

# Standard Operating Procedures

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## Plasma Enhanced Chemical Vapor Deposition

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# Important

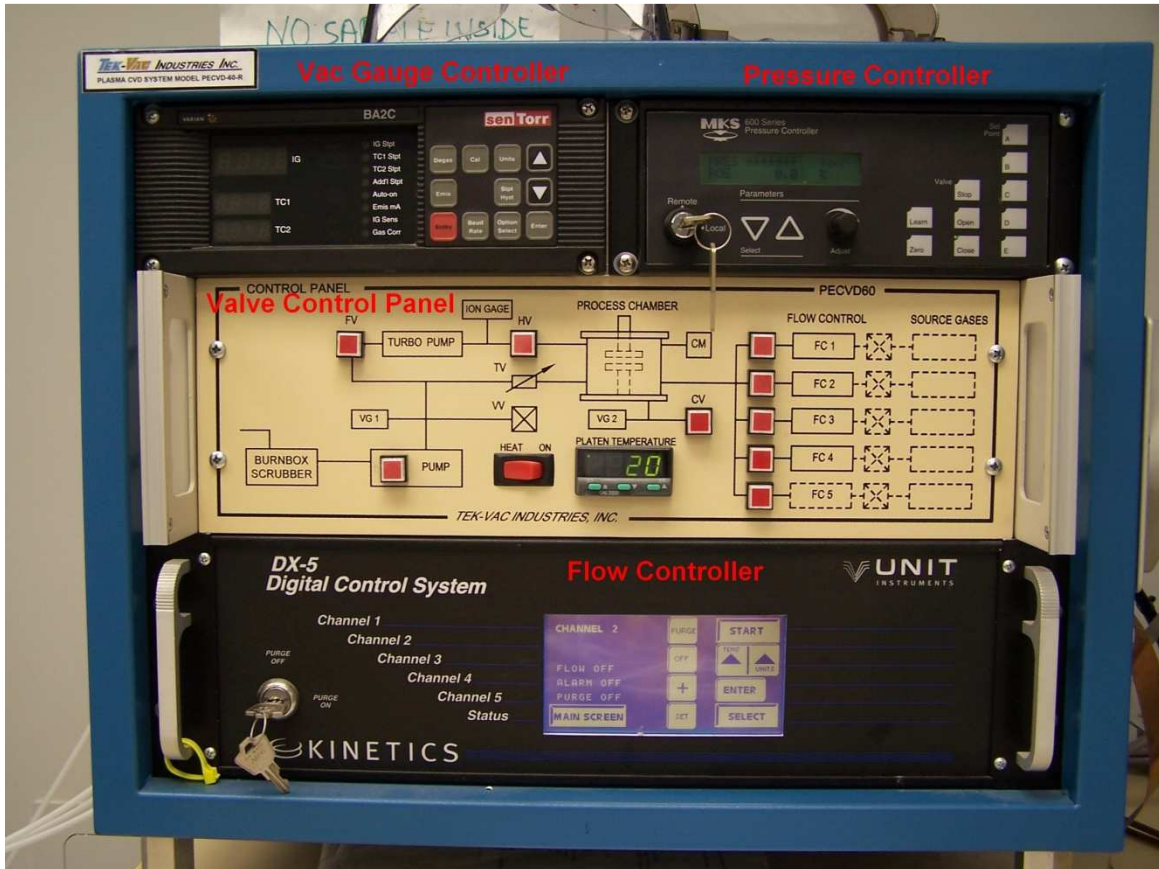
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- Gloves must be worn while working with the open chamber.
- Users should be in standard clean room garb.
- You can only use CeNSE laboratories and equipment if you have been approved by Brian or Chuck, reserved the tool on the calendar, and filled out a form. No Exceptions!
- If the equipment is acting unusual STOP! Please discuss with Brian or Chuck before proceeding and leave a note on the machine.
- Any accidental damage must be reported immediately.
- All CeNSE laboratories are protected by video surveillance.



# Machine exterior and Device controls

Figure 1: Machine Controls



# Machine exterior and Device controls

Figure 2: RF Power Controller



Figure 3: Turbo Controller



# Operating Procedure

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## 1. Preparation

- 1.1. Be sure you are wearing gloves and are properly dressed for the clean room.

## 2. Start-up and Loading the Sample

- 2.1. Press the “CV” button on the tan colored control panel (Fig 1) to vent the chamber. The button will light
- 2.2. After the chamber has vented press the “CV” button again to close the chamber vent. The light will go out.
- 2.3. Place the sample on the platen in the vacuum chamber.
- 2.4. Press the “PUMP” button on the control panel (Fig 1).
- 2.5. Press the “OPEN” button on the throttle valve controller (Fig 1).

## 3. Etching gas set-up and control

- 3.1. Connect the etching gas to flow controller #2 or #3. The pressure set at the gas bottle regulator be set to no more than 15 PSI.
- 3.2. Press the “SELECT” button located on the digital control system screen (Fig 1).
- 3.3. Press the channel button that corresponds to the flow controller that the desired gas is connected.
- 3.4. Press the “SET” button then the “ENTER” button (Fig 1).
- 3.5. Set the desired flow rate. The valve can be increased or decreased by pushing the “+/-” (hit the plus sign and it changes to minus and vice versa) button. Press either the “TENS” up arrow button to increase by 10 units or the “UNITS” up arrow button to increase by one unit.
  - 3.5.1. The set point is a percentage of the rated flow rate of the flow controller. Example. Flow controller #3 has a max flow rate of 500 sccm. A set point of 10.0 is 10.0% of 500 sccm, which corresponds to a flow rate of 50 sccm.
- 3.6. Press the corresponding (i.e. #2 or #3) flow control button on the tan control panel to start the gas flow chamber. The button will light up.
- 3.7. Press the “START” button to activate the set point and start the gas flow (Fig 1).

## 4. Throttle valve control and operating pressure

- 4.1. The pressure reading on the throttle valve controller when the "OPEN" button is lit is the lowest possible chamber pressure. A lower pressure can be obtained by lowering the gas flow set point.
- 4.2. Press the up arrow button on the throttle valve controller until the top line of the display shows "SP A", "SP B", "SP C", "SP D", or "SP E".
- 4.3. Turn the adjust knob until the desired pressure is displayed on the top line of the display.
- 4.4. Press the corresponding "SET POINT" button to set the chamber pressure.

## 5. RF power operation

- 5.1. Set the "TUNE ADJUST" knob to 25 as a basic set point (Fig 2).
- 5.2. Press the "RF POWER" button and the red light will light (Fig 2).
- 5.3. Turn the "POWER SET" knob to get the highest reading on the meter (Fig 2).
- 5.4. Press and hold the "METER MODE" button, turn the "LOAD ADJUST" knob to get the lowest reading on the meter (Fig 2).
- 5.5. Allow the system to run the desired amount of time.
- 5.6. Turn the "POWER SET" knob fully counter-clockwise (Fig 2).
- 5.7. Press the "RF POWER" button (Fig 2).

## 6. Substrate unload and shut down

- 6.1. Press the "OFF" then "ENTER" buttons on the digital flow controller (Fig 1)
- 6.2. Press the lighted flow control button (i.e. FC2) on the tan controller (Fig 1).
- 6.3. Press the "CLOSE" button on the throttle valve controller (top black).
- 6.4. Press the lighted "PUMP" button on the tan controller (Fig 1).
- 6.5. Press the "CV" button on the tan controller (Fig 1).
- 6.6. When the chamber has vented, turn off the N2 flow by pressing the "CV" button again.  
The light will turn off.
- 6.7. Remove the sample from the chamber.
- 6.8. Press the "PUMP" button (Fig 1).
- 6.9. Press the "OPEN" button on the throttle valve controller (Fig 1).
- 6.10. Wait for a pressure reading of about 0.010torr on the throttle valve controller.
- 6.11. Press the "CLOSE" button on the throttle controller (Fig 1).
- 6.12. Press the "PUMP" button (Fig 1).
- 6.13. Close the gas valves on the wall.

## 7. Turbo Pump Option

- 7.1. The operator may want to pump the chamber with the turbo (high vacuum) pump to help reduce contamination in the chamber. Please only use if normal operation produces unacceptable results.
- 7.2. Press the "CV" button on the tan controller to vent the chamber. The button will light (Fig 1).
- 7.3. After the chamber has vented press the "CV" button again to close the chamber vent. The light will go out.
- 7.4. Place the sample on the platen in the vacuum chamber.
- 7.5. Press the "PUMP" button on the control panel (Fig 1)
- 7.6. Press the "OPEN" button on the throttle valve controller.
- 7.7. Wait until the pressure on the controller reads 0.01torr or better.
- 7.8. Press the red "STDBY" button on the vacuum controller. TC1 should read 1.0-3torr.
- 7.9. Press the "FV" and "HV" buttons on the tan controller (Fig 1).
- 7.10. Press the "CLOSE" button on the throttle valve controller.
- 7.11. Press the gray "START/STOP" button on the turbo controller (Fig 3).
- 7.12. Wait until the display says "pump at speed" before continuing.
- 7.13. Press the "EMIS" button on the vacuum gauge controller. After 5 seconds, the vacuum should read next to IG. Wait for desired pressure of at least 5.0-5torr.
- 7.14. Press the "EMIS" button on the vacuum gauge controller to turn off the ion gauge.
- 7.15. Continue to etch as normal.
- 7.16. When complete you may either turn off the machine or load another sample.
- 7.17. To turn off complete the following:
  - 7.17.1. Press the "FV" and "HV" buttons on the tan controller (Fig 1).
  - 7.17.2. Press the "START/STOP" button on the turbo pump controller (Fig 3).
  - 7.17.3. Wait until the turbo pump controller says "ready to start".
  - 7.17.4. Vent normally.
- 7.18. To load another sample complete the following:
  - 7.18.1. Press the "FV" and "HV" buttons on the tan controller (Fig 1). This isolates the turbo pump and keeps it at speed while venting the chamber.
  - 7.18.2. Press the "OPEN" button on the throttle valve controller.
  - 7.18.3. Press the "CV" button on the tan controller to vent the chamber. The button will light (Fig 1). After the chamber has vented press the "CV" button again to close the chamber vent. The light will go out.
  - 7.18.4. Place the sample on the platen in the vacuum chamber.
  - 7.18.5. Close the chamber then press the "PUMP" button on the control panel (Fig 1)
  - 7.18.6. Press the "OPEN" button on the throttle valve controller.
  - 7.18.7. Wait until the pressure on the controller reads 0.01torr or better.
  - 7.18.8. Press the "CLOSE" button on the throttle valve controller.

- 7.18.9. Press the “FV” and “HV” buttons on the tan controller (Fig 1). This reopens the chamber to the turbo pump.
- 7.18.10. Continue at section 7.13