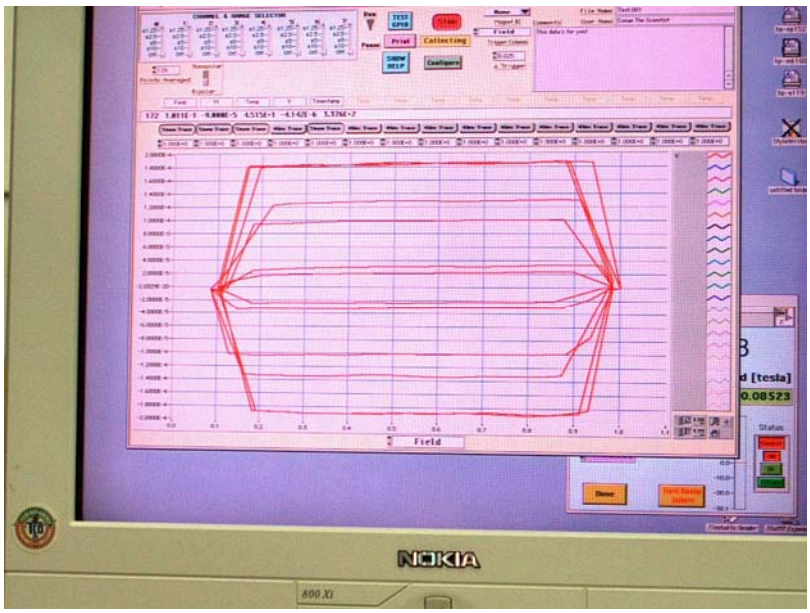
2003 Lakeshore VSM
User Guide

Volume B.1

Finding Field Center
Signal Calibration



Compiled by:
Glover Jones

Reviewed by:
Gordon Armstrong

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

4. FINDING THE FIELD CENTER

The following procedure allows for an effective adjustment.

1. Connect the 19-pin connector from the Breakout Box to the probe. Make sure that the cable is supported sufficiently to avoid excessive stress on the plug.

2. Connect the VSM Controller cables to the probe head connectors.

   A. Head driver cable
   B. Reference cable

Note (1):

The breakout box is labeled numerically. The wiring diagram (probe) will need to referenced for correct pin-out information.

Breakout Box Pin No.:	Wiring Diagram:
13 and 14	N and P

3. Connect dual banana plug cables

Breakout Box: (13 and 14) (high/low side input)		Multimeter (N and P)
Dual banana plug		Dual banana plug
13 red	-	N, High
14 black, tabs	-	P, Low

Figure 1 (VSM Controller)

Note (2):

The VSM Controller, Temperature Controller, Multimeter and Computer Terminal are all connected in parallel. The screw lock assemblies connecting the connectors must be properly tightened.

4. Connect the Mutlimeter to the Temperature Controller using a GPIB connector.

5. Connect the VSM Controller pick-up coil cable. The banana plug end is not connected until after the field centering is completed.

6. Connect the VSM Controller to the Temperature Controller using a GPIB connector.

7. Connect the Computer Terminal to the Temperature Controller using a GPIB connector. (See Figure 11)

8. Turn on the Multimeter, the VSM Controller and the Temperature Controller. Allow sufficient time for equipment to warm up.

9. Setup up your NML Data Acquisition Program

   A. From the Apple Menu select LabView

   B. From LabView select NML Data Acquisition Program

   C. Also select the NML GPIB Bus Scan

   D. Click on red “configure” button to enter instrument & GPIB addresses

   E. In Box #1 double click on name box and select Field

   F. In Box #2 double click on name box and select Keithley 2XXX or the name of the Multimeter being used in the experiment.

   G. Insert the correct GPIB address in Box #2. The NMLGPIB Bus Scan should provide the correct GPIB address.

   H. Time Stamp is always the last box (#3)

   I. Click on the “save setting” button to return to Data Acquisition

   J. Select Magnet ID number and enter none. Entering any cell number will cause problem with your data measurement file

   K. Select the Trigger Column and enter Trigger Value. Value 0.005 is a good choice. You must also select the trigger (Field)

   L. Type in your filename. The program automatically changes the file each time a new data set is run. For example, abc.001 to abc.002

   M. Type in your user name

N. Type in your comments, i.e., sample name, sweep rates, etc., this will help you identify the measurements later.

O. Above the Show/Hide trace boxes, change the rectangular boxes to Field, M, and Time Stamp. Only Box #2 (M) should be shown on the screen as a trace. You can hide or show each trace. The Data measurements are stored in the data folder on the computer system you are using. In addition, the x-axis is normally listed as field.

Note (4):

The control room operator at this point will notify you when you can began your experiment. Make sure to switch to Tesla and not kAmps before starting in the magnet control window.

If you must ramp the through the zero field always set the Slew Rate to a maximum value of 0.5 Tesla/minute

Once you change the value of the SetPoint, the field will immediately go to that value.

In normal operations one should change the Slew rate before changing the SetPoint.

P. Observe the Slew Rate in the magnet control window. The optimum rate is 10 Tesla/m. If not, step X.

Q. Observe the SetPoint in the magnet control window. The SetPoint should be around 0.05, if not step V.

R. Set the SetPoint field to 0.05 Testa

S. Set the Slew Rate to 10 Tesla/m

T. Start the data acquisition software.

U. Set the SetPoint to 1 T. Once you change the SetPoint the field will ramp to that value.

V. Ramp the magnet down to 0.05 T. Click on the SetPoint Button and change value to 0.05

W. Observe the position of the plot traces in Figure 2. Take into account that there is usually an offset voltage at a constant field and a sharp peak at the beginning or end of a field ramp even if the pick-up coils are perfectly centered. Move the probe up or down a certain amount. Unscrewing the clamp screw above the spacer and moving the probe up or down accomplish this. Slightly tighten clamp screw to keep probe from moving. Repeat steps T and U. If the plot traces got further apart, move the probe in the opposite direction. If the plot traces got closer together move it further into the same direction. Repeat this step until there are no obvious

differences between the plot traces. When the optimal position is found, move probe slightly past centering point and monitor trace. Repeat steps T and U. Plot trace should now plot above x-axis when ramping up and below axis when ramping down. Move probe back to optimal position and tighten clamp screw. Tie down the VSM Probe Clamp to the dewar with cable ties or with turnbuckles to fix the probe in its position and avoid it to be pulled out of the dewar.

Note (5):

You can find the field center without having the probe head attached.

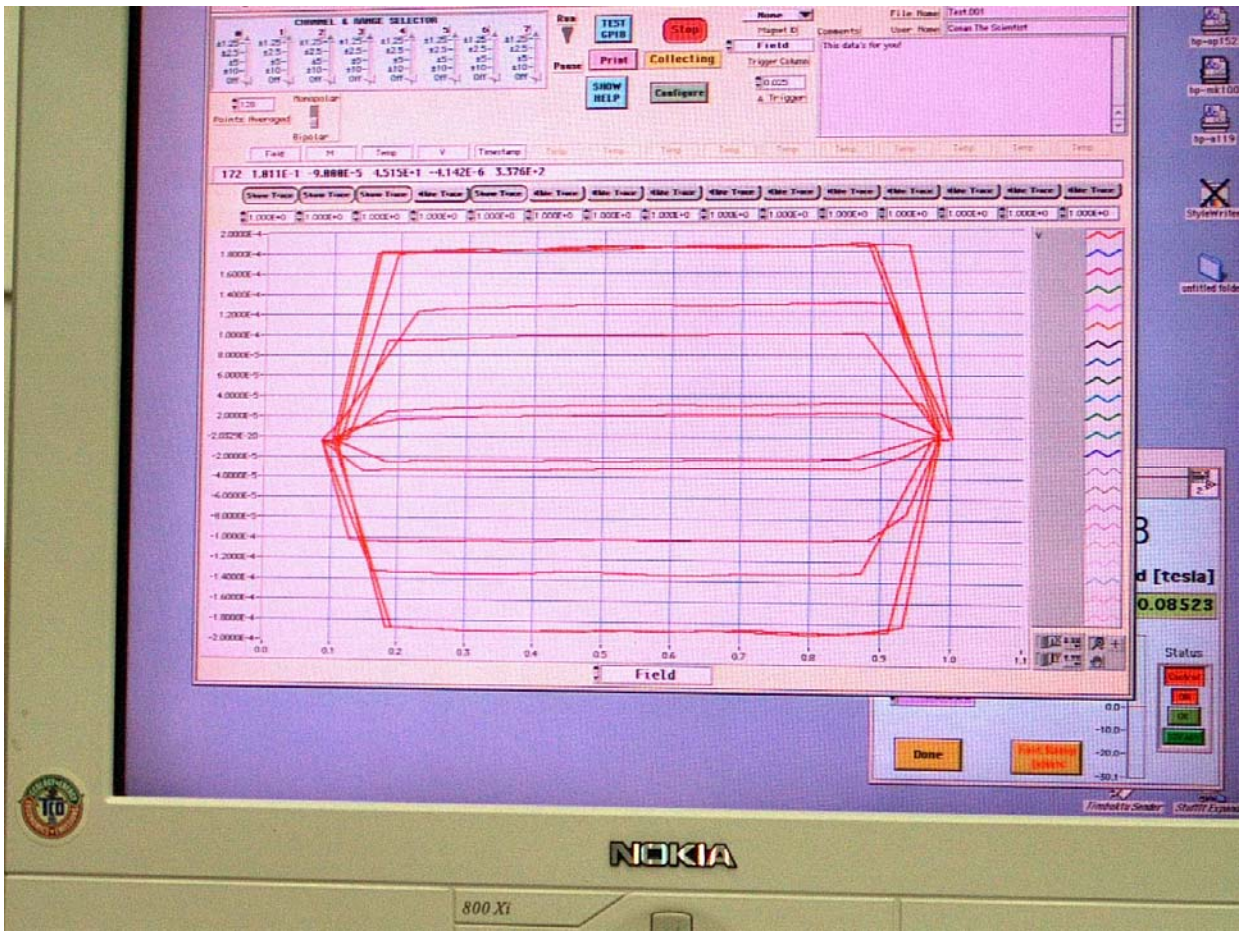

Figure 2 Typical Centering Trace)

5. SIGNAL CALIBRATION

The signal calibration is not necessary for normal operation, but every time a different probe or VSM head is used. It should be performed if the values found are more than 2% off the expected values. A Ni-sample is provided for calibrating the VSM. The manufacturers calibration curves are based on room temperature values. Room

temperature calibration can be used for calibration at He (4) temperature by scaling them up 5.1%. The calibration procedure with the Ni sample includes the following steps:

1. Remove the dual banana plug end cable from pins 13 and 14 on the breakout box that connects to the Multimeter.

2. Connect the VSM Controller Pick-Up Coil cable to the Breakout Box. The pins are the same as used for the centering of the coils. (Pins 13 red and 14 black, tab side). Switch multimeter and GPIB address to Lakeshore and GPIB Address on NML Data Acquisition.

3. Mount the Ni sample on the sample rod and insert it into the VSM. See Volume C, Section 6 VSM OPERATION, A. Inserting the Sample.

4. Set the VSM controller to a 10^1 EMU scale and 1 sec time constant and turn the sample drive on. The signal reading should now be in the range of 10 – 100 mEMU due to remnant Magnetization in the sample even without an external field.

5. Set the field to 0.5 Tesla. The reading should be in the range of several (close to 4.0) EMU.

6. Adjust the height (Z-position) of the VSM head; See Volume B.1, Section 5, Signal Calibration , B. Height adjustment.

7. Adjust the little screw next to the range selector at the VSM so that the reading corresponds to the Ni calibration standard. The calibration is now complete.

A. X-Y Adjustments

This procedure should be done only if a problem occurs. The rubbing between the sample rod and the probe can be detected by listening to the noise in the probe or He can tube. In the optimal case a very distant humming can be perceived, whereas metallic-rattling noises indicated that the adjustment is necessary. The best starting configuration for the X-Y adjustment is the head level and at a specified rotation angle. Slowly turn the X and Y position wheels. Listen to the noise in the probe at the lowest possible position. In an aligned system the noise should disappear completely. If not, redo the X and Y alignment or recheck the initial setup.

B. Height Adjustments

The height (z-position) of the VSM is adjusted by turning the tripod turn handle until the signal is maximized. The signal is reflected on the LCD on the VSM Controller. A good procedure is to turn the wheel in half turn steps, let the signal settle for a few seconds and observe the values. If it appears that the maximum signal is outside the adjustment range and it is confirmed that the sample is mounted correctly on the sample rod, the top plate needs to be lowered or raised about 5mm into the direction the maximum value is expected. Make sure that the bellow fitting will not be overstressed.