

3T/7T MRI FACILITY

SOP Number:	300.02
Title	3T MRI System Start-Up and Shutdown

Revision Chronology		
Version Number	Date	Changes
300.01	01 March 2010	New
300.02	21 January 2013	Updated procedures

Facility Manager Signature: _____

Date: _____

ROBARTS RESEARCH INSTITUTE
CENTRE FOR FUNCTIONAL AND METABOLIC MAPPING:
3T MRI FACILITY

Standard Operating Procedure #300.02

3T MRI System Start-Up and Shutdown

1. Introduction

- 1.1 Research involving Magnetic Resonance Imaging (MRI) at high magnetic field strengths presents unique hazards to both research subjects and individuals working within and around the MRI system. Consequently, the potential for serious personal injury is present due to the sheer magnitude and strength of the static magnetic field along with the immense flexibility of the research system and associated peripheral hardware.
- 1.2 Dangerous and potentially lethal levels of electricity are used by both the 3T and 7T MRI systems. Therefore it is important that all individuals working around the MRI systems be aware of the dangers and understand the 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 may result in breakage, thereby causing electrical arcing, sparking, and high heat levels before the system can shut down. In these instances there is a high potential for personal injury as well as the possibility of a fire being ignited.
- 1.3 Equipment in the 3T 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 or malfunction. Only authorized Level 2 MRI Personnel are permitted to perform these procedures.
- 1.4 Extensive training is required before performing any procedure on the 3T MRI system, see SOP#130: "MRI Personnel Training".

2. 3T Start-Up Procedure

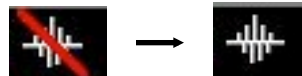
- 2.1 If you are unsure of any of the steps in the following procedure, DO NOT continue. Contact the Facility Manager immediately.
- 2.2 The Start-Up procedure is the same for both the Powered Down and Standby states.
- 2.3 **IMPORTANT:** In the event that there is power loss to the entire MRI system or one of the emergency electrical shutdown buttons has been depressed, DO NOT proceed any further. Contact the Facility Manager immediately.
- 2.4 Start-Up Procedure:
 - 2.4.1 Press the **SYSTEM ON** button located on the Siemens wall control panel in the MR console room.

- 2.4.1.1 Do NOT plug or unplug any RF coils, move the bed, or open any Syngo application (e.g. Neuro3D) while the system is booting. This may cause system errors and may necessitate a system reboot.
- 2.4.1.2 Note that the system takes approximately 20 minutes to boot.



SYSTEM ON button

- 2.4.2 When the system is fully operational, ALL of the following will occur:
 - 2.4.2.1 You will hear **3 gradient knocks** from the magnet.
 - 2.4.2.2 A “**System Online**” message will appear in the Magnet Status window.
 - 2.4.2.3 The **red line** will disappear from the Magnet Status icon.



- 2.4.3 The system is now booted and ready to scan.
 - 2.4.3.1 Note that the system boots to a basic operational state. To gain full access to system, including use of all Windows functions and programs, you must login as an Advanced User.
 - 2.4.3.1.1 Advanced User Login Procedure:
 - 2.4.3.1.1.1 Press **Ctrl + Esc** to open the Windows Start Menu.
 - 2.4.3.1.1.2 From the **Programs** menu, select **Advanced User**.
 - 2.4.3.1.1.3 A new window will open prompting for the Advanced User password.
 - 2.4.3.1.1.4 Contact MRI Technologist or Facility Manager for password.
 - 2.4.3.1.1.5 A confirmation message will appear stating: “Advanced usage is enabled.” Click on **OK**.

2.4.3.2 Occasionally the system will not boot properly, either due to the system not being shut down properly or internal system errors. In these instances you will NOT hear the 3 knocks from the magnet or receive the “System Online” message in the Magnet Status window. The red line will remain on the Magnet Status icon, and when clicked, will display the system error(s) that occurred.

2.4.3.2.1 If the system does boot properly, a full system shutdown and restart is required. Proceed with the “3T Shutdown Procedure” in Section 3.

3. **3T Shutdown Procedure**

- 3.1 If you are unsure of any of the steps in the following procedure, **DO NOT** continue. Contact the Facility Manager immediately.
- 3.2 In Syngo on the host PC, select: **System → End Session**.
 - 3.2.1 A window will open with the following options:
 - 3.2.1.1 Log Off
 - 3.2.1.2 Shutdown System
 - 3.2.1.3 Restart System
 - 3.2.1.4 Restart Application
 - 3.2.2 Select **Shutdown System**.
 - 3.2.3 A verification window will pop up with the message: “Do you really want to shut down the system?” Click on “**Yes**”.
- 3.3 Wait for the message: “It is now safe to turn off your computer”.
- 3.4 Press the **SYSTEM OFF** button on the Siemens control panel.

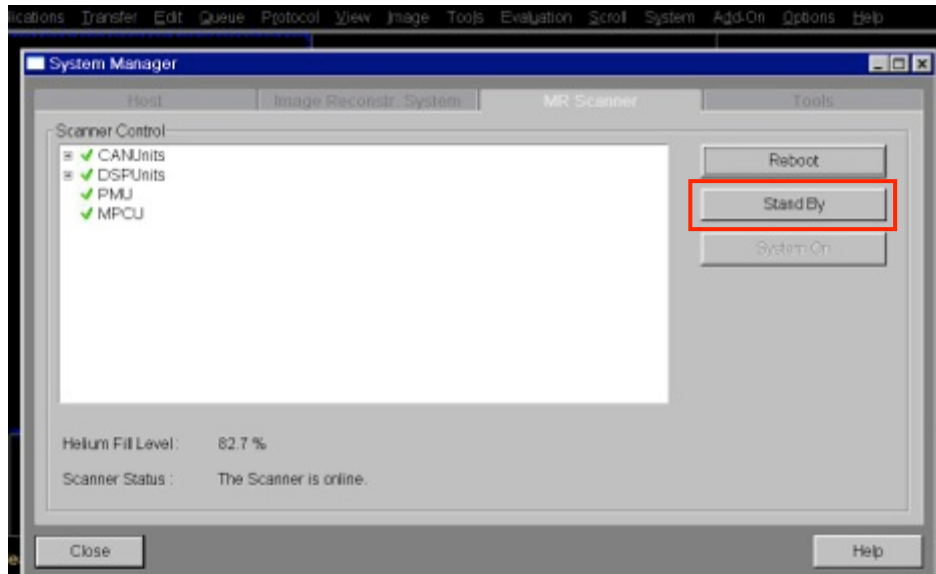


***SYSTEM OFF** button*

- 3.5 The system should be OFF at this point.

4. **Additional 3T System Procedures**

- 4.1 The following procedures are provided for reference. If you are unsure of any of the steps in the following procedure, or are unsure when to perform these procedures, **DO NOT** continue. Contact the Facility Manager or MRI Technologist for further details.
- 4.2 **Scanner Standby**
 - 4.2.1 In Syngo on the host PC, select: **System → Control**
 - 4.2.2 The System Manger will open in a new window.
 - 4.2.2.1 In the **MR Scanner** menu, select: **Standby**
 - 4.2.3 A verification message will appear, click on **OK**.



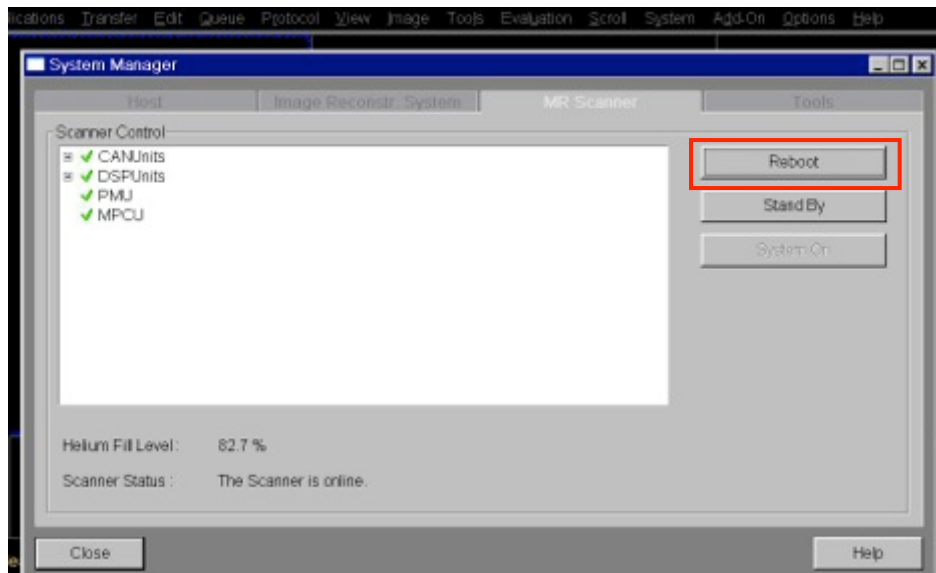
4.3 Reboot Scanner

4.3.1 In Syngo on the host PC, select: **System → Control**

4.3.2 The System Manger will open in a new window.

4.3.2.1 In the **MR Scanner** menu, select: **Reboot**

4.3.3 A verification message will appear, click on **OK**.



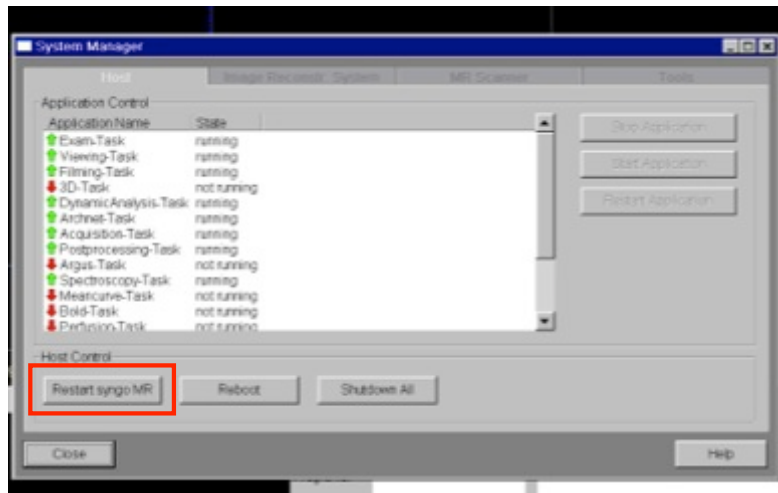
4.4 Restart Syngo

4.4.1 In Syngo on the host PC, select: **System → Control**

4.4.2 The System Manger will open in a new window.

4.4.2.1 In the **Host** menu, select: **Restart syngo MR**

4.4.3 A verification message will appear, click on **OK**.



4.5 Restart Image Reconstruction System

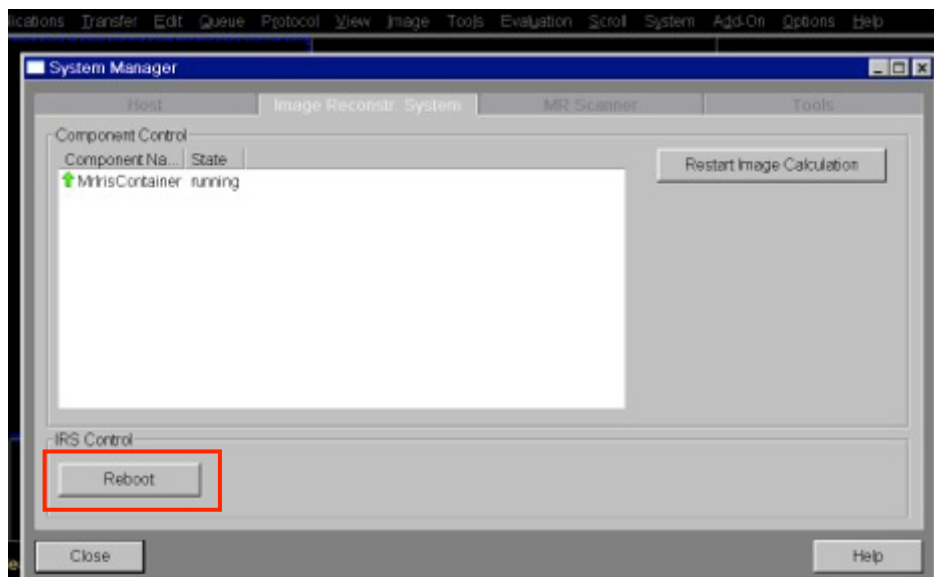
4.5.1 In Syngo on the host PC, select: **System** → **Control**

4.5.2 The System Manger will open in a new window.

4.5.2.1 At the bottom of the **Image Reconstr System** menu you will see a section called “IRS Control Menu”.

4.5.2.2 In this **IRS Control Menu**, select: **Reboot**

4.5.3 A verification message will appear, click on **OK**.



4.6 Save System Log-Files

4.6.1 MRI Operators will occasionally encounter system errors, and should save the error messages for further investigation by saving the system's Log-Files.

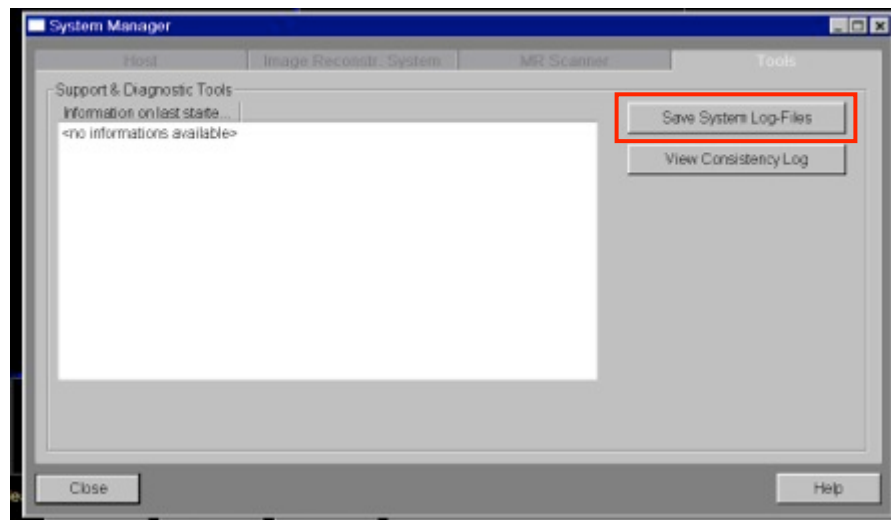
4.6.2 Save System Log-File Procedure:

4.6.2.1 In Syngo on the host PC, select: **System → Control**

4.6.2.2 The System Manger will open in a new window.

4.6.2.2.1 In the **Tools** menu, select: **Save System Log-Files**

4.6.3 Notify the Facility Manager or MRI Technologist that you encountered a system error and saved the Log-Files.



4.7 Physiological Monitoring

4.7.1 Press **Ctrl + Esc** to open the Windows Start Menu.

4.7.2 Select: **Run...**

4.7.3 A new window will open.

4.7.3.1 In the "Open:" field type: **telnet mpcu**

4.7.4 The telnet mpcu program will open in a new window.

4.7.4.1 At the prompt, type: **fMenu** and press **Enter** (note this is case-sensitive).

4.7.4.2 At the prompt, type: **3** and press **Enter** to chose "PMU".

4.7.4.3 At the prompt, type: **3** and press **Enter** to choose "Signal Logging".

4.7.4.3.1 Telnet mpcu is now ready to log your physiological files. This

program may remain open for the duration of your experiment.

4.7.4.3.2 Note that this program is very sensitive to other processes, and commands to start and stop signal logging should only be entered when no other processes or scans are running (i.e. start signal logging only after the scanner is finished shimming and the continue button is on the screen).

4.7.4.4 At the prompt, type the number corresponding to the signal(s) you wish to log, and then press Enter.

4.7.4.4.1 For example, type: **9** and press **Enter** to “Start All Signals”.

4.7.4.5 You will then be prompted to enter a Logfile name. Type your desired **filename** and press **Enter**.

4.7.4.6 Wait for the prompt to reappear in the telnet mpcu menu; once it appears the logging has begun and you may start the MRI scan.

4.7.4.7 When the MRI scan is complete, type the number corresponding to the signal(s) you wish to stop and press Enter.

4.7.4.7.1 For example, type: **10** and press **Enter** to “Stop All Signals”

4.7.5 Physiological monitoring files are saved as text files in the C:\MedCom\log directory and must be manually copied to the server upon scan completion. They will have the filename you assigned to them, with the corresponding suffix (i.e. “.puls” for pulse-ox files, “.ecg” for ECG files, “.resp” for respiratory files, “.ext” for external channel/trigger files).

```

Telnet mpcu
-> FMenu
***** Menu U2.0 ****
* / MPCU-5 Applikations Menu
*****
* 1 - EGT-AMC Pruefung ...
* 2 - Kommunikation zu den BGPs ...
* 3 - FPU ...
* 4 - Trace Utilities ...
* 5 - UsMarka System Info ...
*****
***** h-Help ****
Select number [1-5]: 3

***** Menu U2.0 ****
* /4/ FPU
*****
* 1 - Kommandos zum Frontend ...
* 2 - Debugausgaben steuern ...
* 3 - Signal Logging ...
*****
***** h-Help ****
Select number [1-3]: 3

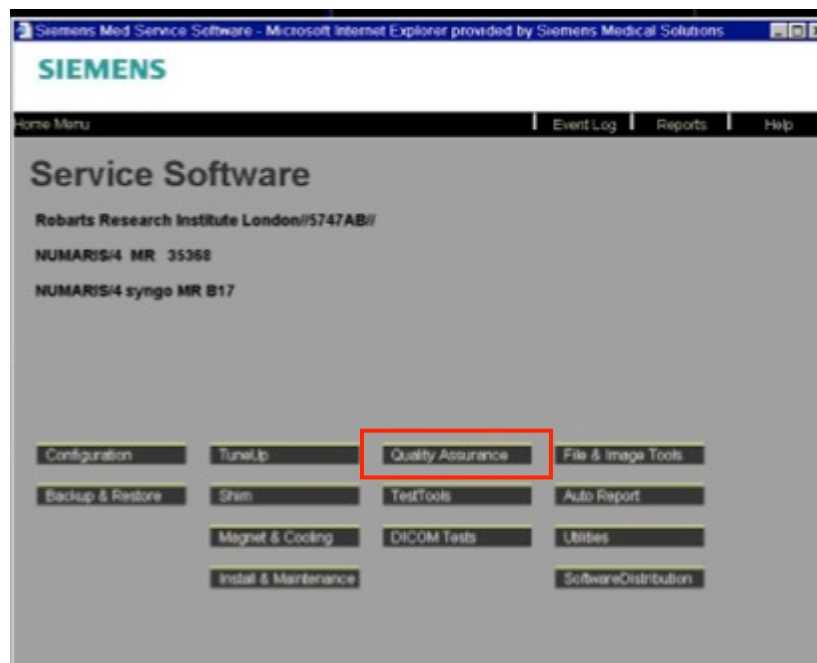
***** Menu U2.0 ****
* /4/3/ Signal Logging
*****
* 1 - start ECG
* 2 - stop ECG
* 3 - start RESP
* 4 - stop RESP
* 5 - start PULSE
* 6 - stop PULSE
* 7 - start EXT
* 8 - stop EXT
* 9 - start all signals
* 10 - stop all signals
*****
***** h-Help ****
Select number [1-10]:

```

Telnet mpcu

4.8 Local Service Menu and Quality Assurance (QA)

- 4.8.1 The Local Service Menu is the entry point to perform quality assurance scans, check magnet status, check temperature and helium levels, access error and QA logs, etc.
- 4.8.2 Note that the Local Service Menu should only be accessed when the scanner is idle. If a scan is running, it will be automatically aborted when you open the Local Service Menu.
- 4.8.3 Routine Quality Assurance is performed on the scanner on a weekly basis. Additional QA may be necessary due to performance issues. Contact the Facility Manager for further information.
- 4.8.4 In Syngo on the host PC, select: **Options** → **Service** → **Local Service**
- 4.8.5 A new window will open.
 - 4.8.5.1 See MRI Technologist or Facility Manager for service password
 - 4.8.5.2 Type in the password and click **OK**
 - 4.8.5.3 Note that this password changes periodically. Check with the Facility Manager or MRI Technologist for current password.
- 4.8.6 The Siemens “Service Software Menu” is now open.
 - 4.8.6.1 Click on the desired option, e.g. **Quality Assurance**.
 - 4.8.6.2 Follow the on-screen instructions as prompted.



Service Software Menu