

Ebenezer Sound System

Cables and Connectors

A. Cables and Connectors

First some basic information about the cables and connectors joining the various pieces of equipment.

Balanced cables

Two microphone leads, *hot* and *cold*, run within an earthed screening sheath. Electrostatic interference is screened by the sheath. The hot and cold leads are twisted together so that magnetically induced interference affects both leads equally. A *differential* amplifier on the mixer input ensures good rejection of noise. Balanced cables effectively allow long runs of microphone cable without significant noise pickup. All of the microphone cables in Ebenezer are balanced and terminated in three-pin **XLR** connectors. Balanced cables can also be terminated with 6.3mm **TRS** (Tip, Ring, Screen) jack plugs. These look like stereo jacks, but are wired as follows: Tip – hot, Ring – cold, Screen – cable screen.

You can safely use mono, **TS** (Tip, Screen), jacks in balanced TRS sockets, but the connection is no longer balanced. All of the Soundcraft EPM 8 mixer TRS jack sockets are balanced mono connectors, with the exception of the stereo headphone socket and the **Insert** sockets (See below). Each of the two *stereo* input channels has a pair of *mono* balanced TRS sockets, one for the left channel and the other for the right.

Unbalanced cables

This is the type of cable that you will find on your home stereo system. A single (mono) or double (stereo) signal leads are surrounded by an earthed screen that also carries the return signal. These are not suitable for long run, low voltage microphone cables, as they have little noise rejection capability. They can be used for short interconnects between various pieces of equipment sited close to each other.

B. The Mixer

Mixer Input sockets

The mixer has 8 mono microphone input channels and 2 stereo inputs. The three pin XLR sockets are designed for microphone level (millivolt) inputs; the 6.3mm TRS sockets are designed for line level (volt) inputs. The fixed microphone cables, e.g. pulpit and table, are terminated with XLR plugs. The cables from the radio microphone receivers and the computer interface are terminated with jack plugs (TRS or TS). All plugs are labelled, as are the channels of the mixer.

Insert Sockets

Each of the mono **Input** channels, and the two **Main Mix** output channels, has an **Insert** socket. These allow you to take a signal out of the mixer, apply some form of signal processing, and then return the processed signal to the same channel. The sockets take a TRS jack that is wired as follows: Tip – signal out to processor; Ring – return signal to mixer; and Screen – cable screen and signal neutral. The use of insert points enables you move your processor from channel to channel. These are not in use at present.

Main Mix Outputs

These are recessed XLR plugs

- The left main mix output is connected by balanced cable to the left side of the compressor. This in turn is connected by balanced cable to the equalizer. The equalizer is connected by unbalanced to the **Amp In** socket of the Inkel PA4000 power amplifier, which drives the (mono) loudspeakers.
- The right main mix output is connected by balanced cable to the line input socket of the hearing aid loop amplifier.

Auxiliary Outputs

- Each input channel has its own **Aux1** and **Aux2** gain control. There are two switches close to the signal level bargraphs that determine whether these auxiliary signals are taken pre-fader or post-fader. For recording we use the pre-fader position so that the recording level is independent of the channel gain faders. These channels have line level outputs from balanced TRS sockets, **Aux1** and **Aux2**. They are connected **Aux1** to recorder Left and **Aux2** to recorder Right channels.
- The **Aux1** output takes the signal from the speech microphones and feeds it via the right channel of the compressor to the left channel of the recorders.
- The **Aux2** signal takes the signal from the hanging microphone to the the right channel of the recorders. There is no need for hardware compression on this channel.
- For services we record in stereo, and later separate and blend the channels for the final product.

Compressor

This is used to reduce the loudness range in the speech microphone channels. By reducing the loudest sounds and increasing the average gain, quiet speech is more easily heard without the congregation being deafened, or the recorder overloaded by very loud speech. The left channel processes the signal to the loudspeakers, and the right to the left channel of the recorder. The hanging (congregational) microphone requires no compression.

D. Equaliser

The equaliser is used to reduce the gain at those frequencies at which feedback tends to occur. It is a single channel device and takes only the signal to the loudspeakers. There is also some roll-off at very high and very low frequencies, as these are not required for intelligible speech.

E. Power Amplifier

- The Inkel PA4000 amplifier is used only to drive the loudspeaker circuits. The preamplifier stages are not used, and (as far as I can tell) the equalizer is bypassed when input is to the **Amp In** connection.
- The 100V speaker circuits provide a flexible way of powering several loudspeakers with one amplifier. With a 100V system you can add or remove loudspeakers as needed. Each loudspeaker has a selector to determine the maximum power it can receive. When installing such a system you need to ensure that the total of the loads selected are within the maximum load capacity of the amplifier.
- There are four separate 100V loudspeaker circuits (annex, chapel, library and kitchen) each with its own on/off switch. There are labels on the amplifier to show which switch controls which circuit. The speaker cables are labelled.

F. Ampetronic Loop Amplifier

- This takes a line level input via a balanced TRS socket. At present it is connected to the right main mix channel of the mixer.
- The output of the amplifier feeds a simple wire loop that runs around the chapel, lobby, annex and library at floor level. The current flow at audio frequency creates a varying magnetic field which can be picked up by hearing aids set to "telecoil".

G. Computer Audio Input

- There is a Behringer UCA202 audio/USB adapter and an Edirol UA-1EX. These contain an ADC (Analogue to Digital Converter) and a DAC (Digital to Analogue Converter). They take line level signal and convert it to 16 bit digital audio for recording on the laptop and desktop computers, and convert the digital audio output from the computer to line level audio. The Edirol has in addition an input gain control.
- The input ports of the USB adapters are connected to the **Aux1 & 2** outputs of the mixer.
- There is an unbalanced cable (TS to phono x2) connecting the right channel of the compressor to the left (mono) channel of the A/D converters.

H. Computer Audio Output

Audio output from the computer the D/A converter in the USB adapter converts digital audio to a line level analogue audio. The output of the laptop's USB audio adapter connects (phono plugs x2 to TS jack plug) to the **Stereo 1** channel of the mixer.

I. DVD/CD Player Audio Output

The audio output leads are connected to the **Stereo 2** channel of the mixer.

Notes:

There are equipment manuals on the website: see http://www.ebenezerbangor.org.uk/av_info/