

DONDERS
INSTITUTE



FUNCTIONAL DESCRIPTION OF MRI-LAB EQUIPMENT

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Overview equipment MRI-lab

Go To



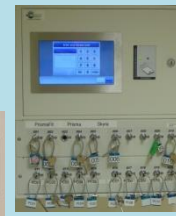
Technical Room



Scanner Room



Control Room



Click on a picture or info-icon to jump to info about the device

AA-Joystick (Home-made & Curdes)
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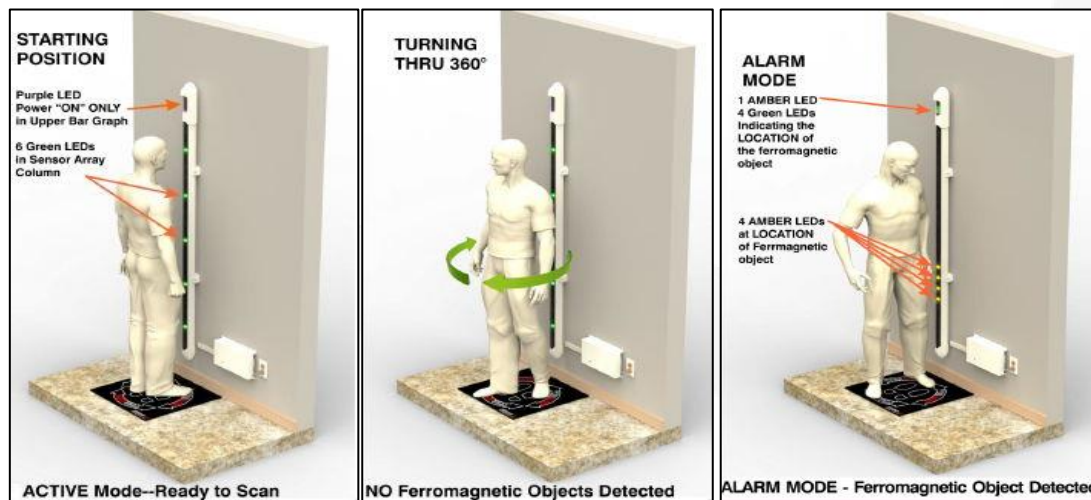
Eyetracker-SMI
Ferromagnetic detector
Foot Response Home-Made
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In Room Monitor
Infra Red Light Source Eyetracker
Insert Earphones
Install/uninstall Projection Screen or
BOLDscreen
KeySafe
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Physiological sensor – Electrode
Physiological sensor - Respiration Belt
Physiological sensors - Galvanic Skin
Resistance
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Ferromagnetic detector

To reduce the risk that, after screening, still an ordinary object suddenly becomes an unintended projectile could become a hazard to either the subject, the researcher, the MR coils or the projection screen, a ferromagnetic detector has been installed in the MRI-lab. The device is intended to detect for smaller ferromagnetic objects, approximately the size of a typical hair pin or larger when the object is approximately 30 cm from the detector



Some important remarks

- Not any type of metal is detected. The **device is NOT a metal detector**. It detects only those materials that will be attracted to the magnet, like iron and nickel. Items made of aluminum, titanium, copper, brass and other non-ferrous materials will not trigger an alarm.
- Please note, that seemingly non-ferrous objects may have enough ferrous parts to activate the audible and visual alarms.
- The detector **only analyzes moving objects** containing ferromagnetic material. Stationary ferromagnetic objects will be ignored.
- The detector has shows the approximate location of the ferromagnetic material. Therefore, if a ferrous non-superficial or subcutaneous object is detected, further investigation is necessary.
- If any ferromagnetic material is discovered, the researcher has to determine the source of the offending object(s) and what needs to be done in order to proceed safely with the scanning procedure. If the exam is to proceed without the object(s) being removed, documentation must be made in the logbook (field: "error reporting") as to what caused the alarm and why the exam continued.

KeySafe

Only certified users (CFU) may operate the scanners. Others may only operate the scanner under the supervision of a CFU. Each CFU received a strictly personal PIN code. With this code, a CFU can access the key safe, which is located in the central control room. After successful verification of the PIN code key(s), assigned to the CFU, can be unlocked. The KeySafe will log actions like who took/returned which key, with date, time stamps. If necessary, the log file is use to trace who was responsible during a certain time/event.

With the keys, you can unlock the door of the scanner room. When finishing scanning the key must put back in the KeySafe. Your responsibility starts when you take the key and ends when you return it. Two keys per MRI scanner are available to avoid devious key exchange when scanning in a row. You can already take the other key from the KeySafe. When the other CFU returns his key, your responsibility starts.

Be aware when returning a key to put it in its original position. In case the key is not put back in its original, position an alarm will beep. The wrong position is marked with a red LED and the right position with a green LED for 10 seconds. If you are too late and the keys are locked again, please login and swap key!

The MRI-lab manager maintains the access rules of the KeySafe.

Keys 011 - 020 are the keys of the drawers of the cabinet in the Intake Room where drugs, used in studies, are stored.



Technical Info:

October 2019: Major upgrade, swap internal PC. OS is now W 10

Network:

00 : 18 : 7D : C3: AF : F5

DNS : keysafemri.dccn.nl

hostname : IQKEYCBNT11685

IP: 131.174.45.57

outlet : 121-24-21



Door switch

All scanner rooms have an entrance with two doors. The first door only has large handle (no lock). It serves two purposes: acoustic and safety. The second door is part of the cage of faraday. Around the door, copper springs ensure a good electrical contact between door and cage. This door also has a lock, which can be open with the key from the key safe.

Regarding the acoustic purpose, the first door, attenuate the noise level with 30 db.

Regarding the safety purpose of the first door, this door is equipped with electromechanical swing. By just pulling the handle of the first door, the swing will automatically open the door. After 15 sec. it will closes automatically again. In case the second door (cage of Faraday door) is open, a wheel mounted on the outer door, will also close (not lock) the second door. In this way, the second door is always closed after 15 second and therefore prevent people (who are not aware of the strong magnetic field) to enter unnoticeable. Of

course, the Certified User is responsible for who is entering the scanner room but due to his/her preparation activities, and with the door wide open, this can happen easily.

Once the second door is closed by the first door, it can be easily opened again by a small push against the second door. It takes a second before the swing opens the first door. Hence, the user has to wait a moment before the second door can be fully opens. When setting up equipment inside the scanner room the automatic function of the first door can be annoying. The automatic function of the door swing can be disabled, by putting the switch in position "1". The first door will be opened automatically and stays open until the switch is brought back in position "0".



The first door will also open by putting the switch in position "1". To close it put the switch back in position "0". By doing so, the user should be aware that the safety purpose of the first door ignored!

Electrical shutdown Emergency button



In case of a calamity in which people came in contact with electricity, or if there is an electrocution risk, the electrical power of the MR-scanner must be switched off by pressing the emergency button “ELECTRICAL SHUTDOWN”, which is situated in the console-room (see picture) and also in the scanner-room. By activating this button the power supply of the MRI scanner will be immediately switch off.

Only use this button in case of emergency.
It does not switch off the magnetic field!



Audio Amplifier (t.amp)



The audio amplifier drives the earplugs used to present auditory stimuli to the subject in the scanner. The input of the amplifier is connected to the Audio Mixer (output).

Use the audio mixer if case sound level for subject is too high/too low.

Only in exceptional cases you can use the level controllers on the front panel of the amplifier. Default position is markers at 12 o'clock position.



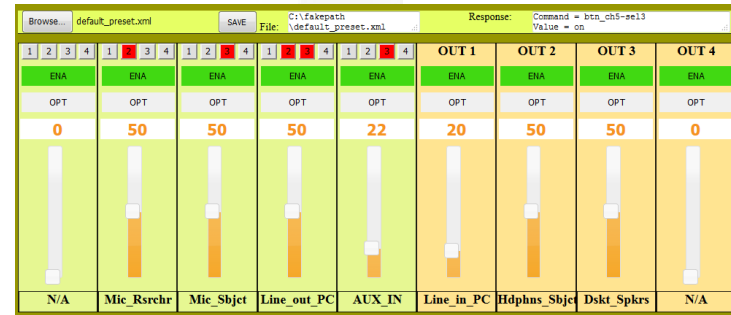
	Controls	Description
1,4	Input level controller for channel 1, 2	Use the input level controllers CH-1 (LEFT) and CH-2 (RIGHT) on the front panel to control the signal amplification in the respective channel
2,3	POWER: Power indicator light	Lights up green when the unit is turned on. In standby mode, the LED lights red. When the unit receives a signal again, it switches back to normal mode and the LED lights green again.
5	POWER: On / off switch	This switch turns the power on and off. When switching on the protection circuits are activated. After a few seconds you will hear two "clicks" - now the speakers are electrically connected to the amplifier and the device is ready to operate.



Audio mixer



The audio mixer is home-made (designed and build by Uriel Plones). It is able to mix 5 inputs to 4 outputs. The mixer is controlled via a web-application running on the EEG PC. Open the web-application by clicking the shortcut on the desktop of the EEG-PC named *Donders Mixer*. At this point, you have to open a preset file. Browse to D:\Mixer Presets and select one. When opening the *default_preset.xml* the inputs and outputs are labeled as in table below.



NOTE: To prevent clipping the keep the input slide of *Line_out_PC* below 50. To prevent noise, keep output slides below 80.

	Label	Despriction	Extra info
Input 1	N/A	Phantom Power Microphone input	Not connected – not used
Input 2	Mic_Rsrchr	Microphone beside MRI –host console	To speak press blue button
Input 3	Mic_Sbjct	Optical microphone mounted on MRI– table	Volume and level of noise-cancellation can be set op FOMRI (Opto Ascostics)
Input 4	Line_out_PC	Line in of mixer	Source is line-out of Stimuus PC
Input 5	AUX-IN	Line in of mixer	Connected to patch panel AUX-IN
Output 1	Line_in_PC	Line out of mixer	Goes to line-in of Stimulus PC for recording
Output 2	Hdphns_Sbjct	In-ear phones subject	Driven by audio amplifier (t.amp)
Output 3	Dskt_Spkrs	Logitech Desktop speakers	Has also a volume knob
Output4	N/A	-	Dual output – two lines out

Desktop Microphone & speakers



The desktop microphone (AV-Jefe PA 333D) and speakers (Logitech Z200) are connected to the Audio Mixer.

In de web application of the Audio Mixer the microphone is connected to INPUT 2 (Mic_Rsrchr). The speakers are connected to OUTPUT 3 (Dskt_Spkrs).

To speak to the subject in the scanner you have to press the blue button on the microphone continuously. When pressing all other audio sources connected to the subject headphone are muted.

To switch on the speakers, turn the Volume knob of the right speaker. A green LED will lit up. The right speaker has also a headphone output in case you do not want to disturb your colleagues.

Do not use the headphone output at the front panel of the Stimulus PC. This will mute the line-out of the stimulus PC.



Technical info:
H x w x d: 241.2 mm x 90 mm x 124.07 mm
Weight: 1 kg
Output (RMS): 5 W
3,5mm-input: 2
Headphone input

Video VGA switch (Extron)



The MVX VGA matrix switchers distribute high resolution video input signals to any combination of outputs. The matrix switcher can route multiple input/output configurations simultaneously. The available switch has a matrix size of 8 inputs by 4 outputs.

Only used functions are described. For descriptions of the other functions/buttons is referred to User Guide (press pdf logo)

2: Power LED – shows if power is connected.

3: Input buttons and LEDs - The input buttons and LEDs select and identify inputs.

4: Output buttons and LEDs - The output buttons and LEDs select and identify outputs.

5: Enter button — The Enter button saves changes when you set up a new configuration (see “**Creating a Tie**”)

7:I/O and Audio Setup button - Cycles through video and audio, video only, or audio only for input and output selection.

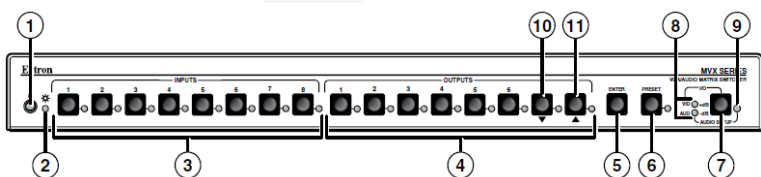


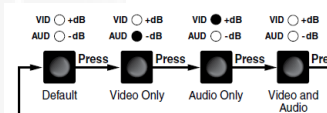
Figure: 2 Front Panel view.

Shown is a matrix switch with a matrix size of 8 inputs x 8 outputs is installed at Skyra. At Prima and PrismaFit the installed matrix switch has 4 outputs instead of 8.



Creating a Tie (or connecting an input to a output)

1. Press and release the I/O button to select (lit) or deselect (unlit) the Video LED, audio LED, or both as desired
2. Press and release the desired input button. (*LED lights to indicate that input is selected*)
3. Press and release one or more desired output buttons. (*The LEDs blink to indicate that the selected input will be tied to these outputs*)
4. Press and release the Enter button. The LEDs for the selected input and the selected outputs light steadily for approximately 1 second to indicate the tie and then turn off.



NOTE: If you wait for the 5-second input/output button timeout to occur after either step **2** or step **3**, the entire set of ties is cancelled.



Video VGA switch connections at PrismaFit

INPUTS		description	Extra information
1	Stim PC 1	VGA output of Stimulus PC (Primary display)	DVI output of video card. In Windows seen as Display 3
2	Stim PC 2	VGA output of Stimulus PC (Clone of main display OR extend display)	This output of the stimulus is disconnected. Hence extended displays are NOT possible anymore
3	laptop	VGA output of laptop (Connected via patch panel)	-
4	MRI Host	VGA output display of MRI Host (Clone of MRI Host Display)	-
5		Not connected	-
6	S-Video scaler	VGA output of S-video converter.	Via S-video switch 1 of 3 S-video sources can be selected
7	General Purpose	VGA output of General Purpose PC (Clone of primary display OR extend display)	In case stimulus software is used running on General purpose PC (eq. Unreal)
8	EEG PC	VGA output of EEG PC (Clone from primary display)	-

OUTPUTS		Description	Extra information
1	Monitor Stim PC	DELL monitor (wide screen) of Stim PC in control room	
2	Beamer	EIKI beamer located in technical room to project image on in bore screen	
3	Ext 01	VGA input of DELL monitor (wide screen) of General Purpose PC	
4		Not connected	



Video VGA switch connections at Prisma

INPUTS		description	Extra information
1	Stim PC 1	VGA output of Stimulus PC (Primary display)	DVI output of video card. In Windows seen as Display 2
2	Stim PC 2	VGA output of Stimulus PC (Clone of primary display OR extend display)	This output of the stimulus is disconnected. Hence extended displays are NOT possible anymore
3	laptop	VGA output of laptop (Connected via patch panel)	-
4	MRI Host	VGA output display of MRI Host (Clone of primary Display)	To use this option please read instructions
5		Not connected	-
6	S-Video scaler	VGA output of S-video converter.	Via S-video switch 1 of 3 S-video sources can be selected
7	General Purpose	VGA output of General Purpose PC (Clone of primary display OR extend display)	In case stimulus software is used running on General purpose PC (eq. Unreal)
8	EEG PC	VGA output of EEG PC (Clone from primary display)	-

OUTPUTS		Description	Extra information
1	Monitor Stim PC	DELL monitor (3:4) of Stim PC in control room	
2	Beamer	EIKI beamer located in technical room to project image on in bore screen	
3	Ext 01	VGA input of DELL monitor (wide screen) of General Purpose PC	
4		Not connected	



Video VGA switch connections at Skyra

INPUTS		description	Extra information
1	Stim PC 1	VGA output of Stimulus PC (Primary display)	DVI output of video card. In Windows seen as Display 2
2	Stim PC 2	VGA output of Stimulus PC (Clone of primary display OR extend display)	This output of the stimulus is disconnected. Hence extended displays are NOT possible anymore
3	laptop	VGA output of laptop (Connected via patch panel)	-
4	MRI Host	VGA output display of MRI Host (Clone of primary Display)	To use this option please read instructions
5	General Purpose LAB-MRI007	VGA output of General Purpose PC (Clone of primary display OR extend display)	To use for demo presentation running on this PC
6	S-Video scaler	VGA output of S-video converter.	Via S-video switch 1 of 3 S-video sources can be selected
7	General Purpose	VGA output of General Purpose PC (Clone of primary display OR extend display)	In case stimulus software is used running on General purpose PC (eq. Unreal)
8	EEG PC	VGA output of EEG PC (Clone from primary display)	-


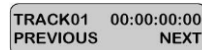



OUTPUTS		Description	Extra information
1	Monitor Stim PC	DELL monitor (3:4) of Stim PC in control room	-
2	Beamer	EIKI beamer located in technical room to project image on in bore screen	-
3	Ext Out	VGA input of DELL monitor (wide screen) of General Purpose PC	In case, two subjects (one inside and one outside the scanner) has to see the stimulus.
4		Not connected	
5		Not connected	
6		Not connected	
7	LG Screen	VGA input of LG screen "Main" display	Input 1 of Scaler to be shown on Screen
8	PIP	VGA input of LG screen "PIP" display	Input 2 of Scaler to be shown on Screen





DV recorder



The DV recorder is a hard drive video recorder. In our case, it can record Analogue video sources (eq. Eye Camera or MRC in bore camera). The unit has a removable hard drive in a caddy, which can be ejected from the unit and connected to a PC via USB to transfer the video files. Below you find a description of the control button. Because audio is not connected, only video controls are described.



	Power On / Off Button. This is a soft power on / off button. The main power on / off switch is on the rear panel.
	Display Panel. The display will show Track Number, timecode, or if the Menu Button is pressed the Menu Display
	Menu Button. This calls up the menu display which is navigated using the Fwd / Rew Buttons and Previous / Next Buttons
	Fwd / Rew Buttons. In playback mode these buttons will operate as Fast Forward and Rewind Buttons. If the Menu Button is pressed these buttons will navigate backwards and forwards between the various menu options
	Video Input Button. Switches the DN-500 to Video Input – Analogue Video Inputs can only be recorded in DV formats.

	Previous / Next Buttons. These buttons navigate up and down between recorded tracks and menu options.
	Record Button. Puts the DN-500 into Record Mode. To start recording press the Record Button and Play Button simultaneously. <i>N.B. Unit will not record if no video signal is present.</i>
	Play / Pause Button. Starts playback of a track, or pauses playback of a track- status will be displayed on the Display Panel. Also Starts /Pauses a recording when unit is in Record mode.
	Stop Button. Stops playback or record.

The input source of the DV recorder can be selected by the pressing one of the 4 buttons on the small S-video switch. By pressing the Video Input button of the DV recorder, the DV input signal is also available at the output of the DV recorder and hence can be viewed on V1 of monitor B.

S-video switch + S-video to VGA converter



The 19" rack is equipped with a video scaler and an S-video switch. The scaler converts (scale) a video composite signal to a VGA video signal. In this way the composite video source, can be switched by the video matrix switch (Extron). In this way, all video sources available at the S-video switch can be switch to eq. beamer.

The small composite switch is a high-performance switcher for composite video signals. It mechanically switches any one of four signals to a single output. The output feeds the input of the DV recorder and to the wall mounted monitor in the scanner room.

Assignment of the 4 of the S-video switch:

- 1 = EYE CAMERA
- 2 = NOT CONNECTED
- 3 = EYELINK
- 4 = MRC CAMERA (if connected – see info))

Dual Display



The Datavideo TLM-702 is dual 7" TFT Monitor with the following features:

- Each monitor has two composite video inputs with bypass outputs.
- High resolution TFT Screens - 1440 x 234 dots
- Switchable Aspect Ratio - 16:9 / 4:3 selectable
- NTSC/PAL compatible (Automatic switching)



The two sources to be viewed on Monitor A are:

- V1 – SMI eyetracker camera
- V2 – MRC in-bore camera

The two sources to be viewed on Monitor B are:

- V1 – output of DV recorder*
- V2 – not connected

**If not playing back previous recorded tracks, the display shows the video source selected by the S-video switch Video Input button of the DV recorder is pressed.*

Response Box Interface (fORP 932)



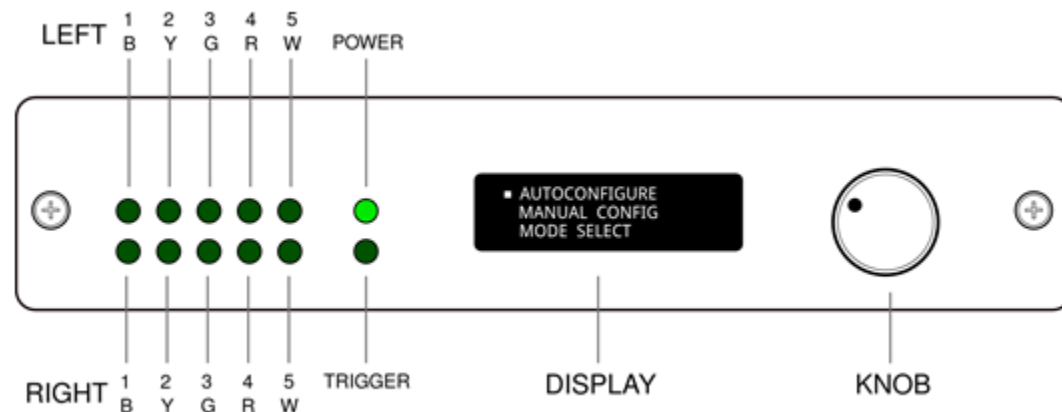
The 932 supports many different handheld devices, and can produce many different types of outputs

The 932 has three outputs.

1. serial output is connected to COM1 of the Stimulus PC.
2. 8-bit TTL output (default) is connected to one of the BTSI's (S-BTSI)
3. USB output to connect the interface to a laptop. It acts like a keyboard HID keyboard)



The TTL output is always connected. The use of the serial output or USB output depends on the selected MODE



The 932 front panel uses a shaft encoder and display to let the user choose among many operating modes, and also displays real-time activity using a bank of 10 green LED indicators. The shaft encoder works together with the display to allow choices from menus, using clockwise and counter-clockwise rotations and a push-click for selections.

USB HHSC-2x4-C HID KEY 12345	← Hardware interface type ← Handheld model number ← Mode Identifier + mode number
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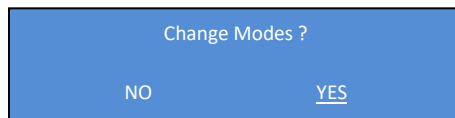
- CONTINUE -



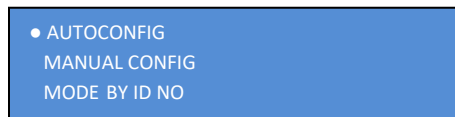
Response Box Interface (continue)

HOW TO CONFIGURE

Setting up the 932 is a matter of making connections and choosing the output you want. Pushing the knob, would cause the display to change



If "YES" is selected (by turning the knob), choices are presented on the display



The three ways of configuration the fORP are described in the manual. Here only the **AUTOCONFIG** is describe.

NOTE: Configuration with AUTOCONFIG is only possible when a proper working handheld of CurrentDesign is connected. Eq. the home-made AA-joystick cannot be configured with AUTOCONFIG. Also, in case one of the response buttons is pushed or broken, the AUTOCONFIG will fail.

Turn the knob to AUTOCONFIG and then press to confirm this choice. The display will change into:



If you want to connect the fORP to your laptop choose **USB**. *Press the knob to confirm*. The next menu shows all the available modes. The default mode is **HID KEY 12345**.

If you do not want connect to the Stimulus PC via the BTSI's choose for **SERIAL**. Eq. if you want to use the home-made AA-joystick. The display does not show the **TTL** as an option because the TTL output (8 bits) is ALWAYS connected to the input of the BTSI!

For an overview of all the available modes click.





Response Devices

Available handhelds at DCCN:



Website

**8 Button Bimanual
Curved Lines
HHSC-2x4-C
8 Buttons**



Website

**4-Button Diamond
HHSC-1x4-D
4 Buttons**



Website

**Grip Force
HHSC-1x1-GRFC-V2
no Buttons**



Website

**Joystick
HHSC- Tethyx
2 Buttons**



**AA Joystick
Home-Made
PJS – mode 651
no Buttons**



**Foot Response
Home-Made
HHSC-2x4-C
2 Buttons**

BTSl code for several response devices		
8 Button Bimanual	ASCII-code	character
right - index - blue	97	a
right - middle - yellow	98	b
right - ring - green	99	c
right - little - red	100	d
left - index - blue	101	e
left - middle - yellow	102	f
left - ring - green	104	g
left - little - red	105	h
4-Button Diamond		
blue	97	a
yellow	98	b
green	99	c
red	100	d
Foot Response		
Right	97	a
Left	101	e



**AA Joystick
CurDes – customer
no Buttons**

Foot Response Home-Made



If the participant cannot respond with finger/hand during your experiment, you can make use of the foot response device. A modified set of (old) handheld 2x4 button box is used. A plastic slab (5 cm x5 cm) is positioned just above the “index finger” button of the handheld. In this way, the participant can be easily press the small button with the ball of the foot or thick toe.



The frame of the foot response device can be easily mounted/fixated in the T-shaped groove of the patient table. By make, use of 3D joints between the rod and wooden slab the user has a lot of freedom regarding positioning of the buttons. Once the buttons are aligned, the bolts of the joints can be tightened with the clamp levers ¹⁾.

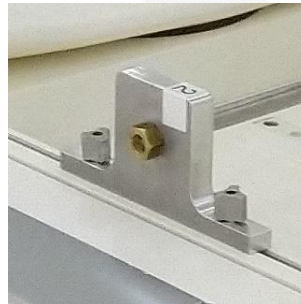
Connect the cable of the foot response device to the extension cable, also used for other response device. Due to the modification of the button box it will NOT automatically be recognized by the interface (fORP 932). Hence the researcher must configure it manually. (HHSC 2x4 C + Serial + ASCII 1234 or by selecting MODE 100)



Slide the bolts with flange in the T-shaped groove of the table.



Position the bolts at the end of the table.



Position device and tighten nuts by hand



With the clamping lever it is easily to lose or fixate the wooden slabs

¹⁾ Clamping levers are mechanical components, which allow efficient tightening and loosening of screws by turning the lever without the use of tools. Their best feature is the ability to work in tight spaces: just pull up the lever to release the threaded serration engagement This will stop the screw from turning even if the lever is rotated.

AA-Joystick (Home-made & Curdes)



Introduction

This, one axis, joystick can be used in a MRI-scanner as a response device to perform the Avoidance-Approach task. During this task, participants have to react on certain events by moving the joystick back- or forward as fast as possible. The joystick mechanism will encounter large forces during the back and forward movements. Therefore this joystick, called AA-joystick, has a rigid design.



The first two AA-josticks (red dome + black dome) were designed and made by our own workshop and contains the optical parts of CurrentDesign's first joystick (bought about 10 years ago). After several years of intensively use they will be replaced by a custom-made AA-joystick, designed and made by Current Design. With the experience buildup with our own design, Current Design made a very accurate and stable AA-joystick! From November 2019 the two "old" AA-josticks will be phased out and replaced by the ones made by Current Design.

To use the AA-joystick, the fORP must be configured as PJS (Programmer JoyStick) – mode 651. In this mode, the fORP is connected to the COM1 of the stimulus PC. During configuration, do not touch/move the stick (should be in the middle).

ScanTriggerBox



The ScanTriggerBox is a home-build interface box for a Siemens MRI scanner. The box provides a synchronization trigger for external devices, e.g. the stimulus computer and/or eyetracker. It extends the length of the scanner trigger, provides sufficient (TTL-level) output driving power and includes optical isolation between scanner and stimulus computer and/or other peripheral devices.

If the MRI scanner sends, a trigger depends on hardcode sequence settings. Hence not all sequences will generate triggers.



All of our EPI-sequences (home-made and Siemens) generated a trigger at the start of each volume by default.

Functionality of the keys

The ScanTriggerBox supports three modes selected by using UP and DOWN keys (default Div = 1)

Below an description of the functionality of the four keys and explanation of display:

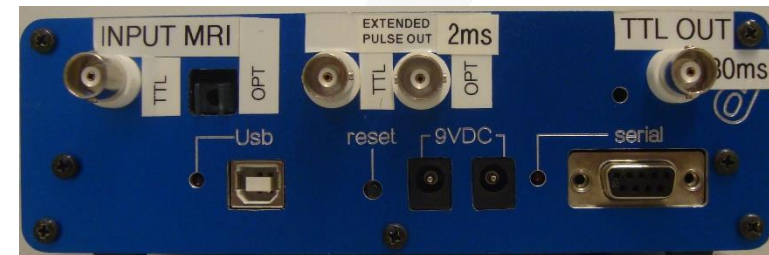
RESET	Reset the counters and sets the Div value on 1 (=default). Can be pressed at any moment. Does not influences in- and output signals	
TRIG	Generates manually a output trigger.	
UP / DOWN	increase / decrease the Div value	
Div = 0	Single Trigger Mode	only a single output trigger pulse for the first input trigger. All next MRI triggers will be suppressed.
Div = 1	Volume Trigger Mode	for each excitation pulse (= each volume in case of EPI-sequence) and output pulse is generated
Div = 2, 3,.....	Slice Trigger Mode	in case a special home-made sequences is used which generate scantriggers for each slice. By making Div equal to the number of slices a volume trigger mode is
#IN	Input pulse counter	Counter of input pulse (generated by MRI)
Div	Divide by	See above
#OUT	Output pulse counter	Counter of output pulse (depending on Div setting)

- CONTINUE -

ScanTriggerBox (continue)

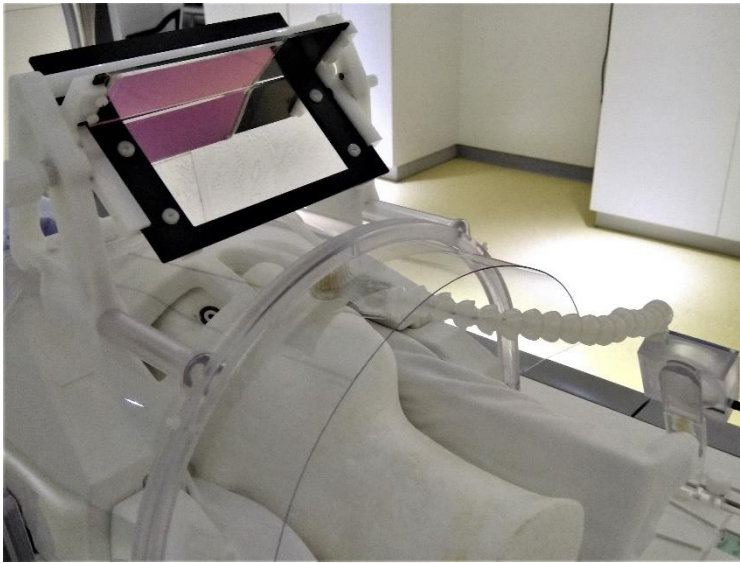
The pulse width of the trigger generated by the MRI is about $10\mu\text{s}$. This is far too short to be detected by other equipment with a logging functionality. Hence the scantriggerbox extend the width of the pulse. This is determined by the “slowest” device which needs to log the trigger. To be sure the SMI eytracker (sample rate 50 Hz or 20 msec) does not miss any of the scantriggers the width of the pulse is set to 30 msec.

Because the input signal is processed by an internal microcontroller the TTL output of the scantriggerbox is, relative to the scan trigger input, delayed. Only when performing combined fMRI-EEG measurement this delay can become critical when applying methods to correct the EEG data for the gradient/RF artefacts. Therefore, the scantriggerbox at the Skyra is modified. It has an additional TTL-output, which is directly related with the input from



the MRI scanner and NOT processed by the internal microcontroller. Internal delay is less than $1\mu\text{s}$ relative to the scan-trigger input. The width of the output pulse is extended to approximately 2 ms. The single shot triggering or divide-by-n triggering functionality is not available on this output.

Optical Microphone



This optical microphone is fully MRI compatible has adaptive noise cancellation, which makes it possible clearly hear your subject during scanning. In the first place this make speech recording (voice key) possible during fMRI. The microphone can also be used as a part of the intercom system, which makes communication with your subject DURING scanning possible.

For optimal results, ensure that the subject's mouth is as close to the pop-screen as possible.

Turn on the unit using the **POWER switch on the back** (left side) of the unit. A blue light should be illuminated behind the slots protecting the loudspeaker.

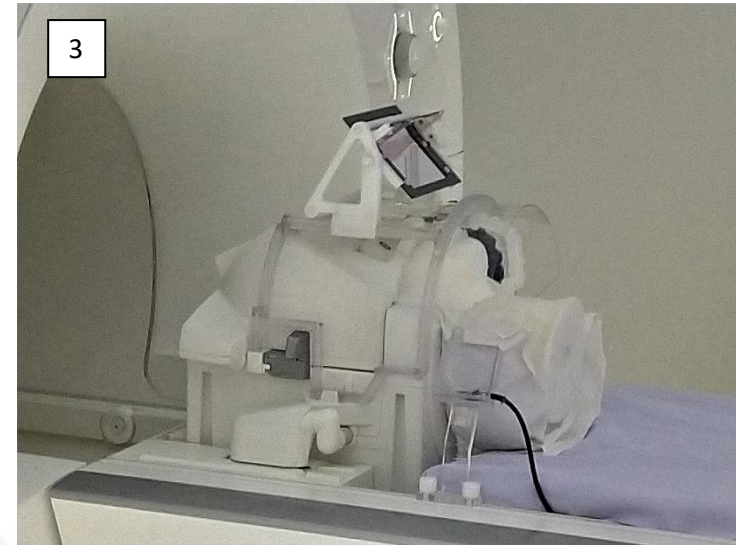
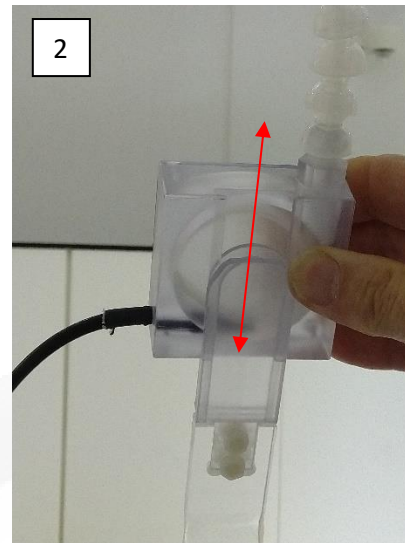
The subject's volume can be decreased by turning the volume knob to minimum. You should hear the voice emanating from an internal loudspeaker with a slight delay (16 msec.).

Set the Noise Reduction knob to level 3 as the default. Only in case where DSP (Digital signal Processor) introduces excessive reduction should it be switched to a lower level. Compare mode "0" and "3" during scan to learn about the Noise Reduction functionality of the system.



- CONTINUE -

Optical Microphone (continue)



Ad 1 In this way the fragile optic cable of the microphone must be stored. Take care you **wrap the cable spacious** over the bracket and not as tightly as the other cable in the picture. Put the base of the microphone stand in the small metal box fixed to the bracket (cable pointing down).

Ad 2 The base of the microphone can slide over an already installed bracket. The bracket can slide in the T-shaped groove of the table (first loose the nuts of the bracket). If you un-install the microphone please slide the bracket **as far as possible** to table (head) end.

Ad 3 This is how it looks after proper installation of the microphone. Notice the **cable runs underneath the mattress** to the table (foot) end to avoid it

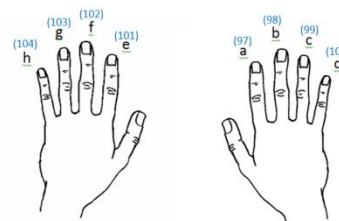


Dual BITSI's

A BITSI (Bit To Serial Interface) is a home-build interface which allows to control 8 inputs and 8 outputs via only one serial PC Stimulus connection. The interface is based on a microprocessor (Arduino). Two BITSI's are available. The inputs/outputs of first BITSI (S-BITSI) is fixed meaning the user cannot re-define it. LED's on the front panel shows the status of each input/output. The second BITSI (R-BITSI) is equipped with BNC connectors to connect TTL in- and outputs of peripheral equipment.



Button responses are registered by the S-BITSI as characters:



The 8 inputs of the pre-defined BITSI are the 8 response buttons which are available for a subject in the MRI scanner. The 8 outputs are reserved to send out an 8-bit code to the logfile of the Eyelink or SMI eyetracker and/or the BrainVision BrainAmp.

Communication between the Stimulus PC and two BITSI's is by serial lines (RS232). The S-BITSI is connected to COM2 and the R-BITSI is connected to COM3. For both serial lines following parameters should be used:

- baudrate: 115200
- parity : none
- databits : 8
- stopbits : 1

COM 2: S-BITSI is used for buttons and log-codes
 COM 3: R-BITSI is used for scantrigger

Finger	Button press (low to high)		Button release (high to low)	
	ASCII code	char	ASCII code	char
Right Index	97	a	65	A
Right Middle	98	b	66	B
Right Ring	99	c	67	C
Right Pink	100	d	68	D
Left Index	101	e	69	E
Left Middle	102	f	70	F
Left Ring	103	g	71	G
Left Pink	104	h	72	H



Dual BITSI's (continue)

The R-BITSI is used to send/receive TTL-pulses to/from peripheral devices. A sending device is for example the scantriggerbox. By default, the output of this device is connected to the 1st BNC input of the R-BITSI. Hence the Stimulus PC will receive the character “a” (ASCII code 97) on COM3 every time the scantriggerbox sends a trigger. The other seven independent input lines of the R-BITSI are available to receive signals from other peripheral devices.

The eight independent outputs of the R-BITSI can be used to control other peripheral devices. To trigger device located inside the scanner-room is preferable done via an optical fiber (=light). For this purpose, the first four outputs of the R-BITSI have also an optical output (parallel connected with the TTL outputs). For example, the shockerbox is controlled in this way. The BITSI firmware gives the user the option to program the output in pulse or level mode. Also the pulse duration can be programmed between 0-255 msec. With the two small push buttons located on the left side of the S-BITSI and on the right side of the R-BITSI the BITSI's can be reset to their default configuration.

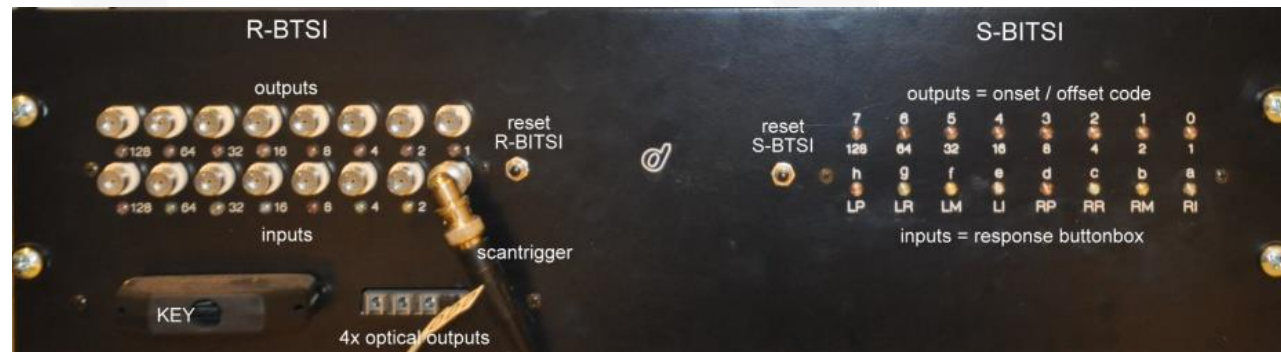
Logging to peripheral devices

The 19”rack houses beside the Stimulus PC also a SMI PC (will be phased out), a Eyelink PC and a EEG PC to measure respectively eye-movements and ExG/physiological signals. The SMI and EEG PC are equipped with 16 digital inputs. The Eyelink PC has only 8 inputs available (datalines of parallel port). These inputs are used to log onset and offset codes generated by the Stimulus PC.

At the SMI PC the 16 digital inputs are logged as one 16-bit word. Meaning if all 16 data inputs are high at the same time it will be logged as $2^{16} = 65536$.

At the EEG PC the 16 inputs are split up into two bytes (= 8 bits) a so-called S-byte and R-byte (both can be defined in BrainAmp workspace).

Inputs 1 to 8 of the SMI PC, the S-byte of the EEG PC and the data lines of the parallel port of Eyelink PC are reserved for receiving a code (0-255) send by the stimulus PC via S-BITSI output. Inputs 9-16 of the SMI PC and the R-byte of the EEG PC are define by the KEY connector.



- CONTINUE -



Dual BITSI's (continue)

Digital Input	Description		SMI PC Active Input is shown as		EEG PC Active Input is shown as		Eyelink PC
1	First bit	S-BITSI outputs	1	Decimal value of 16 bit word	S1	S-byte	1
2	Second bit		2		S2		2
3	Third bit		4		S4		4
4	Fourth bit		8		S8		8
5	Fifth bit		16		S16		16
6	Sixth bit		32		S32		32
7	Seventh bit		64		S64		64
8	Eight bit		128		S128		128
9	Scantrigger *	BITSI MIXER output	256		R1	not available	
10	Right Index *		512		R2	not available	
11	Right Middle *		1024		R4	not available	
12	Left Index *		2048		R8	not available	
13	Left Middle *		4096		R16	not available	
14	Not Connected *		8192		R32	not available	
15	Not Connected *		16384		R64	not available	
16	Not Connected *		32768		R128	not available	

* when default KEY connector is used

Table shows which values are logged by the SMI PC, Eyelink PC and the EEG PC when **ONE** of the digital inputs is high!

If eq. the code 200 is send by the Stimulus PC (via the S-BITSI) this is logged as "200" by the SMI PC and Eyelink PC and as "S200" by the EEG PC.

The scantrigger will be logged as "256" by the SMI PC and as "R1" by the EEG PC. The scantrigger is NOT logged by the Eyelink PC!

Due to the low acquisition rate of the Eyetacker (50Hz = 20 msec) it can happen that different events are logged at the same time and hence resulting in a "weird" decimal value. The decimal value has to be converted to a binary 16 bits word to find out which events occurred.

Eq. 1480 is the sum of 1024+256+128+64+8 › meaning inputs: 11-9-8-7-4 where high › meaning right middle button was pressed, scantrigger was present and code 200 was send by the Stimulus PC.

Beamer - Remote control



All scanners are equipped with a EIKI LC - XL100 beamer. This projector utilizes matrix liquid crystal display (LCD) technology. **The default resolution is 1024 x 768. Ratio 3:4 (NOT WIDESCREEN)**
Refresh rate 60 Hz.

The projector has many useful features. Some of these functions describe below.

Motor-driven Lens Shift

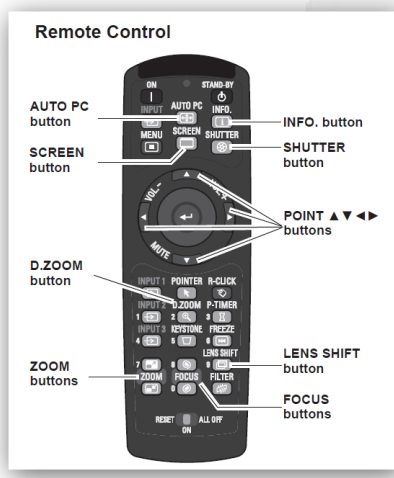
Projection lens can be moved up, down, right and left with the motor-driven lens shift function. This function makes it easy to provide projected image where you want. Zoom and focus can also be adjusted with a motor-driven operation.

Shutter Function

The projector is equipped with the shutter that provides complete blackness when the projected image is not needed with keeping the projector on.



The beamer will be phased out during 2020. Hence for new projects the BOLDscreen MUST be used!



Projection Screen



The output of the beamer projects on back of a transparent diffuse screen. Due to the rear projection, the images are mirrored when looking to the screen from the front. The subject looks via a mirror to the screen (the image is flipped again) and will see the original image.

The screen is made of 5 mm thick rigid plastic material (Macada - DAP diffuse KBA) and fits exactly in the bore. Fixation of the screen is done by using tape. In this way the screen will not break when, due to a mistake in table positioning, the table end pushes the screen out of the bore.

In order to improve contrast the screen, the material is embedded with a dark tint, which absorbs the ambient light striking the screen. At the same time, it absorbs the light from the projector, reducing the light transmission and, therefore, the gain of the beamer

Beamers are designed to project high contrast images on a large distance (meters) therefore the light density factor (gain) is very high. Because the distance between beamer and screen is relative small, the projected image will be over-illuminated. This can result in negative health effects (headaches, fatigue) for the subject. By using two neutral density filters ($T=0.38 + T=0.12$) positioned at the



exit of the wave-guide (inside scanner room) the gain is reduced to a comfortable level.

Optical path and size of projection is on every MRI scanner different. Due to the size of bore and different beamer-screen distance and the properties of the mounted telephoto lens, the size of projected images is at every MRI scanner different (see datasheets below)

DataSheets: *Optical Path*

[PrismaFit](#) – [Prisma](#) – [Skyra](#)



IMPORTANT

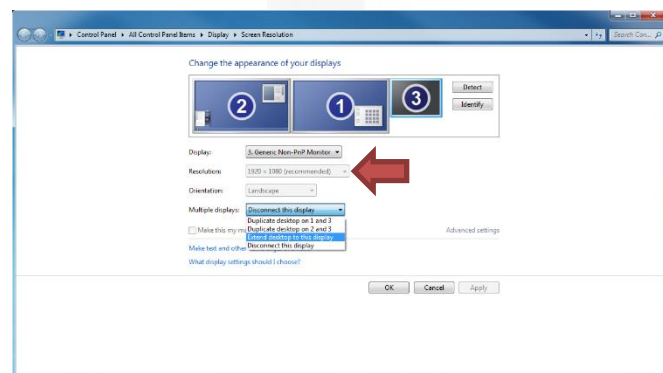
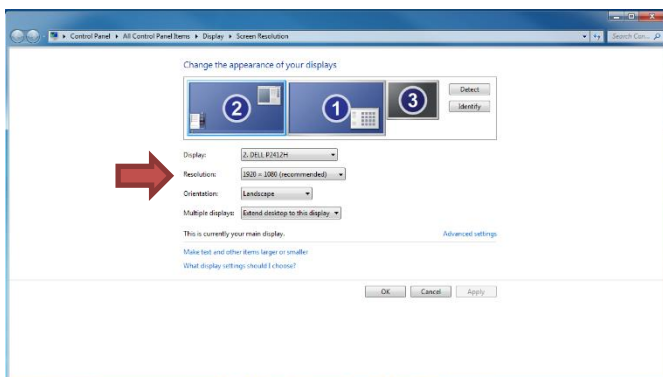
In case the size of the visual angle is important for you experiment, it is advisable to check the projection size before you start! Via the remote control of the beamer users can (unintentionally) change the zoom factor.



Change setup from BOLDscreen to beamer

WARNING

Do not use the NVIDIA control panel to configure the displays. During the setup, it not always shown on your desktop. In case you make a wrong setting and do not see the Screen resolution window on your desktop press simultaneously Shift + Window key + ←/→ (arrows) on the keyboard to shift the active window from an extended display to your desktop display.



Open **Screen resolution** via right mouse click on desktop of Stimulus PC. You can see all displays:

- DELL P24xxx – main – extend/duplicate
- BS32AVI HDMI – extend/duplicate
- Generic non PnP – disconnect

In case DELL and BS32AVI HDMI are duplicated, make them extend!

Open **Screen resolution** via right mouse click on desktop

- select at **display** **Generic non PnP**
- select at **multiple displays** **extend**
- click **Apply**

if needed: simultaneously press within 15 sec Shift + Windows logo key + → (2x)

- click **Keep changes**

Open **Screen resolution** via right mouse click on desktop

If needed: simultaneously press within 15 sec Shift + Windows logo key + → (2x)

- select at **display** **Generic non PnP**
- check if this is your main display otherwise select **checkbox**: *Make this my main display*
- Make this my main display*
- select at **display** **DELL P24xxx**
- select at **multiple displays** **disconnect**
- select at **display** **BS32AVI HDMI**
- select at **multiple displays** **disconnect**
- click **Apply** followed by **Keep changes**

BOLDscreen



The BOLDscreen 32's custom electronics deliver your stimulus direct to the screen - output is lag free and synchronous to the input video signal. The dual link DVI input will synchronize to a **1920x1080 pixels** @ 120Hz video signal and will output video at the same rate. The high resolution 32" IPS panel with native 10-bit RGB color resolution has a static contrast ratio of 1400:1 and a fast 5ms grey-to-grey response time. To achieve the image quality required for scientific visual stimulation, we illuminate the panel with a custom scanning LED backlight (edge illuminated by an array of SuperBright LEDs and DC driven). This produces highly saturated chromatic displays and a peak white output at up to 350cd.m-2. Built-in real-time calibration ensures consistent luminance immediately from switch on, and automatically compensates for the usual drifts in brightness due to temperature changes and ageing.



Display characteristics

- 32" 1920 x 1080 full color IPS LCD with 120Hz panel drive.
- Native 10-bit color resolution (extended to 16 bits by dithering).
- Delay equal to just one horizontal line (~100 microseconds).
- Typical grey-to-grey response time 5ms.
- Brightness: factory set to 120cd m-2.
- Automatic compensation of brightness for temperature and ageing.
- Custom scanning LED backlight, peak white up to 350cd.m-2
- Static contrast ratio of 1400:1
- (measured with the backlight on; [1 1 1]: [0 0 0] RGB contrast ratio)
- Spatial uniformity is corrected by a real-time 5th order polynomial.
- Image can be flipped to correct for viewing via a mirror.

DataSheets: *Optical Path*

[Prisma\(Fit\) –Skyra](#)

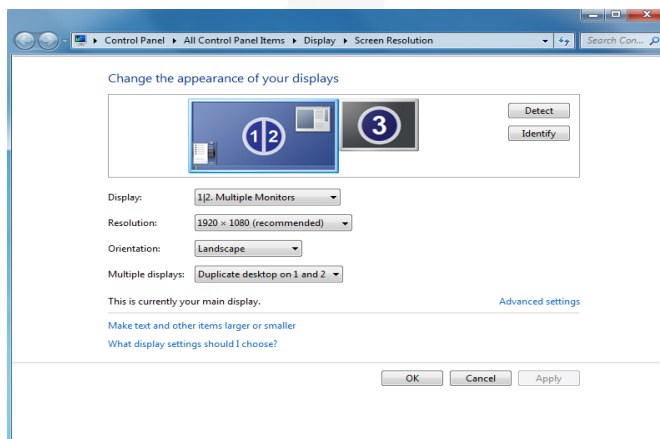
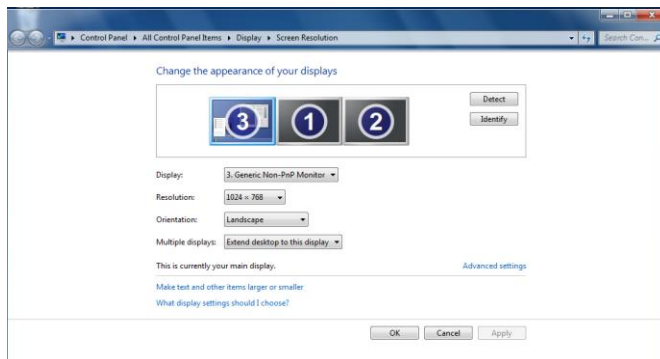
Connecting to the BOLDscreen goes via the [AVI box](#).
The ON/OFF power switch of the screen is mounted on the [patch panel](#).



Change setup from beamer to BOLDscreen

WARNING

Do not use the NVIDIA control panel to configure the displays. During the setup, it not always shown on your desktop. In case you make a wrong setting and do not see the Screen resolution window on your desktop press simultaneously **Shift + Window key + →** on the keyboard to shift the active window from an extended display to your desktop display.



Open **Screen resolution** via right mouse click on desktop of Stimulus PC. You can see all connected displays

1

1. DELL P24xxx - disconnect
2. BS32AVI HDMI - disconnect
3. Generic non PnP – main - extended desktop

2

- Select at *display* **DELL P24xxx**
- select at *multiple displays* **extend**
- click **Apply**
if needed: simultaneously press within 15 sec **Shift** + **Windows logo key** + **→** (2x)
- click **Keep**

3

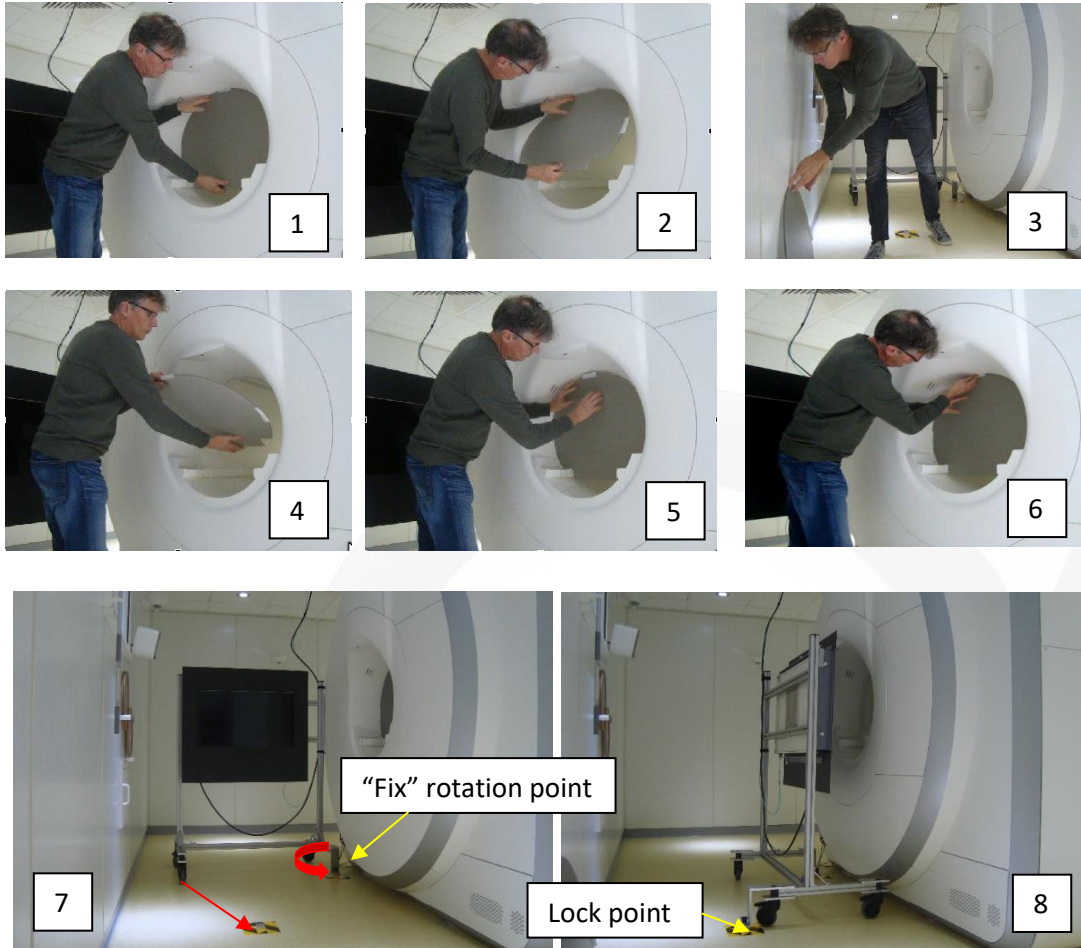
- select at *display* **BS32AVI HDMI**
- select at *multiple displays* **duplicate desktop 1 and 2**
- click **Apply**
if needed: simultaneously press within 15 sec **Shift** + **Windows logo key** + **→** (2x)
- click **Keep**

4

- select at *display* **1|2 Multiple Monitor**
- check if this is your main display otherwise select **checkbox**: *Make this my main display*
- select at *display* **Generic non PnP**
- select at *multiple displays* **disconnect**
- click **Apply**
if needed: simultaneously press within 15 sec **Shift** + **Windows logo key** + **→** (2x)
- click **Keep changes**



Install/uninstall Projection Screen or BOLDscreen



1+2+3 Getting projection Screen Out

Remove piece of tape that fixate screen in bore. Pull lower part towards you slowly. Once screen is tilted, you can take it out easily.

To prevent scratches, put screen straight up against wall. To avoid from topple fix it with some tape against the wall!

4+5+6 Getting Projection screen IN

Tilt the screen and put first the lower part behind the wheels on the rail. Push the top of the screen in until it stands upright against the rim of the bore.

Fix the screen by using NEW pieces of tape on top!

7+8 Position BOLDscreen

AVI Box

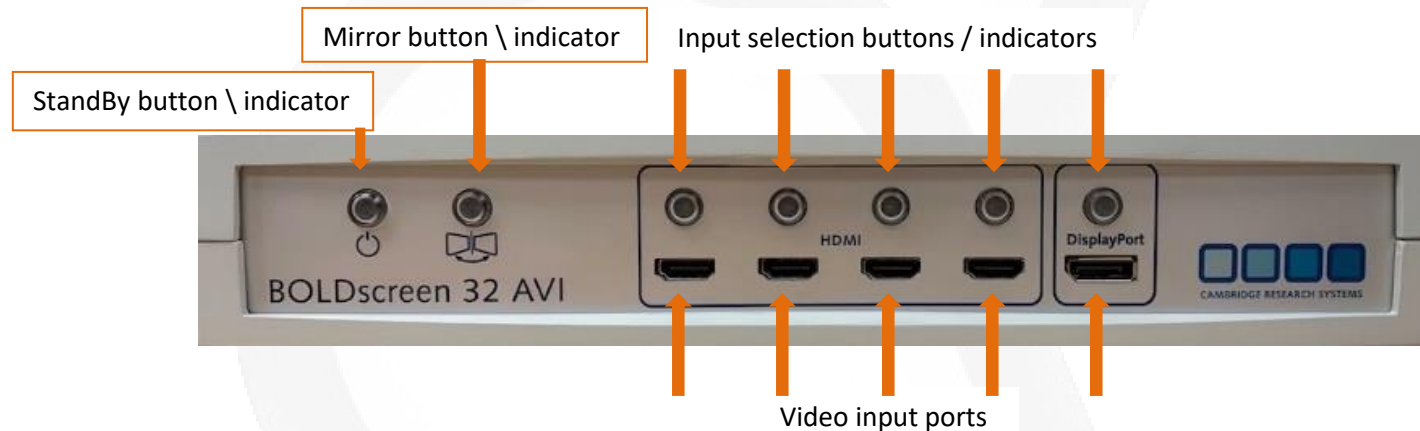


The AVI box makes it easy for you to connect multiple stimulus computers (laptops) or other video sources to the BOLDscreen. It allows switching easily between the different input sources and provides beside the BOLDscreen output a second output to drive a so-called Clone Monitor so you can monitor the images shown to the participant.

The AVI also removes the requirement for the video source to produce a 1920x1080@120 Hz output, as it can re-scale many input resolutions and appropriate output for the BOLDscreen.



The video signal from the AVI box to the BOLDscreen (and Clone monitor) is always **1920x1080 @ 120Hz** regardless of the input resolution and frame rate. If a signal source can only generate 1024x768 @ 60Hz, or 1920x1080 @ 60Hz, this does not matter. The AVI will take those signals and then regenerate (spatial and temporally resample) a 1920x1080 @ 120Hz signal.



If not in use please put the BOLDscreen in standby mode (backlight is switched off) by pressing "StandBy button" once. Indicator (blue LED) will start pulsing slowly.

The ON/OFF power switch of the AVI box is mounted on the patch panel.

Patch Panel



The purpose of the patch panel is to get easy access to several in/outputs available on the 19" rack. Particular when using a laptop as a stimulus computer the user can easily connect to beamer and response buttons. In table below the available in/outputs are described.



Connector no.	Description	Additional info
1	XLR connector to connect Audio signal to AUX-IN of Mixer	<i>Input for external audio source</i>
3	USB (A) to connect Response Box Interface to a laptop	<i>fORP 932 must be in one of the USB modes</i> ⓘ
4	VGA connector to connect video signal of laptop to beamer	<i>Input 3 on VGA switch</i> ⓘ
5	<i>ONLY AT PRISMAFIT Mini DisplayPort</i>	<i>For multi-scanner experiment</i>
7	COM-poort (RS232) to connect external device to Stimulus PC	<i>COM 4 on Stimulus PC</i>
8	COM-poort (RS232) to connect external device to Stimulus PC	<i>COM 5 on Stimulus PC</i>
11	Connects STIM PC or laptop to Eyelink Host PC network card	<i>To control Eyelink remotely (eq. by PresLink)</i>
12	USB (B) to connect to one of the USB ports of Eyelink Host PC	<i>At PrismaFit USB is not accessible at front of Eyelink Host PC</i>
14	LAN Outlet	<i>Connection to network.</i>
15	Power switch AVI box	<i>Switch on/off power supply of AVI box</i>
16	Power switch BOLDscreen	<i>Switch on/off power supply BOLDscreen</i>

In Room Monitor



To optimize the lens settings of the SMI eyetracker, the Eyelink eyetracker or the MRC camera, a monitor is mounted against the wall, just above the observation window. You do not have to change any monitor settings. Therefore the control panel of the monitor is covered (do not remove). Powering the monitor is done by pressing the switch (inside the room) next to the scanner door. The red light next to the switch will indicate the monitor is on.

To connect the desired video output to the monitor next 3 steps must be performed at the 19" rack:

1. Select the video source with the S-video switch.
2. POWER ON the DV recorder by pressing the power button for a few seconds (will light up orange). Once the recorder is initialized press VIDEO INPUT (will light up orange).
3. Switch on Display B (is used to amplify the video signal to the monitor). If input V1 of Display B is selected, you will see the output of the S-video switch on this display.



IMPORTANT

During scanning the monitor must be switched off otherwise, the electronics of the display will interfere with the MRI-signal and increase noise level in images!



Insert Earphones

The S14 insert earphones provide high-quality acoustic stimulus delivery while attenuating scanner noise. They are small enough to fit within any head coil, and can be covered with muffs for added protection if the coil allows. Replaceable canal tips ensure sanitary conditions. Each set of earphones is calibrated.

Frequency response equalization is achieved by pre-filtering stored digital stimuli. For each calibrated set of earphones a set of equalization filters are provided and can be used either within Matlab ([EQ filtering Matlab Utility](#)) or with a stand-alone filtering program ([Setup EQ Filtering 2.2](#)).



S/N		Calib_sheet (pdf)	Used at
407L	407R	S14_407L_407R	PrismaFit
338L	338R	S14_338L_338R	Skyra
520L	520R	S14_520L_520R	Prisma

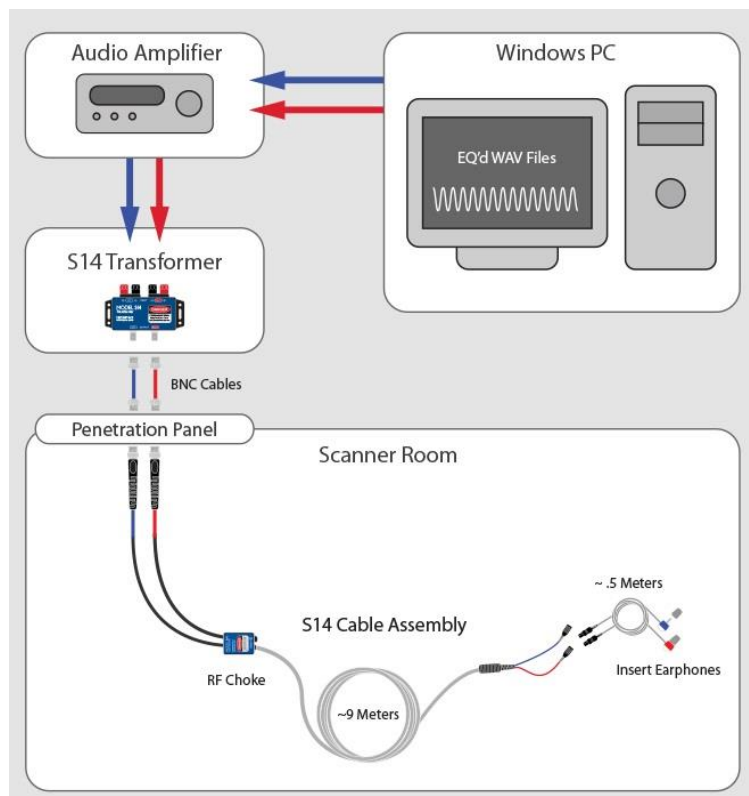


Table : Download equalization filters and calibration sheet

- CONTINUE -



Insert Earphones (continue)

The use of the in-earphones in combination with the support cushion made of pressure relieving TEMPUR material is not always comfortable. Because the earphones stick out, the cushion will push the phones further inside the ear-channel. After some time, this can become painful or at least uncomfortable. Making use of another fixing method (which keeps the ears free) can avoid this.

Another issue concerns the replaceable canal tips. The tip should really fit in the ear-channel. If it is too small, the earphones can easily fall out. If the foam-tip is too large, due to the foam compression, the foam is blocking the hole at the end of the tip and hence blocking the sound.

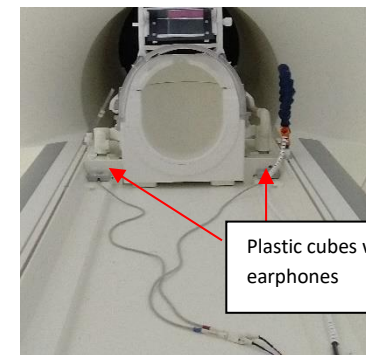
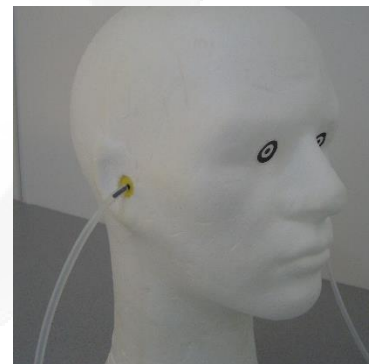
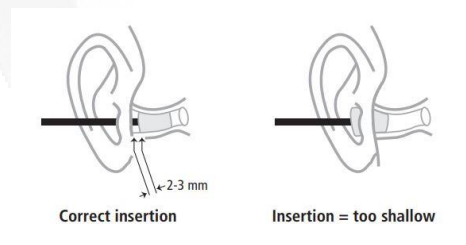
To overcome both issues you can use an alternative foam ear tip.

Once the foam tip is correctly inserted in the ear canal (see pictures) a flexible tube is put over the black tubing of the foam tip. The black tubing is flexible and will easily bend when fixing the head with the TEMPUR cushion. The other end of the flexible tube is put over the plastic tip of the S14 earphone. The S14 earphones are housed in plastic cubes, near to the head coil. A hole on top to give access to the tip. The earphones are already connected to the extension cable, which runs underneath the cushions. The user only has to connect the flexible tubes.

Please take care that due to movement of the subject, the tubes cannot become loose.



The tips on the in-ear phones are also the subject **hearing protection** be sure they fit properly!



Goggles



To correct for eye disorder plastic lenses are available (blue box stored in right cupboard above desk lab manager). We have two complete sets each containing spherical lenses from **+3 to -6 in steps of 0,5**. They do not correct for cylindrical deviations.

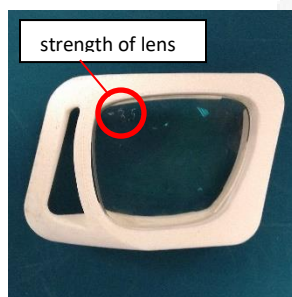
The box, with lenses, also contains separate frames for the left/right lens. Push the lenses in the frames and place them on top of the 32 Head Coil. There is also a frame available, that fits on top of the 64 Head & Neck Coil.

It is not necessary to tape the frame (with lens).



Before entering, the scanner room check the vision of your participant when he/she is wearing the selected lenses. For this, you can use the (Snellen) chart, with letters in different sizes. Place the participant in front of the chart at 1,5 meter distance (this is roughly the distance from iso-centre to BOLDscreen) and point the letters on the chart which have roughly the same size as your stimuli.

To really measure the visual acuity, by use of the chart click [here](#).



Please put the lenses back in the right paper bag and put them in order, in the blue box. The user after you will be grateful.

Unfortunately, not everyone puts the lens back into its own small paper bag.

In one of the top corners of the lens, the strength is scratch.

Hence, you can check this!

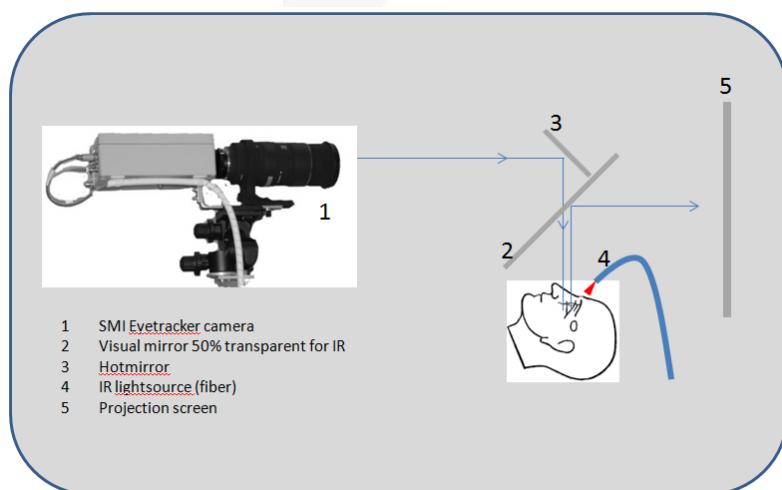


Eye Camera



To keep an “eye” on the participant during the scanning session each scanner is equipped with a so-called eye camera. By making use of the camera, the researcher can e.g. see if the participant is still awake or if the subject has moved up/down. In this way, the “quality” of the acquired data increases. It is possible to [record](#) the camera output

The eye camera (home-made) is battery operated and its housing acts like a cage of Faraday to prevent RF interference. Via an optical fiber (orange cable), the camera signal is fed into the acquisition PC in the control room. The eye camera is equipped with a telephoto lens which makes it possible to picture the eye of the subject over the large distance (>3.5 m) once the subject is positioned in the ISO centre of the MRI scanner. The CCD camera is only sensitive for IR light due to the use of an optical filter. In this way, there is no need for a visible light source. Hence, the camera can operate in the dark. Of course, you need an IR light source to enlighten the eye of the subject. Via an optical cable the light from an IR source, present in the control room, is brought to the subject's eye. Via the mirror mount positioned on top of the head coil the camera can picture the eye. The optical path of the camera is schematic drawn in figure. The hot mirror reflects the IR-light for 100%. The visual mirror has the optical property that it is 50% transparent for IR. In this way, the camera can look through the visual mirror and the subject sees via the mirror the projection screen



Checklist in case you see no EYE

- Zoom the telephoto lens out (lens does not stick out))
- Lens cover of telephoto lens is removed
- The camera is power on
- IR light source (in control room) is switch on
- Table is in highest position
- The hot mirror is angled by (roughly) 45 degree

If you see the image of the eye on monitor A (input V1) of the dual display in the 19" rack but **NOT** on the monitor inside the scanner please check [this](#).

The SMI eyetracker will be phased out. Hence for new projects the Eyelink MUST be used!

Eyetracker-SMI



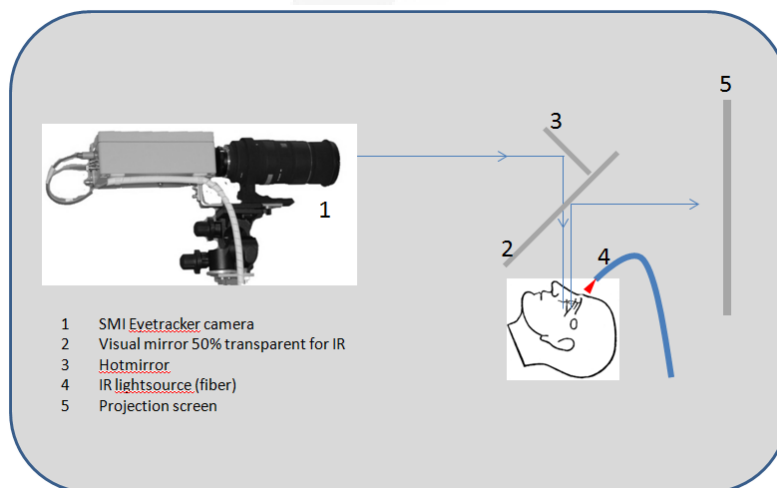
The SMI-eyetracker (iView X) is a dark pupil eye tracking system that uses infrared illumination and computer-based image processing. Images of the eye are analyzed in real-time by detecting the pupil, calculating the centre, and eliminating artifacts. The MRI-scanner is equipped with a non-invasive, video-based eye tracking system. The camera is home-made. The acquisition PC and software (iView X) are from SMI. To prevent vibrations of the MRI scanner interfere with the eyetracking measurement the camera is mounted on a console fixed on the floor.

The camera is battery operated and its housing acts like a cage of Faraday to prevent RF interference. Via an optical fiber (orange cable) the camera signal is fed into the acquisition PC in the control room. The eyetracker camera is equipped with a telephoto lens which makes it possible to picture the eye of the subject over the large distance (>3.5 m) once the subject is positioned in the



Performance MRI-LR

- Sampling rate 50/60 Hz (PAL/NTSC)
- Tracking resolution 0.1° (typ.)
- Gaze position accuracy 0.5° - 1° (typ.)
- Working range (hor./vert.) ± 15° / ± 10° (typ.)



ISO centre of the MRI scanner. The CCD camera is only sensitive for IR light by using an optical filter. Hence, an IR light source is necessary to enlighten the eye of the subject. Via an optical cable the light from an IR source, present in the control room, is brought to the subject's eye. Via the mirror mount positioned on top of the headcoil the camera can picture the eye. The optical path of the camera is schematic drawn in figure. The hot mirror reflects the IR-light for 100%. The visual mirror has the optical property that it is 50% transparent for IR. In this way, the camera can look through the visual mirror used to let the subject see the projection screen in the bore.



Eyetracker-SMI (continue)

Adjust Tracking Parameters

A good eye image is crucial for the eyetracking quality. Therefore the IR spots should illuminate the eye properly. Check if, the spot is correctly aligned and that nothing blocks the IR rays on its way to the eye.

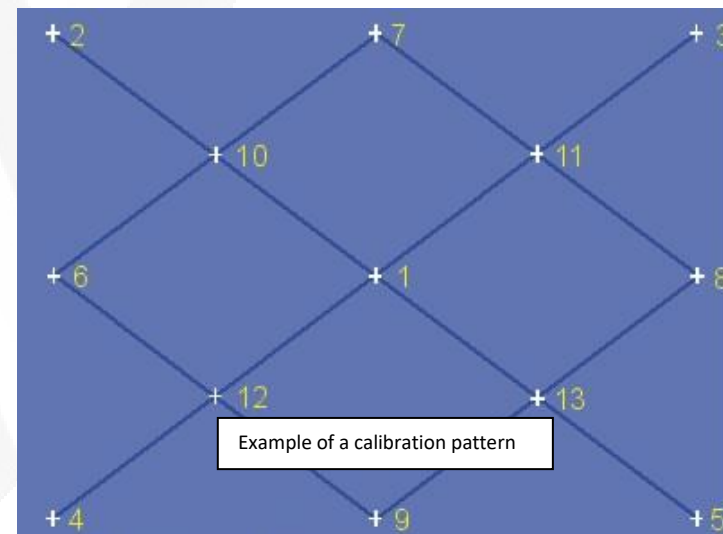
1. Click on the Eye Control window (upper-left corner) to activate the camera view. You should see the video signal coming from the camera. Clicking again will stop the streaming of the camera-signal (window freeze)
2. Set the AOI (area of interest) by dragging the borders of the window towards the middle. This setting it defines the workable area of the eye image where the system will expect to find the pupil. Dark images outside of the AOI box will be ignored. Make a smaller box if the eye image is under-illuminated or if there are competing dark areas in the eye image. Make the box larger if the subject makes frequent head movements that continuously move the pupil out of the AOI box.
3. Move the *Pupil Threshold* slider until the crosshair is moving and follows the pupil.
4. Because we only tracking the pupil and not the corneal reflex under Tracking-Overlays you can uncheck the Corneal Reflex Crosshair to hide these.

If the pupil crosshairs are not visible or not follow the eye's movement, the eyetracker has difficulties to track the pupil. There are some strategies to obtain a better eye image: Click on *Tracking...* to change advanced settings. Click on *Image adjust...* to change contrast/brightness of image. Check *Dynamic*. This will allow the system to automatically adjust the pupil threshold on slight jitter of the eye image contrast.

Calibration

In most eyetracker applications, the bright pupil corneal reflex is also tracked by in order to compensate for the subject's head movements. In this way the pupil location can be translated into gaze data. Tracking of the corneal reflex is in our setup problematic (instable) which result in loss of gaze data. Because during an MRI study the subject's head is fixated we only measure pupil position and equate this to gaze position. The consequence is that we cannot make use of the calibration routine implemented in the iView software.

Hence you have to do the gaze calibration yourself by showing a calibration pattern. While measuring the pupil positioning instruct the subject to fixate on each point for a few seconds. In case the subject's moves a lot the calibration must be repeated.




The SMI eyetracker will be phased out. Hence for new projects the Eyelink MUST be used!



Eyetracker-SMI (continue)

Recording data

Click on the button  in the Recording Control window will start recording. The window will display the set number and remaining recording time.

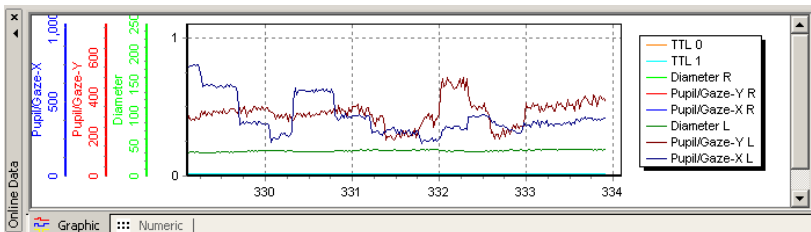
Before start recording check the settings in the *Graphic* tab of the *Online Data* window. All boxes must be checked and the trigger channel number should be 9! Switch camera on and press once the Eye Control window. You should see the graphs in the display move to the left side. Generate manual a scantrigger by the pressing the *Trigger* button of the ScanTriggerBox. In the Graphic display you should see this happening. If not the DIO board settings must be reset. Follow instructions below to solve this bug.

BUG - No scantrigger visible in the Graphic Online Data window workaround.

Click menu *SetUp – Hardware – Communication* and uncheck *Accept Trigger* box in TTL IO/ Analog out part of the window. Press OK to save this change.

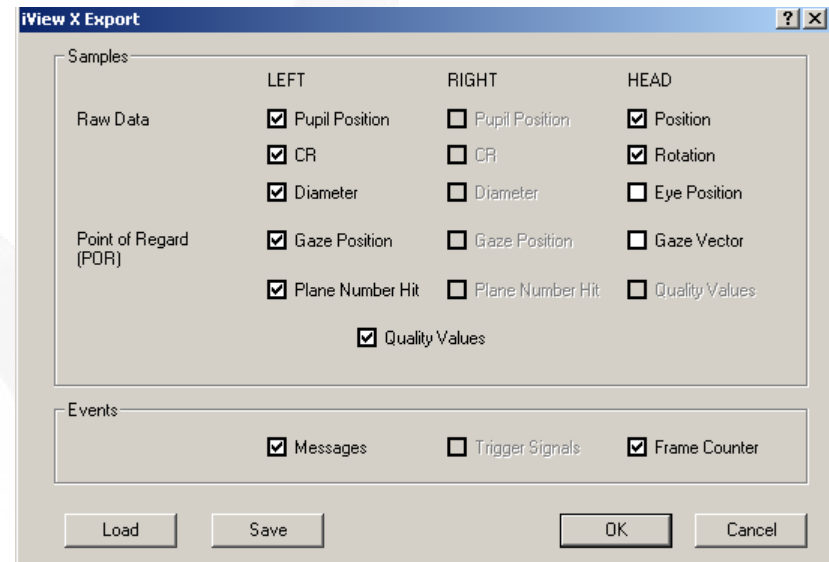
Now repeat this again to check *Accept Trigger* box again and press OK to confirm.

Graphic Online Data Window



Saved data

The data of the eyetracker is saved in a binary format called .idf. To import this data into other analysis or table calculating programs you have to convert this file. This can be done with a software package IDF converter which is available on the Desktop of the iView PC. Use the option to Plain Text. By clicking *Configure*



You can choose which items you wish to exported. Note that only available items can be checked. In the example above our system is monocular, left eye is tracked, and headtracking installed. The not available data is grey-out.

The output will be an ASCII readable text, with lines and columns seperated by a tab. IDF converter is part of [iViewtools](#) package software.

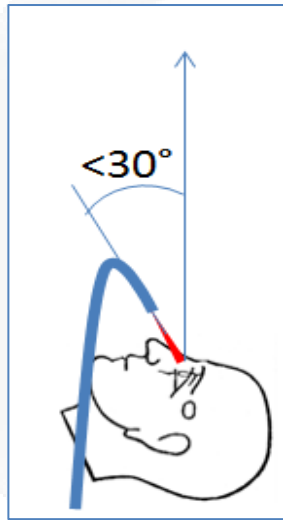


Infra Red Light Source Eyetracker

A good eye image is crucial for the eye tracking quality. The image quality depends a lot on positioning of the IR light source. The light rays coming out of the fiber end are divergent. Placing the fiber too nearby the eye will result in a small light spot which, partly illuminated the eye very bright.



Beside this disadvantage the end piece of the fiber cable is protected with a metal (non-ferro) cylinder. This metal can disturb the magnetic field homogeneity and hence it is not advisable not



positioned in side, or very close to the head coil. For the most optimal illumination of the eye (no shadows around the eye) put the fiber end as high a possible (limited by the bore of the MRI scanner).

Checklist in case you see no EYE

- Zoom the telephoto lens out (lens does not stick out)
- Lens cover of telephoto lens is removed
- The camera is power on
- IR light source (in control room) is switch on
- Table is in highest position
- The hot mirror is angled by (roughly) 45 degree

If you see the image of the eye in the iView software and/or on monitor A (input V1) of the dual display in the 19" rack but **NOT** on the monitor inside the scanner please check [this](#).

The infrared source is mounted on the wall in the control room next to the observation window. If the source is powered the red LED next to the switch lit up.

Eyetracker-Eyelink 1000



An Eyelink eyetracker (SR Research) is available at all three scanners. At PrismaFit a Eyelink 1000 and at Prisma and Skyra an Eyelink 1000 plus is installed. It supports sampling rates up to 2000 Hz (for binocular tracking 1000Hz binocular recording is available). The camera has a non-ferromagnetic optimized design and uses fiber optics for image data transmission. The core of the EyeLink 1000 eyetracker consists of a custom designed high-speed camera connected to a dedicated host computer¹. Running on a real-time operating system, the host software provides fast eye sample access with low inter-sample variability. Detailed information is available in the user manual.



At the MRI scanner, the Eyelink setup is different from the way described in the SR Research installation-guide. The SR illuminator

and so called "long range mount" are NOT used. Instead, it make use of the same mirror mount and IR led as with SMI Eyetracker. To avoid vibrations (caused by the MR Scanner) the SR Eyelink camera is attached to a dedicated ceiling mount, which is in all scanner rooms available.

The mount is accurate aligned with the axis of the bore of the MRI. In this way, the setup and adjustments of the camera and illuminator (fiber bundle) can be done with the table fully outside the bore. After finishing the setup, the table is moved to the iso-centre of the scanner, and the ceiling mount is manually moved towards the entrance of the bore. Only the focus, of the lens of the Eyelink camera, has to be re-adjusted to get again a sharp tracker image. This is also achievable by moving the ceiling mount forwards/backwards.



¹ Note that the Eyelink 1000 plus camera available at Skyra is not compatible with the Eyelink 1000 PC at PrismaFit.



Eyetracker-Eyelink 1000 (continue)

The Eyelink camera is attached to the ceiling mount inside the scanner room by a clamp. Extensions cables, for power and fiber optics for image data transmission, are already in place. To power up the camera connect the power plug to the wall socket (inside MR-room). Do this **before** you start up the Eyelink PC, otherwise the PC does not “see” the camera and will switch to Tower configuration instead of Long Range configuration.

You can use the eyetracker as standalone, but you also can control it fully via the stimulus PC. For different stimulus software packages you find coding examples here (*not available yet*)

An Ethernet connection between Eyelink PC and Stimulus PC is present. In case you are using a laptop, is possible to make this connection via the patch panel. (label: EYELINK – LINK – cross cable).



For synchronization purposes a marker (0-255), send by the stimulus PC, via the S-BTSl (COM2), will be log in the Eyelink logfile (edf). **The scantrigger is NOT logged!**

For this purpose, a cable (D25 connector) connects the output of the S-BTSl to the parallel port connector of the Eyelink host pc. To read the data-lines of the parallel port, some lines must be add in the FINAL.INI. Because the Eyelink 1000 has an on-board parallel port and the Eyelink 1000 Plus makes use of a parallel port on a PCI-board, the code lines are different for both systems.

To see the content of the current used FINAL.INI click [here](#).

Technical info

Lines add to the FINAL.INI to configure parallel port Data Register of Eyelink Host PC

For Eyelink 1000

```
write_ioport 0x37A 0x20
input_data_ports 0x378
input_data_masks = 0xFF
```

For Eyelink 1000 Plus

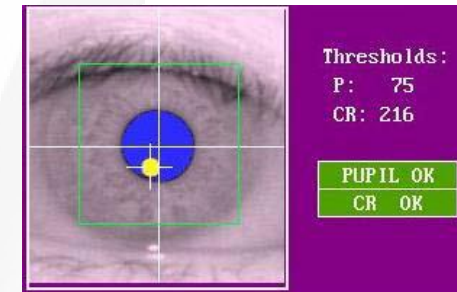
```
write_ioport 0xA 0x20
input_data_ports 0x8
input_data_masks = 0xFF
```

- CONTINUE -

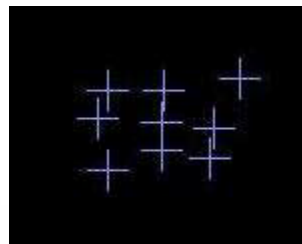
Eyetracker-Eyelink 1000 - Calibration Quality



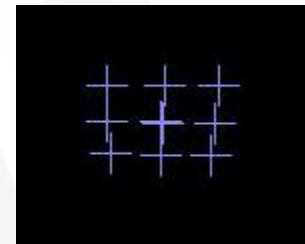
The quality of calibrations determines how useful the data recorded will be and how accurate the gaze calculation will be. Try some of these simple procedures to improve data quality and gaze accuracy:



- The threshold pupil area must be inside the pupil box (displayed as a red box around pupil) when the subject is looking at any area of the display. If a portion of the pupil exits this box, the pupil will be lost. The corneal reflection should never be lost or misidentified when the subject looks around the calibrated area.
- Always ask the subject to look at the four corners of the display after performing the camera setup. Watch for the warning signals on the tracker screen to make sure that the pupil and CR signal is not lost when the subject is doing so.
- Subjects require some practice in stably fixating the calibration targets. Try to perform at least two calibrations per subject before beginning to collect data.
- When writing your own applications, try to match the background color of the screen during calibration and validation to that of the test displays. Changes in pupil size caused by large brightness differences can degrade the system accuracy.
- Always check for the pattern of the calibration grid. For a 9-point calibration, the fixation crosses should form three parallel horizontal (or close-to horizontal) lines and three parallel vertical (or close-to-vertical) lines. Redo calibration or camera setup if you are not seeing this.



Poor Calibration



Good Calibration

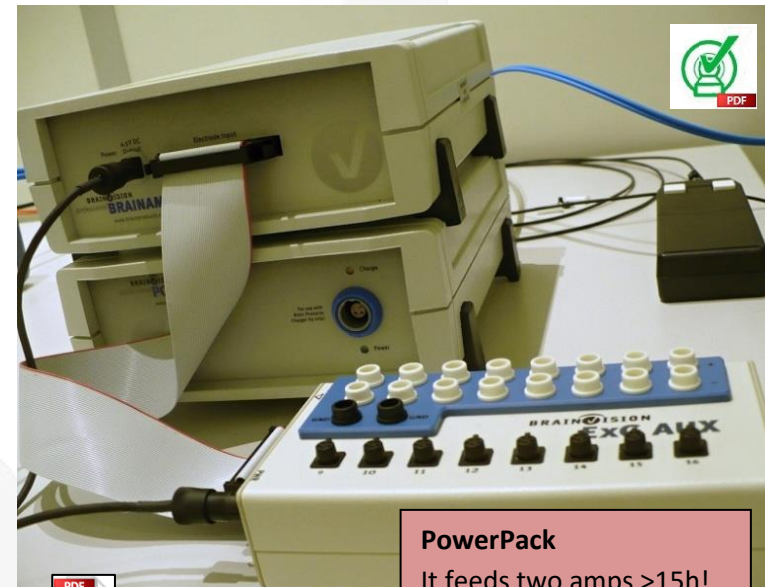
BrainAmp ExG + Physiology sensors



Function

To monitor ExG signals and/or physiology signals we make use of equipment produced by Brain Products called BrainAmp ExG MR. Siemens also delivers sensors to monitor respiration, heartbeat and ECG. Their goal is to achieve gated imaging to reduce artefacts due to cardiac or thorax contractions. Logging of the Siemens sensors is possible but not accurate enough for our purposes (to use these signals as a regressor in the design matrix).

The BrainAmp ExG MR uses a differential measurement principle and is intended for the bipolar measurement of electrical potentials at the surface of the body (EMG, ECG) as well as for non-electrical measurements (respiration, blood circulation) using electrode input boxes and sensors. The amplifier can be used in the MR scanner while the scanner is in operation. Beside the amplifier the system consists of the ExG AUX box to connect electrodes/sensor to the amplifier. The ExG AUX Box makes it possible to connect 8 x bi-polar electrodes and 8 sensors. All electrodes and sensors are MRI conditional for 3T, except the blood pulse sensor.



PowerPack

It feeds two amps >15h!
To avoid destroying the Power Pack **charge it** directly after use.
Don't worry about memory effects.

Available physiological sensors:

Click for more info (if available) on picture



Respiration sensor



Pulse sensor



GSR sensor



3D Acceleration sensor



MRI compatible electrode

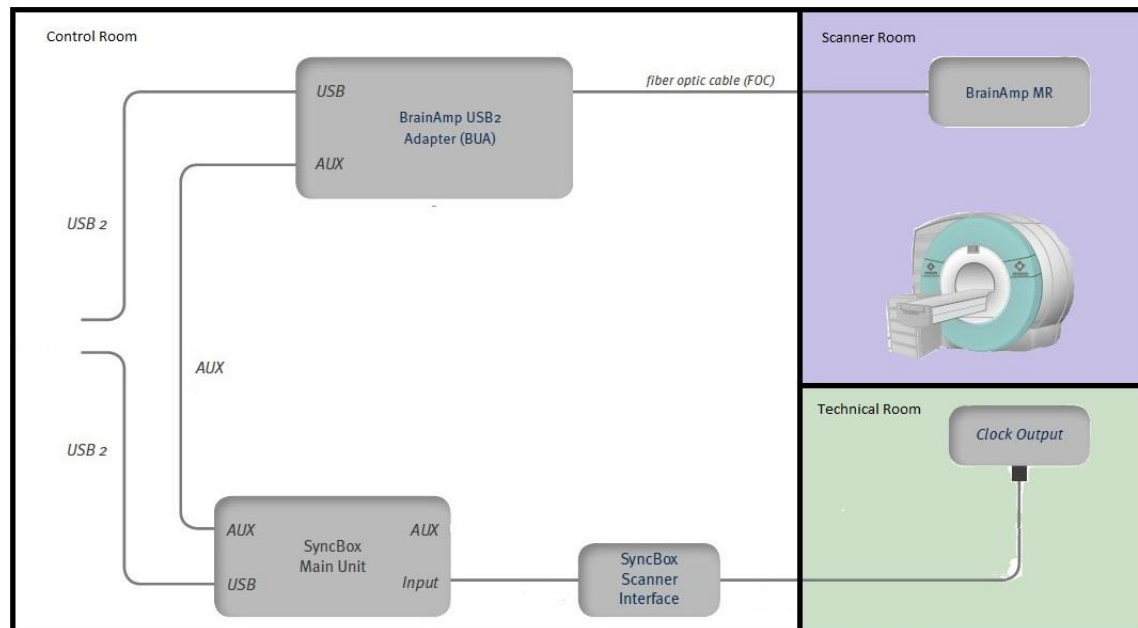
ExG USB adapter



Introduction

The USB 2 Adapter (also known as BUA) serves as a USB interface to connect any BrainAmp amplifier with the EEG PC. It is part of the standard delivery of BrainAmp MR plus and BrainAmp ExG MR amplifiers.

We have two versions of the USB2 Adapter. One with two fiber optic connections (at Prisma and Dummylab)) and two with four fiber connections respectively to connect two or four amplifiers (at Skyra and PrismaFit). If you use only one amplifier, it must be connected to the first optical fiber input of the USB2 Adapter (*Fiber optic 1 assign channel number 1 to 32*). The unit provides also an input (TRIGGER) to establish synchronization with the Gradient clock of the MRI-scanner. The other input (AUX) connector allows reading in 16 TTL inputs.



Physiological sensors - Pulse sensor

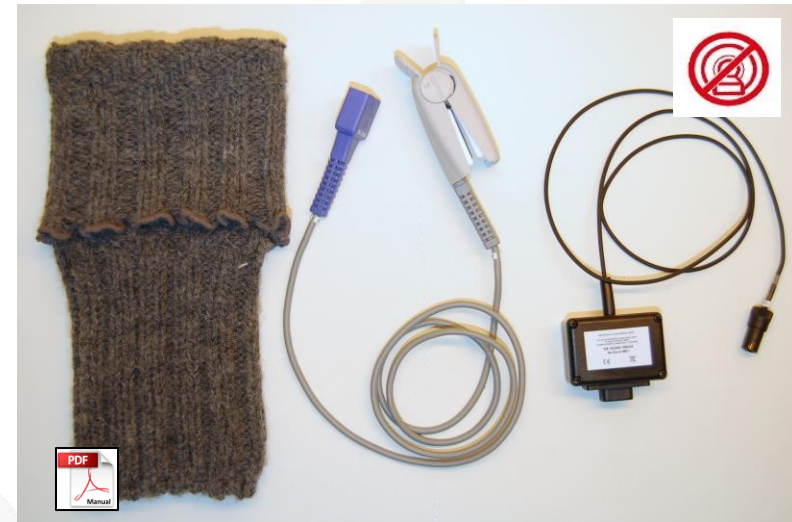


Function

This pulse wave sensor records the pulse wave by sending red light through a finger and is recording the result with a photo diode at the opposite. The flowing blood generates a curve which is proportional to the mass of the flowing blood. Every heartbeat causes an amplitude in the recording curve with a little decay (“pulse wave transition time”) which can be used to draw conclusions on changes of blood pressure. The unit consists of a finger sensor and an amplifier box

Some Tips

- Movements of the sensor cause strong artefacts. It is recommended to fix the hand on which the sensor is attached.
- Use the woolen warmer to keep the hand warm during the experiment. Pulse signal drops significantly when hand cools down



This device is not MRI-safe.

By removing the metal spring of the clamp the sensor is MRI-safe. Also the sensor cable with the purple connector is NOT ferro magnetic. Unfortunately, the black wire of the amplifier box is slightly magnetic. Be sure this cable is fixated by a sandbag!

Physiological sensors - Galvanic Skin Resistance



Function

Skin resistance is an extremely informative indicator of consciousness and emotional states such as stress or pain.

The GSR-MR Module converts the electric conductance of the skin to a voltage recorded by a bipolar amplifier input. It is used together with skin electrodes that are brought into contact with the test subject. The contact between the electrodes and the skin of the test subject is established by means of a special gel.



Some tips regarding *Recommended GSR electrode locations*





Physiological sensor - Respiration Belt

The Respiration Belt is intended to be used for qualitative measurements of the respiratory movements. The Respiration Belt is used to measure the thoracic or abdominal respiratory movements. These can be co-registered with the ExG via the auxiliary inputs of the amplifiers.

The Respiration Belt consists of two main units: the pneumatic sensor and the transducer.

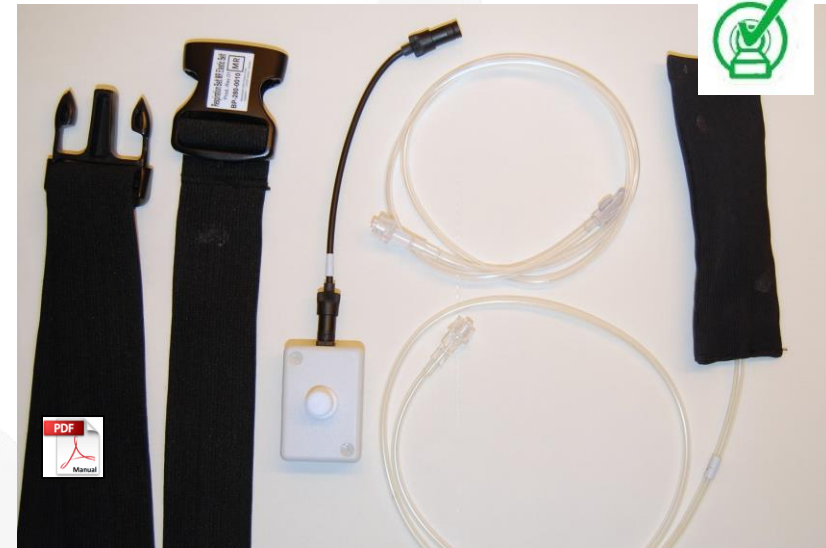
Pneumatic sensor

From an electrical point of view, the pneumatic sensor is a passive component. It is entirely made of textile fibers and plastics. The sensor is clamped between the pouch and body by the elastic belt, and in this way it translates the movement of the chest or abdomen into pressure changes. These changes are forwarded to the transducer via a tube.

Transducer

The transducer converts the pressure differences into electrical signals. The high signal quality is achieved by effective signal

conditioning circuits.



Automatic baseline correction

By connecting the pneumatic sensor to the transducer, a closed pressure system is created. This system possesses a baseline pressure, that is determined by a number of factors, for example, ambient air pressure, ambient temperature, tension of the elastic belt. The baseline pressure is a uniform air pressure applied at the transducer by the pneumatic sensor. If this baseline level changes then the signal amplitude changes. To correct this change, the transducer possesses a low-cutoff filter which causes the signal amplitude to return asymptotically toward the baseline. After approximately 90 seconds, 95% of the peak value has died away.

TIP: Wait at least 90 seconds after:

- attaching the Respiration Belt,
- adjusting the belt tension,
- changing the position of the pneumatic sensor,

After 90 seconds the baseline has reached a stable baseline level.

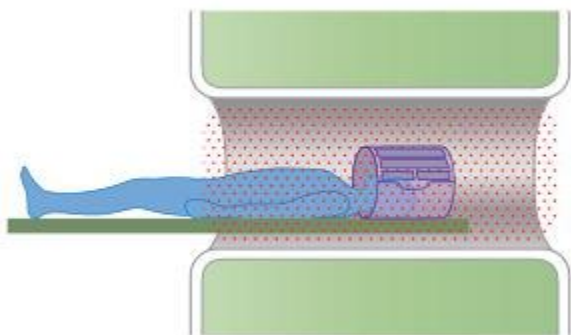
Physiological sensor – 3D Acc. sensor



The 3D Acceleration Sensor captures movements in three dimensions. Its primary application is to detect and record movement/acceleration of the extremities. It is, however, also possible to detect blood pulse and technical artefacts such as vibrations of the scanner.

It should be noted that it is not permitted to use the acceleration sensor inside the gradient coil in conjunction with gradient switching as well as inside the body transmit coil.

The red dots in the figure below mark unsafe area!



The red dots in the figure mark unsafe area!



Technical data:	
Supply voltage	± 5 Volts DC
Range	± 2 g
Output	1400 mV (neutral position)
Sensitivity	420 mV/g
Gain:	3.5
Dimension	22 x 14 x 8 mm
Weight	8 g
Cable length	30 / 70 cm
Connector	BINDER series 719 (5-pole male)



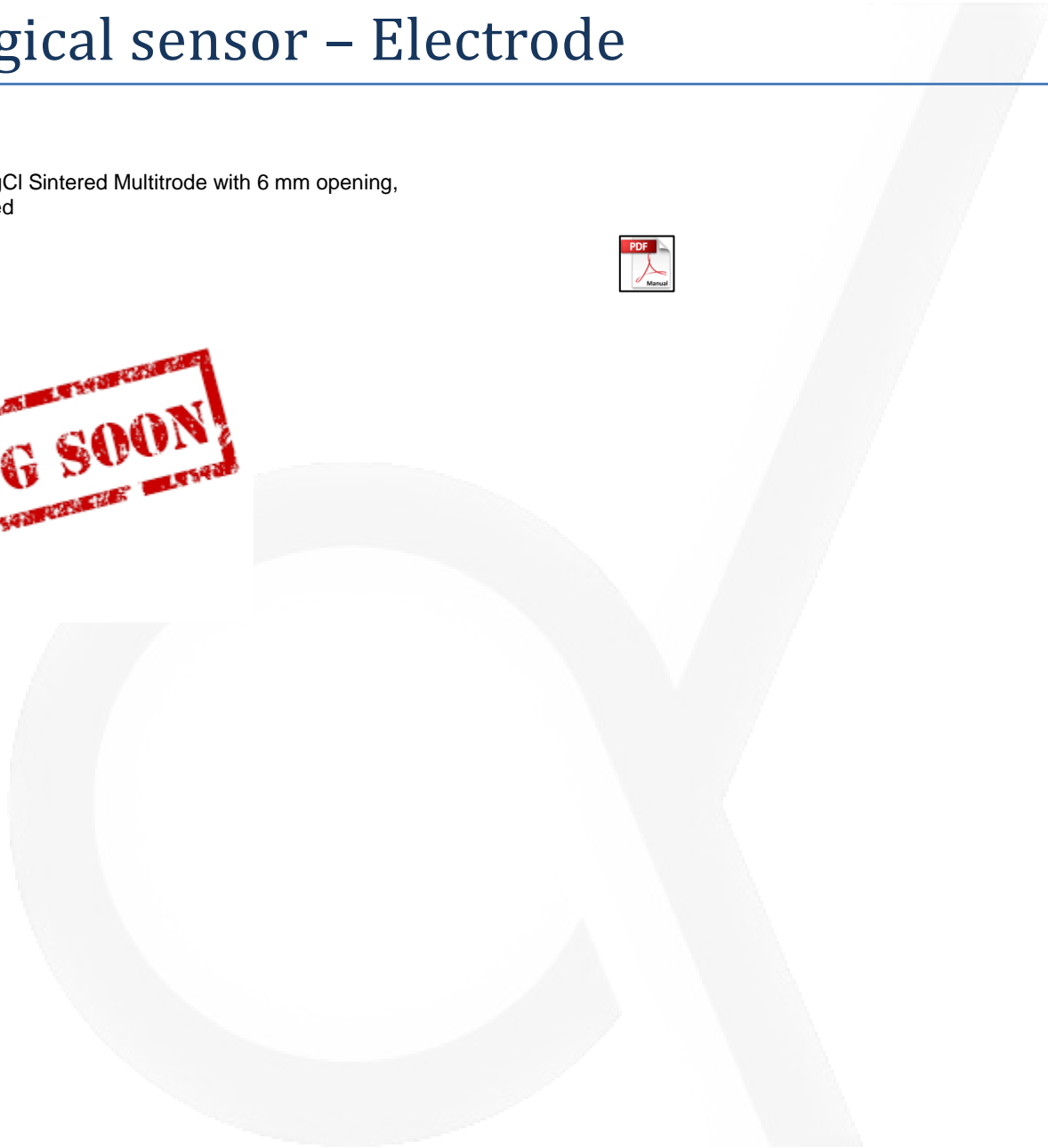
Physiological sensor – Electrode



B18-MR2-LSR-1A20g/AgCl Sintered Multitrode with 6 mm opening,
120cm cable, MR Adapted



COMING SOON





MRC in-bore camera

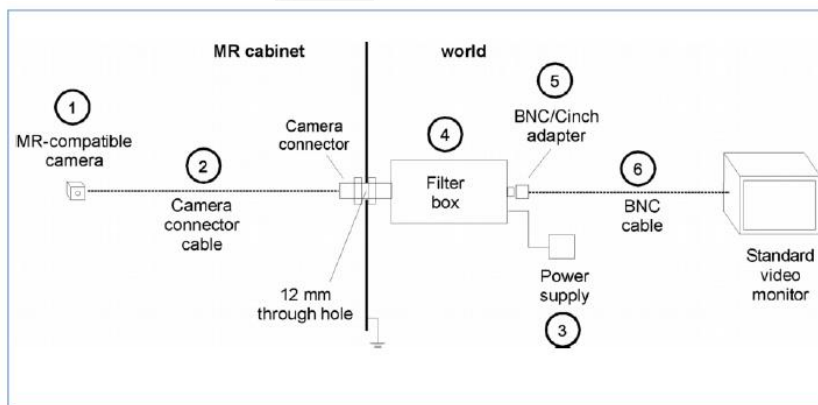
The MR compatible video cameras are designed to view and record video images of subjects in an MR scanner. They can also be used for the monitoring of objects and instruments. The cameras can be used inside the bore of the scanner. They can be equipped with different exchangeable lenses. Two MRC camera's are available. At all three scanners the necessary RF filter box is installed on the small filter panel. Hence the MRC can be used at all of our MRI scanners. In using two MRC's at one scanner is not foreseen.



Lenses available

- f = 4.3 mm
- f = 6 mm
- f = 8 mm

The **focus adjustment** is done by screwing the lens in and out. Care should be taken not to screw out the lens too far, as the lens may fall out of the thread.



The camera is connected to the filter box via the camera connection cable, which includes power and signal lines as well as shielding. The filter box prevents the transmission of disturbing signals into the MR cabinet. It avoids interferences in the video signals and the MRI imaging. The filter box includes a low pass filter that suppresses frequencies higher than 1 MHz with over 100 dB. This filter prevents damage and interferences caused by the high frequency signals of the MR scanner. Additionally an optical isolation is included in the filter box. In that way a full separation of the MRI equipment from the external power network is guaranteed.

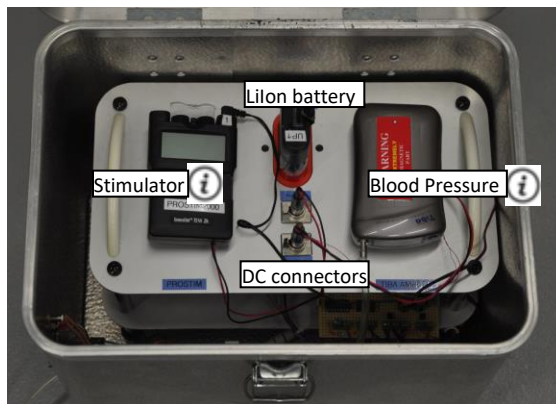
ShockerBox



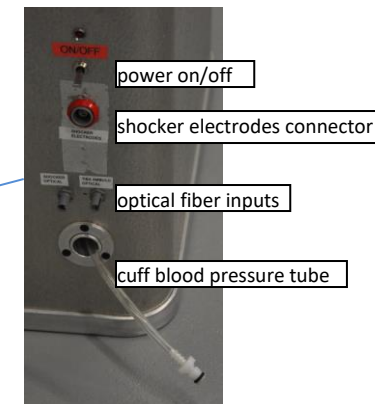
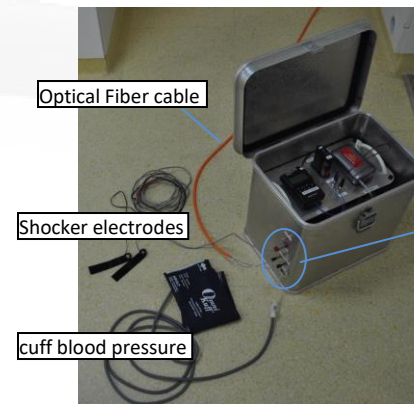
The shockerbox is a home-made aluminum box to house several devices. The box itself acts like a cage of Faraday. In this way, electrical devices, housed inside the box, will not interfere with the MRI. Hence, during scanning, the lid of the box must be closed.

At this moment two devices can be housed inside, a stimulator and a blood pressure device.

A Li ion (10,4Vdc) battery delivers via some electronics the necessary DC voltages. To control the devices from outside (control room) optical fibers are used (one fiber per device). Only basic functions are available. ON/OFF control for the stimulator and a STARTTRIGGER for the blood pressure device. The triggers are sent by the optical outputs of R-BTSI. Electronics, inside the ShockerBox, convert the optical signal to a TTL signal again.



Click on *info-icon* to get more info about Stimulator or Blood Pressure device



Blood Pressure Device (Ambulo)

The Ambulo 2400 is a compact, non-invasive Ambulatory Blood Pressure Monitoring (ABPM) system. It is designed to measure systolic and diastolic blood pressure and pulse rate of adults who are eighteen (18) years and older using the oscillometric method on a cuffed arm. The measurements for systolic and diastolic blood pressure, the mean arterial pressure, and the pulse rate are obtained without supervision, and later downloaded to a computer for analysis and interpretation. Once installed in the ShockerBox this device can be used to monitor the blood pressure of a subject lying in the MRI scanner. Measuring automatically (after a certain timeinterval) is possible but a measurement can also be started manually from the Stimulus PC (via the R-BTSI).

A software program called “Hypertension Diagnostics Suite” is available for configuring the device and reading out the measurement data. To download this software program please click [here](#).



WARNING

This device is **NOT** MRI safe and may only be used when installed in the Shockerbox.

PRODUCT SPECIFICATIONS

Dimensions	119mm x 68mm x 32mm (4.7" x 2.7" x 1.2")
Weight	253 grams (9 oz.)
Measurement Principle	Patented oscillometric technique with linear deflation
Measurement Ranges	Systolic 60 to 280 mmHg Diastolic 30 to 160 mmHg Pulse Rate 30 to 180 bpm
Measurement Accuracy	Blood Pressure: ± 3 mmHg mean difference, ± 8 mmHg standard deviation Pulse Rate: ± 3 bpm According to ANSI/AAMI SP-10:2002 & British Hypertension Society; Grade: A/A
Measurement Intervals	Four adjustable intervals during 24-hour periods, each configurable to 0, 5, 10, 15, 20, 25, 30, 45, 60, 75, 90, 105, or 120-minute measurements. Optional randomization factor up to $\pm 75\%$ within intervals
Available Cuffs	EasyWear + Reusable & Disposable Regular, Large and Small Adult
Actigraphy	Recording of 3-axis of motion via accelerometer for display and categorization of awake/asleep cycles via application software
Memory	Solid-state Flash technology Sufficient for 3000 blood pressure measurements and 7 days of continuous actigraphy
PC Interface	USB
Battery	2 x 1.2V NiMH Rechargeable Batteries Sufficient for approximately 300 measurements
Software	Hypertension Diagnostics Suite for Microsoft® Windows® XP SP2 and Vista®

Stimulator

The Innostim tens 2K is a battery operated pulse generator, known as TENS unit, that send electrical impulses. The device is provided with 2 controllable output channels, each independent of each other. The electronics of the Innostim tens 2K create electrical impulses whose intensity, duration, number per second and modulation may be altered with the controls or switches. The Innostim tens 2K has digital controls and readouts.

The shocker electrodes are Ag/AgCl electrodes, mounted in an plastic clip (curved) with velcro straps. Skin Conductance Electrode Paste is used to improved contact between electrode and finger.



Default settings Stimulator for Stress Induction

- Pulse rate: 150 Hz
- Pulse width: 250 μ sec
- Mode: Normal (constant)

This device may only be used when installed in the Shockerbox.

Mechanism	MAXTENS2000(Digital)
Channel	Dual
Amplitude	Adjustable,0-80mA peak into 500 ohm load each channel
Pulse rate	Adjustable,1 ~ 150 Hz
Pulse width	Adjustable,50 ~ 250 us
Mode	B :Burstmode N : Normal(constant) mode M : Modulation mode
Wave form	Asymmetricalbiphasic pulse
Timer	15,30, 45,60, 90, continue
Power supply	9V Battery(included)
Size	105(H) x70(W) x 24(T) mm
Weight	121g(battery included)

Ouput current MaxTense 150 Hz and 250 usec							Output voltage MaxTense 150 Hz and 250 usec						
bar#	Box1-Tense 1		Box2-Tense 2		Box3-Tense 3		bar#	Box1-Tense 1		Box2-Tense 2		Box3-Tense 3	
	R-output		R-output		R-output			R-output		R-output		R-output	
	-I (mA)	I (mA)	-I (mA)	I (mA)	-I (mA)	I (mA)		-V (V)	V (V)	-V (V)	V (V)	-V (V)	V (V)
1	-3,3	5,2	-3,1	4,9	-3,2	5,2	1	-1,8	2,9	-1,7	2,8	-1,8	2,9
2	-7,3	9,8	-6,5	10,0	-6,7	9,7	2	-4,1	5,5	-3,6	5,6	-3,8	5,4
3	-9,9	13,2	-9,1	12,4	-9,2	12,2	3	-5,5	7,4	-5,1	6,9	-5,1	6,8
4	-11,5	15,1	-10,8	14,5	-10,6	14,3	4	-6,4	8,4	-6,0	8,1	-5,9	8,0
5	-14,2	18,3	-13,6	17,7	-13,3	17,4	5	-7,9	10,2	-7,6	9,9	-7,4	9,7
6	-17,2	21,9	-16,8	21,1	-16,3	20,8	6	-9,6	12,2	-9,4	11,8	-9,1	11,6
7	-20,8	26,0	-20,1	25,4	-19,9	24,9	7	-11,6	14,5	-11,2	14,2	-11,1	13,9
8	-23,8	29,6	-22,9	28,7	-22,9	28,7	8	-13,3	16,5	-12,8	16,0	-12,8	16,0
9	-27,4	33,7	-26,5	32,6	-26,5	33,0	9	-15,3	18,8	-14,8	18,2	-14,8	18,4
10	-29,7	36,6	-29,7	36,6	-29,7	36,2	10	-16,6	20,4	-16,6	20,4	-16,6	20,2
max	-31,9	39,1	-31,2	39,1	-31,2	38,0	max	-17,8	21,8	-17,4	21,8	-17,4	21,2

load : 500 Ω



Scanner Specific equipment

The 19" racks installed at the PrismaFit, Prisma, Skyra and Dummylab are equipped with the same devices. However, a few devices which are not installed at every rack. These devices serve a very special purpose and not frequently enough to justify a multiple purchase of the (expensive) device. Below you find an overview of scanner specific equipment and a description of their purposes.

lab	Specific equipment	Purpose
Skyra	Digital video scaler + LED screen(55 inch) Modified scantriggerbox	<i>For demo and presentation purposes Used when performing fMRI-EEG experiments</i>
Dummylab	Headphone amplifier	<i>Because in Dummylab the Sensemetric in-ear phones are NOT available a common headphone is used.</i>

Screen (only at Skyra)



The control room of Skyra is large enough to show visitors how we measure brain activity with an MRI scanner. For this purpose a 55 inch screen is mounted to present presentations and give the visitors a good view on what can be seen on the MRI-host PC monitor. On the screen is driven by a so-called video scaler is presented which make Picture In Picture presentation possible.

The screen is operated by a remote control. Info regarding the remote control functions is given in an image below.



Model: 55LY330C-ZA

POWER Turns the TV on or off.
TV/RAD Selects Radio, TV and DTV programme.
SUBTITLE Recalls your preferred subtitle in digital mode.
AV MODE Selects an AV mode.
RATIO Resizes an image.
INPUT Changes the input source.
Number buttons Enters numbers.
LIST Accesses the saved programme list.
Q.VIEW Returns to the previously viewed programme.
+ / - Adjusts the volume level.
FAV Accesses your favourite programme list.
GUIDE Shows programme guide.
MUTE Mutes all sounds.
^ P v Scrolls through the saved programmes.
^ PAGE v Moves to the previous or next screen.
Teletext buttons (TEXT/T.OPT) These buttons are used for teletext.
INFO Views the information of the current programme and screen.
SETTINGS Accesses the main menus.
Q.MENU Accesses the quick menus.
OK Selects menus or options and confirms your input.
Navigation buttons (up/down/left/right) Scrolls through menus or options.
BACK Returns to the previous level.
EXIT Clears all on-screen displays and return to TV viewing.
SIMPLINK Accesses the AV devices connected with the HDMI cable through HDMI-CEC. Opens the SIMPLINK menu.
AD By pressing the AD button, audio descriptions function will be enabled.
Control buttons (stop, play, pause, fast forward, fast reverse) Controls the MY MEDIA menus or the SIMPLINK compatible devices (USB, SIMPLINK).
Coloured buttons These access special functions in some menus.
 (Red): Red, (Green): Green, (Yellow): Yellow, (Blue): Blue

RGB-PC, HDMI/DVI-PC Supported Mode

Resolution	Horizontal Frequency (kHz)	Vertical Frequency (Hz)
640 x 350	31.468	70.09
720 x 400	31.469	70.08
640 x 480	31.469	59.94
800 x 600	37.879	60.31
1024 x 768	48.363	60.00
1152 x 864	54.348	60.053
1360 x 768	47.712	60.015
1280 x 1024	63.981	60.020
1920 x 1080 (RGB-PC)	66.587	59.934
1920 x 1080 (FHD only)	67.50	60.00

NOTE

- The optimal display resolution - 1366 X 768 @60Hz
- The optimal timing in each mode is vertical frequency 60Hz.

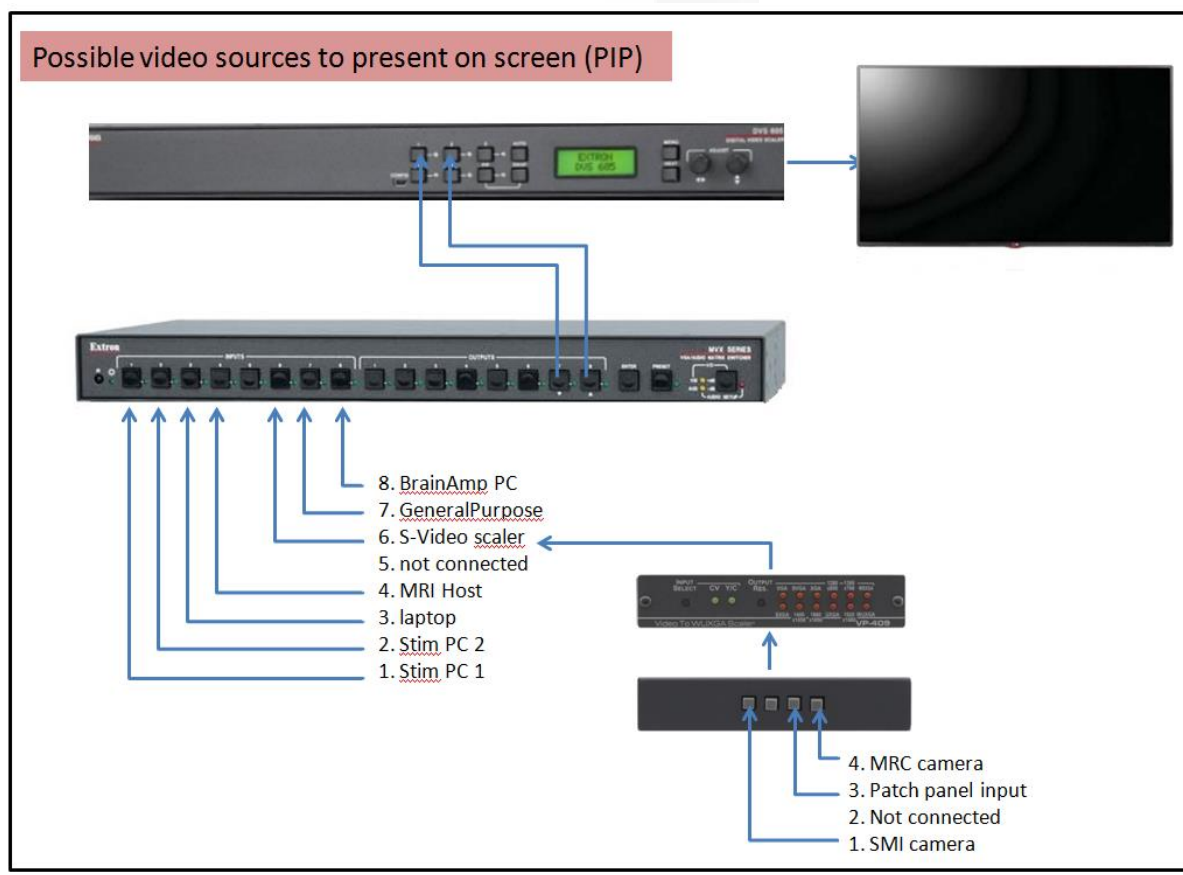
Scaler –PIP (only at Skyra)



The video scaler includes three HDMI inputs, two universal analog video inputs, and simultaneous HDMI and analog high resolution outputs. The DVS 605 models accept a wide variety of video formats including HDMI with HDCP, HDTV, RGB, and standard definition video. It features advanced Extron video signal processing with 100i de-interlacing, Deep Color processing, and true seamless switching.



Only the two universal analog video inputs are connected to outputs of the matrix switch. Hence all VGA inputs of the matrix switch at Skyra can be used as video source. In case Picture in Picture is active, two VGA inputs of the matrix switch can be presented at the same time. First connect two video sources to output 7,8 of the matrix switch. Secondly selected by pressing “1” or “2” on the scaler which video source become “Main”. If “PIP” is activated the second source is automatically assigned to PIP. With the “swap” button the inputs of main display and PIP can easily be swapped.



Batteries & PowerPacks



COMING SOON

Before bringing a battery inside the MR room convince yourself it safe to do this. Check the safety label

To provide electrical power to equipment inside the MR room the use of power adapters is often NOT possible. This has to do that a lot a power adapters contain ferro magnetic parts. In addition, the electronics of the adapter can interfere with the MR-signal, leading to image artifacts or an increased noise levels. The use of batteries can overcome these problems. Some of the batteries are equipment specific. Others can be used as power source for several home-made equipment.

MRI - Alarmbox

The Alarm Box is an interface for:

- MR system power switching
- Magnet status indicator
- ERDU (Emergency Run Down Unit = Quench button)

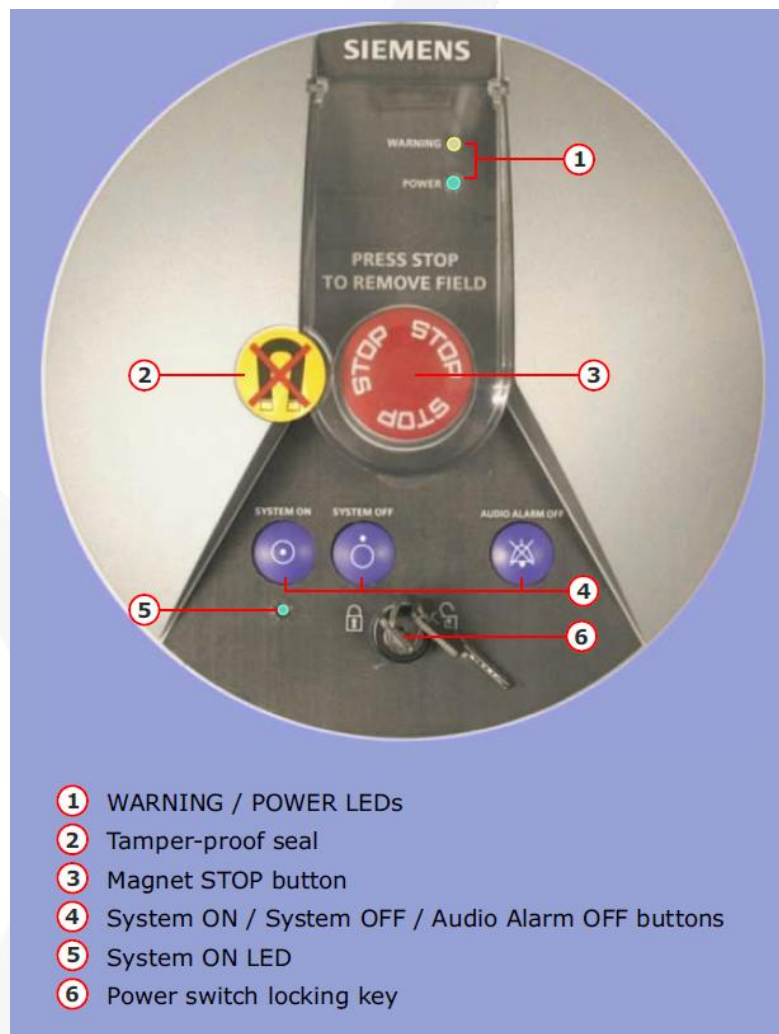
Switch	Description
SYSTEM ON	All MR-System components are powered up
SYSTEM OFF	All MR-System components are switched off
LOCKING KEY	To prevent from unauthorized power switching
STOP BUTTON	Emergency Rundown Unit (ERDU) for magnet
AUDIO ALARM OFF	Resets the relay contact and the buzzer
LED	Description
LINE POWER	Power is supplied to the alarm box
WARNING	<ul style="list-style-type: none"> - Liquid helium level below warning or alarm-thresholds - Quench / switch heater error or ERDU button fault - Magnet pressure too high / low - Compressor stopped (low pressure switch operated) - ERDU battery voltage warning or alarm - EIS drive error

Note:

The Alarm Box has 2 different style alarms:

- Low priority alarm - the alarm box beeps twice every 20 seconds
- High priority alarm - the alarm box beeps three times every 10 seconds.

The buzzer can be reset by pressing the "AUDIO ALARM OFF" button.



- 1 WARNING / POWER LEDs
- 2 Tamper-proof seal
- 3 Magnet STOP button
- 4 System ON / System OFF / Audio Alarm OFF buttons
- 5 System ON LED
- 6 Power switch locking key

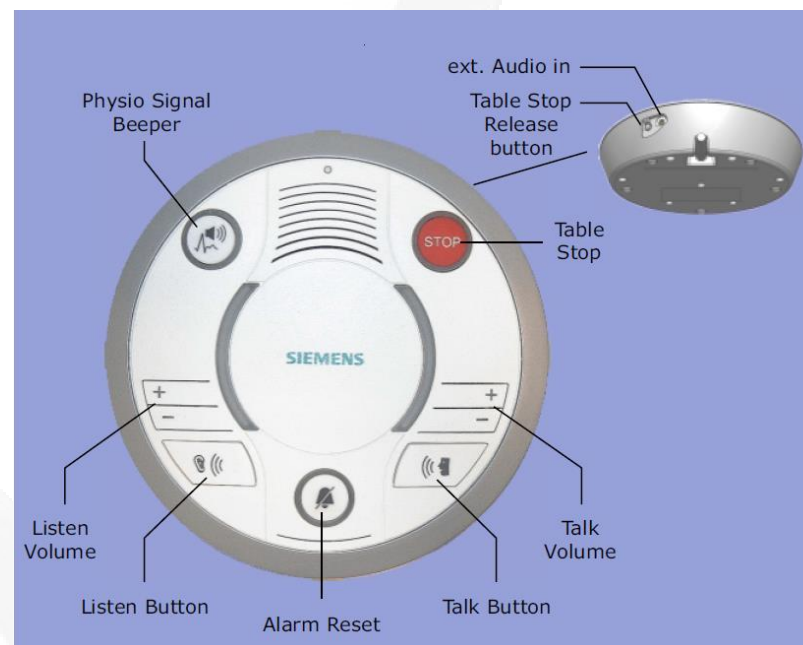
NOTE: Pressing the STOP button results in a quench of the superconducting magnet and the magnetic field decays within 20 seconds.

MRI - Intercom



The following operating elements are available:

- Talk button - operator to patient
- Listen button - patient to operator
- Volume adjustment - talk and listen
- Alarm reset - for the patient alert (squeeze ball)
- Physio signal - switches on/off the physiological signal beep
- Table stop - stops table movement and measurement
- Table stop release - button at the Operating Units' rear-side
- External audio input



NOTE: To reset a Table Stop initiated at the Operating Unit, press the Table Stop Release button at its rear-side.



MRI - How to

MRI - How to turn on

MRI - How to turn off (full shutdown)

MRI - Registration

MRI - Squeeze Ball

SyngoMR - AA scout

SyngoMR - Export to Offline

SyngoMR - ExportOffline (continue)

SyngoMR - Export of raw data files

SyngoMR - TWIX

SyngoMR - SaveMeasData

SyngoMR - FileBrowser

SyngoMR - Retrospective Reconstruction

SyngoMR - View/Print images in 2D/3D viewer

SyngoMR - Correct patient meta data

MRI - Use of E-marker

- CONTINUE -

MRI - How to turn on



1. Press the “system on” button on the Siemens scanner control box (Alarm box) located on the wall next to the MR Scanner window
2. It will take approximately 8 minutes for the system to complete the startup process.

At the end of the start-up, you will hear three knocks (caused by the safety test of the Stimulation monitor of the MRI). If the system is ready to use, the icons in the status bar, representing the acquisition and/or reconstruction system, are not strikethrough by a red line anymore.



ERRORS DURING START-UP
NO SCANNING POSSIBLE
see trouble shoot section

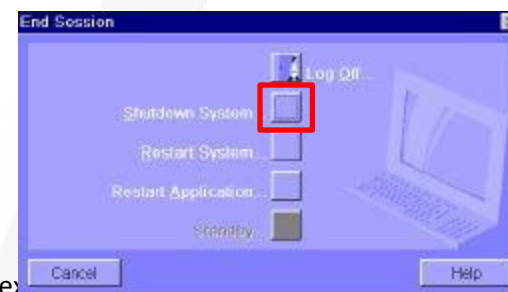


SYSTEM READY

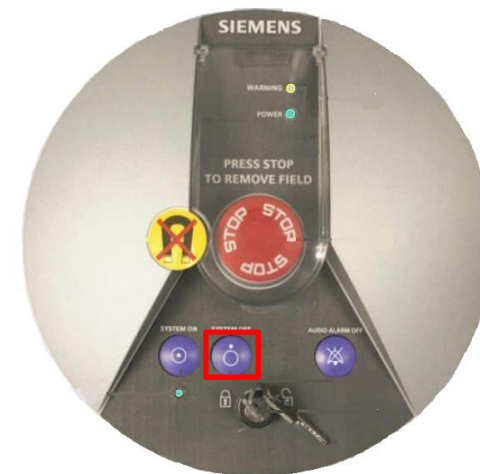
MRI - How to turn off (full shutdown)



1. Make sure the scanner bed is at the home position (all the way out)
2. If a coil is on the table, all element should be plugged in
3. Click the "System" tab at the top of the screen
4. Click on "End Session"
5. Click "Shutdown System" (see also footer)
6. After approximately 8 minutes you see "it is now safe to turn off your computer"
7. Press the blue "system off" button on the Siemens scanner control box located on the wall next



Never press the powerbutton of the MRI Host PC



Note:

In the "End Session" window you can select three options.

As mentioned above "Shutdown System" – will shut down the whole MRI (Host – MARS)

The option "Restart System" will only restart the Host PC (PC below the table in the control room)

Do not use this option if you want to perform a short reboot to eliminate an error. In most cases, you have to reboot the MARS. This not happens by "Restart System" (indeed somehow confusing).

Restart Application will only restart the Syngo Software running on the Host PC. Only necessary it very rare case!

SyngoMR - Registration

Some fields of the Patient Registration are used to automatically transfer the acquired data to your projectfolder. To overcome typos the necessary text is downloaded from a so-called worklist.

The worklist list is generated (re-newed), once in 5 min, by extracting data from the bookingcalendar. The most convenience way to import is to open the Patient Registration window and click *Search*. Highlight your entry and click *OK*.

The screenshot on the right shows the other fields which must be filled out by the user (mandatory). If you want to add extra information use the field *Additional Info*. The content of ALL fields will be visible in the DICOM header of the acquired images.

Legend:

- Input from Worklist
- Input by user (mandatory)
- Input by user (optional)

Last Name	Referring Physician	Location
3013065 01_sub-025_ses-01	Rathiga Varatheeswaran	Scheduler
3055010 02_sub-x138_ses-01	Paul Gaalman	Scheduler
3011154 01_sub-041_ses-02	Ian Cameron	Scheduler
3017048 01_sub-x328_ses-01	Jessica Maatta	Scheduler
3014018 08_sub-048_ses-01	lli Ma	Scheduler
3017048 01_sub-021_ses-02	Jessica Maatta	Scheduler
3055010 02_sub-x138_ses-01	Paul Gaalman	Local
3017057 01_sub-045_ses-01	Joyce Dieleman	Local
3017057 01_sub-044_ses-01	Joyce Dieleman	Local
3017048 01_sub-022_ses-02	Jessica Maatta	Local
3055010 01_sub-001_ses-02		Local
3055010 01_sub-001_ses-02		Local
3055010 01_sub-001_ses-01		Local
3017048 01_sub-x378_ses-01	Lieke Hofmans	Local
paugaa_20080507_mattjjs		Local
Retro Recon		Local

The correct way of patient registry manually, to enable automatic transfer of DICOMs:

Patient ID: “<projectID>_<subjectID>” e.g. “3055010.02_sub-001”.

Request ID: “ses-MRI<sessionID>” e.g. “ses-mri01”.

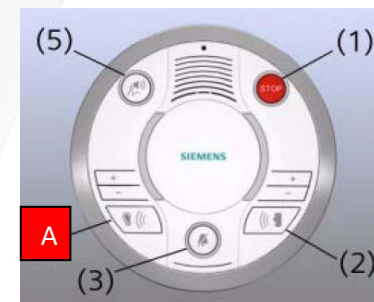
The ‘Last name’ field is actually not used for automated transfer of the data, but should best be filled out like done when picking up from the scheduler: Last name: “<projectID>_<subjectID>_<sessionID>” e.g. “3055010.02_sub-001_ses-01”

MRI - Squeeze Ball



In case, the participant presses the squeeze ball:

1. **Stop the scanner** using the mouse and clicking the stop icon in the lower left on the console screen
2. To clear the alarm, **press the talk button** on the intercom 2^A or 3^A.
3. **Enter the scanner room** and ask if the participant wants to get out.
4. DO NOT press the “Stop” button on the Siemens Intercom 1^A.



Ad 1: Do not try to communicate to the subject when a sequence is running. This is not possible! Only if the participant wears in-ear phones and the optical microphone is installed, you can start a conversation with the subject while scanning. Also after aborting the scan, communication with a participant, wearing ear foam plugs, is difficult. Do not try to communicate via the intercom but go immediately inside!



Ad 2: If the participant keep squeezing the ball, acknowledge (silence) of the alarm by buttons, 2 or 3 does will not work. Do not spend time on this! Go immediately inside the scanner room! Inside the scanner room, you can also acknowledge the alarm by pressing small jog wheel^B.



Ad 3: Check if the participant really wants to stop. Maybe the squeeze ball was pressed accidentally.

Ad 4: If you pressed the “Stop” button (#1), you will activate the table stop. It will NOT silence the alarm. Due to the table stop the table control buttons are not working. The table can only be dragged out of the bore manually. Because that action ask some force, you can pull the “emergency release handle”^C that is located on the right side of the foot of the table if you are facing the scanner. Moving the tabletop goes easy.



SyngoMR - AA scout



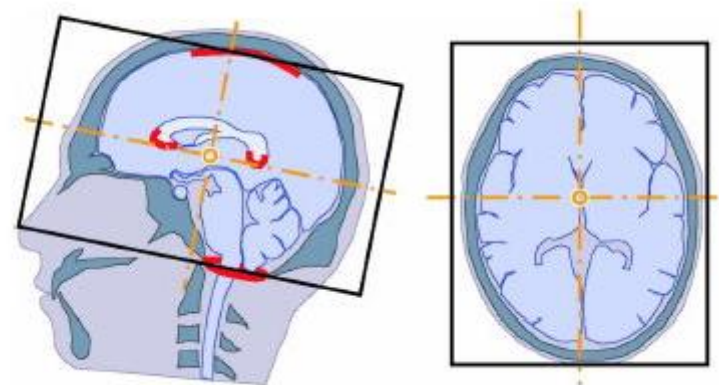
AutoAlign assists the user in positioning the slices in a robust and reliable way regarding positioning and arbitrary patient positions, different patient ages, pathologies and interventions. Within a special 3D scout volume, AutoAlign detects the position and orientation of the predefined AutoAlign sub-regions in the individual patient anatomy. This information is available in the following protocols.

Within the AutoAlign region, the position and orientation of multiple so-called AutoAlign references are detected. For the head region these reference positions are: Basis, Brain, Inner ear, Orbits, Optic nerves, Optic nerve, Head > L Optic nerve R.

The default for DCCN sequences is Head > Brain.

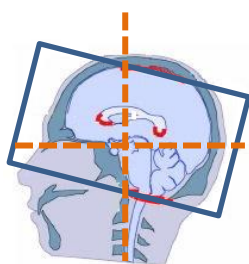
An AutoAlign scan program starts with an AutoLign scout (T1-weighted 3D volume). Based on landmark detection, several AutoAlign Head references (anatomical positions and orientations are computed from the 3D volume. Several calculated MRPR localizer images are reconstructed and automatically loaded in the Exam task card.

The shift, translation and rotation of the detected landmarks relative to the patient coordinate system are defined. With this information the FOV is positioned in such a way it covers the same region as stored in Exam database

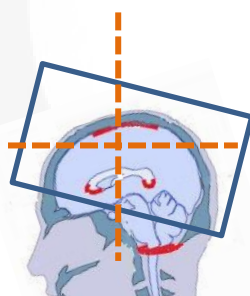


Alignment:

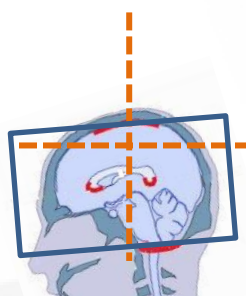
- Perpendicular to the midsagittal plane that is provided by the AutoAlign reference **Head > Basis**
- Tilted Tra > Cor along the corpus callosum contour



FOV position BrainAtlas



FOV position before AA

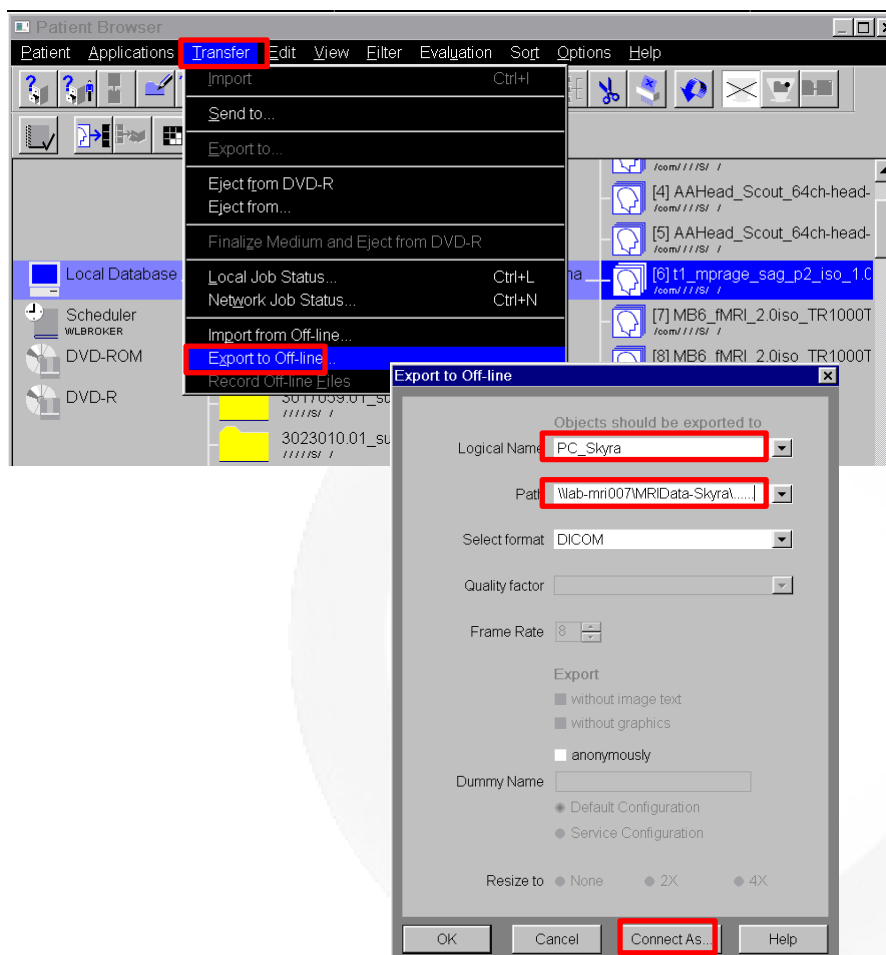


FOV position after AA

SyngoMR - Export to Offline



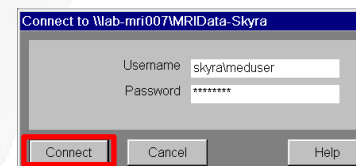
If during registration, the worklist data is used, the acquired MRI data is, automatically streamed to the project folder. In case a pilot project number is used, or when registration is done manually, you have to transfer the acquired data via the “Export Offline” option.



To start “Export to Offline” go to the Patient Browser and click on the **Transfer** tab. (In the menu bar of the Exam view is also a tab Transfer but this is not the right one!) Highlight the folder you want to transfer.

When clicking on Export to Off-line a new window will open.

1. Select one of the transfer PC by select Logical name (PC_%scanner%) or the Path Name of the export PC's:
2. Extend the path to create a subfolder in MRIdata_%scanner%
3. Use **Connect As** button and connect using the following credentials: **Username: %scanner% \ meduser Password: meduser1**





SyngoMR- ExportOffline (continue)

The screenshot shows the SyngoMR Patient Browser interface. The main window displays a tree view of the Local Database with folders for patient studies. A table at the bottom shows patient information and image details.

Image No	Slice P...	Protocol Name	Image Co
1	0.0	localizer	
3	0.0	localizer	
2	P30.0	localizer	

Two dialog boxes are overlaid on the interface:

- Another user connected:** A warning dialog with a yellow triangle icon. The text reads: "Connection can not be made because another user is connected. Do you want to disconnect User: PRISMA\meduser and reconnect as User: meduser?". It has "Yes" and "No" buttons.
- Connect to Wlab-mr007\MRIData-Skyra:** A login dialog with fields for "Username" (containing "meduser") and "Password" (containing "*****"). It has "Connect", "Cancel", and "Help" buttons.

Below the login dialog, there is a "Dummy Name" field and radio buttons for "Default Configuration" and "Service Configuration". There are also "Resize to" options: "None", "2X", and "4X". At the bottom of this dialog are "OK", "Cancel", "Connect.As...", and "Help" buttons.

It often happens that the connection to export_PC fails due to login conflicts. Close all windows and try again to solve the problem. Sometimes you have to do this several times before the connection is established.

Rebooting the export PC can also solve this problem.

An always working workaround is unfortunately not known (yet).

SyngoMR - Export of data files




With the “Export to Offline” command, you can only export DICOM files. To export other data like, k-space data or raw spectroscopy data in ASCII format (*.rda) you have to use another way:

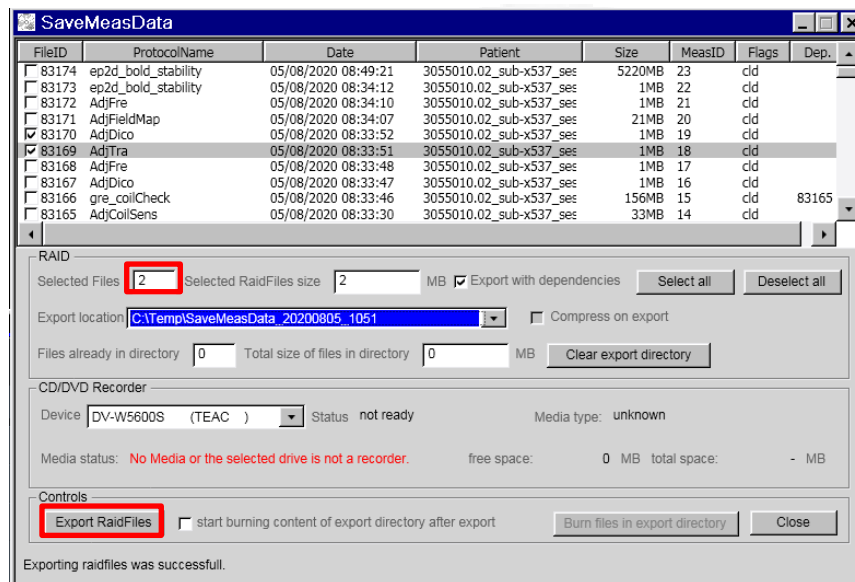
- **TWIX**
Exports raw data (k-space data) from the imaging reconstruction system to a local or Network drive.
- **SaveMeasData**
Exports raw data (k-space data) from the imaging reconstruction system to C:\Temp.
- **Filebrowser**
Exports data from MRI console to a local or network drive.



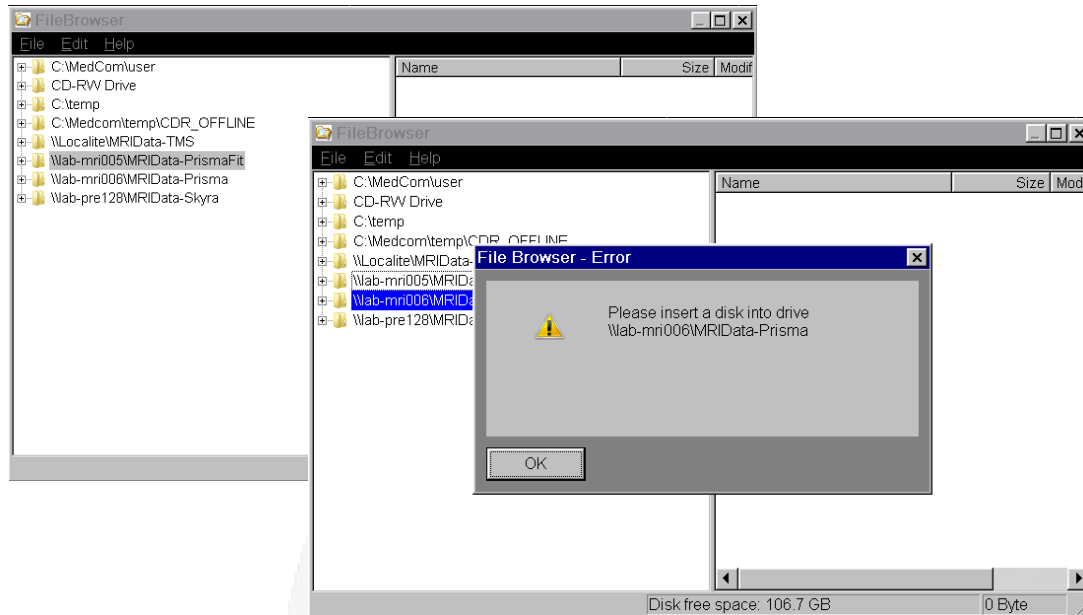
SyngoMR - SaveMeasData



1. Click control and escape key simultaneously - *W7 start-menu will pop-up.*
2. Click SaveMeasData  icon - *All raw data on the RAID of the image reconstruction system will be listed.*
3. First press "Deselect all" to be sure you not going to copy files you not need. Select the raw data you wish to save by choosing the correct participant ID and sequence. Each filename is based on the protocol name. Some will be tune-up files, others data files (data files are generally bigger). Right click on it and choose the top option "copy total raid file".
4. Press "Export RaidFiles" to start the transfer.
5. To copy it from C:\Temp\... to another network location, you will need the lab-manager to enter the *Advanced User mode.*
6. After the transfer, you must delete the data manually to avoid lack of disk-space on the C: drive.



SyngoMR – FileBrowser



The *FileBrowser* can be opened in all Syngo Tabs (*Exam – Viewing – Filming -3D - Spectyroscopy*). Go to *Options* in top-taskbar. With the *FileBrowser* you can save/copy/move data files. Only a few specific folders on the C-drive of the MRI-host and some pre-defined network drives are accessible (see picture left).

Often it happens, when trying to open one of the *Export-Offline* directories (e.g. \\lab-mri006) you get an error message “Please insert...”

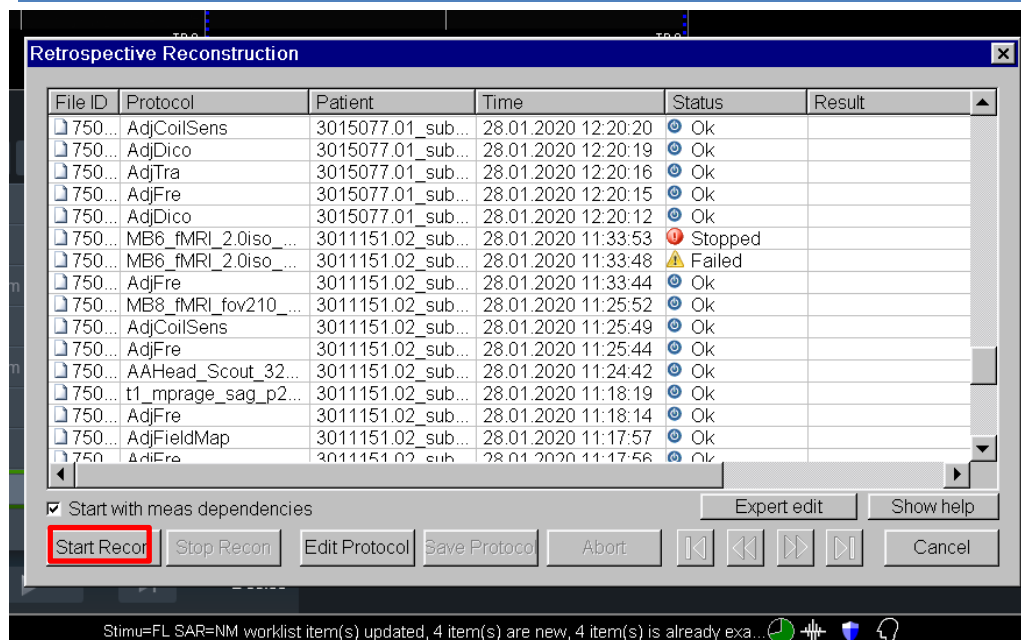
This, rather weird, error message pops up when the network drive is not accessible due failing login.

Unfortunately, the *Filebrowser* does not support the option to login with other credentials. To solve this read [WORKAROUND](#).


WORKAROUND

To connect, to one of the network drives please, just transfer one DICOM image to the network drive, using [Export to Offline](#). In the *Export to Offline* dialog window it is possible to connect to a network drive as a different user. (*Connect As...* option). Once this connection is established, the network drive is also available in the *FileBrowser*.

SyngoMR - Retrospective Reconstruction



Before start please be sure the Reconstruction System is free of errors. You can do this by clicking the Tab *System > Control and clicking* in the System Manager window the tab *Meas & Recon*. Click *MriIrisContainer@mars* and click *Restart*. The Green arrow in front of the label will turn to red and after a while green again. This means the component is running again.

Click simultaneously: **Shift +**  **icon.**

The Retrospective Reconstruction Window will pop-up. Highlight the protocol file, which failed, and click *Start Recon* in the left bottom corner of the window.

The system will first make a copy of the highlighted file. It appears on top of the list (highest File ID). In the *Result field* the status of the retrospective reconstruction is given. First you see “*Analyse*” and after a while (can take long) “*Calculate*”. Now you can open the online display in Syngo. If you re-reconstruction of an fMRI dataset you will see the reconstructed volumes passing by one by one. Retrospective Reconstruction is finished when in the Result field shows “*Calculation done*”.

In the *Patient Browser* the reconstruction sequence is labelled with **RR** in front of the sequence name. If again “*Failed*” is shown, please first check in the *Patient Browser* if the number of images (volumes) is indeed less than expected. The status “*Failed*” is also shown when the sequence was aborted manually or due to an unexpected error.

Some background information

Sometimes the acquired (RAW) data is, due to an unknown cause, not automatically reconstructed by the reconstruction system (RS). There is also no error/warning message popping up to warn you. It can happen that you only discover this when checking the acquired dataset in the Patient Browser. To avoid this you check if the DICOM images are reconstructed by opening the online display window. As long as the RAW is available in the buffer of the RS you can recover the data. The buffer works as a First In First Out buffer. Hence, at one point the already stored data, is overwritten. The buffer size is about a few hundreds of gigabytes (Prisma/PrismaFit about 520 Gb, Skyra about 330 Gb). Taking into account a RAW dataset, acquired during 30 minutes of scanning, is about a few tens of gigabytes, you have to do the recovery within a day (depending on scanner usage and type of experiments researcher after you are running).

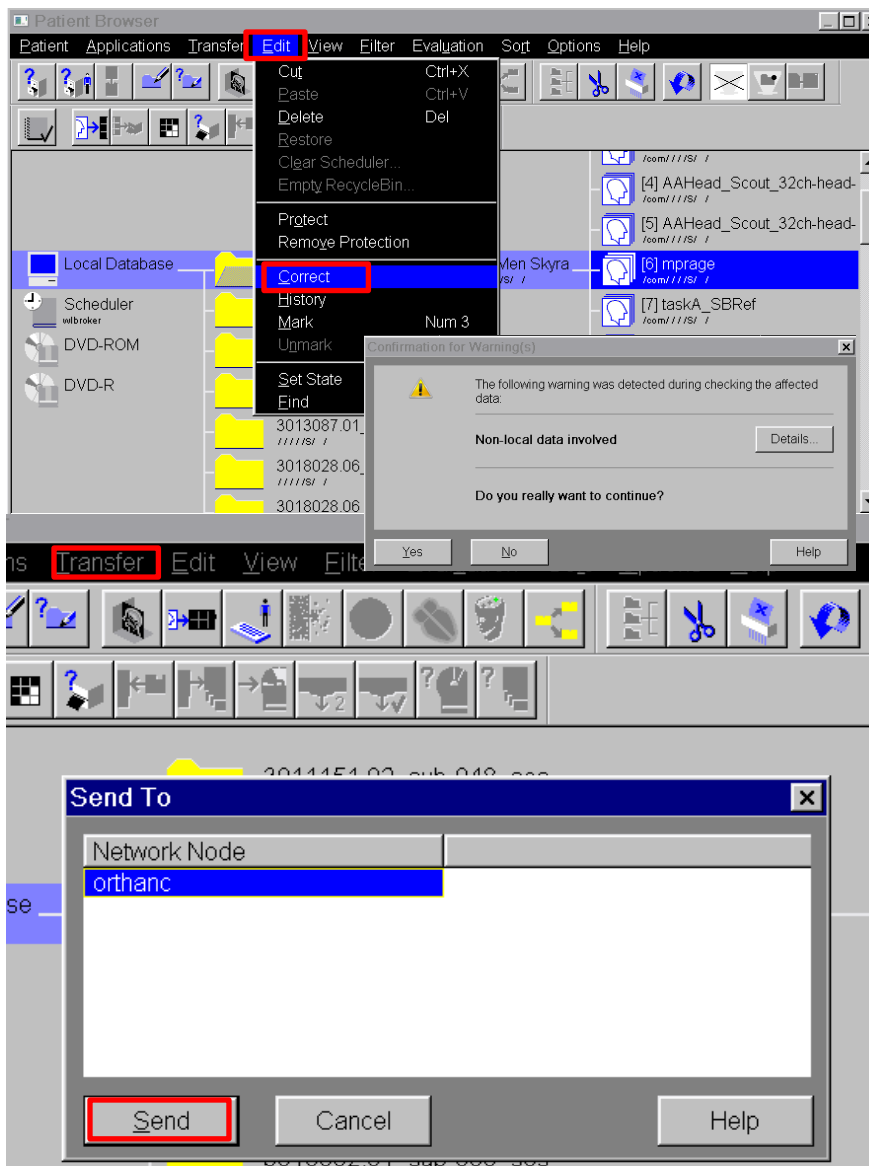
SyngoMR - View/Print images in 2D/3D viewer



COMING SOON



SyngoMR - Correct patient meta data



To correct for a typo (eg. date of birth) you should first close the patient session (Patient → Close Patient). Hence, you can only do this when finishing scanning.

The highlight in *Patient Browser* the dataset to correct. Open the *Correct* window by clicking Edit → Correct. A warning will pop-up meaning you only can correct the data locally stored. Hence the DICOM images, already (automatically) send to our DICOM server (ortanc), are not affected.

Click **YES** and make the necessary correction and click **OK**.

To correct also the non-local data (in your projectfolder) you have to re-send the data-set after the correction is made.

WAIT!!!

Before re-sending the data delete or rename the folder of this subject in the P: drive. Because the streaming info is NOT changed the re-send data will be copied to the same folder (structure).

Click in Patient Browser Transfer → SendTo. Choose the only available network node orthanc and press **Send**.



MRI - Use of E-marker

The position of the auditory canal is used to co-register MEG acquired data with anatomic MRI data. During a MEG session, the position of the auditory canal is resolved by attaching coils to ear molds (manufactured by Doc's Proplugs). The location and orientation of the coils can be derived from the MEG data. In a separate MRI session the coils are replaced with vitamin E capsules. Vitamin E capsules are used as MRI visible markers.

The ear mold with E capsules have no hearing protection properties. For a proper hearing protecting the Siemens **headphones must be use.** Inside one of the shells another E capsules is placed (invisible form the outside; a label marks its position). This **capsule must marks the right side** of the subjects head. Hence always check if this is the case !

The 32 channel headcoil (default coil) is too narrow to fit the subjectshead wearing a headphone. Hence we have to use the also available 20 channel head&neck coil. The used anatomical sequence can be loaded from the DCN tree in the Exam Explorer – folder *MEG anatomical*

Legend of figures

Figure 1: Schematic drawing of use ear mold at MEG

Figure 1: Home made capsule with vitamin E (yellow stuff)

Figure 1: Storage box of E capsules and different sizes of ear molds

Figure 1: Ear mold with E capsule

Figure 1: Siemens headphones with vitamin E capsule in right shell

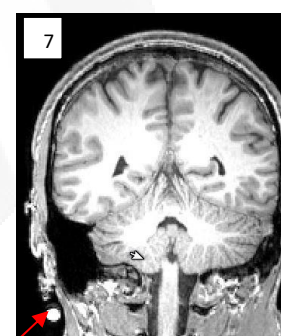
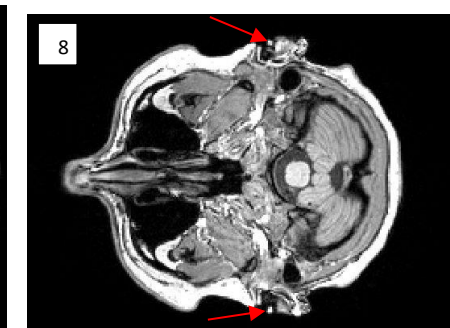
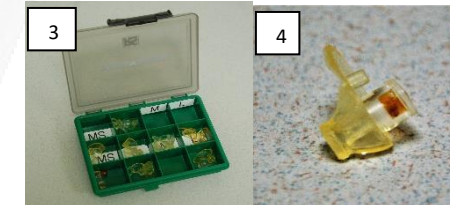
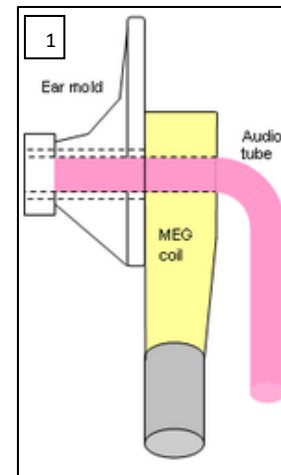
Figure 1: E-marker in ear

Figure 1: Coronal T1 image shows RIGHT SIDE marker

Figure 1: Transversal T1 image shows E capsules

See this page for technical notes about the Vitamine E earplugs:

<https://intranet.donders.ru.nl/index.php?id=lab-earplugs-vitamin-technical>





Troubleshooting

Audio - Issues

Beamer – No projection

BOLDscreen - AVIbox – issues

BrainAmp ExG – Bad signal(s)

BrainAmp ExG – Error during recording

BrainAmp ExG – No connction

BrainAmp ExG – Not working sensor(s)

Eye-Camera - Issues

InRoom Monitor – Nothing on display

MRI scanner – AAscout warning/error message

MRI scanner – Cannot Login

MRI scanner – Coil error

MRI scanner – Erroneous Readout Table position

MRI scanner – Error message during shutdown

MRI scanner – Gradient Supervision

MRI scanner – Helium level warning

MRI scanner – How to handle an error message

MRI scanner – How to make a MR Save Log

MRI scanner – MR signal does not converged

MRI scanner – MrVCheck message

MRI scanner – Network drive(s) not accessible

MRI scanner – reboot MARS

MRI scanner – Recover after Table Stop

MRI scanner – Registration issues

MRI scanner – Restart (power OFF/ON)

MRI scanner – SAR exceeded

MRI scanner – Stimulation threshold exceeded

MRI scanner – Subject feels sensation

MRI scanner – Table cannot move

MRI scanner – Worklist issue

MRI scanner –Image reconstruction failed

Response Device – Issues

Shocker – Not working

Stimulus PC - Fixation cross disappears

Stimulus PC - I cannot find my user folder



MRI scanner – Cannot Login



This can only be solved by System Administrator!

1. *Open cmd tool with administrator rights*
2. *Type: "net user meduser /active:yes*
3. *(command is not case sensitive. Do not forgot the spaces!)*
4. *Close cmd tool and Restart the system*

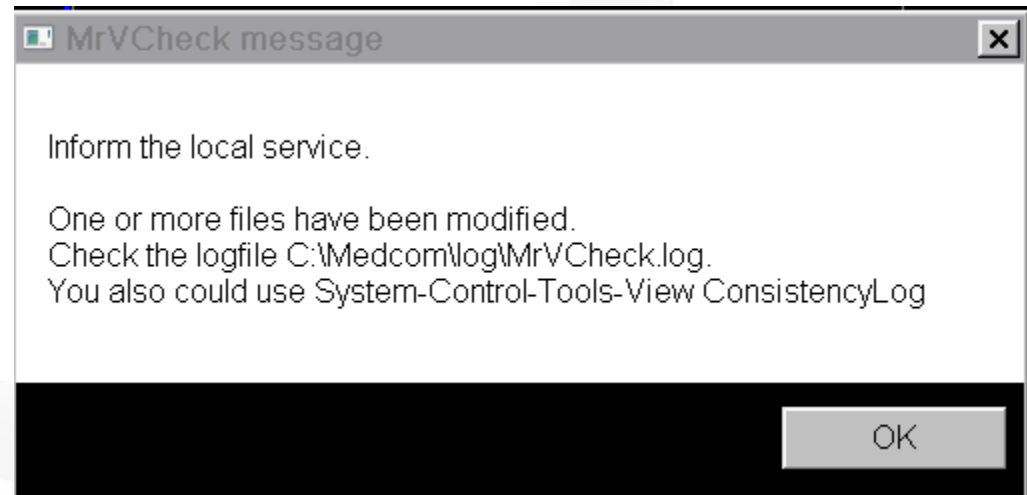
Some background info:

Normally Auto-login is enable. Hence, it is not necessary to type the meduser account credentials to start-up Syngo. In case, someone tries to log in (remote) 3 times with the wrong password then the corresponding will be locked.

MRI scanner – MrVCheck message



Ignore this warning message, just press OK.



Some background info:

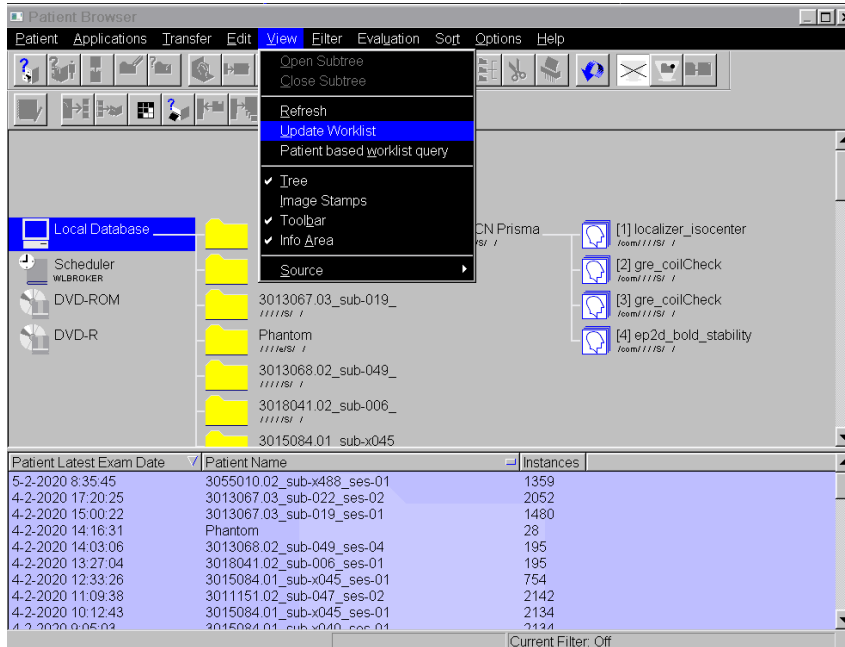
During start up the scanner software does a so-called summation check (sum check) on all vital system folders and compares the outcome with the result of a checksum made during the previous start up, in order to verify data integrity.

In most cases this messages pops up when a physicist has added/modified/removed a homemade sequence file (.dll).



MRI scanner – Worklist issue

If you do not see, your book entry in the scheduler (Patient Browser) or search window (Exam card).
 At the top of the screen **click Patient Browser > View > Update Worklist**



Some background info:

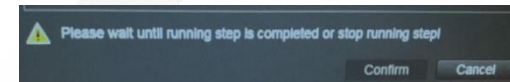
The worklist list is automatically generated (re-newed), once in 5 min, by extracting data from the bookingcalendar. If the scanner is just running up the script did not run yet. If you changed you book entry it will take some time before it pops up in the worklist. Please be aware, your changed book entry will NOT popup , in case the booking start-time already passed in time.



MRI scanner – Registration issues

You cannot confirm your registration due to error.

This happens when there are still active sequences in the Exam Card



- Go back to the Exam card and stop (red square) or **skip the remaining sequences in the queue.**

This happens when a participant aborts a scan early or the group runs out of time and stops scanning before their protocol is complete. Also note, you will not be able to close the patient on the Exam card until the sequences are stopped, skipped and/or deleted

The registration exam button is grayed out so you cannot click it.

This means you have **forgotten to complete a required field.**
 Required fields are in **BOLD** !



MRI scanner – Erroneous Readout Table position

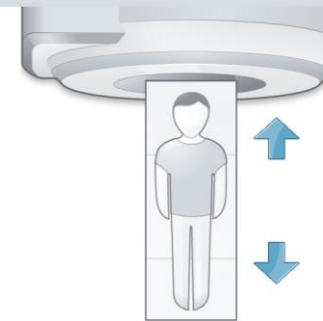
If you first move in the **patient table to the iso-center** (table readout *Isocenter*) **before the registration** of the participant, an erroneous table readout will appear on the display. Once the registration is done (after pressing *Confirm*) you suddenly see a table readout of minus *44 mm* on the display.

Do not, move the patient table to the isocenter (again). If you do, the table will move out over a range of 44 mm and you will scan your participant in a wrong position. If you start the first sequence (after pressing *Apply*) you will see (very shortly) the readout changing back from minus *44 mm* to *Isocenter* (without any table movement).

Also, in case you close your scanning session, in the Exam card (by pressing *Close Patient*), before moving the table to the home position, you will get the same erroneous table readout.

You can avoid this error by first doing the registration before you put in you subject.

New patient registered



-44 mm

Head 32 anterior
Head 32 posterior



Some background information

The default head coil for the scanner is the 20 channel head & neck coil. When positioning the laser light in alignment with the center marker of this coil the table will travel less than when you do this for the 32 channel head coil. The difference is exactly 44 mm. The table position is checked by the software after registration. Which coil will be used is known when applying the protocol. In the meantime, it shows by default the position of center marker of the 20 channel head & neck coil.



MRI scanner – How to handle an error message

In case of a hardware/software error a message window “Call Siemens” will appear. At the same time the icons in the status bar, representing the acquisition and/or reconstruction system, will be strikethrough by a red or yellow line.

Sometimes **restarting the sequence (drag & drop)** is enough to reset the error. If this is the case, you just can continue scanning.

- If not try to **restart the imager reconstruction process** – [click here](#)
- If this also will not solve the problem, **reboot the MARS**. – [click here](#)
- As final attempt, you may **restart the scanner** – [click here](#)

In total, the procedure will take about 15-20 min.

If this will NOT solve the problem....
then STOP trying.
Inform users who booked the MRI after you.

To find out was is causing the problem you can check the System Manager
At the top of the screen – click *System > Control*
You will get a “System Manager” pop-up box.
Within this box you can check the “Host”, “Meas & Recon” and “Periphery” components.

Please inform lab-manager the details of the problem

Icons in the status bar



There is at least one system error. Measurements are not possible until the error is corrected.



The previous measurement has at least one acquisition error. The error does not affect subsequent measurements.
By starting a new measurement, all errors in the previous measurement are reset.



There are no acquisition errors.



There are no errors after reconstruction.



Errors were reported that occurred sometime between image reconstruction or post-processing and image storage to the database.

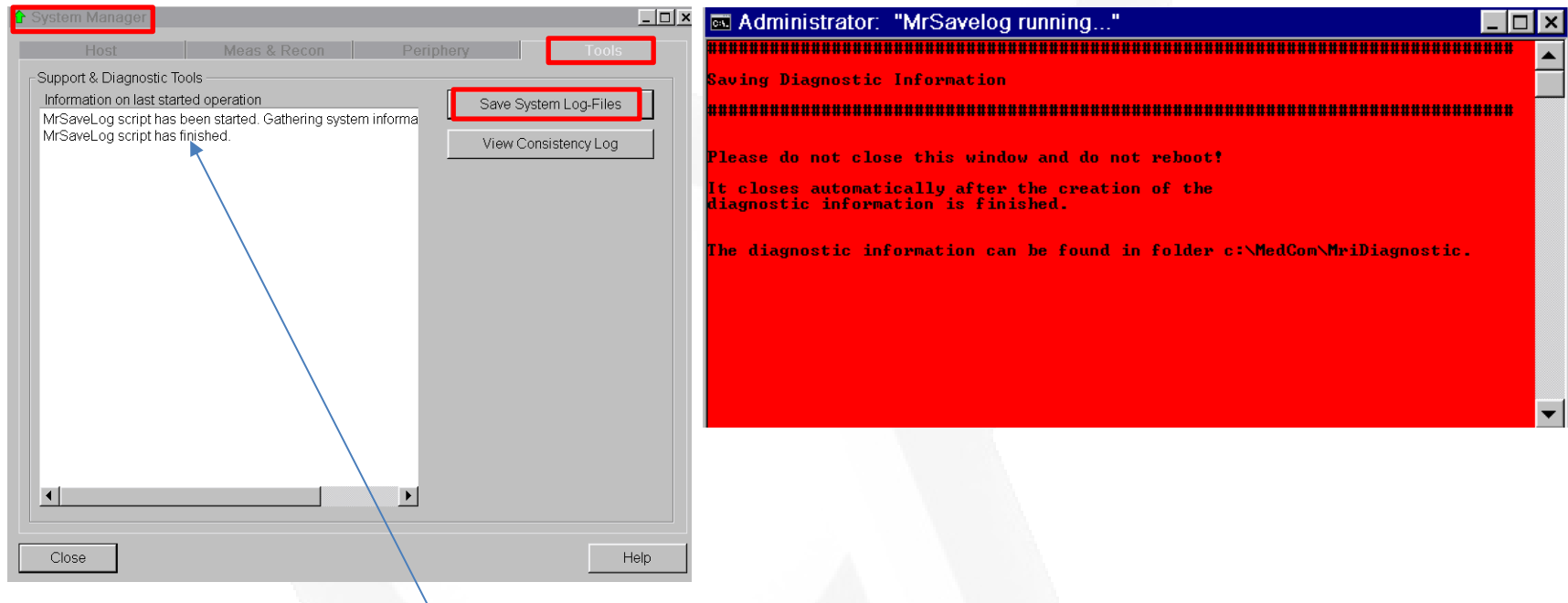


MRI scanner – How to make a MR Save Log

If you ever have a scanner problem that requires you to reboot, it is very important to make a **MR Save Log entry BEFORE you reboot** the system. This log entry helps the Siemens engineer isolate the scanner problem and expedite the system repair.

At the top of the screen – click *System > Control > Tools* - Click on “*Save system log files*”

You will see a box pop up with script on a black background, LEAVE THIS ALONE! Another box will pop up where you can input the problem. Fill out the “User” section and then click OK.



You must wait until the black pop box with script closes before you can proceed to reboot, scan etc.



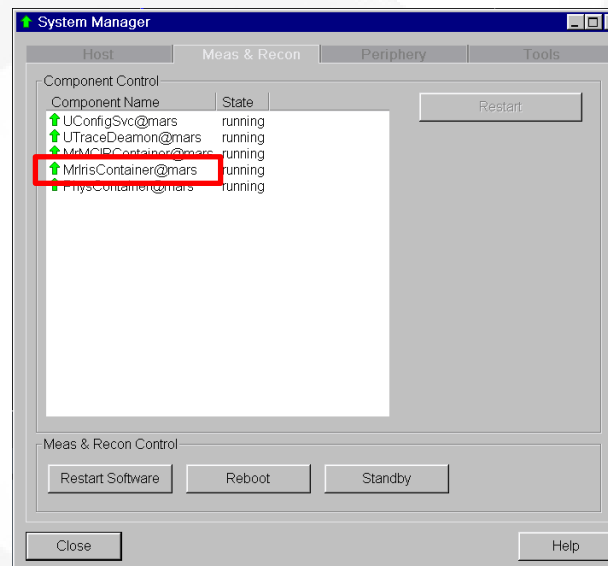
MRI scanner –Image reconstruction failed

For unknown reasons the MARS sometimes crashes during running of a CMRR sequence. It is not always immediately clear that it occurred. You would expect a red (error) line striking through the “head” icon in the status bar but, in most cases, it is a yellow (warning) one. Error messages like “scanning stopped by Image Reconstruction” or “Image reconstruction failed” are shown in the taskbar. Fact is you cannot continue scanning. To solve it you have to **restart the imaging reconstruction process**.

Go to Tab System > Control...Click in the System Manager window the tab Meas & Recon. The imager restarts by clicking the component with the name “MlrisContainer@mars”. The button labeled with “Restart” becomes active. Click on it!

The arrow besides “MlrisContainer@mars” will turn red (pointing down arrow). After 10-20 sec it will become green again (pointing UP) indicating that the component is running again.

Leave the System Manager by closing it and try to restart the aborted sequence. Due to the restart re-shimming is needed (is done automatically).



If this did not solve the problem and scanning is still not possible, follow the instruction on the next page.



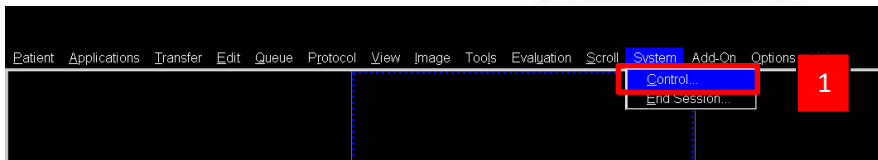
MRI scanner – reboot MARS

BEFORE REBOOTING PLEASE MAKE A SAVELOG FIRST (see MRI scanner – Error Message General)

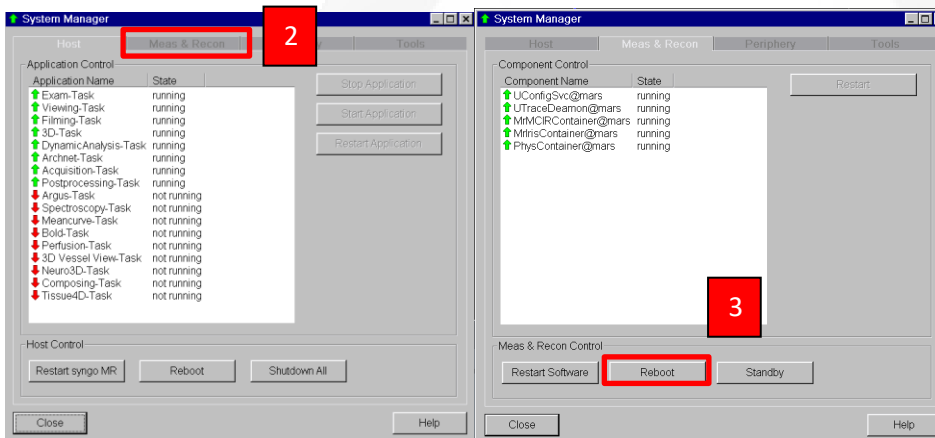
A **reboot of the Meas&Recon (MARS)** will solve in more than 90% of the cases the problem.

To do this go to Tab System > Control...Click in the System Manager window the tab Meas & Recon. To reboot the MARS click on the button labeled with “Reboot”. It will take approximately 6 till 8 minutes. You do NOT have to bring the participant outside the bore (= table in home position). Do not move the table and or connect/disconnect coils during a reboot. After hearing three knocks, (due to testing of the stimulation monitor) it will only take a few seconds before the scanner is up and running again. Due to the reboot, all reference images are lost. Hence, you have to start with an AA-scout before continuing the other scans.

If this did not solve the problem and scanning is still not possible, follow the instruction on the next page



When a participant is already installed he/she can just stay in the bore during the reboot. Just inform the participant and ask if it is fine not to take them out.





MRI scanner – Restart (power OFF/ON)

Before doing this bring the table to the home-position (outside bore).

Go to tab System > End session...and click Shutdown All.


(Do not click *Reboot* – it will only reboot the host PC and not the whole MRI)

After the MRI is shutdown, wait 10 sec. to turn it on again.



MRI scanner – Error message during shutdown

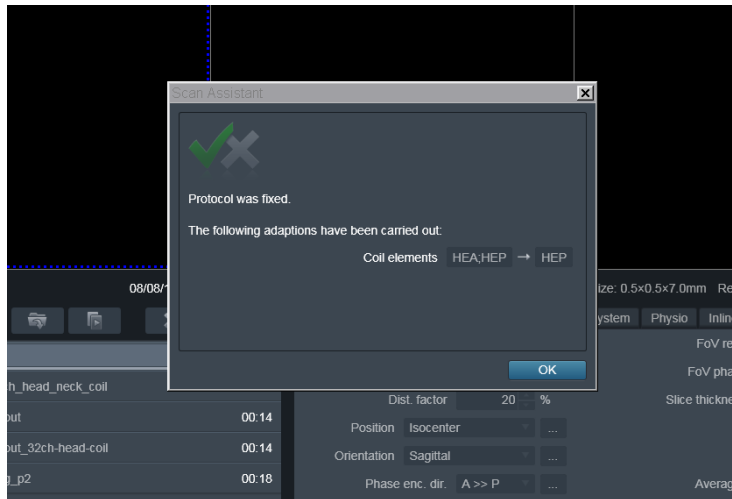


In most cases this indicates that the automatic transfer of the Dicom images to our DICOM server is not finished yet. If you press **NO** you can check this by looking if the transfer icon  in the taskbar is still visible. By pressing the icon th transfer window will popup to check the status. If you press **YES** the transfer will be stopped. Do not worry you data will not be lost. When starting up the next time, the transfer will start again automatically to finish the aborted transfer task.

If the content of the message is different from the one above just **ignore it and press YES** to continue the shutdown.



MRI scanner – Coil error



If you see warning messages while scanning, please read the message and address the issue. **DO NOT just click "OK"**. Ask a tech for help if you are uncomfortable with resolving the issue on your own.

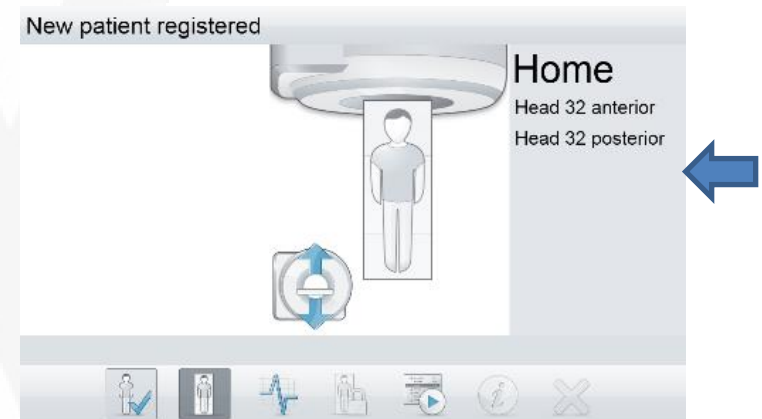
The pop up message will let you know that it is turning off the elements that are not plugged in properly. If you click "OK", you will be approving this change and you will lose signal from that part of the coil. Data collected in the manner will be suboptimal and most likely unusable

Resolution

1. Check the coil plugs
2. Reseat the plug if necessary
3. Make sure the LCD screen displays the anterior and posterior elements

The wrong coil was put on the scanner bed

The display above the bore shows which coil-parts are recognized by the MRI. All available head coils have an anterior and posterior part. You can scan with one of them but in most cases this is not desirable. Hence convince yourself both parts are connected.



32 channel headcoil

Posterior - cable connector - socket 1
Anterior - cable connector - socket 2

64 channel head/neck

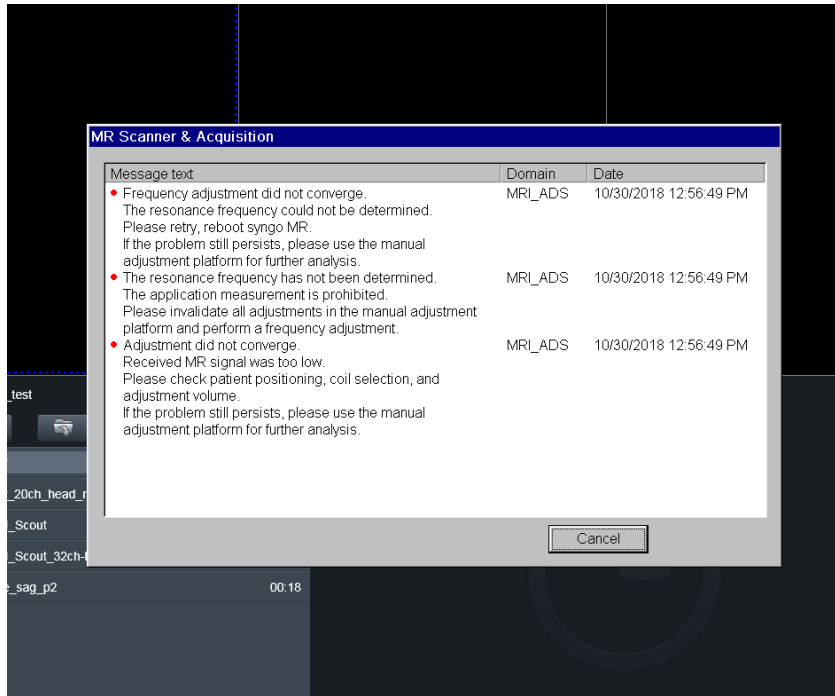
Posterior - Direct Connects - socket 5 and 6
Anterior - cable connector - socket 2

20 channel head neck

Posterior - Direct Connects - socket 5
Anterior - Direct Connects - socket 5



MRI scanner – MR signal does not converged



This means manual alignment of the laser light localizer went wrong or the table is not at the isocenter.

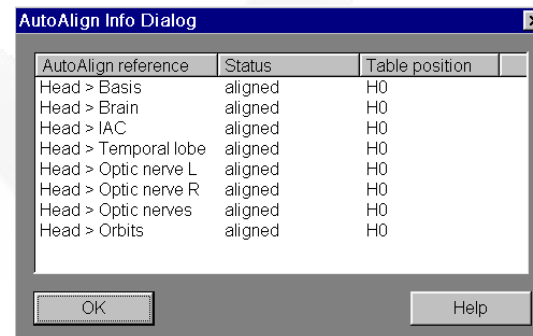
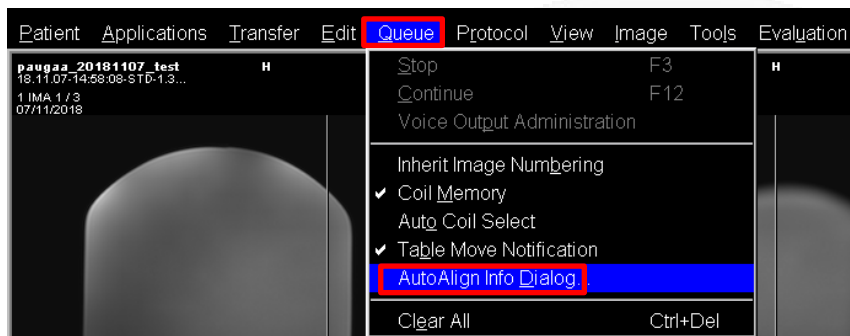
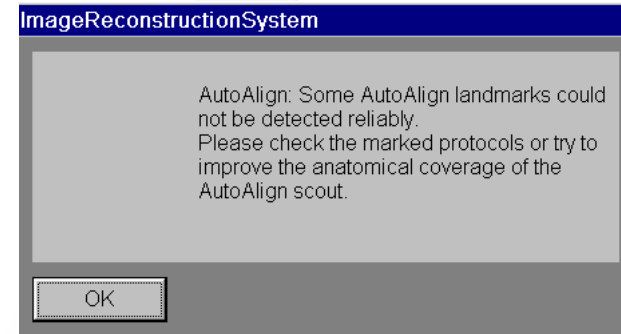
Redo the alignment of the laser light and/or move the table to the isocenter.



MRI scanner – AAscout warning/error message

Sometimes the following message pops-up. It means the AA-scout alignment algorithm was not successful in finding all the brain structures.

By default, the AAscout uses the Brain structure for alignment. If this is the case for all your sequences, just check the status of Head > Brain. If it say, “aligned”, you can continue scanning. The positioning of the FOV by the AAscout will be successful!




To avoid this warning/error message please check the position of the FOV of the AAscout. Check if the head is completely by the FOV. If not, pan it in such a way that is does and redo the AAscout. In >90% it will now succeed in finding all structures.

Some background information

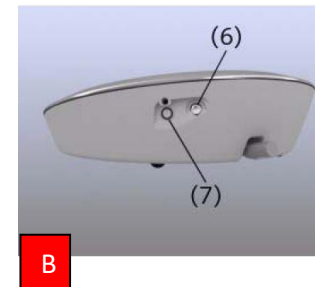
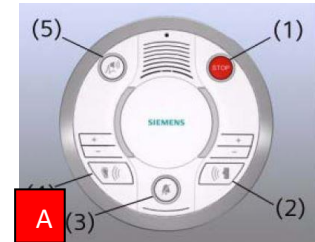
The AutoAlign option enables easy and accurate patient follow-up. AutoAlign references the 3D MR brain atlas and automatically aligns the slice positions in a standard reproducible way. Per sequence, you can select on which brain structure the alignment is done.

MRI scanner – Table cannot move



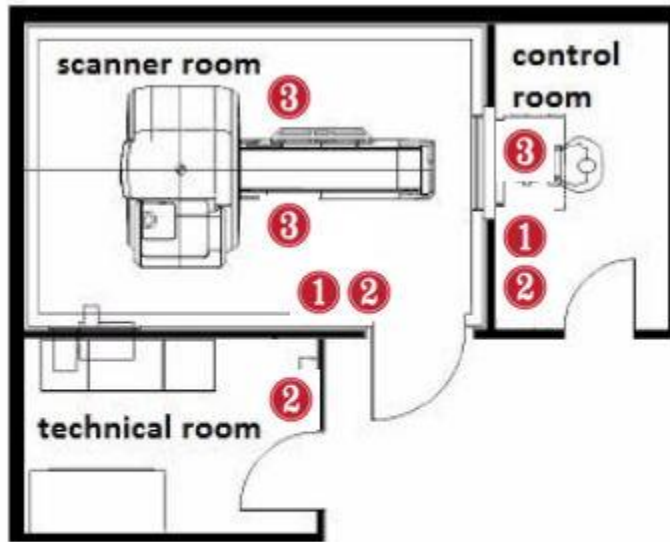
Probably it is caused by someone accidentally pressed the STOP button (1), in an attempt to stop the audible alarm caused by pressing the squeeze ball by the participant. By the way, this only can be done, by pressing  ^A.

1. Press the (#7) button ^B on the side of the intercom box.
2. Enter the scanner room. Simultaneously press the “Table Up” and “Table Down” buttons ^C. Keep these buttons pressed until, on the Patient Data Display located above the bore entrance, “HOME” is visible ^D.





MRI scanner – Recover after Table Stop



- (1) Magnet Stop switch
- (2) Emergency Shut-down switch
- (3) Table Stop button

To stop a table movement immediately the system is equipped with three Table Stop buttons, marked with 3 in picture below.

To reset the table stop, turn **Table Stop** button clockwise until it releases mechanically. Then simultaneously press the **Table Up/Inward** and **Table Down/Outward** button fully.

If the Table Stop was activated by pressing the **Stop Button** of the Siemens Intercom please follow [these](#) instructions.



At Skyra an extra Table Stop switch is installed in the guiding rail of table top. This switch, installed at the time the Boldscreen became available, avoid a collision between table and Boldscreen in case of unattended table movements. At Prisma\PrismaFit this is done by a software setting in Syngo.



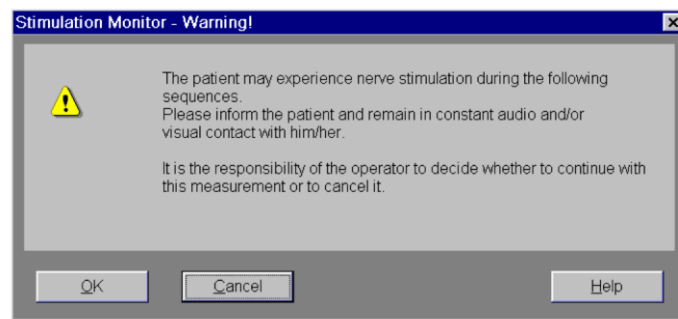
MRI scanner – Subject feels sensation

If your subjects feels a twitching sensation during scanning, it is cause by peripheral muscle or nerve stimulation.

Nerve stimulation manifests itself as e.g. tingling sensations or slight muscle spasms in the ribs, side, abdomen, hip, buttock, or thoracic regions, along the upper arms or the back muscles in the shoulder region. Depending on physiological conditions, the stimulation threshold may vary greatly from participant to participant.

What to do

Inform your subject that due to the switching of the magnetic fields electrical currents can be generating in the nerves. These nerve stimulations are harmless and not a safety issue. If the participant feels sensation in the upper arm, you can instruct the participant to move the arms away from the wall the bore. At all times the subject decides if he/she wants to continue the experiment.



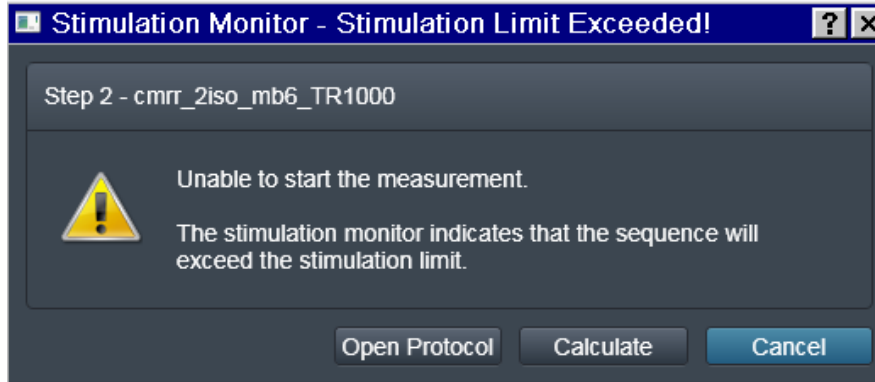
At the start of a sequence, this warning might pop up. Be aware this is a WARNING not an error! Nerve stimulation is harmless and the chance it occurs is low. In case it happens, the subject will press the squeeze ball if he/she feels uncomfortable. Do not inform, at forehand, nerve stimulation can happen. Many participants will reports false positive stimulation.

Some background information

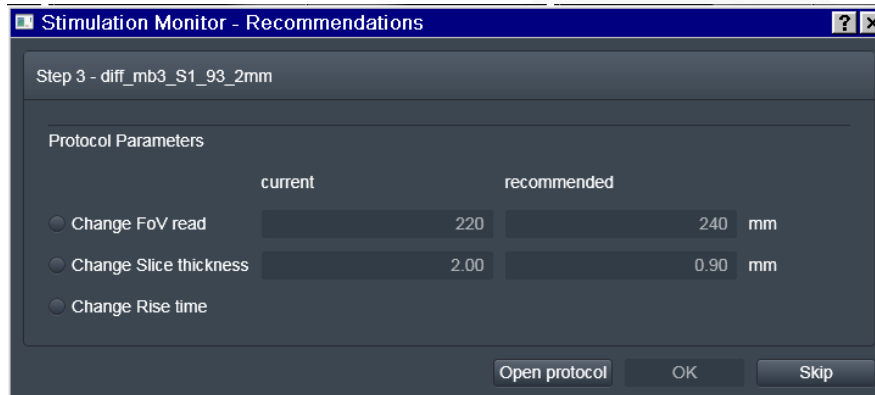
During the measurement, patients are expose, to an electrical field created by the time-varying magnetic fields of the gradient coil. Assuming all conditions remains constant the strength of the electrical field is directly proportional to the change of the magnet flux (dB/dt). The electrical field affects the participant. If the strength of the electrical field exceeds a certain threshold (stimulation threshold) the participant experiences peripheral nerve stimulation. The MR-system software includes a monitoring feature (stimulation monitor) which monitors how close the participants are to the stimulation limit. Prior to starting an MR measurement protocol, the stimulation monitor checks whether the stimulation limit may exceed. If so, the measurement cannot started. To perform the examination, the parameters of the measurement sequence must adjusted accordingly. Based on the statistical distribution, it can expected that up to 50% of all patient will experience at least mild stimulations after reaching the stimulation limit.



MRI scanner – Stimulation threshold exceeded



First, try to reduce the **tilt angle of the FOV** of the sequence. The less tilted, the less the strength of gradient has to be! Try again to start the sequence.



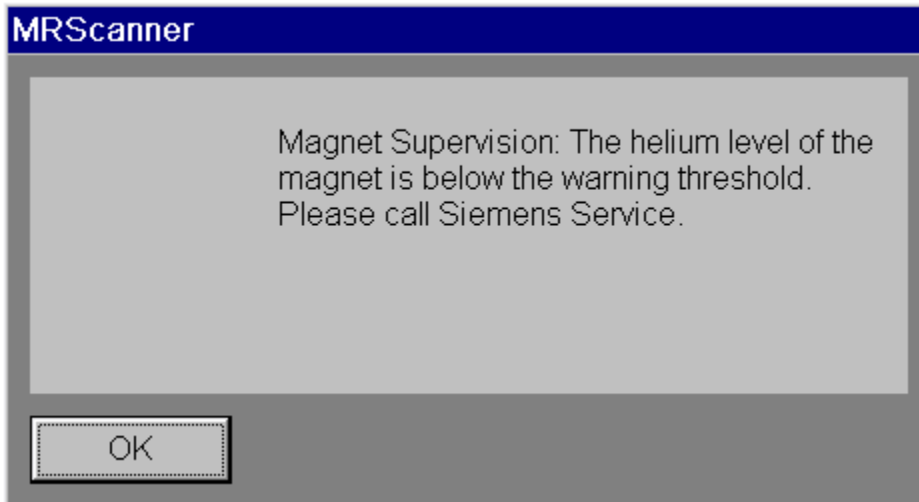
If the stimulation limit is still exceeded: Press **"CALCULATE"**. A window will pop up with some recommendations. Choose the option **"Change Rise time"**.

Depending on the sequence settings, this option is not always available. For most of you, changing FOV or Slice thickness is NOT an option. Skipping the sequence is then the only option.

Please contact the physicist about this error afterwards.



MRI scanner – Helium level warning



DO NOT PANIC! - It is NOT an Emergency

Check the helium level – Go To : Syngo MR – System – Control – System Parameters.

- If the value is **below 45%** further loss of helium can result in a quench! Scanning is NOT allowed. Please shutdown the system and inform your colleagues the MRI is out of service. Inform the lab manager. See contact.
- If the value is **above 45%** you can still continue scanning! The lab-manager has set the alarm level higher than 45% (Probably 60%) so he will be notified in time to schedule a refill. You can silence the alarm beep by pressing the blue "AUDIO ALARM OFF" on the [Alarm Box](#).

Some background information

The level of helium is automatically measured once a day (at night at 02h00) When starting up the MRI the last measured value is compared with the set alarm level. If the measured value is lower than the alarm, the alarm box start to beep twice every 20 seconds. At this point, also this message pops up!

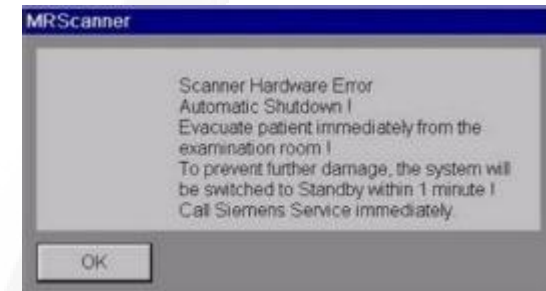


MRI scanner – Gradient Supervision

Gradient Malfunction!

Smoke gases are detected! **Evacuate patient immediately from the scanner room and close the door of the scanner room!** To prevent further damage, the system will be switched to Standby within 1 minute.

Within 60 seconds, the system will be switched off automatically. Then, the patient table motors cannot be operated any longer. By switching off the system the fire source hopefully will extinguish. If you see any smoke in the scanner room call 55555. If you do not see any smoke, it can be that it is removed by the air ventilation system. If so, the fire detector in the venting system will alarm the fire brigade.



continuing scanning is NOT Possible

Some background information

The MRIs equipped with an externally mounted Gradient Supervision unit which prevents major damage to the MR-site in case the gradient connections should overheat in a fault situation (e.g. bad contacts). Monitored connections and components are the cabinets in the technical room, the gradient filters and connections on the filter panel and the gradient connections at the magnet. In case smoke gases are detected within the monitored areas, the unit switch the MRI off.



MRI scanner – SAR exceeded

The Radio Frequency Safety Watchdog (RFSWD) prevents further scanning.

Generally, this message pops up when a user sequence (Spin Echo) is started and a pre-calculation of the expected SAR value (look ahead monitor function) is done. The software decides, whether the measurement will be released - SAR below the limit -or not.

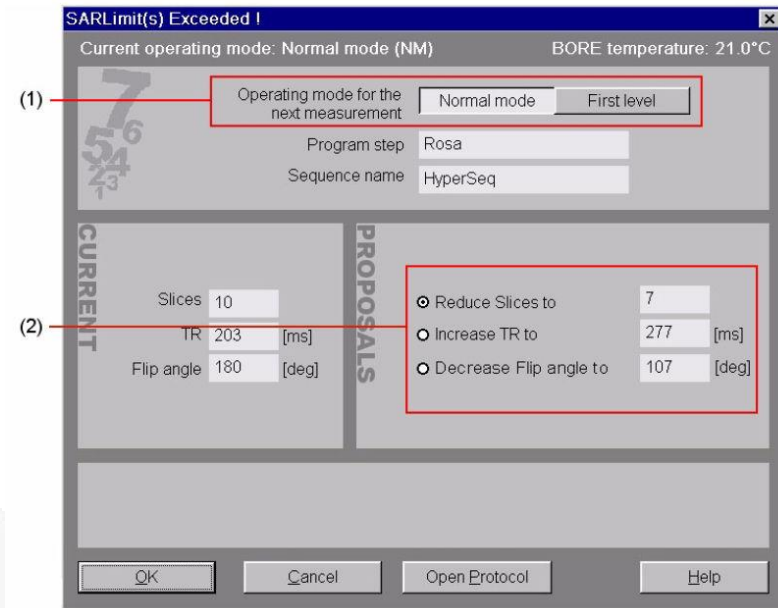
For a reliable calculation, the registration data must be correct. Hence, in case you get the SAR is exceeded message, **check first if participant's age, sex and weight**, are filled out correctly.

For a healthy participant it is allowed, to **increase the SAR limit to "First level"**

May be protocol does not exceed the "First level" threshold (1).

The pop-up window also provides you with recommendations on how to avoid exceeding the SAR limit (2). The proposed **changes** apply to **one parameter** (TR, slices or flip angle), assuming that the other two parameters are not to be changed.

If it happens during scanning, a hardware failure in the RF transmit path is probably the cause. The RFSWD prevents excess transmitted RF-energy. **Continue scanning is NOT possible anymore.**



If an option is dimmed, no change proposal is available for that particular measurement parameter. When all options are dimmed, the protocol cannot run. You have to cancel it.

Some background information

The human body is conductive for radio frequency. A great part of the RF will not flip spin vectors but stay as losses in the body and simply heat it up. The measure of the amount of RF deposited by an RF-field in a certain mass of tissue is called **SAR** (Specific Absorption Rate). The units for SAR are given in watts per kilogram (**W/kg**).

MRI scanner – Network drive(s) not accessible



Accessibility from the MRI console to network drives works, due to network credentials issues, not smoothly. This makes copying data not that straight forward, as you would expect. Once a network connection is established the

COMING SOON



Stimulus PC - I cannot find my user folder



Probably you are in the **wrong Operating System Environment**.

Please restart the Stimulus PC and select (manually) during the boot process the partition you need.

If you do nothing the Stimulus PC will startup (by default) the Windows Lab environment.



Some background information

The lab stimulus PC's have a quadruple boot system consisting of two Windows and two Linux partitions. The default partition is the *Windows lab environment*, which serves the Presentation stimulus program and MATLAB/PTB. It is tuned for optimized timing accuracy. The second Windows partition (*Windows test environment*) is for other than Presentation stimuli programs. The Linux environment has a similar setup as mentioned above. The Linux lab environment serves the Matlab/Psychtoolbox programming environment and is tuned for optimized timing accuracy. The second Linux partition (Linux test environment) is for other than Matlab/PTB programming languages. Timing accuracy is not guaranteed on the test environment partitions



Stimulus PC - Fixation cross disappears

Remove the USB connection between the patch panel (LAPTOP fORP) and the USB input at the front of the Stimulus PC.



Some background information

When you use *Windows Photo Viewer*, to present a fixation cross, it can happen that the viewer leaves the full screen mode “automatically”. This is caused by a USB cable connection between the patchpanel (LAPTOP fORP) and one of the USB front inputs at the front of the stimulus PC. Due to this connection, the Stimulus PC sees the fORP as a second keyboard. Hence with every scantrigger the fORP sends a character (“5” or “T”) to the Stimulus PC. The Windows Photo Viewer sees this as a key press and leaves the full screen mode.



Beamer – No projection

In case, you do not see an image on the screen!

- Press the MENU button on the remote control. If no MENU pops up the beamer is OFF. Please press ON button shortly. One press will do. It takes 20 sec before you see the EIKI logo and 50 sec before the beamer is operational. If after this time beamer is still off, light bulb can be broken or battery of remote control low power. (contact lab-manager) .
- In case the MENU pops up and the screen color is black please press the shutter button.
- If you still not see an image and the screen is blue then please check the INPUT settings. For INPUT 1 it should RGB (AV HDCP). You can change/check it in the MENU's first item
- If the input settings are right and you still see a blue screen, it means that there is no video source available. Check the settings of the video matrix switch!

If none of the above solutions worked.... Please inform lab-manager.

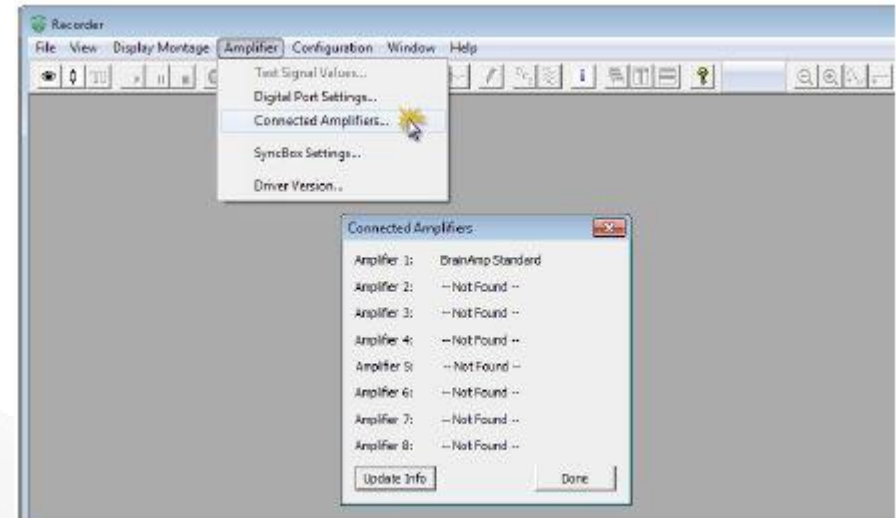


BrainAmp ExG – No connection

Check if the Recorder software “sees” the connected BrainAmp by *Choose Amplifier > Connected Amplifiers...* from the menu. The Connected Amplifiers dialog opens. It lists all amplifiers currently connected to your computer and are ready for operation.

If you see no amplifiers check the following:
(press after each check “Update Info” to see connection is established)

- If BrainAmp ExG power is switched on. (*The green Operate LED on the rear of the PowerPack indicates that a supply voltage is present*).
- If both ends of the used optical fiber is connected).
- If connectors are pushed in with the right side up and far enough.
- If the cylindrical PowerSupply Adapter at the back of the battery is screwed tightly (*check green Operatie LED op PowerPack*).



If this not solve the problem, you may swap the amplifier-powerpack set with another set. Please notify the lab- manager about the malfunction.



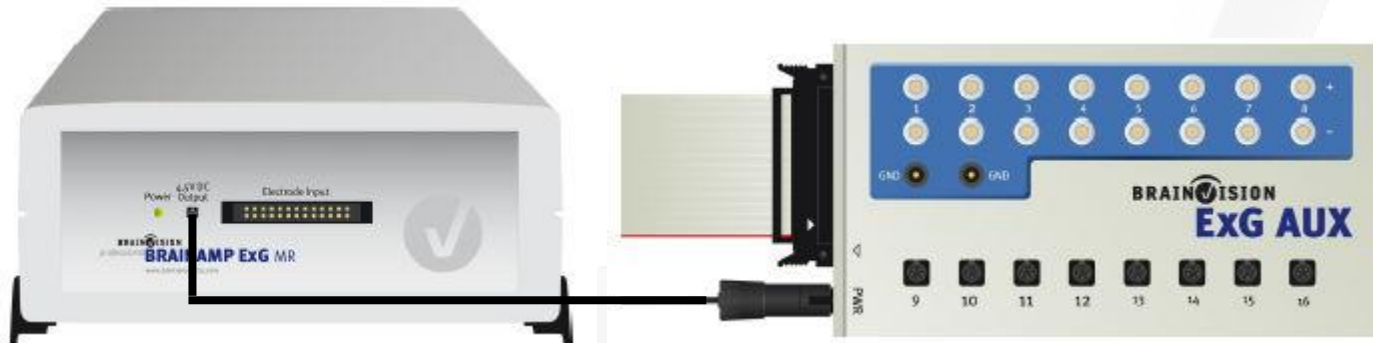
WORKAROUND

One of the BrainAmp ExG needs a wooden stick for a correct operation. The small stick is stuck between top of the optical fiber connector and amplifier housing. In this way, the optical fiber connector is push down slightly to achieve a properly aligned with the receiver (inside the housing).



BrainAmp ExG – Not working sensor(s)

To supply the sensors with power, connect the PWR input of the ExG AUX Box to the power output of the BrainAmp ExG/BrainAmp ExG MR 16 bipolar amplifier using the supplied 3-way power cable. The power output at the front of the amplifier is marked 4.5 V DC Output.



Check if this cable (3 way power cable) is connected

If cable is damaged or if one of the connector parts is loose replace the cable. Notify lab-manager!

(If red LED of pulse sensor lit up, when the monitor in Recorder software is active, ExG box is powered.)

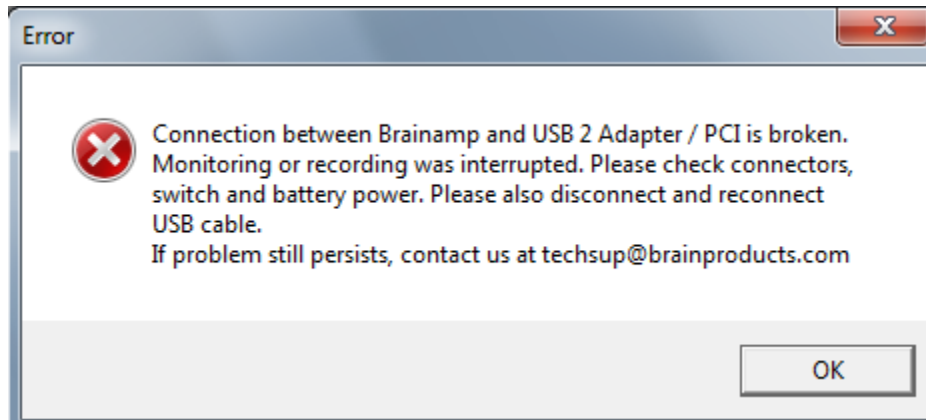


BrainAmp ExG – Bad signal(s)

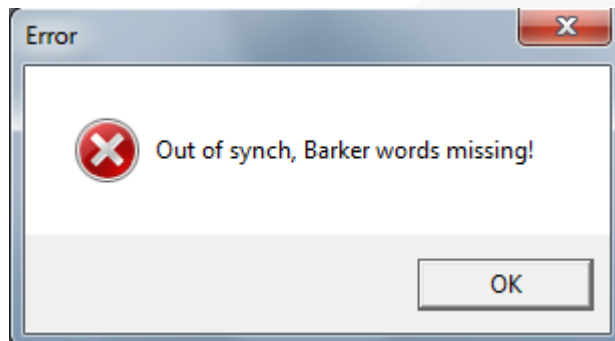
- **Pulse sensor** - Red LED does not lit up, broken sensor, notify labmanager -Finger/hand of participant is cold, let particiopant warmup their hands under running warm tap water. Use the woolen warmer to keep the hand warm during the experiment. Pulse signal drops significantly when hand cools down.
- **Respiration** – Strap is too loose – Balloon is not positioned on the tight spot (depends on if the participant is chest or belly breathing) – plastic tube connecting balloon with interface is kinked.
- **GSR** – Bad skin contact, use more gel – fingers with callus, no good measurement possible – resistance of GSR electrode is to high due to degrading AGcl-Ag surface, use an other pair, notify labmanager.
- **ExG electrode** – Bad ground/reference electrode, replace, notify labmanager - bad skin contact, clean skin first – resistance of electrode is too high to degrading AgCl-Ag surface and/or broken lead or bad connector, notify labmanager.



BrainAmp ExG – Error during recording



This often happens when you want to start monitors. Due previous abruptly disconnected of cables this message pops up. **Just press OK and start the monitor again.**



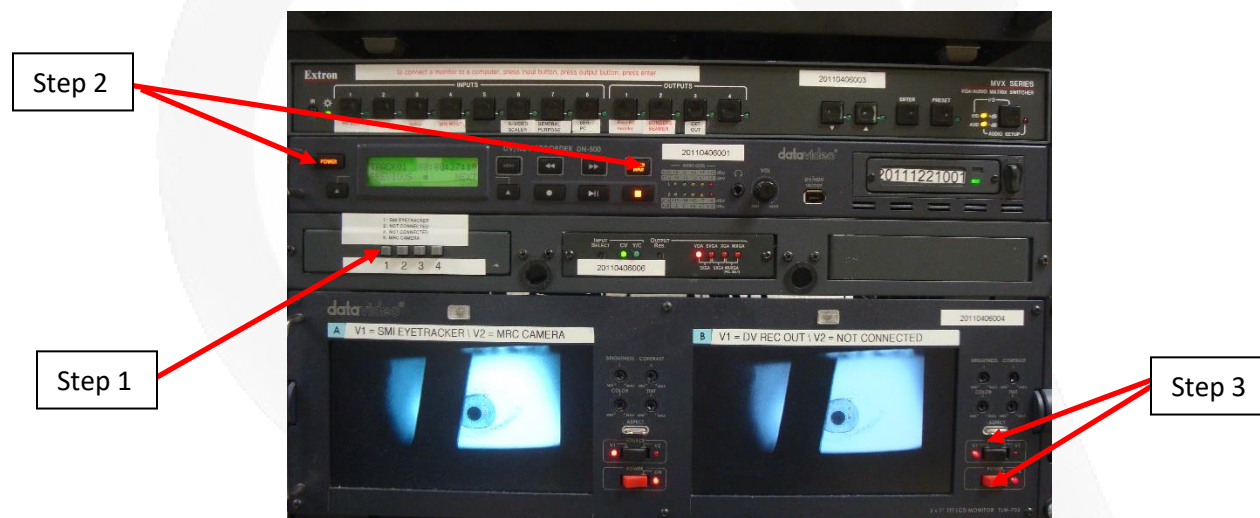
This refers to a problem with the optic fiber cable. In case connector is damaged, the fiber ends have small scratches or fiber cable itself is damaged (probably were stuck when moving patient table). **Use another fiber optic cable** (at each scanner 4 fibers are present; 2 mounted on table and two and the back of MRI)

InRoom Monitor – Nothing on display



Power on the in-room monitor with the wall-switch (with red indicator), inside the scanner room, next to the door.
To display a video source on In-Room monitor (for adjusting purpose) perform the steps below.
(first ensure yourself the video-source is powered on)

1. Select (push) button on the S-video switch: 1 = Eyecamera, 2 = not connetec, 3 = Eyelink , 4 = MRC camera.
2. Power on the DV recorder by pressing the power button for a few seconds (will light up orange). Once the recorder is initialized, press VIDEO INPUT (will light up orange).
3. Power on Display B (is necessary to amplify the video signal to the monitor). If input V1 of Display B is selected, you will see the output of the S-video switch on this display.





Response Device – Issues

In most cases, [re-configuration](#) of the fORP interface will solve the problem. Be aware that not everyone uses the same fORP configuration. It depends on which response device they use and in which way they want to record the responses.

After re-configuration all of the BTSI LEDs should be OFF
(except in case the home-made joystick is connected or the foot-response device).

If NOT:

- Check if participant did not push any of the buttons during reconfiguration.
- Check if buttons are not pressed (*eq. in case when a box is lying upside down*)
- Check if button(s) are not stuck. (*replace the button box by a spare one and inform the lab-manager*)
- Check connection between extension cable and response device (in-side scanner room)



Other known issues:

Beside the button-responses, generated by the BTSI (like a-b-c-d-e-f-g-h), a '5' or 'T' appears in the editing window or log-file. **Remove the USB connection between the patch panel (LAPTOP fORP) and the USB input at the front of the Stimulus PC.**

Some background information

Due to this connection, the Stimulus PC sees the fORP as a second keyboard. Hence with every scantrigger the fORP sends a character ("5" or "T") to the Stimulus PC.

The Windows Photo Viewer sees this as a key press and leaves the full screen mode.





Audio - Issues

Subject does not hear you speak via researcher microphone.

- Check if audio amplifier in 19" rack is ON.
- Check audio mixer settings (app on EEG PC).
- Check tubing between foam tips and in-earphones.

Subject does not hear the auditory stimuli.

- Check if playback device is not muted
- Check if Speakers/Headphones (Realtek..) is selected as playback device (and not HDMI....)

Subject cannot hear you very well.

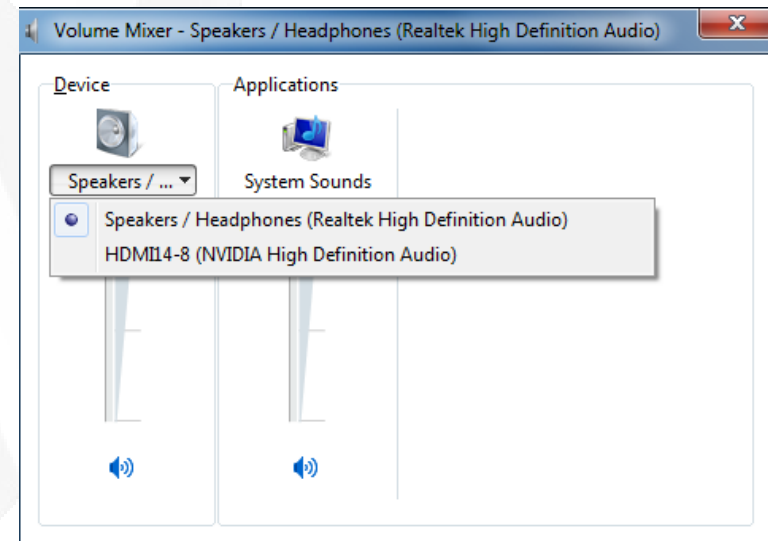
- Increase level of *Mic_Rsrchr* or *Hdphns_Sbjct* in the Audio Mixer.

Subject cannot hear the auditory stimuli very well.

- Increase level of *Line_out_PC* or *Hdphns_Sbjct* in the Audio Mixer.
- Increase sound level of playback device in Windows



Browse... default_preset.xml				SAVE	File: C:\fakepath\default_preset.xml	Response: Command = btn_ch5_sel3 Value = on					
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	OUT 1	OUT 2	OUT 3	OUT 4
ENA	ENA	ENA	ENA	ENA	ENA	ENA	ENA	ENA	ENA	ENA	ENA
OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT	OPT
0	50	50	50	22	20	50	50	0			
N/A	Mic_Rsrchr	Mic_Sbjct	Line_out_PC	AUX_IN	Line_in_PC	Hdphns_Sbjct	Dskt_Spkrs	N/A			





Shocker – Not working

I assume you already checked:

- *The connectors on both ends of the optical fiber cable have the same label.*
- *The battery is not empty. (The display shows at least two blocks)*
- *The shocker is switched ON and you control the wired output (tense device has two outputs. Only one is connected)*

Check optical output of BTSI. To do so, remove the optical connector, and look if a red light is visible when triggering.

- 1** *YES: BTSI is working*
NO: Reset BTSI by pressing small black push button at the front panel and try again. If still no light is visible, contact lab manager)

Connect optical fiber to BTSI output again and check if light output is visible on fiber end in the scanner room.

- 2** *YES: Fiber is oke*
NO: make use of other fiber and report this to lab manager)

Do you hear a click (produced by internal relais) when pulse is given by stimulus program?

- 3** *YES: Relais is working*
NO: Hardware failure – replace shocker box by another one and report failure

Connect Shocker Test Device to shocker output of shockerbox. Switch it on. When triggering a beep should be audible.

- 4** *YES: The output of shockerbox is working*
NO: Hardware failure – replace shocker box by another one and report failure

If all of the tests above are positive and the participant still does not feel any electrical stimulation please swap the electrodes. Probably the electrodes need to be renewed. Please, give the broken set of electrodes to the lab manager.





BOLDscreen - AVIbox – issues

If there is no active signal on the selected video input, this can result in slightly odd behavior¹ when the equipment is switched on. If something does not appear to be working correctly follow the next procedure.

First switch off the power of the BOLDscreen and the AVIbox.

Switch on the BOLDscreen and wait about 30 seconds for the BOLDscreen 32 to display its self-generated “Status Screen”.

Switch on the AVIbox.

¹ *Blinking of BOLDscreen every few seconds; color depth 16 bit instead of 32bit; selected video signal not presented.*



Eye-Camera - Issues

I cannot see no eye

- Zoom the telephoto lens out (lens does not stick out)
- Lens cover of telephoto lens is removed, nothing blocks the view path of the camera.
- The camera is power on
- IR light source (in control room) is switch on
- Table is in highest position
- The hot mirror is angled by (roughly) 45 degree

In-room display is not working

- If you see the image on monitor A (input V1) of the dual display in the 19" rack but **NOT** on the monitor inside the scanner please check [this](#).

Interruption of camera signal during measurement

- Battery power is getting low – swap battery
- Participant moved hand/leg/feet and blocks the view of the camera.



Contact

Phone (Paul)

048 – 7522364 (Home)

SMS (TG members)

Please notice the TG members are not expected to offer general lab-support outside normal working ours. Don't misuse this SMS service to ask for their support in case something doesn't work for your experiment. Only use this SMS message in case of a more serious incident, an alarm or a severe malfunction the DCCN lab.

In case of an incident, alarm or a severe malfunction in a DCCN lab, you may report this via SMS 'LAB' to 0625766038. The SMS message must start with 3 characters 'LAB', followed by a short description of the incident, alarm or serious malfunction. Don't forget to include the name of the lab or the lab room number.

For example SMS 'LAB' to 0625766038: 'LAB, some alarm is beeping in the MRI Skyra lab, room -1.049

Your SMS message will automatically be forwarded to our TG members and subsequently one of them will try to respond to it, normally by calling you back.

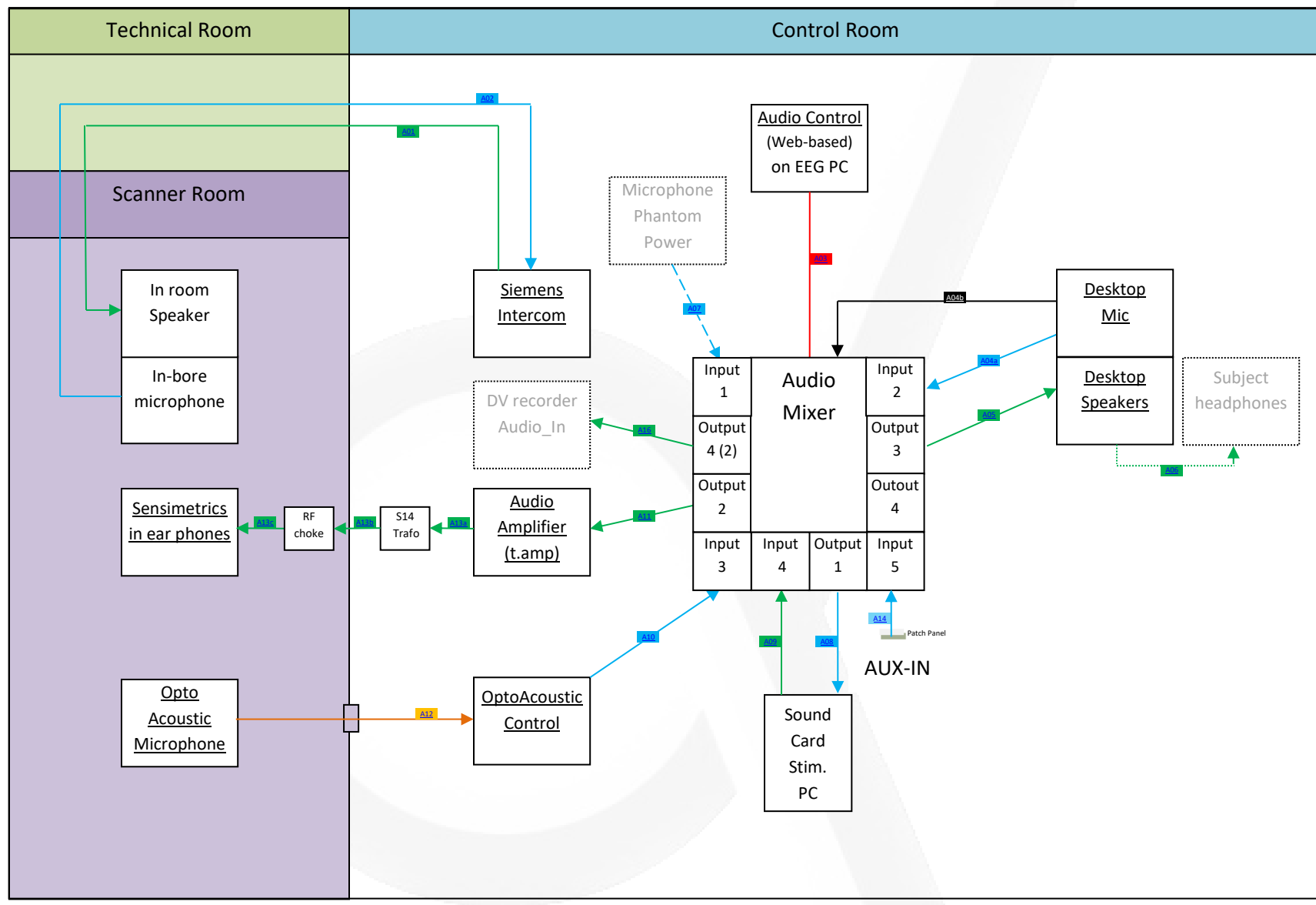


Technical pages

Block diagram: Audio
Block diagram: Triggers, Responses & Physio.
Block diagram: Video
Composiet Video – Optical Converter (vv)
CurDes Interface PCB
Dual BTSI Interface PCB
How To - 932 interface – Current Design
Ipconfig - MRI hosts
Network connections: Prisma
Network connections: PrismaFit
Network connections: Skyra
Remote switch for BOLDscreen
SMI I/O Adapter
VGA – HDMI converter
VGA to S-video converter



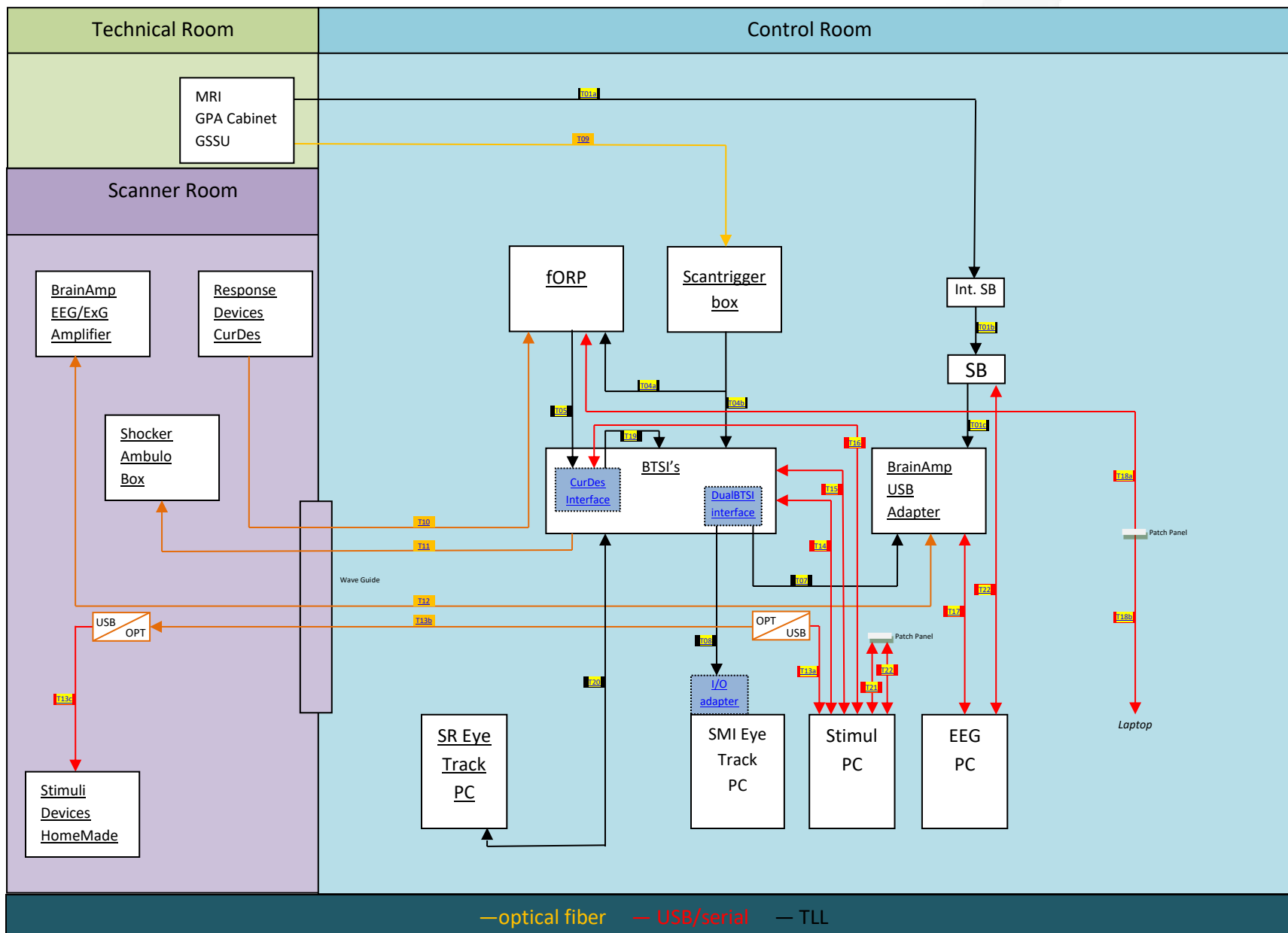
Block diagram: Audio



— line out — line in — optical fiber — serial — TLL

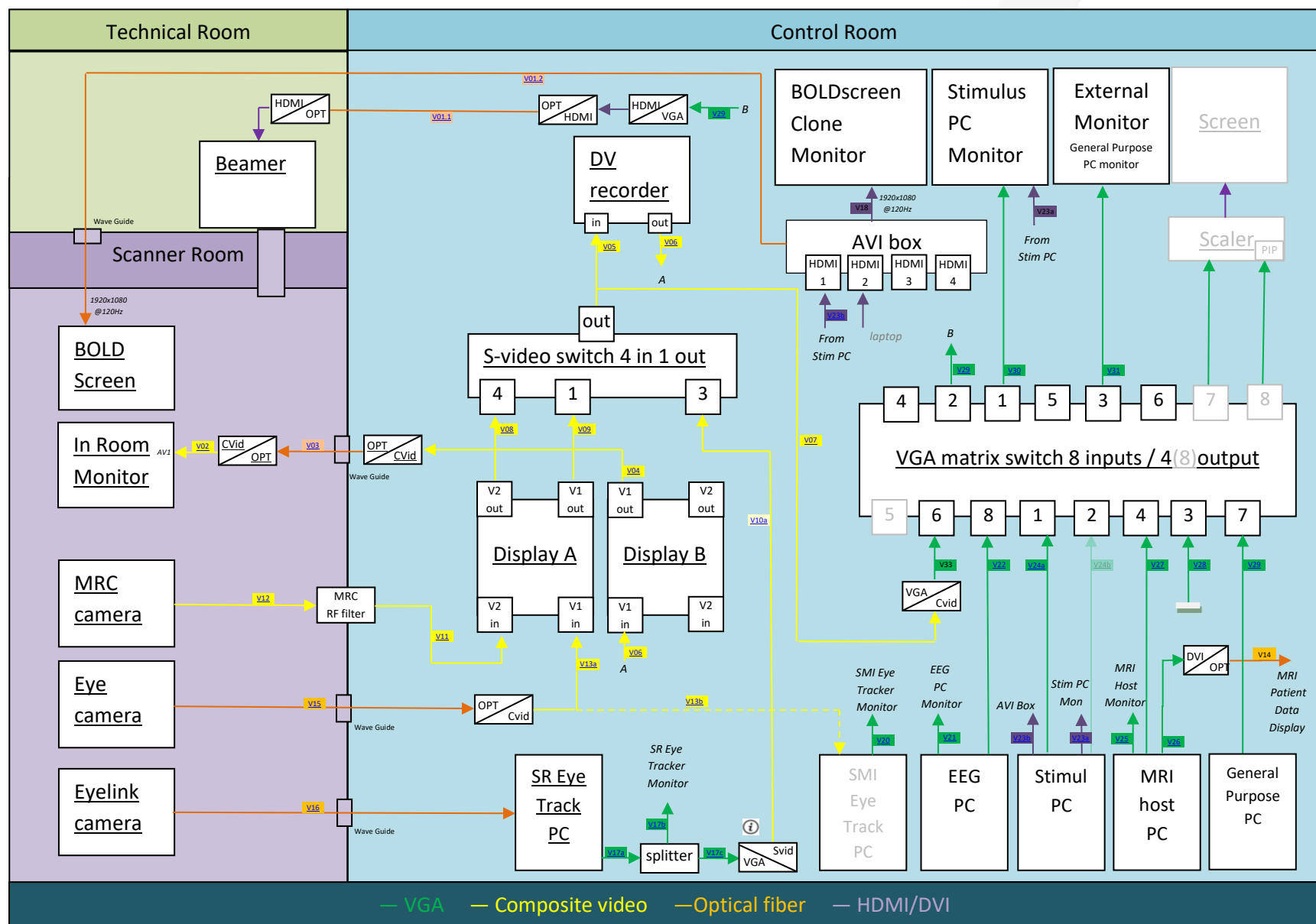
Volume Control

Block diagram: Triggers, Responses & Physio.





Block diagram: Video

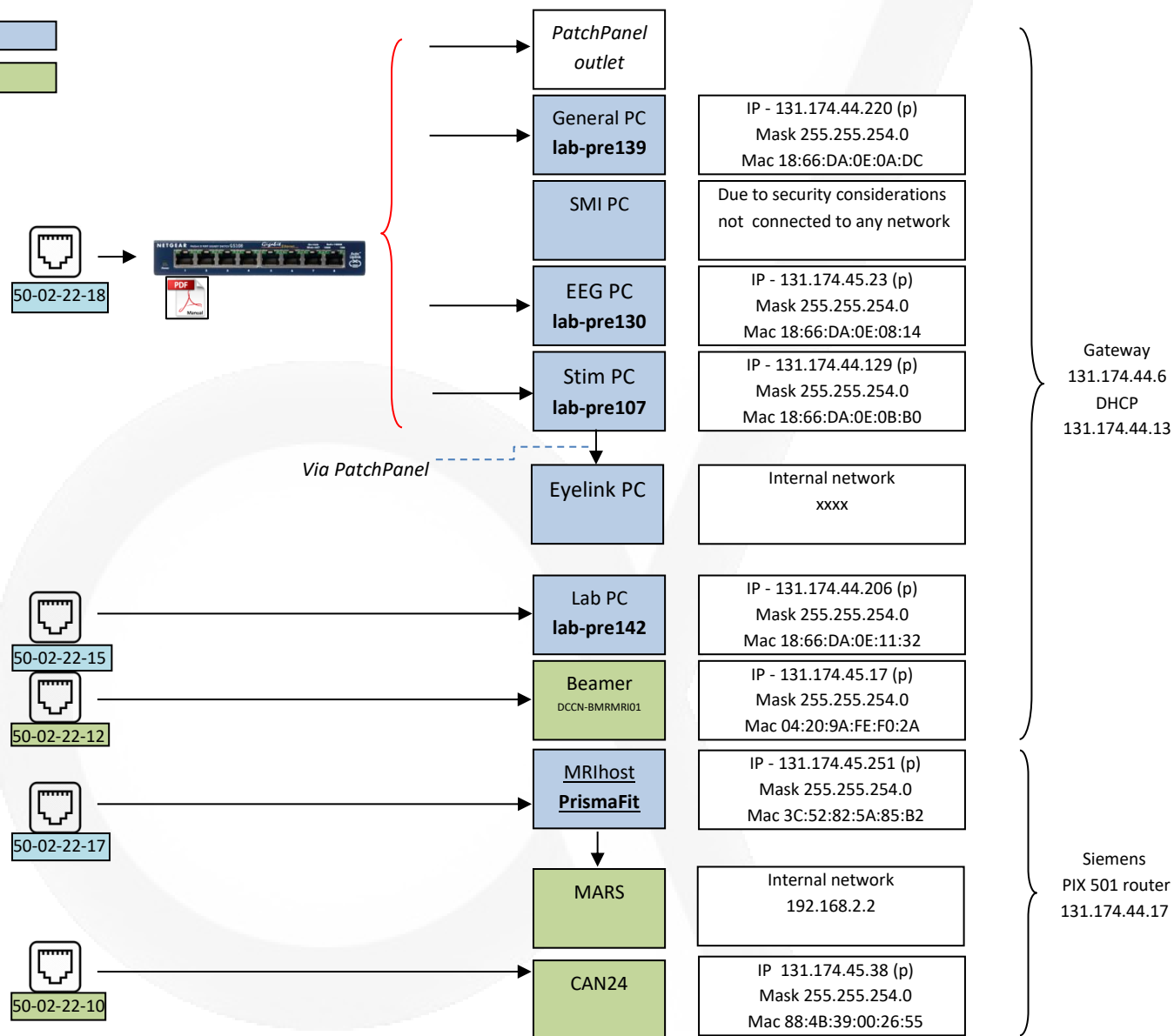




Network connections: PrismaFit

LOCATIE: MRI-LAB

LOCATION: TECH.ROOM

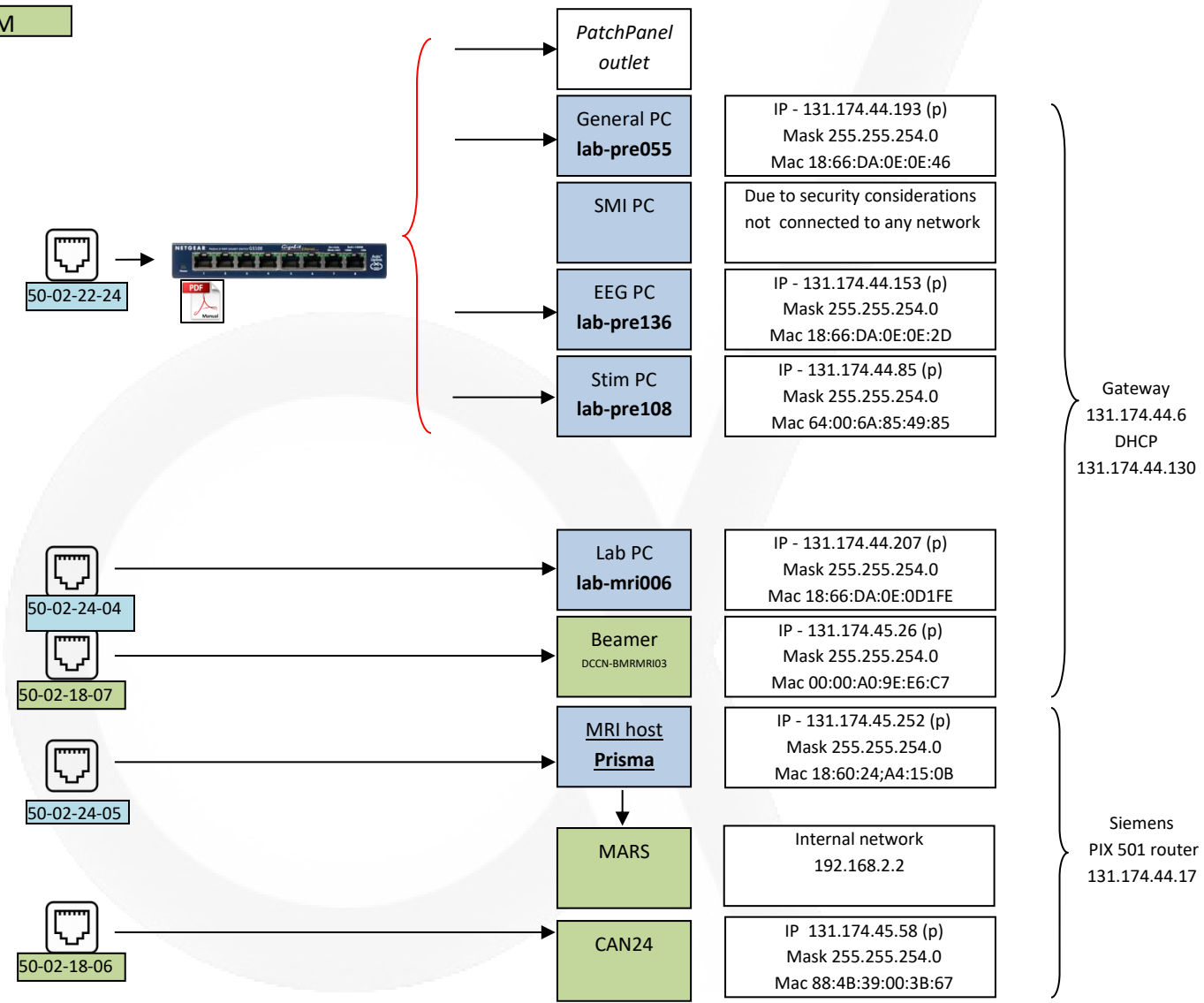




Network connections: Prisma

LOCATIE: MRI-LAB

LOCATION: TECH.ROOM

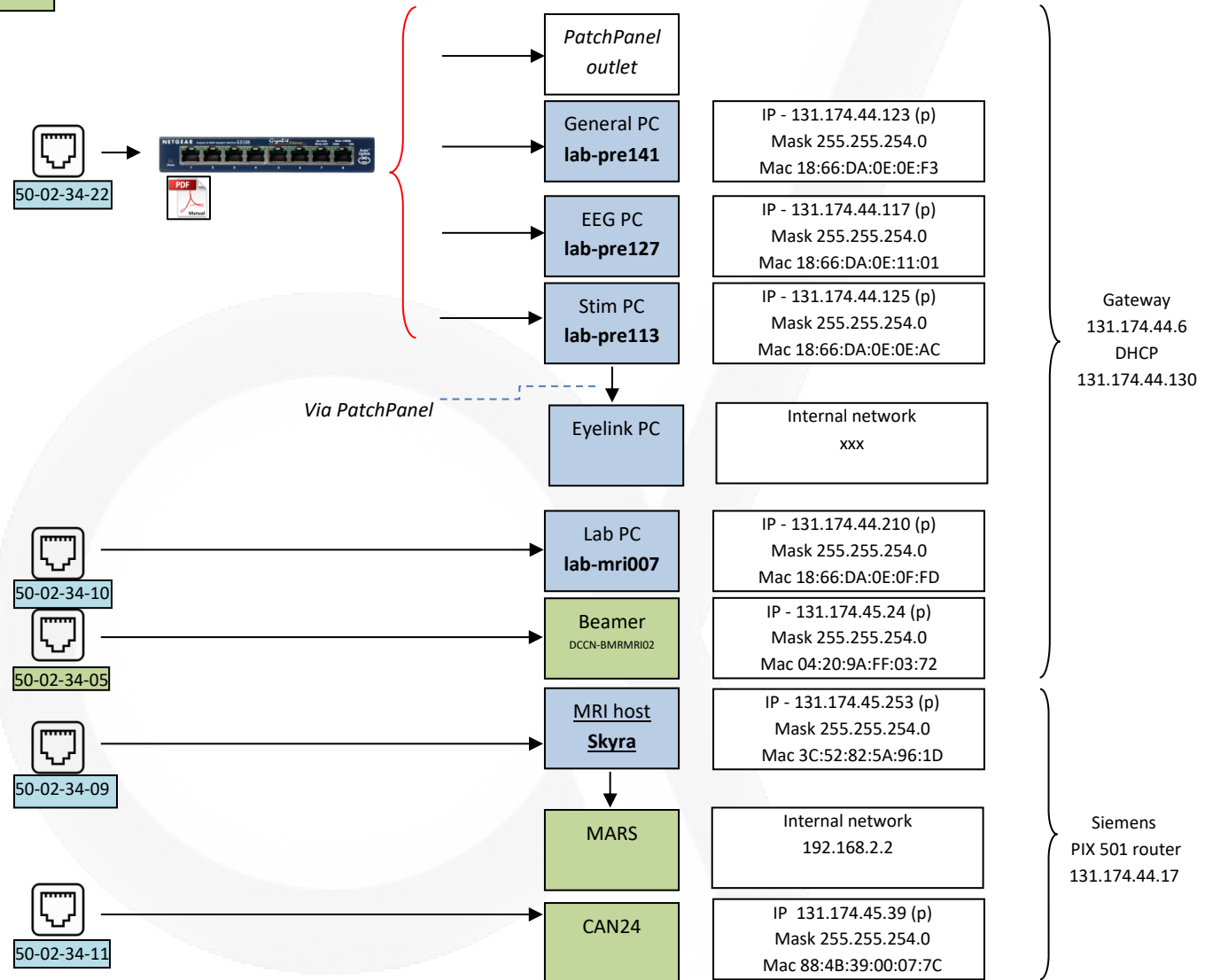




Network connections: Skyra

LOCATIE: MRI-LAB

LOCATION: TECH.ROOM





Ipconfig - MRI hosts

```

Administrator: Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\meduser>ipconfig -all

Windows IP Configuration

Host Name . . . . . : SKYRA
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) Ethernet Connection (2) I218-LM
Physical Address. . . . . : 3C-52-82-5A-96-1D
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv4 Address. . . . . : 131.174.45.253(Preferred)
Subnet Mask . . . . . : 255.255.254.0
Default Gateway . . . . . : 131.174.44.17
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Local Area Connection 2:

Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) Ethernet I210-T1 GbE NIC
Physical Address. . . . . : 68-05-CA-64-BC-29
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv4 Address. . . . . : 192.168.2.1(Preferred)
Subnet Mask . . . . . : 255.255.255.240
Default Gateway . . . . . :
NetBIOS over Tcpip. . . . . : Enabled
    
```

Skyra – 29/04/2020

```

Administrator: Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\meduser>ipconfig -all

Windows IP Configuration

Host Name . . . . . : PRISMA
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) Ethernet Connection (2) I218-LM
Physical Address. . . . . : 18-60-24-A4-15-0B
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv4 Address. . . . . : 131.174.45.252(Preferred)
Subnet Mask . . . . . : 255.255.254.0
Default Gateway . . . . . : 131.174.44.17
DNS Servers . . . . . : 131.174.44.130
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Local Area Connection 2:

Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) Ethernet I210-T1 GbE NIC
Physical Address. . . . . : 68-05-CA-89-95-92
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv4 Address. . . . . : 192.168.2.1(Preferred)
Subnet Mask . . . . . : 255.255.255.240
Default Gateway . . . . . :
DNS Servers . . . . . : 131.174.44.130
NetBIOS over Tcpip. . . . . : Enabled
    
```

Prisma – 29/04/2020

```

Administrator: Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\meduser>ipconfig -all

Windows IP Configuration

Host Name . . . . . : PRISMAFIT
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) Ethernet Connection (2) I218-LM
Physical Address. . . . . : 3C-52-82-5A-85-B2
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv4 Address. . . . . : 131.174.45.251(Preferred)
Subnet Mask . . . . . : 255.255.254.0
Default Gateway . . . . . : 131.174.44.17
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Local Area Connection 2:

Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) Ethernet I210-T1 GbE NIC
Physical Address. . . . . : 68-05-CA-63-C0-90
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv4 Address. . . . . : 192.168.2.1(Preferred)
Subnet Mask . . . . . : 255.255.255.240
Default Gateway . . . . . :
NetBIOS over Tcpip. . . . . : Enabled
    
```

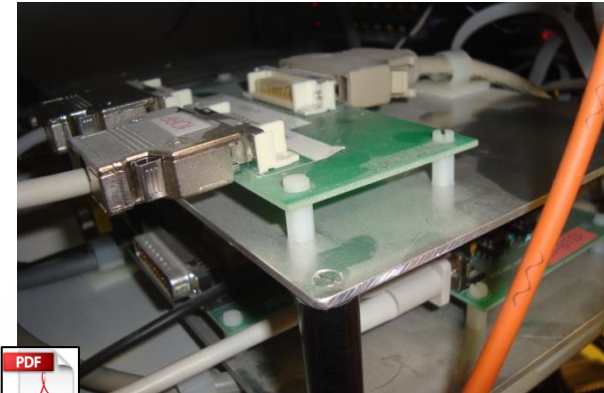
PrismaFit – 29/04/2020



CurDes Interface PCB

The purpose of this home-made board is to make the serial and parallel output of the 932 interface available at the same time. Hence no cables need to be connected/disconnected at the back of the 932 interface when the user wants to switch between the serial and parallel (TTL output). To avoid the need of a home-made soldered cable (the high density connector makes soldering difficult) and the wish to use only cable assemblies delivered by the manufacturer (which makes replacement of cables easy) a PCB was designed and ordered.

On the Interface PCB three MDR 36 pins connector (male) are mounted to connect the by Current Design delivered Serial 932 Cable and the Parallel 932 Cable. The third connector is used to connect a female to female cable to the input MDR connector of the 932 interface.



Some remarks:

A missing track on the PCB is replaced by a wire. The tracks to pin 16 and 18 of the Parallel 932 connector are cut through. The original cables delivered by Current Design are equipped with a resistor on pin 16 and 18. With this resistor the 932 interface can detect which cable is connected and is used to show only the available configuration options for the attached cable. Via the PCB the resistor in the serial 932 cable is switched in parallel with the one in the parallel 932 cable resulting conflict which is solved by cutting the two tracks.



Dual BTSI Interface PCB

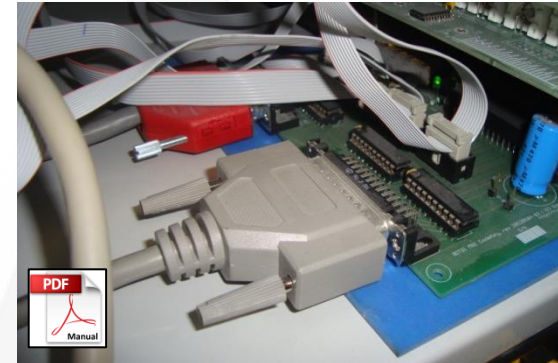
The purpose of the home-made BTSI – PCB is to make logging of events by peripheral equipment possible.

In principle at the stimulus PC all events necessary for an experiment are logged. But it can be desirable and handy to log also some of this events on peripheral equipment like BrainAmp , SMI eyetracker and Eyelink. With the Dual BTSI PCB this becomes possible.

The Dual BTSI PCB routed the output of the S-BTSI the first eight bits of the digital inputs board of Brainamp and SMI eyetracker. Both have 16 digital inputs. Hence eight input lines are still available for logging events.

With the Dual BTSI PCB the user can choose which eight other in- and outputs (of both BTSI's) must be made available for external logging. This is done by the use of a so-called KEY-connector. The female part of a 37 pins D-connector is mounted in the frontpanel of the DualBTSI. The input lines and output lines of the R-BTSI and the input lines of the S-BTSI are available at this connector. Eight other pin on the connector are connected with the 8 free digital inputs of the peripheral equipment.

The male part of the KEY-connector is wired according the wish of the researcher (which 8 in/output lines must to connect to the 8 digital inputs). Because the male part of the connector can be easily removed and replaced by another one it is easy to customize logging to the peripheral equipment. At all scanners the default KEY connector is installed. By this KEY the ScanTrigger and the button responses of Right Index, Right Middle, Left Index and Left Middle are logged by the peripheral equipment.





SMI I/O Adapter

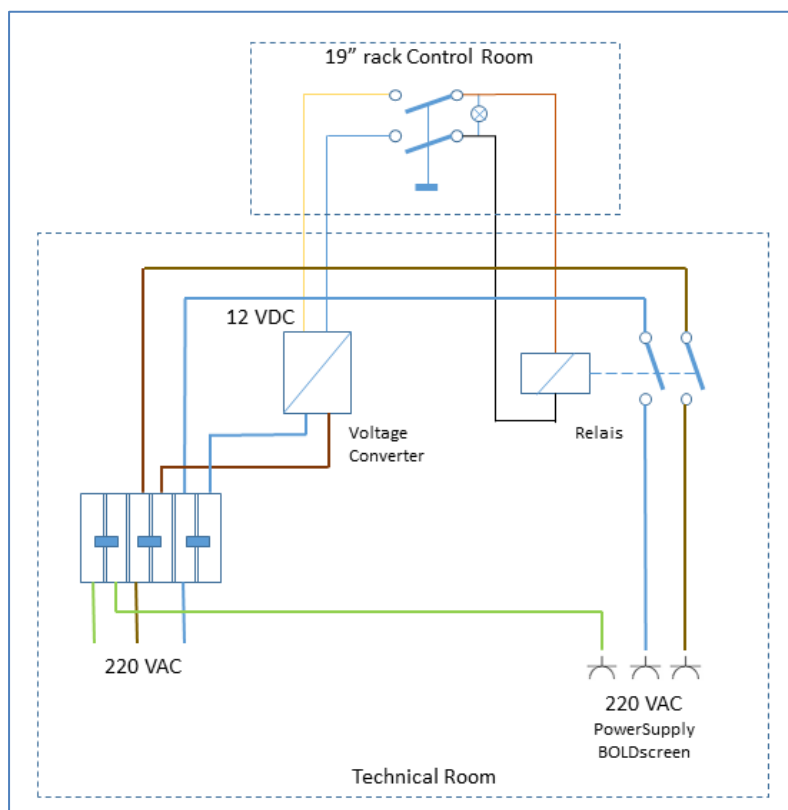
Not all in- and outputs of the Digital I/O PCB mounted in the SMI Eyetracker PC are available on the rear panel of the PC. To make use of all 16 digital inputs the 8 input lines, which are not accessible from the rear, are extended by a flat cable. Together with the lines available on the 37 pins D connector, mounted on the rear panel, the adapter re-arrange all lines to a D25 (female) connector for all inputs and a D25 (male) connector for all output lines. In this way, we can make use of standard cable assemblies. In our set up, we only use the inputs of the Digital I/O PCB hence the D25 output connector is NOT connected.





Remote switch for BOLDscreen

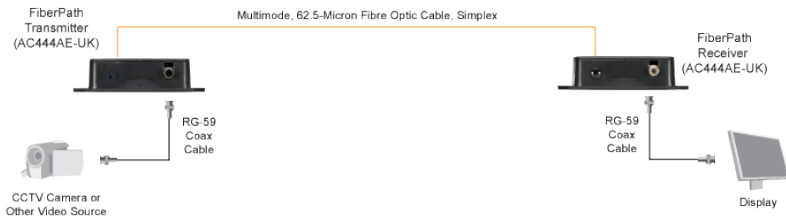
The power adapter of the BOLDscreen is installed in the Technical Room of the MRI scanner. In this way, the length of the power cable can be limited. Because, only Super Certified Users have access to the technical room of the scanner, it is not possible for everyone to power off the monitor, in case it needed a reset. Hence this a facility to switch the BOLDscreen power remotely.





Composiet Video – Optical Converter (vv)

FiberPath is the way to transmit video over fiber. It transmits clean, crisp color or black-and-white video signals over standard multimode fiber optic cable



Receiver



Transmitter

Technical data

Distance (Maximum) — 2.4 km

Optical Loss Budget — 12 dB minimum

Optical Wavelength — 850 nanometers

Connectors — (1) 62.5 μ m multimode ST[®], (1) BNC coax

Power — External adaptors; input: 230 VAC, 50 Hz; output: 9 VDC, 500 mA

Size — 2.7H x 8.47W x 10.6D cm

Remark: The transmitter and receiver must use in pairs. A replacement transmitter (AC445A-TX) and receiver (AC446A-RX) are available separately

VGA – HDMI converter



To transmit the video signal coming from the VGA switch in the 19" rack to the beamer in the technical room a distance of more than 20 m has to overcome. To prevent interference from all kind of sources (MRI electronics) over a distance of roughly 20 m, an optical cable is needed.

Nowadays only optical HDMI cables are commercially available. Hence, we had to convert VGA to HDMI. Transmitting audio also possible with this converter but not used.

The converter is power by USB taken from one of the USB ports of the Stimulus PC.





VGA to S-video converter

This High Resolution VGA to Composite or S-Video Converter is a simple hardware solution that allows you to convert a VGA/PC video signal into a Composite or S-Video signal for use with a CRT or flat panel display



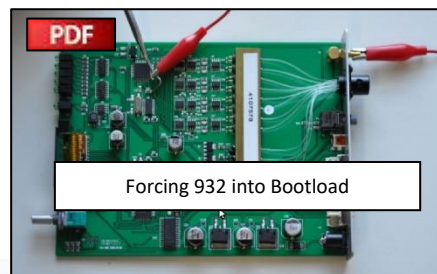
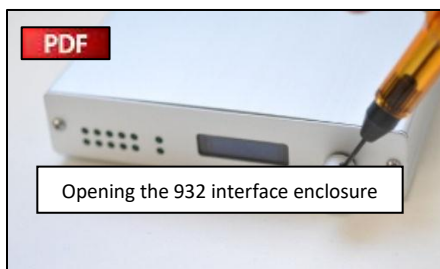
Technical Features

- High resolution inputs from your PC up to 1600x1200
- Provides output in both composite and S-Video formats
- Supports NTSC and PAL compatible displays
- Image underscan and overscan selectable switch
- Technical Specifications
- Input Resolutions: 640x480 to 1600x1200
- Video Output: Composite and S-Video
- Refresh Rate: 1600x1200 @ 60Hz

How To - 932 interface – Current Design



Some documentation is available regarding service actions be done by customer.



V01.1a-b-c

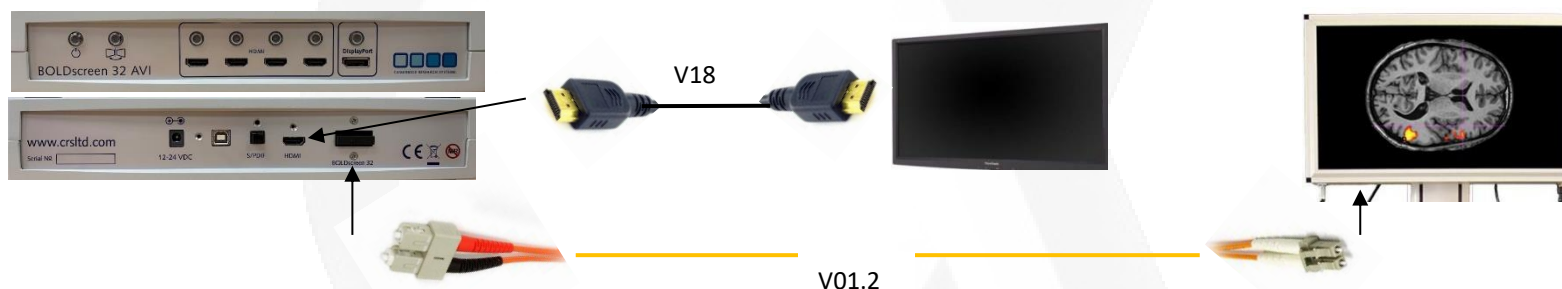


Description

Optical HDMI cable with HDMI/optical converter and optical/HDMI converter.

Video signal coming from VGA-switch in 19" rack goes via a VGA to HDMI converter to beamer in technical room of the MRI scanner (Distance in approximate 20 m). An optical cable is used to prevent RF interference with high power cables of the MRI. Because the beamer has no HDMI input (only a DVI) HDMI to DVI adapter is used to connect cable to beamer. *With type M1-2000 the HDMI/optical converter is powered by adapter DC 5V / 1.2A. Type OP5016 does not need an external power adapter. DC 5V is provided by HDMI output of VGA to HDMI converter.*

V01.2+V18

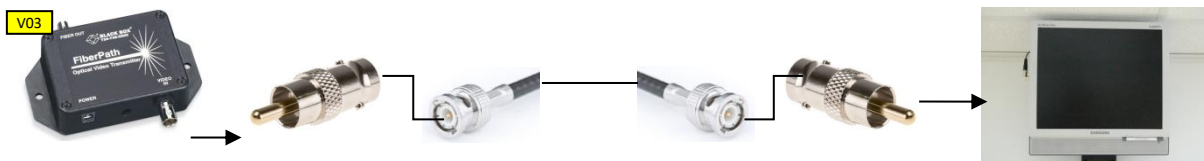


Description

V01.2 Optical (SC to LC) cable between output of AVIbox and BOLDscreen input. Routing along Faraday cage – Technical Room – Filter Panel.

V18 Video Cable Assembly with on both ends a male HDMI male connector to connect the HDMI “clone” output of the AVIbox to HDMI input of the BOLDscreen clone monitor in the control room (wall mounted).

V02



Description

Connects 'Optical to Composiet Video' converter output (RCA socket) to the CV input of the in-room monitor (RCA socket) by a coax cable assembly.

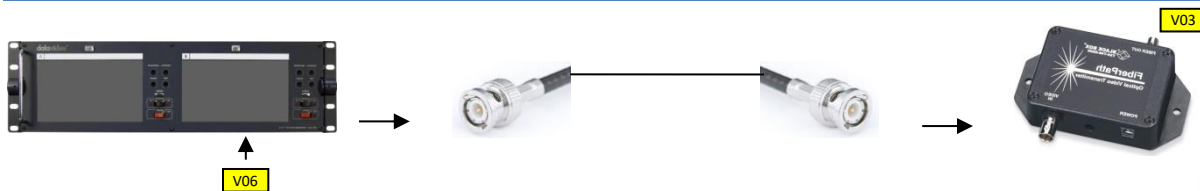
V03



Description

Optical cable assembly to connect the transmitter output to receiver input of Composite Video–Optical Converters.

V04



Description

Coax cable assembly with BNC male connectors on both ends.

Connects output V1 of monitor B (BNC socket) to input of Composit Video-Optical Converter- transmitter (BNC socket).

Output V1 of monitor B is clone of Input V1 monitor B (=output of DV recorder)

V05



Description

Output of S-video switch (S video socket) to input of DV recorder (BNC socket) and to the input of the S-video to VGA converter (RCA socket). At the input of the DV recorder the signal is split by a BNC T piece.

V06



Description

Output of DV recorder (BNC socket) to input V1 of monitor B of Dual Display

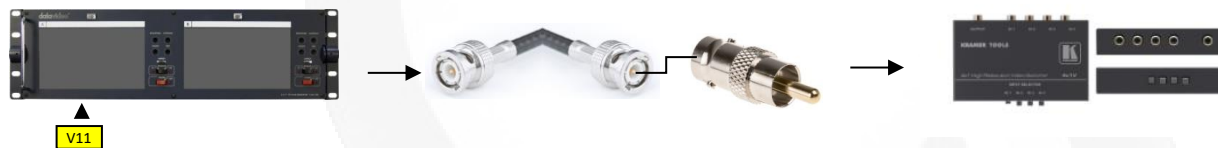
V07



Description

At input of DV recorder video signal from S-video switch is split (by BNC T piece) and via a coax cable connected to input of s-video to VGA converter by using an BNC socket to RCA plug adapter.

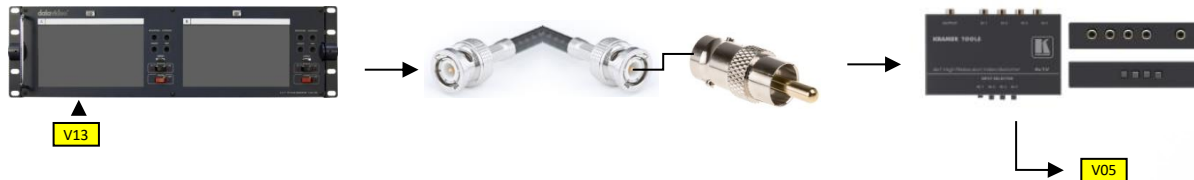
V08



Description

Coax cable assembly with on both ends BNC plugs connects the output V2 (BNC socket) of monitor A via an adapter (BNC - socket to RCA-plug) to input 4 (S-video socket) of S-video switch. Output V2 of monitor A is clone of the MRC camera signal (connected at input V2 monitor A).

V09



Description

Coax cable assembly with on both ends BNC plugs connects the output V1 (BNC-socket) of monitor A via an adapter (BNC-socket to RCA-plug) to input 1 (S-video socket) of S-video switch. Output V1 of monitor A is clone of the SMI eyetracker camera signal (connected at input V1 monitor A).

V10a-b



Description

Coax cable assembly to connect video signal of Eyelink PC via a videosplitter, a VGA to Composite video converter (BNC-socket) and the patch panel (BNC-socket) to input 3 of the S-video switch (S-video socket). To make this possible an adapter is used (BNC-socket to S-video-plug).

V11



Description

Coax cable assembly with BNC plugs at both ends to connect output of MRC RF filter (BNC-socket), mounted on small filter panel, to input V2 (BNC socket) of monitor A (Dual Display).

V12

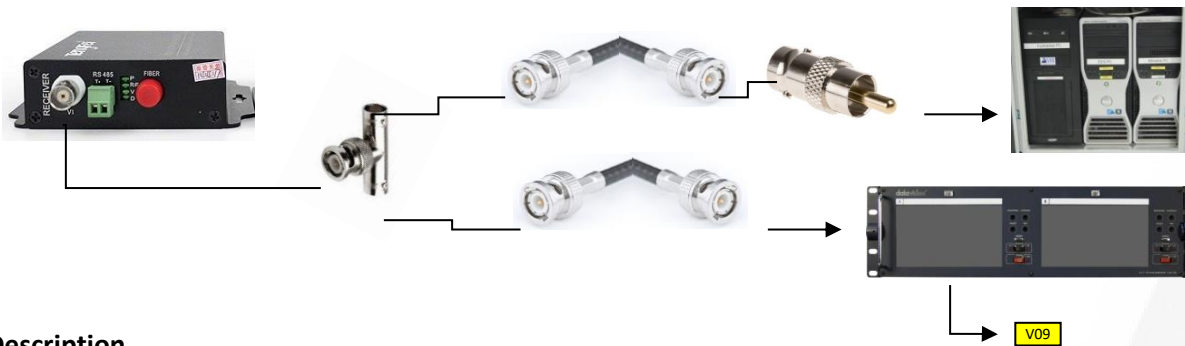


Description

Special elongation cable delivered by MRC to connect 12M camera to input of MRC filter box mounted to small filterpanel. Cable has Lemo plugs on both ends. At camera type FGG.0B and at filterbox FGG.1B.

CABLE IS NOT PERMANENT INSTALLED

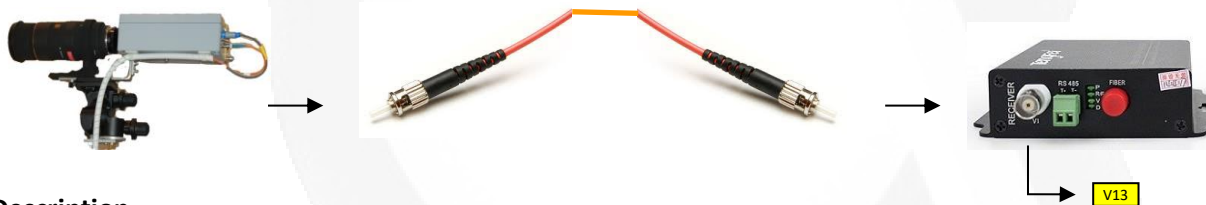
V13a-b



Description

At the output of Optical to Composite Video converter of the SMI eyetracker, the video signal is split by a BNC T-piece. From here one coax cable assembly with BNC plugs on both ends goes via an adapter (BNC-socket to RCA-plug) to the input of the frame grabber PC board (RCA-socket) in the Eyetracker PC. The other coax cable assembly (BNC-plugs on both ends) is connected to input V1 (BNC-socket) of monitor A (Dual Display).

V15



Description

Optical cable assembly, with on both ends ST-plugs, to connect output of SMI eyetracker camera (ST socket) to input of Optical to Composite Video converter (ST socket).

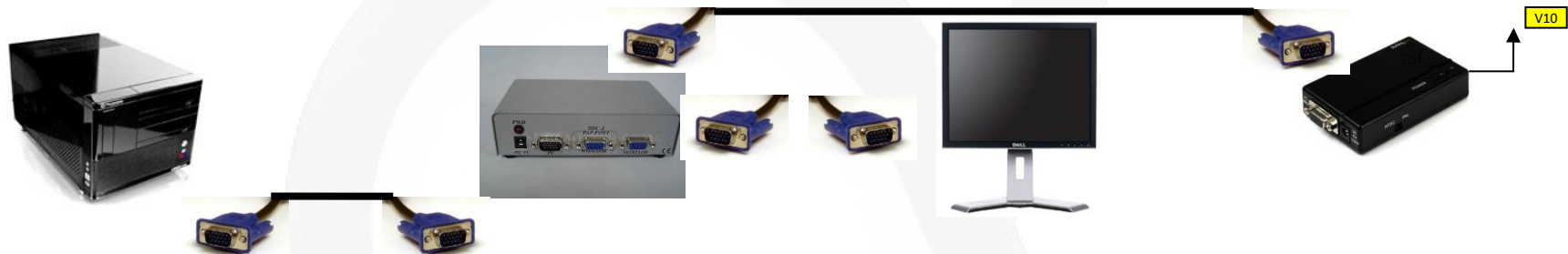
V16



Description

Optical fiber cable assembly with on both ends LC plugs. The cable connects the camera of the Eyelink eyetracker with the base-block of the Eyelink PC

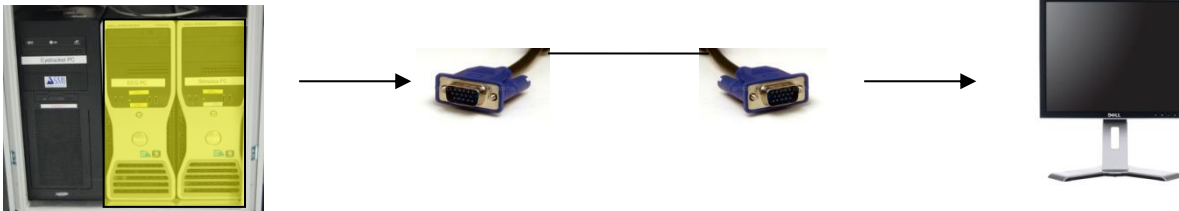
V17a-b-c



Description

VGA assembly cable with male connector on both ends. **V17a** connects the VGA output of the Eyelink PC to a 150 MHz video splitter (PC input). The video splitter has two outputs. One output (Monitor) connects by **V17b** a VGA assembly cable (male connectors on both ends) to the SR Eyelink monitor. The other output (PnP Port) is by **V17c** (VGA assembly cable male connector on both ends) connected to converter which converts the VGA video signal to S-video.

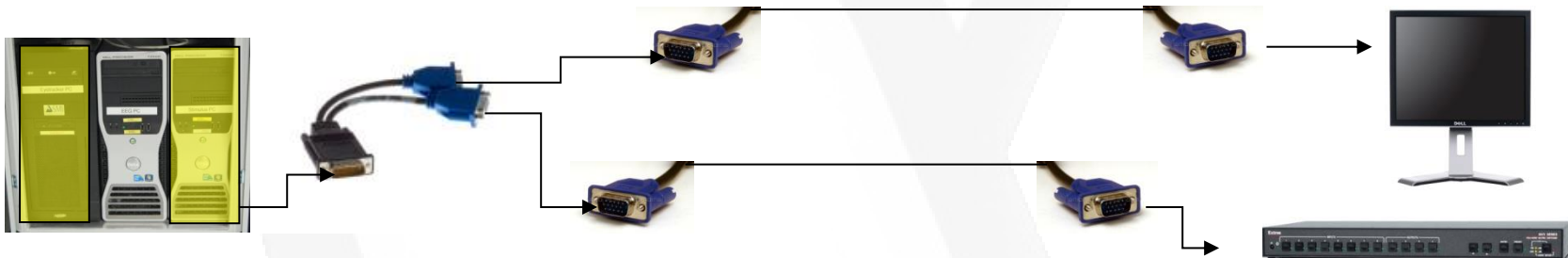
V20



Description

Video Cable Assembly with on both ends a male VGA connector to connect the VGA output of the SMI eyetracker PC with a Dell monitor 1908Fpc.

V21+V22



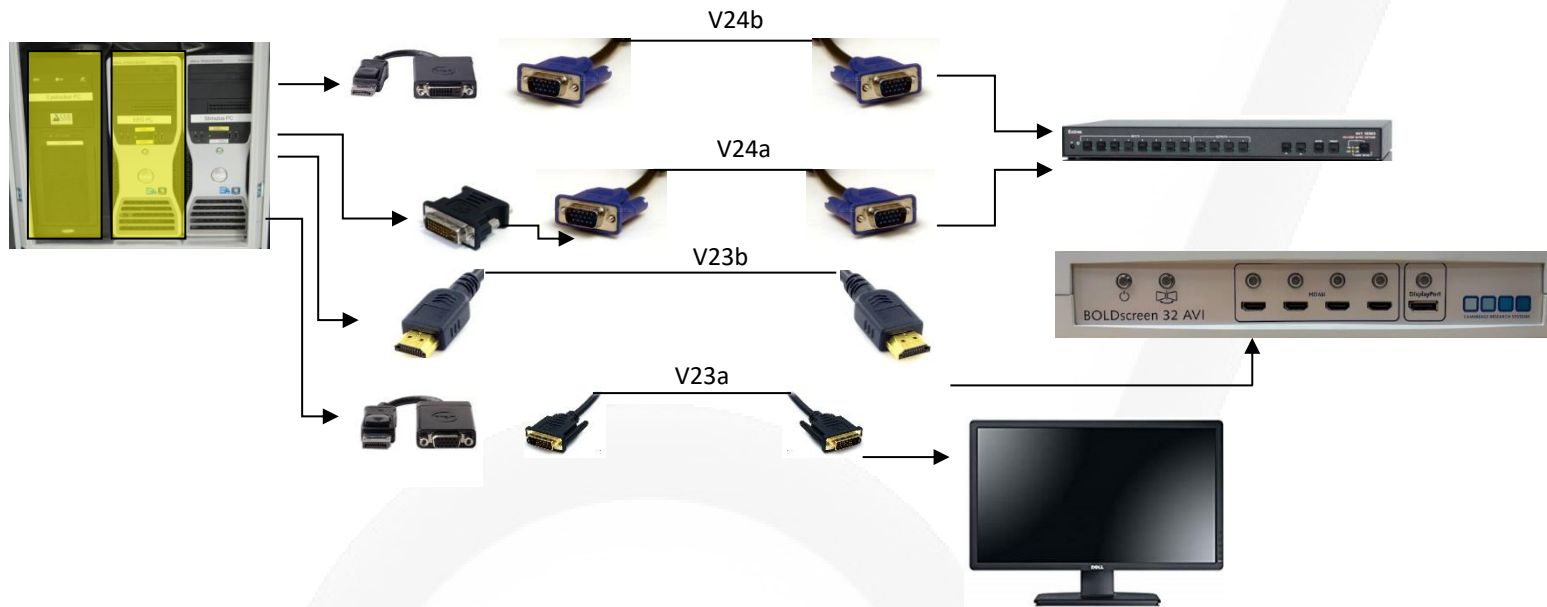
Description

V21 Video Cable Assembly with on both ends a male VGA connector to connect the VGA output 1 of the EEG PC with a Dell monitor 1908Fpc.

V22 Video Cable Assembly with on both ends a male VGA connector to connect the VGA output 2 of the EEG PC with input 8 of the Extron VGA matrix switch.



V23a+V23b+V24a+V24b



Description

V23a Video Cable Assembly with on both ends a male HDMI male connector to connect the HDMI output of the Stimulus PC to the first HDMI input at the front of the AVIbox.

V23b Video Cable Assembly with on both ends a male DVI connector to connect the DisplayPort output of the Stimulus PC, via the DisplayPort to DVI adapter with the DVI input of the Dell monitor.

V24a Video Cable Assembly with on both ends a male VGA connector to connect the DVI output of the Stimulus PC via a DVI to VGA adapter to input 1 of the Extron VGA matrix switch.

V24b Video Cable Assembly with on both ends a male VGA connector to connect the DisplayPort output of the Stimulus PC, via the DisplayPort to VGA adapter, with input 1 of the Extron VGA matrix switch. (DISCONNECTED JAN2020)

V28

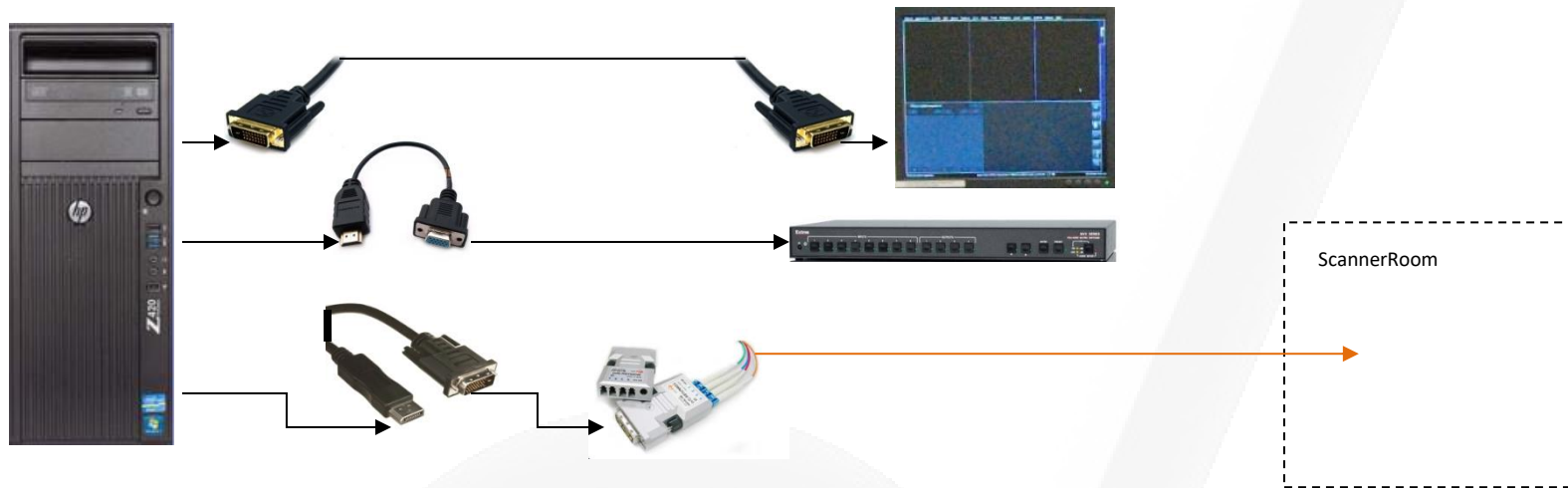


Description

Via a VGA female connector mounted on the patch panel a laptop can be connected to the VGA matrix switch and via this switch connect to e.g. the beamer. The cable connection between patch panel and switch is a video cable assembly with on both ends a male VGA connector.



V25-V26-V27

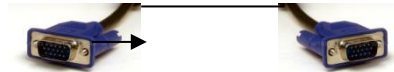


Description

The graphics card of the Host PC has three outputs. The DVI output of the graphic card of the Host PC **V25** is connected by a video assembly cable (with on both end DVI-D male connectors) to the MRI console (Host PC monitor). The second and third output of the graphic card of the Host PC are Display Ports. Display Port (2) connects to input 4 of the Extron VGA matrix switch via a Video Cable Assembly with on both ends a male VGA connector (=V26). This cable is not connected permanent. The graphics card only supports 2 outputs (of 3) and these two are already in use by the MR-system. The other Display Port (3) is connected to a DVI-optical converter (transmitter) by an adapter cable **V27** (Display Port to DVI-female). This output connects PC Host to the Patient data Display. This display is mounted above the bore at the front of the MR scanner. This is also the reason why this has to be an optical connection. The receiver (optical to DVI) is mounted behind the front cover.



V29+ V30+V31



Description

V29 Video Cable Assembly with on both ends a male VGA connector connects output 2 of the Extron VGA matrix switch to EIKI beamer.

V30 Video Cable Assembly with on both ends a male VGA connector connects output 1 of the Extron VGA matrix switch to VGA input of Stimulus PC monitor (Dell P2412).

V31 Video Cable Assembly with on both ends a male VGA connector connects output 3 of the Extron VGA matrix switch to EXT01 (=VGA input of monitor of General Purpose PC - Dell P2412).

A01+A02



Description

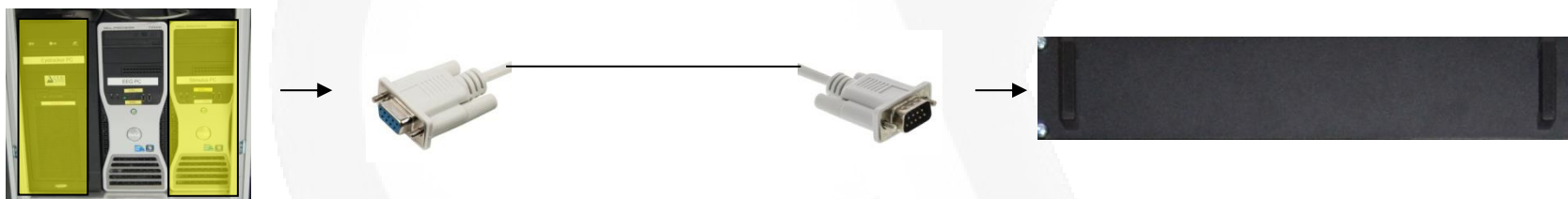
With this Siemens cable assembly the built-in microphone of the Siemens intercom is connected to the two speaker of the MRI scanner. (Location: at the magnet front cover left-side and magnet cover rear-side). The two microphones (at Body Coil front and rear) are connected to the speaker in the Siemens intercom. If it is necessary, only Siemens can replace this cable.

A03



Description

A serial cable (RS232) assembly connects the AudioMixer with the serial port (onboard - COM1) of the EEG-PC on which the web-application, control the AudioMixer, runs.

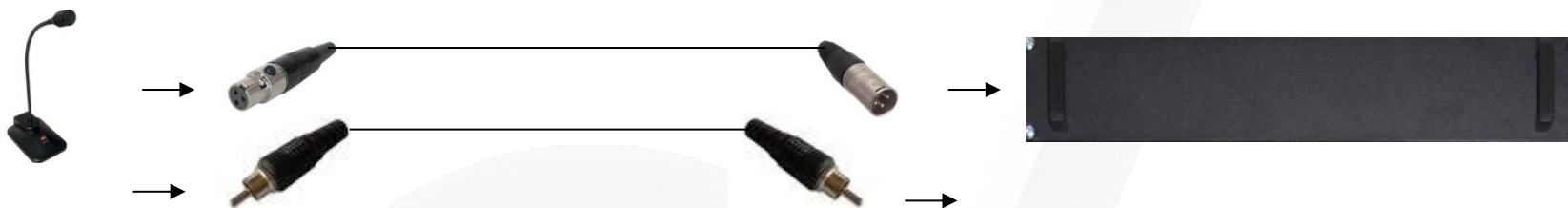


A04a+b



Description

Microphone cable with XLR-3 pins to connect desktop microphone to AudioMixer input 2. An assembly cable with on both sides RCA-male connectors also connects the desktop microphone with the AudioMixer. Via this cable all outputs of the AudioMixer are muted when the blue (speak) button on the desktop microphone is pressed.

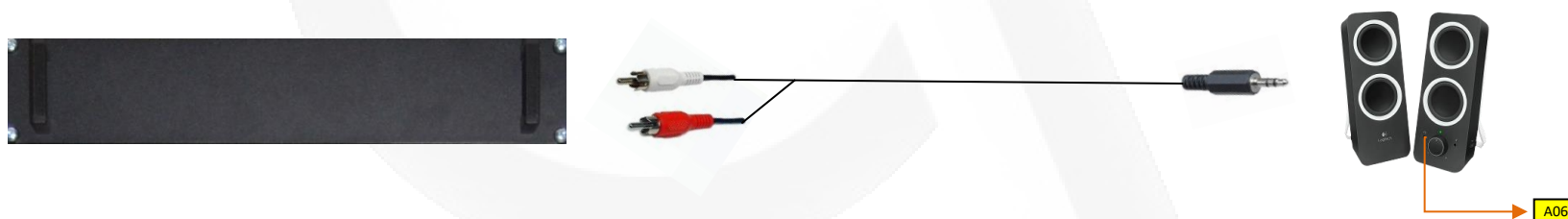


A05



Description

Cable assembly to connect output 3 of the AudioMixer with the desktop speakers. Two RCA male connectors (red – white) to connect to the AudioMixer and one DIN 3.5 mm stereo jack (male) to connect to one of the desktop speakers.



A06



Description

CABLE IS NOT PERMANENT INSTALLED

A headphone can be connected by pushing the DIN 3.5 mm stereo jack (male) of the headphones in the socket located on the front of the desktop speaker with the volume knob.



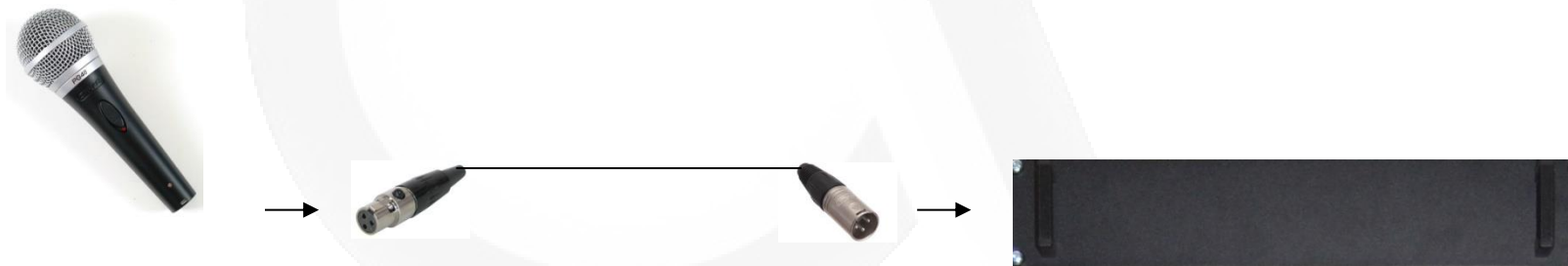
A07



Description

CABLE IS NOT PERMANENT INSTALLED

Cable to connect a (extra) microphone to AudioMixer input 1 by XLR- 3 pin connectors. A male connector at AudioMixer side. A female connector a side of microphone. Input 1 of the AudioMixer is configured with a phantom power supply.

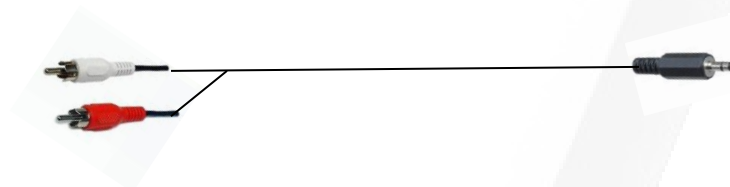
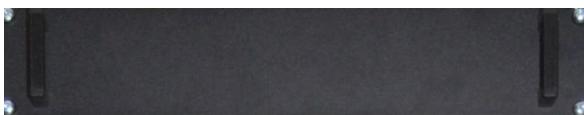


A08



Description

Cable assembly to connect output 1 of the AudioMixer (via two RCA male connectors red, white) to the line-in of the Stimulus PC (by a DIN 3.5 mm stereo jack (male)).

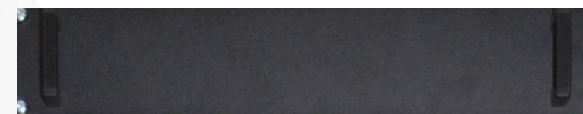
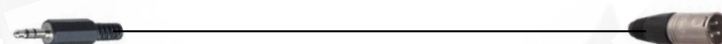


A09



Description

Cable assembly to connect the line-out of the Stimulus PC (by a DIN 3.5 mm stereo jack- male) to input 4 of the AudioMixer (by a XLR connector male) .

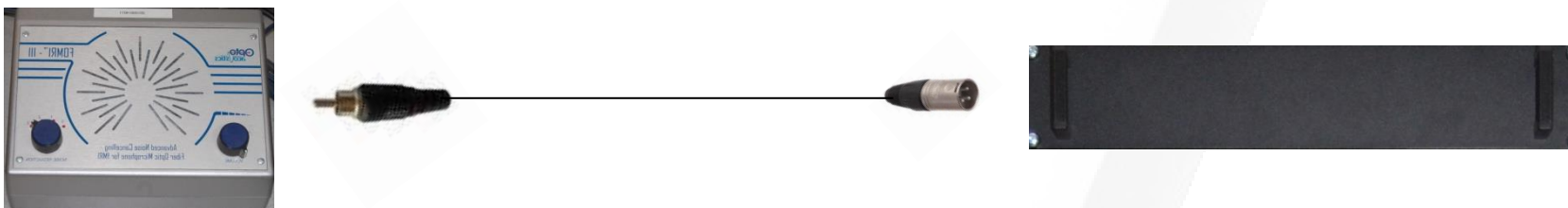


A10



Description

Cable assembly to connect the DSP output of the Optical Microphone (by a RCA male) to input 3 of the AudioMixer (by a XLR male connector).

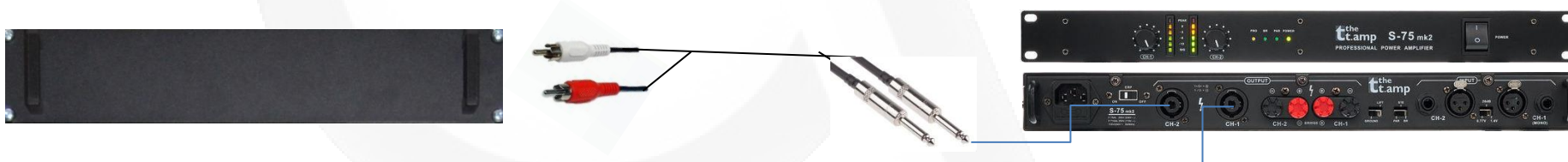


A11



Description

Cable assembly to connect output 2 of AudioMixer (by two RCA male connectors) to one of the audio inputs of the Audio Amplifier t.amp (by two Jack 6.3 mm connectors).

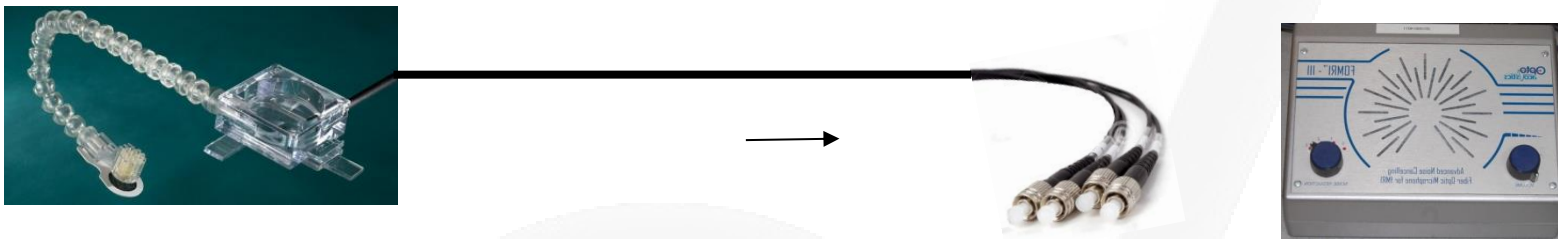


A12



Description

The Optical fiber bundle of the Optical Microphone is connected to the Optical Microphone control unit (FORMRI III) by four ST-connectors (male). The bundle consists of four fiber connections, two labeled as MAIN and two labeled as REF.

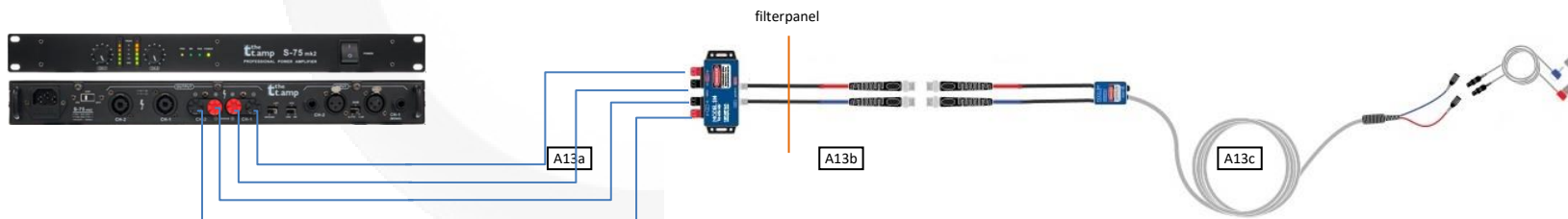


A13a+b+c



Description

The cable assembly to connect the in-ear phones of Sensimetrics to the speakers output of the Sony amplifier consists of three parts. A13a is a twin core cable connects speaker output of Sony amplifier with S14 trafo. Via two coax BNC cables (A13b) the signal is fed via the penetration panel to the RF choke. Cable A13c is an extension cable with on one side a fixed connection to the output of the RF choke. On the other side some female connectors to connect the in-ear phones. This cable is made by Sensimetrics and only replaceable by the company.

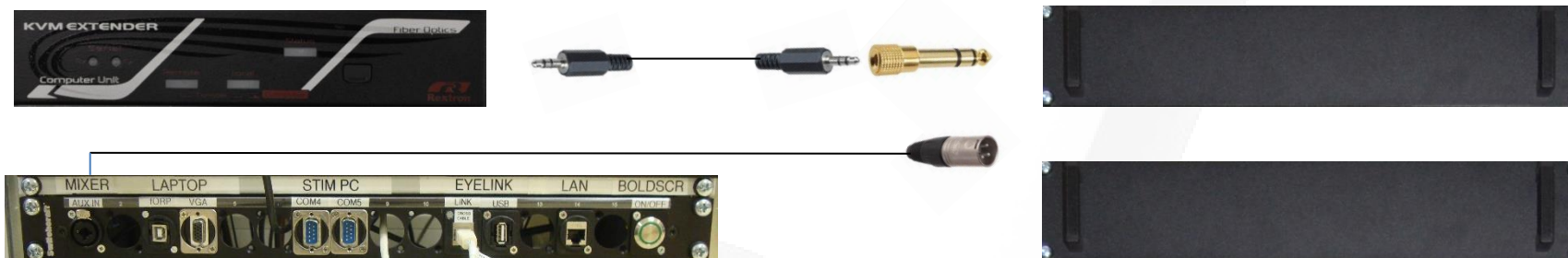


A14



Description

Cable assembly to connect the line-out of the KVM extender (by a DIN 3.5 mm stereo jack- male) to input 5 of the AudioMixer (by a DIN 3.5 mm stereo jack- male in combination with a DIN 3.5 mm jack (female) to DIN 6.3 mm jack (male) adapter). **DISCONNECTED JAN 2020**



Description

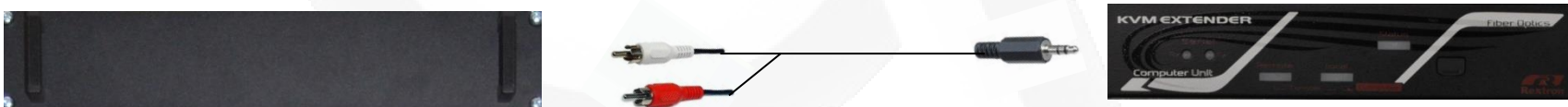
The female XLR panel connector, labelled with AUX IN, is connected to input 5 of the AudioMixer (by a Jack 6.3 mm connector). The cable is soldered at the back of the panel XLR connector.

A15 (only at Prisma)



Description

Cable assembly to connect output 4 (dual output) of AudioMixer (by two RCA male connectors) to the line-in of KVM extender (by a DIN 3.5 mm stereo jack- male).

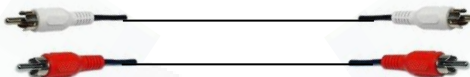
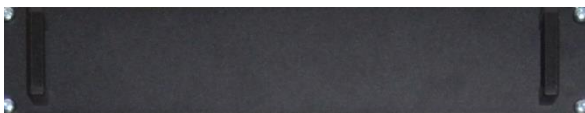


A16



Description

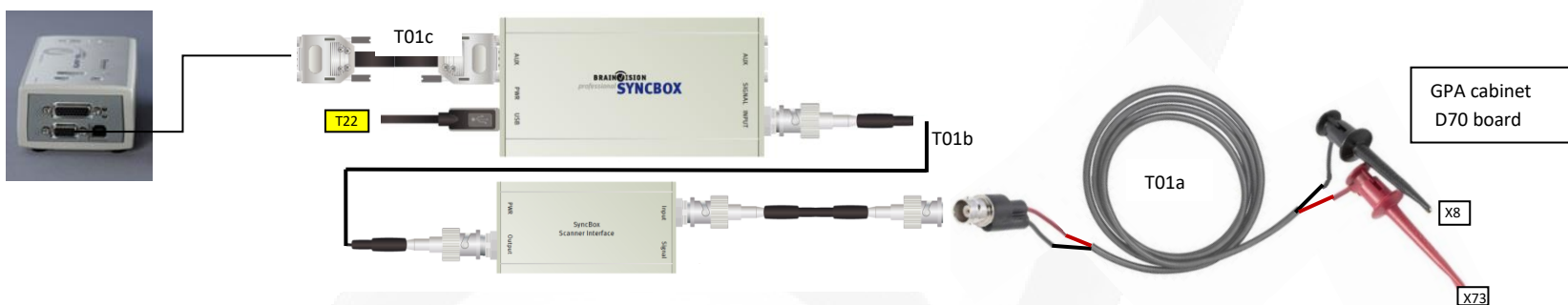
Cable assembly to connect output 4 of AudioMixer (by two RCA male connectors) to the audio input of DV recorder (by two RCA male connectors).



T01a+b+c

Description

The cable connects the gradient clock modulator signal to the Brainamp USB Adapter via the SyncBox Scanner Interface and the SyncBox. The signal is generated in the GPA cabinet in the technical room of the MRI on PC board D70 pins X73(signal) and X8(ground). A home-made cable (T01a) feeds the signal to the SyncBox scanner interface. The output of this box is connected by coax BNS (T01b) to the input of the SyncBox. The cable T01c is delivered by BrainAmp. It is a short cable with on both sides a HD 15 pin connector (male).



T04a+b

Description

Output of the ScanTriggerBox is fed to R-BTSI input 1 and to fORP 932 interface. A BNC T-piece splits the output signal of the ScanTriggerBox. A BNC coax cable (female) is connected with BNC input connector on the front of the R-BTSI. The connection to the fORP is made by a coax cable assemble with a BNC mal connector on one side and a SMB connector (female).



T05



Description

Cable assembly with on both ends 36 pin MDR connector (male). The AUX output contains both the TTL and serial output signals of the fORP. The manufacturer of fORP (CurrentDesign) delivers different cables for using the serial output and TTL output. To make use of the original manufacturer cables and have both output signals available at the same time (not swapping cables) a small interface board is used.



T07



Description

The 8 outputs of the S-BTSl are used to send codes (for logging) to SMI eyetracker and BrainAmp ExG\EEG. Both devices has an I/O board with 16 lines. Hence besides logging the code 8 other input lines are also available. Via a so-called DuoBTSl interface board one can select which input/output lines of the two BTSl's will also be logged. Via T07 these lines are sent to the BrainAmp ExG\EEG USB adapter. This is a home-made cable with on the DuoBTSl-interface side a D25 connector (male) and on the BrainAmp USB adapter (TRIGGER-input) a HD 36 pin connector.



T08



Description

The eight outputs of the S-BTSI are used to send codes (for logging) to SMI eyetracker and BrainAmp ExG\EEG. Both devices have an I/O board with 16 input lines. Hence beside the lines used for the code eight other input lines are available. Via a so-called DuoBTSI interface board one can select which input/output lines of the two BTSI's will also be logged. Via T08 these lines are sent to the SMI eyetracker PC. This cable assembly has a D25 connector (female) on both ends. On the external connector of the I/O board of the SMI eyetracker PC only 8 inputs pins are available. The other 8 pins are available on an internal connector. To make use of all 16 input lines a home-made adapter box is used. The D25 connector of the assemble cable is connected to the input of this box.



T09



Description

The scantrigger of the MRI-system is generated at the output U2 of D90 board which is a piggy-back board on D67 in the GPA cabinet (technical room). This optical signal is led via an optical fiber directly to the optical input of our home-made ScanTriggerbox by a non-latching VL connector.



T10



Description

Current Design optical fiber bundle consist of 12 optical fibers shielded by a flexible plastic tube. It connects the fORP 932 interface with a handheld device.



T11



Description

Optical cable assembly with two fibers. It is used to control devices in the ShockerBox by one of the four optical outputs of the R-BTSl. On both ends a VL (non-latching) connector is used.



T12



Description

Duplex optical fiber cable to connect the BrainAmp ExG/EEG (inside the scanner room) with the BrainAmp USB adapter. The rigid fiber has on both ends VL duplex latching connectors.



T13abc



Description

With this optical USB extension cable a Human Interface Device inside the scanner room can be connected to the Stimulus PC with perfect electrical galvanic isolation and without any magneto-electrical interference. For the uplink it makes use of the USB controller power. For the downlink a 5V power adapter (not MRI safe) is used.

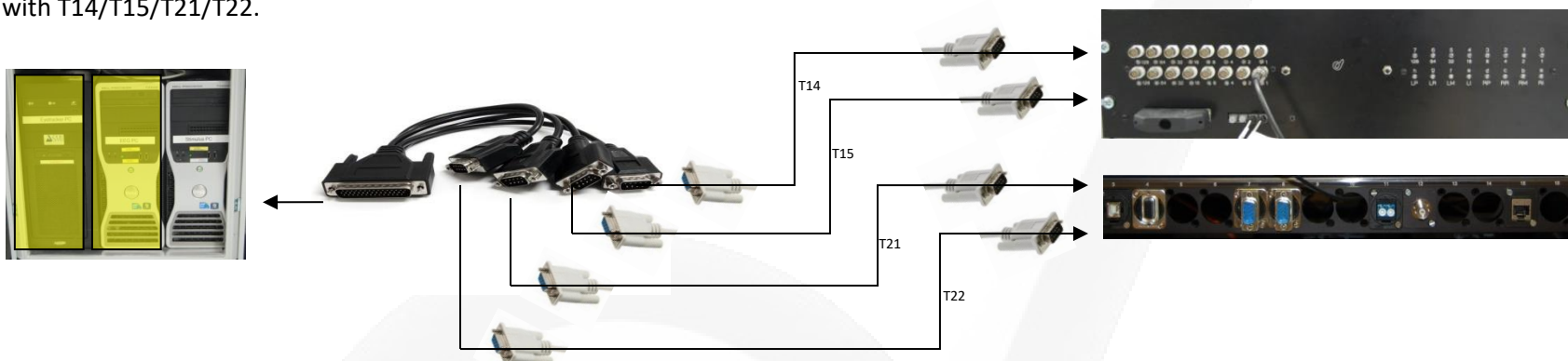


T14/T15/T21/T22



Description

The inputs and outputs of BTSI are controlled by the Stimulus PC via a RS232 cable. For this purpose the Stimulus PC is equipped with an additional 4-port Universal PCI serial board labeled P1/P2/P3/P4 respectively defined as COM2/COM3/COM4/COM5 and respectively connected with T14/T15/T21/T22.



T16



Description

Original Current Design RS232 cable assembly connects the serial output of the interface board with COM 1 of the Stimulus PC.

Assembly consist of a MDR connector 36 pins which is connected to the interface board and a D9 connector (female) which is connected to the COM1 of the Stimulus PC.

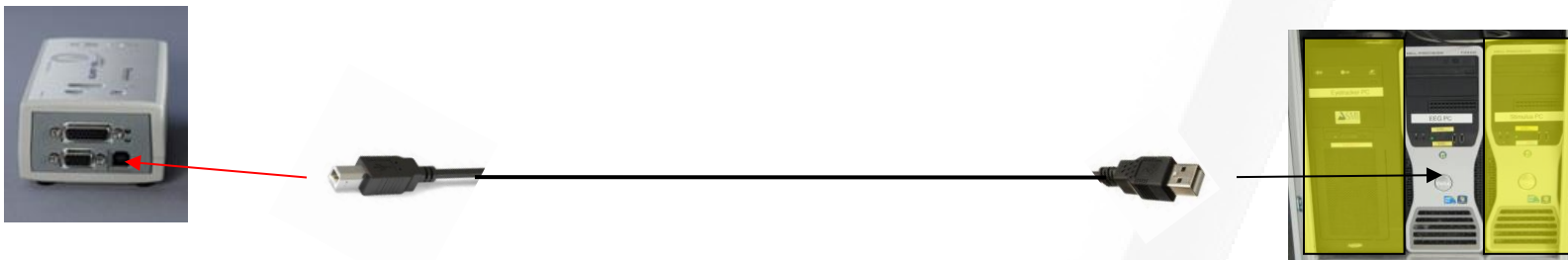


T17



Description

USB cable with A connector and B connector to connect the BrainAmp USB adapter to EEG PC

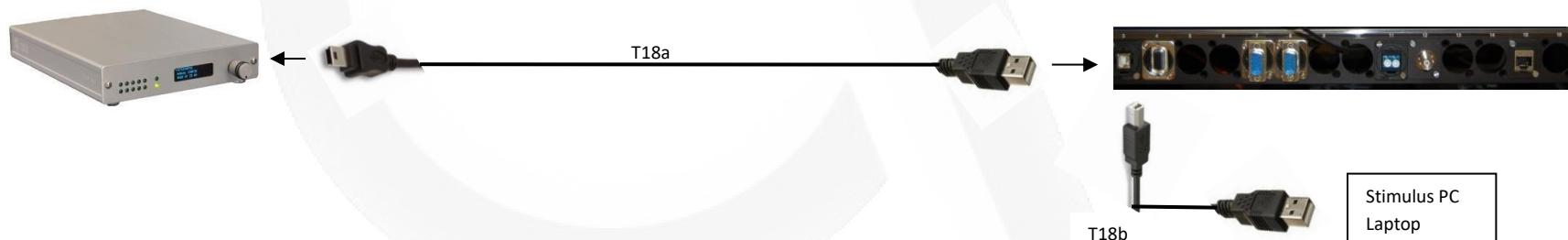


T18ab



Description

Besides the serial and TLL outputs, the fORP 932 interface can also communicate via USB. In that case the fORP acts like an HID keyboard. The USB cable assembly has on one end a mini USB and on the other end a USB A connector. Via the patch panel the USB cable can be connected to Stimulus PC or laptop.

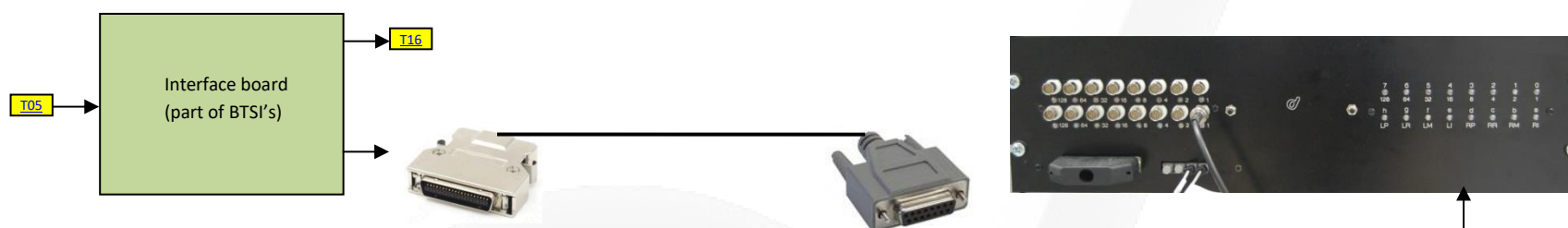


T19



Description

Original Current Design TTL cable assembly connects the TTL output of the interface board with input connector of S-BTSl. Assembly consist of a MDR connector 36 pins which is connected to the interface board and a D25 connector (female) which is connected to the input of the S_BTSl.



T20



Description

Original LTP cable connects output of S_BTSl (female D25 connector) via a gender converter (male to male) to the parallel port of Eyclink (female D25 connector). Via this cable a 8-bits code send by the stimulus PC can be logged by the Eyclink eyetracker.

T21



Description

USB cable with A connector and B connector to connect the BrainAmp SyncBox to EEG PC.



T22

