

Restarting the MMRC Kratos Ultra after a Power Failure

When there is a power blip in Pasadena, the Kratos Ultra XPS is frequently unaffected because the Affinity chiller will often restart once power comes on again. If the Affinity does not restart, the Kratos turbo pumps for the STC and load lock will turn off, since they are no longer receiving cooling water from the Affinity. (Note that the Turbo pump for the HREELS receives its water from the NesLab and so will shut off if the NesLab stops.) When the STC turbo pump shuts down, the Kratos controls will close the gate valve between the STC turbo and the its backing pump and the flap valve. The space behind the turbo will leak pressure into the STC as the STC turbo spins down and ultimately the cold cathode gauges for the STC and SAC will also switch off as the pressure rises.

Typically, if the instrument is not opened up to atmosphere while these pumps are down, it is possible to restart all the pumps in the correct order. If the instrument sits in this state for long enough, it may need to be baked to achieve acceptable pressures. Overall, the sooner all the pumps are restarted, the better.

The general procedure to restart the Kratos is as follows:

1. Kratos should have all gates closed (load lock to STC, backing for STC Turbo and flap valve).
2. **Restart the Affinity chiller and NesLab if they are off.**
 - a. The switch for the Affinity is on the front bottom left of the chiller.
 - b. Check the water level in the chiller and the set point temperature (18°C).
 - c. The NesLab switch is on the front but you need to hold it up a few seconds to keep it running.
 - d. Check the NesLab water level.
3. Check the pressures in all chambers on the VCU and status of the turbo pumps on the computer software.
 - a. If the computer is off and the control panel on the NICPU (Control Process Unit) displays the E.5 error, restart the computer. Open the Kratos software (Vision Manager) to reconnect to the Kratos.
 - b. Wait for the VME initialization to complete.
 - c. Open the Vision Manual window.
 - d. Ensure that the software is in Engineering Mode so that Full Manual mode is accessible.
4. Check the load lock turbo. If it has turned off and vented, simply restart it normally, (the Affinity must be on).
5. If both the STC turbo pump and the SAC ion pump are on,
 - a. Restart the CCGs if off.
 - b. If the pressures are low enough <1e-8 Torr, nothing else needs to be done, and the Kratos is ready for use.
6. If STC turbo pump is off,
 - a. Make sure the Affinity cooler is on.
 - b. Close the gate between the Turbo and backing pump, V3.
 - c. Restart the two Scroll pumps (one is for the STC Turbo on the floor near the load lock) with manual switch on the side of the pumps.
 - d. Turn on the STC turbo using the Kratos software in Full Manual mode.
 - e. When the backing pressure (pirani gauge, PG) falls below 1E-1 Torr, open the gate valve to the backing pump, V3.
 - f. About 10 min after the turbo has come up to speed, try turning on the STC CCG.

7. If the SAC ion pump is off, and neither the ion gun or UPS lamp were not in use prior to the power failure.
 - a. Turn on the SAC CCG. If the gauge refuses to stay on, the pressure is likely too high, and the chamber will need to be evacuated through the STC.
 - i. If the pressure is higher than 1E-4 Torr you will need to vent the STC before you open the flap valve between then and pump it out with the turbo.
 - ii. If the pressure is < 1E-4 Torr open the flap valve and let the STC Turbo pump the chamber down to 1E-7 Torr.
 - b. If the CCG shows pressure <1E-6 Torr, turn on the SAC ion pump. The pressure should return to normal over time.
8. The instrument is ready to use once the pressures are < 1E-8 Torr; however, it is better to wait until the pressure is in the <3E-9 Torr range or lower before using it.
9. If the HREELS Turbo is off:
 - a. Restart the Scroll backing pump on the floor under the HREELS transfer arm.
 - b. If the pressure in the LEED chamber is <1e-4 Torr
 - i. Turn on the HREELS turbo (control box is in the rack toward the IR room)
 - ii. When the backing pressure is <1e-1 open the valve between the turbo and the backing pump
 - iii. When the turbo is up to speed open the valve to the LEED chamber.
 - c. If the pressure in the LEED chamber is > 1e-4 Torr.
 - i. When the backing pressure starts to go down open the valve to the Turbo and to the LEED chamber.
 - ii. Turn on the HREELS turbo (control box is in the rack toward the IR room).

Valve	Function	Normal Position	
V1	From Load Lock to STC	Closed	
V2	Differnetial pumping for Sputter	Open?	
V3	Backing pump for STC Turbo	Open	
V4			
V5	N ₂ Vent for system	Closed	
V6			
V7			
V8	Ar for Suptter Gum	Closed	
V9	To STC baking pump for Sputter gun	Closed	
FLAP	Between STC and SAC	Closed	