

Ebenezer Sound System

Basic Information

EPM8 Mixer:

Input channels

- The three pin **XLR**¹ sockets are for low level microphone input, and the 1/4" **TRS**² jack sockets are for line level input from wireless microphone receivers, computers and DVD players etc.
- The **Insert** socket allows a signal processor, e.g. compressor, to be inserted into a channel. The insert plugs can be moved from channel to channel, as needed.
- The **Gain** control is adjusted to give a high signal level, to reduce noise pickup in the various mixer components, but without clipping (overloading) with loud sounds. In our case, the gain has been set to maximum for the dynamic (Shure SM58) microphones, and the pulpit microphone and the radio microphone receivers are set to match the signal level from the dynamic microphones. The result is that the white channel faders can usually be set to around 0dB gain.
- The **HF**, **MF** and **LF** equalizer controls allow some adjustment of the frequency response on a channel by channel basis.
- The **MF** channel has a centre frequency adjustment as well as a gain control. See the Soundcraft manual for details.
- **Aux1**, **Aux2** provide alternative output channels, e.g. for the loop amplifier or recording gear: individual channel gain knobs control these outputs. The **Mute** buttons control the auxiliary as well as the main mix channels. Two switches close to the bargraph indicators determine whether the auxiliary channel's signal is taken off before (Pre) or after (Post) the channel faders.
- **Pan** should be normally left at zero (12 o'clock). The **Pan** controls set the balance between the left and right channels. These would be adjusted if you were mixing for a stereo system.
- **PFL** (Pre-Fader Listen) is *always* up. It can be used to monitor an individual channel when adjusting the audio system's "gain structure". *Depressing a PFL button sends that channel's signal (unaffected by the mute button and fader), instead of the main mix signal, to the output bargraph lamps, the monitor sockets and the headphone socket. It can cause confusion if one, or more, of these buttons is depressed by mistake.*
- **Mute** is used to turn a channel on or off. It removes the signal from all outputs including the auxiliary channels. It is usually more convenient to preset the faders and use the mute buttons to switch channels on or off. Normally, in a sound reinforcement situation, in order to reduce background noise and the risk of feedback, only one channel should be open at a time.
- The channel **Fader** is used for moment to moment control of the channel level. When the channel input **Gain** controls have been set appropriately, the usual working

¹ **XLR** –Originally a Cannon connector from their **X** series, later incorporating a **L**atch and a **R**ubber compound surrounding the contacts, now produced by several manufacturers.

² **TRS** a 6.35mm "jack" plugs with three contacts named **T**ip, **R**ing and **S**creen

range is between +5dB and -5dB.

- If a **Peak** light illuminates, the corresponding input channel is being overloaded. This should only occur with extremely loud sounds. If it occurs regularly, the channel input gain will need to be reduced somewhat. *Tim has only ever noticed this when the piano microphone is placed against the back of the piano and it receives a very high sound pressure level.*

Master Section - Output Channels and Controls

- We have only a single-channel power amplifier driving the loudspeakers: this is driven by the **Mix-L** (Left) output channel. The **Mix-L** yellow mix output fader is normally left on 0dB. Use the white channel faders to control gain.
- The **Mix-R** (Right) output channel is fed to the loop amplifier and the fader is adjusted to give suitable signal level to the Ampetronic loop driver (about -15dB).
- The output **Insert** sockets allow a signal processor, e.g. a compressor, to be placed in the output channels.
- The **2 Track** input sockets are designed playback from a recorder, but there is no gain control on these inputs, so they are not very useful. We feed the output from the Behringer UCA202 USB/audio adapters into the **Stereo 1** channel which has the usual signal processing controls and a mute button.
- **2 Track** buttons – These determine where the signal from the **2 Track** input is directed:
 1. **To Mix** adds the signal directly to the main mix.
 2. **Monitor** sends the **2 Track** signal instead of the main mix signal to the level bargraphs, the monitor and the headphone outputs. This can easily cause confusion..
Leave these in the up position. Do not touch them unless you know exactly what you are doing!
- **Phantom Power** – The pulpit microphone requires a power supply for its built-in amplifier: this is provided by *phantom power*³ from the mixer. A red indicator light is placed next to the switch. The red light on the microphone merely indicates that the microphone is connected and that the phantom power is switched on. It does **not** indicate that the microphone channel is open.

Main Amplifier

- The Inkel PA2000 amplifier is used to drive the loudspeaker circuits.
- The loudspeaker switches:
 - 1. Annex & Porch;
 - 2. Chapel;
 - 3. Library;
 - 4. Kitchen.
- The Master volume control is determines the power delivered by the loudspeakers. This is normally set to the 11 o'clock position.

³ **Phantom Power**, so called (perhaps) because it is invisible to balanced microphones not requiring it.

Compressor/Gate

The compressor/gate can reduce background noise (the gate function) and can control loud sounds (the compressor function). The gate reduces the gain when only background noise is present. The compressor acts as an automatic volume control, reducing the gain for louder sounds.

- The compressor has two channels.
- The **Left** channel is connected into the audio amplifier circuit. The aim is to give adequate gain for quiet speech and to reduce the amplification of louder sounds.
- The **Right** channel is connected into the line to the recording devices. This prevents clipping and distortion of loud speech while giving greater gain, and better audibility for quieter speech.
- On the back are input level selector switches: these should be up (un-depressed = +4dB) for both channels.

The first section is the noise **Gate**:

- The **Threshold** sets the sound level at which the gate opens and the **Ratio** determines the amount of gain reduction when the gate is “closed”.

The main section is the **Compressor**:

- The **Threshold** sets the sound level at which compression begins. This can be set to allow normal speech levels to remain uncompressed.
- The **Ratio** determines the amount of compression applied to signals above the threshold. Once the mixer controls have been set optimally for normal speech, the compression can be increased to prevent excessive amplitude when the preacher shouts.
- The **Attack** and **Release** times are set to low level as a quick response is appropriate for speech.
- The **Output Gain** control allows fine control of the level of the output signal. It can normally be left on 0dB.
- When the '**OverEasy**' button is depressed, you get smoother transition from an uncompressed to a compressed signal. Leave it depressed.
- The **Bypass** switch passes the signal through without any processing: useful for testing.
- *Do not change the settings unilaterally: discuss problems, or suggestions with Tim.*

Equalizer

The graphic equalizer allows the gain of individual $1/3^{\text{rd}}$ of an octave frequency bands to be adjusted independently. It has been adjusted to give a more even frequency response from the loudspeakers in the important 250Hz to 6kHz range and to reduce the gain at the main feedback frequencies. *Do not alter the settings without discussion with Tim.*

Loop Driver

This sends a large current into a wire loop run around the chapel, the hall and the library. The magnetic signal can be picked up by hearing aids switched to “Telecoil” mode. *(If you look carefully, you will notice that loud sounds, and the resulting strong magnetic pulses, can cause some shimmering of the picture on the projector screen!)*

- The loop is currently connected to the **Mix-R** output channel of the mixer and can be

controlled by the **Right** channel yellow fader. A setting of -15dB gives enough drive to the loop amplifier.

- As long as the right hand green lights are flashing, the signal level is probably fine. If more than three of the left hand green lights are flashing frequently, or if the red LEDs light, the device is being overdriven. Reduce the gain with the right yellow fader.
- You can ask someone with a hearing aid to tell you how well the loop is working, and whether the level is too high or too low. We aim for a comfortable listening level with a clear sound without a lot of background noise.
- There is a loop monitor in the bottom drawer. It switches on when you plug in the headphones. Hold the device vertically; and keep it away from the loop amplifier as it can pick up a lot of AC mains hum when held close. The problem with this device is that, as it has its own gain control, you cannot tell how loud it sounds to a user of a hearing aid.

Behringer UCA202 Audio/USB interface

These contain better quality Analogue to Digital and Digital to Analogue converters than those found in most computers. They allow us to send an audio signal to, or get audio from the computers. They accept and produce line level voltage levels up to 1 volt.

Connecting to Other Audio Devices

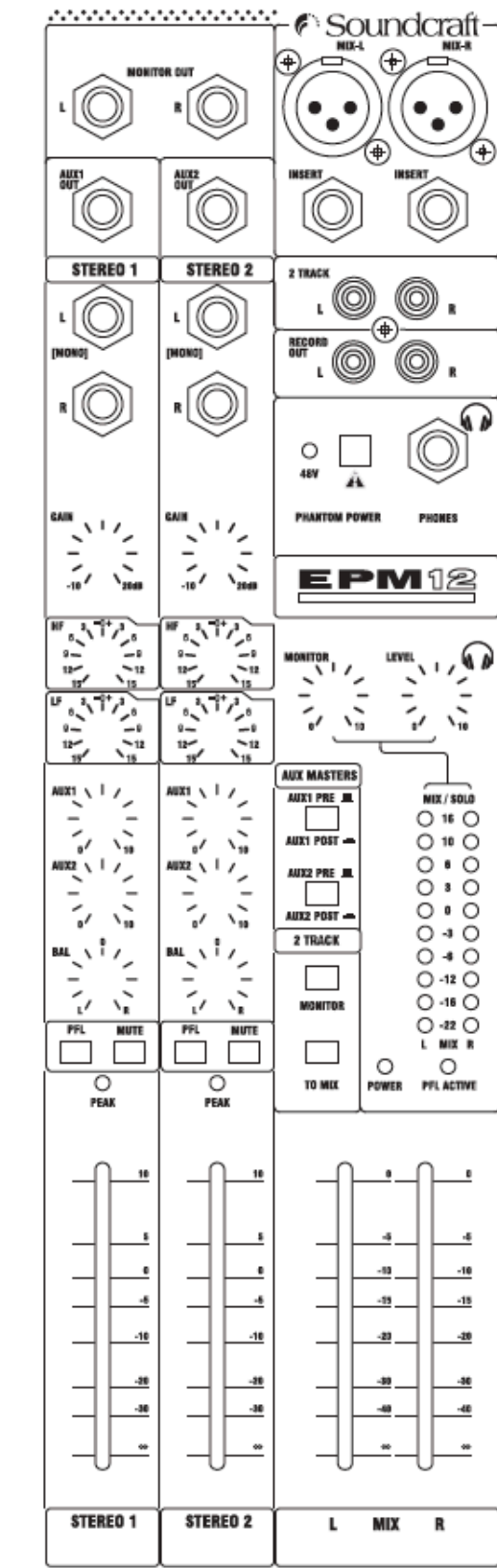
- The **Aux1**, **Aux2**, **Monitor** or **Headphone** sockets can be used to output audio to other devices.
- Each input channel has its own **Aux1** and **Aux2** gain control. With the **Aux Masters** button set to the up position (pre-fader), the white channel fader has no influence on the output signal.
- The **Record Output** sockets are not useful as they give too low a signal level to drive the audio/USB devices adequately.
- The **Stereo 1** channel takes the audio output from the church laptop computer.
- The **Stereo 2** channel takes the audio signal from the DVD/CD player.
- Do not use the **2 Way** sockets and buttons!

Recording Sermons

There is a TRS jack which takes the signal from the mixer to the Behringer audio/USB interfaces via the right side of the compressor.

- It can be placed in the **Left** side **Monitor Out** socket. In this case, the white channel fader, the left main mix yellow fader and the monitor gain control, will affect the signal level to the recorder. Use the **Monitor** gain for control for final adjustment.
- It can be placed in one of the **Aux Out** sockets. In this case, the gain is controlled by the relevant channel's **Aux** gain control. If the relevant **Aux Masters** button is in the down position (**Aux Post**) then the white channel fader will also affect the recording level.
- The first is perhaps easier to understand. The second, with the **Aux Master** set to **Pre** makes the recording level fully independent of the faders.

Sound System Connections:



Mix-L → Left compressor → Equalizer → Audio Amplifier → Loudspeakers.

Mix-R → Loop Amplifier.

Monitor Out L → Compressor Right → Recording Equipment (Behringer UC202 x2) → Computers.

Two Track – unused

Record Out – unused

Phantom Power – On - Power is needed by the inline amplifier for the pulpit microphone.

Monitor Gain Control – Controls gain for recording.

Aux Masters – These buttons determine whether (white) input channel faders control signal to **Aux Out** sockets.

2 Track buttons – Always up.

Mix-L – controls gain to Audio Amplifier – usually 0dB.

Mix-R – controls gain to Loop – usually -15dB.

Stereo 1 – audio from laptop computer.

Stereo 2 – audio from DVD/CD player.