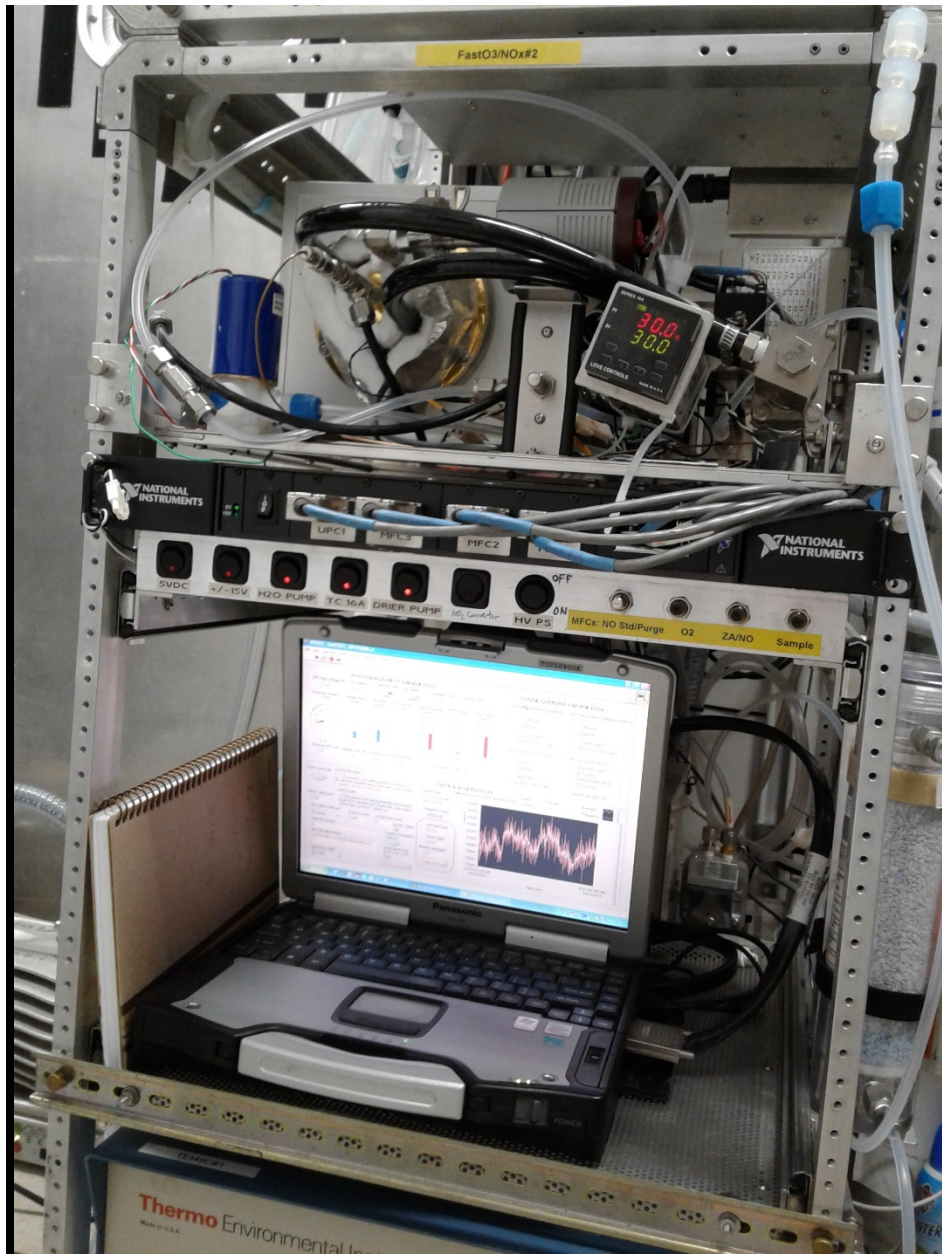
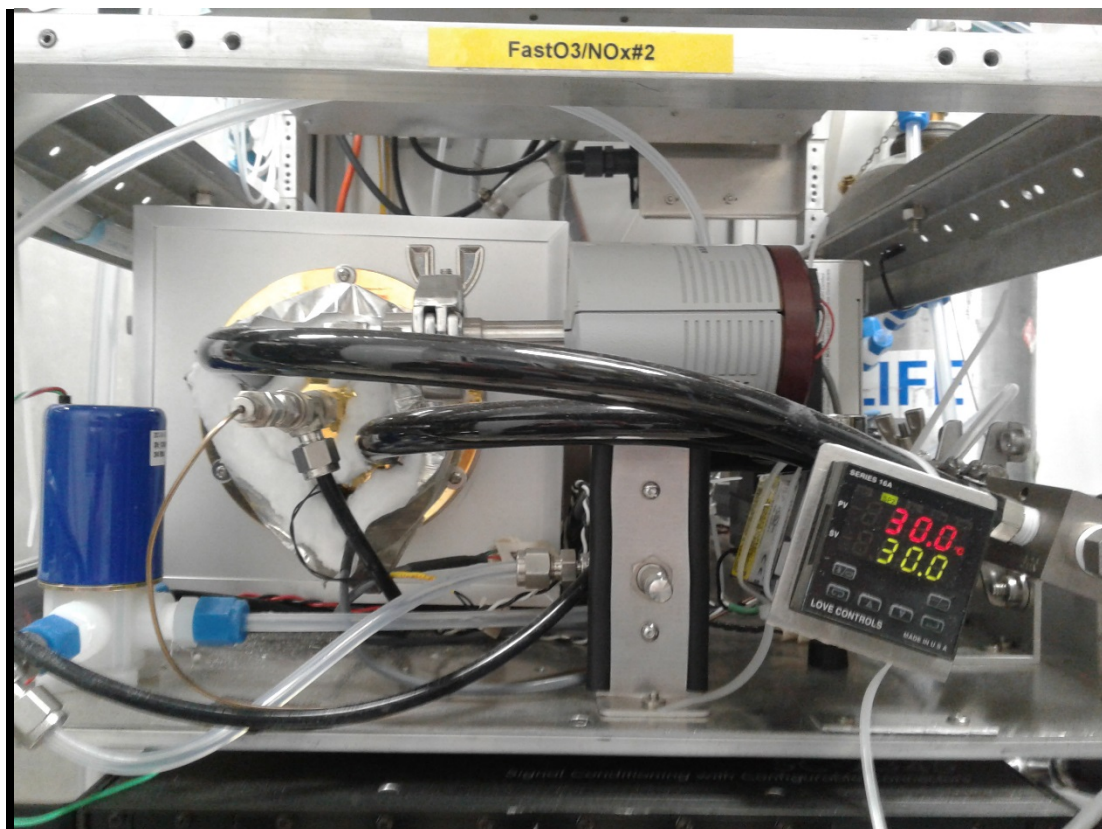


# Fast ozone instrument #2 operation guide

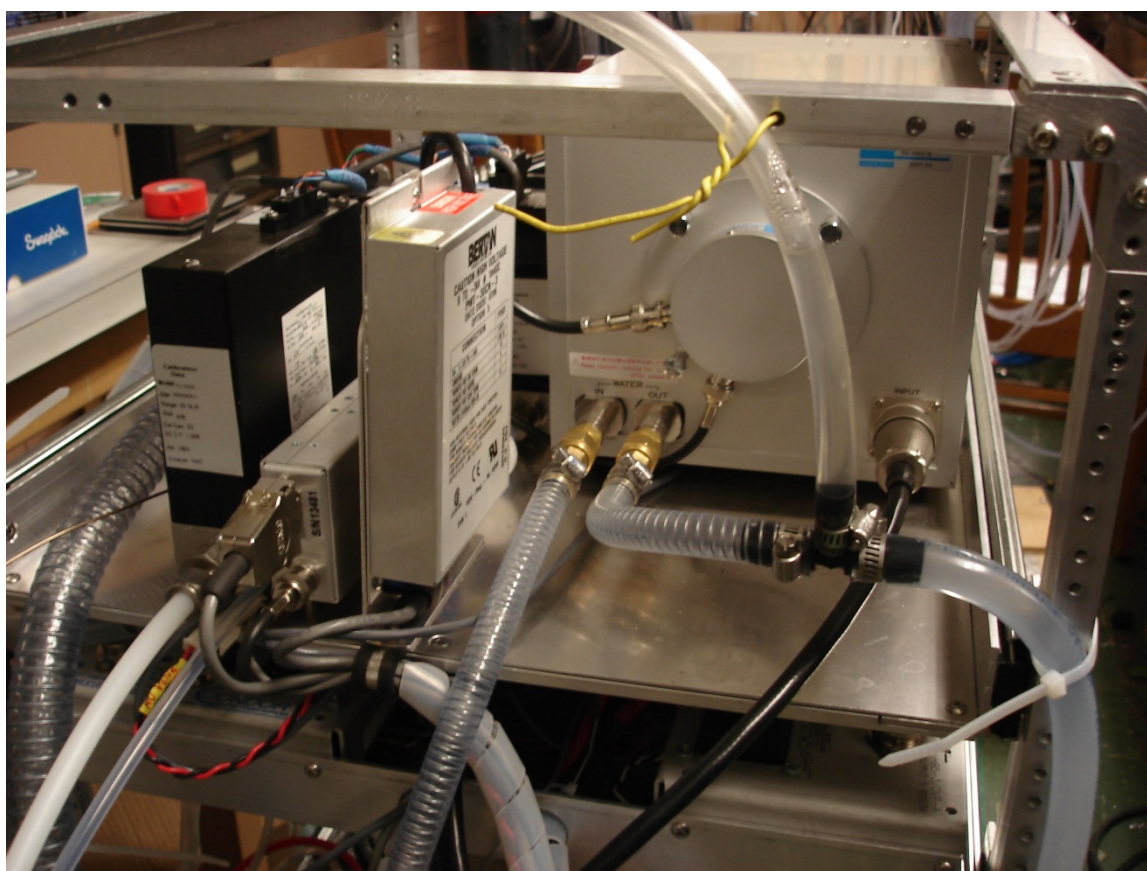
(MOSAIC version 1.0, 10/12/2019)



Pic 1: general view of the instrument

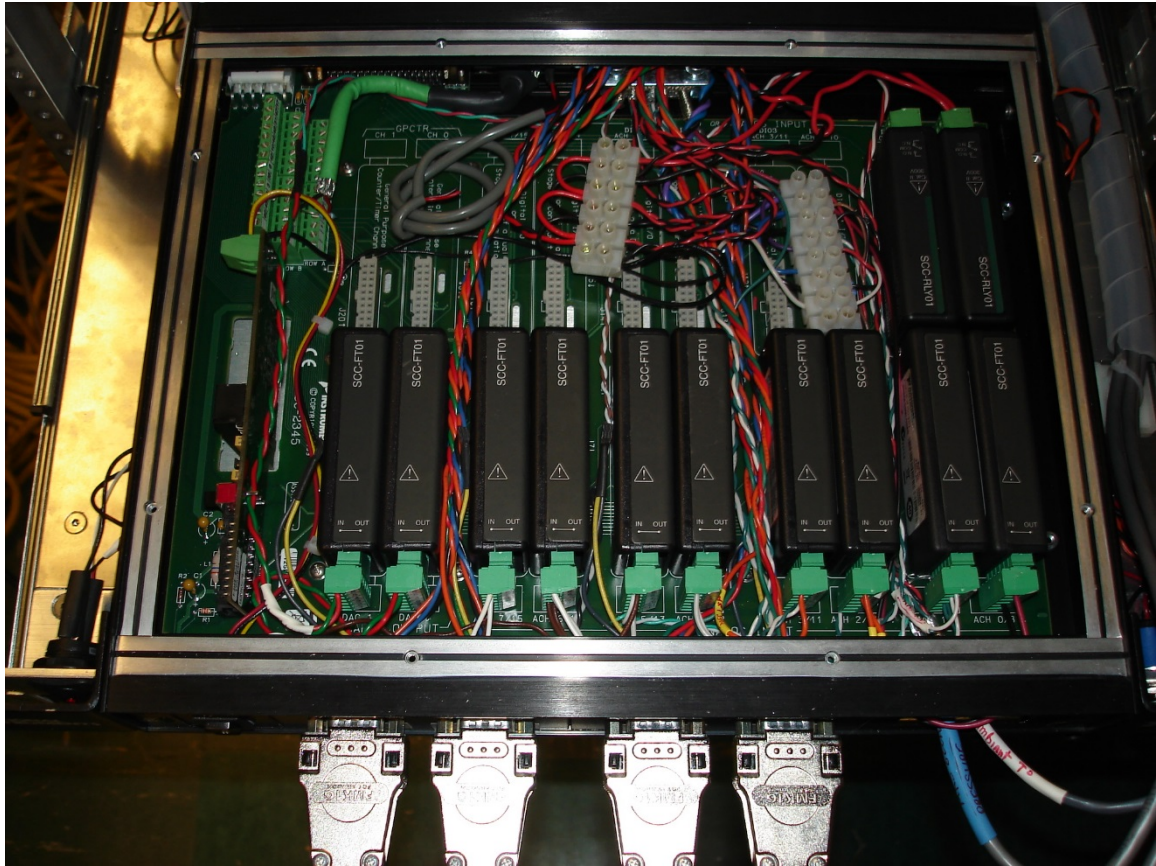


Pic 2: Front of the top drawer : Temp controller, Pressure transducer, Reaction vessel.

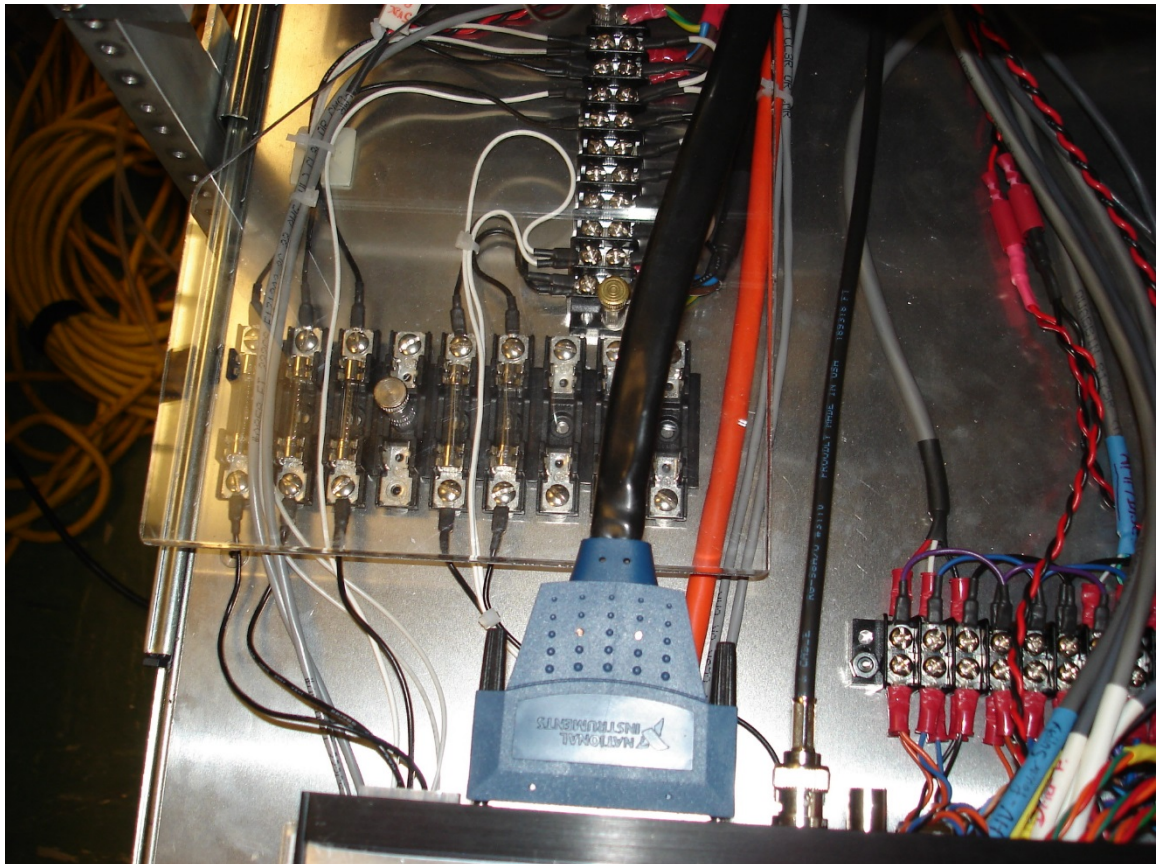


Pic 3: Back of the top drawer: PMT enclosure, PMT power supply, A/D, MFC



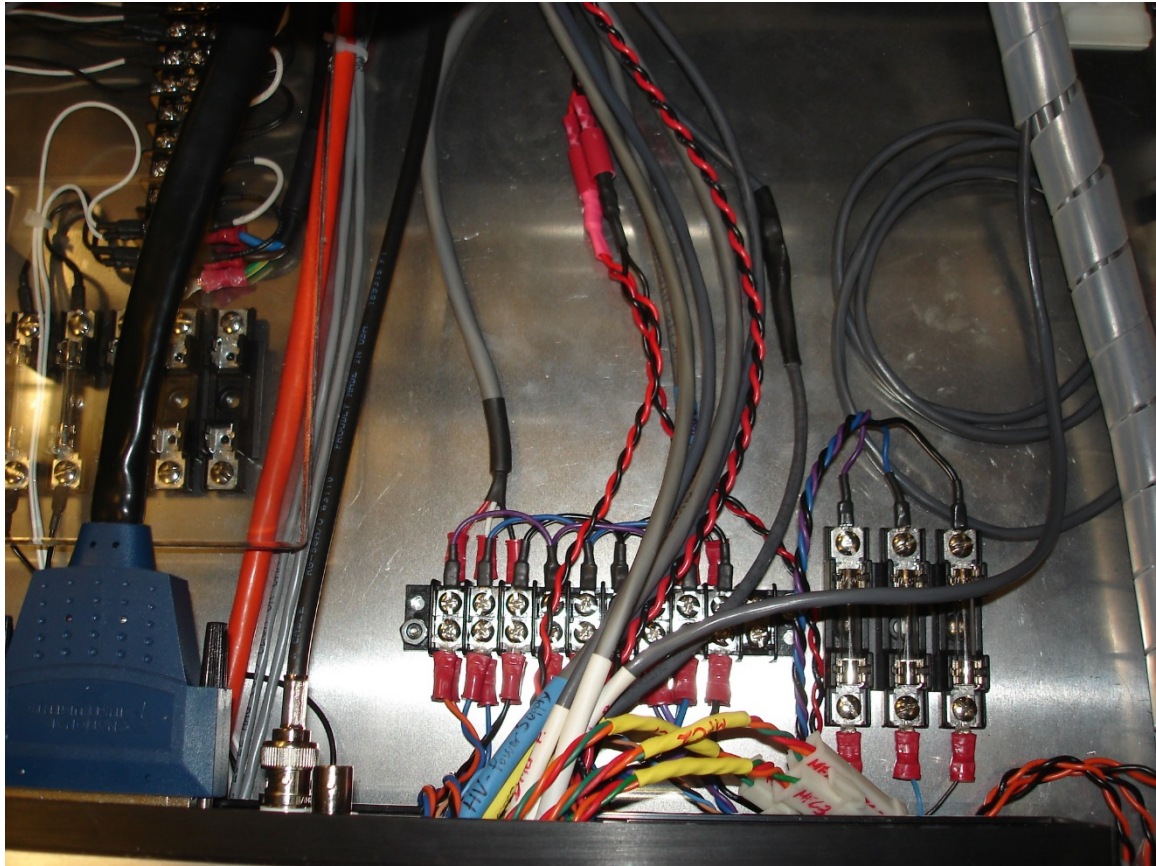


Pic 4: Second drawer: Signal conditioning box.

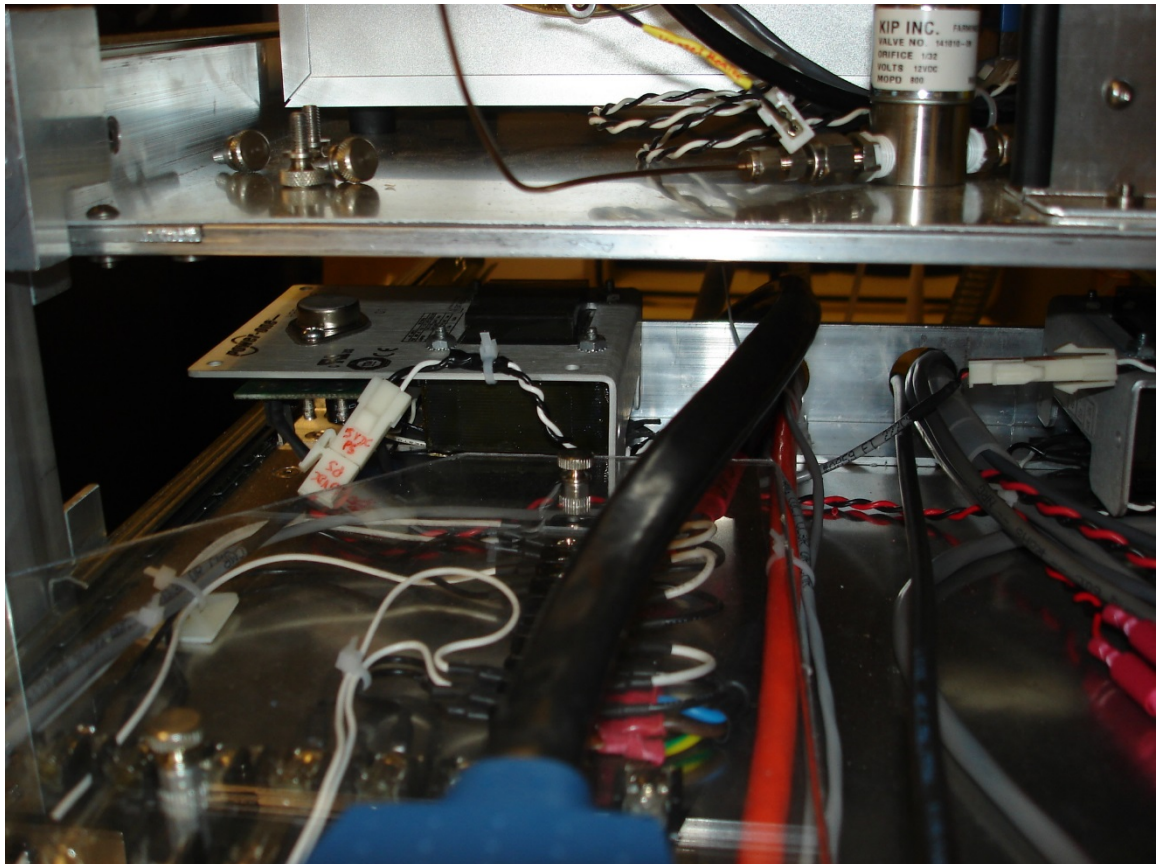


Pic 5: Second drawer: DAQ card cable connection, fuses.



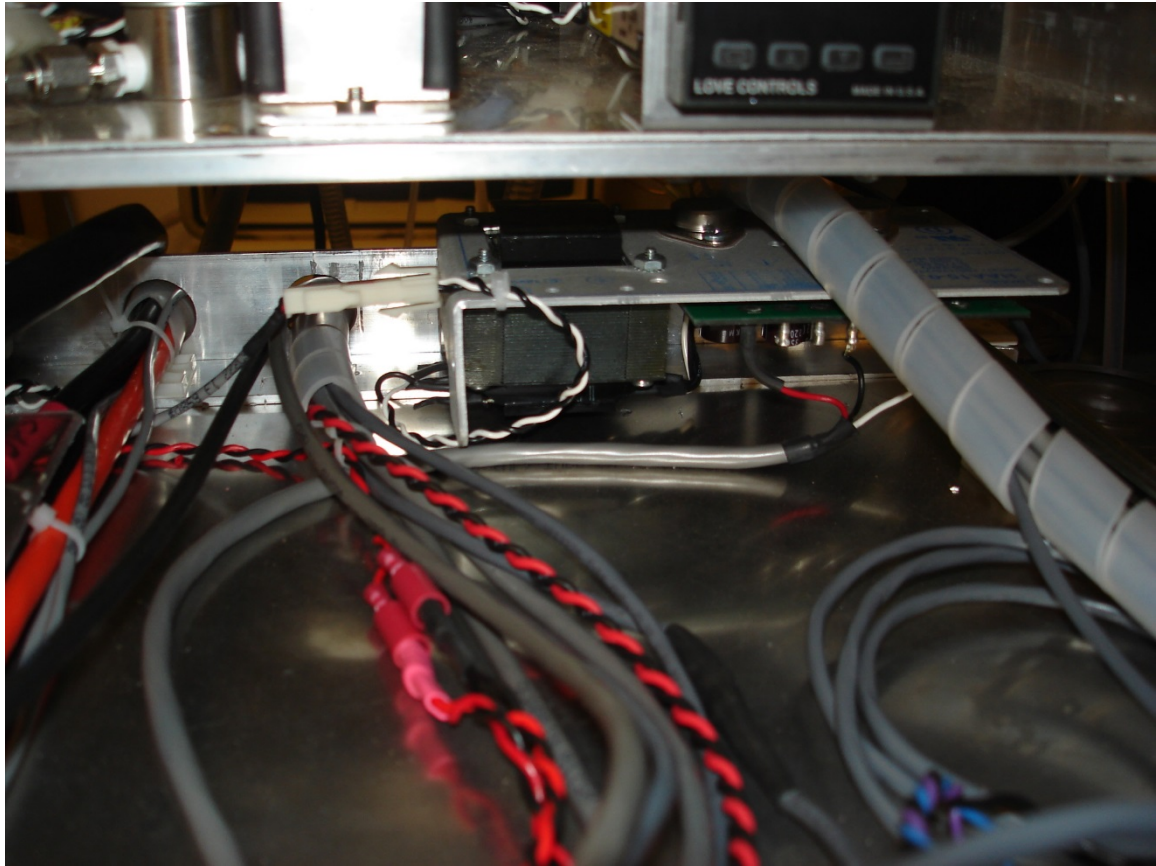


Pic 6: Second drawer: +/-15VDC distribution and fuses for the PMT power supply

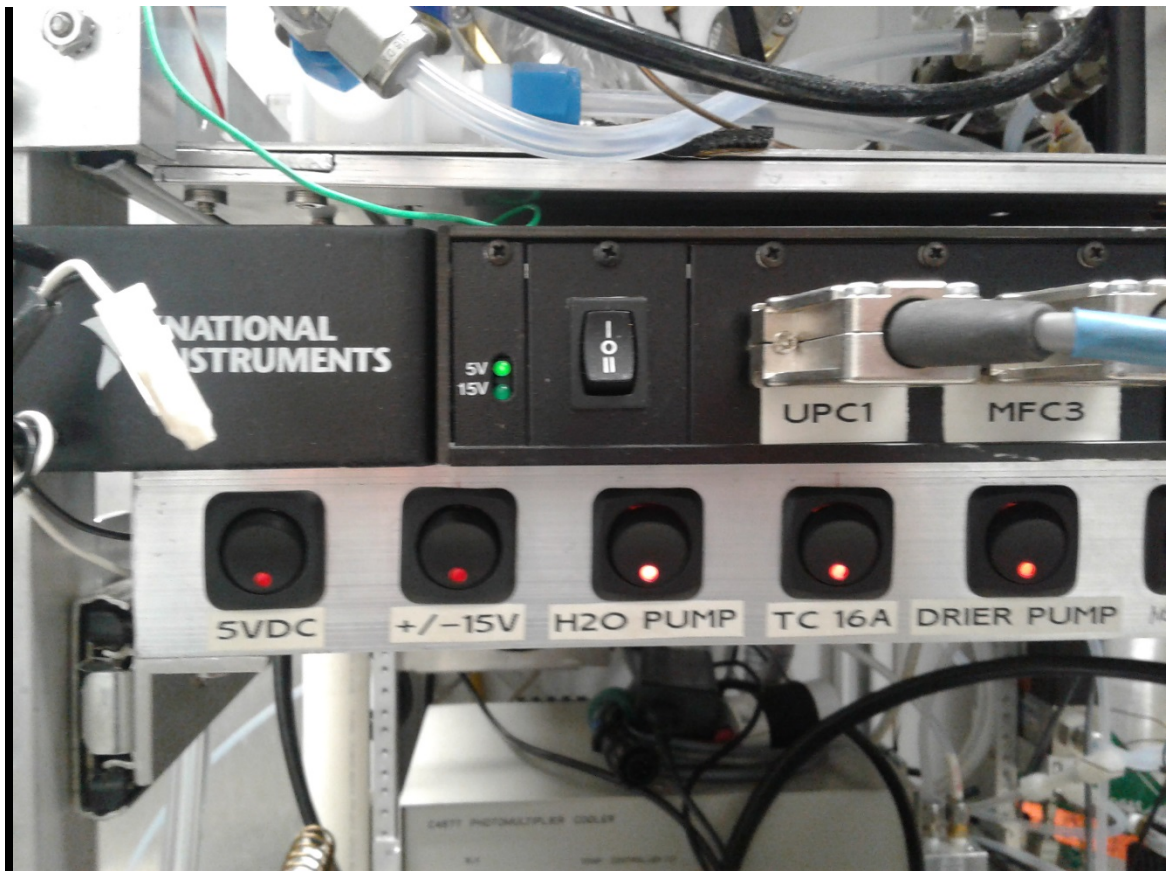


Pic 7: Second drawer: +5VDC power supply (on the back to the left)



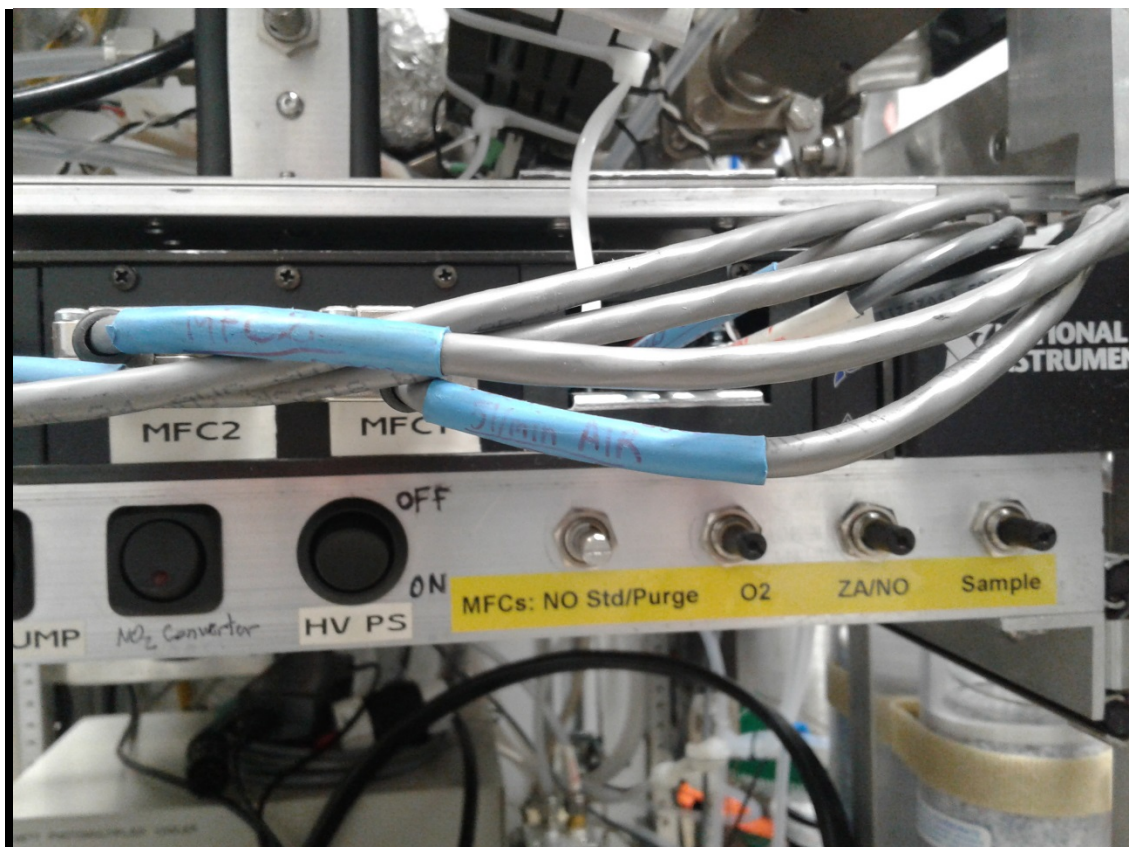


Pic 8: Second drawer: +/-15VDC power supply (on the back right)



Pic 9: Second drawer: Main switches.





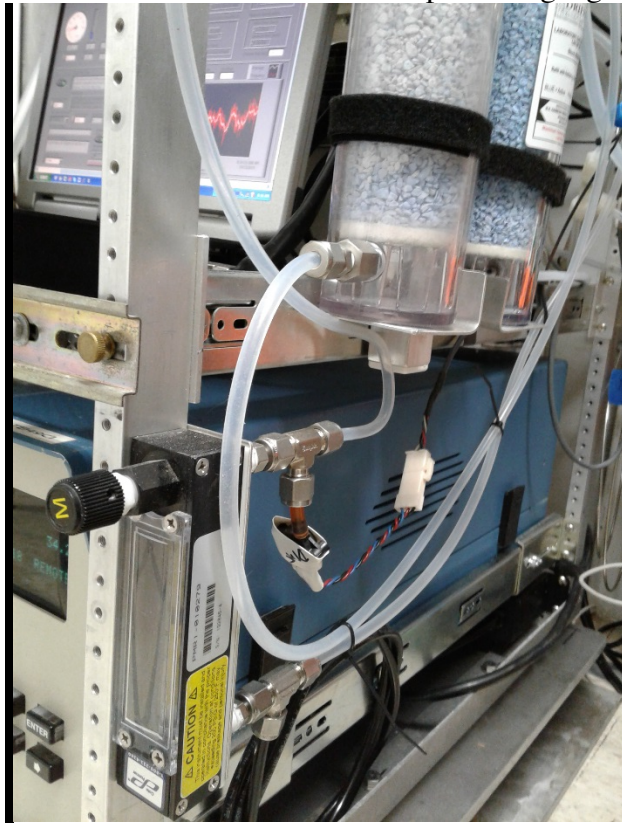
Pic 10: Second drawer: Main switches and potentiometers for MFC flows setpoint.



Pic 11: Third drawer: PMT Cooler controller, drier pump and computer



Pic 12: NO Shut off valve + NO pressure gauge



Pic 13: Drier Cycle is attached to the right side of the frame: Drierite columns, flow meter with needle valve, pressure sensor.



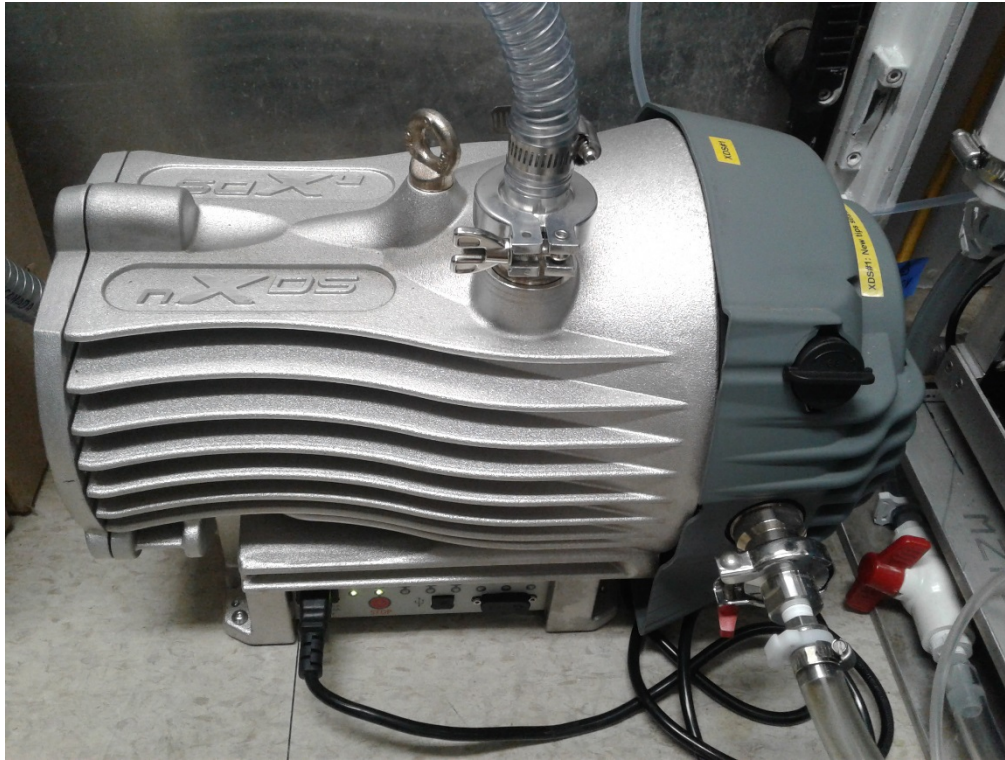


Pic 14: Water pump and fan+radiator.



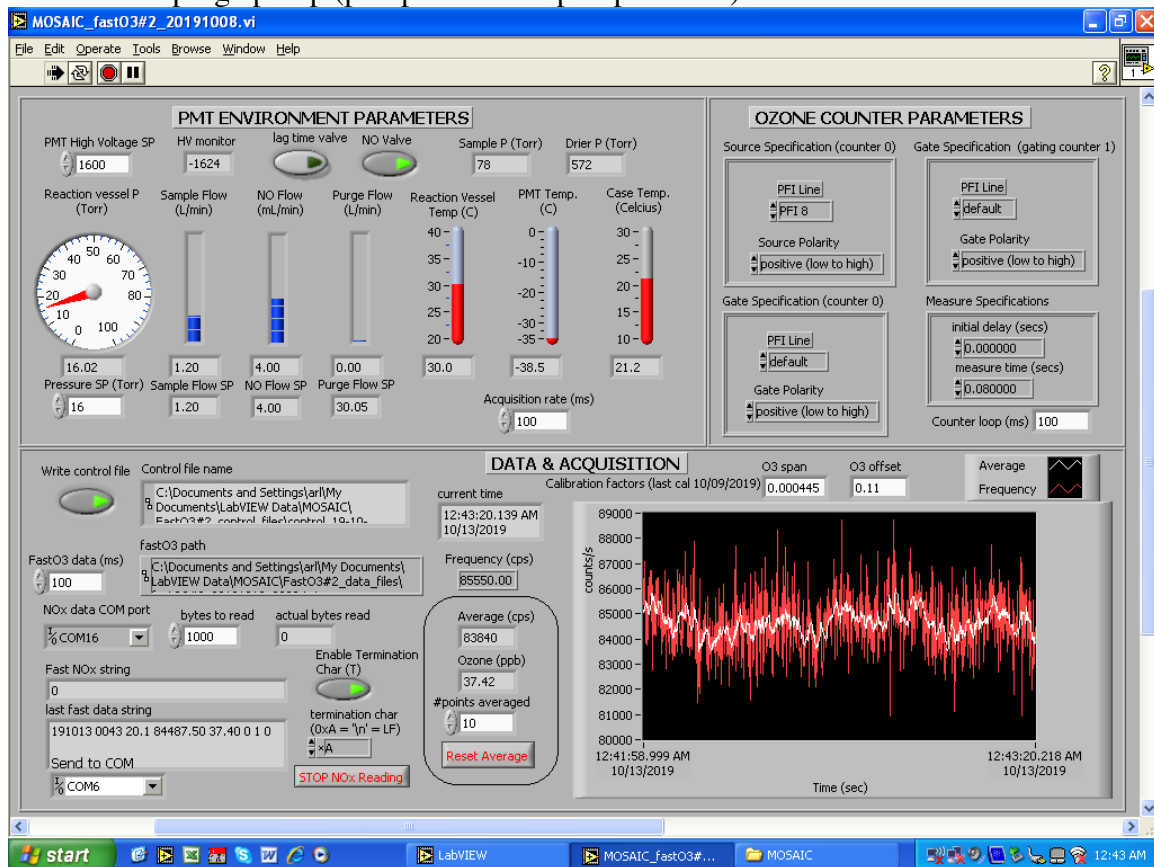
Pic 15: Water reservoir input





Pic 16: Scroll pump.

Pic 17: Line purge pump (pump inside the pump cabinet).



Pic18: Labview VI front panel.



## Turning off the instrument:

1. Turn OFF the **Line Pump** in the pump cabinet (unplug the pump from the orange cord). In the VI, the **purge flow** reading should drop to 0.
2. Turn OFF the **NO shut off valve** and watch the **NO flow** reading on the VI. When the flow drops to 0, proceed to next step.
3. Slowly turn down the **PMT High Voltage SP** in the VI (steps of 100V), all the way to 0.
4. Switch OFF the **PMT cooler** (toggle switch on the left side, pic. 11)
5. On the switch panel, turn the **HV PS** switch OFF (pic. 10)
6. On the switch panel, turn OFF **Drier Pump** switch and **TC 16A** switch (pic. 9)
7. Close the **vacuum isolation valve** and watch the **Reaction Vessel pressure** in the VI go to 100.
8. If the system will stay off for an extended period of time (days), turn off the scroll pump. Since the exhaust of the scroll pump is shared with the Fast NOx instrument, turn off the O3 generator on the FastNOx system, wait for a couple minutes and then disconnect the output of the FastO3 scroll pump and cap the tubing. This will prevent back flow of FastNOx exhaust through the FastO3 pump. Then, turn the O3 generator back on on the FastNOx system.
9. On the switch panel, turn OFF the **+/-15V** and **5VDC** switches (pic. 9)
10. If the system will stay off for several days, shut OFF the **H2O pump** switch on the switch panel (pic. 9)
11. Stop the Labview VI on the laptop (stop button on the top left)



## Turning on the instrument:

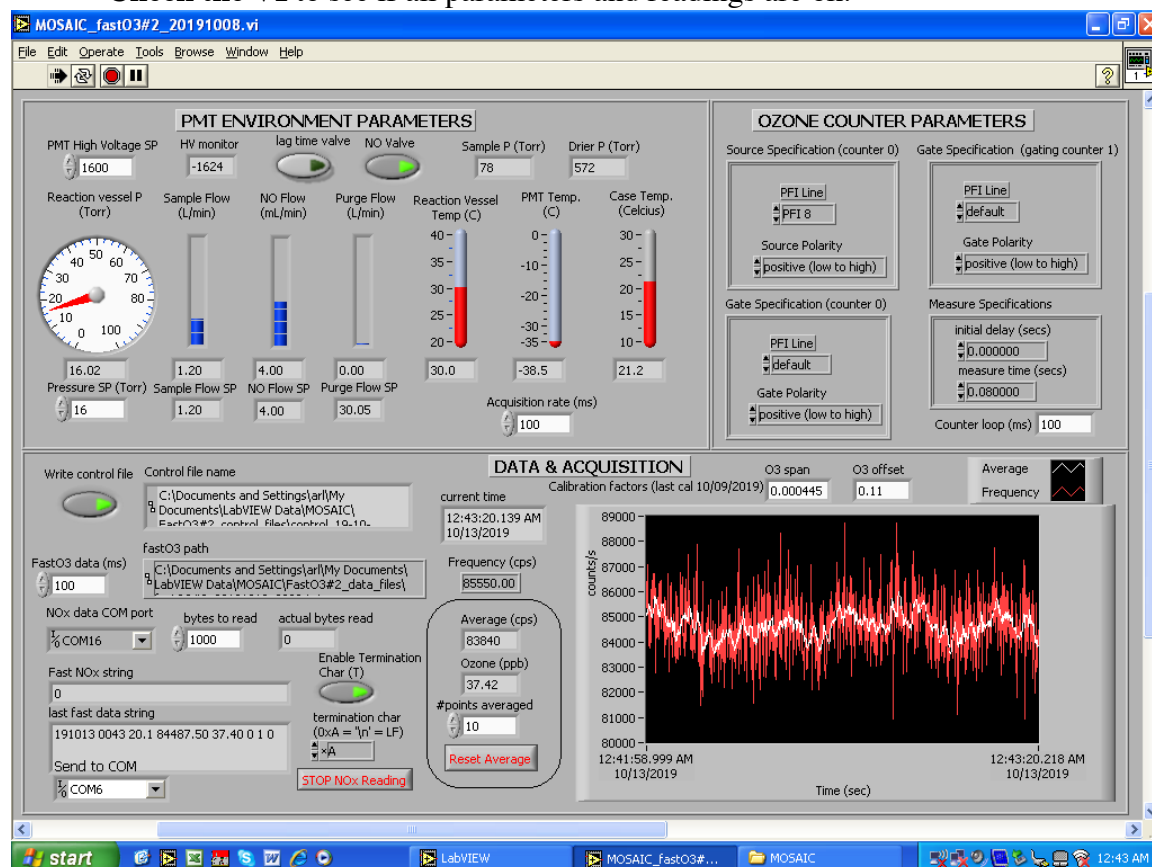
1. Turn ON the H<sub>2</sub>O Pump switch on the switch panel (pic.9)
2. Turn ON the computer and launch the Labview VI (shortcut on the desktop: **MOSAIC\_fastO3#2\_191008.vi**)
3. In the VI, change the **PMT High Voltage SP** to 0.
4. Turn ON the **5VDC and +/-15V** switches on the switch panel (pic 9)
5. Turn ON the temperature controller: **TC 16A** switch on switch panel (pic. 9). On the VI, the Reaction vessel temperature should start rising and will settle at 30C.
6. Switch ON the **PMT cooler** (toggle switch on the left side, pic. 11). Also make sure that the temperature knob is set to -35C (all the way count-clockwise) and that the grey button next to it is on the ON position.
7. Turn ON the **scroll pump** (green button on the side of the pump)
8. Open the **vacuum isolation valve**. On the VI, you should see the sample flow reading go to 1.2L/min and the Reaction Vessel pressure settle at 16 Torr. If you have disconnected the pump output when you turned off the system, reconnect the exhaust tube to the output of the pump. Make sure to turn off the O<sub>3</sub> generator on the FastNO<sub>x</sub> system before uncapping the exhaust tube.
9. On the switch panel, turn ON the **Drier Pump**. Check that the ball on the flowmeter is between 30 and 40. If necessary, adjust it with the valve on the flowmeter.
10. Turn ON the **NO shut off valve** and watch the **NO flow** reading on the VI. It should go to 4mL/min. Also make sure that the cylinder of NO is open and that the delivery valve on the regulator is open as well.
11. Turn on the **Line pump** in the pump cabinet (reconnect the pump to the orange cord). If the wind conditions are good, pump should come on and the **purge flow** reading in the VI should go up to 30L/min
12. When the PMT temperature is below 0C, turn the **HV PS** switch ON (pic. 10). Then, in the VI slowly increment the **PMT High Voltage SP** to 1600. You should start seeing counts on the VI now.
13. Let the instrument equilibrate for a while and check that control files and data files are being recorded. Also check that data is being recorded in the DAS.



## REGULAR CHECKS/MAINTENANCE:

Daily:

- **Check the Drierite** status. If first column is all purple/pink, replace with a spare one (replace before the second one starts turning purple/pink). Turn off the drier pump during the replacement and turn it back on right after.
- **Check the NO cylinder pressure** and log it in the gas logbook on the GCMS inlet computer.
- **Check the water level** in the water reservoir. Should be 1-2" (3-5cm) below the tee where the water cycles back in.
- **Check the VI** to see if all parameters and readings are ok:



PMT High Voltage SP: 1600

PMT reading: -1624V (+/-20V)

Reaction Vessel Pressure SP: 16 Torr

Reaction Vessel Pressure reading: 16 Torr (+/-0.02)

Sample Flow SP: 1.20 L/min

Sample Flow reading: 1.20 L/min (+/-0.02)

NO Flow SP: 4.00 mL/min

NO Flow reading: 4.00 mL/min (+/-0.01)

Purge Flow SP: 30 L/min

Purge Flow reading: 30.0 L/min (+/-0.1)

Reaction Vessel Temperature: 30.0C (+/-0.5C)

PMT Temperature: below -34C

Case Temperature: 20-25C

Drier Pressure: 570 Torr (+/-50)

Sample Pressure: disregard this reading, the pressure sensor is not present.

Acquisition Rate: 100ms

- **Check that the control file and the data file** are getting written:

**Control File:** My Documents/LabVIEW Data/MOSAIC/FastO#2\_control\_files/  
control\_DATE\_TIME.lvm

**Data File:** My Documents/LabVIEW Data/MOSAIC/FastO#2\_data\_files/  
fastO3#2\_DATE\_TIME.lvm

- **Transfer data** to a USB stick or drive and transfer to the ship's data archive

Weekly, or when necessary:

- **Refill the water reservoir** to about 1-2" (3-5cm) below the tee where water comes in. Use the small bottle with the green cap and a funnel if necessary. **Be careful to pour very slowly! It fills up fast!**
- **Regenerate the used Drierite** in the oven in Wet Lab1 (Nasslab 1). Lay the Drierite in a **thin layer** on an aluminum boat. Set the oven at **190C** and bake the Drierite for **1h**. Make sure to take the Drierite out of the oven while it's **still hot**. Pour into a glass jar to let it cool and then transfer back into the Drierite column.  
**NOTE:** As drierite is reused, it tends to get dustier and stick to the walls of the plastic column, so before refilling a column always wipe the inside with a damp paper towel or completely remove the felt bottom and rinse with water and dry.
- **Replace the NO cylinder.** This should be done very carefully. Contact Jacques and Detlev when cylinder pressure gets below 50PSI for further instructions.