

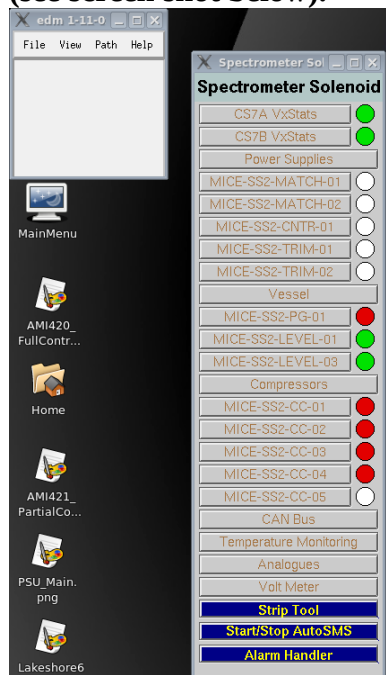
EPICS Controls and Monitoring Instructions Spectrometer Solenoid Testing at Wang, NMR

Username – epics
Passwd – standard

There are 6 desktops – magnet monitoring, power supplies, alarm handler, www, archiver and a workspace for development.

When logging into the system an xterm will appear – this is not necessary and should be minimized.

Go to the “Main Menu” shortcut on the desktop – upper left. Click on this and it will open EPICS control/monitoring GUI column entitled “Spectrometer Solenoid” (see screen shot below).



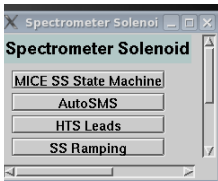
Click on the “Vessel” button on the column – about midway down – it will open the overall SS GUI showing the cryostat with the 5 cryocooler heads on top. This display shows all of the LHe level information, has a link for the HTS leads, and will show the individual coil current levels, cryomech info, and

Click on the “Power Supplies” button on the column – this opens the main EPICS GUI with the power supply controls and monitoring for all five coils. Move this GUI to the “Power Supplies” desktop.

Before we do anything, we must start the servers first – click on the shortcut on the upper left side of desktop. This opens a small window with four buttons (see image

below): MICE SS State Machine (not yet enabled or used), AutoSMS (not yet enabled – relies on the State Machine to function), HTS Leads, and SS Ramping. We will need the last two buttons – HTS leads (associated with Vessel GUI) and SS Ramping (associated with Power Supplies GUI).

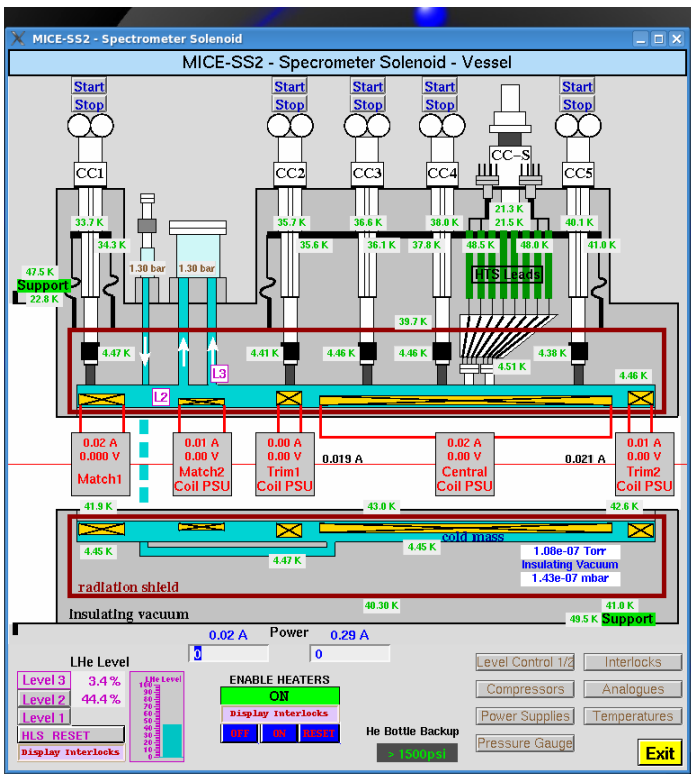
Note: Only start the SS Ramping server if you want to start the new interface which has preset buttons for ramp settings.



**Click once on the HTS Leads button – this will start the HTS server.
Click once on the SS Ramping button – this will start the ramp server.**

Vessel

Moving the mouse over the GUI will cause more activate-able buttons to appear under the mouse. Clicking on these buttons will open an additional GUI.



This is a cross section of the magnet and is drawn to scale.

Anything that is light blue is Helium. The maroon rectangle is the radiation shield – upper part of the cross section and lower part. The rest is the insulating vacuum.

Yellow blocks with black crosses represent the five coils.

LHe levels:

The L3 sensor is up on top inside one of the vent lines.

The L2 sensor is located on the upper half of the main volume of liquid Helium.

The L1 sensor is located on the bottom half of the main volume of liquid Helium.

NOTE: The L1/L2 gauge is the sensor monitored by the Quench Detection system. Be careful when running the magnet to not switch between the L2 and L1 LHe sensors because the QD system cannot tell the difference and reads the same output no matter which sensor you have chosen. Switching could erroneously give the QD system a good value in LHe levels.

If you want to know the name of the Process Variable, center-click on any display number and the PV name will appear. The name will go away when you let go.

There are few things within the system that cause a quench. Almost every failure in the Controls system does NOT cause a quench; rather, it causes the power supplies to ramp down gradually.

Actions related to the “Vessel” GUI:

- 1) **Make sure that the LHe level monitoring is set correctly to:**
 - a. **Level2 when ramping the magnet**
 - b. **Level1 when initially refilling He after a quench**
- 2) **This is the GUI where you can enable the heaters – either for ramping the current or for keeping it stable over night**
- 3) **Middle mouse button held over monitoring parameters gives EPICS name of process variable – this is how to figure out what to plot in the strip tool or archiver.**

Strip Tool

This can be started again from the first column menu – click the “Strip Tool” button near the bottom. In the StripTool Controls window, you must then “load file” – you can find the file in /home/epics/Config/StripConfig.

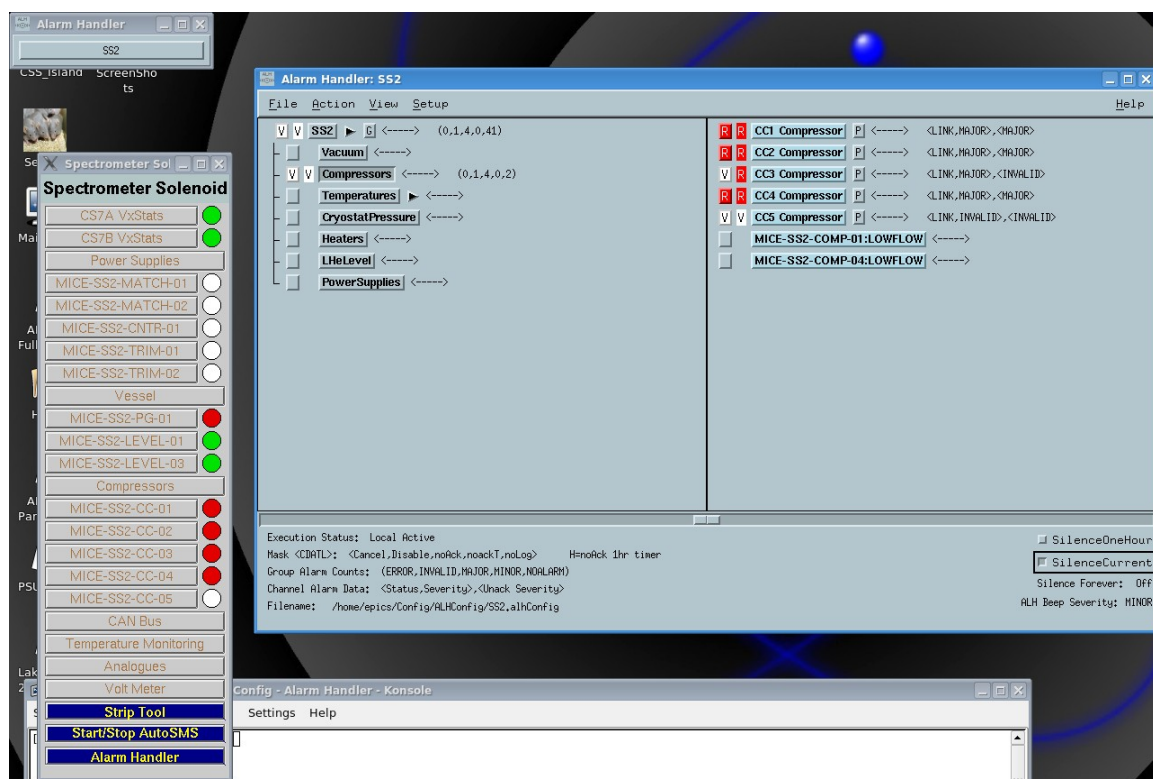
Note that the “Config” directory has a capital C – there is another directory called “config” that you do not want.

There are already several Strip Tool configuration files available that Pierrick has set up. CurrentRamp.stp is useful for watching the coil currents during at training ramp. The user can create new configuration files which should be saved in the /home/epics/Config/StripConfig directory.

In the Config subdirectory there is Alarm Handler configuration, the Strip Tool configuration and a way to get to the visual (EDM) panels.

Alarm Handler

This can be started from the first column menu – click the “Alarm Handler” button near the bottom. This brings up a small window with a single button labeled ‘SS2’ – click on this button. This will open another larger window (see below): ‘Alarm Handler: SS2’ with buttons for Vacuum, Compressors, Temperatures, Cryostat/Pressure, Heaters, LHeLevel, and PowerSupplies.



Clicking on any of the buttons in the left column will display individual alarms in the right column, along with their current alarm state. A white V symbol indicates an error in communication between the Alarm Handler and the device being monitored. There are different levels of alarm – LoLo (red – major alarm), Low (yellow – minor alarm), Hi (yellow – minor alarm), and HiHi (red – major alarm). Ultimately, the values for each level will depend on the State Machine.

Note: As of this writing (12 February 2013), the compressors routinely alarm falsely. Pierrick is also working to remedy the miscommunication alarms.

Useful commands:

When looking for information on which processes (ie. servers or archiver elements) are running, the following commands are helpful:

➤ ps aux

This shows all processes running on the machine.

Use piping to limit this to what you are interested in seeing.

➤ ps aux | grep rchive

This gives you all processes with the text string 'rchive' in it. Change the string depending on what you want to search for.

NOTE: The search is case sensitive.

Archiver

There is an instruction manual on how to run the EPICS Archiver...it can be found: ??????? (LINDA – POST THIS INTO MICEMINE DOCUMENTS AREA AND LINK TO MICE IIT PAGE)

There are three parts to the archiver:

- engine – collects data and puts into files. You cannot look at anything with just this running.
- data server – reads data collected by the engine and serves it up for the viewer
- viewer – can read the data from the server and display in a user-friendly manner

First – look to see if the archiver is already running.

Type:

➤ ps aux | grep rchive

This shows the processes running that are related to the archiver. **If the archiver engine is already running, DO NOT start it again.**

If the archiver is **not** running, then you must start all three elements of it.

Go into /home directory

➤ cd /home/archiver

There are two bash files – StartArchiver.bash, and StartArchiverDataServer.bash.

Type:

➤ ./StartArchiver.bash then carriage return

This starts the archive engine. Again – **DO NOT** run this unless you know that there is no Archiver already running

Type:

- `./StartArchiverDataServer.bash` then carriage return

This starts the second part of the Archiver.

Now start the archiver viewer.

- `ArchiveViewer.bash`

This finally opens up something you can use to view information.

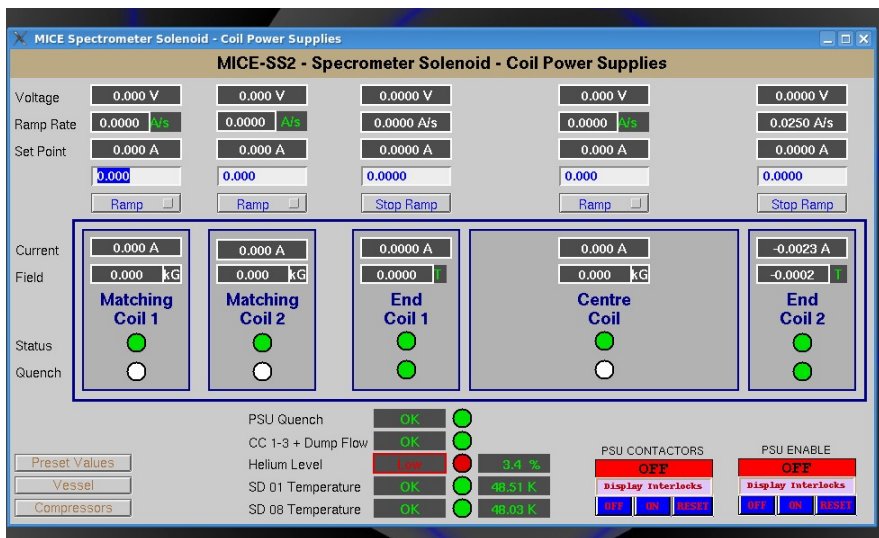
Click on File, Open – then look for the file you want. One useful file is “plotSS2-powering.” Play with this and save any new configuration with a unique name to this area for future use.

Periodically, when you want to refresh a plot of data to bring it up to the current time, you must do the following:

In `/home/archiver`

- `./UpdateMasterIndex.bash`

This must be done to allow viewing of all data over time. If not done, then the data plotting stops at a date/time when this was last run.



Power Supplies

See the ‘SS2-Spectrometer Solenoid – Coil Power Supplies’ GUI shown above.

If the new Preset Button GUI will be used, then the server (SS Ramping) must be running.

On the Power Supplies GUI – click on the Preset Values button on the bottom left side. This brings up another small window – SS2 Magnet Preset. There are three categories of

preset values for each coil – set I=0A, set I=10 A for a test ramp, and set I=flip mode values for a training ramp.

Since there is no OFF button, to find and stop processes, do:

➤ ps aux | grep HTS

or

➤ ps aux | grep ramping

and

➤ kill NNNNN

where NNNNN is the process number.

Note: The HTS lead info is coming from the Quench Detection system through the file made available from that system.

If you will NOT be using the preset buttons, you must type the ramp values into the controls window for each PS.

- In the “Power Supplies” GUI, click on a rectangle representing one of the power supplies. For example, click on the Matching Coil 1 dark grey rectangle. This will bring up another small window GUI for the M1 PS.
- In this window, click on the “Full Control” button. This brings up a large control panel with many columns.
- Set all values for the M1, M2, and C power supplies first:
 - In the Power Supplies GUI – click on Pause Ramp.
 - Make sure that the ramp rate for each power supply is set correctly.
 - Make sure that the voltage and current limits are set correctly.
 - Make sure that the current set point is set correctly.
 - Note: when you are entering the current set point for the M1, M2, and C power supplies, this will be a POSITIVE number. (ex. 285A)
- Once the M1, M2, and C settings are ready, set all values for the trim power supplies (E1, E2):
 - It is not possible to pause the ramp for these supplies so you must be careful not to hit ‘return’ after entering the current set point until you have everything else ready and have started the ramps on the M1, M2, and C supplies.
 - Make sure that the ramp rate for each trim power supply is set correctly.
 - Make sure that the voltage and current limits are set correctly.
 - Make sure that the current set point is set correctly.
 - Note: when you are entering the current set point for the trim supplies (E1, E2), this will be a NEGATIVE number. (ex. -44 or -29A)
- After all values are entered, return to the main Power Supplies GUI.
- Click on the Ramp button for the M1, M2, and C power supplies.
- In the current set point line for E1, hit ‘return’ to start the trim supply ramp.
- In the current set point line for E2, hit ‘return’ to start the trim supply ramp.

Where current values coming from?

The Trim coil shunt value – shown in red on main Vessel GUI.

The other is the actual end coil current in black next to the little E1 and E2 boxes on the main Vessel GUI.

??? What about when done and are back to 0A? Do we do the PSU Contactors and PSU Enable in reverse? Do we need to turn them off?

Test ramp procedure:

- 1) Confirm that the magnet is in a state ready to be powered.**
- 2) Turn on the power supplies in the rack**
- 3) Make sure that the pressure limit on the heater control is set to 1.050**
- 4) Make sure that the TDK Lambda out is set on the center coil power supply**
- 5) Make sure that the current limit is set to 300A on M1, M2 and C power supplies**
 - a. To do this on the M1 and M2 power supplies, push in the “SET POINT” button and hold it down. Then turn the “CURRENT” knob to reach the desired current value. When there, stop turning and release the “SET POINT” button.
 - b. For the C power supply, push the “PREV” button. Then use the knob to change the current limit. Note: while you are actively changing the limit value, the system will stay in this mode. If you stop moving the knob for a few seconds, the PS will change back into the regular display mode.
- 6) Open the main EPICS SS2 control column by clicking on the “Main Menu” shortcut on the desktop.**
- 7) Open the “Vessel” and “Power Supplies” GUIs**
- 8) Make sure that the HTS Leads server is running**
- 9) IF you are using the Preset Buttons for ramping – make sure that the SS Ramping server is running**
- 10) Make sure the Archiver is running and ready**
- 11) Get the StripTool up and running**
- 12) Start the Alarm Handler**
- 13) Put the Quench Detection system in “Balance” mode**
- 14) get PSU enable – hit reset and ON**
 - a. Must have water ON, etc.
 - b. Must have QD system in “Balance Mode” while this is set
- 15) get PSU contactors enable**
 - a. hit reset, ON
 - b. must have QD system in “Balance Mode” while this step is done
- 16) Once the contactors close, put the QD system back into active mode.**
- 17) Before setting the currents on each power supply, we must ensure that all errors in each PS are cleared.**
 - a. In the SS2 Coil Power Supplies main GUI, left click the mouse into the Matching Coil 1 box. This will bring up another smaller PS control GUI

window with Error Status, Status System, Quench Detection, and other information on that power supply.

- b. For the M1, M2, and Center PS.
 - i. We must make sure that the Quench Detection is active. Note: PSU Enable and PSU Contactors must be enabled and green in order to complete this step. Click on Quench Detection – make sure QD is enabled. Click on Clear and Enable.
 - ii. To clear the errors in the PS, click on the “System” button. This will open another small GUI window. Click on the “Clear Error” button as many times as necessary to clear all errors. This process is completed when the number of errors listed drops to zero and turns green (it is red when there are errors present).
- c. Lakeshore Trim supplies:
 - i. We must make sure that the Quench Detection is active. Note: PSU Enable and PSU Contactors must be enabled and green in order to complete this step. Click on Quench Detection – make sure QD is enabled. Click on Errors and Enable.
 - ii. To clear the errors in the PS, click on the “Error Status” button. This will open another GUI window with several columns of green and red buttons indicating the presence (or not) of errors. Click on the “Clear Errors” button.
- d. Repeat for each PS box on the main GUI until all PS errors have been cleared.

18) Set PS current set-point, ramp rate, and limits for both current and voltage for each power supply. Either use the preset buttons or enter these values manually in the “Full Control” GUI for each magnet.

- a. Use the SS2 Magnet Preset mini-window. Click on the coil button you want to set – ex. M1 Set I Flip or C Set I Flip to start a training ramp.
- b. NOTE: As soon as there is a value, the Trim Supplies start ramping – so either wait to click on the two Trim Supply buttons or hit “Pause Ramp”.
- c. NOTE: we may need to go to Full Control in the Lakeshore Trim Supplies (ie. those used for the E1 and E2 coils) to make sure all values are set correctly as there have been issues getting the set point to register appropriately. This is corrected by hitting carriage return in the set point window. Pierrick will attempt to fix this when the PS circuits have been reconnected. (10 Feb 2013)

19) All power supplies should be ramping now. Pay attention to the strip tool and archiver to observe progress in the magnet.