**SIMPLIFIED REFERENCE CELL PROCEDURES**

*T. Averett,* 17-Aug-2020

Cell 757-561-6702

1. The Reference Cell Controller chassis is gold-colored, has 2 digital gauges, red and green rectangular buttons, and is located to the left of the target control computer.
2. There are three operations that can be performed on the reference cell system.
   1. Vent the cell to atmospheric pressure, 0 psig.
   2. Evacuate the cell.
   3. Fill the cell with 3He, N2 or H2 to any pressure up to the maximum safe limit, 150 psig.
3. There are two gauges on the control panel in the counting house
   1. Reference cell pressure, 0-1000 psig.
   2. Reference cell vacuum, 0-1000 Torr. This gauge is inaccurate due to being subjected to overpressure. This means we cannot accurately know the pressure below 0 psig.
4. There is one more gauge, located between the roughing and turbo pumps. It reads in Torr or milliTorr. It is only visible on the camera screen in the counting house. You do not need to worry about this gauge. (Experts: It is this gauge that must fall below 5 Torr when evacuating the cell before you can release the red button).
5. IMPORTANT NOTES on the accuracy of pressure readings
   1. The pressure/vacuum values indicated on the reference cell control panel digital gauges are set to zero by the user as described below. But the values in EPICS come straight from the Baratron sensors and will not be changed by adjusting the zero on the gauges.
   2. The zero values tend to drift. Before you fill the cell you need to zero the gauges.
      1. The pressure gauge reads in psig. To zero the gauge, first vent the cell. Do not evacuate. Set the gauge to 0 (psig) with a screwdriver. Note that it will still read zero if you pump below 0 psig so don’t try to set the zero when the cell is evacuated.
      2. To zero the vacuum gauge, vent and then evacuate the cell. Wait until the vacuum is near zero Torr and stops dropping. Set the gauge to zero with a screwdriver. Remember this gauge is not accurate due to damage by overpressure.
   3. If you are taking data, record the pressure on the gauge in the beginning and end of run files, and the HCLOG, for each run.
6. VENTING THE CELL
   1. Press and hold the red VENTILATION button until the pressure stops falling.
   2. The minimum pressure may not be 0 psig if the gauge is not properly zeroed.
7. EVACUATING THE CELL
   1. Vent the cell.
   2. Hold the red EVACUATE 5 TORR button until the vacuum gauge reaches < 5 Torr then release.
   3. When you reach < 5 Torr, the button will remain illuminated and evacuation of the cell will continue.
   4. The minimum pressure may not be 0 Torr if the gauge is not properly zeroed.
8. FILLING THE CELL
   1. Vent the cell, zero the pressure gauge.
   2. Evacuate the cell, zero the vacuum gauge.
   3. If you are using a different gas than was previously used, it is a good idea to “purge and pump” the system 2-3 times, except for 3He.
      1. Press and hold the green button for the desired gas and watch the pressure increase to around 50 psig.
      2. Ventilate the cell.
      3. Evacuate the cell.
      4. Exception - for 3He, do this procedure only once as the 3He is very costly.
   4. Press and hold the green button to for the desired gas and watch the pressure increase to the desired value.
   5. Record the pressure in HCLOG.
9. OTHER BUTTONS
   1. There are buttons, labeled “TURBO ON” and “TURBO OFF”. These are used by experts to turn the turbo pump on and off from the counting house. If you suspect the turbo is off, call an expert.
   2. The “REMOTE CONTROL ON” button should be in the UP position. Switching it to the DOWN position gives control to the panel in Hall C. If you do this by accident, just switch it back UP.