Sound Desk Overview at The Barn

What this document covers

This document is intended to give an overview of the Sound Desk at The Barn and how it is used to control the sound. It describes non-technical elements of the operation of the sound-desk – i.e. it is not intended to be an instruction manual on what buttons or sliders to press on the Sound Desk. Some technical elements are covered where they might be key to the good operation of the sound-desk, or where they are so occasionally used (or set once and left) that they might be forgotten and could help with problem-solving.

Who this document is for

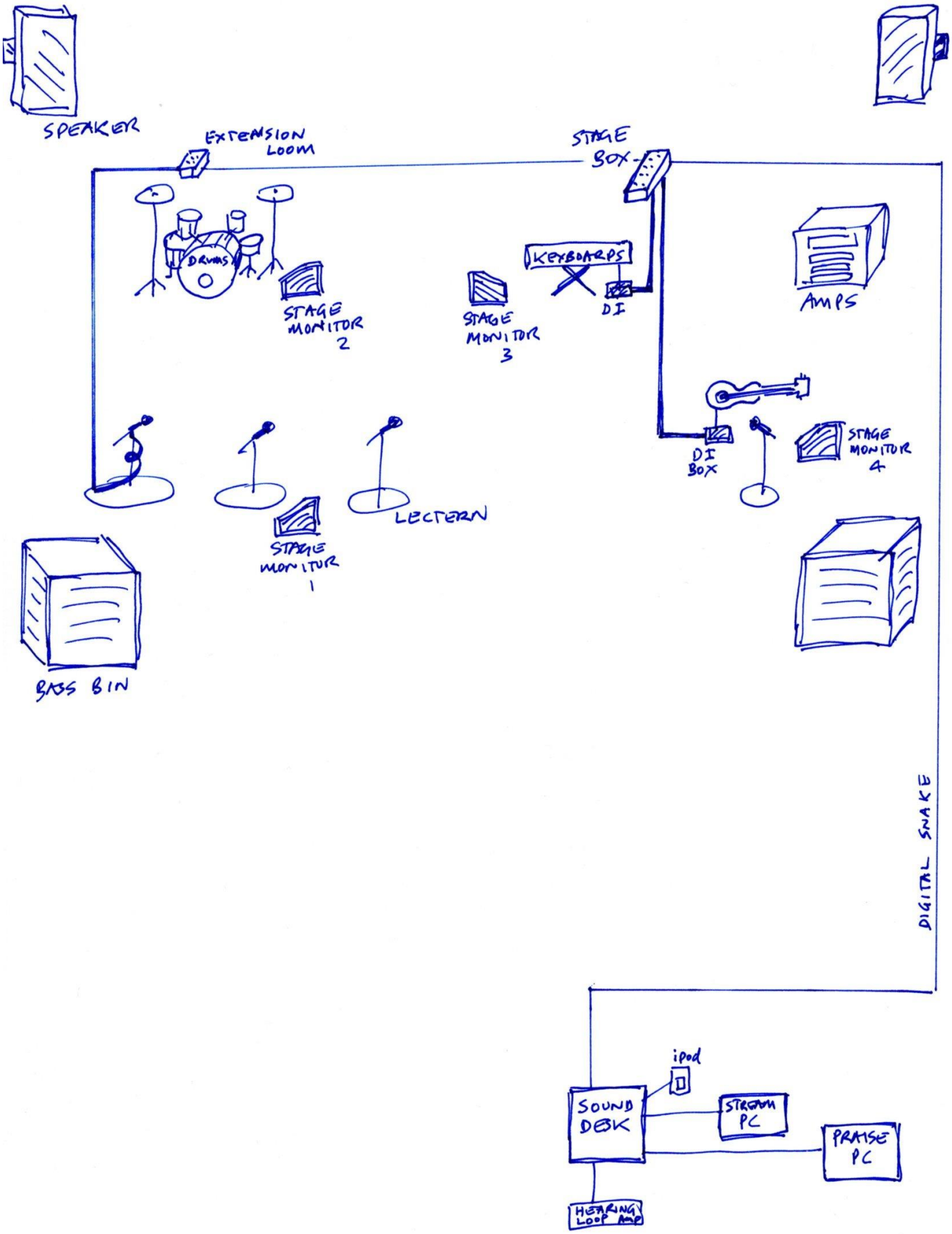
This document has been written for:

- people who operate the Sound Desk;
- people learning to operate the sound-desk;
- people speaking in church (preaching; praying; reading);
- people who play instruments and sing;
- the church leaders so that they have an over-view of the role of the Sound Desk operators.

What this document is for

The aim of this document is to try and consistently apply the principles of creating the most positive sound mix and level to promote a positive engagement of the congregation. Everyone is an individual, hears and interprets things differently, and it is, therefore impossible to apply this in a mechanical way, but writing down how the Sound Desk should be operated will help. The Worship Group cannot hear what the congregation hears when it is playing so needs the confidence that the sound levels are correct to enable them to give a clear and confident lead.

Schematic of the PA system at The Barn



In the drawing above, it shows how one Microphone, Keyboards and Acoustic Guitar connect to the Sound Desk (it would be too cluttered to include every microphone and instrument). The keyboards & guitar both plug into a DI box which in turn plugs into the stage box, then the digital snake takes the audio signals from the stage box to the Sound Desk. The microphone on the left plugs into the extension loom which in turn plugs into the stage box.

Terminology

The following technical terms are used in this document:

- **Public Address system/PA system** – this is an electronic system comprising microphones, amplifiers, loudspeakers, and related equipment. It increases the apparent volume (loudness) of human vocals/ musical instruments/recorded sound/music.
- **Sound Desk/Mixing Desk/Mixing Console/Mixer/Mixing Board/Control Desk** – this is the console at the back of the church to the left of the Stream & Praise PCs. It is operated independently of the PCs. The Barn Sound Desk Model is an ”**SQ5 Mixer**” (made by Allen & Heath) and has 40 channels operated with 16 physical channel controls which can switch between layers.
- **Stream PC** - this is used for live streaming church services via Zoom.
- **Praise PC** - this is primarily used to run a software application called “Easy Worship” which manages song words which can be projected onto the wall above the stage but it can also be used to play videos and songs via the Sound Desk.
- **Hearing loop/Audio induction loop** - this is a special type of sound system for use by people with hearing aids. The hearing loop provides a magnetic, wireless signal that is picked up by the hearing aid when it is set to 'T' (Telecoil) setting. There is an induction loop aerial installed around the perimeter of The New Barn.
- **Induction Loop Amp/Hearing loop Amp** – this is at the heart of an Induction Loop system, it drives current into the loop cable. Located in the cupboard under the Sound Desk.
- **Worship Group** - the musicians and singers in the band.
- **Worship Leader** – the person leading the worship group.
- **Sound engineer** - the person operating the Sound Desk.
- **PA Speakers** - these are designed to play audio at a loud volume so they can be heard by a large group of people. They are attached to the wall and are located high up, left and right, above the Subs. Unlike the Subs, they are not plugged into a power source, they get their power from the on stage amplifiers .
- **Subs/Bass Bins/Subwoofers** - these are low-frequency PA speakers that also feature a built-in amplifier. These are located at the front, left and right of the stage and are plugged into wall sockets.
- **Stage monitors/Wedges** – these are the 4 speakers on the stage which enable members of the worship group to hear each other’s instruments & vocals.
- **Stage box** - this is the interface device used to connect microphones, instruments, and speakers to the Sound Desk. The stage box is connected to the Sound Desk via a digital snake which allows the Sound Desk to be further from the stage. It also simplifies setup onstage. Located on the floor at the right hand side of the keyboards.
- **Extension Loom** – this is an extension for the stage box which enables us to have an additional box at the opposite end of the stage (located behind the drum kit) , this simplifies setup since there are less cables on the stage.
- **Amplifiers/Amps** – these take the audio signal from the Sound Desk and magnify it. Then they send that amplified signal to the PA speakers. Located in a rack on the right-hand side of the stage, there are 4 amps in the rack (the bottom amp is not currently used).
- **Digital Snake** - this cable transfers audio signals as digital. Located on right-hand wall of the church, high up.
- **DI boxes/Direct Inject Boxes** - Some instruments need DI boxes to draw power from the PA system. Keyboards and acoustic guitars are connected to the PA using DI Boxes (small silver boxes near the instruments which have a red indicator light when the Sound Desk is switched on).
- **Talkback Microphone** - this is the "gooseneck" microphone attached to the Sound Desk which enables the sound engineer to communicate with the worship band on stage.
- **Radio Headset microphones** - there are two main and one extra headset microphones which are stored in a drawer underneath the radio receivers. These are powered by internal batteries.
- **Radio Microphone Receivers** - these receive the signals from the Radio Headset microphones, they are located in the cupboard below the Sound Desk
- **Handheld Microphone** - this is a radio microphone and is powered by an internal battery. This should be stored in the cupboard below the Sound Desk.
- **Omnidirectional microphones** - these have a very wide range of pickup ie able to pick up sounds from multiple directions and are commonly used in concerts or television shows. The Barn Handheld mic & Lectern mic are **Omnidirectional,** we want people to stand back from these mics so that they can be heard more naturally.
- **Unidirectional microphones** - these pick up less than 50% as much sound from the sides as from the front, and less than 10% as much sound from the rear. The Barn vocal mics are **Unidirectional**, we want singers to be close and speak directly into them.

Mixing

General principles

The operation of the sound-desk helps the congregation with all aspects of worship during worship services including: hearing preaching; praying; listening to the bible being read; and singing. Getting the sound levels and balance right can help people gain a positive experience of church services. The most difficult balance to get right is the worship group vocal & instruments, but spoken word, the control of Zoom Meeting Broadcasts and the hearing loop need to be considered as well.

Terminology

The following terms are used in the context of sound mixing:

1. **Mixing (sound)** – this is balancing the levels of singers and instruments so that they can all be heard with vocalists being heard above the instruments. It includes setting tone levels and ensuring that those in the church building (ie the congregation, worship group, and people using hearing-aids) can hear a well balanced sound. This also applies to those listening online via Zoom.
2. **Sound check** - a test of sound equipment before a musical performance to check that the desired sound is being produced. Sound checking at The Barn starts at 0930.
3. **Main mix** – the sound that is heard by the congregation inside the church. There is a slider control on the sound-desk which can be used to increase or decrease the overall volume of all of the instruments and microphones plugged into it.
4. **Stream mix** - the sound that is heard by anyone joining the online meeting via Zoom.
5. **Induction Loop mix** – the sound that is heard through hearing aids.
6. **Gain** - this is the decibel (dB) input of a channel, the gain controls how loud something is before it goes through any processing.
7. **Sliders/Faders** - these are the volume controls on each channel of a Sound Desk, they allow adjustment of the level of that channel.
8. **Channels** - A channel is essentially a signal path. Channels on The Barn Sound Desk are mostly for microphones and musical instruments.
9. **Feedback** – this is a screeching or humming sound resulting from the return of a fraction of the output signal from an amplifier, microphone, or other device to the input of the same device.

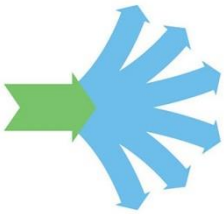
The Barn Soundesk

The diagram below illustrates all the sounds going into and leaving The Barn Sound Desk.
Several sound **inputs** go into the Sound Desk, these are mixed by the sound engineer so that the different **outputs** sound well-balanced and pleasing to the ear!

Inputs

2 headset mics
handheld mic
Lectern mic
Talkback mic
3 vocal mics
Keyboards
Acoustic guitar
Flute
Electric guitar
Bass guitar
Violin
Drums
IPod *
Praise PC **

Sound Desk



Outputs

4 Stage Monitors Mixes

PA speakers and subs (Main mix)

Stream PC (Stream Mix)

Hearing aids (Induction Loop mix)

** An iPod or MP3 player can be connected to the Sound Desk in order to play songs e.g. Funeral/ Christmas/ Ceilidh songs.*
*** The praise PC can be used to play mp3 songs which have been copied onto the PC and also songs on the Internet via YouTube.*

Electric Guitar & Bass Guitar

There are DI boxes for Bass and Electric guitars if required. However, some guitar players prefer to use their own guitar amplifier instead of a DI box. If the guitarist wants to use their amplifier, it needs to be mic'd to the PA so that its levels can be controlled. This is best done via a uni-directional mic. Placed slightly off-centre from the guitar

amplifier and a couple of centimetres away from it. The guitar amp level can then be quite low (if it can be loud enough to be heard by the electric guitar player it is helpful) as long as there is enough volume for it to be controlled through the main mix. If a very high pitched squeak can be heard, and it is not coming through the PA, it is likely to be eliminated by moving the mic further off-centre, rather than further away, from the amp.

Drums

The drums are not mic'd at present because they are generally as loud as the amplified music coming through the PA speakers. However, we may choose to mic the drums in the future so that they can be heard on the Zoom broadcast.

Mixing Music

Introduction to mixing songs

The challenge in balancing music is for it to be loud enough to lead the congregation without it being too loud for the congregation to hear itself singing. This will vary from song to song. Most songs require a strong lead for the congregation to engage in them. This means that the vocalists, especially the lead vocalist, have to be able to be heard well above the instruments and congregation. The instruments should blend well and be discernable in the main mix. Drums (for most songs) need to be played loudly because they are un-mic'd and although they can sound quite loud from the drummer and worship group's perspective sometimes cannot be heard from the congregation.

Stage Monitors and leading the worship group

The 4 stage monitors need to be mixed so that the worship leader (instrument and voice) can be heard well by the whole worship group so that the worship group can be lead. If a song tends to slow down, or if the group doesn't seem to be together, one likely cause is that the person leading cannot be heard. Turning the worship leader (voice and instrument) up slightly on the stage monitors is likely to help this. The stage monitors have been positioned away from the acoustic guitar to try and minimise feedback, but it can feedback if it is too loud. The volume of the stage monitors are controlled from the Sound Desk and the sound engineer will liaise with each band member during sound check to set the levels of each stage monitor. Different musicians in the band will often want to hear different elements of the overall sound in the monitor mix closest to them. Eg The drummer may ask only for the Worship Leaders instrument and vocals. At the touch of a button on the Sound Desk, the operator can access the mix for each monitor and set it during a sound check.

Recognising the difference between songs

Different songs have different sound dynamics. This can mean that for songs in a higher key the singers tend to sing more loudly (especially if the song is at the high end of a person's vocal range). Strumming a guitar can sound louder than picking the individual strings.

The violin changes volume with pitch, a high pitch is usually louder. Sometimes the lead instrument plays more softly for quiet songs but still needs to be heard and the same for vocal lead. This means that it is likely that small adjustments of the sliders on the Sound Desk will be needed throughout the services and changing the mix is a good thing – even, sometimes, within songs. The best example being when the violin goes from playing one high pitched harmony part during one verse, to playing the tune for another when its volume will probably have to be increased to be heard.

Tone Controls

The use of tone controls on the Sound Desk can help the overall sound of the worship group. This can prevent harsh sounding instruments sounding "off". When this happens, the temptation is to turn an instrument down to the point it can't be heard (to make the group sound better) but there are ways to use the Sound Desk in order to isolate the instrument from the rest of the mix so that you can hear it better and make adjustments:

You can listen to individual instruments/vocals on their own using headphones and the Sound Desk.

Alternatively, during sound check only, you could mute all channels except the instrument and adjust the tone controls to get a better sound, then introduce it back into the mix at the correct level. The same can be true for voices, and it can be useful to listen to a singer un-mic'd to get an idea of what their natural voice sounds like and try and replicate their natural voice through the system.

TIP - Looking at a singer or instrument player while adjusting levels can help to pick them out from the rest of the worship group when everyone is playing together.
Note – These kind of adjustments are best made during sound check and practices. Although faders should be used during live services, all except essential adjustments within channels should be avoided.

Mixing Speaking

Introduction to speaking

Being able to hear words spoken in church is of critical importance. In this there are three systems which need to be managed: The main mix, the Stream Mix and the induction loop mix.
Spoken word does not need to be heard through the stage monitors. Spoken word being heard through the stage monitors can put some people off, and cause feedback since the lectern mic is Omnidirectional (picks up sound in a wide range).

Microphones

The main speaker will usually have a headset radio mic, with others using a handheld radio mic or one of the worship group's microphones. The levels will change from speaker to speaker therefore this will affect the main mix/Stream Mix/induction loop mix and each should be adjusted accordingly.

Coaching in the use of mics

It is very useful to get speakers to speak into a mic, after being coached in its use, before the service. Omni-directional mics (eg the Handheld radio mic is omni-directional) should be held away from the mouth (normally chest level is ok). Uni-directional mics should be held very close to the mouth. It is best to be able to see the person's mouth when they are speaking so omni-directional is best for speaking, with unidirectional being best for singing. Practice of the use of mics can be difficult on a Sunday morning (because of worship group practicing and people entering church) but worth it if it can be done. Coaching on the use of the mic and reassurance that the Sound Engineer will take care of their sound level will usually be enough to reassure the person that they will be heard. When setting the microphone level, It is best if people speaking keep speaking to allow the level to be adjusted rather than say "can you hear me" and stop speaking. The lectern mic is very powerful and NEVER needs adjusted by the speaker. They only need stand at the lectern and speak clearly in their normal voice, which will allow the sound engineer to adjust their volume appropriately.

Tone controls

When people are speaking sometimes the letters "p" and "t" can come through more loudly than other letters. This can be controlled by using the tone controls and is likely to require adjustment for each speaker.

Sound Engineer Steps for Sunday Morning Worship

Soundcheck

- Arrive at 9:30, same time as the worship group .
- Perform start-up procedure for Sound Desk, amps, monitors, subs etc
- Identify worship leader.
- Set stage monitor levels for band members closest to each of the four monitors, ensure worship leader voice and instrument is loud enough on each monitor in order to lead the worship group, and add/adjust other channels they'd like to hear.
- Test the battery strength of handheld & headset microphones (Headset belt packs and receivers have battery indicators).
- Test the headset microphones, handheld microphone, Lectern microphone.
- Set initial main mix, ensuring that the singers (especially worship leader) is loud enough to lead the congregation. Balance sound levels, remembering tone controls for singers and instruments.
- Set the Stream mix levels.
- Set induction loop levels.

- Identify speakers (e.g. visiting Minister) and which microphones will be used.

15 minutes before church starts

- Turn main mix down to allow congregation quiet time before service starts

During church service

- Adjust Main mix to suit songs, ensuring worship leader voice is loud enough to lead the congregation in singing.
- Adjust the Stream mix.
- Adjust hearing loop mix if necessary.
- Adjust sliders for speakers as necessary.
- Turn down instruments when minister is praying.

After church service

- Turn the main mix down slightly immediately after the service ie before the worship group starts playing when people start leaving.
- Perform shutdown procedure for Sound Desk & PA.