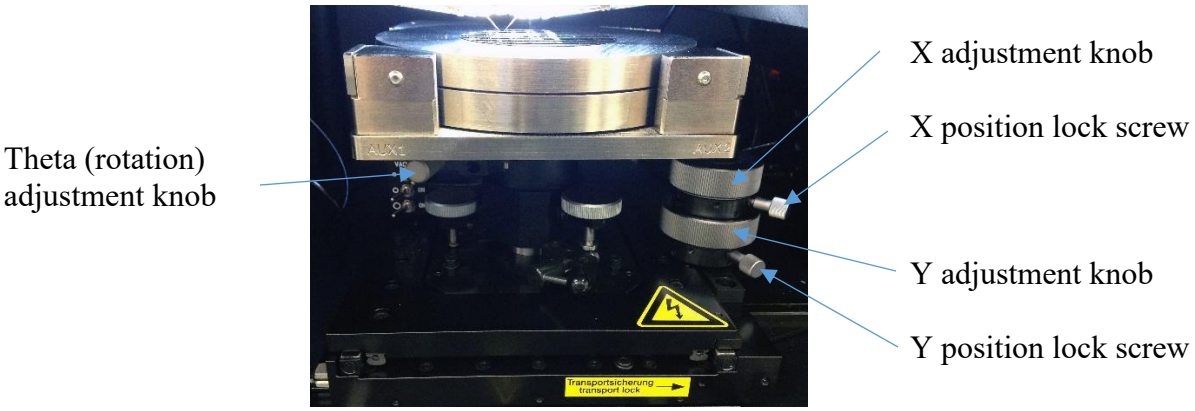
7. Load the sample **[Video: PROBE2-07]**
   Note: Ensure there is sufficient clearance between the stage and the probe tip; if necessary, increase spacing by rotating the knob on the lever arm mechanism.
   a. Pull the stage all the way forward (toward you)
   b. Place the sample on the center of the stage
   c. Use the switches under the left side of the stage to control the stage vacuum zones (see following picture). The 50mm, 2-inch switch should always be on, and is used for samples smaller than 50mm as well.





   d. Turn the chuck vacuum switch located on the right side of the stage to the ON position
   e. Push the stage all the way forward
8. Position the sample using the stage controls and the probes so that contact can be made with the desired measurement points. Adjust the zoom, focus, and position of the microscope as needed. **[Video: PROBE2-08]**



9. Slowly rotate the lever arm on the left side to the contract position to lower the probes **[Video: PROBE2-09-11]**
   a. If the probes start to make contact with the sample, use the circular knob above the lever arm to raise the entire probe platform

    b. At this point, the platform height should be adjusted such that the probes are just out of contact with the sample when the lever arm is in the contact position
10. Make final (minor) adjustments to the sample and probes to ensure that the probes will contact the sample in the desired locations
11. With the lever arm in the contact position, adjust the circular knob while looking through the microscope to slowly lower the platform until the first probe makes contact with the sample
12. Adjust z positioner on the remaining probes individually (if needed) until all probes are in contact with the sample
13. Measure your sample:
    (See the appropriate section below, depending on your measurement type: "For I-V or Resistance Measurements" or "For C-V Measurements")
14. When completely finished, raise all probe tips safely away from the sample
15. Slide the stage out and remove your sample
16. Push the stage all the way forward
17. Unload your probe tips
    a. Release the magnet on the probe holders by toggling the switch to the off (left) position
    b. Move the probe holder so the end is in front of the stage, away from the stage surface
    c. Loosen the nut at the end of the probe holder by turning it clockwise
    d. Unload your probe tip
18. Turn off the microscope lamp
19. Close the light enclosure box
20. Exit out of any open software
21. Turn off the power on the LCR meter if it was used
22. End your PROBE2 reservation in iLab if you finish early (so it is available to the next user)

Signatone S-302-4 Four-Point Resistivity Probe Station

1. Ensure you have a PROBE2 reservation in iLab
2. Load your sample onto the sample chuck
3. Lower the four point probe head into contact with the sample using the lever arm.
    a. When the probes make contact, continue lowering until the tips have compressed between 50% and 70% of their travel.
    b. The probe height can be adjusted using the Z-adjust knob on the right side of the probe station.
4. Measure your sample using the KickStart software as described in the "For I-V or Resistance Measurements" section below.
5. When completely finished, be sure to raise the probe head fully and remove your sample.
6. End your PROBE2 reservation in iLab if you finish early (so it is available to the next user)

NOTE: The cable ends connected to the Keithley 2450 should NOT be moved. Users should ONLY move the Triax cable ends attached to the black probe station box if needed (depending on which probes you are using). Those using the Signatone Four Point Probe do NOT need to move any cables.

For I-V or Resistance Measurements:

a. Power ON the Keithley 2450 if it is not already ON.
b. For 1st time 2450 users (existing users skip to step c.):
    1. Click “SMIF-User-Data" folder shortcut on Windows Taskbar:

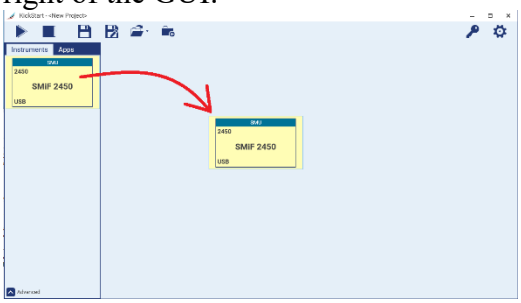
    2. Create a copy of the existing folder “User-to-copy” and rename the new folder with your name

c. Open the KickStart software on the Windows Taskbar:

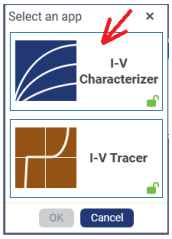
d. Open your desired KickStart Project file (for 1st time users, the folder you copied contains 2 projects: I-V sweep and Four Point Probe) or create a new one*

    * To create a KickStart project:
    - click the New Project icon at the top of the KickStart GUI:

    - Drag the 2450 SMU box from the left pane into the large workspace on the right of the GUI:



    - Select “I-V Characterizer in the pop-up window and click OK



    - Edit the project parameters to your desired settings. Make sure you select the correct Input Terminals: Front = Four Point Probe; Rear = Black Probe Station Box

e. To run your project click the Run button:

f. You can re-run the project as many times as you like.

g. If you wish to save data, click the Export icon and select desired path, etc. You can opt to export ALL new runs you perform automatically by checking the "Automatically export new runs" box.
h. When you are completely finished be sure to save your data if desired, then close the KickStart software.

For C-V Measurements: [Video: PROBE2-12-CV]

a. Turn on the power to the Agilent 4284 LCR meter
b. Connect the Hi and Low cables that lead to the Agilent 4284 LCR meter to the appropriate connections on the outside of the light control box
c. Open the CSM program on the desktop computer next to the probe station. This program will run the Agilent LCR meter
   Name: Engineer
   Password: smif
d. Select "System Setup and Test" and then "Setup Meters" to define frequency, measurement speed, and other meter parameters. Select "Exit to Main Program" when done
e. Select the desired test program (e.g., "Engineering MOS C-V Tests")
f. Select the desired subtest program (e.g., "MOS C-V Plots")
g. Select "Edit Test Recipe" to define or verify measurement parameters
h. Select "Start Test" and then select the desired measurement file
i. Enter Sample ID and then select "Measure"
j. Select "Zero Capacitance Meter" and then follow on-screen instructions to zero the meter, connect the probes, and start the measurement
k. After the measurement is completed, select "Analyze Data" and the desired output format to view and save the data
l. When completely finished, save any desired data then close the CSM software.

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