



Science & Technology Facilities Council

UK Astronomy Technology Centre

ULTRASPEC

Handling and liquid nitrogen cooling procedures

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Electrostatic Issues

WARNING !!! – the cryostat contains an expensive detector which can be destroyed by an electrostatic discharge from your body to the detector pins. These pins are exposed when connectors are not fitted to the cryostat. Just by getting out of you seat, especially at a mountain site can cause your body to be charged to many thousands of volts by a triboelectric process. The Clock and Video sockets must never be left unconnected. On the telescope they should have their cables connected. For packing or carrying the “shorting” plugs shown should be fitted as shown below.

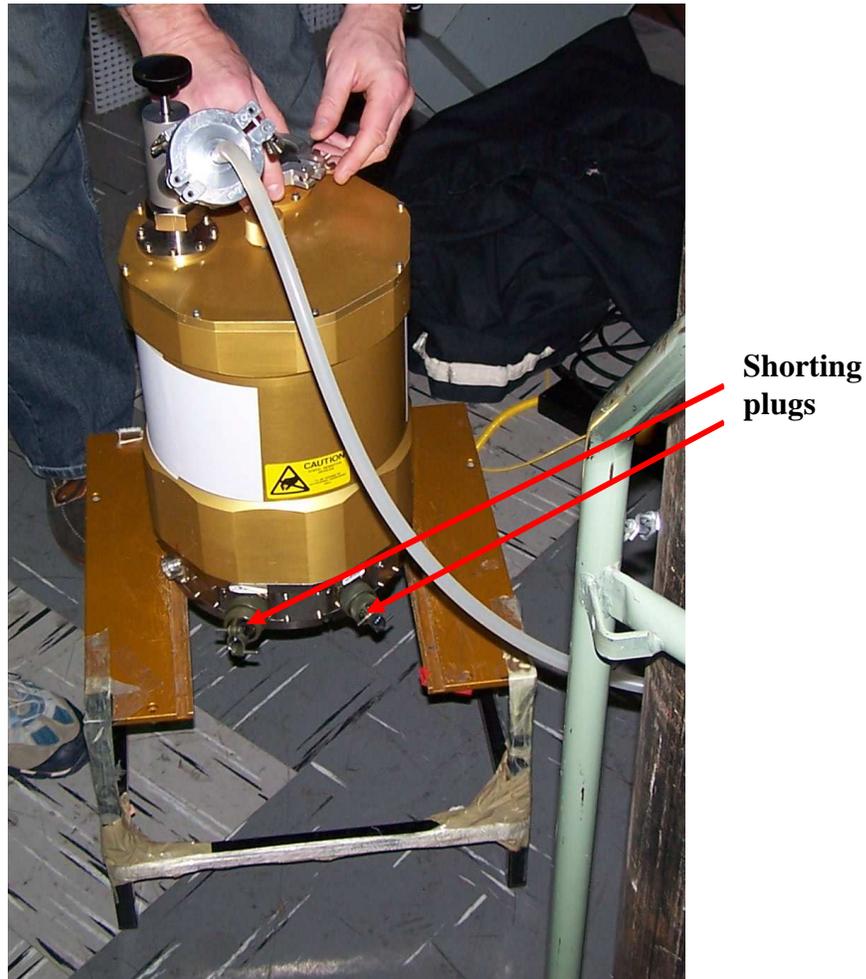


Figure 1 - Shorting plugs fitted to cryostat

The shorting plugs are shown below in Figure 2.



Figure 2 - Shorting plugs

The shorting plugs have all their pins connected together and these are then connected via a 1M Ω resistor to the shell of the connector. When connecting/disconnecting these plugs the user should be connected via an ESD strap (1M Ω resistor fitted in plug or strap) to an earth point. The user should also ensure that they do NOT touch the resistor in the connector. When connecting the cables the user should also be connected via the ESD strap.

Cables between controller and cryostat

When connecting the cables between controller and cryostat the user should follow the following procedure :-

- **Connect mains power cable to controller power supply and ensure that power supply is switched OFF.**
- **Connect power cable between power supply and controller.**
- **User should put on their ESD wrist strap at this stage.**
- **Connect clock cable from controller to cryostat.**
- **Connect video cable from controller to cryostat.**

Temperature control cable

- **Ensure Lakeshore unit is switched off.**
- **Connect Cable to back of Lakeshore unit,**
- **Connect Temperature cable to cryostat.**
- **Switch Lakeshore unit on.**
- **Ensure set temperature is 160K**
- **Switch heater on. HEATER RANGE must be set to MEDIUM only.**

Pumping down the cryostat

The Pump Valve Mechanism (PVM) as shown in Figure 3 must be connected to the cryostat using the following procedure :-

- **Push PVM over the valve**
- **Tighten large nut so that PVM is reasonably tight over valve**
- **Push shaft down until it bottoms out on valve**
- **Turn shaft one or two turns clockwise until it engages with valve thread**
- **You are now ready to pump cryostat down**

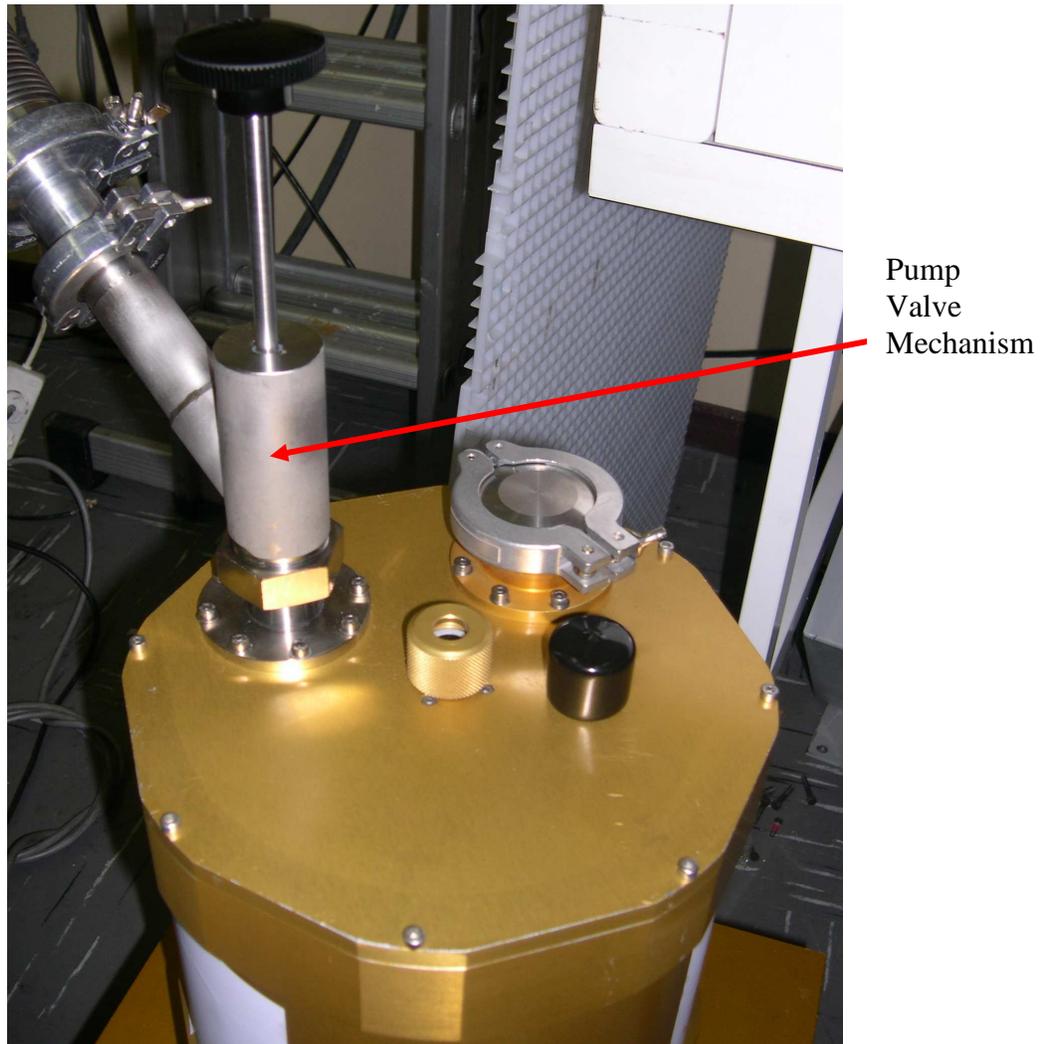


Figure 3 – Pump valve fitted to cryostat

Connect Pump to PVM

Connect pump to PVM as shown in Figure 4 using appropriate sized 'O' ring and clamp.

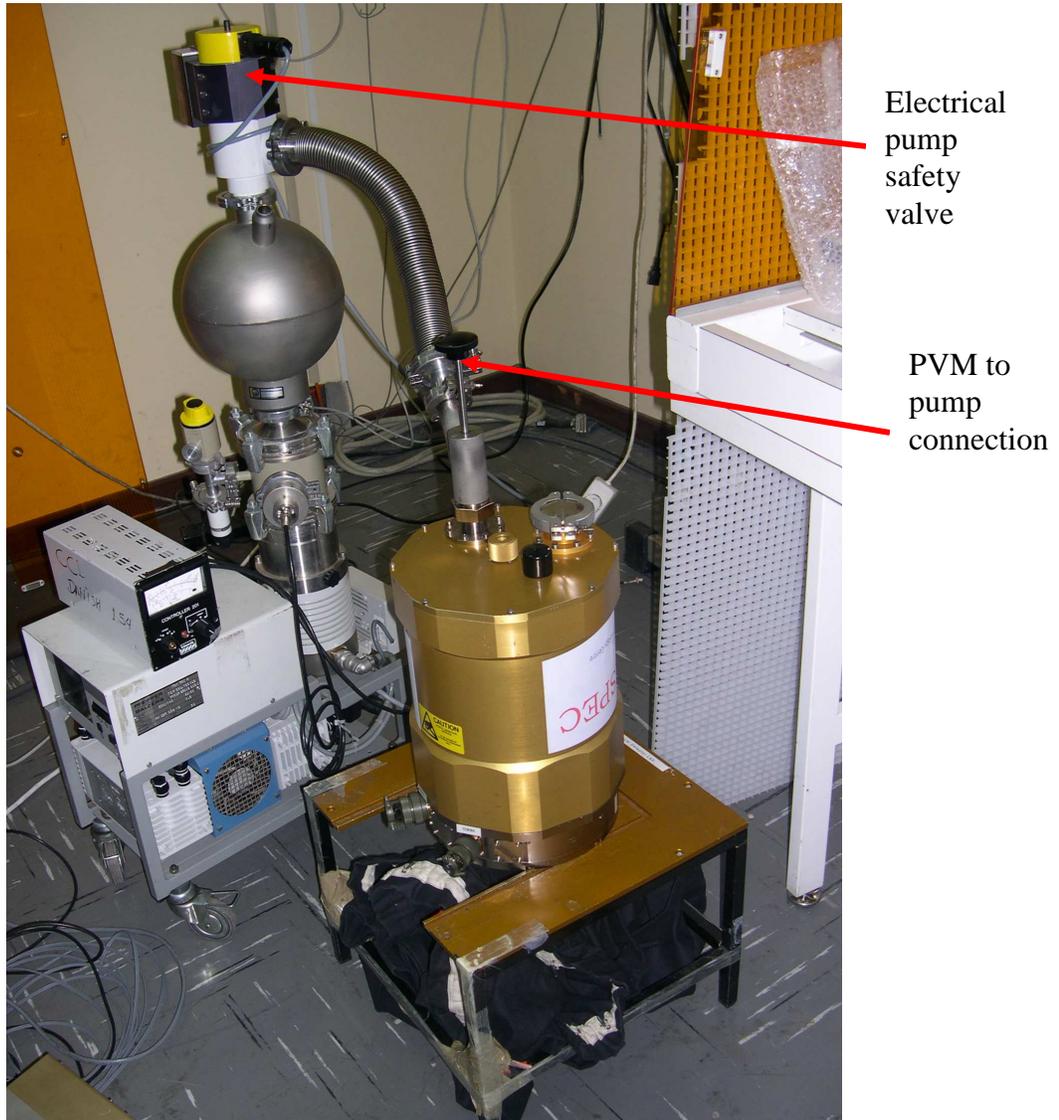


Figure 4 – Pump connected to cryostat

One of two possible procedures must now be followed depending on whether the cryostat is already under vacuum or not.

Cryostat already under vacuum :-

- **DO NOT open PVM yet !!!**
- **Ensure ESO electrical pump safety valve is OPEN.**
- **Switch pump on.**
- **Pump should spin up to a speed of about 1000 rpm in a few minutes.**
- **Monitor pump pressure.**
- **When pump pressure falls below 1E-5 Torr then slowly open valve on cryostat on PVM. This is achieved by pulling slowly up on the black knob on the end of the shaft of the PVM. The pressure will probably go up, check gauge.**
- **Cryostat should be pumped for 24 hours if possible or until the ESO pressure gauge reads less than 1E-6 Torr.**

Cryostat at atmospheric pressure :-

- **OPEN PVM by pulling slowly on the black knob on the end of the shaft of the PVM.**
- **Ensure ESO electrical pump safety valve is OPEN.**
- **Switch pump on.**
- **Pump should spin up to a speed of about 1000 rpm in a few minutes.**
- **Monitor pump pressure.**
- **Cryostat should be pumped for 24 hours if possible or until the ESO pressure gauge reads less than 1E-6 Torr.**

Disconnecting cryostat from pump :-

- **Close the PVM valve by pushing down firmly on the back knob until it bottoms out. This process forces the valve into the cryostat such that an “O” ring on it ensures a vacuum in the cryostat.**
- **Check the pressure on the pump gauge. It should go down further if the cryostat valve has been closed correctly.**
- **Switch pump off and wait until it spins down and stops.**
- **Do 5 turns of the black knob anti-clockwise to disconnect the shaft from the valve,**
- **Pull black knob all the way up.**
- **The PVM can now be removed from the cryostat by unscrewing the large nut on the PVM.**
- **Insert black dust cover over cryostat valve,**

Liquid Nitrogen filling of cryostat

Filling from warm

Insert liquid nitrogen fill tube into position shown in Figure 5. Loosely tighten screw around neck of cryostat to hold fill tube in place. Not too tight or it will be difficult to unscrew it again when cold.

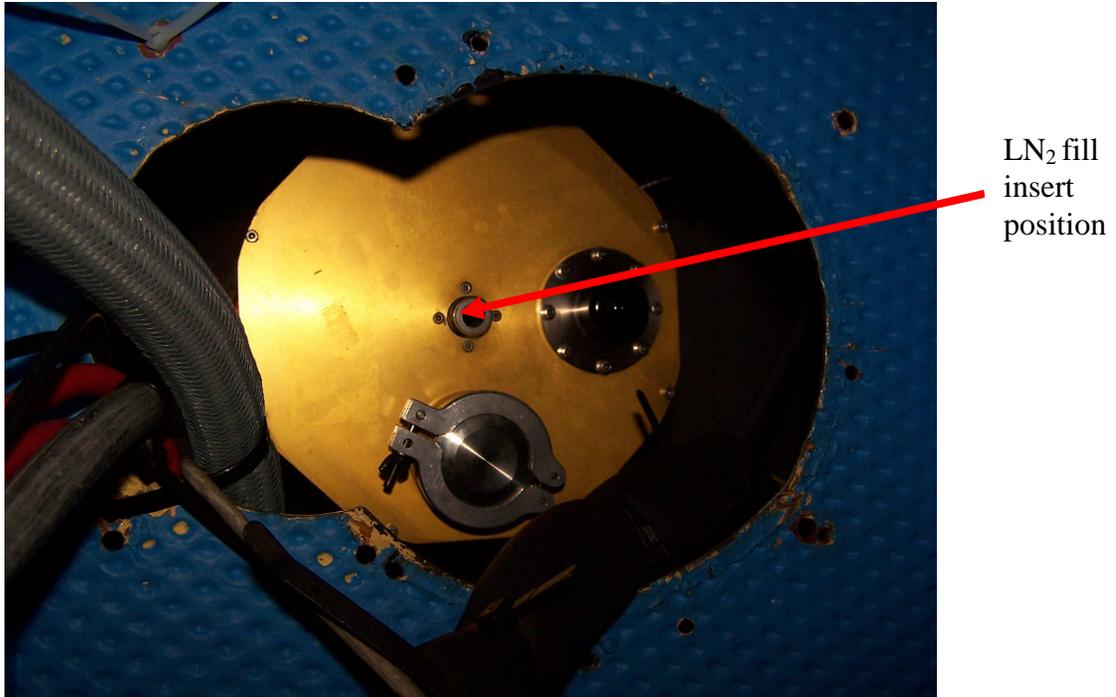


Figure 5 - LN₂ fill port

Paul Kerry is seen below in Figure 6 holding the insert tube (with safety glove) of the liquid nitrogen vessel, required to fill the cryostat. The ESO right angle tube is shown but only the straight through tube can be used when the cryostat is mounted on the telescope.

- **Ensure that the pressure meter reads 20 bar or so.**
- **Turn valve on neck anti-clockwise.**
- **The cryostat is full once liquid pours out from the right angle section of the fill tube.**
- **The cryostat should be filled again about 1 hour after the first fill and again once the cryostat has reached its working temperature.**
- **Close fill blue knob by turning clockwise.**



Figure 6 - Nitrogen vessel including cryostat fill tube

Filling the cryostat when mounted on the telescope

- **The telescope should be moved to a position 10-15 degrees north for cryostat filling as shown in Figure 7.**
- **The cryostat should then be filled through the hole in the cage using the straight fill tube.**
- **The cryostat should be filled every 12 hours.**



Figure 7 – telescope position for cryostat fill