

# Magnet Operating Procedure

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## 1 Preparing the magnet

1. Take all related lab safety training.
2. If your name isn't on the Lock-Out-Tag-Out key to the Oxford IPS power supply then make sure you have permission to operate the magnet and power supply.
3. Make sure you have liquid helium in the magnet dewar.
  - Absolute minimum operating level is 16 inches on the AMI Liquid Level Probe
  - We've typically seen loss rate of  $\approx 1\text{L/hr}$  for liquid helium
4. Connect the switch heater leads to the Oxford IPS magnet power supply.
  - Switch heater leads exit the magnet dewar through the 19-pin connector
  - And enter the magnet power supply through a red-black twisted pair
5. Connect the magnet leads and magnet ground to the magnet and power supply.
  - Red and black leads are identified on the magnet terminals
  - Red is  $V+$  and Black is  $V-$  on the back of the magnet power supply
  - Green earth is connected to the power supply earth and the metal top plate of the AMI dewar

6. Sweep with a permanent magnet to check for magnetic items within 5 Gauss line
7. Check if red wires containing reed-switch for “Magnet On” light are taped to side of AMI dewar, and plug in power-supply for the light.
8. Physically unlock the power supply plug and plug it into the wall socket and back of the power supply.

## 2 Ramp magnet from zero field

1. Switch on the instrument by means of the ON/OFF switch on the front panel, the green POWER lamp illuminates.
  - The unit will always power up at zero current, with the output clamped and under LOCAL control.
2. Press SET POINT and SET RATE buttons to check that these values are as required.
3. Modify the values if required, by pressing RAISE/LOWER while holding down the appropriate SET button.
  - Present (software-programmed) maximum ramp rate: 3A/min
  - Maximum ramp rate from magnet manual: 3A/min. DO NOT EXCEED THIS
  - Maximum current is 48.5 A (5.0 T)
4. Turn on the heater by pressing the SWITCH HEATER button. This puts the IPS into SWEEP mode.
5. Wait 15 seconds for the switch to open.
  - The SELECT lamp indicates the selected state of the switch heater

- The CONFIRM lamp shows when current is actually flowing in the heater circuit. CONFIRM detects a heater current of approximately 5 milliamp or more.
  - If SELECT is on and CONFIRM is off then check that the switch heater leads are correctly connected.
6. Press the HOLD button, causing the clamp to release and connecting the magnet. The power supply output may now be controlled by the HOLD, GOTO ZERO and GOTO SET buttons.
    - Note: When ramping the power supply will make the “clamping” once more on it’s way to the set point. Don’t be alarmed.
  7. The display on the control unit will indicate the current being delivered by the power supply or the equivalent field, unless a voltage limit is reached, in which case it will flash whilst indicating the target output.
  8. Once magnet is at desired current/field press HOLD button
  9. Press SWITCH HEATER button to turn off heater and put magnet into persistent mode.
    - IPS remembers the magnet current value prior to going into persistent mode, and won’t open the switch again until you match that current.
    - But you should still write this down!
  10. Ramp down magnet leads by pressing GOTO ZERO. Magnet should stay at field because it is persistent.

### 3 Reconnect leads to persistent magnet

This assumes the magnet is at field but the persistent switch is off.

1. Press SET POINT and SET RATE buttons to check that these values are as required.  
The SET POINT should be the same current value as the persistent current in the magnet.
2. Modify the values if required, by pressing RAISE/LOWER while holding down the appropriate SET button.
3. Ramp leads using GOTO SET. This should be quick ( $< 30$  s) because the IPS is in IMMEDIATE mode.
4. Once leads have ramped back up to previous value of magnet current press HOLD.
  - It is safe to reattach the leads to the magnet using the switch heater.
5. Turn on the heater by pressing the SWITCH HEATER button.
6. Wait 15 seconds for the switch to open.
7. The leads are now connected to the magnet and the magnet can be ramped.

### 4 While the magnet is on

1. Monitor liquid helium level in magnet.
  - Do not refill with the magnet at field
  - 16 inches is minimum operating level
2. Do not touch the leads at the back of the power supply or on the magnet!

3. Observe 5 Gauss line for working with magnetic material or materials sensitive to large magnet fields.

## **5 After the magnet is off and you're done for the day**

1. Disconnect power supply from the Oxford IPS and lock it out.
2. Congratulate yourself on doing some science today. :)