Getting started on Low-T Superconductivity Expt:

1. Turn on the small vacuum pump, and open the small toggle valve. It takes about 15 minutes for the pressure in the vacuum jacket to reach its lowest value.

2. Read the value for the atmospheric pressure on the Hg barometer near the window to the nearest 0.1 Torr.

3. Replace the slotted cork with the solid cork in the top-vent of the central dewar. Then, turn on the large vacuum pump, and open valve #1. It takes 1-2 minutes to pump down below 0.1 Torr, but the pressure may not be exactly 0.0 Torr (which would be 0.000 volts on the DMM, calibrated at 100 Torr/volt).

4. Zero the offset on the pressure sensor to 0.0 Torr (or 0.000 volts).

5. Close valve #1, and check that valve #1a is closed also. Now, open valve #4 to atmospheric pressure. At this point, you can adjust the gain on the pressure-sensing circuit to match your reading from part 2.

6. Close valve #4, open valve #1, and pump down the inner (central) dewar once more. After the pressure sensor indicates that the vacuum is at 0.0 Torr, close valve #1.

7. Introduce helium gas (from the large high-pressure cylinder) slowly into the inner dewar through valve #4. You can watch the pressure rise and see when it reaches 1-atm. Then, remove the rubber stopper and let helium gas flow through the dewar for about 10—15 sec (in order to flush out any residual air).

8. Fill the outer dewar jacket with LN2. This cooling should occur for 30 minutes at the minimum. Check the clock to note the time.

9. During this cool-down period, you can use the time to check that the electronic instruments are working properly and the settings are as indicated in the writeup.

10. When the 30 minutes are up, the TA. technician or professor will fill the liquid helium. It can be an expensive lesson to teach each student how to transfer at a minimum cost of $50 per attempt.

11. When the transfer is completed, put the solid black cork back into the top-vent of the inner central dewar, and SLOWLY open valve #1a (where valve #1 should still be closed). Initially, try to keep the pressure at about 500 Torr.

12. Each student should now take a few moments to look for the Lhe level. It is very hard to see (with index of refraction nearly unity), but look for it anyway. Someone should also be watching the pressure sensor and adjusting valve #1a as necessary.

13. With Lhe in the dewar, readjust the “Bridge Balancing Box” to 50% on the X-output (which is DISPLAY 1).

14. Since the xy-recorder should be sweeping back and forth, look to see if a transition (or jump) occurs in this signal. If not, try reducing the pressure. If you have not seen a transition by the time the pressure is near 400 Torr, call the TA to help find it, or determine if the transfer failed.

15. Coordination of student effort is required to take the data. One student should be responsible to adjust valve #1a as needed, trying to carefully keep the pressure roughly constant (to within a few Torr). Some practice may be required.

16. Another student will operate the xy-recorder, setting the pen down during each right-to-left sweep, and lifting the pen after each transition has been completed.

17. A third student will note when the initial sharp transition edge occurs and will read the pressure sensor or ask the valve controller (the first student) to read the meter. This third student will then record that pressure on the xy-recorder paper (as soon as it is convenient) near the appropriate transition. Alternatively, the xy-controller student may do this recording, but the third student makes sure that it is correct). This sheet of paper is your data for this experiment, so be careful.

18. When all the data are taken, remember that you must convert the horizontal time scale to a magnetic field scale. This is done by noting the current scale along the bottom of one of the pages. It is assumed that, if you use multiple sheets of paper, you register each page exactly the same way each time.