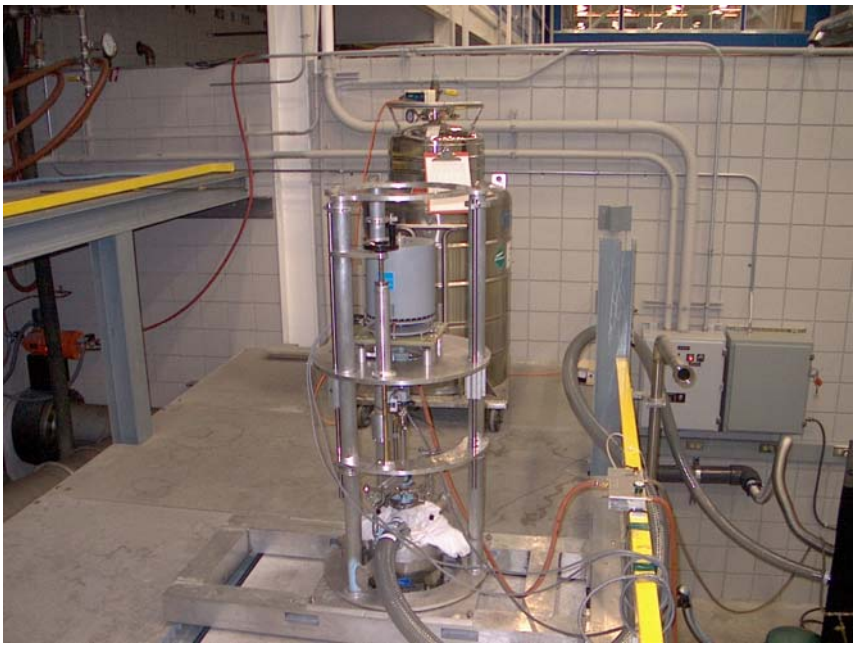
2003 Lakeshore VSM
User Guide

Volume C

VSM Operation



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A newer version including some improvements is under construction.

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NHMFL GAS HANDLING SYSTEM (Helium 4)
NHMFL GAS HANDLING SYSTEM (Helium 3)

MISCELLANEOUS INFORMATION

6. VSM OPERATION

A. Inserting Samples (room temperature only). See Note (1): for cryogenic operations. See Figures 1 and 2 for reference.

Note (1):

The procedure for inserting samples during cryogenic operations is essentially the same as room temperature. The only distinct difference is when the stopper is removed for sample insertion, helium must be venting out of the probe before inserting the sample rod. Please insert the sample rod slowly. This helps prevent any problems relating to introducing materials with two different temperatures.

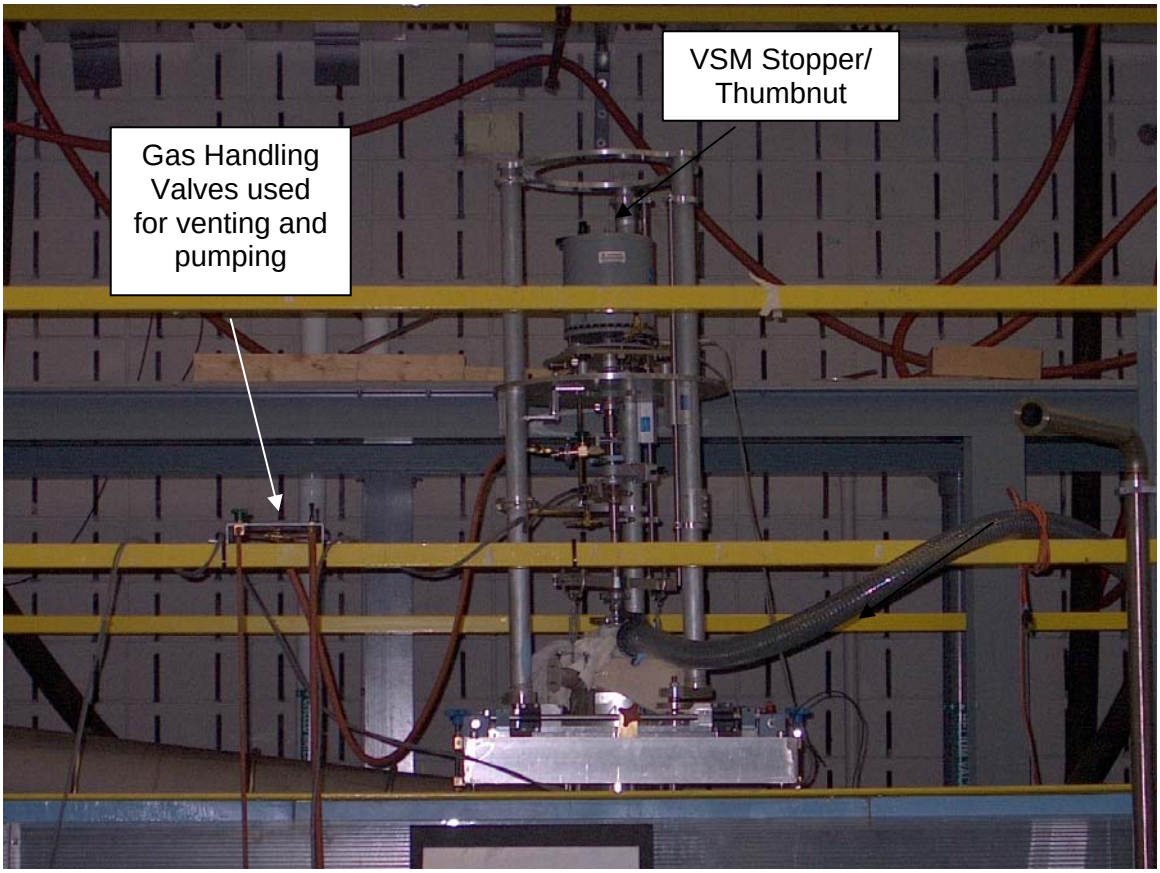

Figure 1 (VSM setup for cryogenic operation)

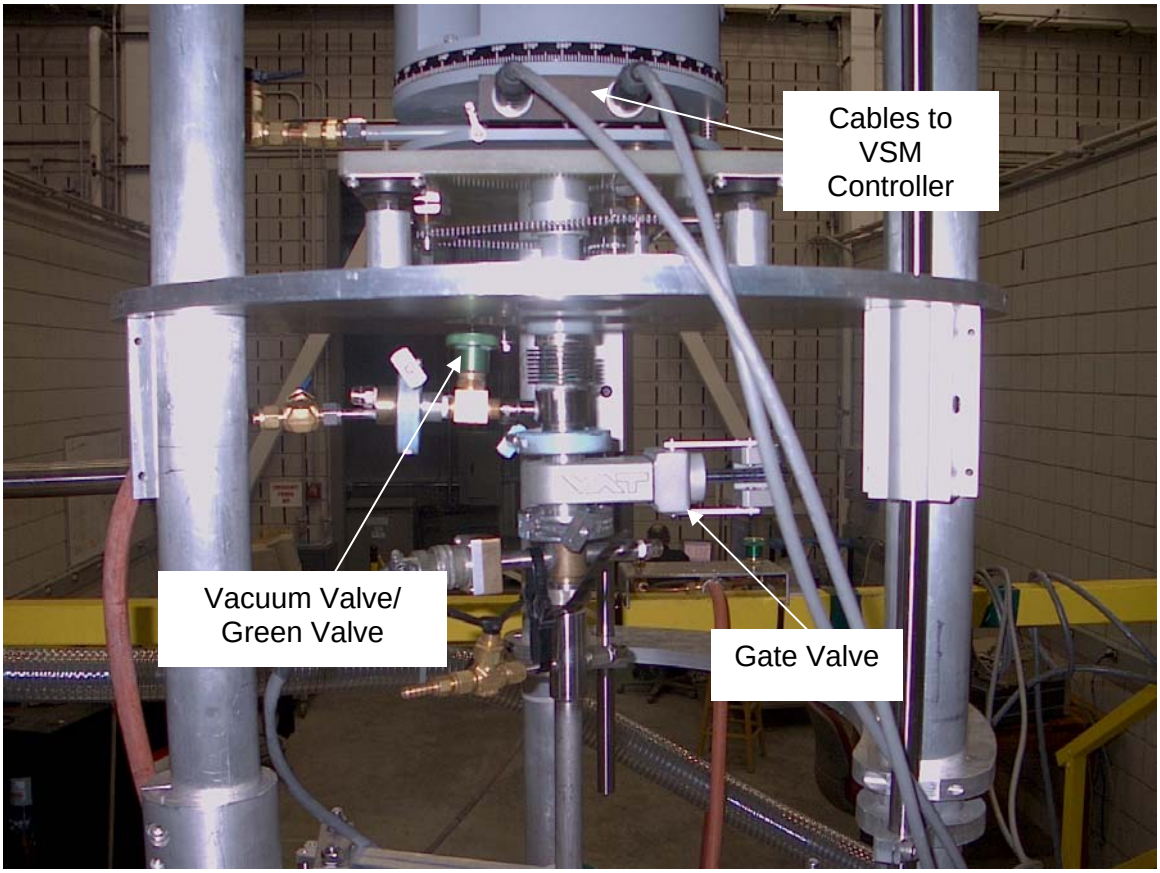

Figure 12

1. Insert the sample in the sample holder or mount the sample on the sample holder if applicable. In thin-film or gel-capsule sample holders, GE-varnish, Duco cement or low temperature tape can be used to hold the sample in place.

2. Screw the sample holder on the short fiberglass sample rod.

3. Screw the short sample rod onto the brass sample rod.

4. Recheck that the gate valve is open and sample drive is off on the VSM Controller.

5. Remove the VSM stopper and thumbnut from top of the VSM head.

6. Carefully insert the sample rod without bending it. It will slide in without any applied force

7. Align the grooves in the top part of the sample rod with notches in the VSM head. You can feel them lock in if you turn the rod slowly. Make sure that the lower and upper notches are in place.

8. Tighten the thumbnut finger tight.

9. Insert the VSM stopper.

10. Turn on the VSM Controller sample drive.

11. Adjust the VSM Head for maximum signal. This step is optional and is not required if calibration sample was properly centered. See Volume B.1, Section 5, SIGNAL CALIBRATION, B. Height Adjustment.

B. Sample Data Measurement

1. After sample is inserted.

2. Set the range according to the expected signal strength.

3. Verify VSM Controller sample drive is on.

4. For automated data logging, start using the NML Data Acquisition program. Steps 5 – 11 and assumes the user previously used program to center coils.

5. From the Apple Menu select LabView.

6. From LabView select NML Data Acquisition.

7. Select the NML GPIB Data Log screen.

8. Box #1 should read Field. If not, double click on box and change.

9. Box #2 should have the name of the Multimeter used in centering the coils. Double click on this box and change to VSM Controller. The address should also be changed to 10.

10. Box #3 should be titled Time Stamp. Double click on box and change, if required. Changes to the NML GPIB Data Log screen are complete.

11. Click on select the NML Data Acquisition screen.

12. You can know start ramping magnet and collect data with the Data Acquisition Program.

C. Removing Sample (room temperature only); See Note (2): for cryogenic operation

Note (2):

The procedure for removing samples is similar to that of room temperature extraction. Remember that helium must be pumping out of the probe before removing the stopper. In fact, when you begin to pump helium out of the VSM, the stopper should pop out in your hand. The difference in pressure should always be taken into account.

1. Turn the sample drive off .

2. Remove the stopper from the top of the VSM.

3. Unscrew thumbscrew.

4. Carefully remove the sample rod. It will slide out with minimal force.

5. Replace thumb screw and insert the stopper.

D. Temperature Control

For all operations a heater and temperature sensor on the probe allow the control of the probe and sample temperature. Heater and sensor need to be connected to a suitable heater controller. This is accomplished through the 19 - pin Breakout Box. The sensor number is noted on the wiring diagram. For most conditions, a heater power setting of 0.05 W up to 10K and 0.5W up to 200K is sufficient.

The wiring diagram for the Lakeshore VSM list the New Sensor 3473 on the 19 – pin connector as pins E, F, G and H. The Temperature. The corresponding connections on the Breakout Box are 5, 6, 7 and 8. After connecting the Temperature Controller to the Breakout Box with the appropriate two pair banana plug cable (Breakout Box) to 4 - pin, sensor 1 connector (VSM Controller), you should be able to see the current temperature of the probe. The 19 - pin connector must be connected to the probe for a temperature display. If may be necessary to reverse both dual banana plug connections or simply reverse one pair of banana plugs if the readout is invalid.

The heater connections on the 19-pin connector are currently pins B and J, corresponding to connections 2 and 9 on the breakout box.

Note (3):

Do not use more than 0.5 W; it will damage heater and pick-up coils. The user is responsible for repairs.

Check the Temperature Controller set-up to make sure the appropriate sensors, etc. are selected.

E. Measurements Over Temperature Ranges

There are different procedures for controlling the temperature, depending on the temperature range. The main parameter is the amount of exchange gas in the temperature insert (Helium 4 can). The lower the desired temperature, the more exchange gas is needed. If a large range of temperature is to be covered, the higher temperatures should be measured first. The following procedures have been used successfully.

1. Temperature between 1.2K and 4K.

A. Add 1” of exchange gas to the can before inserting it into the cold dewar. After the probe is cold, add another 2 feet of exchange gas. The probe should cool down to the 4 K region. If not, check sensor.

B. For temperatures between 2 and 4 K, pump down the bath and set the bath pressure so that the temperature reading reaches the desired temperature. The system is not in equilibrium (pressure gradient between bath and pumping station, so the temperature obtained from the vapor pressure curve will be lower than real temperature and cannot be used for temperature control.

C. Below 2 K another several feet of exchange gas need to be added to the can to condense a super fluid, which allows for a good thermal contact between bath and probe. The vapor pressure of the bath can be used to determine the temperature. It should agree with the sensor reading.