



Fridge Filling Procedure:

Please use the following link to fill the evaporation refrigerator:

<https://confluence.its.virginia.edu/display/twist/Fridge+Fill+Procedure>

Please following the procedure in the paragraph **“Procedure for Filling the Fridge with LHe”**.

Procedure for Filling the Fridge with LHe

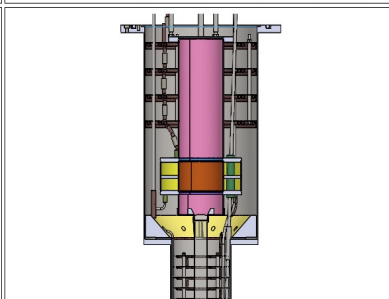
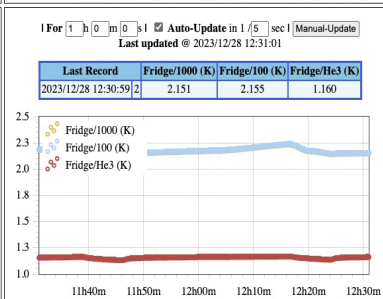
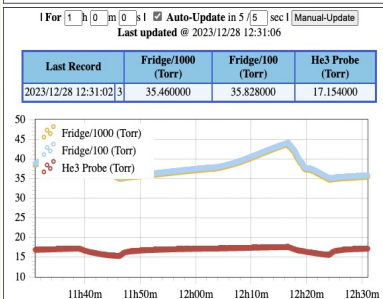
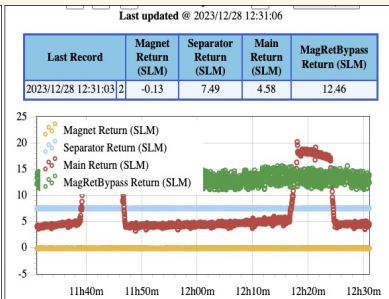
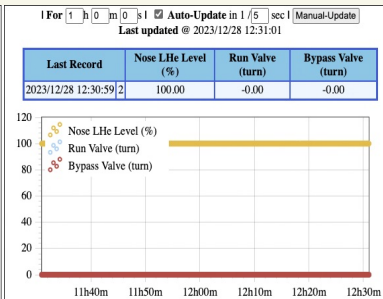
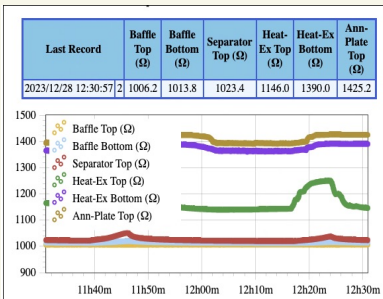
The fridge is supposed to have no LHe at the beginning. You can/should use [this preset page](#) to monitor the key parameters.

A serious failure during this procedure is an overflow of LHe to the fridge (above the separator). When you lose track of the liquid level, you must close the bypass valve (on [Fridge_Valve_Main.vi](#)).

1. Change the separator flow to 20 SLM (from 7 SLM usually).
2. Wait for 1.5-2.0 hours.
3. Change the separator flow to 25 SLM.
4. Change the setting of the gate-valve bypass as follows:
 - a. The auto control is disabled.
 - b. The absolute valve position is 0.08 turns.
5. Change the setting of the fridge valve system as follows (on [Fridge_Valve_Main.vi](#)):
 - a. The level-probe mode is “CONT” (not “HOLD”).
 - b. The interlock with Heat-Ex Top is enabled.
6. Open the bypass valve at 2.0 turns. Confirm that the fridge return flow goes up.
7. Open the bypass valve at 3.0 turns.
8. Change the separator flow to 30 SLM.
9. Wait until the **Ann-Plate Top** resistor goes up to 1400 Ohm, which indicates that the liquid started accumulating. It usually takes 30 minutes from step #3. If it takes longer than 40 minutes, search for unexpected conditions.
10. Wait until the **nose LHe level** reaches 100%. It usually takes 15 minutes from the previous step.
11. Wait until the **Heat-Ex Bottom** resistor goes down from 1400 Ohm and then up. It usually takes 10 minutes from the previous step.
12. Wait until the **Heat-Ex Top** resistor goes up to 1400 Ohm, which indicates that the liquid is as high as Heat-Ex Top. It usually takes 10 minutes from the previous step.
13. Close the bypass valve.
 - a. Usually the software interlock sets it at 0.5 turns automatically.
 - b. Anyway you set it at 0.0 turns manually.
14. Change the separator flow to 7 SLM.
15. Change the setting of the gate-valve bypass as follows:
 - a. The set point for the auto control is 40 Torr.
 - b. The auto control is enabled.
16. Change the level-probe mode back to “HOLD” if you changed it in step 5.

Please also open the preset page (**Fridge 2x3**) to monitor the key parameters:

https://e906-gat1.fnal.gov/data-summary/e1039/target-par-preset/fridge_2x3.php



Steps:

1. Change the separator flow to 20 SLM (from 7 SLM usually).
2. Wait for 1.5-2.0 hours.

The screenshot displays the Cryo Control Panel software interface. The main window shows a 'Cryo Control Panel' with a 'Stop This' button and a 'Last Update' timestamp of 2023-12-28 12:56:14. Below this, there are monitoring graphs for 'Flow (L/min)' and 'Magnet Surface Temperature'. The 'Flow Control: Separator Return (FC2)' section is highlighted, showing a 'Change S.P. to 7' button and a 'Flow Range' of 0 to 50 L/min. The 'Subsystem Control' panel on the right lists various controllers and their statuses, with 'THCD-401' highlighted in red. The 'THCD-401: Mass Flow Control & Monitor' window is also open, showing a 'Change S.P. to 7' button and a 'Flow Range' of 0 to 50 L/min. The 'Insulating Vacuum Chamber' section shows various temperature and pressure readings.

In the above picture, click on the point 1 **THCD-401** to open the VI to control the separator flow.

Manually change the value on point 2 in the **Change S.P. To 20** and press **Enter**.

3. Change the separator flow to 25 SLM.

4. Change the setting of the gate-valve bypass as follows:
 - a. The auto control is disabled.
 - b. The absolute valve position is 0.08 turns.

The screenshot shows the Cryo Control Panel software interface. The main window displays various system parameters and a schematic diagram of the cryogenic system. A secondary window titled "Gate-Valve Bypass Control" is open, showing control options for the gate valve. The "Auto Control with Pressure" option is selected, and the "Set point" is currently set to 0.000 turns. The "GV Bypass" button is highlighted with a red box and labeled with a '1'. The "Auto Control with Pressure" radio button is labeled with a '2', and the "Set point" field is labeled with a '3'.

In the above picture , click on the **GV Bypass** on point 1 to open the VI to control **GV Bypass**.

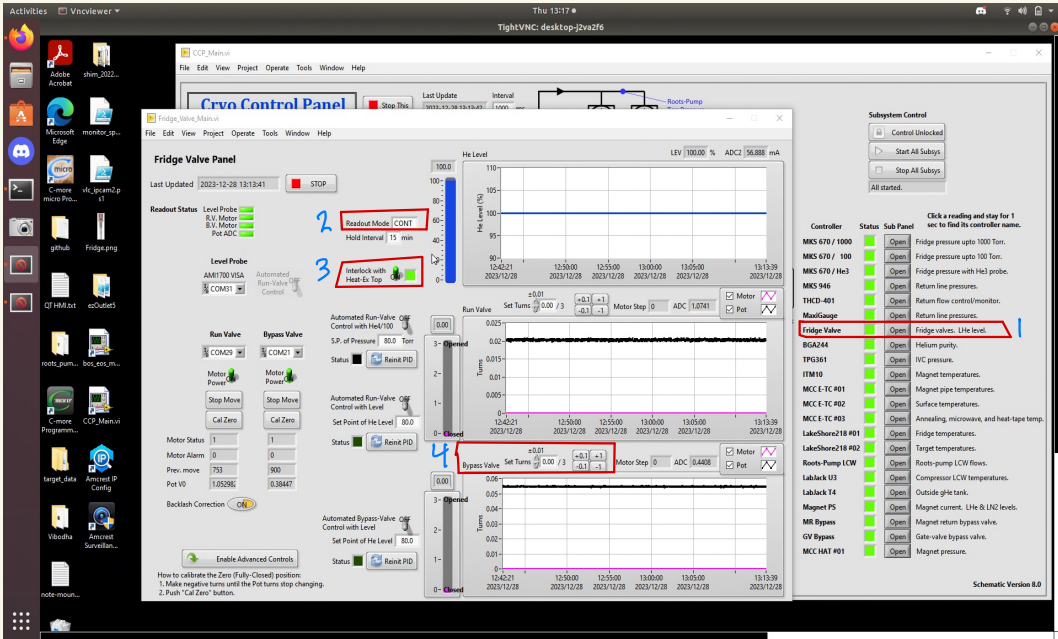
Click on Point 2 to disabled the **auto control with pressure**.

Change the set point on point 3 manually by entering **0.08** and press **Enter**.

5. Change the setting of the fridge valve system as follows (on **Fridge_Valve_Main.vi**).

A. The level probe is “CONT” (not “HOLD”).

B. The Interlock with Heat-Ex Top is enabled.

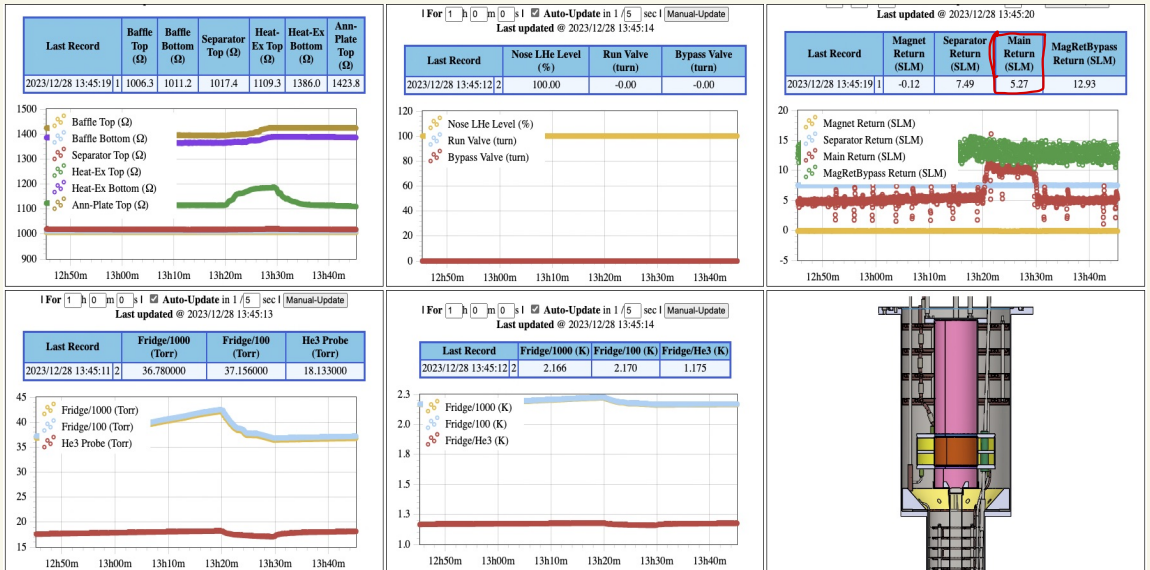


In the above picture, click on point 1 **Fridge Valve** to open the VI to change the readout mode. If the **Readout mode** is not “CONT” mode, put it on “**CONT**” mode on point 2. Check the status of **Interlock with Heat-Ex Top**, if it is not on Interlock toggled the button to put it on the **Interlock with Heat-Ex Top** mode.

6. Open the bypass valve at 2.0 turns. Confirm that the fridge return flow goes up.

In the above picture, set the **Bypass turns** at 2 but manually inserting 2 and press **Enter**. To check the **Main Return flow**, please see the highlighted parameter on the strip chart on the next page.

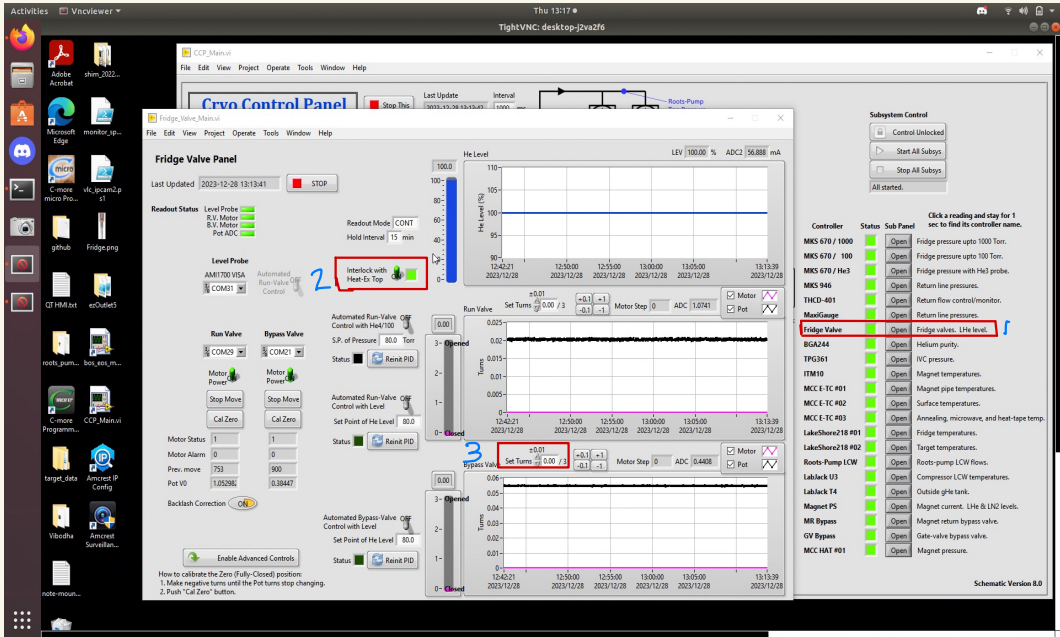
By opening the bypass valve, you will notice the elevation of the Main return flow.



7. Open the bypass valve at 3.0 turns. (See last page)
8. Change the separator flow to 30 SLM. (Use the THCD-401 VI as mentioned on the previous pages).
9. Wait until the **Ann-Plate Top** resistor goes up to 1400 Ohm, which indicates that the liquid started accumulating. It usually takes 30 minutes from step #3. If it takes longer than 40 minutes, search for unexpected conditions. (Please see the parameter in the above Strip charts).
10. Wait until the **nose LHe level** reaches 100%. It usually takes 15 minutes from the previous step.
11. Wait until the **Heat-Ex Bottom** resistor goes down from 1400 Ohm and then up. It usually takes 10 minutes from the previous step.
12. Wait until the **Heat-Ex Top** resistor goes up to 1400 Ohm, which indicates that the liquid is as high as Heat-Ex Top. It usually takes 10 minutes from the previous step.

13. Close the bypass valve.

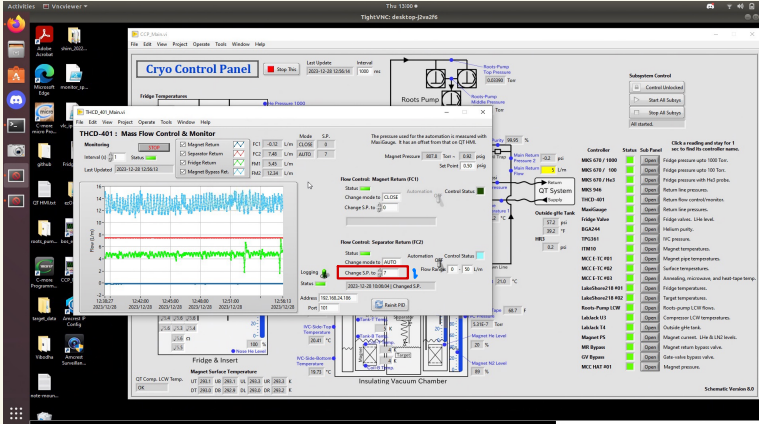
- Usually the software interlock sets it at 0.5 turns automatically.
- Anyway you set it at 0.0 turns manually.



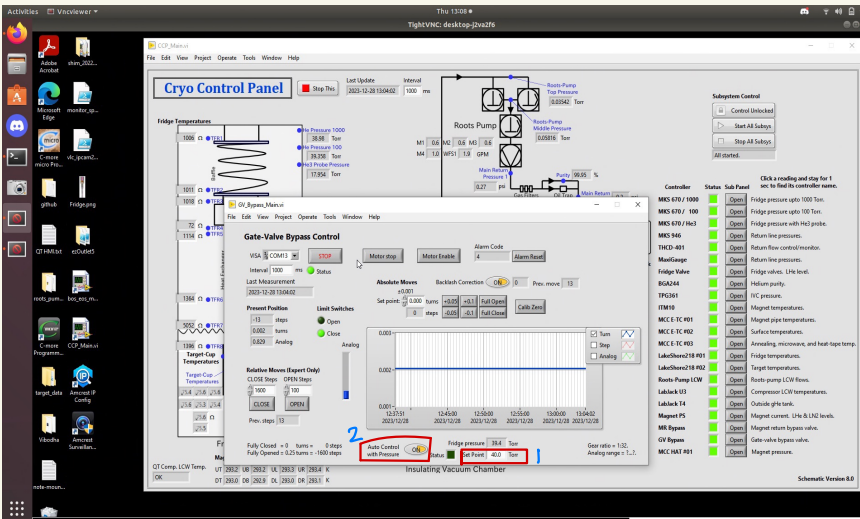
In the above picture, click on Point 1 top open the **Fridge_Valve** VI, according to Step 12, when the **Heat-Ex Top** resistor goes to 1400 Ohms the interlock becomes red and set the bypass valve at 0.5 turns automatically.

After that you can fully close the bypass valve by inserting 0 at point 3 and press **Enter**.

14. Change the separator flow to 7 SLM.



Manually insert 7 at point 1 to set the separator flow at 7 slm.

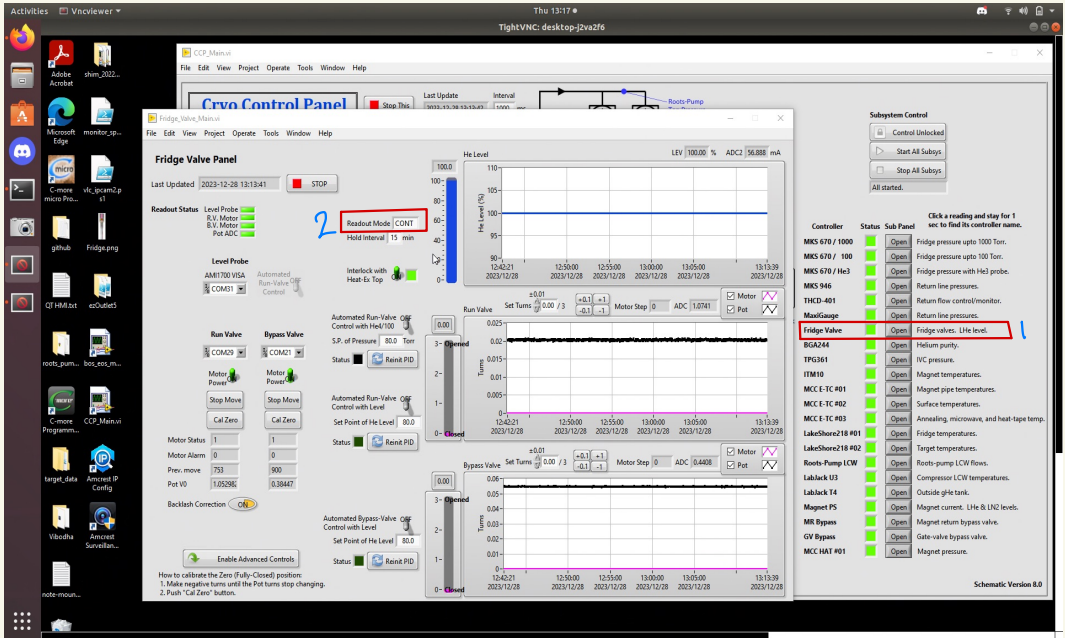


15. Change the setting of the gate-valve bypass as follows:

- The set point for the auto control is 40 Torr.
- The auto control is enabled.

In the above picture, check the **set point** which needs to be 40 torr. If it is 40 torr then toggle the button (**Auto Control with Pressure**) at point 2, if not at 40 torr manually insert 40 and press **Enter** and finally toggle the **Auto Control with Pressure** at point 2.

16. Change the level-probe mode back to “HOLD” if you changed it in step 5.



In the above picture, click on point 1 to open the **Fridge valve**. Click on point 2 to put the **Readout Mode at “HOLD” mode**.