Setup and Operation Guide for Wollongong Baptist Church Audio Systems

If then you have been raised with Christ, seek the things that are above, where Christ is seated at the right hand of God….

…Whatever you do, work heartily, as for the Lord and not for men, knowing that from the Lord you will receive the inheritance as your reward. You are serving the Lord Christ.

Colossians 3:1, 23-24

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Audio for Church

The primary goal as Christians at Wollongong Baptist Church is *to Know Christ and to Make Him Known*.

Here are a few things to keep in mind that will help people achieve this goal each week:

The primary focus of the church service is for a group of Christians to gather together and worship God.

As an audio operator you are in control of a system that can have a dramatic impact on the way people in the service hear and understand what is happening on the platform.

Most of what you mix at church is speech and it is important that it is easy to listen to. Not so soft that you have to strain to hear, not so loud that it is distracting. Practise listening and learn to find a balance.

Sometimes how you would like music to sound isn't necessarily the most appropriate for the service you are mixing.

You will (undoubtedly) receive feedback about your mix from time to time. **Listen to the feedback you receive.** Sometimes making a change for someone will help them to achieve the primary focus of the church; worshiping God.

As you develop experience, learn to discern what feedback is reasonable or unreasonable and try to adjust your mix accordingly where possible.

Audio Basics

In its simplest form an audio system consists of the following parts:

- Input Device (converts sound to an electrical signal).
- Signal routing and modification (patching and mixing console).
- Amplification.
- Output Device (converts electrical signal back to sound).

At WBC the same applies; the system looks something like this:
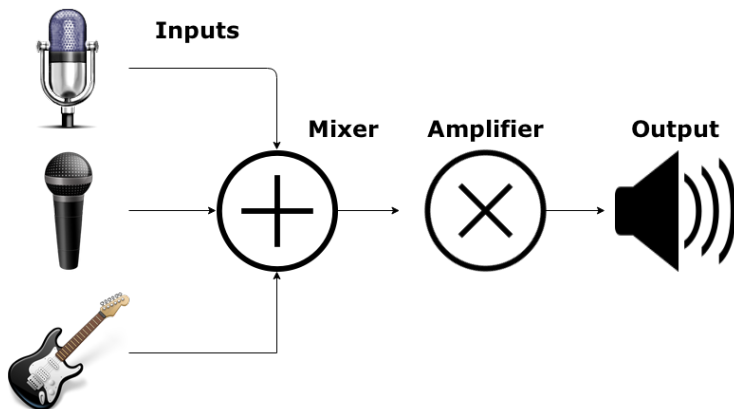
Some Definitions

Stage Left – describes the Left-hand side of the stage when standing on the stage, facing the audience.

Stage Right – describes the Right-hand side of the stage when standing on the stage, facing the audience.

Microphone stands

WBC has a few different microphone stands that will help you to position microphones effectively.

Straight stands are usually used for vocal microphones and can only be adjusted vertically.

Boom stands are freely adjustable and so can be used for most other applications.

Short boom stands are good for kick drum or guitar microphones.

3-pin XLR – Often called microphone cables. They are female (socket) at one end male (pins) at the other. This is the connector used for interconnection between the input devices at WBC (microphones, DI boxes).

Speakon – refers to the connector used on speaker cables. These cables are the same on both ends. When plugging a Speakon connector in, push it into the socket and turn it until you hear it 'click'. It will then be locked in place.

To release a Speakon connector. Pull back the tab on top and twist in the opposite direction before pulling it out of the socket.

Instrument Leads – Sometimes called phono lead or jacks. This is a lead with a 6.5mm plug on both ends. Use them to connect keyboards or guitars to the input of a DI box.

Patch bay – located in the audio equipment rack where all inputs/outputs are routed.

Stage Box – concealed connections for inputs/outputs on stage.

Phantom Power (+48VDC) – a DC (direct current) supply voltage required by some input devices to operate. It is good practise to switch phantom power OFF on channels that do not need it.

Channel – refers to the whole signal path of 1 input on the mixing console

Fader – the sliding thing on the mixing console that controls the volume level of each channel

Pad – Level attenuation (reduction), usually -10dB, -15dB or -20dB

Choosing Devices

In order to get sound into an audio system you need to use input devices to capture audio from voice, acoustic or electronic instruments or other input devices.

At WBC there are 3 different ways of getting audio into our system; microphones, DI boxes and auxiliary inputs.

Microphones

Shure MX415

This microphone should be primarily used on the lectern. It has a standard 3-pin XLR connecter and can be used on a normal microphone stand with standard lead if necessary. (For example: during wedding ceremonies the lectern may not be wanted)

Requires Phantom Power (+48V)

Shure SM58

The SM58 is most commonly used as a vocal microphone but can also be used on instruments if necessary.

Does not require Phantom Power (+48V)

Shure SM57

The SM57 is more specifically designed for instruments. It's good for use on snare drum, saxophone, guitar amplifiers.

Does not require Phantom Power (+48V)

Rode NT5

The NT5 is a small microphone that is very sensitive and therefore is good for picking up subtle dynamics of instrument such as flute, violin.

Requires Phantom Power (+48V)

Sennheiser E902

The E902 is great on the kick drum or on other instruments that have a lot of energy at low frequencies. Sounds sweet on other drums such as djembe.

Does not require Phantom Power (+48V)

Sennheiser E604

The E604 is a small instrument microphone with a clip specifically designed for mounting onto drums. Use them on the tom drums.

Does not require Phantom Power (+48V)

Sennheiser EW100 Handheld with E865 Capsule

Use the wireless handheld microphone for vocals or if you need a microphone to rove around the auditorium.

Does not require Phantom Power (+48V)

Sennheiser EW100 Belt pack with Countryman presenter microphone

Use the wireless belt pack if a preacher would prefer to use it over the lectern microphone. Sometimes the kids-spot presenters also prefer to use the wireless belt pack.

Make sure that the fragile connections between the microphone cables and the belt pack are secure and located on the body of the presenter in a position that will prevent damage (from sitting, pulling on the cable).

Does not require Phantom Power (+48V)

MX415

SM58

SM57

NT5

E902

E604

Unscrew this section to replace batteries

E865 Handheld

Open this panel to switch off / on

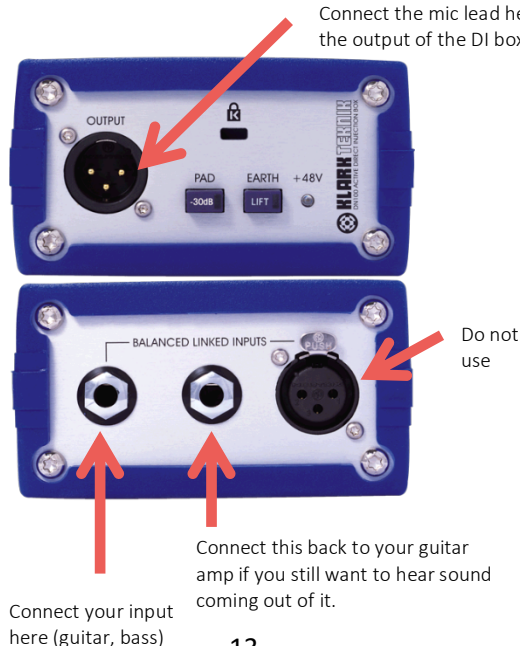Gently bend the mic to suit presenter

Countryman

DI Boxes

If you are wondering what the DI stands for, there are different understandings by different professionals and product manufacturers (Most commonly Direct Input or Direct Injection).

The primary purpose of a DI box is to take an electronic signal and convert it to a different form (*unbalanced* high *impedance* to a *balanced* low impedance signal) that reduces noise over long cable runs.

WBC has several Klark Teknik DN100 DI boxes. Connect them to electronic instruments using an instrument lead (keyboards, guitars).

Requires Phantom Power (+48V)

Connect the mic lead here. This is the output of the DI box

Do not use

Connect this back to your guitar amp if you still want to hear sound coming out of it.

Connect your input here (guitar, bass)

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The PAD switch softens the input by 30dB when switched on. It should be used when there are very high input levels and the DI box is distorting as it enters the mixing desk.

Use the EARTH switch if there is a humming noise on the channel. It will not always work, but often does.

Note: the two guitar plugs are the same (it doesn't matter which one is your input and which one goes to the amplifier). The red +48V light indicates the DI box has phantom power from the mixing desk (needed to operate).

Auxiliary Inputs

Auxiliary inputs take care of things such as iPods or other portable media players. Auxiliary inputs are plugged directly into the mixing console via an auxiliary cable.

The mixing console has provision for 2 auxiliary inputs. 1 is dedicated to the projection PC for playback of audio from videos (AUX A). The other is for general use (AUX B).

Does not require Phantom Power (+48V)

Microphone Reference Chart

| Input type	Which mic?	How to mic + tips
Singer	Shure SM58	Use a mic stand with no boom (unless they are also playing an instrument). Their mouth should be a few centimeters from the mic.
Kick drum	Sennheiser e902	Use a short boom stand. Place the mic directly in front of the hole
Snare drum	Shure SM57	Use a boom stand. Angle it at 45º just inside the rim, 5cm away.
Tom drum	Sennheiser e604	They clip on (no stand). Make sure the mic is angled down. There is also a clip on the microphone for putting the mic lead through.
Hi hats (optional)	Rode NT5	Use a boom stand, place the mic vertically downwards, 5cm in from the outside edge, and above the hi-hat.
Percussion	Various	Use whichever drum mic seems most similar/appropriate

Input type	Which mic?	How to mic + tips
Bass / Guitar	DI box	
Keyboard	2 DI boxes	(Left and right)
Electric Guitar	Shure SM57	Use a short boom stand. Close mic, off center, from the speaker in amp
Piano	Rode NT5	Use a boom stand, open lid, mic from above 1/3 from bass end
Other melody	Rode NT5	Use a boom stand and close mic
Lectern	Lectern mic	This plugs into the lectern, and the lectern has a mic plug at the base (**Note:** there are two plugs - make sure you use the right one)
Wireless Microphone	Various	There is a wireless handheld mic and a wireless lapel mic.

Patching

Patching refers to the connection that you make between the input/output devices and the mixing console.

At WBC there is a patch bay located in the audio rack in the stage-right wing.

There are also 5 stage boxes located in the stage floor. They are labelled with a box letter (A-E) in the layout shown below.
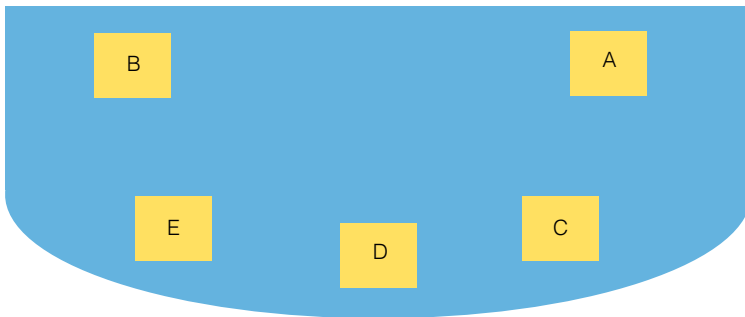
A physical cable joins each stage box to the patch bay. Another physical cable joins the patch bay to the mixing console.

This allows us to make a connection from any stage box to any channel on the mixing console at the patch bay.

Inputs (Microphones, instruments)

Input devices should be patched using a 3-pin XLR cable.

- Patch the input device into one of the stage boxes.
- Take note of the stage box letter and number that you plugged into.
- Find the corresponding letter and number on the patch bay.
- Use a short 3-pin XLR lead to connect that point to a channel on the mixing console (whichever is appropriate for the input device you are patching).

Outputs (Fold back)

There are six fold back speakers which can be placed anywhere on the stage. The purpose of a fold back speaker is to allow musicians to hear what they (and others) are playing. Generally, each musician will use one speaker.

The speakers need to be connected to the stage boxes. Each stage box has two connectors which can be used for this.

Fold back speakers should be patched using a *Speakon* lead.

- Patch a fold back speaker into one of the stage boxes.
- Take note of the stage box letter and number that you plugged into.
- Find the corresponding letter and number on the patch bay.
- Use a short Speakon lead to connect that point to a channel on the mixing console (whichever is appropriate for the fold back speaker you are patching).

These connectors need to be twisted clockwise until they click. To undo, pull the grey collar out and twist anticlockwise

Setting up the Mixing Console

It's very important to set up your mixing console well before each service. Take a bit of time to get it set up right before starting to do other things.

Make sure all of the channels are muted when you turn the system ON. This way, when you are patching or setting up the channels you won't get any noisy surprises.

Input Stage

Gain

The gain sets the input level to the mixing console of the signal coming from the input devices. I recommend the following method for setting gain:

- Adjust the channel gain so that the indicator meters in the yellow zone for louder transients.
- Make sure that the signal does not *peak* on high transients. If it does, reduce the gain level a small amount.
- If the gain knob is very low and you are still getting high input levels (particularly from DI boxes), try pressing a *pad* button on the DI box to reduce the input level.

Setting the gain this way will allow you to have good level control at the fader. Setting the gain too high will result in peaking and you will have to operate in the low range of fader motion before the output becomes too loud. If you set the gain very low, you will have to operate in the high range of fader motion and may struggle to get adequate output volume.

Note: It is good practise to only adjust the gain when setting up the mixing console at the beginning of each service. Changing the gain of a channel will affect all of the outputs that you have assigned that channel to (Main, fold back, recordings).

Phantom Power (+48V)

For each channel check if the input device plugged into it requires Phantom Power. Press and hold the +48V until the indicator turns bright red.

Select

Selects the channel to access equalizer,
compressor, limiter.etc for that channel

PAFL

The *PAFL* button can be used to isolate and
monitor the selected channel through the
headphones.

Mute

Mutes the channel. Note that the mute button also
mutes that channel in any fold back that it might
be assigned to.

Equaliser

High-Pass Filter

Each channel has a high-pass filter. The control
is located at the far left of the channel strip.

Blocks low frequencies below the *cut-off
frequency*. Allows all frequencies above the cut-
off frequency to pass.

Use the variable frequency threshold to
remove low frequency plosives and boominess. On vocal
microphones, apply a high-pass filter at around 130-240Hz.

Make sure that the high-pass filter is OFF on instruments like
the bass guitar otherwise dynamic range will be dramatically
limited.

Parametric Equaliser

Each channel is also equipped with a *parametric equaliser*. This function parameter control to adjust different specific frequencies.

The parametric equaliser is comprised of 4 sections;

1. Low
2. Low Mid
3. High Mid
4. High

Each of which has 3 parameters that you can control:

Parameters

1. **Centre Frequency** – The frequency you want to adjust.
2. **Bandwidth (Q)** – How far either side of the centre frequency your adjustment will affect.
3. **Gain** – how much you want to add or remove. By default, equaliser gain is always 0dB and has a +/- range of motion.

Fold Back

Fold back is used so that the musicians on stage can hear what they are playing. There are 6 fold back (Aux) sends available at WBC:

1. Singers 1
2. Singers 2
3. Keyboard
4. Bass
5. Drums
6. Guitar

Qu-24 and 32

Select the fold back send that you want to adjust using the *Mix* button.

Then use the knobs in the multi-purpose panel to adjust the level of each input sent to the fold back.

You can use the *Output* knob to adjust the overall output to the individual fold back speaker.

Work with the musicians to achieved a balance that suits them while they are practicing. If you can set it up well during practice, you won't need to change much during the service.

Scenes for Band Teams

One of the great things about serving in Teams is that you get to know one another and develop a cohesive workflow. Scenes are a great way to build, maintain and improve your setup and mix.

Once you have established a mix with your team, you can save this as your own Scene which can be recalled next time you are serving together, or if you are absent, someone else can recall and work with your Scene.

You can develop your Scene, by storing team member names and improving you main and foldback mixes over time.

Work in the Scene page to save and recall your Scene

Mixing a Service

As the operator, you will adjust the volume levels of the various input devices to achieve a balanced overall sound.
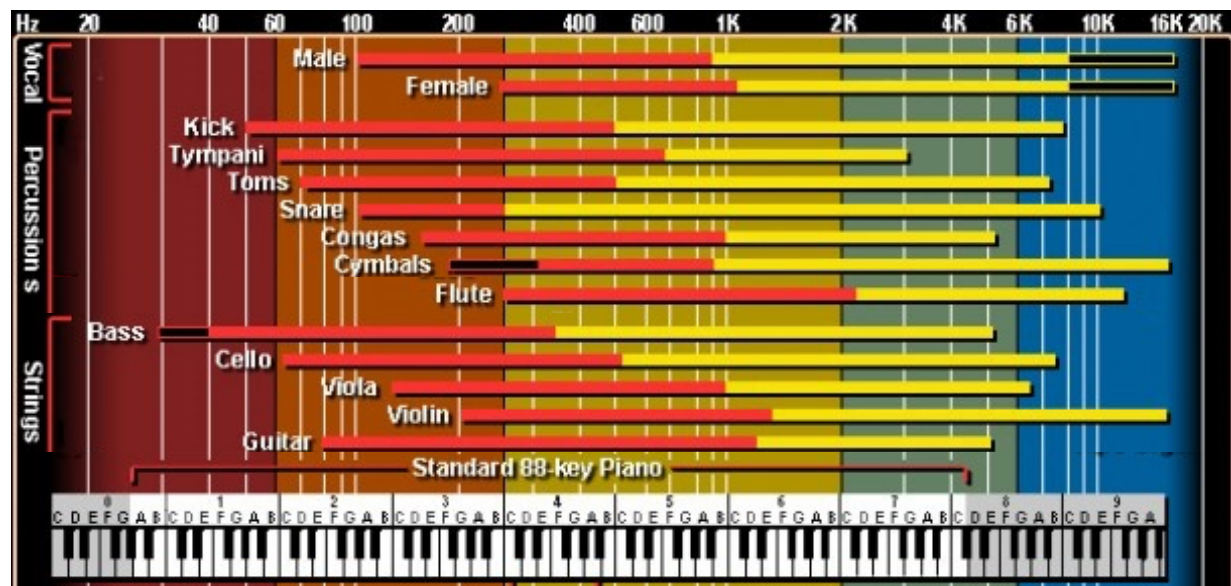
Learn to mix at a level that is not too loud, and not too soft. This applies to speech just as much as music.

Remember that our purpose as audio operators in church is to assist in enabling others to worship God in song and through what is said from the front.

	Too Loud	Too Soft
Speech	Becomes irritating and distracting. Can cause discomfort.	People strain to hear and aren't able to hear some or all of what is said.
Music	Becomes distracting. Congregation cannot hear their own voice and stop singing as a result.	It becomes awkward for the congregation to sing; people stop singing.

Getting a good balance in music is not only about volume. Another important aspect of achieving a good balance is *frequency*.

Different instruments (including voice) operate in different frequency ranges. One way to think of balancing frequencies is to find 'space' for each instrument as you mix. The following chart shows the operating range of some common instruments. Red indicates fundamental frequencies, yellow indicates harmonics produced by the instrument.

Hz | 20 | 40 | 60 | 100 | 200 | 400 | 600 | 1K | 2K | 4K | 6K | 10K | 16K 20K

Vocal
- Male
- Female

Percussions
- Kick
- Tympani
- Toms
- Snare
- Congas
- Cymbals
- Flute

Strings
- Bass
- Cello
- Viola
- Violin
- Guitar

Standard 88-key Piano

0 1 2 3 4 5 6 7 8 9
C D E F G A B

- Think about the frequency space that each instrument takes up.
- Avoid clutter in that space.
- Use the equaliser to remove frequencies from instruments that are clashing. For example: because the piano/keyboard operates across a wide frequency range, you can remove some of the low frequencies, using the equaliser, to make space for the bass guitar.
- Similarly you can amplifier certain frequencies to provide a presence in the mix. It can sometimes be appropriate to do this with lead instruments, such as guitars.

Advanced Mixing Console Features

Additional features of the mixing console are described briefly below. It is helpful to have a basic understanding of these features; however, you should have no problem mixing a service at WBC if you don't understand them fully.

Please do your own research or follow the links at the end of this booklet for a more detailed explanation of these features.

Effects

The mixing console has 2 effects channels. You can assign a variety of different effects to each effects channel.

Signal from each input channel is routed to the effects section by pressing the *Mix* button on each effects channel (similar to setting up fold back sends).

Dynamics

Compressor

Reduces (compresses) the dynamic range of the signal, when the signal level exceeds a set threshold.

Gate

Automatically mutes (gates) the channel if the signal level on the channel is below a set threshold.

Limiter

If the signal level on a channel exceeds a set threshold the limiter automatically prevents (limits) any gain above the threshold.

Recording

It is important that the sermons are recorded each week so that they can be uploaded to the church website for other people to download.

To Record:

- There is a Marantz PMD570 recorder in the rack under the sound desk.
- Make sure that the unit is powered ON.
- Press the *record* button once. It should now flash red. This cues the recorder but does not start recording. You can do this at the start of the service.
- When you are ready to start recording, press the *record* button again. It should now be steady red. It will record until you press *pause* or *stop*.
- To resume recording after pressing *pause* just press the *record* button again.
- If you press *stop* you will need to start the whole process again.

Record the Bible reading and sermon each week.

Troubleshooting

You will be most effective at troubleshooting if you have a good understanding of how the whole audio system is pieced together.

When you fully understand the system you will be able isolate parts of it to identify where a fault has occurred. Here are some starting points to troubleshooting a problem at WBC:

No sound from an individual channel.

Do you have INPUT lights showing on the channel you are having problems with? If not, the problem lies before the mixing console.

- Check that the patching is correct.
- Does the input device you are using need phantom power? If it does, turn it ON.

If yes, then the problem lies after the input stage of the mixing console.

- Is the channel is unmuted?
- Check the channel fader is up.
- Check that the master fader is up.

No sound coming out of fold back speaker.

- Make sure that the master for the particular fold back send is turned UP and that some channels are assigned to it.
- Check that the patching is correct.
- Ensure Speakon connectors are properly inserted.

- Make sure that all of the circuit breakers are ON in the distro at the top of the audio equipment rack.

No or low sound from the system.

Do you have OUTPUT lights showing on the main output of the console? If yes, check that the amplifiers are powered ON and all of the gain knobs are turned UP all the way (This is rare, but can happen from time to time).

Make sure that all of the circuit breakers are ON in the distro at the top of the audio equipment rack.

Quick Start Guide

1. Turn ON the main power switch in the stage right wing.
2. Plug the lectern or another microphone into a stage box. Use Box D Port 1 (Front Centre Box).
3. At the patch bay, use a short cable to connect D1 to CH18.
4. At the mixing console;
   a. Check CH18 gain is about half way.
   b. Make sure that CH18 is not muted.
   c. Make sure MAIN fader (far right of the console) is at about 'U'.
   d. Adjust the volume of the microphone accordingly using the CH18 fader.
5. To pack up:
   a. Mute everything.
   b. Unplug microphones and pack away.
   c. Turn system OFF.