B83 He3 System Cool Down Notes

Version 3.0

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Insert Assembly Notes

Preparing Sample and Checking Connections

1) Load and align your sample on the sample stage.
2) Install and align magnet if you will be using one.
3) Screw on copper shield with lead foil and filter paper inside it to shield magnetic fields.
4) Check all connections at room temperature with proper electronics.

Lab Bench Insert Preparation

1) Clean off brass taper with Kimwipes and IPA.
2) Clean off inside of brass taper (on brass shield) with Kimwipes and IPA.
3) Apply vacuum grease in a uniform layer on the taper (male and female ends).
   This should be done liberally for a good seal.
4) Connect mobile pump to IVC port, but do not start pumping yet.
5) Remove SORB material with tweezers.
6) Use heat gun to warm up and degass the IVC Sorb for 3 min on low setting.
7) Replace SORB material into the copper cup on the insert.
8) Put brass shield on the insert, twist it on to make sure it seals well on the taper.
9) Pump on the IVC until it is in the low 10-5 mbar or high 10e-6 pressure range.
   This will be an overnight pump if pumping from atmosphere.
10) Pump the 1K Pot down to the low -5 mb to prevent the lines from icing while cooling.
    This will take 2 hours from atmosphere (blown out with He4 or N2 gas)

Notes for Cooling Down from a Warm Cryostat

Loading the Insert for a warm Cryostat and Preparing for Cooldown

1) Hang the insert from the chains (this will take 2 people).
   NO PRESSURE SHOULD BE ON THE CAP OF THE INSERT!!!
2) Lift the insert and lower it into the cryostat.
3) Secure the insert in with the proper clamp (KF-50 flange).
4) Connect the thermometers and the He4 level meter connection.
5) Attach the dry nitrogen to the Insert He4 Recovery Port.
6) Blow dry nitrogen through the He4 space to blow any residual water out.
   This should be done for 5 min to be sure it is completely dry before cooling down..

Cooling the Insert and Cryostat (300K to 77K)

1) Introduce a small amount of He4 into the IVC as exchange gas.

2) Transfer LN2 into the He4 space using the 1/2" diameter Tube.
    The transfer tube should click into the cone at the bottom of the Cryostat
3) Let the insert and cryostat thermalize overnight
4) The next morning, connect dry nitrogen to the He4 recovery port with a nipple
5) Blow the LN2 into from the cryostat (it will fill about 2 N2 trap Dewars)
6) Blow dry nitrogen through the system for 20 min to evaporate any residual LN2

Cooling the Cryostat (77K to 4.2K)

1) Pump and Flush the He4 space to remove N2 from the space
    1a) connect a He4 cylinder to the inert He4 recovery port
    1b) Connect the 1K Pot pump to the Cryostat He4 recovery port
    1c) Pump the He4 Space down to 100mb. Do not go below this!
        If you go below 100mb you risk crumpling the super insulation!
    1d) flow 2spi He4 gas into the He4 Space until it stops flowing
    1e) repeat 1c) and 1d) 4 or 5 times to remove all N2 from the space
2) Transfer He4 into the Cryostat in the usual way
3) Let the fridge sit overnight to thermalize
4) Go to Whiskey Wednesday with the group, cuz the fridge is cold!

Notes for Loading Insert into a Cold Cryostat

Prepping the Insert for a Cold Cryostat

1) Introduce a small amount of He4 into the IVC as exchange gas
2) Hang the insert from the chains (this will take 2 people)
    NO PRESSURE SHOULD BE ON THE CAP OF THE INSERT!!!
    DO NOT ALLOW CHAINS TO EXERT TORQUE ON INSERT!!!
3) Clean off the sliding seal, and put down a very thin layer of vacuum grease (optional)
4) Connect the He4 insert recovery to the wall recovery, but keep the valve shut
5) Connect the thermometers so that the speed of the cool down can be monitored

Cooling the Insert with a Cold Cryostat (300K to 4.2K)

1) Close off the wall He4 recovery valve and release the pressure in the cryostat
2) Remove the baffles from the cryostat.
2) Lower the insert down to the precool height in the cryostat by
    2a) Lift the insert high enough so it clears the cryostat
    2b) Position the insert DIRECTLY ABOVE the opening
    2c) Begin Lowering the insert into the cryostat
    2d) When nearing the 1K pot intake, rotate the thermometer wiring to point west
    2e) Continue to lower. If pressure goes off the chains, lift and lower it agin.
3) Blank the He4 space cryostat recovery line after securing the KF-50 flange
4) Open the wall He4 recovery valve and the Insert He4 recovery speedy valve
5) Let the insert sit like this for 30 min, or until the sorb temp reads around 80K - 90K

    At this point the He4 boil off should be traveling up the insert and out the insert recovery line to the building He4 recovery system. A small amount of

condensation on the stainless sliding seal is normal for the system. Large ice accumulation is not a good thing, and is liable to plug up the 1K pot tube when trying to condense He3 if it falls into the cryostat.

6) Begin to lower the insert by a 4-5 inches every 3-5 min.
The danger of lowering the insert too fast is two fold.
a) He4 will boil off faster, emptying the cryostat faster for more $$.
This can be seen by condensation on recovery lines going past the floor on the tubes
b) You risk cryo shocking your sample and the fridge.
This is evident by wire bonds popping off, and leaks developing in the long term use of the fridge.

Notes for Operations with Insert in Cold Cryostat (4.2K)

Condensing the He3 and Running to Base Temperature

1) Make sure the floor pump is connected to the 1K pot pumping port.
2) Turn on floor pump.
3) Open speedy valve to start pumping on the 1K pot. It should be >4K
4) Open the needle valve to 10% and wait for temp to drop below 2K.
adjust the 1K pot needle valve to stabilize the 1K pot with T<2K
5) Turn on the SORB Heater to 10% and watch temperature rise.
6)Continuously Adjust the 1K pot needle valve and the main heater such that
a) the 1K Pot temp stabilizes below 2.3 K
b) the SORB temperature rises to 30+K

You are condensing He, with the SORB at 30K, the 1K pot at 2.2K, and the sample at <2K
Condensing all of the He3 should take about 30-45 min.
7) Turn the heater to 0%
8) When the sample temperature reads 1.499K, switch to the low temp thermometer.
This requires unplugging the sub D9 connector and plugging in the other one
The 1K pot temperature is equal to the sample temperature below 1.5K.
The SORB never goes <2.6K.

Removing the Insert while keeping the Cryostat Cold.

1) Close the needle valve and make sure the 1K pot is dry (temp > 4K).
2) Close the 1K pot speedy valve.
3) Disconnect floor pump from the 1K pot and all other lines from Insert.
4) Position crane DIRECTLY ABOVE the Insert and connect carabiners.
5) Slowly lift the insert out at a rate of a 4” every 5 min to the precool height.
6) Close the recovery at the wall, and release the pressure from the cryostat.
7) Unclamp the KF-50 flange and lift the insert the rest of the way out of the cryostat.
8) Put the baffles in the cryostat and use the same KF-50 flange to seal it on.
9) Reconnect the cryostat recovery to the wall, and open the wall recovery valve.

Warming the Cryostat and Insert Up (4.2K to 300K).

1) Close the needle valve and make sure the 1K pot is dry (temp > 4K).
2) Close the 1K pot speedy valve.
3) Disconnect floor pump from the 1K pot.
4) Position crane DIRECTLY ABOVE the Insert and connect carabiners.
5) Slowly lift the insert out at a rate of a 4" every 5 min to the precool height.
6) Let the insert sit for a looooooooong time until all the helium is boiled off
7) Go to Whiskey wednesday with the rest of the group.
8) come back when your hangover from Whiskey wednesdays is gone.

Fridge and Accessory Side Notes:

- Russ Giannetta is the only lab that has the SV9 connector for pumping the transfer rod out. It should be pumped to the low e-4 mbar or high e-5 mbar range for proper transferal of He4. Raffi has an SV8, which is not the correct size.

KF Flange Fun Facts (from Kurt J Lesker technical notes on KF Flanges at www.lesker.com/**)**

- KF flanges are limited (by the o-ring's properties) to applications with temperatures between ~0° C and 120–180° C, and pressure from atmosphere to ~10^{-8} Torr or mbar.

- The name KF (for Klein Flansche) was adopted by ISO, DIN, and Pneurop standards organizations. It is also called QF, NW, and occasionally, DN.

- The flange is sized by the largest nominal I.D. (in, mm) tube that can be welded to it.

- Standards sizes are: KF10, KF16, KF25, KF40, and KF50. Although these sizes are used in North America, the true nominal bore is often that of standard inch dimensioned tubes. Despite dimensional unit differences, KF flanges made by reputable manufacturers in any country will almost certainly mate