Tower Theatre Sound System

Auditorium and Sound Desk User Guide
4th February 2022

This is a user guide for the Tower Sound System, primarily written for Sound Designers, though Operators may find it useful. There are three sets of loudspeakers installed around the auditorium, which can be easily accessed through Q-Lab. This guide will explain how to access these speakers, how to use 'Specials' and the way the system has been set up.

There are Mini-Disk and CD players by the sound desk, but the expectation is that most designers will run the sound plot with Q-Lab. If you need more information about Q-Lab you can look at 'Designing Sound using Q Lab', which is in the 'Technical Information' section of the 'Members' pages' on the Tower's website.
https://www.towertheatre.co/notes/qlab.pdf

Turning the power on

If you are the first person in the auditorium you will need to switch on the power. The light switches for working lights for the auditorium are to the right of the main door, and the light switch for the upper mezzanine is to the right of the mezzanine stairs.

The sound system is switched on at the sound operator's position. 'THE SWITCHER' is at the top of the rack unit by the mixer. This unit automatically switches everything on and off in the correct order, protecting the amplifiers and speakers.

You will see that the red light on the unit shows 'Off'. Enter the code: 1 2 3 4 and the light will change to 'On.' There are three separately switched circuits and the unit powers up each of these in turn. It may look like nothing is happening, but the process takes about 30 seconds in all, with a 10 second delay between each section powering up. You will hear a relay switch on for each one and on the main power unit (in the rack on the floor) you will see a light come on as each circuit powers up.

The circuits are:
1. Q-Lab computer, interface, mixer (plus CD, minidisc etc.)
2. Amplifier 3 for the Rear auditorium speakers (mounted under the operator's desk.)
3. The Amplifier rack on the mezzanine.

When you see that the light has come on for the first circuit in the power unit you can switch on the Mac Mini and the Audio Interface.

The Mac Mini, which runs Q-Lab, is at the bottom of the rack unit on the desk to the left of the mixer. Turn on the computer – as you look at it, the small power switch is to the right hand side of the Mac Mini. It is on the corner nearest to you on the side where the cables are plugged in.

Once the Computer has booted up enter the password, which you can get from one of the technical team.

The PreSonus Audio Interface is in the rack above the computer. The power button is at the far right of the front panel and it should be switched on after the Mac Mini.

A memory stick can be plugged into the USB socket nearest the front of the Mac Mini to copy your project onto the desktop.

The Auditorium Loudspeakers

There are three sets of loudspeakers installed around the auditorium.
Set 1: a pair of medium sized speakers on the left and right auditorium walls, on each side of the front of house playing area in the 'standard' auditorium set-up.
Set 2: a pair of larger speakers on either side at the front of the upper mezzanine.
Set 3: four smaller speakers on the back wall, behind the audience in the 'standard' auditorium set-up. These are paired: two left and two right.

You may wish to send most of the sound cues through Sets 1 and 2, with some music and FX sometimes going through Set 3 if you want them to 'wrap-around' the audience. There is an additional amplifier for **Specials** – portable loudspeakers that can be put anywhere in the playing area if you need, say, music from an on-stage radio or TV. See 'Specials' on the next page.

Using different outputs in Q-Lab

Outputs 1&2 in Q-Lab go to **Set 1** (FOH)   Outputs 3&4 in Q-Lab go to **Set 2** (Mezzanine)
Outputs 5&6 in Q-Lab go to **Set 3** (Back wall)   Outputs 7&8 in Q-Lab go to **Specials**

When loading audio into Q-Lab the cues automatically go to Outputs 1&2, so will go to **Set 1**, the FOH speakers either side of the main playing space. In this example we will also select them to go to **Set 2**, the larger speakers which are on the mezzanine.

Select the cue you also want to send to **Set 2** and look at the 'Audio Levels' tab of that cue. To the right of the line of faders is an arrow pointing down marked 'Scroll down for routing'. Scroll down and you will see the various 'Crosspoints' for each of the channels. As it stands, there will be a zero in line 1 for channel 1, and a zero in line 2 for channel 2. Click on the window in line 1 for channel 3 and enter '0'. Click on the window in line 2 for channel 4 and enter '0'. Scrolling back up to the faders, you will see that they are at standard level of output, so the cue will now come out of **Set 1** and **Set 2**.
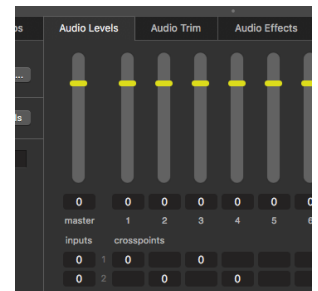
The 'Crosspoints' windows are effectively Volume Controls selecting the **Input** level of your Audio Cue – as they are set at '0', they are at the normal 'standard' level. The Fader controls the level of the signal going to the selected speakers.

There are 8 pluggable outputs from the Audio Interface and we have used these in pairs to give us the four different sets of loudspeakers we can easily access. Audio cues can be sent to all 8 outputs if required by entering '0' in the 'Crosspoint' window of the outputs you want to use.

You may wish to send the cue only to, say, the right hand side of the auditorium. In the picture here we have closed faders 1 and 3, so that the cue is now only going to faders 2 and 4, which are the right hand speakers of Set 1 and Set 2, the ones in the auditorium and on the mezzanine.
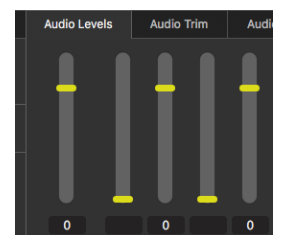
We have decided to make the standard operation logical for the operating position, so that when we talk of 'left', we mean the left hand speakers as you sit at the sound desk rather than the 'stage left' speakers.

Obviously you can move Audio Cues from one set of speakers to the other gradually or on cue by fading up and fading down the required channels in Q-Lab. This allows for a great amount of creativity in the way the different speakers in the auditorium are used, as cues can be panned or moved from speaker set to speaker set with ease.

On the desktop is a Q-Lab project called *'Loudspeaker Test'* which has speaker identification cues. Playing the first Group: 'Speaker Identification', will identify the speakers. The second Group 'Airplane Fly Past' plays a cue through all the speakers in turn. There are groups with a string quartet, FX mixes using all speakers and a selection of pieces of music.
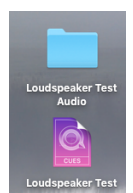
Specials

There will be occasions where you need a separate feed for a practical loudspeaker on stage for, say, a radio or TV, or a pram with a crying baby etc. In Q-Lab, select anything you want to send to the **Special** to Outputs 7 or 8. Generally speaking you will only need a mono feed if your Audio Cue is only going to one loudspeaker.

The bottom Amp in the Amp rack on the mezzanine is Amp 4, which is used for **Specials**. Many productions are unlikely to use **Specials**, so the power switch on the front of the Amp 4, is left 'Off' to avoid being regularly powered up unnecessarily. If you are going to use **Specials** you will need to turn on Amp 4's power switch *before the switching on procedure*.

Above the Amps are two sets of Speakon Sockets. The bottom row is the Outputs of the Amplifiers and the top row is the Inputs to the loudspeakers.

The Outputs of Amp 4 are the two plugs at the far right marked 'Amp 4'. Directly above them are four sockets in the upper row related to the **Special** loudspeakers. 'Special 1', 'Special 2', 'Centre' and 'NC' ('Not Connected' – for future use). 'Centre' is a small JBL speaker in a central position in the lighting rig, above the main playing area.

'Special 1' and 'Special 2' are two stage boxes with Speakon sockets. These are on the wall at the back of the standard playing area, on the walls either side of the mezzanine, next to the power sockets. Speakon cables can be plugged into these and attached to any practical loudspeaker as part of the set.

Obviously you can run a longer cable from the Speakon sockets from the Output of Amp 4 if the 'Special 1' and 'Special 2' boxes are not convenient for where you want to install your speakers.
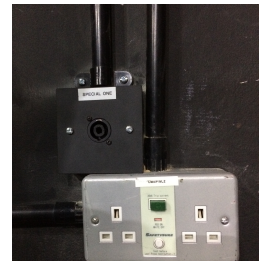
Speakon plugs are removed by pulling back the metal clip at the top with your thumb, rotating the plug round to the left and then pulling them out. They are inserted by doing the opposite.

In consultation with the Set Designer and Stage Management team connect your loudspeaker from the 'Special 1' or 'Special 2' stage boxes, depending on where you want your practical loudspeaker to be located. There are various small practical speakers stored on the mezzanine, find a suitable cable with a Speakon plug on one end and whatever is needed to attach to the speaker at the other.

Generally speaking, any practical speakers will be quite small, so you should avoid over-pushing them. Build up any volume gently and keep listening out for any distortion.

CD, Mini Disk and other sources

The CD player is plugged into channels 11&12.
The Mini Disk player is plugged into channels 13&14.
There is a mini jack plug on a flying lead plugged into channels 15&16. You can use this to connect an iPod/phone/lap top etc.

All the sources plugged into channels 9–16 can be sent to the main FOH and the mezzanine speakers. It is not possible to send them to the rear speakers or Specials without re-plugging and re-configuring the mixer.

To send them to the main FOH speakers select the 'MIX' button above the faders of the channels you are using.

To send them to the Mezzanine speakers select the 'SUB' button above the faders of the channels you are using. You can, of course, send them to both 'MIX' and 'SUB'.

Using Microphones and Reverb

The system has the option of plugging in two microphones. This is mainly intended for compere/Stand up mics, as a music set-up of any complexity would need to bring in additional equipment.

In the stage box on the Amp rack in the upper mezzanine there are two sockets highlighted 'MIC' in channels 9&10. An XLR lead can be run from these to a mic on stage. These mics will come up on mixer channels 9&10. Select 'MIX' and/or 'SUB', and adjust the input gain accordingly.
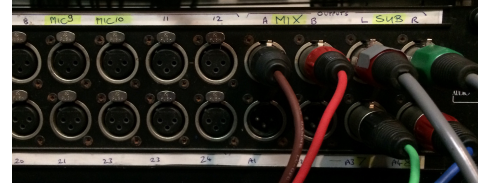
If you are using condenser mics you will need to switch on the 48V phantom power button for channels 9-16, which is at the top of the mixer, above channels 12&13.

The Soundcraft FX16ii Mixer has an onboard reverb unit. This allows you to add reverb to microphones, either for a vocal mic, or if you wished to add reverb to a scene which is set in a cathedral/warehouse etc.

The Reverb section is at the top right of the mixer. There are a number of different parameters that can be changed when setting up reverb, so the process will involve changing a few settings until you get the required result.

The amount you send from your microphone is done on the individual mic channel, by turning up the lilac 'FX' knob (above the yellow 'Pan' knob). Initially set this to about 9 o'clock. The amount that is being sent to the reverb unit is adjusted by the Master lilac 'FX' knob directly above the pair of Red faders. Likewise set this to 9 o'clock.

The reverb going to the output (i.e. coming through the speakers) is controlled by the 'EFFECTS RETURN' knob, which is the right hand knob directly below the 'Lexicon' logo. You can send the reverb to *either* 'MIX' *or* 'SUB' speakers. Turn this up gently while someone is talking into the mic and see how this sounds. Adjust parameters until you get the desired effect.

There are many different Reverb settings. There is a list of programs on a chart at the top of the mixer in two Banks. Select the number of the reverb you want by turning to that number on the 'PROGRAM SELECT' knob at the bottom of the reverb section. You have to toggle through Bank A to get to Bank B. The Bank A or Bank B lights will show which bank you are looking at. Once selected, the program takes about a second to load, and parameters within each program can be adjusted with the 'Adjust' knobs.

When you are using reverb for a singer, you will want a mix of the microphone output *and* the reverb unit. However, if you are using it to add, say, a 'cathedral' effect to a scene, you only want to hear the Reverb *without* the output of the microphone going to the speakers.

Connect a mic and find a suitable place to hang it – an ideal place can usually be found suspending it from the lighting rig. You do not want it too close to the acting area, so that it will only be activated when the actors raise their voices. On the microphone channel make sure 'MIX' or 'SUB' are *not selected*. The fader and 'FX' knob will still be active, but the output of the microphone will *not* be coming out of any speakers. You will need to adjust the channel gain and reverb 'send' and 'return' to find the optimum level. You can use the fader to control how much of the reverb effect you hear once you are happy with your other parameters.

More information about the use of the onboard reverb unit and the mixer in general can be found in the manual, downloadable here:
https://www.soundcraft.com/en/product_documents/soundcraft-fx16ii-user-guide-pdf

Powering down

Save your Q-Lab project, quit, and shut down the Mac Mini (select 'Shut down' in the menu).

DO NOT TURN OFF INDIVIDUAL PARTS OF THE SYSTEM (Mixer, Amps etc.)

The aim of 'THE SWITCHER' is to protect the individual parts of the system; so when powering down it is important not to switch off parts of the system separately, apart from the Mac which must go through its own shut down procedure as above.

On 'THE SWITCHER' enter the code: 1 2 3 4 and the system will power down in reverse order to the powering up. As with powering up, it takes about 30" in all, so do not think it is not working. You will hear the relays switching and see the lights in the power unit at the bottom of the rack underneath the sound desk go out.
Once the power down procedure is completed, switch off the two circuit breakers ('DIM RM SOUND C FORM' and 'SOUND DESK C FORM SKT') in the fuse box on the mezzanine.

This is all you should need to be aware of to access the different sets of speakers. However, it is worth having a look at **'Standard Settings'** below, to get an overview of how the system fits together and give you a chance of recognizing if anything has been altered or re-plugged.

Standard Settings

The system must be left in the 'Standard' state at the end of each show, so that the designer of the next show can be confident that the system will do what they expect. Due to the flexibility of Q-Lab and the way the amplifiers and speakers can easily be re-plugged you are at liberty to configure the system for your show but at the get-out please re-set anything you have changed back to the 'Standard' state.

Basic Set-Up Overview

Q-Lab is operated on the Mac Mini, which is connected to the PreSonus Audio Interface via USB. The Audio Interface's 8 Outputs are connected to the first 8 channels of the mixer.

Mixer channels 1&2 are selected to 'MIX', channels 3&4 are selected to 'SUB' and direct outputs are taken from channels 5&6 and channels 7&8. Via a multicore, the 'MIX', 'SUB' and direct output of channels 7&8 are connected to the Amplifier rack on the upper mezzanine.

The Amp rack on the upper mezzanine has three Crown XLi800 power amplifiers, and two QUAD 303A2 Amplifiers. In the rack the Crown Amps are numbered from the top: Amp 1 takes the 'MIX' output, which feeds **Set 1** loudspeakers (auditorium)

The QUAD amplifiers take the 'SUB' output and feed **Set 2** loudspeakers (mezzanine)

Amp 2 in the rack is not connected at present, but can be used to take the 'SUB' output, which feeds **Set 2** loudspeakers (mezzanine)

Amp 4 takes the output of Channels 7&8, which feeds any **Specials**.

The Direct Output of Channels 5&6 goes to Amp 3, another Crown XLi800 amplifier, which is in the unit underneath the sound desk which feeds **Set 3** loudspeakers (back wall).

Mac Mini plugging

USB lead from Mac Mini to the Audio interface.

USB lead from Mac Mini to small hub, to which the keyboard and mouse are connected.

USB lead from Mac Mini to the lighting desk for option to run lighting cues from Q-Lab.

The USB socket nearest the front (as it is mounted in the rack) is free to plug in memory sticks.

Thunderbolt connector to VGA connector for the monitor

Audio Interface plugging

Outputs 1 to 8 of Q-Lab are plugged from the back of the Audio Interface with a ¼" jack snake into mixer channels 1 to 8. As we are taking the separate outputs 1 – 8 the volume control on the front of the interface is not in circuit, as it controls the 'MAIN' Mixer output. The Audio Interface is connected via USB lead to the Mac Mini.

Mixer plugging and routing

Mixer channels 1& 2 are selected to 'MIX', which go through the YELLOW faders at the far right. Channels 1&2 are panned Left and Right. All EQ is flat. Faders on Channels 1&2 are set to '0'.

Mixer channels 3&4 are selected to 'SUB', which go through the RED faders. Channels 3&4 are panned Left and Right. You may wish to add some High Frequency boost if the set design means the mezzanine is behind drapes or flats. Faders on Channels 3&4 are set to '0'.

NB 'Sub' should not be confused with 'Sub-bass'.

The 'MIX' and 'SUB' selector buttons are above the faders on each channel.

Mixer channels 5& 6 are **NOT** selected to 'MIX' or 'SUB'. The channels are panned centrally.

All EQ is flat. Faders on Channels 5&6 are set to '0'.

Mixer channels 7& 8 are **NOT** selected to 'MIX' or 'SUB'. The channels are panned centrally.

All EQ is flat. Faders on Channels 7&8 are set to '0'.

The Red 'SUB' and Yellow 'MIX' faders are set to '0'.

The intention is that all Fading and Panning actions are done through Q-Lab, so that the operator does not need to touch the mixer at all. Obviously the faders can be adjusted if the volume of a particular output needs to be changed quickly, but any adjustments should then be entered into Q-Lab.
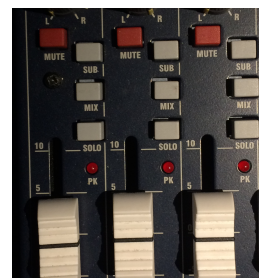
Mixer channels 9&10 are connected via multicore to the stage box in the Amp rack. XLR leads for mics can be plugged into the stage box into inputs 9 and 10 (highlighted in green 'MIC').
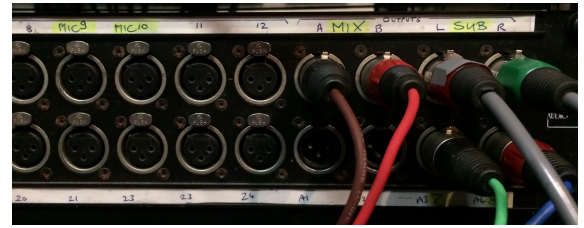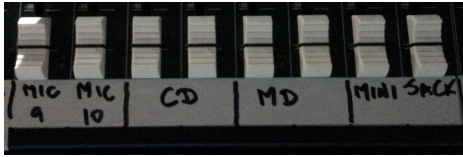
The CD player is plugged into Channels 11&12 and the Mini-Disk player is in Channels 13&14.
A flying lead with a mini jack is plugged into Channels 15&16. This can be used for an iPod/phone/lap top etc.
The Mics, CD, Mini-Disk and Mini Jack Channels can be selected to 'MIX' and/or 'SUB', so that they go to **Set 1** and/or **Set 2** Loudspeakers. It is not easy to quickly select them to **Set 3** or to the **Specials**, as you would need to re-plug and re-configure the mixer.

Amplifier Rack on the Mezzanine
The amp rack on the upper mezzanine consists of:
The stage box for the multicore. The other end is at the Sound Operator's position on flying leads.
Two rows of Speakon sockets: the top row: inputs for the loudspeakers, the lower row: outputs of the power amps installed in the rack.
Three Crown power amplifiers mounted in the rack (Amp1, Amp2, Amp4) and a pair of QUAD amplifiers on top.
Amp 1 feeds **Set 1** (FOH), the QUAD amps feed **Set 2** (mezzanine) and Amp 4 feeds **Specials**.
At present Amp 2 is not connected.
A slave power-switching unit (the unit by the Sound Operator's position is the master).

Settings for the power amps
These are on the back of the amps and should not be changed, but are included here for reference.
Stereo/Parallel/Bridged switch (next to the XLR input socket): Set to **Stereo**
Sensitivity switch (Options 1.4v or 0.775V): Set to **1.4v**

Many productions are unlikely to use **Specials**, so the power switch on the front of the bottom amp, Amp 4, should be left 'off' to avoid being regularly powered up unnecessarily. Obviously, if you are going to use **Specials** you will need to turn on Amp 4's power switch *before the switching on procedure*.
As Amp 2 is not connected at present it is also left with the power switch 'off'.

Standard plugging in the Stage box
The male XLR plugs that are threaded up through the brush come from the input sockets of the power amplifiers. They are plugged into the XLR sockets connected to the multicore from the Sound desk.
The input to Amp 1 is on the pair of plugs with Brown (L) and Red (R) cables. They are connected to the sockets marked 'MIX'.

The inputs to the QUAD amplifiers are plugged from the sockets marked 'SUB.
If you wish to use Amp 2 with a different set of speakers you can unplug the 'SUB'
leads and use the pair of plugs with Orange (L) and Yellow (R) cables to feed Amp 2.
The input to Amp 4 is on the pair of plugs with Green (L) and Blue (R) cables. They are plugged into the sockets marked '7, 8'.

From the lower row of Speakon sockets the Output of Amp 1 is connected via two short Speakon cables to the Input for **Set 1** loudspeakers in the upper row.

From the lower row of Speakon sockets the Output of Amp 2 is connected via two short Speakon cables to the Input for **Set 2** loudspeakers in the upper row.

There are four sockets in the upper row related to the **Specials** speakers. 'Special 1', 'Special 2', 'Centre' and 'NC' ('Not Connected' – for future use). See 'Specials' on page 3.

Using your own computer rather than the Tower's Mac Mini

If you wish, you can use your own computer, rather than the Tower's set-up.

If you are using a Mac with Q-Lab: there is a USB lead connecting the Mac Mini to the Audio Interface. Find this lead and unplug it from the back of the Mac Mini and plug it into your own Mac. This will connect your Mac to the Audio Interface. You may need to change the allocation in your Q-Lab project in the 'Audio' page of 'Settings' to send the project's output to 'Studio 18 24' rather than 'Built-in output'.

↑
USB

It is important to be aware that if you have been working on the free version of Q-Lab on your Mac then it will only allow you two output channels, Outputs 1&2. As a consequence, you can only easily access **Set 1** and **Set 2** loudspeakers. It may be easier to copy the project from your Mac on a memory stick and transfer it to the Tower's computer (using 'Bundle Workspace' in the 'File' drop down menu). The Tower's license will then allow you to use the other outputs.

If you are using a PC or do not wish to use the Tower's Audio Interface you can plug the flying lead with mini jack (Channels 15&16) into the headphone socket of your computer.

If you do use your own computer please re-connect the Tower's Mac Mini at the end of your show.

Additional Sound

There are a couple of standard audio features for the theatre, which are needed for every production. They are both derived from a single microphone suspended above the playing area.

Tannoy: a feed for the loudspeaker in the dressing room.

Induction loop: fitted in the auditorium, for people with hearing difficulties.

The microphone is connected to a mini mixer on the second sound rack on the upper mezzanine. This is powered from one of the Technical Power circuits.

The Volume can be turned up here as marked, or, more conveniently on the volume control on the loudspeaker in the dressing room.

The induction loop should be in circuit once the system is powered up.

Troubleshooting

No Power

The technical power for the auditorium goes through a fuse box with circuit breakers, which is on the right hand wall of the upper mezzanine.
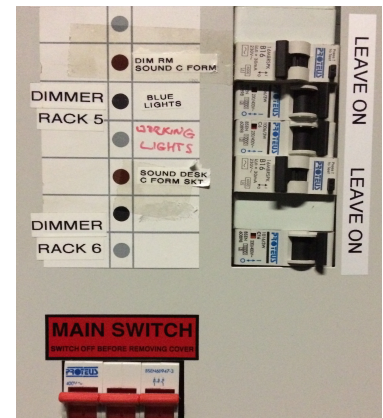
Find the circuit breakers marked:
 'DIM RM SOUND C FORM'
 'SOUND DESK C FORM SKT
and make sure they are switched on.

In this photo they are the ones in the 'LEAVE ON' section that are switched off.

Check that there is an 'On' light at the bottom of the Amp rack on the mezzanine, and in the rack underneath the sound desk.

No Tannoy

The Tannoy for the dressing room and the induction loop are both derived from a single microphone suspended above the playing area.

The microphone is connected to a mini mixer on the second sound rack on the upper mezzanine.

Check that the circuit breaker powering the plug sockets on the mezzanine is switched on. It is marked:
'DIM RM PWR' (below 'TECH PWR C')

Make sure the volume has not been turned down here (volume knob as marked), or on the volume control on the loudspeaker in the dressing room. If the tannoy is too quiet it can be turned up in the dressing room or at the mixer.

No Sound

If the system appears to have powered up correctly but you do not hear anything when you play a cue.

Check that the Mixer has not been switched off – it will have lights showing if it is powered up. Turn off the whole system before powering it up to avoid putting a dangerous 'thump' through the system. The Mixer's power switch is at the top right hand corner on the back edge.

Check that the Amps have not been switched off – Amp 1, the top amp in the amp rack on the upper mezzanine, the two QUAD amps on top of the Amp rack and Amp 3, in the rack underneath the sound desk should all have lights showing. Their Volume knobs should be at about 2 o'clock.

Check the mixer faders are at their correct levels: Channels 1 – 8 at '0', and the Red and Yellow faders at '0'. Channels 1&2 should be sent to 'MIX' and Channels 3&4 should be sent to 'SUB'. Channels 5 – 8 should not be sent to either 'MIX' or 'SUB'.

CG 4th February 2022