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Use of Cryogenic liquids on ISIS Instruments

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USE OF CRYOGENIC LIQUIDS ON ISIS INSTRUMENTS
(instructions for users)

by

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Contents

Abstract

Simple instructions for users of the ISIS instruments are presented to help them to operate with cryogenic liquids: liquid nitrogen and liquid helium. A safe method of performing the important procedures is described.

HELP

These instructions are prepared to help experienced ISIS users after appropriate training to work with cryogenic liquids on the instruments. These instructions **are not** for first time visitors. But if you have any questions or problems during these operations then help is available from:

a) your local contact; this is the first person you should ask for help;
b) technicians associated with the spectrometer;
c) the Control Room during silent hours;
d) the instrument scientist if help from above stated persons is unavailable.

The list of instrument scientists and technicians is given in the Appendix.

How to replace an empty nitrogen tank

1. Place a full nitrogen tank close to the empty one. If one isn't immediately available, seek help.

2. Switch off the nitrogen pump (see fig.1).

Fig.1.

3. Withdraw the plastic pipe from the cryostat (see fig.2).

Fig.2.

4. Remove the nitrogen pump from the empty tank (see fig.3) and immediately insert it into the full tank (see fig.4). More than brief expose to air will cause the pump to block.

Fig.3.

Fig.4.

5. Reconnect the plastic pipe into the cryostat.

6. Switch on the nitrogen pump.

How you should fill an orange cryostat with liquid helium

1. Be sure that you know what and where the following are:
   a. Helium level controller (this is a small electrical device in the stand. See also fig.1).
   b. Helium siphon (see fig.2). Check there is a filter on the siphon. If not, seek help.

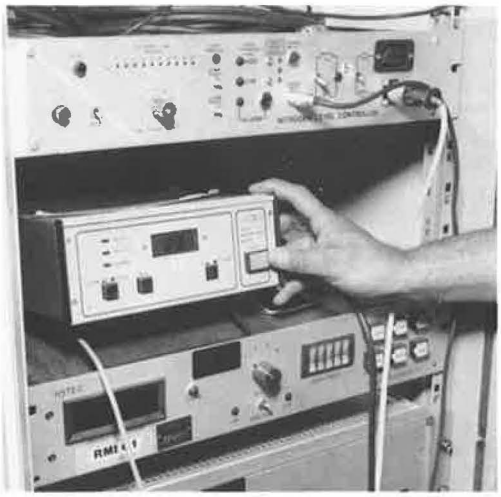


Fig.1.

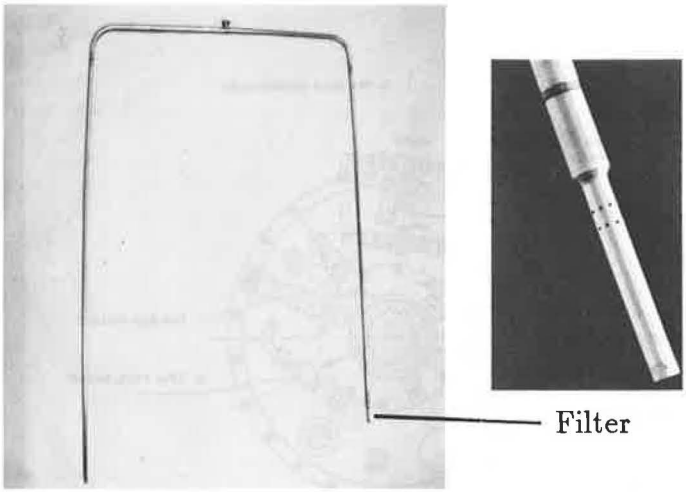


Fig.2.

   c. The gas panel (see fig.3).
   d. The helium dewar (see fig.4).

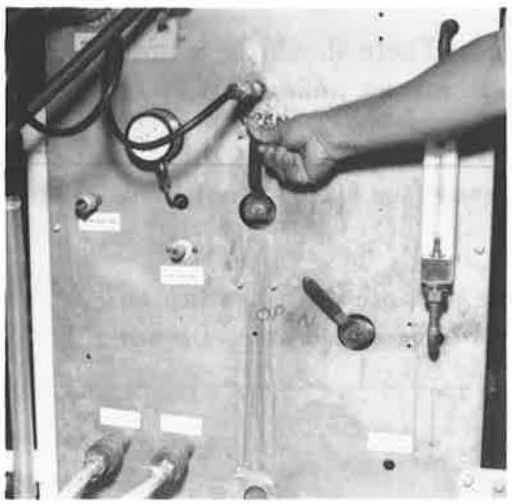
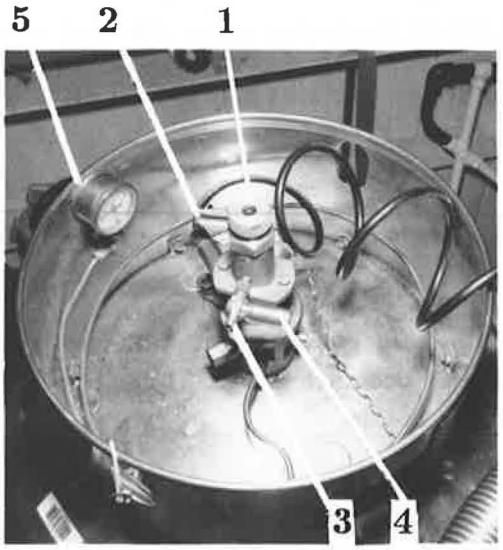


Fig.3.



1. Liquid He outlet with brass adaptor
2. Pressure relief line
3. Helium gas inlet
4. Gas inlet tap
5. Manometer

Fig.4.

2. Understand the correspondance between the attached drawing (see fig.5) of the top of a helium cryostat and its photo (see fig.6). Find the following relevant parts on the cryostat:
   1. DE-PRESSURISING VALVE (sometimes designated V12)
   2. He GAS RECOVERY
   3. Liquid He FILL PORT

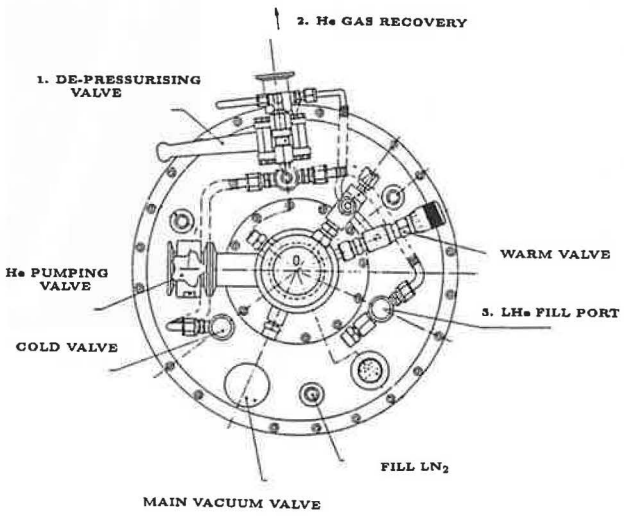


Fig.5.

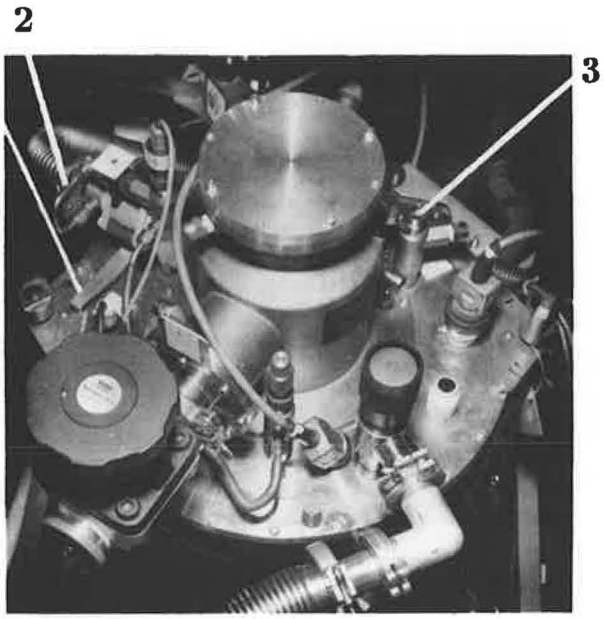


Fig.6.

3. Switch on the helium level controller in the stand. Check how much liquid helium you have in the cryostat (see fig.1) (about 50% should last at least 20 hours at full helium flow without pumping) If the cryostat needs filling proceed.

4. Check that He dewar contains at least 30 litres of helium. There should be a note on the dewar showing how much helium is left. If there are no indications, seek help.

5. Check there is a brass adaptor on the He outlet of the dewar (see fig.4). If not, seek help.

6. Check that the helium gas bottle is not empty. For this purpose open the tap on the bottle and read pressure gauge. If gauge shows 10 bar or less seek help. Do not forget to close the bottle.

7. Take the helium siphon and measure the distance between the arms. Adjust the position of helium dewar so that siphon fits the distance between the liquid He outlet of the dewar and liquid He FILL PORT on the cryostat (see fig.7 and fig.8).

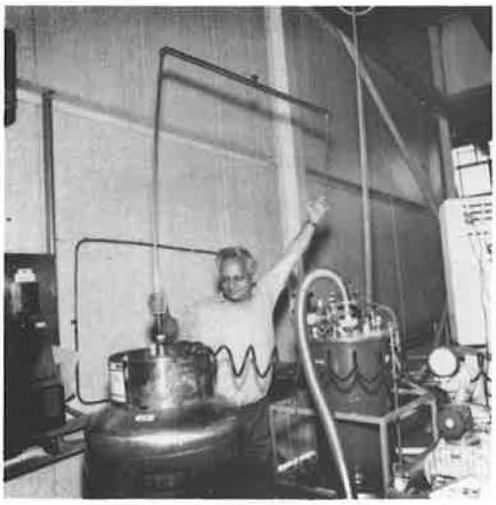


Fig.7.

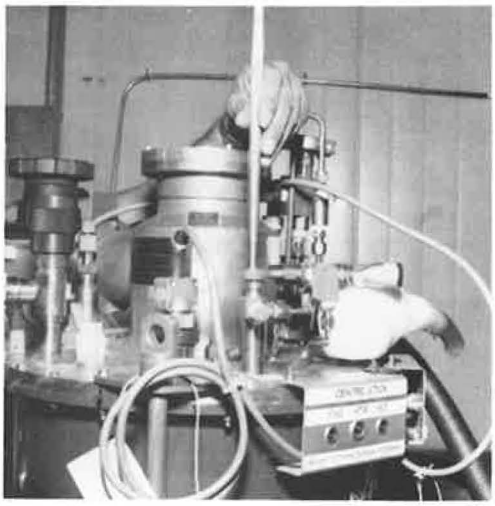


Fig.8.

8. Open the helium depressurizing valve on the cryostat (see figs.5,6 and fig.9).

Fig.9.

9. Open (turn up) the upper helium tap on the gas panel (see fig.3) The lower tap should always be open. If you find it closed, open it as well.

10. Open (turn up) the liquid helium outlet tap on the helium dewar (see fig.10).

Fig.10.

11. Loosen the ferrule nut and remove the plug from the liquid He FILL PORT of the cryostat (see fig.11).

Fig.11.

12. Loosen the ferrule nut on the liquid He outlet of the dewar (arrow 1 in fig.4).

13. Disconnect the plastic helium recuperation line from the helium dewar (shown by arrow 2 in fig.4).

14. Insert with care the siphon arm with filter into the liquid He outlet of the dewar. Cool gas will start to come from the other end of the siphon. Insert the other arm of the siphon into the helium FILL PORT of the cryostat (see fig.12). Push the siphon down evenly until the end of the siphon touches the bottom of the helium dewar. Then lift the siphon approximately 1 inch off the bottom. Tighten the ferrule nuts on the dewar and cryostat to seal the siphon (finger tight only).

Fig.12.

15. Go to the helium bottle and check that the output tap on the pressure regulator is closed (arrow in fig.13). If not, close it. Open the helium bottle and adjust the pressure regulator (see fig.13) to have an output pressure 4 psi (0.25 bar approx.).

Fig.13

16. Open the outlet helium gas tap and check whether you do have a flow from the rubber hose output (see fig.14).

Fig.14.

17. Connect the rubber hose onto the helium dewar's gas inlet (see arrow 3 in fig.4 and fig.15).

Fig.15.

18. Open the gas inlet tap on the dewar (marked by arrow 4 in fig.4).

19. Control the pressure inside the dewar by reading the manometer (marked by arrow 5 in fig.4). As necessary, reduce or increase the pressure by using the pressure adaptor on helium bottle.
Note: do not exceed 4 psi.
In case of an emergency.
Should the pressure go above 4 psi and is out of control pull off the rubber hose. When you are sure that the situation is again under your control

connect the hose and proceed from instruction 12. The procedure can always be stopped quickly by removing the rubber hose and allowing the pressure in the helium dewar to fall. DON'T PANIC!

20. Check the amount of liquid helium in the cryostat by reading the helium level indicator.

21. At the beginning of the operation you will see a large flow of helium gas on the flow indicator of the gas panel. At this stage you may even observe a decrease of liquid helium level in the cryostat. After a few minutes the gas flow should slow down and you will begin to observe an increase of helium level in the cryostat. If the flow is high for a long time (more than 5 min.) and you continue to see a decrease of helium level in the cryostat then something is wrong (most probably your helium dewar is empty). **STOP THE OPERATION IMMEDIATELY and seek help.**

22. When the cryostat is full (helium level controller shows more than 90%) close the gas tap on the dewar (arrow 2 in fig.4). It is sometimes possible (when you use an almost empty helium dewar) that the gas flow increases before the cryostat is full and the level of liquid helium in the cryostat decreases. This means that your dewar is now empty. **STOP HELIUM FILLING.**You may assess that there is enough liquid helium in the cryostat to start your measurements (50% is usually more than enough to work overnight) . If not seek help.

23. Close the inlet helium gas tap on the dewar (arrow 4 in fig.4).

24. Close the helium gas outlet on the pressure regulator on the gas bottle.

25. Close the helium bottle.

26. Disconnect the rubber hose from helium dewar (see fig.16).

Fig.16.

27. Reconnect the plastic helium recuperation line onto the helium dewar (arrow 2 in fig.4).

28. When the pressure gauge reads zero on the dewar, loosen the ferrule nuts on the dewar and cryostat which sealed the siphon and remove the siphon from the cryostat and helium dewar evenly.
Note: the siphon will be very cold. It may not come out easily. Use protective gloves for this operation and in case of trouble warm the siphon with a dryer.

29. Insert the plug into the liquid He FILL PORT of the cryostat (see fig.17) and tighten the ferrule nut to seal the plug.

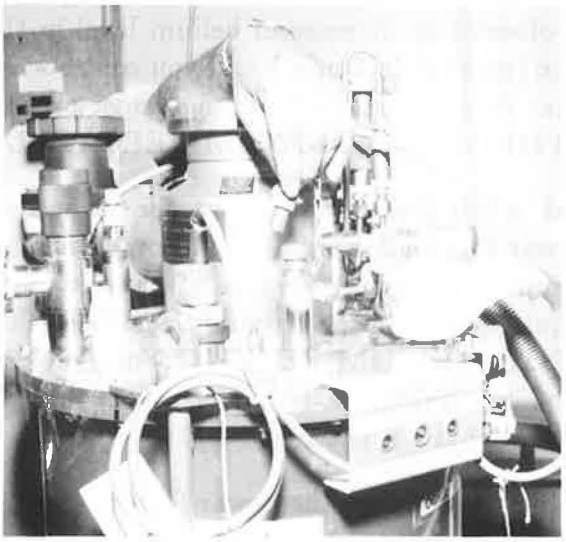


Fig.17.

30. Close (turn down) the liquid helium outlet tap on helium dewar (see fig.18).

Fig.18.

31. Close (turn down) the upper tap on the gas panel (see fig.19).
Note: the lower tap on the panel must remain open!

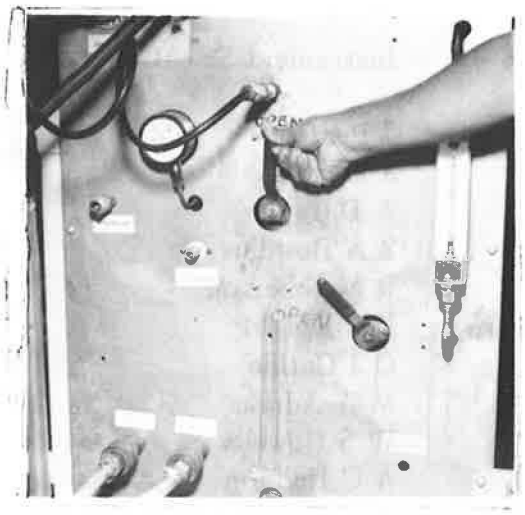


Fig.19.

32. Close the helium depressurizing valve V12 on the cryostat (see figs.5,6).

33. Switch off the liquid helium level indicator (see fig.20).

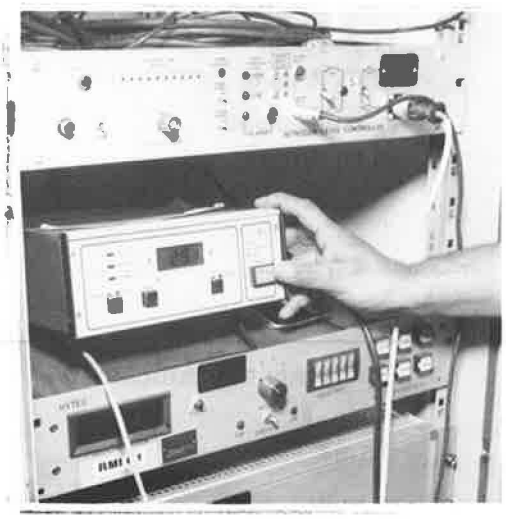


Fig.20.

APPENDIX

Instrument	Instrument Scientist	Ext.
CRISP	J Penfold	5681
eVS	J Mayers	5882
HET	A D Taylor	6681
	Z A Bowden	5683
HRPD	R M Ibberson	5871
	K S Knight	5220
IRIS	C J Carlile	5684
	M A Adams	6157
LAD	W S Howells	5680
	A C Hannon	5358
LOQ	R K Heenan	6744
	S M King	6437
MARI	A D Taylor	6681
	S M Bennington	5368
POLARIS	S Hull	6628
	R I Smith	5683
PRISMA	U Steigenberger	5145
SANDALS	A K Soper	5543
	A C Hannon	5358
SXD	D A Keen	6556
	C C Wilson	5137
TFXA	J Tomkinson	6686
	M A Adams	6157
MuSR	C A Scott	5135
ISIS Main Control Room		6789

Instrument technicians:

Name	Ext.
J Chauhan	6182
M L Yates	6502