Decontamination of Cryopump Helium Circuit w/ the Maintenance Manifold

Summary: *The intent of this procedure is to instruct and guide the decontamination of a high-pressure cryopump helium circuit.*

Helium Contamination

A contaminated helium system can affect vacuum quality. Severely contaminated systems can cause mechanical damage to the cryopump, resulting in unscheduled downtime.

Cryopumps require 99.999% (5 9's) ultra-pure helium. Helium contamination occurs when the helium circuit has been exposed to the atmosphere or other gases.

Signs of helium contamination include:

- A helium circuit with a purity of less than 99.999% will reduce refrigerator efficiency and may prevent the cryopump from cooling below 17 K.
- A loud knocking sound while the cryopump is cooling down, sometimes referred to as a "ratcheting" sound.
- The compressor helium pressure falls to zero, indicating that the helium circuit is open to atmosphere.
- The cryopump motor stalls.

Helium Decontamination equipment required:

	Part Number	**Description**
	CP-M-Decon-A	**Helium Decontamination Kit w/ Accessories**
Qty	**PTB Part Number**	**Description**
1	CP-M-DM	Decontamination Manifold
1	CP-M-HL10	Helium Charge Line 10' S.S. Constructed
1	CP-M-HR	Helium Regulator
2	CP-M-FH5	1/2" S.S. Braided Flex Hose w/ 1/2" Couplings - 5'
1	CP-H-CW1	1" Coupling Wrench
1	CP-H-CW118	1 1/8" Coupling Wrench
1	CP-H-CW1316	1 3/16" Coupling Wrench
1	CP-H-CC	Carrying Case
1	CP-H-DPFNA	Helium Bottle w/ Ultra Pure Helium - 99.999%

Isolate Cryopump to be Decontaminated (contaminates will be trapped in the cryopump)

1. On systems with multiple cryopumps manifolded to a common compressor, leave the cryopump to be decontaminated operating and cold.
2. Warm up the remaining cryopumps connected to the same helium manifold.
3. Operate the cryopump to be decontaminated for approximately 1 hour, or until the second-stage temperature stabilizes below 25 K. This allows the majority of the contaminants in the helium circuit to be cold-trapped in this cryopump.
4. CAUTION: While the cryopump is still running, disconnect the helium SUPPLY line, then the RETURN line, from the cryopump.
5. Turn off the cryopump and allow it to warm to room temperature.
6. By following this procedure, the majority of the contaminants have been cold-trapped in the cryopump.

At this point, the helium gas lines have been disconnected from the cryopump and the refrigerator has warmed to 285 K–310 K. The next step is to evacuate the contaminants from the cryopump.

Evacuate the Cryopump

1. Close the ball valve and needle valve on the maintenance manifold.
2. Connect the two 5 ft helium flex lines from the cryopump supply and return aeroquip fittings to the maintenance manifold.
3. Slowly open the ball valve to evacuate the helium from the cryopump.
4. Close the ball valve.
5. Install a vacuum gauge on the maintenance manifold, if available.
6. Connect a roughing pump, preferably a dry roughing pump, to the KF25 flange on the maintenance manifold or to the vacuum gauge assembly, if installed.
7. Turn on the roughing pump and slowly open the ball valve. If a vacuum gauge is installed, evacuate until the pressure reaches ≤ 50 mTorr. If a vacuum gauge is not installed, evacuate for a minimum of 2 hours.
8. Close the ball valve, then turn off the roughing pump.

At this point, the contaminants have been evacuated from the cryopump refrigerator.

Charge the cryopump with ultra-pure helium (99.999%)

1. With the helium regulator attached to the 99.999% helium bottle, attach one end of the helium charge line to the regulator. Keep the bottle valve closed.
2. Set the helium regulator to 225 psi.
3. Slowly open the bottle valve and purge the regulator and helium charge line for 10 to 15 seconds.
4. While maintaining a slow helium purge, connect the charge line to the closed needle valve on the maintenance manifold.
5. Ensure the ball valve on the maintenance manifold is closed.
6. Open the needle valve on the maintenance manifold.
7. Observe the pressure gauge on the maintenance manifold. When the pressure reaches 225 psi, proceed immediately to Step 8. Charging should take approximately 5 seconds.
8. Close the needle valve.

At this point, the cryopump has been charged to 225 psi with ultra-pure helium (99.999%)

Disconnecting the Decontaminated pump from Maintenance Manifold

1. Ensure the ball valve and needle valve are closed.
2. Disconnect the two 5 ft helium flex lines from the cryopump SUPPLY and RETURN Aeroquip fittings.
3. Disconnect the helium charge line.

Reconnecting the Decontaminated pump to the Helium Circuit

1. Connect the helium RETURN helium line from the compressor to the return connection on the cryopump.
2. Connect the helium SUPPLY helium line from the compressor to the supply connection on the cryopump.

Restart System

1. Ensure all cryopumps are properly connected to the helium circuit and verify that all helium connections are fully seated and secure.
2. Verify that the compressor helium pressure is appropriate, then turn on the compressor.
3. Start a "Full Regen" for the entire helium circuit.
4. The system is now operational.