



A classic error that Churches make is to put all their money into a super Digital Mixer, thinking they will get a super sound. If you are using cheap or old Microphones, you have started by not capturing the sounds properly. These poor sounds go through to the Mixer, which balances the channel volumes, and lets you shunt your collection of poor frequencies using the Equalisers. The Loudspeakers then make your poor sound louder. Garbage in... Garbage out. If you had good Microphones and captured the sound well, then pass them to bad Loudspeakers, the outcome will be the same. Quality in... Garbage out.

Quality Microphones and Quality Loudspeakers must always be your accent, not a super-expensive Mixer placed in the middle of poor equipment. Sound quality is only as good as the singers and musician's ability, the microphones, and the loudspeakers... mixer equalisers are actually at the bottom of the list.

BASIC SOUND SYSTEM:

Microphones

Live microphones take a lot of abuse, accidentally dropped, thrown into a box at the end of the day, microphone-stand falling over and landing on the microphone, singer banging the microphone sharply asking, “is this going?” Dynamic microphones are the first choice, because of this, as they are robust and relatively economical. The **Shure** brand is the industry standard as it has been around for many decades, proving its robustness and sound quality lasts years of treatment. An example of robust quality dynamic mics is the Shure SM58 made for the voice and the Shure SM57 made for instruments. Of course, there are plenty of valid brands that sound really good in the music shop, the real test is how they sound in a year’s time.

Radio Microphone(s) and Receiver(s).

When you’ve got enough budget to start using wireless (and get more freedom of movement and sound clarity) consider which type will suit your need:

Handheld has the biggest capsule and best sound quality, so singers should have these.

Headset rests on back of neck and hooks on back of ears. It is extremely light and puts a small microphone close to your mouth.

Lavalieres clip on to the shirt collar just under the chin. It has a small microphone. The Headset and the Lavalier are made for speaking, not serious singing.

The **Radio Mic Receiver box** comes with the microphone you choose. A box with two antennae for one microphone (diversity receiver) is the best choice.

Microphone Stands.

Tripod (3 legs) have been found to be the most efficient. They minimise any vibrations coming up from the floor (make sure the centre pole never touches the floor). You can purchase shorter stands which are more discrete and handier for getting close-up to Guitar and Bass Amplifiers etc.

Microphone Stand holders.

Microphone holders are a problem. Life is simple if you can use the same microphone on the same holder (that came with it) on the same stand, all the time. Unfortunately microphones and microphone stands are typically grabbed at random and may or may not match. If you have microphones of varied thickness you will need to take care of what attaches where. Resist the temptation to get Bulldog-clip type holders, which may seem the perfect solution, but unfortunately, they do not hold very tightly and will drop your microphone onto the floor with the slightest bump or angling up or down, away from horizontal.

Audio Cables.

They come in several different lengths. As they normally break at their most stressed points just behind the connectors, try and get cables with good rubber or coiled-wire support at the back of the connectors, this absorbs a lot of the stress.

Cable Ties. There are ties that you can attach permanently to the cables you are always coiling and uncoiling. These are available in music stores and are typically Velcro. Apart from keeping things tidy, a cable that is properly coiled, then tied, will last longer.

Adaptors. The audio industry has various types of connectors, which cause multiple mixtures. It is wise to keep a combination of adaptors ready to cover the unusual one-off requests you get, quite often, at the sound desk.

D.I. Boxes. Passive D.I. Boxes are all you should ever need. Active models that require batteries or phantom power are really only needed in highly specialised situations. Should you have a tight budget you can build your own very cheaply using three audio connectors, a transformer, and a switch (no battery needed).

Stage-Box.

They are used to send signals back to the stage (Floor Monitors, Loudspeakers etc) as well as receive all signals from the stage to the mixer. Be sure you purchase one that has enough connectors going each way for your needs (plus a few free for unforeseen situations which are always happening in audio).

Mixer.

The Mixer should be chosen according to how many channels you will need (how many things to plug in) plus at least 5 or 6 spare channels for unexpected situations. For 'live' work, which is what you are doing, the more Aux Sends on a mixer, the better. As long as it has good standard channel Equalisers, that's it! Mixers don't do much else (they especially don't do miracles)!

Remember: Sound quality is only as good as the singers and musicians ability, the microphones, and the loudspeakers... mixers are at the bottom of the list.

Mixer Headphones. The kind that cover your ears properly, and isolate out the surroundings.

Torch. One that gives a small discrete light so that you don't disturb people around you.

Loudspeakers (and Power Amplifiers if not inside the Loudspeakers). The Loudspeaker cones must be large in order to move a large column of air.

Loudspeaker Stands / Supports. They must be stable as a falling loudspeaker can seriously injure, and even be fatal. If you are using a stand that is fully extended and sways a lot when you push it, consider chaining it to something (just in case).

Floor Monitors (and Power Amplifiers if not inside the Floor Monitors). *The Floor Monitoring (Fold-back) is always a source of complaint from the musicians and singers, it's almost never loud enough. The ideal is always a floor monitor that has a horn as well as a cone. Floor monitors with large loudspeaker cones, or twin cones will give more sound, without more volume, as they offer more acoustic punch. You simply won't get away with using monitors that are too weak. For example 50 watts won't do it because the on-stage noise is louder than that.*

Recording Device (perhaps Computer).

Be sure the earthing (grounding) is good, and the levels going to the Recorder are high, to ensure minimal background noise.

Music Player (perhaps Computer, CD player, Cell phone, USB).

Be sure the earthing (grounding) is good, and keep the playback level from the Player is high, to ensure minimal background noise is passed through.

Ongoing consumables at the mixer:

Batteries. Masking tape (to write on). Felt Pen. Duct Tape.

FIRST UPGRADE MIGHT INCLUDE:

Graphic Equalisers.

While there are 10 band and 12 band etc equalisers available (probably quite cheap) the most appropriate is one that has 31 bands. These are the most selective and consequently the most versatile, able to remove feedback squealing and remove the effect that room resonances (from the church building) adds to your sound. 31 band models allow selective filtering of the main L-R mix to control the basses, remove muddiness, and add a little crispness. Inserting a 31 band equaliser in a channel with a 'difficult' sound, that you just can't balance using the channel equaliser, will let you resolve the problem.

Compressors.

Compressors typically come with two in a box (in case you want them for stereo) but they are completely independent and can be used for two different tasks if desired. A compressor with an easy to read G.R. meter (Gain Reduction) and Threshold Lights are most desirable features as this is the easiest way to monitor how much a compressor is working (a quick glance every now and then while the meeting progresses made easy). A Limiter on board is a bonus.

Reverb Unit.

These may be dedicated Reverb Units, or Multi-Effect Units. If you buy a Multi-Effect unit then you are paying for all those other effects that you won't use (if you are always going to use it for Reverb). In this case perhaps a dedicated Reverb Unit is better?

Sound Level (SPL) Meter.

This is what the Local City Council noise-control officer carries when your neighbours complain. When you find a good volume that isn't too loud at the front, and is still acceptable at the back for singing, you can take a volume (SPL) reading at the mixer, then the sound team have a definitive max volume to work to.

Contact Microphones / Pickups to attach directly to instruments.

Cheap ones don't usually sound very good... check them out! Pickups offer a good natural sound for acoustic instruments and reduce the number of open microphones that contribute to feedback squealing.

Boundary microphone inside piano.

Placed on a rubber mat, or physically attached to the inside of the piano. They guarantee a clean, stable full piano sound, even with the lid closed.

A drum of **Audio Cable** and loose **Connectors**. **Soldering Iron** and electronic solder to repair, and build, your own cables. *Soldering is easy to learn.*

Multi-meter to check batteries and cables.

LATER IMPROVEMENTS MIGHT INCLUDE:

In-Ear Monitors and Transmitters.

Stay with well-established brands when buying this kind of thing. They eliminate floor monitors and permit the front-of-house sound to be so much better (by removing the offstage spillage).

Feedback Eliminator.

These are wonderful assets if you are having squeal problems a lot. Check to see how easy they are to use, some are for professionals and require a lot more inputting by the user. Try and find one that is very automatic, and let it make all the decisions.

Drive Rack.

As these contain a multitude of Effect Units and utilities, they can be difficult to navigate. Be sure the intended users are going to be able to operate it (some are more user-friendly, others are meant for professionals and make no apologies). Placed at the L-R Output of the mixer they make you sound very good.

Drop box (small stage-box for areas where there are a lot of microphone cables).

These may be purchased, or it may be better to custom-make some connector boxes to go from your Stage box over to areas where there is a concentration of audio cables, so that you can cut a single length of multicore cable to suit, and thereby keep the stage area cable free.

Split Snake for separate Floor Monitor Mixing (Side-mix).

Be sure you purchase one that has enough connectors going each way for your needs (plus a few free for unforeseen situations which are always happening in audio).

Floor Monitor Mixer.

When you are side-mixing Floor Monitors you can use any Mixer (preferably one with many aux sends). If you aren't intending to invest in IEM's any time soon you may consider a dedicated Floor Monitor Mixer. These have long rows of auxiliary sends and permit really great control of the floor monitoring.

Sub-Woofers Loudspeakers.

These are not a primary requirement, and indeed are not even suitable for many live applications as they increase boomy and rumble in a church building and make the sound muddier. They are mainly for enhancing certain genres of music. Check that they produce clean defined basses, and not just rumble. Two regular sized woofers in a well-constructed bin will often give a better sound than larger sized woofers. Consider their weight also, Subs are heavy by nature.

Hard-of-Hearing Induction Loop.

This is a wire that you get installed in a loop around the walls of the church building. It is a good service to offer the elderly as they can hear the spoken word directly to their hearing aids instead of trying to hear through the loudspeakers.

Spectrum Analyser

These let you "see" the sound, laid out in its various frequencies. This allows you to filter (equalise) individual sounds properly, rather than trying to use your ear in the midst of a whole lot of other sounds playing (it works well connected to the PFL Headphone line). There are plenty of software versions as well as hardware version. The preference should always be a 31 band display which shows the most detail (and lines up instantly with 31 band Graphic Equalisers).

Super Digital Mixer.

These have a lot of convenient features, most importantly good equalisers and compressors on every channel. In the hands of amateurs there isn't a great sound improvement, but once set-up in a permanent venue, they do make life easier. Don't invest heavily here until your Microphones and Loudspeakers are sorted.

PURCHASING MUSICAL INSTRUMENTS:

Usually musicians like to have their own, but the church sometimes purchase things like...

Piano. Keyboard. Organ. Drums (Acoustic or Electronic). Electric Bass. Electric Guitar. Instrument Amplifiers. Acoustic Guitar. etc.

If you wish to buy musical instruments they should have a good sound, suitable for accompanying singers, and hold their tuning well. There is no reason to have the latest and greatest model of something if the people playing them are amateurs and volunteers who are accompanying amateur singers. A more expensive instrument **will not** sound significantly better (it's not all about the instrument... a professional musician will still make a lousy instrument sound nice), buy them instruments to suit their musical ability and something that can take a bit of abuse (because it will).

PURCHASING SOFTWARE:

There is plenty of freeware, or \$20 packages that do everything you would want. If you want to buy serious software, always stay with brands that are well established. These will have all their bugs sorted and are the least likely to crash. Apart from that, audio software isn't rocket science, they all do the same thing.

CREDITS

This material is offered freely to the Christian Churches; downloadable at Pietango.com

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Ever since the creation of the world, God's invisible attributes and divine nature have been evident. They are clearly understood through his workmanship, and all the wonderful things that he has made. Therefore, those who fail to believe and trust in him are without excuse, or defence. **Romans 1:20**

All of us have sinned and fallen short of God's glory, but God treats us much better than we deserve.

Because of Christ Jesus, he freely accepts us and sets us free from our sins. God sent Christ to be our sacrifice. Christ offered his life's blood, so that by faith in him we could come to God. **Romans 3:23**

If you declare with your mouth, "Jesus is lord," and believe in your heart that God raised him from the dead, you will be saved. For it is with your heart that you believe and are justified, and it is with your mouth that you profess your faith and are saved. **Romans 10:9**

For the Scripture (*Isaiah 28:16*) says, "Whoever believes in Him will not be disappointed." **Romans 10:11**

These things have been written so that you may believe that Jesus is the Christ, the son of God; and that by believing, and relying on him, you may have new life in his name. **John 20:31**