

**STANDARD OPERATING PROCEDURE:**  
**MRI SYSTEM STARTUP**

**1. INTRODUCTION**

- 1.1 Research involving Magnetic Resonance Imaging (MRI) at high magnetic field strengths presents unique hazards to individuals working within and around the MRI system. The potential for serious personal injury is present due to the sheer size and strength of the static magnetic field along with the immense flexibility of the research system and associated peripheral hardware.
- 1.2 There exist dangerous and potentially lethal levels of electricity in the 9.4T MRI system. As such, it is important that all individuals working around the MRI system be aware of the dangers and safety issues concerning electricity. Current carrying cables, connections and junction points in the vicinity of the main magnetic field are particularly susceptible to damage due to the extreme Lorentz forces created through the normal operation of the system. Periodically, the effects of prolonged mechanical fatigue will result in breakage causing electrical arcing, sparking and high heat levels before the system can shut down. There is therefore a high potential for personal injury and the possibility of a fire being ignited.
- 1.3 Equipment in the 9.4T MRI Facility is sensitive to the order used in powering the system up and down. If the proper procedures are not followed, the equipment may be damaged. Only qualified operators are to perform the following procedure.
- 1.4 Training is required before any procedure involving the MRI equipment is attempted. See SOP#200-01 "Safety and Training of Personnel".

**2. STARTUP PROCEDURE**

- 2.1 If you are unsure of any of the steps in the following procedure, DO NOT CONTINUE - immediately contact the Head Technician or the Facility Manager.
- 2.2 It is important to ensure first that the system is fully SHUT DOWN. If this is not the case follow the Shutdown Procedure in SOP#315-02 "MRI System Shutdown".
- 2.3 In the event that there is power loss to the entire MRI system, DO NOT proceed any further. Immediately contact Robarts security and indicate power has been lost to the laboratory. Building Services should respond and assess the problem with the UPS that feeds the laboratory. Also contact the Head Technician and the Facility Manager and advise them of the situation.
- 2.4 Otherwise begin startup procedure as follows (in this order):
  - 2.4.1 Determine whether or not building supplied chilled water is present.
    - 2.4.1.1 If not contact the Head Technician or the Facility Manager.
  - 2.4.2 Turn on the power to the chiller.
  - 2.4.3 Power up the power distribution unit in the VNMRS console.
    - 2.4.3.1 Turn on the main power. The switch is located on the back of the right bay.
    - 2.4.3.2 Wait fifteen seconds.

- 2.4.3.3 Press the green button located above the main power switch.
- 2.4.4 On the chiller, open the flow control valve until the flow meter reads 6 L/min if using the 305/210/HD gradient coil, 4.25 L/min if using the 205/120/HD gradient coil and 1.5 L/min if using the 115/60/HD gradient coil.
  - 2.4.4.1 If this cannot be done, contact the Head Technician or Facility Manager.
- 2.4.5 Turn on the shim power supply. The switch is located on the back of the left bay of the console.
  - 2.4.5.1 Never pulse the gradients with the shim power supply off and the shim coils connected to the power supply. Doing so could damage the power supply.
  - 2.4.5.2 Wait until the shim power supply has completed boot sequence. This typically takes approximately 30 seconds.
- 2.4.6 Turn on the RF Front End. The switch is located above hole through which the cables enter the RF Front End.
- 2.4.7 Boot the VNMRS console.
  - 2.4.7.1 Turn on the card cage power supply. The switch is located at the bottom of the front of the right bay.
  - 2.4.7.2 Wait for the console to complete boot sequence. Console cards will have yellow scrolling LEDs when boot sequence is complete.
- 2.4.8 Turn on the RF amplifiers
  - 2.4.8.1 Put the main power switch in the on position. This switch is located on the power distribution unit and is accessible from the back of the RF amplifier bay.
  - 2.4.8.2 Put the power switches in the on position. They are located on the front of the amplifiers.
- 2.4.9 Turn on the gradient power amplifiers.
  - 2.4.9.1 Put the Heavy Duty Safety switch in the on position.
  - 2.4.9.2 Select the tuning configuration appropriate for the gradient coil. For the 305/210/HD, all dip switches should be in the on position except the Ext Sync on the bottom two amps. For the 205/120/HD, all dip switches should be in the off position except the Ext Sync on the top amp. The dip switches are located on the back of the amplifiers.
  - 2.4.9.3 Put the power switch in the on position.
  - 2.4.9.4 Press the RESET button on the Imaging System Status Board. It is located in the front of the left bay of the console. The READY LED should be illuminated.
  - 2.4.9.5 Press the INHIBIT button on each amplifier. The STATUS LEDs should be illuminated. If not, contact the Head Technician or the Facility Manager.
- 2.4.10 Ready to go.

ROBARTS RESEARCH INSTITUTE  
CENTRE FOR FUNCTIONAL AND METABOLIC MAPPING  
9.4T MRI FACILITY

SOP #310-02

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*SOP Approval Signatures*

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Dr. Robert Bartha, Facility Director

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Dr. Greg Dekaban, RRI Biosafety Officer

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Date