HP4145 Semiconductor Parameter Analyzer - Testing Resistors & Diodes

NOTES: DO NOT move the wafer or touch the rotary stage control of the probe station when probes are in contact.
Clockwise will always raise the probes of the probe station.
DO NOT save results onto the floppy disk

1. Wipe down the probe station with isopropyl alcohol & ensure clean working space and gloves.
2. Inspect the tungsten needle probe that you plan to use. Replace the needle probe if needed. Refer to the “Changing Probe Station Tungsten Probe Needle SOP”.
3. Use the top control wheel on the magnetic base to raise the needle probes - clockwise is up, counterclockwise is down.
4. Ensure the other control wheels on the needle probes are adjusted so that the screw area is centered.
    a. Y control is about 5.5 rotations in either direction
5. Move the magnetic base of the probes so that the needles are not in the middle of the central stand.
6. Ensure that both the HP4145 and the probe station lamp are plugged in.
7. Place the wafer on the central stand of the probe station.
8. Move the wafer directly underneath the scope using the rotary wheels in the front and on the right side - front for y-axis, side for x-axis.
9. Turn on the probe station microscope at the lowest magnification and navigate towards the desired structure using the rotary controls on the probe station. Try to get the structure in the middle of the cross hairs.
10. Move the magnetic base of the needle probes so that the needle probes are relatively close to the desired contact pads.
11. Use the microscope and probe controls to navigate the tungsten needle probes towards the structure contact pads with the control wheels on the magnetic base. Aim the tungsten probes above the structure and slightly lower the probes more into focus.
    a. Note that when lowering the probes they tend to move closer to their base. Do not immediately lower the probes onto the structure, it is better to adjust the probes slowly each way.
12. Increase magnification and refocus. Continue until you can easily see the probes touch the contact pads.
    a. The probes touch the structure when the double image of the probe seen in the microscope becomes one. Note that since the probes do not move

directly up and down, the contact pads will likely get scratched. This is okay, but try to reduce the scratches as much as possible.

13. Insert the blue floppy disk labeled “HP4145B” into the parameter analyzer.
14. Power on the parameter analyzer and allow the menu screen to load.
15. Select the first softkey, it should be called “1 CHAN DEF” for channel definition. If you cannot see this option, select the “MENU” button under “PAGE CONTROL”.
16. Select the “DIODE VF-IF” softkey and inspect all parameters (including the SMU lead connections plugged into the back of the parameter analyzer) and change them if necessary using the arrow buttons, alphanumeric keys, and the enter key. When finished, either press “NEXT” or navigate to MENU and select the “2 SCE SET UP” key for source set up.
17. Adjust any source parameters here, and ensure that the voltage does not exceed 10V and the current compliance does not exceed 100mA. If you plan to input a higher current or voltage, run this by Dr. Jessing first.
    a. Ensure symmetry of START and STOP voltage sweep parameters
    b. These structures will likely be measured from -2V to 2V and a compliance of 100mA or less.
18. Press “NEXT” or navigate to MENU and select the “3 M&D SET UP” softkey for measurement and display mode set up. Here you should select the number of axes you want, the type of plot, and the source of each axis.
    a. Ensure that the x and y axis values are symmetrical and map all sweep values input on the previous page
19. Carefully connect the corresponding red leads (they are labeled and should not be unplugged) from the HP4145 SMU to the tungsten needle probes.
20. Turn off the probe station microscope lamp.
21. Press “NEXT” and a blank graph should come up. To see the results of the measured resistor, select “A SINGLE”, “B REPEAT”, or “E APPEND” from the MEASUREMENT block.
    a. “A SINGLE” will take a measurement of the device and erase any previous data that was in the graph.
    b. “B REPEAT” will take repeated measurements of the device until the “E STOP” button is pressed. This mode will also erase any previous data on the graph.
    c. “E APPEND” will add new repeating measurements to the previous data on the graph.
22. Select the “AUTOSCALE” softkey to autoscale your graph.
23. Select the “EXTN” softkey to see more options
    a. “MARKER” brings out a marker that can be moved with the dial.
    b. “LONG CURSOR” brings out a full page cursor that can be controlled with the CURSOR arrow keys.
    c. The arrow soft keys can be used to zoom in and out in various directions.

    d. “SHORT CURSOR” brings out a cross hair that can be controlled with the CURSOR arrow keys.
24. To obtain a list of the plotted values, press “PREV” in the PAGE CONTROL section of the parameter buttons or navigate to the “MEAS & DISP MODE SETUP” page.
25. Use soft keys to select the value you want to see, for these structures it is likely “IF”.
26. Select “NEXT” and then “SINGLE”. The values should be displayed and you can scroll up or down with the “ROLL UP” and “ROLL DOWN” soft keys.
27. When done, turn off the parameter analyzer, take out and store the floppy disk carefully.
28. Unplug the SMU leads from the probe station.
29. Carefully raise the tungsten needle probes and remove the wafer.
    a. Clockwise rotation of the top control is always to raise the probes.
    b. Note that since the probe station is not in the clean room, tested samples will likely need to be cleaned immediately.
30. Wipe down the probe station (do not wipe down the HP4145B)