MRI SIMULATOR
PST-100355
OPERATOR MANUAL

MRI Simulator Operator Manual
PST-100444
Rev 7
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If you have any questions or comments regarding this manual, or require installation assistance, please contact Psychology Software Tools, Inc. Product Service and Support Department at:

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This manual describes the installation procedure for the MRI Simulator. Please review the manual completely and thoroughly before beginning the system installation. Proper performance of this system is guaranteed only while the simulator is used in accordance with the enclosed instructions and safety guidelines.

The MRI Simulator (PST-100355) is for research purposes only.

Table of Contents

Chapter 1: **Safety**

1.1 Safety Symbol

The following symbol will be used throughout this manual and as a means to alert you to potential safety hazards on the accompanying equipment.

Attention! Consult Accompanying Documents

Chapter 1: **Safety**

Please **read all WARNINGS carefully and completely before continuing** with the assembly and use of the MRI Simulator.

DO NOT power up the MRI Simulator until you are instructed to do so.

Participants new to the MRI environment may become anxious or panic from the close confines of the enclosure in the Simulator. All efforts should be made by the researcher to quickly remove the participant, if such an event were to occur.

See instructions on use of Participant Table Emergency Release Handle for manual extraction of Participant Table.

If the Participant Table Remote Control is to be given to the participant, check the batteries to make sure it is working properly.

To avoid injury, please use a solid step stool and exercise caution when participants are getting on/off of the Participant Table.

DO NOT use alcohol on the surface of the Simulator, use only non-abrasive cleaners to clean the finished surfaces.

Chapter 1: **Safety**

Please **read all WARNINGS carefully and completely before continuing** with the assembly and use of the MRI Simulator.


The unit is designed to support a maximum weight of 275 pounds.


DO NOT remove or modify the lighting system.


DO NOT remove or modify the fan system.

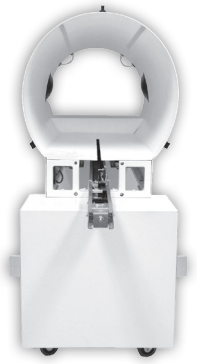

Service to be performed by a qualified personnel only. Opening any panel may produce a shock or hazard. Opening the panel by non-qualified personnel may invalidate the warranty.


DO NOT open or remove control panel enclosure. Opening this enclosure may produce a shock hazard. Service to be performed by a qualified technician.


To avoid personal injury keep participant hands and hair away from the sides of the Participant Table.

Chapter 2: **Components and Technical Specifications**

The MRI Simulator is shipped in a custom crate. The five (5) main components of the Simulator are the Bore, the Facade, the Participant Table, the Participant Table Base and the Extension Panels. (A packet of small parts for assembly are included) See **Unpacking Instructions**, Step 4.

The Bore	
The Facade	
The Participant Table **The Participant Table Base**	
The Extension Panels	

Chapter 2: **Components and Technical Specifications**

Additional assembly components are packed in the crate. Be sure they are removed before continuing with assembly.

Contents Include:

- Bolts with Hinged Covers and Wing Nuts
- Male to Male Audio Cable
- Participant Table Remote Control
- Power Cable
- Table Locking Alignment Knobs

Optional Contents:

(*For additional information about purchasing these products, contact us at info@pstnet.com.*)

- Button Response System
- Head Coil
- Headphones
- MoTrak
- SimFx
- Video Monitor

Chapter 3: **Hardware Setup**

The following section provides step by step instructions for the proper set up of the MRI Simulator.

3.1 Location Selection

Find a reliable location where the MRI Simulator will be put to use.

1) We strongly recommend leaving the MRI Simulator disassembled until you have moved the pieces to the location where it will be put to use.

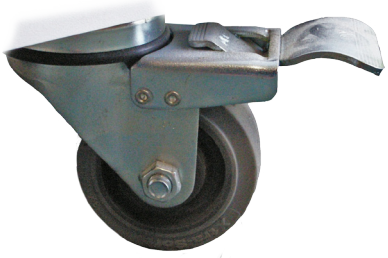
   Although, the Simulator is on **locking casters** (shown at right), it is best to keep it in separate pieces when moving it around.

   The individual pieces will easily fit through a standard sized door.

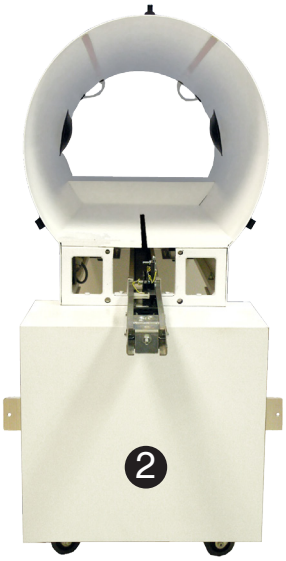
2) When you are ready to begin assembly, move the **Bore** section to the desired location.

Locked

Unlocked



Bore



Chapter 3: **Hardware Setup**

3.2 Facade and Bore Tube

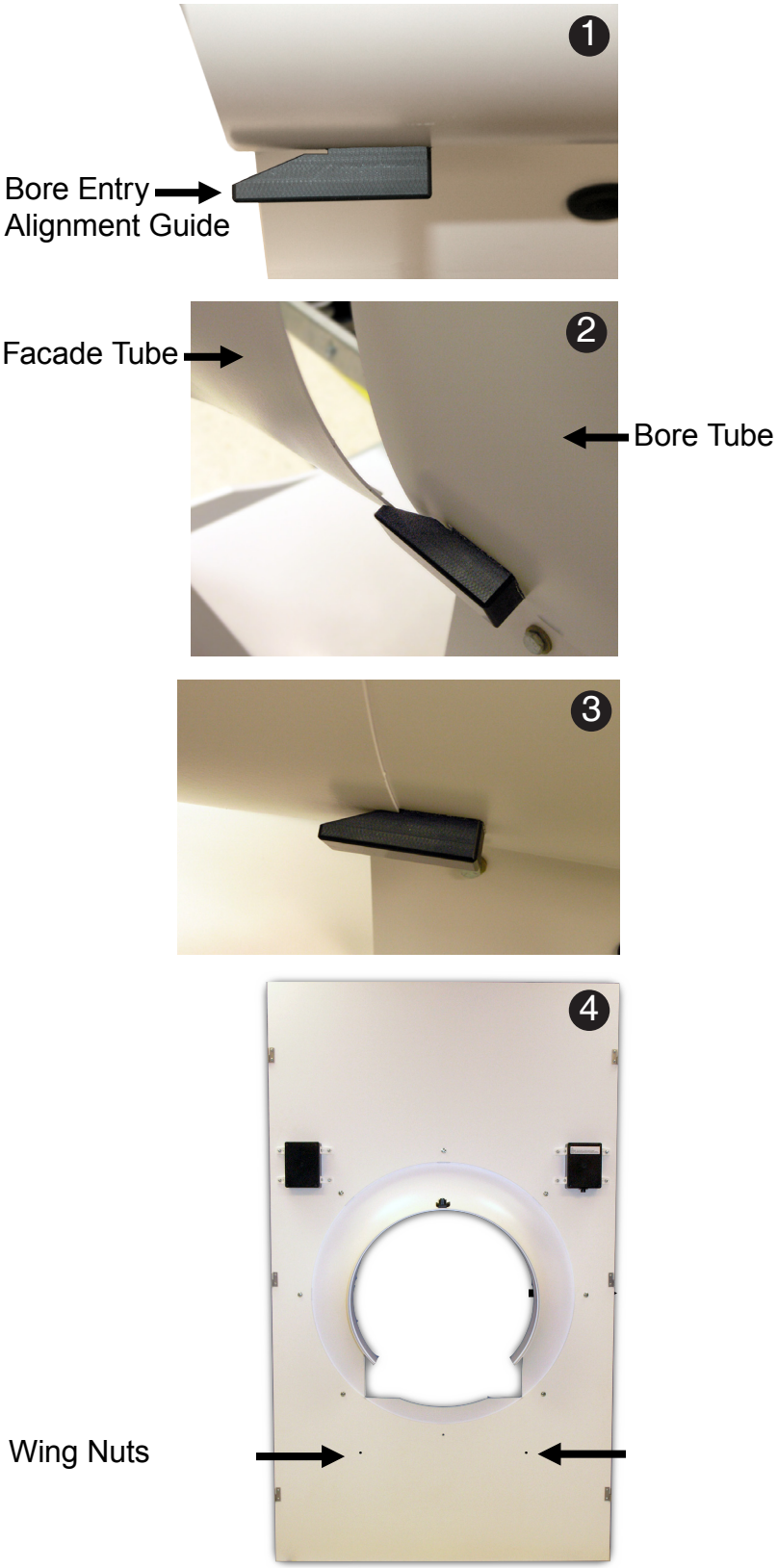
Assembly of the Facade Tube onto the Bore Tube.

1) *Locate* the two (2) black plastic **Bore Entry Alignment Guides** on the undersides of the Bore Tube front.

2) *Fit* the **Facade** onto the **Bore** section so that the lip on the Facade Tube goes over the Bore Tube.

3) Start at the top and work your way down on both sides.
You may have to **gently pull on the Facade Tube** once you get towards the bottom.
Slide the Facade Tube into the **Bore Entry Alignment Guides** as shown to the right.

4) There are two (2) **Bolts with Hinged Covers and Wing Nuts** that help align and hold the Facade in place.
Insert the bolts from the front and hand tighten the Wing Nuts.

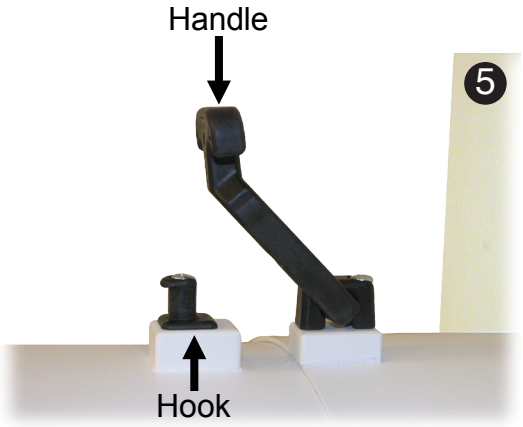


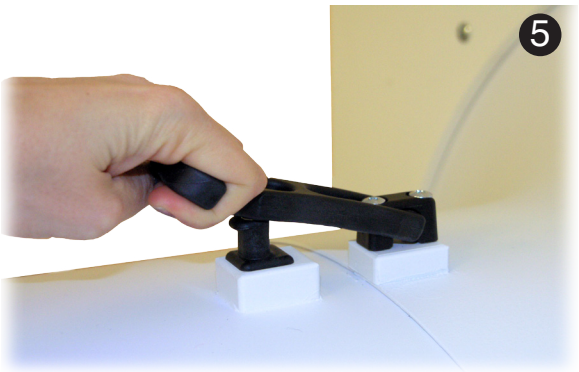
Chapter 3: **Hardware Setup**

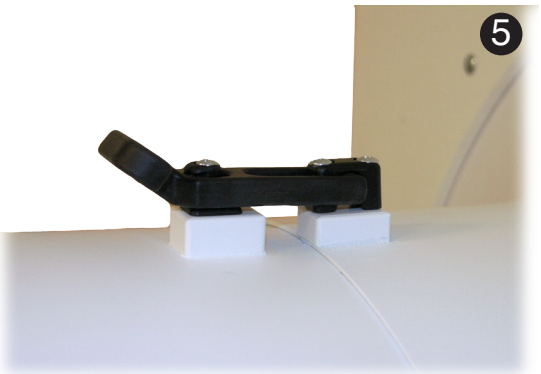
3.2 Facade and Bore Tube Continued

Assembly of the Facade Tube onto the Bore Tube.

5) The top of the Facade has a **rounded t-shaped rubber handle** that must be *pulled outward* and *down* to properly latch onto the hook mounted on the Bore.







Chapter 3: **Hardware Setup**

3.3 Bore and Participant Table Base

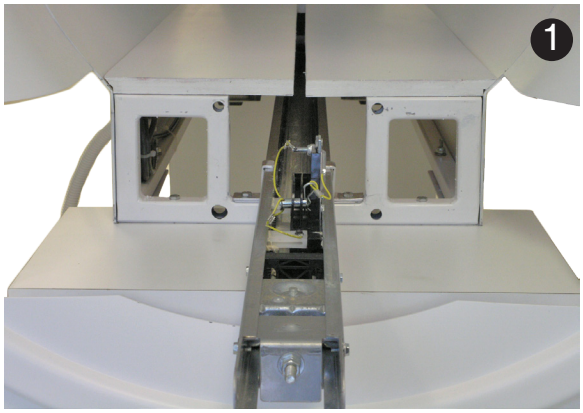
Assembly of the Participant Table Base onto the Bore section.

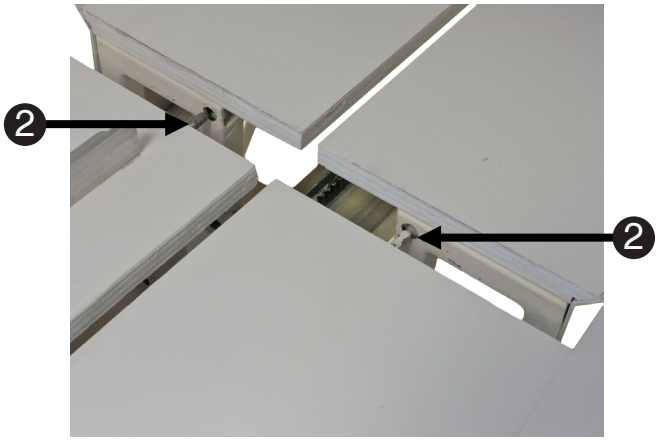
1) Now fit the **Participant Table Base** through the Facade onto the **Bore section** as pictured to the right.

2) There are **guide pins** on the Participant Table Base that must be aligned with holes in the Bore section.

   In order to connect the **Participant Table Base** and **Bore sections**, *align* the guide pins and *push* the Participant Table Base from the other end.

   You will need to use a moderate amount of force to connect the two (2) pieces together.





Chapter 3: **Hardware Setup**

3.3 Bore and Participant Table Base Continued

Assembly of the Participant Table Base onto the Bore section.

1) *Slide* the **Participant Table Base** onto the **Bore section**\ until it fits snugly against the Bore.

   Then, go underneath the Bore section and *insert* the two (2) **Table Locking Alignment Knobs** (shown at the right) and *turn* them *clockwise* to secure the Participant Table Base to the Bore.

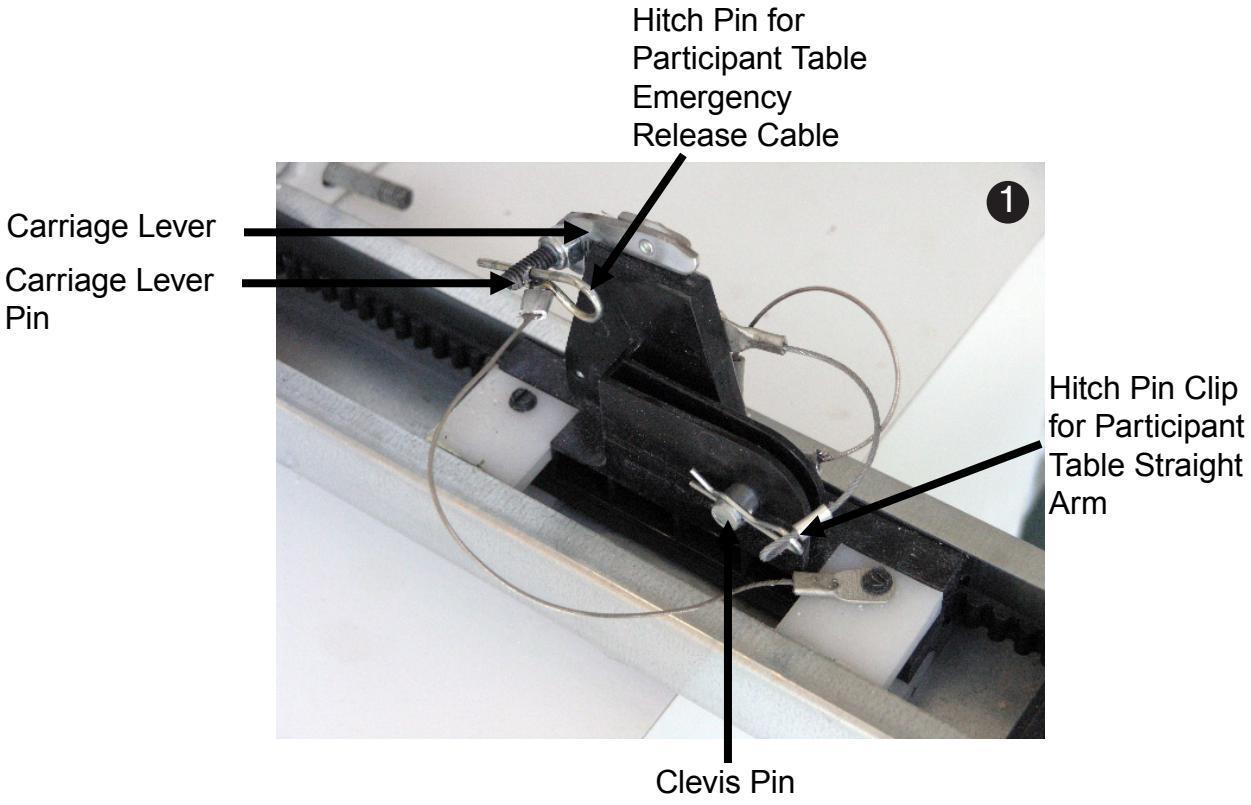
Table Locking
Alignment Knobs

Chapter 3: **Hardware Setup**

3.4 Carriage Assembly

Assembly of the table motion linkage on the Carriage Assembly of the Bore.

1) Identify the necessary components of the table motion linkage on the **Carriage Assembly** of the Bore section.



Chapter 3: **Hardware Setup**

3.4 Carriage Assembly Continued

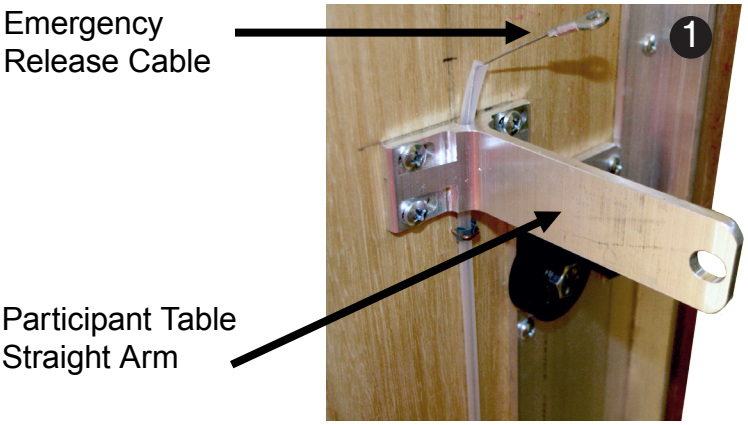
Assembly of the table motion linkage on the Carriage Assembly of the Bore.

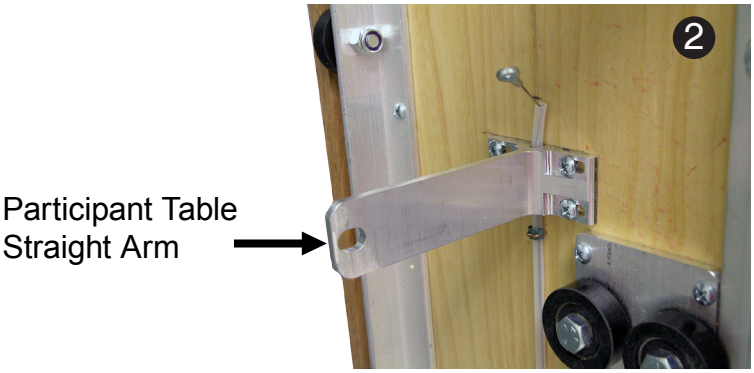
1) *Identify* the necessary components of the linkage on the underside of the **Participant Table**.

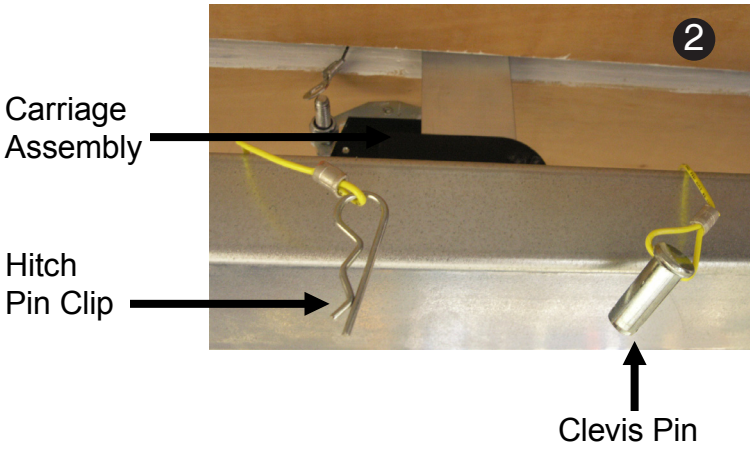
⚠ **NOTE:** *In the event you have difficulty reaching the Emergency Release Cable, we suggest using needle nose pliers.*

2) *Move* the **Participant Table** into position over the **Carriage Assembly**, which is under the Bore base and attached to the Bore section. (*shown at the right*)

   The **Participant Table Straight Arm** should fit down inside the Carriage Assembly.







Chapter 3: **Hardware Setup**

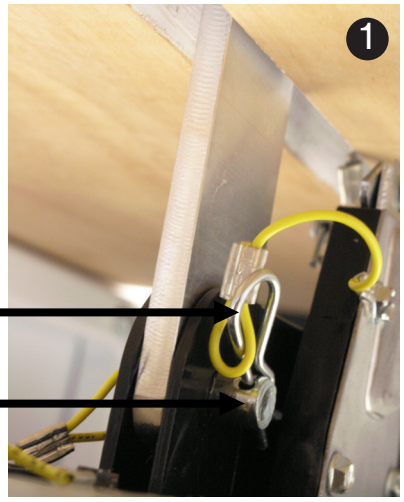
3.4 Carriage Assembly Continued

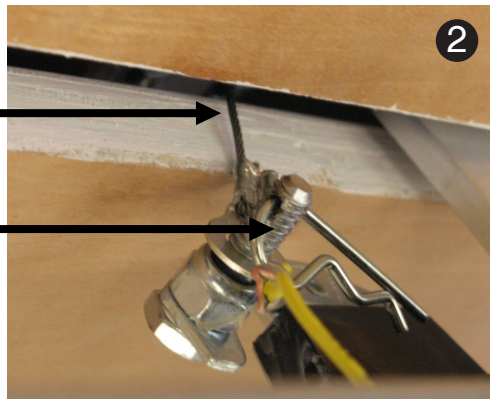
Assembly of the table motion linkage on the Carriage Assembly of the Bore.

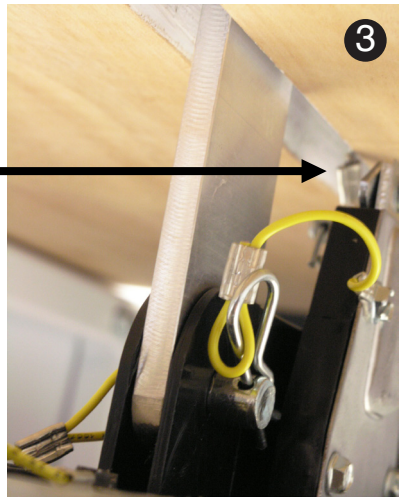
1) Once the Participant Table Straight Arm is properly seated in the Carriage Assembly, *pass* the **Clevis Pin** through the opening and secure it in place with the **Hitch Pin Clip**.

2) *Attach* the **Emergency Release Cable** to the **Carriage Lever Pin** using the **Hitch Pin** to keep it securely in place.

3) The figure at the right shows the finished Carriage Assembly with the Participant Table Straight Arm attached in the forefront.







Chapter 3: **Hardware Setup**

3.5 Control Panel Assembly

Assembly of the control panel mounted on the Facade.

1) *Attach* the **Control Panel Power Cable** that runs along the side of the Bore to the rear of control panel that is mounted on the Facade.

2) When connected you may plug the Simulator into the power source for use.

Chapter 3: **Hardware Setup**

3.6 Extension Panels Assembly

Assembly of the Extension Panels to both sides of the Facade.

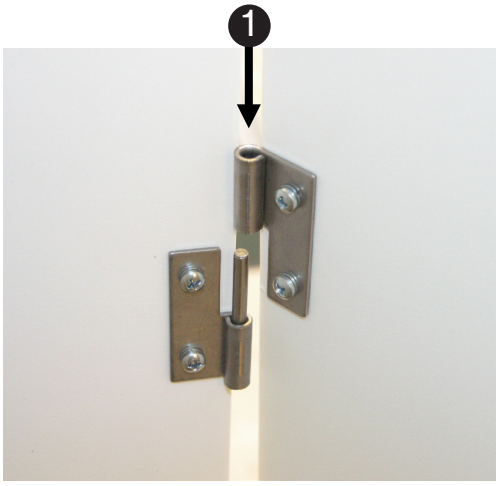
1) *Align* top, middle and bottom **hinges** on the **panel** to top, middle and bottom **hinges** on the **Facade**.

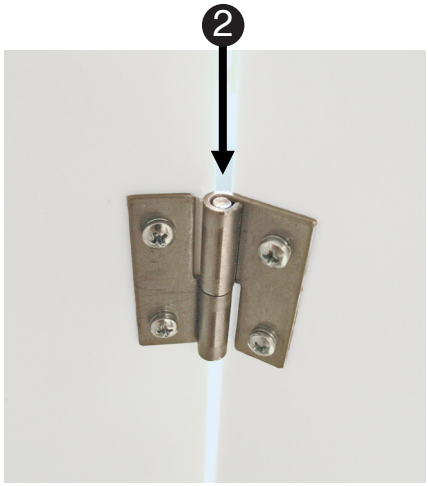
2) Once the hinges line up they will fall into place, as seen at the right.

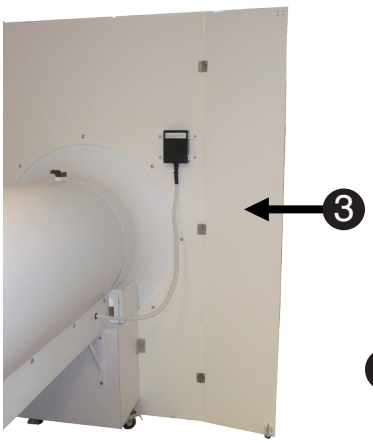
   Repeat with other side.

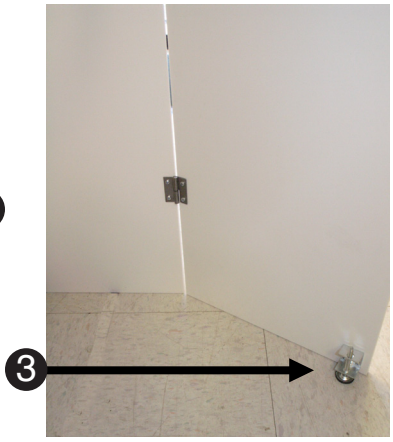
3) When the panel is in place and adjusted to your preference, adjust the **floor stop** to keep panel in place.

   Repeat with other side.









Chapter 4: **Operating Instructions**

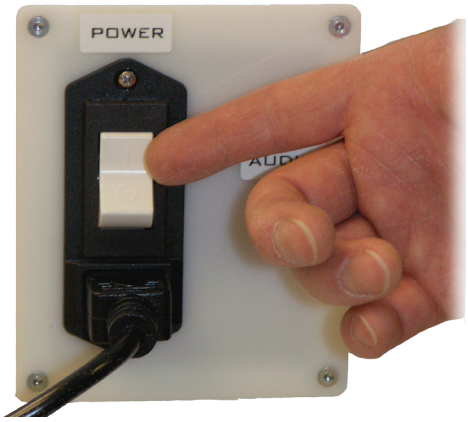
4.1 Power Supply

The power supply for the Simulator is located towards the rear of the Bore section on the same side as the control panel. The power switch is a manual reset circuit breaker.

⚠ **NOTE:** Make sure the power switch is in the OFF position before attaching the Power Cable. (*See figure below*)

Plug the Power Cable into the outlet located below the power switch.

When instructed, move the power switch to the ON position.



Chapter 4: **Operating Instructions**

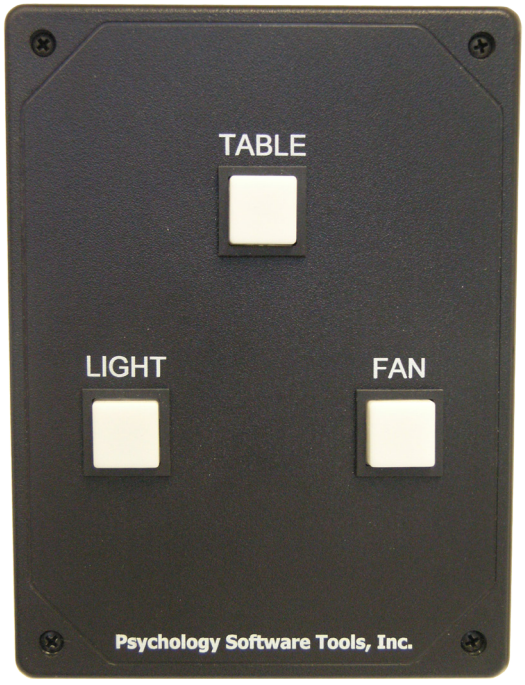
4.2 Control Panel Instructions

There are three (3) buttons on the Control Panel:

1) An *on/off switch* to control the Lights.

2) An *on/off switch* to control the Fans.

3) A *momentary button* to move the Participant Table in and out of the MRI Simulator Bore.



Chapter 4: **Operating Instructions**

4.3 Fans

Two (2) fans are located on the Simulator Bore. They are operated by a lighted ON/OFF switch located on the control panel. When active, the light switch on the control panel will be illuminated.

4.4 Lights

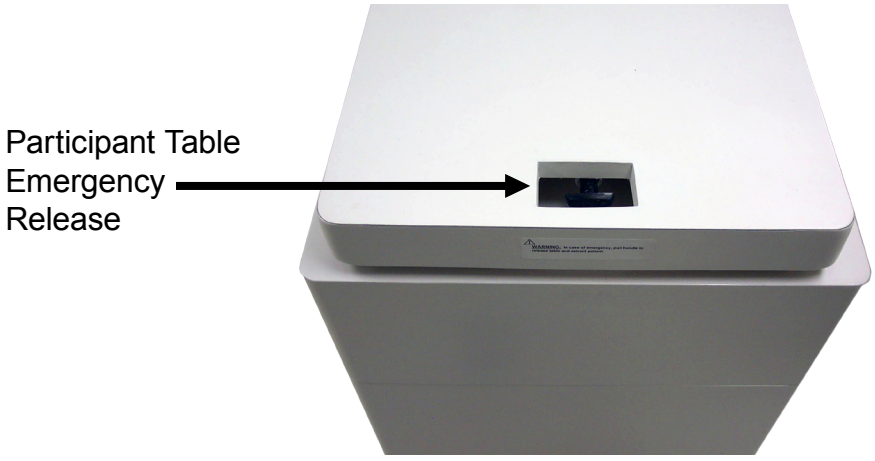
Lights are located in the Simulator Bore. They are operated by a lighted ON/OFF switch located on the control panel. When active, the light switch on the control panel will be illuminated.

4.5 Participant Table Instructions

A single press of the Table button on the control panel moves the Participant Table into the Bore. Pressing the switch again stops the Participant Table and pressing it one more time will cause the Participant Table to move out of the Bore. The Participant Table will move slowly upon initiation and will slow again when coming to a stop. The Participant Table is equipped with a safety mechanism to reduce the likelihood of injury. It will automatically stop the Participant Table if it encounters too much resistance.

4.6 Participant Table Emergency Release Test

There is an emergency safety release at the foot of the Participant Table (see below) that will release the table from the mechanism, allowing it to be moved manually. Pulling the knob towards the foot of the table releases the table from the Carriage Assembly. To re-attach the table slide the Participant Table forward with a moderate amount of force until you hear the table lock back into the Carriage Assembly. Pull on the Participant Table to verify it has locked back in place.



Chapter 4: **Operating Instructions**

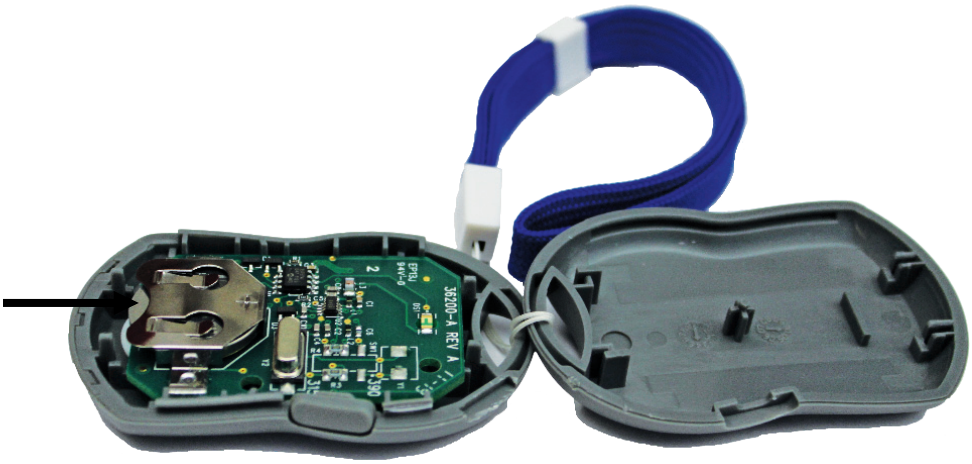
4.7 Participant Table Remote Control

Test the Participant Table Remote Control (*pictured below*).
To use, press the white button once to move the Participant Table into the Bore, press the button again to stop the Participant Table, then press the remote control button once again to move the Participant Table out of the Simulator Bore.

This can be a useful tool for researchers doing self testing or piloting experiments. This also provides anxious participants an element of control by allowing them to move themselves out of the Simulator.

The Remote Control is battery operated so periodic battery replacement will be necessary. The battery can be accessed by opening the Remote Control casing. Slide a coin into the slot located near the remote's base.
⚠**NOTE:** *A wide straight bladed screwdriver could also be used in place of a coin.*

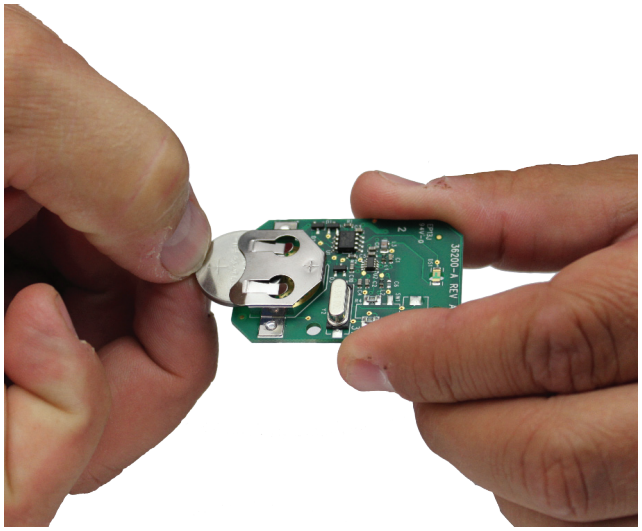
Twist the coin to rotate and open the casing.



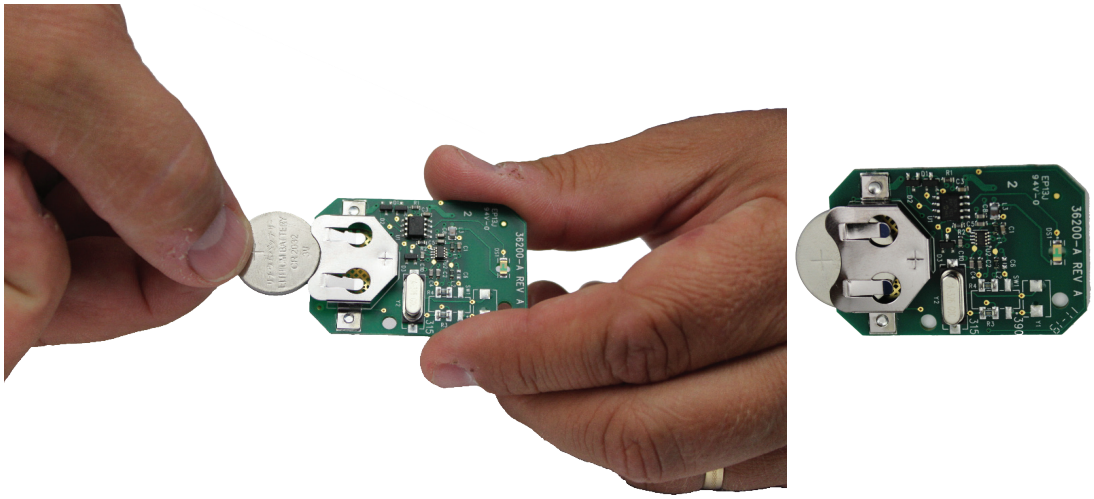
Once the casing is opened, the battery can be replaced.

Chapter 4: **Operating Instructions**

Hold the circuit board by its edges and remove the battery by pulling it out of the housing.



Replace the battery. ⚠ **NOTE:** *Insert the battery PLUS(+) side up as shown.*



Position the circuit board over the white button inside the casing, as shown. Squeeze case firmly together to snap both halves closed.

Chapter 4: **Operating Instructions**

4.8 Speakers

The Simulator speakers can be driven by your computer audio card or any compatible sound source.

The sound input is located on the side of the Simulator Bore behind the control panel.

Computers supplying scanner sounds can use SimFx software to play ambient magnet room sounds optionally mixed with realistic scanning sounds.

The Simulator audio system is for simulated scanner sounds only and is not to be used as a substitute for an audio stimulus presentation system for the participant.

For the optimum performance we strongly recommend the use of two (2) computers in the Simulator environment. One computer to supply the ambient scanner noise and one as your stimulus presentation computer.

4.9 Speaker Testing

With the Male to Male 1/8 inch Audio Cable (provided), attach a sound source (PC with Sound card, cd player, etc.) to the Simulator through the **Audio Input** jack located on the power panel at the rear of the Bore. The volume on the speaker system is set at the highest magnitude. You will need to do all of your fine volume adjustments from the sound source volume and sound controls.

Audio Input to Speaker System

Chapter 4: **Operating Instructions**

4.10 Proper Placement of the Participant into the Simulator

The following section is intended to help the researchers get optimal results from the use of their MRI Simulator. This is by no means an exhaustive list of proper or common simulator practices and procedures. It is intended to provide insight and suggestions to improve the simulator environment.

The operator should go through all of the steps that an MR technician would normally go through in a normal scanner session. They should include all items such as ear plugs and headphones, performing a standard screening just as they would in a normal scanning environment.

Be sure to explain the expected experience and all aspects of the test for the participant before conducting any testing. They should be allowed to handle the stimulus response devices, view the stimulus presentation system and any other critical aspects of the scanner environment.

If the participant is to be given the Participant Table Remote Control or any emergency device, instruct them on its usage and allow them to use it several times to assure their comfort and confidence of use.

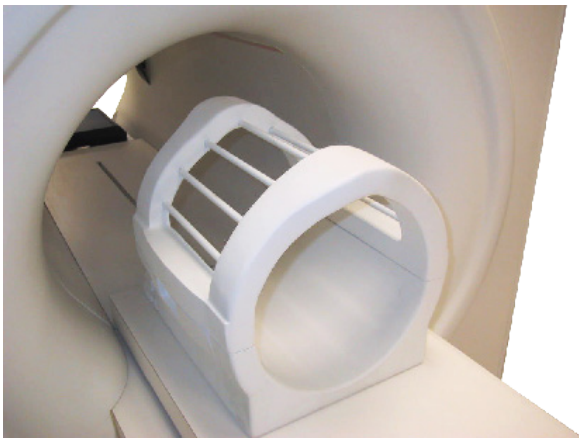
Upon completion of the experiment and withdrawal of the participant from the Simulator, give an exit interview to the participant. Exit interviews provide valuable information that might highlight potential problems that may occur in the actual MR runs (feelings of panic, discomfort, etc.) and can be used as feedback to improve the simulator environment.

Explain any differences between the simulator and actual scanner experience. Some examples might be; room temperature, separation of the scanner and control rooms, and the presence of additional staff.

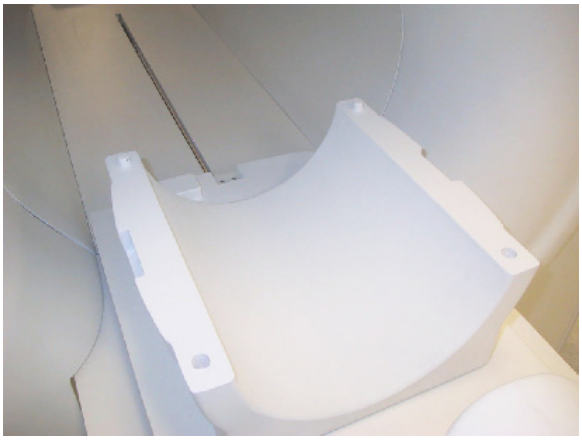
Chapter 5: **Accessories**

A: Mock Head Coil

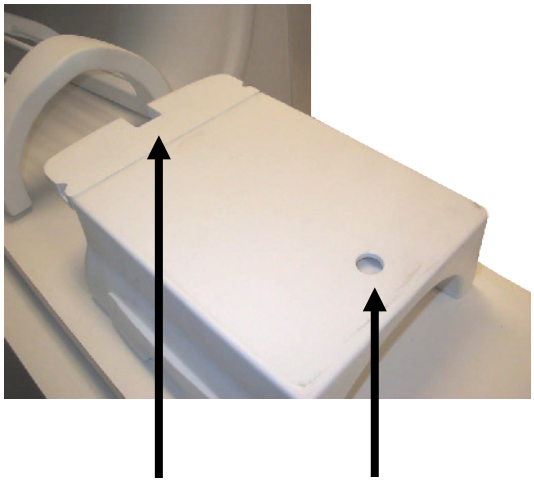
The MRI Simulator Mock Head Coil (below) is a two (2) piece unit designed to allow easy participant placement and simulation of “birdcage” style head coils used in actual MRI scanners.



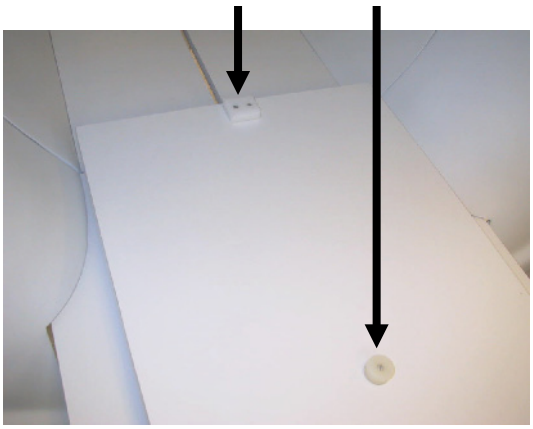
The top piece of the Mock Head Coil is easily removed for participant placement.



Chapter 5: **Accessories**



When placing the head coil on the participant table, align the notches on the underside of head coil with the two (2) corresponding tabs mounted on the participant table pictured below.



Chapter 5: **Accessories**

B: MoTrak Installation

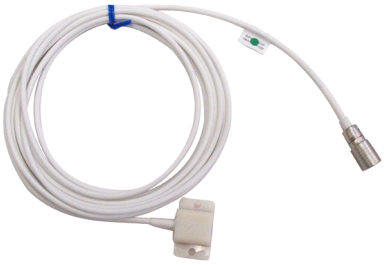
Chapter 5: **Accessories**

Equipment supplied for the MoTrak Head Motion Tracking System

Shelf Mounted Console

MoTrak Console Power Supply

Transmitter



Sensor

Headbands

Chapter 5: **Accessories**

6 Foot USB Cable

16 Foot Extension, USB Active Extender

10 Foot Serial Cable

20 Foot Cable Assembly, HD15 male to male

Supplemental Hardware Manual and Drivers

Manual, CD and Hardware Key

Tools needed for the MoTrak Head Motion Tracking System

- A screwdriver to mount the shelf on the Bore.

Chapter 5: **Accessories**

1) The Simulator must be assembled prior to setting-up the MoTrak System.

2) The first step is to mount the MoTrak console on the rear of the Bore. The shelf and the Bore are pre-drilled (Refer to **Figures 1** and **2** below).
Align the pre-drilled holes with each other and insert the provided screws and tighten. Do not over tighten.

⚠ **NOTE:** This shelf may come pre-installed.

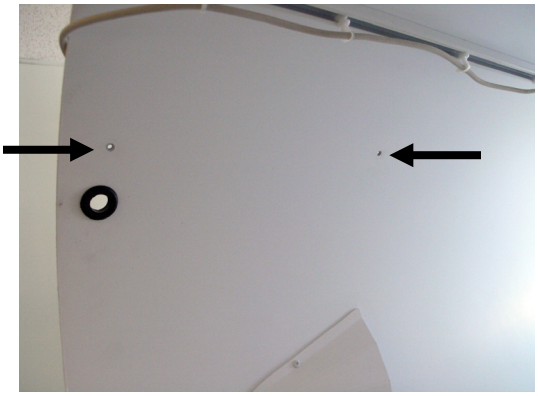


Figure 1
Left Side of Bore

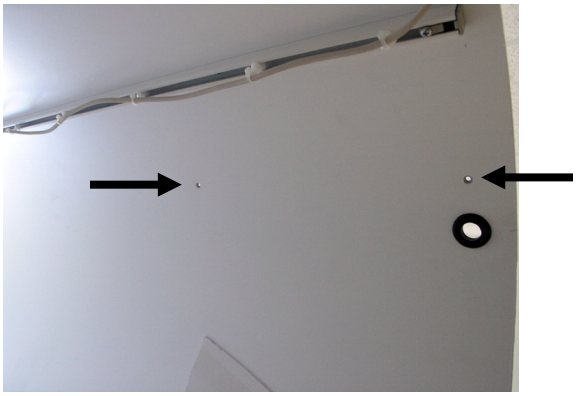


Figure 2
Right Side of Bore

Figure 3
Completed Installation — shelf mounted with MoTrak

Chapter 5: **Accessories**

3) The transmitter mounts on two (2) pins located inside the rear of the Bore. (Refer to **Figures 4** and **5** below).

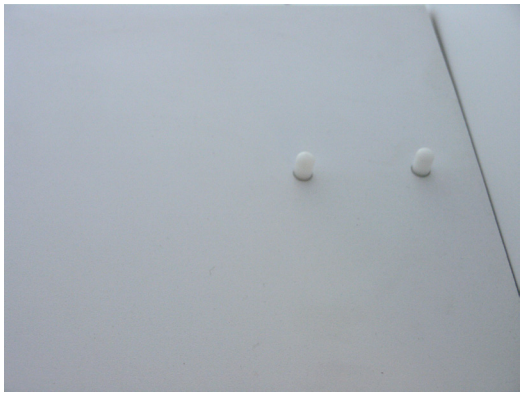


Figure 4

Figure 5

4) The sensor is pre-mounted on a sliding track and no other modifications are necessary except to uncoil the cable.

5) Connection to the MoTrak:
Refer to **Figure 6** for the following steps:
A. Plug the Transmitter into the port marked Transmitter on the front of the MoTrak console.
B. Plug the Sensor into Sensor Port 1 on the front of the MoTrak console.

Figure 6

Chapter 5: **Accessories**

Refer to **Figure 7** for the following steps:

C. Plug the Power Supply into the port on the right rear of the MoTrak console.

D. Plug the 6 foot USB Cable into the port marked USB on the center rear of the console.

⚠ **NOTE:** If the USB cable is not long enough to reach the PC, plug the USB cable into the USB Active Extender.

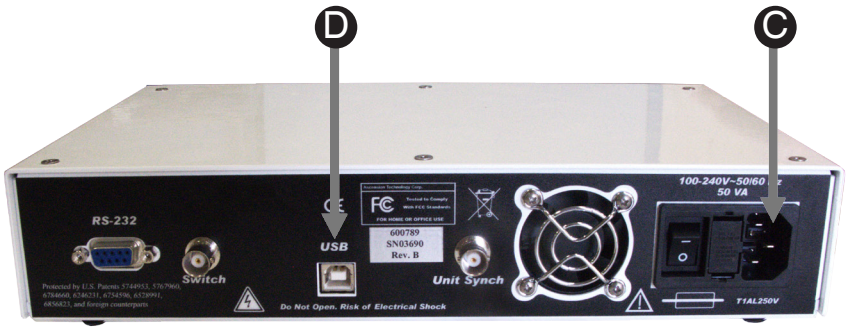


Figure 7

6) When the sensor cable is not in use it is designed to mount on the front of the Simulator so that it will not become damaged by the Participant Table being moved in or out of the Bore (Refer to **Figure 8** below).

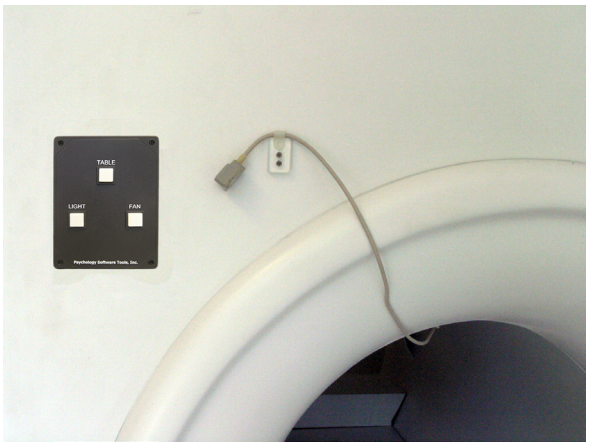


Figure 8

Chapter 5: **Accessories**

7) When the sensor is in use and connected to a participant it is designed to mount on the rear of the head coil. (Refer to **Figure 9** below).

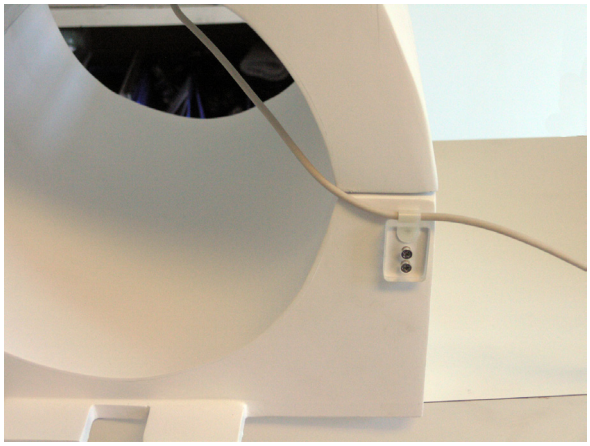


Figure 9

8) **Figure 10** shows the headband connected to the sensor. It is recommended that the sensor be placed on the participant's forehead with the headband around the circumference of the head.

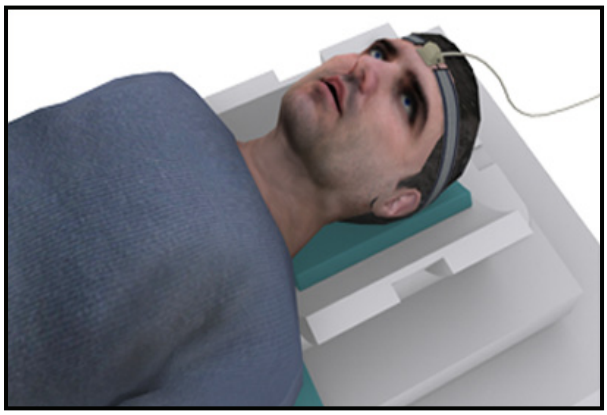


Figure 10

Chapter 5: **Accessories**

C: SimFx

SimFx software simulates the ambient scanner sound and the active scanning noise.
The player allows two (2) sound files to be played at once. It also has the capability to accept input from an experimental paradigm which can be used to simulate how the scanner synchronization pulse triggers an experiment.

Supported file formats

.wav, .mpa, .mp2, .mp3, .au, .aif, .snd, .wma

Included files

AmbientNoise.wav, GEScannerSound1.wav, GEScannerSound2.wav, GEScannerSound3.wav

File locations

C:\Program Files\PST\BrainLogics\SimFx\Sounds

Serial Communications

The serial communication settings can be used to configure your serial port to listen for outside input. They can be accessed via the File menu under Configuration… Below is a list of serial communication settings and a brief description of how they function.

⚠ **NOTE:** *It is unlikely that you will need to change your default configuration settings.*

COM Port: This option designates which port you want the program to use to communicate.

Baud Rate: This option controls the number of data bits per second that are transferred via the selected port.

Data Bit: This option will change the number of data bits you want to use for each character that is transmitted and received.

Parity: This controls the type of error checking the device performs. Please be advised that the computer or device you are communicating with must have the same setting as what you chose here.

Stop bit: Changes the time between each character being transmitted.

For more information about what specific configuration settings do, please consult the help provided by your OS.

The address of your port can be found by selecting “System” from the Windows Control Panel, clicking on the Hardware tab, clicking on the Device Manager button, and navigating to Ports. Select the serial (COM1, COM2, etc.) port to which your device is connected, click the Properties button, and select the Port Settings tab.

Here the current settings of the port will be shown. The SimFx configuration settings should match the port setting in order for your serial port to be enabled. Otherwise, the program will prompt you that the serial communications are disabled.

D: Contact Information

For additional information or support

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Phone: 412.449.0078
Fax: 412.449.0079
www.pstnet.com

For product support and technical issues
Please e-mail us at
info@pstnet.com

To report a medical emergency that is suspected to be caused by a MRI Simulator failure call **412-449-0078** ext. **1441**.

For failure outside of normal business hours, please call **888-540-9664**.