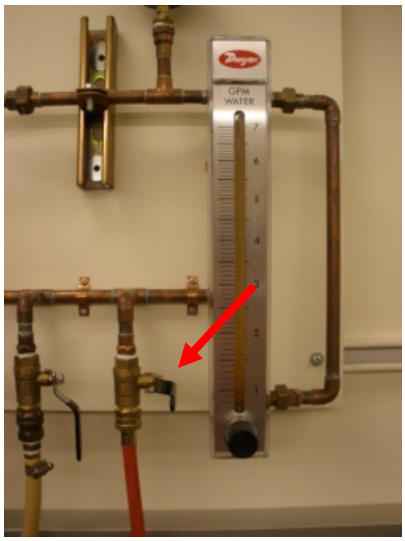
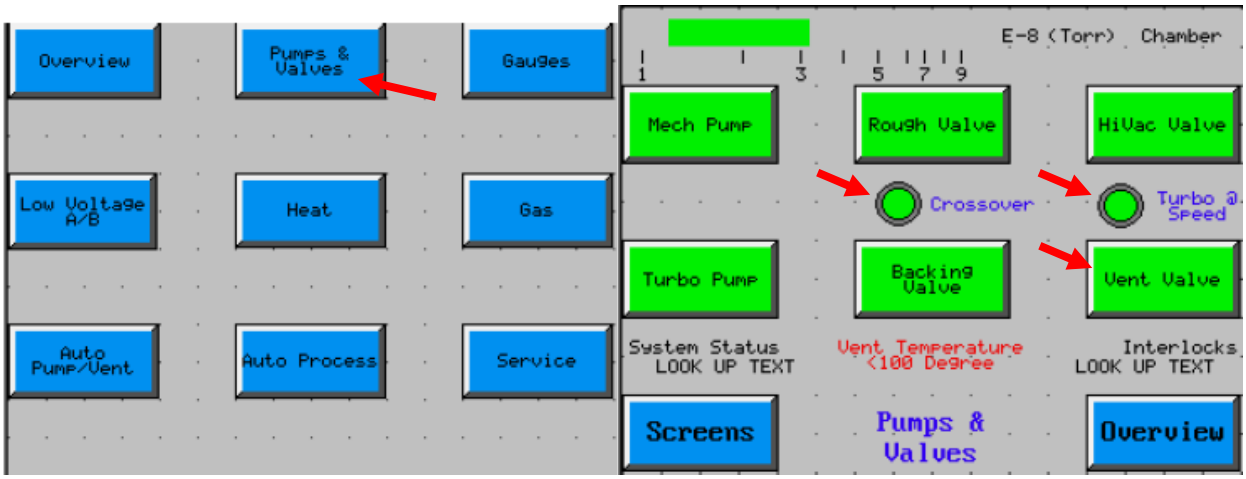
Denton Vacuum Evaporator
Standard Operating Procedures



Preparing to deposit:

1. Record use on FOM.
2. Turn on the cooling water using the valve on the wall (red hose).
3. Pull out the red knob on the front lower panel.
4. Push the green button on the front lower panel.
5. On the touch screen, push the System Start button.
6. Go to the Pumps and Valves Screen:
7. Turn on the Mechanical Pump by pushing its button (red indicates closed/off, green indicates open/on). Wait a minute.
8. Open the Backing Valve. Wait a minute.
9. Turn on the Turbo Pump.
10. Wait 10-20 minutes for the Turbo@Speed light to turn green.

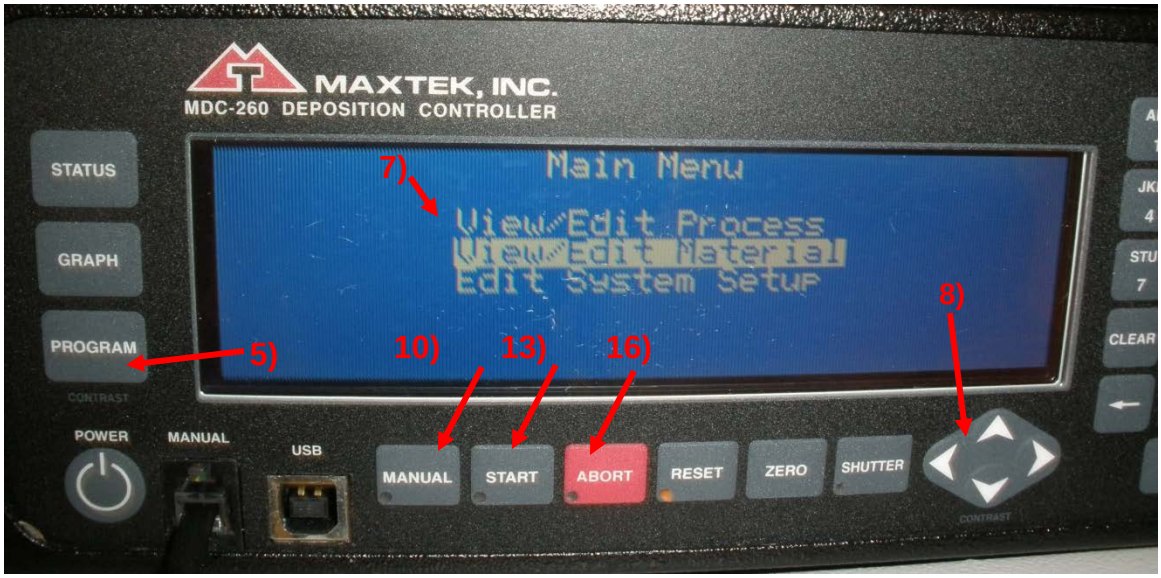


1. While the turbo pump is coming up to speed, the chamber can be opened and loaded. Open the **Vent Valve** to bring the chamber to atmospheric pressure.
2. **Load substrates** and deposition materials
3. When the **turbo is at speed** (indicator is green), the chamber can be pumped down.
4. Close the **Backing Valve**. Wait 15 seconds.
5. Hold the door closed with your left hand while pressing the **Rough Valve** button on the screen.
6. Wait until the pressure reaches 1.5 x 10^{-1} torr or less, and the **Crossover** icon is green.
7. Close the **Rough Valve** and wait 15 seconds.
8. Open the **Backing Valve** and wait 15 seconds.
9. Open the **Hi-vac Valve**.
10. The chamber will need time to reach operating pressure of **10^{-6} torr**, 20-30 minutes.

Depositing films:

1. Plug in the **manual control handset(s)** to the Maxtek controller(s) you will be using.

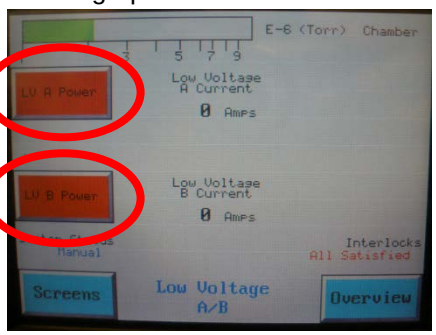
2. On the Denton control panel, navigate to the **Low Voltage A/B screen**, and turn on the power to the deposition source(s) you will be using (left is A, right is B).
3. Using the Maxtek controller, set up your deposition.
4. Pressing **Program** brings up the main menu.



5. Choose the "**View/Edit Process**" option.
6. Use arrow buttons to navigate and set up your process – the **film thickness** and **element** being used are the important parameters.
7. The Left arrow will lead back to the main menu.
8. Press **Manual** to allow manual control.
9. Use the handset to **increase power** – most materials begin to deposit in the 10-25% power range.
10. Watch the chamber pressure on the control screen – the materials outgas as they are heated, and the interlocks will shut off the power at a pressure of 5×10^{-5} torr.
11. When the desired rate is achieved, press **Start** on the Maxtek controller.
12. All programmed processes will be listed – **choose your process** and press **Start** again.
13. The controller will now automatically zero thickness on the monitor, open the shutter, and deposit the programmed thickness of material.
14. After the layer has been deposited, press **Abort** to turn the power down to 0%.

Removing samples:

1. Turn off all **power supplies**. The graphics for these should be **RED** (off).



2. Close (if open) the **Hi-Vac Valve**.
3. Close (if open) the **Rough Valve**.
4. Open the **Vent Valve** and wait for the chamber to come to atmospheric pressure.
5. Remove samples and/or deposition sources, leaving the chamber clean for the next user. The deposition sources heat the chamber, so be careful if removing samples immediately after turning the power down as the surfaces may be hot.
6. Reload if more samples are being run, if not the system is pumped down and left under static vacuum (see shutting down the system).

Shutting down the system

1. Do not leave the system open to air for extended periods (e.g. overnight), always evacuate the chamber at the end of an experiment.
2. Close (if open) the **Hi-Vac Valve**.
3. Turn off the **Turbo Pump**.
4. **Wait 20 minutes**, allowing the turbo pump to spin down.
5. Close the **Backing Valve**.
6. If the chamber is at atmospheric pressure, hold the door closed with your left hand while pressing the **Rough Valve** button on the screen.
7. If pumping down the chamber, wait until the pressure reaches the **10^{-1} torr level** (a few minutes).
8. When chamber is pumped down, close the **Rough Valve**.
9. Turn off the **Mechanical Pump**.
10. Press the **red knob** on the lower front panel to power off the instrument.
11. Turn off the **cooling water** using the valve on the wall.

Instrument Hazards and Best Practices: Thermal Evaporator

This document will cover the inherent hazards when utilizing this piece of equipment as well as the best practices and procedures to avoid danger.
Lab coats are to be provided by the user.

Hazards:

- Chemical exposure
- Vacuum chamber
- Eye damaging radiation

1. Required PPE

Appropriate laboratory attire is required at all times in the AMSEC laboratories. Whenever chemicals are being used, an additional requirement of a lab coat is required. Lab coats are to be provided by the user.

Whenever a user is in the AMSEC labs, the minimum requirement for eye protection is wrap around impact glasses. Anytime liquid chemicals are present in the same room as the user without a direct barrier, all users in the lab must wear chemical splash goggles. Splash goggles must be approved by State of Washington Administrative Code (WAC 296-155-215).

If chemicals being used are considered toxic, caustic, corrosive, flammable solvents, carcinogenic, mutagenic, or teratogenic, a minimum of disposable nitrile gloves is required. Avoid chemical transfer by taking off gloves when using anything other than the chemical(s).

2. Vacuum chamber

The thermal evaporator utilizes a vacuum chamber which is under control of the user. It is possible for the vacuum chamber to fail catastrophically. If this event occurs, the user may hear a loud sucking noise and/or pump malfunctions which will most likely be loud and sound like metal grating or colliding. If any of these symptoms of catastrophic failure are observed, evacuate the lab as soon as possible notifying any other lab occupants. Notify the lab manager immediately.

3. Eye damaging radiation

During the course of operating the thermal evaporator a user may want to visually examine the evaporation in progress. The potential exists for harmful radiation to be emitted from the evaporation source during intense heating. Protective glasses are provided which shield the user's eyes from said radiation. Do not view the evaporation without these protective glasses on. The glasses should be located on the instrument and should have green lenses. If these glasses cannot be found, contact the lab manager and do not look at any evaporation in progress.