

FPP-5000 4-POINT PROBE SOP



The VEECO FPP-5000 4-point probe simplifies the measurement of resistive properties of semiconductor wafers and resistive films. The microprocessor based electronics permits direct computation of V/I , sheet or slice resistivity, and metallization thickness and P-N type testing. Unlike most four point probes and probing stations, which move the probe head into the wafer, the FPP-5000 is designed so that the wafer is moved into the probe head. This insures constant probe force independent of operator force and wafer thickness.

Requirements before use

1. To sign up for training go on the NRF website.
2. Check-out platen (Figure 5), wafer holder (Figure 5), and hand held probe (Figure 7) at the reception desk.

Keyboard Description:

- **V/I** - Displays measured V/I multiplied by programmed GEOM Constant.
- **SHEET** - Displays sheet resistance based on measured V/I.
- **SLICE** - Calculates the bulk resistivity of a slice of layer whose thickness is entered in the PRGM mode.
- **THICK** - Calculates the thickness of a layer of slices whose bulk resistivity is entered in the PRGM mode.
- **TYPE** - When selected, a type test is performed.
- **PEN** - When selected, a penetrate voltage is applied to the sample.
- **PRGM** - Put the keyboard into the PRGM mode for entering bulk resistivity or film thickness. Press STORE afterwards to store the input into system memory.
- **SELF-TEST** - Performs a system self-test.
- **RETEST** - Performs a retest when the previous test failed.
- **CONST** - Displays the selected input stored in the memory.
- **NUMERICAL KEYS** - To enter the input required for calculation.



Figure 1

Set up and Sample Loading:

1. Enable tool through TUMI login. Power switch should be in the ON position.
2. All display lights should be on except FAIL.



Figure 2

3. Press CLEAR (will look like Figure 3 after pressing CLEAR).



Figure 3

4. Open lid (Figure 8).
5. Place wafer holder (2" or 4") inside of machine.



Figure 4

6. Place the wafer (shiny side down) you wish to probe in the appropriately sized wafer holder (2" or 4").



Figure 5

7. Place platen (spiral side down) on top of wafer.



Figure 6

8. Adjust the rear stop by loosening the thumb screw (Figure 8) and moving the position of the stop.
9. Select desired measurement mode (see page 8 for details).
10. Close the lid and gently press down until the measurement is complete. Results will be shown on the display.
11. When finished open the lid, remove your wafer and close lid.
12. Log out of TUMI and record any malfunctions or comments. Return checked-out items back to the reception desk.

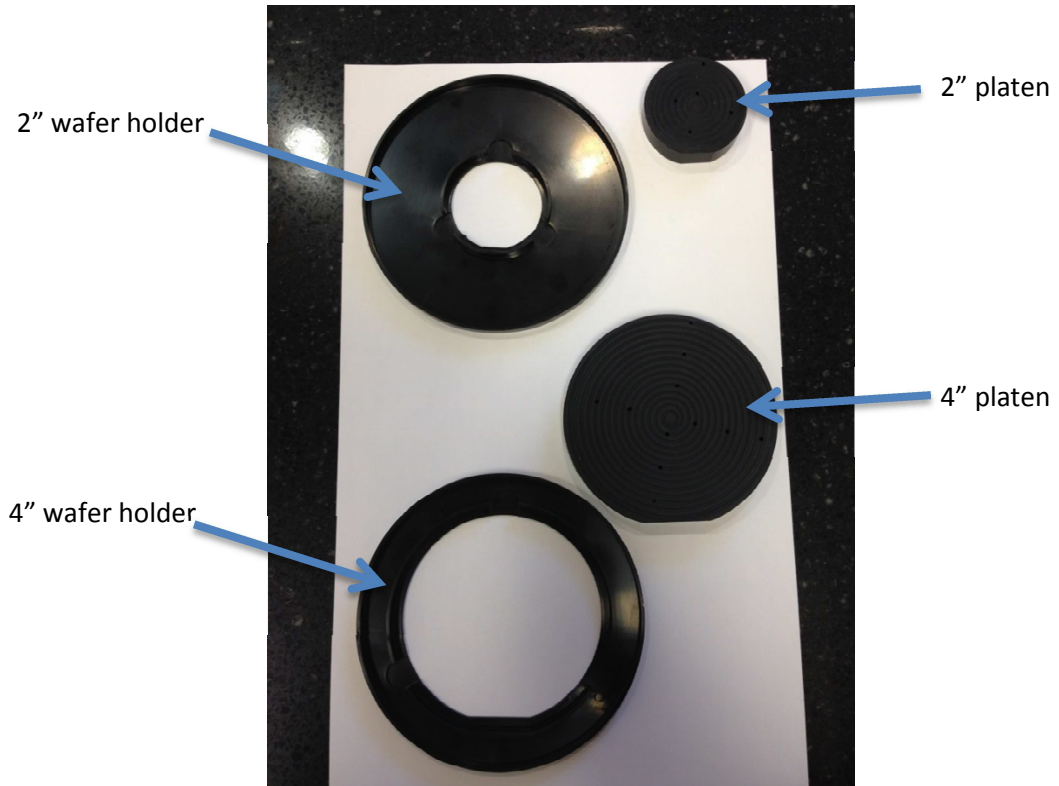


Figure 7

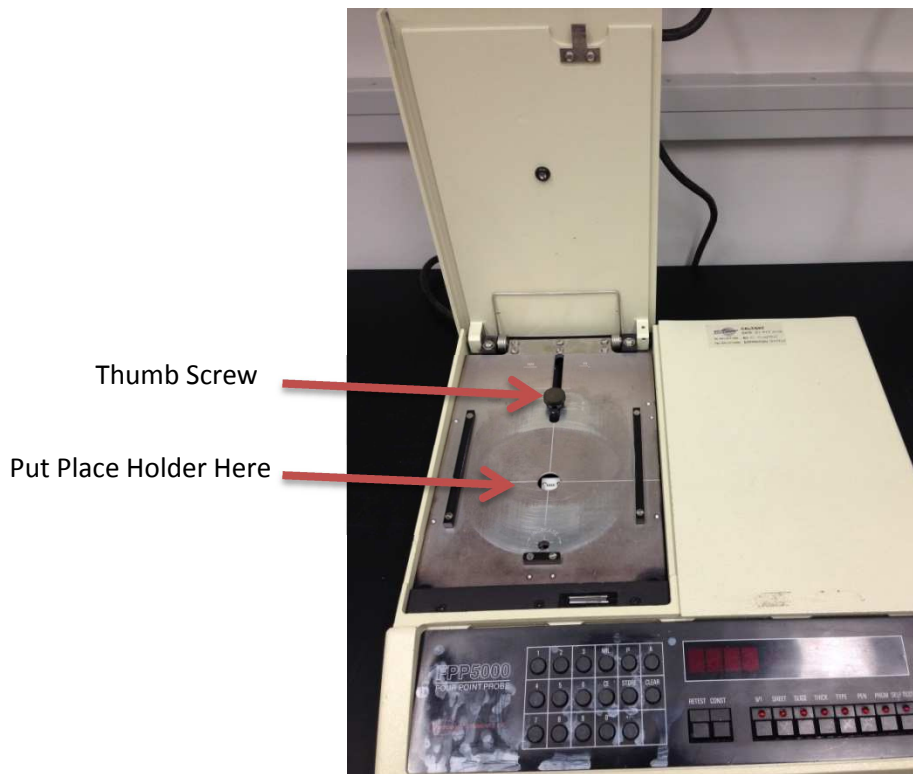


Figure 8: Open lid of Main Console

Operating Hand Held Probe:

1. Connect to the port below the ON/OFF switch on the left rear of the main console (Figure 10).
2. Sample size must be a minimum of 1" by 1" (See below for an exact reference).
3. Gently press down on wafer with hand held probe until measurement is complete. Results will be shown on the display.
4. When finished disconnect from main console and turn off machine. Return hand held probe back to receptionist.



***CAN ONLY OPERATE MAIN CONSOLE OR
HAND HELD PROBE ONE AT A TIME.***



← **MIN. SIZE REQUIREMENTS TO USE HAND HELD PROBE**



Figure 9: Hand Held Probe



Connect
Hand
Held
Probe
Here

Figure 10: Back of Main Console

Operation Procedure:

- A. Measure Resistance V/I (Ohms) Measurement range: 0.25e-3 to 99.9e3
1. Press “V/I” button, light should illuminate.
 2. Press “PRGM” button.
 3. For samples with a diameter greater than 2.5 inches enter 1.
 4. Depress the “PRGM” button.
- B. Measure Sheet Resistivity $R=\rho/T$ (Ω/sq) Measurement range: 1.1e-3 to 4.50e5
1. Press “SHEET” button, light should illuminate.
 2. Press “PRGM” button.
 3. For samples with a diameter greater than 2.5 inches enter 1.
 4. Depress the “PRGM” button.

Other Options for Testing

- C. Measure Slice Resistivity $\rho=RT$ ($\Omega\text{-cm}$) Measurement range: 4.19e-5 to 17.1e3

Must perform Operation Procedure A 1ST

1. Press “SLICE” button, light should illuminate.
2. Press “PRGM” button.
3. Enter thickness in angstrom (\AA), micron (μm) or MIL.
4. Press “STORE” button
5. Press “PRGM” button and that is your answer.

- D. Measure Thickness Measurement range: metallized thickness up to 2.43e-5

1. Can do this measurement assuming know resistivity (Must perform C 1st.)
2. Press “THICK” button, light should illuminate.
3. Press “PRGM”.
4. Enter the slice resistance in $\Omega\text{-cm}$.
5. Press “STORE” button
6. Press “PRGM” button and that is your answer.

[Micrometers to Mils Conversion Formula](#)

$$L_{mils} = L_{micrometers} * \frac{5}{127}$$

Other Options:

1. **P/N**; the measurement will also indicate whether the semiconductor is n-type or p-type.
2. **PEN**; a high voltage (penetration voltage) is applied to the wafer to break through a thin insulating layer prior to measurement.
3. **RETEST**; perform the same test again without opening the lid.
4. **SELF-TEST**; performs a self-test. If successful, all lights except FAIL should be lit, and indicator should display 888x108. The clear button must be pressed to continue.
5. **CONST**; display the programmed constant.

Error Messages:

Pressing **“Clear”** can clear most error codes.

<u>Error Codes</u>	<u>Description</u>
E 01	Retest attempted with probe interlock open
E 02	Probe interlock is opened while a measurement is in progress
E 03	Display exponent over flow or under flow
E 04	Store attempted without completing entry of the new constant in PRGM mode
E 05	Penetrate switch depressed while penetrate mode internally disabled
E 06	Normal and reverse V/I disagree by more than 10%
E 07	Arithmetic error produced as a result of a geometric correction measurement
E 21 thru E 40	Electronic failure while attempting to make a measurement
E 51 thru E 57	Self-test error