

Technics 800 Micro RIE Operating Manual

Description

Reactive Ion Etch Series 800 Plasma System (MICRO-RIE) (Appendix: Figure 1) uses a radio frequency signal to generate plasma of chemically reactive gas used to etch various materials. The system generates low pressure, low temperature, and gaseous plasma. The surface to be etched is placed directly onto the cathode and momentum transfer plays a significant role in the etching process. Thus by varying the process parameters, etching may be done either isotropically and anisotropically.

The RIE has three mass flow controllers (MFCs) to assure precise control of the process gases. The exhaust valve controller controls chamber pressure. The power supply provides up to 300 watts at 30KHz. The system can support four-inch wafers however different size and shape samples can be mounted.

Safety

1. Before using this tool, users must be properly trained and certified by Lab staff.
2. DO NOT rely on the interlocks or valve controls on this system to shut off gas bottles. Always use the manual shut-off valves and proper purging procedures (Appendix: Figure 3).
3. Plasma is a source of UV radiation. Do not look directly into plasma for long periods.
4. If the machine malfunctions any time during the process, press emergency shut off button (Appendix: Figure 2) and call NCNC staff.
 - a. Lab Phone 2-9831
 - b. Bob Prohaska 2-1094

Initial System Check

1. Check the logbook for latest entry and comments.
2. Make sure the system is **ON**. Check to see that the L.E.D. displays are **ON** (Appendix: Figure 1).
3. The system should be in **MAN** mode (Appendix: Figure 4).
4. Exhaust valve controller settings (Appendix: Figure 5).
 - a. Make sure the exhaust valve controller is **ON**. If the controller is in OFF position, turn it on and allow fifteen minutes to warm up.
 - b. Confirm that the INT/EXT toggle is in the **INT** position.
 - c. The input toggle should be in **1V** position.
 - d. The set-point dial should be set to **zero**.

5. Make sure the gases you want to use are connected to the system.

Startup and Etch procedure

Determine your recipe

1. Film to etched (SiO_2 , Si_3N_4 , PR, etc).
2. Thickness if known
3. Look up similar recipe in the logbook. Note the (i) types of gases needed, (ii) flow rates in sccm, (iii) pressure in mTorr, (iv) power in watts, (v) time needed if relevant.

Loading Sample

To load a sample/samples put Sol'n to **CLOSE** position and **OPEN** Vent. Wait about one minute to open the chamber and wipe any particles around the chamber. Now **CLOSE** Vent. Load your sample and close the chamber. Put Sol'n to **OPEN** position (Appendix: Figure 4).

Note: If you are using small samples use slow pump option for 2-5 minutes (Appendix: Figure 4).

Set etch parameters and etching

Note: Before starting the etching process, arrange your own stop watch/timer for etching.

1. Go to the cylinders and open the manual shutoff valve for the required gases (SF_6/O_2 or CF_4/O_2 or O_2). **DO NOT ADJUST** the pressure regulators valve between the two dial gauges.
2. Set your gas flows and flip on the required gas switches (Appendix: Figure 6).
 - a. Select the gas using gas selection knob.
 - i. A: O_2
 - ii. B: CF_4
 - iii. C: SF_6
 - b. Set the read/set dial knob to **SET**.
 - c. Use gas regulator knob for particular gas to set the flows.
 - d. Turn on the toggle switch.
3. Wait till the chamber has pump down to 25mTorr (.025 Torr). Then turn on (flip up) the **GAS 1** switch (Appendix: Figure 4). You will see the LED lights lit up

Note: You could use more than one gas, follow the same procedure from a-d. Set the read/set dial to **READ** to read the gas flow of the selected gas on the gas selection knob.

4. Adjust the set point dial of the exhaust valve controller to the required settings. Double check with the pressure display on the RIE. You should see the pressure display changing as you turn set point dial. Wait until the pressure stabilizes.
5. Turn **ON** the power switch and set the power setting display on the RIE. Plasma will ignite (Appendix: Figure 4).
6. Once you are done with the etching process
 - a. Turn the power to **OFF** position
 - b. Turn the Gas1 switch to **OFF** (flip down) position.
 - c. Turn **OFF** the toggle switches on gasses.
 - d. Turn the pressure valve controller to **zero**. **DO NOT TOUCH ANYTHING ELSE.**

Unloading the Sample

1. Wait till the pressure display on the RIE shows 25 mTorr. Stop Pump Down (Sol'n **Close**), purge by venting on and off quickly (Vent **Open** then **Close**), and Start Pump Down (Sol'n **Open**). Repeat for 3 times.
2. Stop Pump Down (Sol'n **Close**). Start Vent (Vent **Open**). Wait about one minute and open the chamber. Stop Vent (Vent **Close**). **Remove Sample.**
3. Wipe and clean chamber with IPA if necessary. Close Chamber. Pump Down (Sol'n **Open**).
4. Wait till pressure display on RIE shows 25 mTorr, Stop Pump Down (Sol'n **Close**) and note the final displayed pressure reading after 1min in the logbook.
5. Go to the gas cylinders and close manual shut-off valves. **DO NOT ADJUST THE PRESSURE REGULATOR KNOB** that is between the dial gauges.
6. Comment on the Log Book.

Appendix:



Figure 1: Technics 800 RIE System



Figure 2: Emergency Shutoff Button

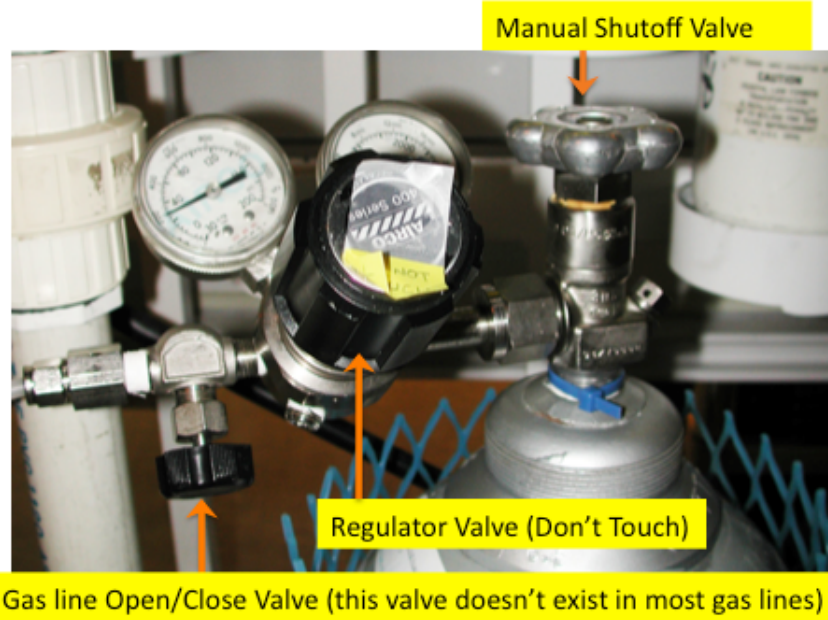


Figure 3: Gas Cylinder Regulator

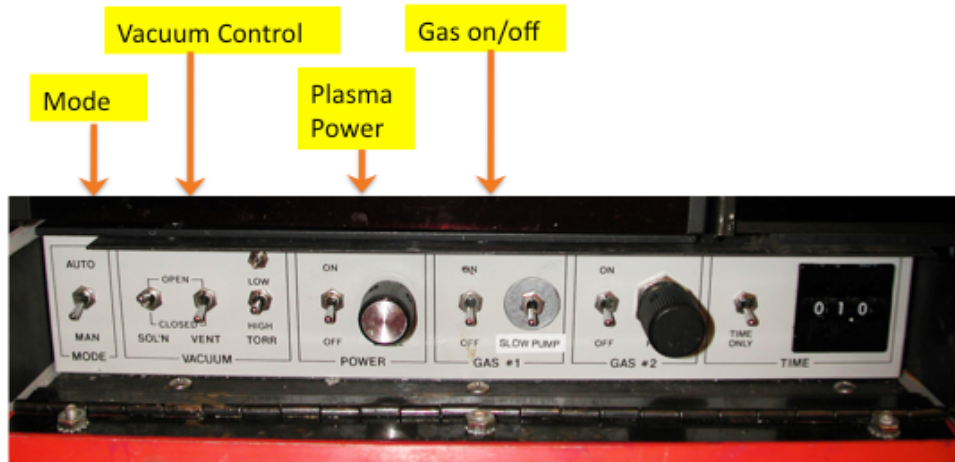


Figure 4: System Control Panel

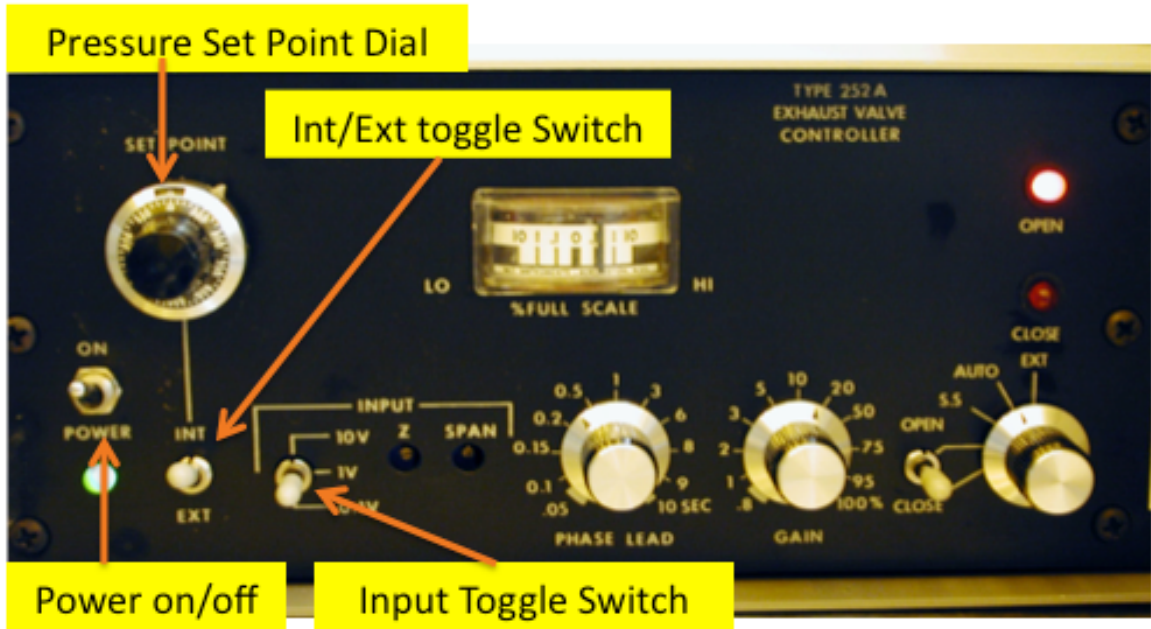


Figure 5: Pressure/Exhaust Valve Control

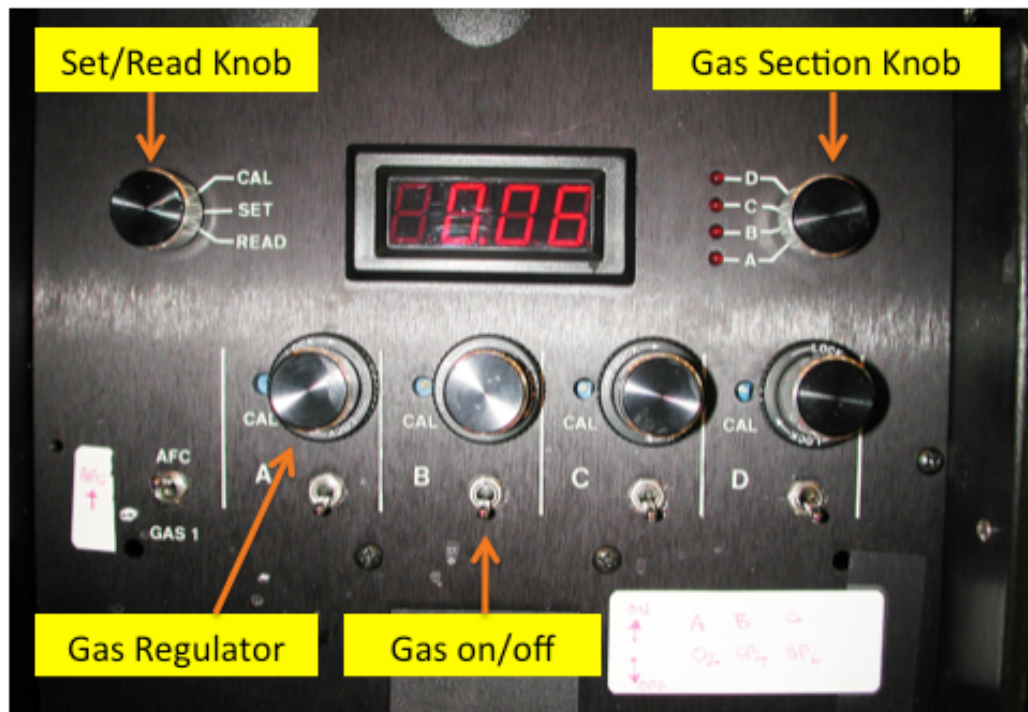


Figure 6: Gas Selection and Regulator Panel