BOLDscreen 32 AVI

Getting Started

Version R01

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Introduction

BOLDscreen32 AVI makes it easy for you to connect multiple stimulus computers or other video sources to your BOLDscreen 32 MRI-compatible LCD display. The AVI allows switching easily between different input sources and provides an auxiliary output to drive a second monitor so that you can monitor the image shown to the patient from the control room. The AV also removes to requirement for the video source to produce a 1920x1080 120Hz output, as it can re-scale many input resolutions and produce an appropriate output for the BOLDscreen 32.

System Features

- 1920x1080 @ 120Hz output, via fibre connection appropriate for connecting directly to BOLDscreen32.
- 1920x1080 120Hz output via HDMI, suitable for connecting to a monitor in the MRI control room.
- S/PDIF audio output for connection to MRI headphone systems.
- Four HDMI inputs.
- One DisplayPort input.
- All inputs accept resolutions of 640x480 up to 1920x1080 at framerates between 50 and 120Hz.
- One input source can be shown on the BOLDscreen 32 at any one time.
- Remote control of BOLDscreen 32 mirror-mode and low-power features.

Parts List

BOLDscreen32 AVI — Video input switching box.

Getting Started Guide — Printed version of this document.

SD Card — If you purchased your AVI to work with your existing BOLDscreen32, you will have received a replacement San Disk 4 GB or 8GB SD/SDHC card or similar. This contains a firmware upgrade for your BOLDscreen 32 that will enable the remote control features.

Power Supply Unit — IEC320-C14 input connector. 60 W, 24 V DC output. 1 m attached cable terminates in barrel connector.

Power Cord — 2 m IEC320-C13 power cord. Terminates in region-specific plug.
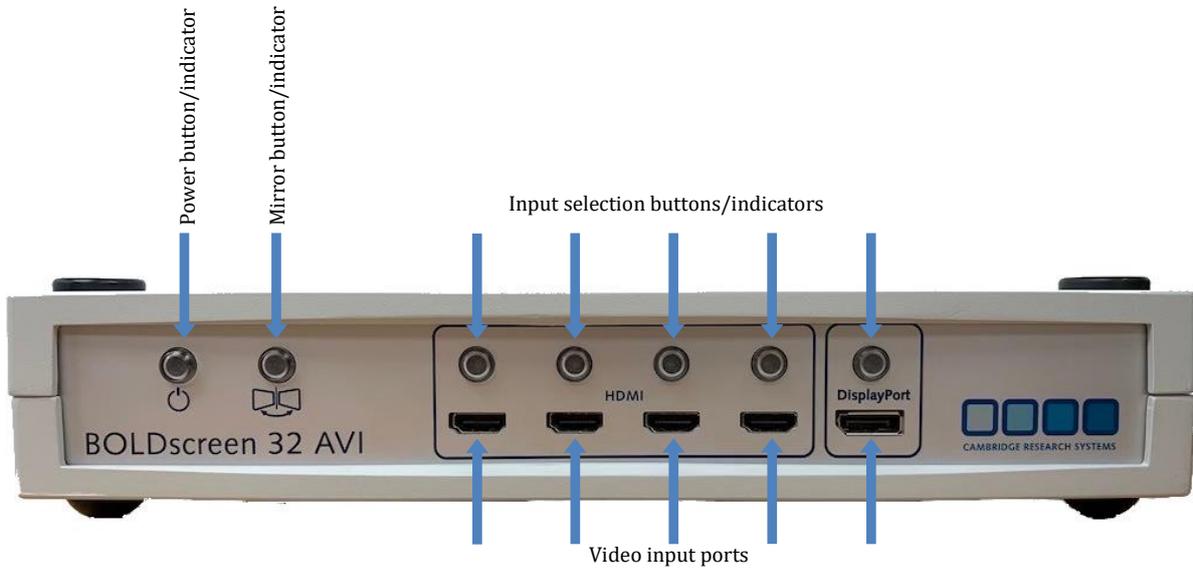
Hardware Requirements

A variety of inputs are supported. For example:

- A computer running Windows XP SP3 or later (ideally Windows 10), Mac OS X 10.11 (El Capitan) or later, or a Linux distribution like Ubuntu 16.04 or later. The computer must have a HDMI (via an adapter if necessary) or DisplayPort output.
- A Blu-ray Disc player or DVD player with HDMI output.
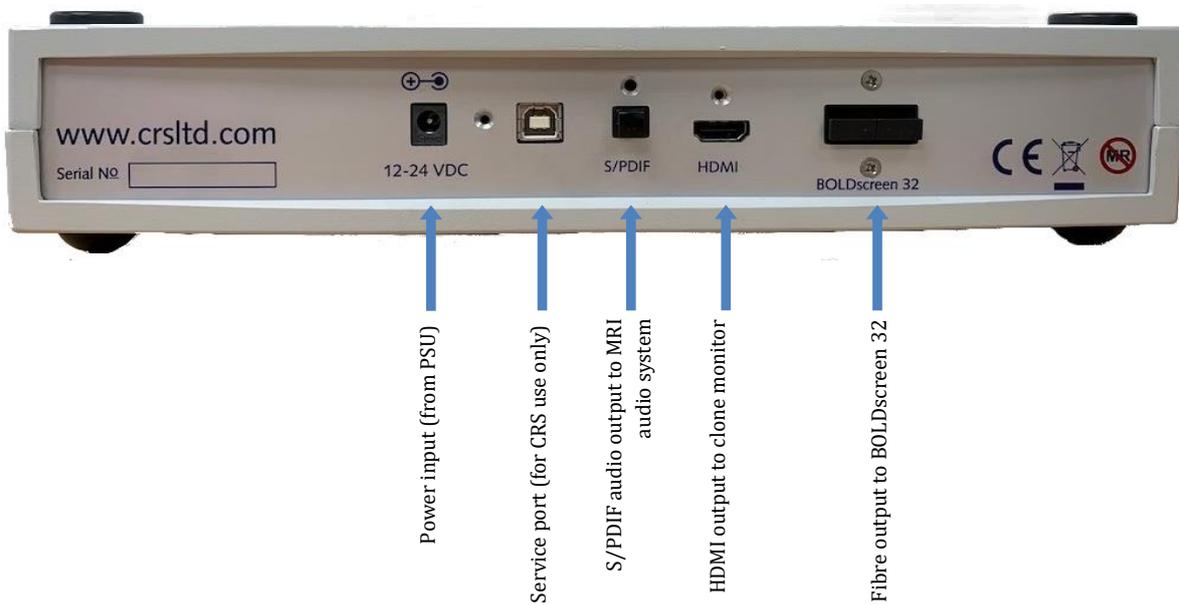- A streaming media device with HDMI output.

Optionally, a second monitor can be connected to monitor the BOLDscreen 32 image from the control room. The rear of the AVI has a clone HDMI output for this purpose. This clone output is identical to the fibre output and produces video at 1920x1080 @ 120Hz. We have tested the clone HDMI output with 24" ViewSonic XG2401 and XG2402 LCD monitors – other desktop LCD monitors should work too if they can support 1920x1080 @ 120Hz via HDMI.

Connectors and controls

Front panel

Power button/indicator

Mirror button/indicator

Input selection buttons/indicators

Video input ports

Rear panel

Power input (from PSU)

Service port (for CRS use only)

S/PDIF audio output to MRI audio system

HDMI output to clone monitor

Fibre output to BOLDscreen 32

Installation

1. You may have received a new SD card for use with your existing BOLDscreen 32. This contains a firmware upgrade and new set of FPGA logic files to support the AVI. Your monitor must be used with the new SD card – just switch the monitor off and replace the original SD card with the new one, then switch the monitor on again. When the monitor restarts, the upgrade will be loaded. The upgrade supports the Power Off and Mirror Mode features that you can select on the AVI front panel.
2. Situate the AVI in the control room so that the fibre cable connected to the BOLDscreen 32 can reach the rear of the AVI and so that you can easily access the front panel. Do NOT take the AVI box into the MR room.
3. Connect the fibre cable from the BOLDscreen 32 directly to the connector marked "BOLDscreen 32" on the back of the AVI unit. You do not need to use the DVI fibre transmitter if one was originally supplied with your BOLDscreen. The AVI contains an embedded dual-link DVI video to fibre optic converter. Please return the Ophit TX dual-link DVI to fibre converter module that was originally supplied with the monitor to CRS.
4. Turn on the power to the BOLDscreen 32.
5. Optionally, connect a clone monitor to the HDMI output on the rear of the AVI box via a standard HDMI 1.4 (or above) cable. This monitor should be situated in the control room, NOT in the MR room.
6. Optionally, connect your MRI headphones amplifier to the S/PDIF output on the rear of the AVI with a standard audio optical fibre (Toslink) cable.
7. Connect the power supply unit barrel connector to the rear of the AVI. Connect the power cord to the power supply unit and to a suitable wall outlet.

Operation

1) Connect a suitable video source to one of the four HDMI inputs or the DisplayPort input. Connect other inputs as necessary.
2) Configure the output resolution on the source. The native, recommended video input mode is 1920x1080 at 120Hz, but 1920x1080 at 60Hz is a good choice too. The AVI box will re-scale other resolutions.
3) Press and hold the power button on the front of the AVI unit for three seconds to wake-up the AVI from low-power mode. The power button indicator will change from slowly pulsing to blinking.
4) Press the appropriate input select button to choose which input source will be displayed on the BOLDscreen 32. The same image will also be shown on your clone monitor (if connected) and the corresponding audio will be played through your MRI headphones (if connected).
5) Press the power button once to send video the BOLDscreen 32. It may take several seconds for the BOLDscreen to switch modes. You may also briefly see the status screen during this time. The power indicator will be continuously illuminated.
6) If required, toggle the mirror-mode on and off by pressing the Mirror Mode button on the front panel of the AVI box. This toggles left/right inversion of the image. This is useful for presenting correctly-oriented images to patients as they view the BOLDscreen

32 through a head-coil mirror. The image on the clone monitor (HDMI output) will not be affected.

7) If required, switch between inputs by pressing the appropriate input select button. Again, there may be a delay while the BOLDscreen switches modes.

8) Press the power button once to place the BOLDscreen 32 in a low-power mode. This mode turns off the BOLDscreen 32 LED backlight so that no picture can be seen. The power indicator will change to blinking.

9) To restore the image on the BOLDscreen 32, press the power button once to restore video to the BOLDscreen32.

10) To place the AVI box in low-power mode, first place the BOLDscreen 32 in low-power mode as in step 8, then press and hold the power button for three seconds. The power indicator will change to slowly pulsing.

Note: If an input source stops sending video, for example because it is powered off or goes into sleep mode, then the AVI box will stop sending video. When the source begins sending video, the AVI box will not output video to the BOLDscreen 32 automatically. Press the corresponding input select button to restore video.

Power states and button functions summary

AVI box state	BOLDscreen32 state	Clone monitor state	Short press	Long press (~3s)
Low power (power indicator pulsing slowly)	Low power	No video	N/A	AVI box-> Sending video
Sending video (power LED blinking, one input LED on)	Low power	Displaying video	BOLDscreen32 -> Displaying video	AVI box-> Low power
Sending video (LED solid on, one input LED on)	Displaying video	Displaying video	BOLDscreen32 -> Low power	N/A

Safety Warnings

The MRI scanner should only be used by suitable qualified personnel aware of the risks involved. National regulations and guidelines should be followed. Follow all safety instructions from the MRI scanner manufacturer.

Life support applications

BOLDscreen 32 AVI should NOT be used in situations where failure of the device would constitute a hazard. It is designed for visual stimulus of research applications only, and like any other regular electronic device the device could fail at any time, without warning.

BOLDscreen 32 AVI box

The BOLDscreen 32 AVI box contains SIGNIFICANT FERRO-MAGNETIC CONTENT. **<u>DO NOT TAKE THE AVI BOX INTO THE MAGNET ROOM.</u>**

Servicing

DO NOT ATTEMPT TO DISMANTLE any part of the BOLDscreen 32 AVI system. The BOLDscreen 32 AVI unit and mains PSU contain no user serviceable components, refer all servicing to Cambridge Research Systems.

Cleaning

Clean external components of BOLDscreen 32 AVI with a damp cloth only. Do NOT allow fluids to enter the AVI unit or PSU. Do not sterilise in an autoclave.

Mains PSU

The mains PSU contains SIGNIFICANT FERRO-MAGNETIC CONTENT. **<u>DO NOT TAKE THE MAINS PSU INTO THE MAGNET ROOM.</u>**

The power supply contains dangerous mains voltage and also has no user serviceable parts. Do not attempt to dismantle.

Optical hazard

The infra-red laser diodes in the DVI video transmitter are class 1M. Do not view the output of the fibre transmitter, or end of the fibre cable, with optical instruments.

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