

RECORDING AND PRODUCTION

WORKBOOK 5

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-  Chapters that are essential to this workbook.
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Please note

Any details or photographs of equipment, software, manufacturers or suppliers do not constitute a recommendation or endorsement by DWP, but are intended to provide typical reference examples only.

STUDIO RECORDING EQUIPMENT

WHAT IS IT?

This chapter is about recording studios and recording equipment – the places and equipment used to capture sound, mix it and turn it into a CD or other master.

We will start with an overview of recording studios, such as the types and uses of studios, which will then develop into the different recording formats.

We will look at microphones, mixing desks and other studio equipment, concentrating on how to use them to record different types of instrument and sound sources.

We will finish off by looking at the mix process, including using effects and producing a master.

WHY DO I NEED TO KNOW ABOUT THIS?

Many musicians and DJs will end up working in some form of recording studio over the course of their career. These come in many different shapes and sizes, but follow the same basic principles.

Even if you have no intention of becoming a recording engineer, understanding how the studio works and how to achieve the best sound will help you as a musician or DJ to improve your abilities and help ensure you leave the studio with the best possible sound recording.

Being able to use recording equipment will make you more employable, as there are many different career paths that involve recording technology, from musician / producer, to forensic study, to conferencing, video and TV.

The same techniques discussed here can be applied to almost all recording situations, from simple 4 track or computer based recording at home to a £500 per hour commercial recording studio.

Use and trust your ears!

YOU MUST HAND IN YOUR WORK BY _____ TO _____



HOW LONG
should this assignment take?

Every person works at his/her own pace. As a guide, spend 2 hours reading and making notes, another 2 hours to write your answers and a further hour to discuss them with your MOLP tutor.



HOW
will I be assessed?

Your tutor will assess your work. He/she will give you feedback on how you have done. If you have not completed the work, you will be given the chance to do further work to pass this assignment.



WHAT
do I do now?

Read the TASKS section below to get an overview of this project. Then read the NOTES AND GUIDANCE section for help. Carry out the TASKS.

TASKS

1 Tick the boxes below to show what recording experience you have already.

- I have been in a commercial recording studio
- My friend has a studio that I have used
- I play in a band and we have been recorded
- I am a DJ and have produced a tune
- I own a computer with some music software
- I have used a commercial recording studio
- I have my own recording equipment
- If you have your own equipment, list it here

2 There are two boxes below that represent the two main rooms in a recording studio. From the list below, organise the equipment and processes that happen into the correct room.

CONTROL ROOM

LIVE ROOM

Equipment

Mixing desk, Microphone, Guitar amp, Effects units, Drum kit, Patch bay, Computer, Headphones

Processes

Playing drums, Setting levels, Listening to recordings, Setting up microphones, Programming drums, Mixing, Rehearsing

3 Research a local recording studio and find out what equipment they have. Write it down below.

4 Describe the recording process, using short bullet points

-
-
-
-

5 For each of the recording formats below, list 2 advantages and 2 disadvantages.

Format	Advantage	Disadvantage
Cassette		
2" Analogue Tape		
Hard Disk Recorder		
Computer (Pro Tools, Logic etc)		

6 The following list are all true / false statements about capturing different sound sources. Circle true or false in the box next to each statement.

Any old mic will do, you can always fix it in the mix later True False

New strings on a guitar will make it sound better True False

You don't need to tune a drum kit True False

When recording vocals, the singer should be 6"-8" from the microphone True False

If you only have two microphones for recording drums, point one at the hi hat and put the other one in the kick drum True False

When recording, avoid rooms with lots of natural reverberation True False

7 For each instrument in the list below, circle whether you would use a dynamic microphone, a condenser microphone or a DI box to record it to get the best sound.

Acoustic Guitar	Dynamic / Condenser / DI Box
Electric Bass	Dynamic / Condenser / DI Box
Snare Drum	Dynamic / Condenser / DI Box
Keyboard	Dynamic / Condenser / DI Box
Vocal	Dynamic / Condenser / DI Box
Electric Guitar	Dynamic / Condenser / DI Box
Drum Overhead	Dynamic / Condenser / DI Box
DJ	Dynamic / Condenser / DI Box

8 Describe two forms of stereo miking technique

9 If you are recording in a bad sounding room, what can you do to improve its suitability for recording?

10 Write what each of the following controls on a mixing desk does

High Pass Filter

Gain

Solo

11 Out of the following list of effects, circle whether it is an insert effect or a send effect

Compression	Insert / Send
Reverb	Insert / Send
Delay	Insert / Send
Noise Gate	Insert / Send

12 Pick a recording you know well, and fill in the tick sheet below to describe what effects you think are used on what parts. You will need to listen to it carefully. Remember to take a copy of the song to your tutorial so that you can discuss your answers with your tutor

ARTIST		SONG			
	Reverb	Compression	Delay	Chorus	Noise Gate
Vocal					
Drums					
Bass					
Guitar					
Keyboards					
Other					
Other					

RECORDING STUDIO OVERVIEW

Recording studios come in all sorts of shapes and sizes, from a bedroom in a house with a computer, to a multi million pound residential recording facility. There are certain things that all recording studios have in common, and certain techniques and tricks that can be used in all studios. These techniques will be outlined later in this chapter.

Most commercial recording studios still have at least two rooms.

THE LIVE ROOM

where the musicians play



THE CONTROL ROOM

where the equipment and engineer reside



However the technology has changed vastly over the last twenty years.

A live room will typically contain a drum kit, guitar amp and bass amp, and have connections through to the control room for connecting microphones and other sources. The musicians either play all together in the live room, or one at a time (overdub recording) wearing headphones to hear the rest of the recording.

A CONTROL ROOM can contain any amount of equipment, from just a computer and a pair of speakers (studio monitors), to racks and racks of equipment so that it looks like the bridge of Starship Enterprise. Generally speaking, you would expect to see the following in a control room, whether physical equipment or software equivalents in a computer;

Mixing desk

for setting sound levels of microphones etc, and for mixing the recorded parts together
e.g. guitar, drums, vocals.

Multi-track Recorder

this could be a computer, an analogue tape machine or some other type of digital recorder

Effects Units

such as reverb, compressor, noise gate etc (more later)

Studio Monitors

high quality loudspeakers with a neutral sound

Patch Bay

where the connections for all the equipment are brought to one 'easy to access' place to enable simple connection of one unit to another

THE CONTROL ROOM is where the programming, editing, mixing and listening takes place, and will often contain a sofa.

Today, there are many other types of studio that are used for recording and mixing different sorts of audio and sound, for example;

Mastering Studio

where the finished mixes get final equalisation and compression etc before going to manufacture

Production Studio

often a single room studio where songs get written and programmed, or for remixing

Foley Studio

where sound effects for film and TV are recorded

Forensic Audio Studio

Forensic science often calls for audio recordings to be improved in order to be more useful as evidence. Forensic Audio is one of the many spin off areas of employment for an audio engineer.

A TYPICAL RECORDING SESSION WILL CONSIST OF

TRACKING

This is the recording of the parts onto tape or hard disk, whether the musicians play together or one at a time.

OVERDUB

This is where additional parts are recorded whilst listening back to the recorded parts.

MIXING

This is where the parts are mixed together, effects are added and the recording takes shape.

MASTER

This is the final recording onto two track (DAT, CD etc) of the finished mix.

EDITING

Sometimes it is necessary to edit recordings; removing noise, copying one section over another etc.

MASTERING

This final stage is when the finished mix is tweaked to make it sound good on a range of hifi's, and gaps between songs are set.



RECORDING FORMATS

There have been major advances over the last 60 years in recording technology, starting with the magnetic tape in 1936, but what are the formats still used for recording today?

Recording studios contain a multi-track recorder, enabling different instruments or microphones to be recorded separately, so that their respective sound levels can be adjusted (mixed).

Most recording studios now use 'digital' recording technology for their multi-track recorders. This means that they use either a digital tape recorder, such as an Alesis ADAT, or a hard disk based recorder, either a computer (Apple Mac or PC) or a standalone device such as a Fostex D2424.

This means that they use either a digital tape recorder or a hard disk based recorder.

PORTASTUDIOS

It is still possible to buy 'analogue' cassette based 4 track and 8 track portastudios, and these often offer a good, cheap introduction to recording. (4 track recorders are around £100 brand new)

Portastudios are now available in digital formats as well; Minidisc, Hard Disk, Compact Flash etc. These more modern designs often include a basic drum machine and simple editing facilities, and the on-board mixers often feature basic tone controls and effects.

MULTITRACK RECORDERS

On the other end of the 'analogue' recording scale are 2" 24 track tape machines, enabling 24 tracks of microphones, instruments or any other sound source to be recorded.

These multi-track recorders are expensive and need maintenance to keep them running at their best. The tape is also expensive – around £100 for 30 minutes of 24 track recording.

Many engineers and producers prefer the "sound" of analogue tape to that of digital. This sound is caused by natural "tape compression", which is when the recorder makes the loud signal peaks (such as drum hits) quieter, keeping the overall sound level more consistent.

Sometimes, instruments are recorded onto analogue tape to get the sound, and then transferred to a digital medium such as Pro Tools for editing and mixing.

Alesis developed an 8 track digital recorder in 1991 that uses video tape, called the ADAT. These machines can be chained together giving 8, 16, 24 track counts. The tape used is fairly cheap as are the recorders, and these quickly became a studio standard.

Quite a lot of commercial recording studios now are making use of standalone hard disk recorders, such as the Fostex D2424 and the Mackie SDR24/96.

These offer the same 24 tracks, but for a much lower price, around £1000.

As they record to internal hard disk, they are capable of storing several hours of 24 track audio at high quality. If they become full, you can either backup onto DVD or buy additional drives, either of which are fairly cheap options. These machines are great choices for mobile recording as they are more stable and reliable than a computer, but still offer simple editing and high quality recording and replay.

The last format, and probably the most common now is the computer. Apple Macintosh or PCs are capable of recording many tracks of high quality audio (similar to the hard disk standalone recorder) but with the added convenience of on screen editing, built in mixing and effects and many other features. Computers capable of recording audio are cheap (£500 upwards) and need very little additional equipment. On the downside, computers can crash in the middle of a session (sometimes destroying data), they don't like to be moved around (so aren't great for location recording) and sometimes the wrong combination of software and hardware can cause untold misery when it refuses to work or becomes temperamental!

BOSS Digital studio



MOBILE RECORDING RIG



8 TRACK DIGITAL RECORDER D-108



DIGITAL MULTITRACK RECORDER D-90



CAPTURING THE SOURCE

The sound you record onto the tape or hard disk is the most important part of any recording. Despite phrases like "fix it in the mix", there is no substitute for a well recorded instrument and it pays to spend some time getting it right. Therefore, this part of the chapter will be fairly detailed, to enable you to get the sound right from the start.

There are some very basic rules that apply to all recordings;

- 1 Get the instrument or source to sound as good as possible first.
- 2 If a guitar, this means new strings and ensuring it is in tune.
- 3 If using a microphone, experiment with positioning of the instrument in the room as it will sound better in some places than others. If you can, try different rooms.
- 4 If using a microphone, move it around the source to get the best sound you can.
- 5 Do this either by wearing headphones whilst positioning the mic, or by recording test runs and listening back.
- 6 Use the shortest possible signal path. e.g. microphone to mixer or preamp then to recorder

Having a choice of two different types of microphone can be helpful as one will probably sound better than the other on some things. Microphones don't have to be expensive, a good all round condenser can be bought for £50.

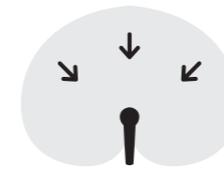
If you are working in a recording studio with a live room then you shouldn't have to worry about acoustics too much, as this should have been part of the studio design. However, if you are not recording in a properly designed room, then you may need to do something yourself. If a room is too live – i.e. there is too much reverb or echo, then you need to deaden it by adding soft furnishings. Often a duvet can make an excellent piece of acoustic treatment – hang one on the wall behind the singer and it will reduce the ambience a lot.

Set the record levels with the performer playing along with the track, so that in the loudest bits they peak at -3dB if recording to a digital system, or to +3dB if onto analogue (although this does depend on your machine). A general rule is to never light the top light on the meter.

Following these basic principles and the suggestions for recording below should be a good starting point. Feel free to experiment, and remember, use your ears not your eyes!

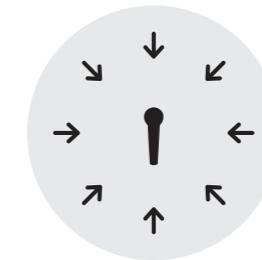
MICROPHONE TYPES

Microphones come in a variety of types, with the polar pattern being one of the more important specifications. This defines how the microphone picks up sound, whether from all around, in front etc.



Cardioid

Sound from the front and sides is picked up



Omnidirectional

Sound from all around is picked up

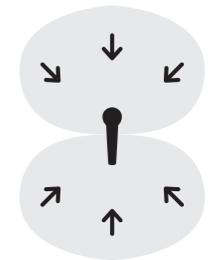


Figure of eight (bi-directional)

Sound from the front and back is picked up



Cardioid microphone examples

- 1) Shure SM58 - a dynamic vocal mic
- 2) Shure SM57 - a dynamic mic generally used for drums
- 3) Shure Beta 58 - another dynamic vocal mic
- 4) AKG D112 - a dynamic mic for bass drums
- 5) Rode NT1 - condenser, cardioid response, used for vocals
- 6) AKG C1000 - condenser, cardioid response, used for acoustic guitar and drums

RECORDING VOCALS

Vocals are fairly straightforward to record. The first thing to be aware of is the sound of the room you are recording in. Recording studios often have vocal booths especially designed for recording vocals in. If you are not in a recording studio environment, a small room will have a more boxy sound than a bigger room, and rooms with lots of hard surfaces are probably best avoided. Ideally, a room with a short natural reverb (like a lounge) is best.

Whatever the room, experiment with where in the room sounds best for singing. Set up the microphone on a stand, so that the mouth of the singer is level with the capsule of the microphone.

A pop shield is a must. These help stop plosives (such as "p"s) which can be problematic on a recording. Position it between the mic and the singer.

The best mic to use for recording a vocal is a condenser mic. Condenser mics are more suitable for recording sounds with lots of high frequency content, such as cymbals, and are more sensitive than most dynamic mics.

CONDENSER MIC AND POPSHIELD SET UP FOR VOCALS

Try to position the singer between 6" to 9" from the microphone, although this depends entirely on the sort of sound you want. The closer to the mic, the more intimate and involving the recording will be. Try to get the singer to stay at the same position throughout the recording.

If you have a preamp with a compressor built in, and are more experienced with recording, then you can record with a little compression (a ratio of 3:1 or so) to help even out the recording.



POPSHIELD

TIP

COMPRESSION

The job of the compressor is to even out the volume of a track. Compressors have a threshold and a ratio control, and when the input level gets louder than the threshold you have set, it is reduced in volume by the amount set by the ratio control. This means that louder sounds are reduced in volume compared to the quieter sounds, and therefore the range of volumes is lower.

TOP: Emagic amt8 MIDI interface
MIDDLE: MOTU 828 MKII firewire audio interface
BOTTOM: Focusrite VoiceMaster Pro Mic preamp and compressor



RECORDING ACOUSTIC GUITARS

Acoustic guitars also sound better when recorded in a fairly dead room with a condenser mic, and can sound even better when recorded in stereo with two mics.

Spend time getting the guitar to sound good first. Put new strings on it, and make sure it is in tune with itself and the other instruments to be recorded. A guitar tuner is as worthy a piece of equipment as your speakers!

Again, experiment with where in the room (or which room) sounds best, and then set up the microphone pointing at the soundhole, around 12" from the guitar. Use this as a starting point and move the microphone around whilst listening to get the best sound. Sometimes, putting the mic near the ears of the player can give a good sound as that is what they are hearing...

If you have the luxury of 2 microphones, try positioning the other mic at the headstock of the guitar, pointing at the middle of the neck. These can then be recorded onto two separate tracks and mixed in stereo, to give a wider sound.

Again, if you feel competent and have the equipment, applying a little compression whilst recording can be a good idea, but if you are unsure it's best to leave it. If the sound isn't lively enough, then try putting a board of wood on the floor below the guitar, as the reflected sound from this can add to the recorded sound.

The most important thing with recording acoustic guitar is getting the mic in the right place. A movement of as little as 1" can make a massive difference, and try moving it closer and further away to see how that changes the sound.

Electro-acoustic guitars have a pickup or microphone inside that can be plugged into an amp for playing live. This can be used for recording, but tends to sound a lot worse than recording with a microphone, even a cheap one.



RECORDING ELECTRIC GUITARS

Electric guitars are generally played through a guitar amp, and the amp itself has a big impact on the sound. If you were to plug an electric guitar into a hifi or a mixing desk the sound would be disappointing. You can either put a microphone in front of a guitar amp, or use a guitar amp simulator like a Line 6 POD or Behringer V-Amp. These are digital devices that emulate the sound of a guitar amplifier and speaker, and can model a wide variety of different amps. They are quite good, and are useful if you can't make too much noise, as often a guitar amp will need to be quite loud in order to sound good.

If you are using a guitar amp, then position a **dynamic** mic such as a Shure SM57 so it is pointing at the cone, somewhere between the centre and the edge of the cone, and about 3" from the front of the loudspeaker.

Bringing the mic nearer to the centre of the cone will produce a harsher, more brittle sound, and nearer the edge will be warmer and less bright.

Guitar amps come in either valve or solid state models, with most guitarists preference being valve. Valve amps sound much better when driven a bit harder, and therefore louder.

If you have two microphones then try miking two different parts of the speaker, or put one further back in the room.

If the guitarist uses their own effects pedals, such as distortion or delay, then these should be recorded as they form part of the sound and change the way the instrument is played, although reverb can be left off. You will often find that the sound a guitarist uses live will not suit a recording.

If you have a guitar amp simulator, like a Line 6 POD, then you merely plug the guitar into this, and then this into the mixer or recorder.



RECORDING BASS GUITARS

Bass guitars are generally recorded by plugging the bass into a **DI box**. A DI (Direct Inject) box connects between instruments and mixing desks, to ensure that each work at the correct level.

Some recording preamps have instrument sockets that bass guitars can be plugged in to instead of using a DI box, and you can then use the sound shaping controls on the preamp such as EQ and compression to alter the sound.

If you are unsure, record with no EQ or compression.

Some engineers choose to record the bass amp, much as you would record a guitar amp. If you are miking up a bass amp, use a microphone with a large diaphragm, such as a dynamic mic like the AKG D112, or a condenser such as a Rode NT1.

MICROPHONE SIZES

The diaphragm is the moving part of the microphone. The larger the diaphragm, the better at picking up low frequencies a mic will be. Most microphones exhibit the Proximity Effect, which is a boost in the bass response of the mic when it is close up to a source.

Position the mic somewhere between the edge of the cone and the centre, pointing at it. Some engineers like to record both a DI and a miked amp onto separate tracks, and then combine the two recordings at the mixing stage.

As with guitars, new strings are an idea, and ensure that the bass is in tune. As bass strings are quite expensive, some bass players revive the strings by taking them off and boiling them in water. This can help to bring some of the treble back to the strings, but will only work a couple of times with a set.



Using a DI output on a Bass Amp



RECORDING DRUMS

Drums are perhaps one of the hardest instruments to record well, especially a whole drum kit, which is often the case.

The way in which you record a drum kit depends on your situation. If you are in recording studio with live and control rooms and a cupboard full of microphones, you will find it easier to get a good sound than trying to record them at home with 2 mics.

The room has a large impact on the sound. Some people prefer the sound of a live room (one with a bit of reverb), and others a dead room (with no echo). If you have more microphones then the room will have less of an impact as you will be able to get them closer to the drums.

Ensure the drum kit has good skins on it that are well tuned. If you have to tune the kit, turn opposite tuning lugs a quarter of a turn at a time, going round the drum in a star formation. Sometimes it can help to deaden the ring of the drum by putting a bit of gaffer tape or taping a little bit of tissue to the skin.

If you have only one mic, then the best place is probably in front of the drum kit, about 1m from the floor, pointing at the kit.

If you have two mics, preferably one dynamic and one condenser, then the condenser should be placed over the drum kit pointing at the snare (on a strong, droop-free mic stand), and the dynamic mic should be positioned inside the **kick drum**, off centre pointing at where the beater hits the drum skin. The AKG D112 is often used as a kick drum mic, due to its large diaphragm and robust build.

If you have another mic, then position it on the **snare**, about 1" from the rim and 1" in from the rim, pointing at the centre of the drum. Again, a dynamic mic is best for these close positions as the high volumes from close miking drums can damage some

condenser mics. Obviously be aware that the drummer may hit the mic, so check with the drummer when you have positioned it.

If you have more mics, then they can be added to individual drums. Dynamic mics such as the Shure SM57 or SM58 are best used on snare drums and tom toms, whereas condensers are better for cymbals and hihats. **Tom toms** are miked in the same manner as snare drums, again being aware that the drummer may hit them.

If you have two condensers, then these can both be used as overheads, recorded onto separate tracks and then mixed in stereo to give more realism to the drum sound. If you have a third, then this can be positioned on the hihat, about 12" from the top hat pointing down and between the centre and edge of the top hat. Often enough hihat sound comes through the snare mic and overheads, and so a hihat mic is not essential.



STEREO MIKING

There are several techniques for stereo miking, the two most common are **spaced pair** and **coincident pair**. Both involve using two microphones, preferably identical. For a **spaced pair**, the mics are positioned pointing at the source, with a spacing of between a half and a third of the width of the sound source being recorded. **Coincident pairs** (or XY) are two microphones placed with their capsules next to each other, at a 90 degree angle from one another. Coincident pairs provide better mono compatibility (which can be important for songs played on the radio).

SPACED PAIR (side view)



Q (front/back view)



COINCIDENT PAIR (side view)



Q (front/back view)



Sometimes snare drums are miked from above and below, as the rattling snare sound comes from the bottom of the snare drum. If two mics are being used on the snare, then often the bottom mic needs to be put "out of phase" when mixing, as they are facing opposite directions. Most mixing desks and computer recording programs have a button for changing the phase of a channel.

Obviously each mic should be recorded onto a separate channel, and generally no processing is used on drum recordings until the mixing stage.

As with all the other instruments, doing test recordings to check the sound of the mics is very important, as moving them a little bit can make a world of difference.

Lastly, some engineers like to put one or two mics up further back in the room and record the ambience and natural reverb from the room. If you wish to try this, again condenser mics are the better choice.

RECORDING KEYBOARDS

If you are recording a typical band who have a keyboard player, then you would normally take the stereo outputs from the keyboard through a pair of DI boxes into the mixer or recorder. Keyboards generally produce sound in stereo so it makes sense to record it this way (assuming you have the tracks).

If you are recording/producing a track that is written on a computer (such as dance music) then the keyboards will probably be connected via MIDI, and so it makes sense to record the MIDI information (see next chapter), although you can still record the audio using DI boxes if you wish.

Hammond organs have their own special amp and speaker called a Leslie, which has rotating speakers to give a special sound. Therefore, as with guitars, you should use microphones to record the speakers.

BEHRINGER ULTRA-DI Active Direct inject box model DI100

TOP



SIDE



RECORDING DJs

If you need to record a DJ, then generally you would record the output of the DJ mixer. As with a keyboard, you would simply take the stereo output from the mixer through a pair of DI boxes into the recording mixer.



RECORDING ENSEMBLES

Apart from the traditional guitar band recording scenarios described above, you may need to record more traditional musicians such as choirs, orchestras, brass bands etc.

As there are many different ways of recording ensembles, here are a couple of general tips to get you started.

Generally ensembles are recorded as a whole, and most of the time you wouldn't put a microphone on every instrument/singer as balancing the mix would be a nightmare. The more common techniques involve putting 2 or more microphones in front of the ensemble pointing at them. If there is a conductor, microphones are usually positioned over him/her as in theory that is where the best sound will be heard.

Normally condenser microphones would be used due to their sensitivity and frequency response (as often ensembles cover a wide range of volumes and frequencies).

You can use the spaced pair or XY techniques positioned above the conductors head, or one of the techniques below;

ORTF near-coincident technique

A pair of cardioid microphones at an angle of 110°, spaced about 17cm apart.

NOS near-coincident technique

A pair of cardioid microphones at an angle of 90°, spaced about 30cm apart.

Decca tree

Three omnidirectional microphones arranged in a triangle pattern, with the central microphone being forward of the others. Typically, the two rear microphones are spaced about 140cm apart, and the central microphone is about 75cm in front of them. Because of the third mic in the middle, the Decca tree has a clearer centre image than the other techniques.

MIXING & EFFECTS

Once you have all the parts recorded, whether you recorded them simultaneously or one after another, the next step is to mix them together.

This one of the most creative aspects of recording, when you can apply EQ and effects to change how the parts fit together.

Whether you are using a traditional analogue mixing desk, a digital mixing desk or a software mixer in a sequencer, all are split into channels, and each channel will have most of the following controls;

MACKIE 1642 VLZ pro compact mixer



Gain – adjusts the level of whatever is coming into the channel.

High Pass Filter – a switch to remove low frequency rumble from the sound.

EQ – equalisation is usually split into two or more bands, each covering a different frequency band, allowing you to boost or cut those frequencies.

Aux Sends – allow you to adjust how much of the channel you route to the effects units – for example you may have a reverb unit plugged into aux send 1, so turning up the aux send 1 control on a channel sends some of that channel to the reverb unit.

Solo – enables you to just hear that one channel on its own.

Mute – whilst this button is down that channel will not be heard.

Fader – allows you to set the relative level of the different channels against each other.

Routing – some mixers have groups which are essentially sub mixes. The routing buttons allow you to send the channel either to a group or straight to the main mix. For example, you could send all the drum channels to a group, and this would enable you to use the group fader to set the level of the drums relative to the rest of the mix.

Here are some general principles about mixing. You can refer to the [Want to know more?](#) section for further information.

- 1 Never mix on the same day as recording – your ears will be tired, and you will have very little perspective on what you are trying to achieve. Start afresh the next day.
- 2 Zero the mixer – always start any mix with all mixer controls at zero, and all effects turned off. This avoids problems associated with sounds coming from strange places, and helps eliminate problems.
- 3 Gain structure – working on one channel at a time, put the fader at 0dB, then set the input gain for the channel so that the channel peaks at about 3dB (with an analogue mixer, or –6dB with a digital mixer). This ensures that when you mix, you have the best chance of avoiding both noise and distortion.
- 4 Surgical EQ – the next step is often removing unwanted frequencies. For example, you won't want loads of bass frequencies on your acoustic guitar, as it will sound muddy and get in the way of the bass guitar and kick drum. By the same token, some instruments may have harsh frequencies or too much treble, and so EQ can be used to take this off.
- 5 Always mix in context – there isn't much point spending hours getting the kick drum sounding great on its own, to find that when you bring the rest of the track in the EQ you've set is all wrong. Spend a bit of time on each part individually, then bring in the rest of the track and adjust EQ whilst the whole track is playing.
- 6 Louder isn't better – try to avoid the situation where you keep on turning channels up. Keep an eye on the mix level meters, as it's all too easy to end up with them in the red all the time.

When mixing it pays to be aware of what frequencies each instrument or part generates and how they all fit together. The best mixes are the ones in which you can hear all the parts clearly and nothing is overlapping anything else. Sometimes surgical EQ is needed to remove parts of one channels' sound in order to make it sit better in the mix, even though on its own it sounds great.

EFFECTS AND DYNAMICS

Once you have each channel EQ'd and sounding good, it's time to look at dynamics processing. Dynamics in music describes the difference between loud and quiet, soft and harsh. When recording music, dynamics can play a different part, for example if the singer moves around whilst recording a vocal the recording will have a varying level. We can use dynamics processing to help control dynamics.

Compression evens out the level of a recording, making the quieter sounds louder. It reduces the dynamic range of a recording.

Compression is one of the most used processes, especially in modern rock/pop recordings as the tendency now is 'louder is better'. As a general rule, compression is used on vocals to keep them up front in a mix. It is often used on acoustic guitars to keep their level more even, and on drums to keep them powerful.

For more information on compression settings, look in the [Want to know more?](#) section.

Another popular form of dynamics processing is the Noise Gate, which exists to remove sound if it is below a certain level.

Noise gates help eliminate background noise off channels, and tidy up a recording so that only the sounds you want on there can be heard.

Dynamics processing is usually placed as an insert effect, which means that it is connected into the signal flow of a channel and hence all the sound from that channel goes through the effect.

Other effects (like reverb and delay) are generally placed as send effects, which means that they are connected to an aux send, and you can therefore adjust how much signal from each channel is sent to the effect.

There are a wide range of effects available. Reverb is probably the most popular and perhaps the most important. Reverb emulates acoustic spaces, from rooms to halls to caverns. It is used to give a sense of space to a recording, and can help make an overdub recording where all parts are recorded separately sound more cohesive. Generally, the slower the track the longer reverb you might use, but it really is down to taste. Avoid using too much reverb, you don't want it to sound like the Grand Canyon.

OTHER EFFECTS INCLUDE;

Delay – this is where a sound is repeated (echo)

Chorus – this is used to thicken a sound, e.g. a guitar

Double tracking – this is when you record two takes of the same part and have them both in the mix. This works especially well with acoustic guitar panned left and right.

Enhancer – this adds extra high frequencies to a recording. Useful for brightening dull recordings.

Distortion/overdrive – mainly used as a guitar effect to get a big saturated sound, but can be used on other parts to good effect.

The most important thing to do when mixing is to reference your mix against commercial recordings in the same style. You should learn to spot effects and dynamics processing in commercial material so that you can apply those techniques to your own work.

THE MASTER

Once you have got your mix ready, the next step is to record it as a master. Normally you would record onto DAT, CDR or hard disk, with the latter becoming the most common.

The process normally involves rehearsing a mix if you are using a non-automated mixing desk (automated mixing desks can be programmed to remember fader movements) to ensure you know when to move faders, then you record the mix onto on the master.

Once it is in two track form as a master, the next and final step before duplication is Mastering.

Mastering is the process of ensuring the mix sounds good on a range of playback systems, organising the tracks into an order, getting gaps between the tracks right and ensuring the overall level of each track is right.

Mastering is generally done by a different engineer to the mix engineer, as it is a different way of listening and working with a track. Mastering studios have expensive monitoring and well designed rooms that enable the engineers to hear exactly what is going on in a track. It is often useful to have another pair of ears work on your tracks, which is why most recording/mix engineers don't do their own mastering. It is possible to do your own mastering, although it's best to err on the side of caution and not do anything too drastic.

Effects such as EQ and compression are often used to get the track to sound polished and loud enough. Multi-band compression is often used – this is where the sound is split into 3 or more frequency bands (bass, middle and treble) and each is compressed separately. This allows you to raise the volume of the track more than is possible with conventional compression.

Once the effects have been added (if necessary), then the tracks are put into order and fades and gaps between tracks prepared. Generally two seconds is the normal gap between tracks. The order the tracks are in is very important on an album, and it is worth spending some time over. Try listening to a few commercial albums and try to figure out why the tracks are in the order they are. If you are preparing a demo to send to a record company, make sure the first track is an attention grabber.

Lastly, the level of each track compared to the rest is adjusted to ensure that the dynamics of the album work and it is loud enough on the whole.

Once you have completed all the editing and mastering, the tracks are recorded onto a CDR or DAT for duplication (see Chapter 4).

Remember that it takes years of practice to be a good engineer. Equipment is by no means everything, but knowing how to get the best out of what you have is.

WANT TO KNOW MORE?

LINKS

New Deal for Musicians has no responsibility for or control of the following sites. The inclusion of any site does not necessarily imply New Deal for Musicians approval of the site. To access any of the sites please type in the address into a browser or search using keywords from the name of the link.

www.dfes.gov.uk/ukonlinecentres Find Internet access that's close to you.

MORE INFORMATION AND LINKS

- www.futuremusic.co.uk**
Specialises in modern music technology, reviews, tips and techniques. Occasionally will contain competitions. Links to equipment manufacturers. Second hand gear listed.
- www.soundonsound.com**
More general studio equipment and techniques. Reader's ads for second hand gear. The "Search" for articles from past issues is very useful.
- www.computermusic.co.uk**
Good info on the basic computer based set up for music. Tutorials on music software. Reviews of readers demos.
- www.remixmag.com**
News, reviews, features and links to other sites. Includes features on equipment aimed at djs and remixers.
- www.dv247.com**
Digital Village – suppliers of recording equipment

INFORMATION ON RECORDING TECHNOLOGY

- <http://penny100.home.mindspring.com/info/timeline.htm>**
A timeline of audio/video technology
- www.hammersound.net/audiobasics/audiobasics.html#DA_Theory**
The basics of digital audio explained
- www.crownaudio.com/mic_htm/tips/mictip2.htm**
Microphone pickup patterns and general information
- www.scottymoore.net/studio_sun.html**
History of Sun records and the Memphis recording service
- www.bbc.co.uk/radio/onemusic**
- www.discogs.com**
Discographies for any artist or remixer.

MAGAZINES

- Future Music**
All the latest hi tech equipment is reviewed, plus studio and remixing tips.
- Sound On Sound**
More general studio technology features. Good tips and techniques from professionals.
- Computer Music.**
Magazine specifically for making music with computers. Usually has a free CD with samples and software.

BOOKS

- Last Night A DJ Saved My Life**
Frank Broughton and Bill Brewster
Publisher : Headline
ISBN : 0747262306
The history of the DJ. Their rise to prominence in today's music scene. Covers most dance music genres.

MORE TASKS

- 1 With a budget of £3000, make a shopping list of the equipment you would buy to set up a basic recording studio, including reasons for your choices.
- 2 Record a vocal line or rap to go over a backing track – it doesn't have to be someone with a great voice, your task is to make it sound as good as possible. Answer the following questions about the process:
 - a) What microphone would you select?
 - b) What is the ideal positioning for the vocalist to be from the microphone?
 - c) What effect would you use to reduce changes in volume produced by the singer?
 - d) What other effects would you be likely to use on the recorded vocal track?
- 3 You are recording an electro-acoustic guitar. What options do you have for how you will record the sound? What are the advantages and disadvantages of these?
- 4 What is "true stereo"?
- 5 You are recording one track for a band who have no previous recording studio experience. The band have a drummer, rhythm and lead guitarist, bass player, keyboard player and lead vocalist. They also want to use a sample string passage and to do backing vocals. Write a plan which sets out what activities will be involved and in what order, with an indication of timings e.g. Setting up and miking up drum kit – 40 mins

**MUSIC
TECHNOLOGY
EQUIPMENT &
SOFTWARE**

WHAT IS IT?

This chapter is about music technology equipment and software and follows on from the recording principles outlined in chapter one. Music technology generally refers to computers and music.

We will start with an overview of the hardware – different computer platforms, a bit of history of music technology and advice on choosing the right equipment.

We will look at software – from recording software to software synthesizers and samplers to software effects and plug ins.

We will look at technology, in terms of using it to do the job and getting the best out of it.

We will finish off by looking at troubleshooting, giving you some simple advice on problems and solutions.

WHY DO I NEED TO KNOW ABOUT THIS?

The days of the grand recording studio with a control room like Starship Enterprise and big tape machines are passing. The majority of recording now is on a computer, and a lot of musicians use computers and music technology as an aid to composition and arranging.

Whether you wish to become a programmer, remixer, producer, engineer or even a musician, you will come into contact with music technology and need to understand it. Embrace the technology, as it can make your life easier, and can be an aid to the creative process.

One of the biggest reasons for the conversion to music technology is price. In the last 10 years the price of computers compared to their speed and capabilities has come crashing down. This, coupled with the abilities of modern software enable the software to replace what was expensive studio equipment. This means that the cheapest way of getting into recording and production is through owning a computer and some software, whereas before you would need a small fortune to buy just a mixing desk.

Never before has it been easier to record on the move. You can have an entire recording studio in your bag on a laptop, and only carry a mic and some headphones to interface with the outside world. You could be writing your best selling album whilst sat on the beach!

YOU MUST HAND IN YOUR WORK BY _____ TO _____



HOW LONG
should this assignment take?

Every person works at his/her own pace. As a guide, spend 2 hours reading and making notes, another 3 hours to write your answers and a further hour to discuss them with your MOLP tutor.



HOW
will I be assessed?

Your tutor will assess your work. He/she will give you feedback on how you have done. If you have not completed the work, you will be given the chance to do further work to pass this assignment.



WHAT
do I do now?

Read the TASKS section below to get an overview of this project. Then read the NOTES AND GUIDANCE section for help. Carry out the TASKS.

TASKS

1 Tick the boxes below to show what music technology experience you have already

- I have a computer
- I own sequencing software
- I know what MIDI stands for
- I have access to a computer based studio
- I record audio with my computer

2 If you have your own equipment, list it here

3 Write a definition of sequencing in the box below

4 In the table below, describe two important computer components, and compare them to hardware equivalents in a typical recording studio

Component	What it does	Comparison to typical studio equipment

5 Complete a specification for a music PC in the table below. You can find out what sort of components music PC manufacturers use by looking at their websites and reviews of their computers.

Component	Manufacturer	Model	Price	Reason
e.g. Processor	Intel	Pentium IV 3GHz	£127	Intel Processors are used in most music PCs
Processor				
Motherboard				
Memory				
Graphics				
Card				
Hard Drive				
CD Drive				
Sound Card				

6 Sequencers have different features. This task is to choose a sequencer that meets your needs.

What would you need a sequencer to do?

Which sequencer would you choose?

Explain why you would choose this sequencer.

7 Explain the steps involved in making an audio recording on a sequencer. Your answer can either be specific to a certain sequencer, or more general.

8 Explain what automation is and why it is useful when mixing a song.

9 Label the channel strip below, detailing what each control does.

10 Answer the following questions, circling whether each is true or false.

Sequencers and audio editors are the same True False

Native Instruments Battery is an effect plug-in True False

Any software synth will work on any sequencer True False

Samplers enable playing of audio recordings with a keyboard True False

11 For the following questions you will need access to a computer with a sequencer on it and an audio input. Tick off these tasks as you complete them.

- Switch on the computer and load the sequencer
- Set up a channel to record audio
- Set a recording folder, giving it an appropriate name
- Connect an audio input to the computer – e.g. a guitar, mic or keyboard
- Record 4 bars of audio
- Put a reverb plug-in on the audio channel

12 Answer the following questions, circling whether each is true or false.

It is faster to put all your files in the root directory of the hard drive True False

All audio files for a song or project should be kept together in a folder True False

External hard drives make backing up easy True False

A DVD disc holds 7.34 GB of data True False

13 In the box below, explain what advantages computer recording studios have over conventional recording studios.

THE HARDWARE

Hardware is the physical pieces of computer equipment that you use. The central piece of hardware in a music technology setup is a computer. Nowadays this can be either a PC or an Apple Macintosh, and there are numerous different types of each available.

TYPES OF COMPUTER

Either a PC or Mac can be used for making music, and users are divided into two equal camps. Generally the same software is available for both. There are a variety of reasons why some people prefer Macs over PCs and vice versa, but the main reasons are below ;



Macs

- Built from the ground up by one manufacturer, meaning that all components are compatible
- Apple now own Emagic and no longer support PC's. Therefore if Logic is your sequencer of choice you need a Mac in the future
- Look good
- Can't really be upgraded

PCs

- PC's are cheaper if you build your own, as there are many different manufacturers making components, the competition keeps the price down
- Easily upgradeable and can be built fairly easily
- Massive range of software available
- Due to the wide variety of components, there can be compatibility problems which can be a nightmare to resolve

WHAT COMPUTER DO I NEED?

A few years ago the PC wasn't thought of as reliable enough for professional use for music, but there are now many specialist music PC retailers who provide pre-configured packages complete with technical support;

Red Submarine
Carillon
Inta Audio
Digital Systems
Digital Village

Since the arrival of these companies, PCs are more common in professional studios.

Deciding on what sort of computer to buy can be difficult. If you are intending to make music on a computer, then be wary of buying one from a general computer shop. It is far better to buy one from a specialist retailer who can give you appropriate technical support.

The choice between Mac and PC is really down to preference, and that preference now extends to choice of sequencing software. If you want to use Logic, get a Mac. Other than that, there are no rules.

Once you have decided between Mac and PC, then you need to look at what you will be doing with the computer. If you want to record lots of audio, then you need a big hard drive, but can afford a slower processor. If you wish to use the computer to replace the entire studio and want it to make sounds as well as record them, then the processor speed becomes more important.

A general rule is not to buy the top of the range, as in a short time it will have halved in price.

MIDI

MIDI (Musical Instrument Digital Interface) is a universal standard for keyboards, drum machines and synthesizers to communicate.

Sequencing is the recording, editing, storing and playing back of MIDI information. It is different from conventional tape recording as no sound is recorded, only information about what notes are being played.

EDIROL UM-2 USB MIDI Interface



THE CHOICE OF MAC

Apple Mac computers come in 3 forms – laptops (iBook and Powerbook), all in one formats (eMac and iMac) and desktops (Power Mac G4 and Power Mac G5). The cheapest are the eMac which are around £500 and the iBook at around £800. The most expensive, and the ones most used in recording studios are the Power Mac G5's, which start at £1500 (plus monitor).

THE CHOICE OF PC

Choosing a PC can be more complicated. You could buy from a specialist retailer, for instance Phil Rees (www.philrees.co.uk) supply a budget music PC for £500 which is capable of most recording tasks, or at the other end of the scale Inta Audio (<http://inta-audio.co.uk>) supply the Elite workstation for £2000.

THE OTHER CHOICE

The other choice is to build your own or buy a PC from a normal retailer, specifying certain components. You can do this simply by researching what music PC retailers use for their machines, and then buying these components elsewhere. Be aware that the technical support from a normal PC retailer will be poor compared to the music PC retailer.

As a general rule of thumb, the following manufacturers are most commonly used for music PCs:

COMPONENT (Manufacturer)

MOTHERBOARD (Asus)

Ensure it has an Intel chipset

PROCESSOR - CPU (Intel)

The newest processors cost a lot more than ones that are 6 months out of date, so pick one of those

MEMORY (Crucial, Geil)

Ensure you buy the correct memory for your motherboard – the Crucial memory website will tell you what you need for your computer

HARD DRIVE (Seagate)

The Seagate Barracuda is a popular drive for reliability and noise

GRAPHICS CARD (Matrox, ATI)

Some support more than one monitor, which is great for music technology

THE SOUND CARD

Once you have decided on the computer system, you will need a soundcard to go with it. Most computers have built in sound, but it is generally of a low quality and needs to be replaced by a sound card or audio interface.

Some sound cards are installed inside the computer, and are called PCI cards. Others are external and connect either to a PCI card inside the computer, or via a USB or Firewire cable. The ones that connect with USB or Firewire are the most flexible as they can also be used with laptop computers, whereas PCI cards can't.

Again your choice depends on what you are going to be doing with the computer. Below are some examples:

TYPE OF WORK	OTHER EQUIPMENT	TYPE OF SOUND CARD	EXAMPLES
Recording bands	None	Needs to have many inputs for microphones, but not many outputs as mixing will be inside computer	MOTU 896HD (firewire) £1000 – 8 high quality mic inputs and 8 outputs
Recording bands	Mixing desk & effects	Needs to have many inputs and outputs at line level, as computer is just replacing tape recorder	M-Audio Delta 1010LT (PCI Card) £200 – 10 inputs and 10 outputs (line level)
Producing dance music	None	Need one or two good quality inputs and outputs to record vocals or single instruments	M-Audio Audiophile 2496 (PCI Card) £80 – 2 inputs and 2 outputs
Producing dance music	Mixing desk & effects	Need one or two inputs and many outputs for mixing outside computer	M-Audio Firewire 410 (firewire) £250 – 4 inputs and 10 outputs

TOP (black) : MOTU 896HD



M-Audio Audiophile 2496



OTHER HARDWARE

You may also need a **MIDI interface** so that you can connect MIDI equipment such as keyboards and synthesizers to your computer. Some sound cards have MIDI interfaces built in.

If your sound card doesn't have MIDI, then you can buy a MIDI interface that connects to a USB port on your computer for around £40, such as the Edirol UM2-C.

If you don't already have a keyboard, you will need a **MIDI controller keyboard** so that you can play the sounds the computer software is generating. This is basically a keyboard with no sounds built in that just sends out MIDI information. These start at around £70 for one with full size keys.

You will also need some kind of **monitoring system**, as all studios do. You can either get an amp and speakers or active monitors, which are speakers with amplifiers built in. These start at £150. Don't be tempted or persuaded to buy computer speakers – they are not of a good enough quality for recording music. If you are on a low budget, then either use your hifi or buy some good quality headphones.

HARDWARE CONTROLLERS

If you are intending to mix with your computer, then you may miss the hands on feel of a mixing desk with faders. You can buy hardware controllers that provide 8 or more faders to control the virtual mixer on your computer. This can provide the best of both worlds, as it gives the hands on feel that is missing from computer music.

Emagic logic control



DSP CARDS

Finally, there are now PCI cards that can be installed in your computer to provide extra processing power. These DSP (Digital Signal Processing) cards run their own effects and software synthesizers and some provide support for other manufacturers. There are currently two main cards, the TC Electronic Powercore, and the Universal Audio UAD-1.

UAD-1 DSP CARD & POWERED PLUG-INS



HOW DOES IT CONNECT TOGETHER?

Once you have assembled the equipment, connecting it together is the last hurdle. The diagrams overleaf give indications of typical computer music studios.

MIDI

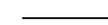
arrow shows OUT to IN



USB



FIREWIRE



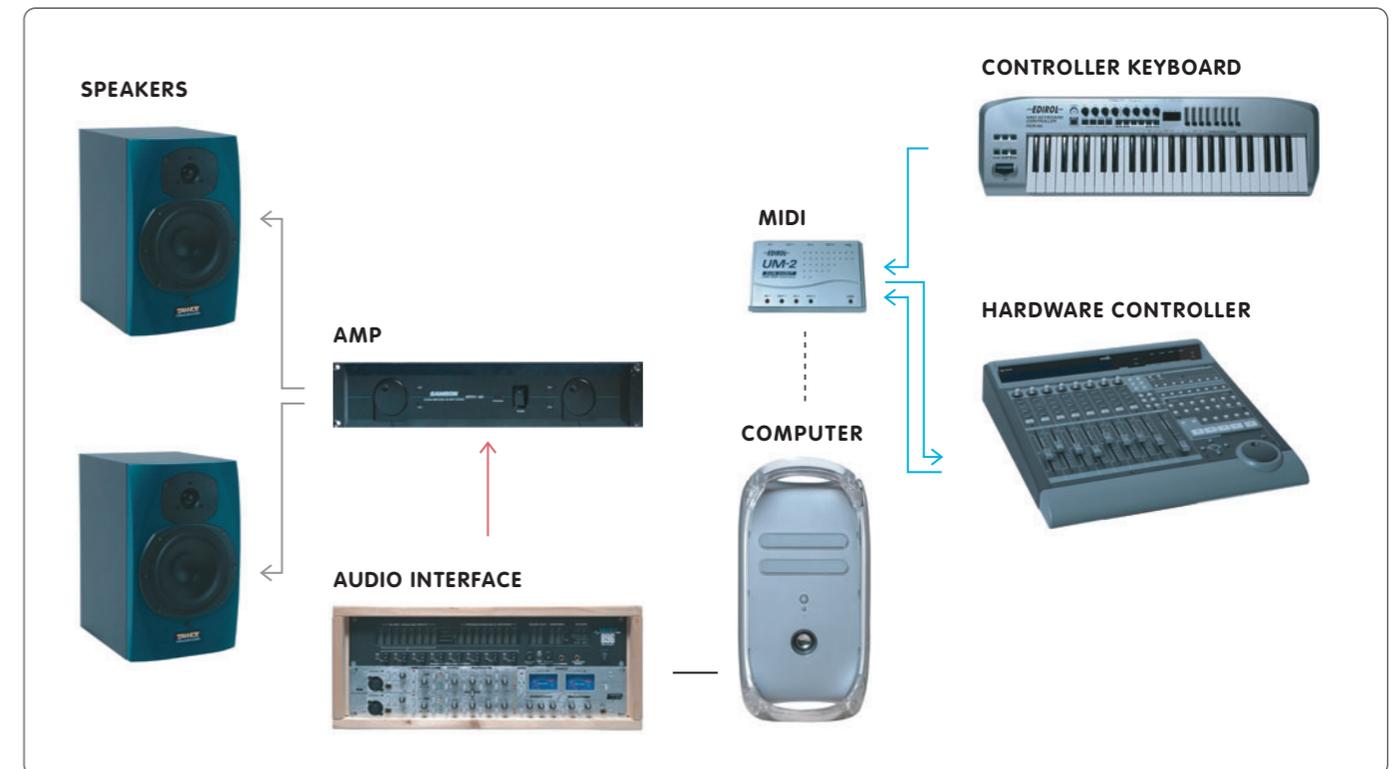
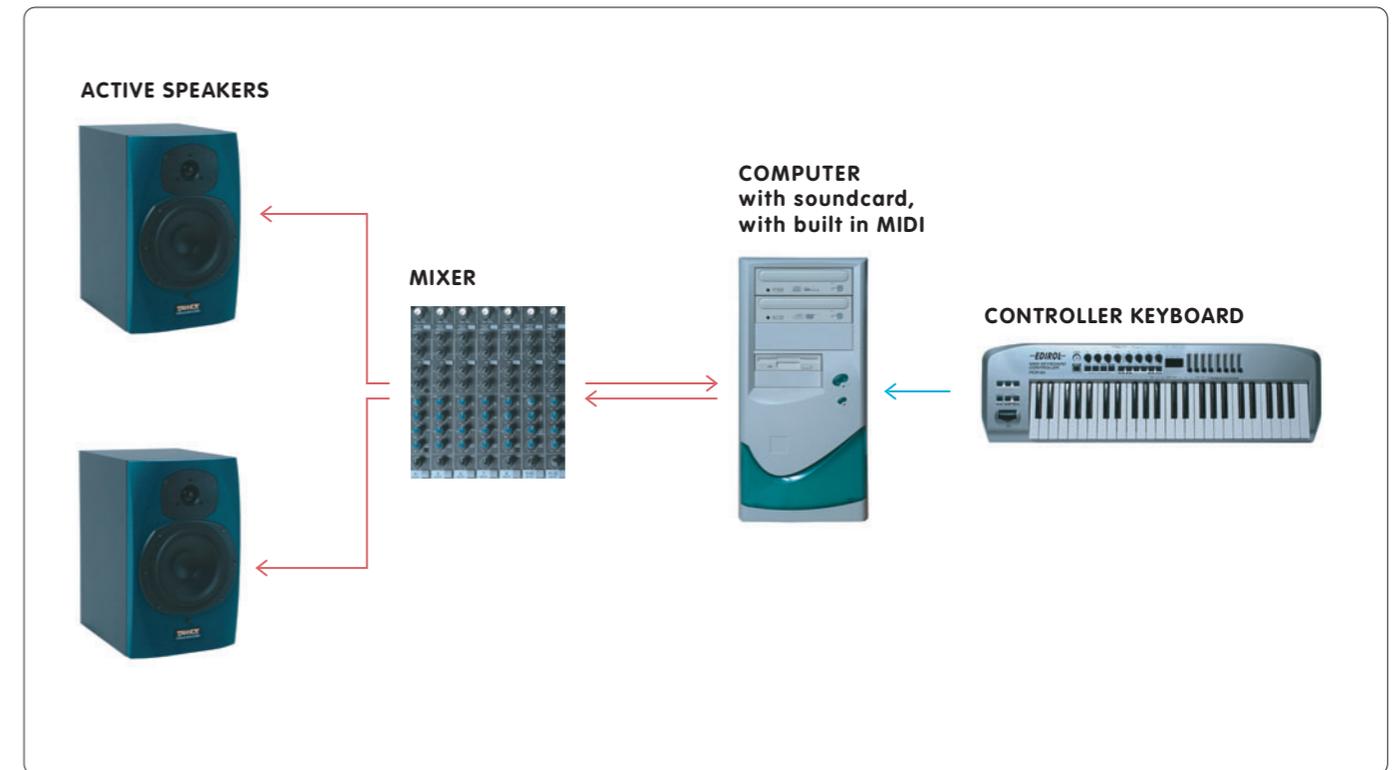
AUDIO

arrow shows OUT to IN



SPEAKERS

arrow shows OUT to IN



SOFTWARE

RECORDING SOFTWARE

Once you have your hardware in place, the next step is to decide what software you want and need. There is a wide variety of software available, with an equally wide price range.

Types of software;

- Sequencer
- Audio Editor
- Software Instrument
- Software Sampler
- Plug-in Effects

The most important bit of software for music technology is the Sequencer.

SEQUENCERS

There are many sequencers on the market. Some are better for working with audio, some better for MIDI, some better for video etc. The most common are listed overleaf.

Steinberg Cubase SX



Emagic Logic



Product	Platform	Notes
Emagic Logic	Mac (no future support for PC)	Good for audio and MIDI
Steinberg Cubase SX	Mac & PC (most users are PC)	Good for audio and MIDI
Steinberg Nuendo	Mac & PC	Good for video and audio
Digidesign Pro Tools	Mac & PC (most users are Mac)	Good for audio and surround sound
Cakewalk Sonar	PC	Needs own hardware
MOTU Digital Performer	Mac	Good for video and audio
Propellerheads Reason	Mac & PC	Good for creating music designed as an all in one studio

Most of the sequencers listed come with some software instruments and plug-in effects, so you have all you need to get started. Look at some of the websites listed in the Want to know more? section for more information.

On a professional level, most recording studios run Pro Tools. This sequencer is mainly designed for dealing with audio, and has become a standard replacement for tape recorders.

At a semi-professional (and professional) level, the two main sequencers are Logic and Cubase.

Sequencers all have similar features and operate in a similar way.

Transport controls

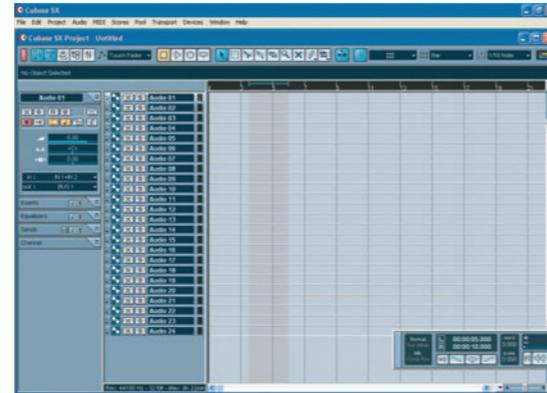
which emulate the Play, Record, Rewind, Stop etc on a tape machine.

Arrange Page

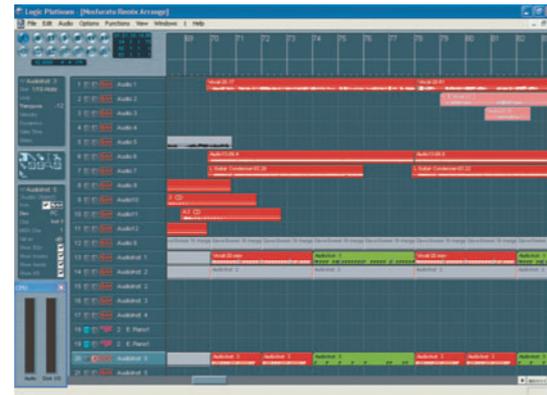
which is where the arrangement for the song is created. This is split into lanes, tracks or channels, which resemble tracks on a multitrack tape recorder. The difference with most sequencers compared with tape recorders is that the amount of tracks you can use is only limited by the power of the computer running the software.

Arrange page samples

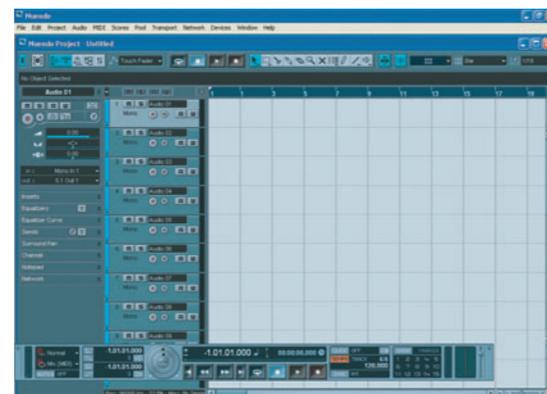
Steinberg Cubase SX



Emagic Logic



Steinberg Nuendo

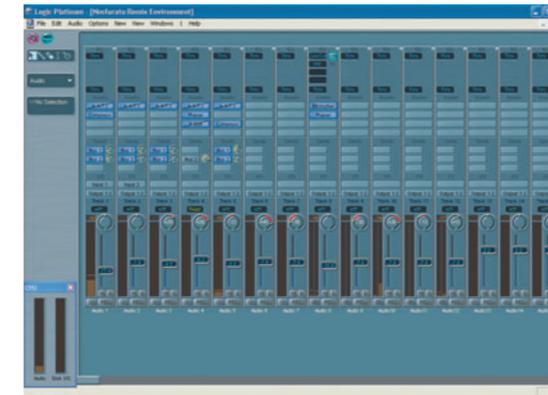


Mixing page samples

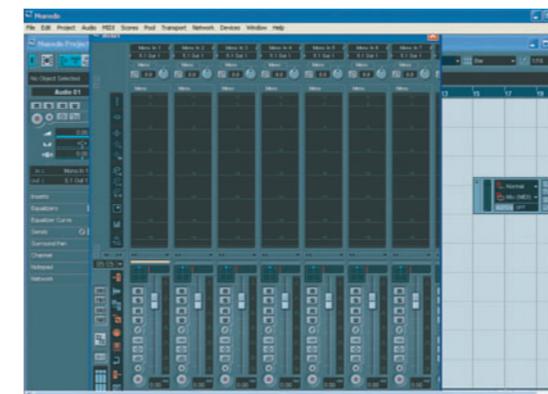
Steinberg Cubase SX



Emagic Logic



Steinberg Nuendo



Mixer

each track has a corresponding channel in the mixer page, which resembles a hardware mixer.

Editing

most sequencers have a few MIDI editing pages and an audio editing page, in order to fine tune recordings and zoom in on them.

The general principle of recording with a sequencer is to open a new blank song, set up a channel on the arrange page for either a MIDI or audio input, tell the computer where to store the recording, set the Tempo (speed of song) and hit record.

ARRANGE PAGE

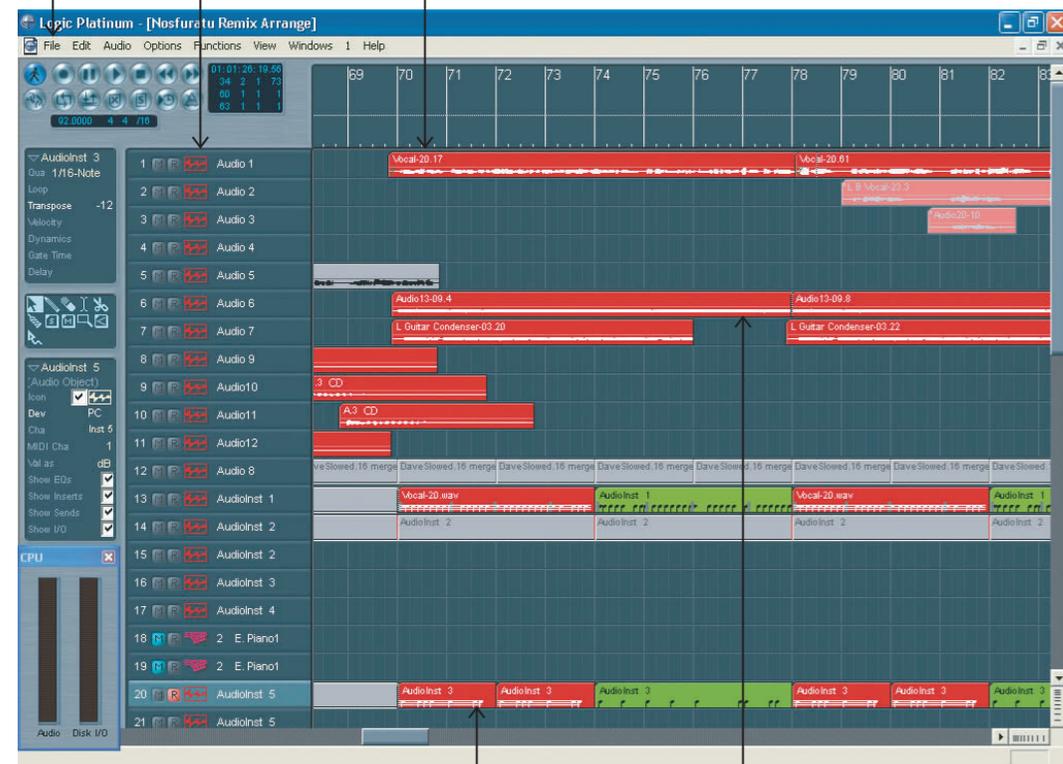
The arrange page is a time based display, with the start of the song on the left and the end on the right. Each thing you record is called a Region and is represented by a coloured box on the arrange page. This can be moved around, cut, reversed etc as you wish. The arrange page normally has a grid which relates to the tempo and time signature of the song, so you can easily move things around in time.

The lines on the regions on the screenshot are displaying Automation, which is where you program the sequencer to remember your mix, so the lines could be indicating where the channel level changes, for example.

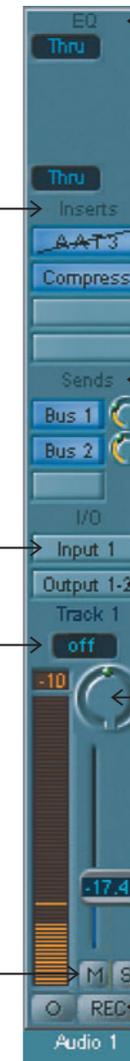


Emagic Logic

MENU **TRACKS** **RULER** showing bars and beats, with time left to right



MIDI REGION **AUDIO REGION**



EQ
Clicking here will open an EQ menu

Insert Effects
Clicking here will open a menu of effects you can load as an insert effect on this channel (internal and plug-ins)

Send Effects
Clicking here will allow you to send some of the channel to a send effect

Audio Input
Clicking here chooses which audio input is assigned to the channel

Automation
This is where the sequencer remembers fader movements etc, so the mix can be repeated

Audio Output
Clicking here chooses which audio output the channel is assigned to

Pan
These controls all function the same as a hardware mixer

Fader

Mute & Solo

Record
This control "arms" the channel so it is ready to record from the assigned audio input

New channels can be added for more tracks, software instruments can be assigned to tracks so that sound is generated by the software, tracks can be routed to external MIDI devices, video can be imported to write music along to, the list goes on.

It is not practical to cover the ins and outs of operating each sequencer within this workbook, so please refer to instruction manuals and the Want to know more? information at the end of this chapter.

AUDIO EDITOR

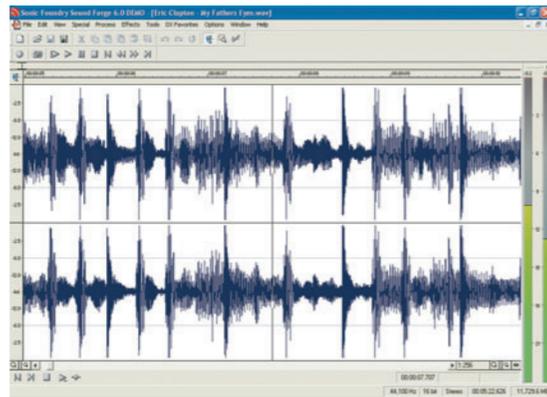
Another variety of recording software is the Audio Editor. Audio Editors primarily exist for editing audio files, but can also be used for recording and playback. Below are some of the more popular choices.

Product	Platform	Notes
Steinberg Wavelab	PC	Good in built surround facilities and CD/DVD burning
Sony Sound Forge	PC	
Adobe Audition (was Cool Edit)	PC	Able to record and playback multi channel audio burning
Bias Peak	Mac	
TC Works Spark	Mac	

Steinberg Wavelab



Sony Sound Forge



The typical features of audio editing software are;

- Editing** - cut, paste, reverse, level change etc
- Effects** - built in effects and ability to use plug-in effects
- Mastering**
- Analysis**
- CD/DVD burning**
- Recording**
- MP3 Encoding**

SOFTWARE INSTRUMENTS AND SAMPLERS

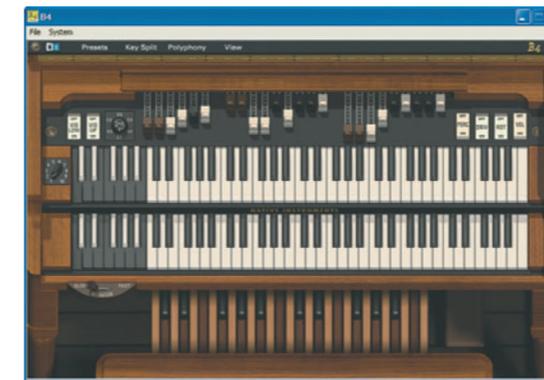
You can now buy software that emulates, or 'pretends to be' a synthesiser or sampler. Software instruments come in a few standards. The most common standard being VST (Virtual Studio Technology) instrument and plug-in, which was invented by Steinberg. Most applications support the VST standard, except Pro Tools (although there are "wrappers" available that can enable them to work).

The newest and second most common standard is the Audio Unit (AU) standard, which was developed by Apple for their Mac computers. Therefore if you are a PC user, your instruments will be VST instruments.

Most sequencers come with some software instruments that can be used straight away. Cubase SX comes with the "Universal Sound Module" that contains all sorts of sounds, as you would expect from a keyboard.

Most software instruments have similar controls, and the ones that emulate real instruments, such as the Native Instruments B4, have controls that replicate the emulated instrument.

Native Instruments B4



Software instruments are played with a MIDI controller keyboard, and most can either run on their own, or within a sequencer. Some can be quite intensive in their use of the computer power, so you may only be able to run a couple at a time.

Software samplers are based on the same principle as software instruments, to replace the hardware. The beauty of software samplers compared with their hardware equivalents is that the screen on a computer is a lot larger and more capable than the screen on a sampler. This makes editing of the sample (which is an audio recording) easier as you can see the waveform.



As with the software instruments, some sequencers come with their own software samplers, such as Logic's EXS24 sampler. They too come in a variety of formats.

PROPELLERHEADS REASON

Reason is a different kind of software package that integrates a basic sequencer with software instruments, samplers and effects in a virtual rack.

It comes complete with samples and instruments and is ready to create music. It visually emulates a studio, so you have to move virtual patch leads to connect instruments to the mixer etc.

Reason has become very popular as a compositional tool, especially for electronic music, as it is very quick to produce results.

PLUG-IN EFFECTS

Plug-in effects follow the same principles as software instruments, in that they are software emulations of hardware devices.

The most common plug-in standards are VST on both PC and Mac, DirectX on the PC and Audio Unit on the Mac.

Some plug-ins are designed to emulate hardware effects units, and this is more common with the ones that run on DSP cards such as the UAD-1. Some plug-ins are designed to make recordings better, the Antares Auto Tune being a very popular effect that can put a singer in tune. Other plug-ins are simply there to mess the sound up as much as possible, and everything in between.

As with the software instruments, free and shareware plug-ins can be found on the internet, again look at the weblinks in the Want to know more? section.

Software effect plug-ins have controls that resemble the controls you would get on a hardware effect, so a reverb plug-in would have controls for room size, reverb time, diffusion etc. Generally software plug-ins come with presets that are a good starting point to use.

Effect plug-ins can be used either on individual channels, on groups of channels (busses) or on the whole mix (master bus).

Emagic compressor



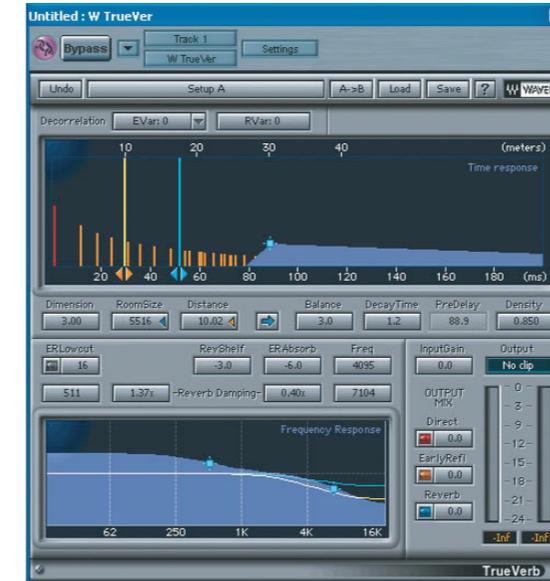
Emagic platinumverb reverb



TC WORKS Native Reverb



Waves TrueVerb reverb



Waves Q10 Paragraphic Equalizer



Emagic evp88 Electric Piano Virtual Instrument



T-Racks mastering plug-in



WORKING WITH TECHNOLOGY

Working with technology can invoke a range of feelings, from joy through to despair. However, it is possible to minimise the despair by being sensible and following some basic tips. Most importantly, if at all goes wrong, keep calm and be logical.

FILE MANAGEMENT

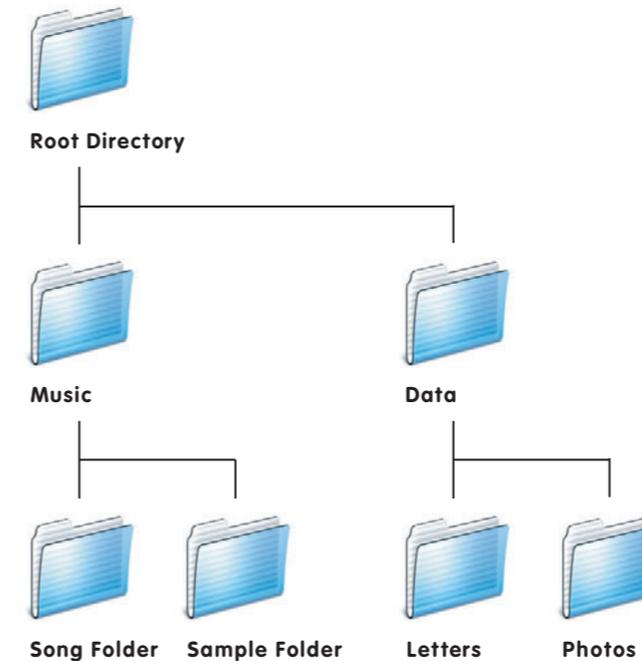
If you use tapes to record onto, whether for the multitrack or master or both, organisation and labelling are highly important. It can be very frustrating to lose the master tape of a project with a deadline looming, or to tape over a multitrack tape because it wasn't labelled – you must have done this with videos, and studios are no different.

If you are using a computer to create music, then file management becomes even more important. There are a few basic facts about computer design that are worth noting.

If you are building or buying a computer for music, then it is a good idea to get two hard drives – one for data and one for programs and operating system files. This is for two reasons; firstly it is easier to backup as all data files are on one drive, secondly it is faster for the computer to have the program files separate to the audio and data files, rather than on the same drive.

When organising files on a computer it is better and faster to have a tree structure to your files than to have loads of files and folders in the root directory.

This also makes it easier to backup files, as they are all within one folder.



BACKUP

Once you have mastered the art of file management, this will make backup easier. There are several choices when it comes to backing up, but whichever you choose, ensure you do choose one! It is a hard lesson to learn when a hard drive decides to stop working and you have all your work on it. Backup, and regularly.

CD-ROM

CD-ROM's are probably the cheapest form of backup. The problem with using a computer to record audio is that very quickly one song can take up a CD-ROM's worth of data or more.

DVD

DVDR discs hold 4GB (4000 MB) of information, so you can fit 10 × 5 minute × 16 track songs on a DVD. DVD discs are more expensive, and not all computers have a DVD burner.

Hard drive

A more preferred and easier form of backup is to use an external hard drive, connected via USB or Firewire. External hard drives cost £70 for an 80GB drive, enough for 200 × 5 minute × 16 track songs. See the weblinks in the Want to know more? for information on backup software.

COMPUTER MAINTENANCE

Computers need looking after in order to work well. Assuming the setup works well when purchased or built, then keeping it running isn't too hard.

Don't install loads and loads of software in one go. Install one package and check everything still works before installing another.

If it can be avoided, don't use your music computer for internet surfing. When you are online your computer can be exposed to viruses and other bugs.

Keep programs and drivers up to date. It is a good idea to check the websites every now and again and download any updates. Updates are often released to help with problems that may have been found, or solve conflicts.

Defragment hard drives. Defragmenting a drive sorts out the information into a useful order making it more accessible.

Don't install new software or hardware when you are about to start an important project. It is better to have a slightly out of date system that works perfectly than an up to date one that crashes every two minutes.

Don't fill your hard drives – ensure they have at least 20% free space, or you can have problems leading to loss of data.

BUYING A COMPLETE SYSTEM

If you are about to buy a computer and sound card etc, then consider buying the whole thing from a dealer (see [Want to know more?](#) for weblinks to dealers). There are several reasons for this, even though you may not get the best price for each component this way.

Firstly, if you buy a computer, a sound card and some software together it is the responsibility of the dealer to install and setup the system and ensure it works.

Secondly, if it goes wrong, you can call their technical support line and, as they supplied and installed it all, it should be easier for them to help you fix the fault. If you have bought the soundcard separately and installed it yourself then the computer supplier wouldn't accept any responsibility for fixing it.

WANT TO KNOW MORE?

LINKS

New Deal for Musicians has no responsibility for or control of the following sites. The inclusion of any site does not necessarily imply New Deal for Musicians approval of the site. To access any of the sites please type in the address into a browser or search using keywords from the name of the link.
www.dfes.gov.uk/ukonlinecentres Find Internet access that's close to you.

MORE INFORMATION AND LINKS

- www.futuremusic.co.uk
specialises in modern music technology, reviews, tips and techniques. Occasionally will contain competitions. Links to equipment manufacturers. Second hand gear listed.
- www.soundonsound.com
more general studio equipment and techniques. Reader's ads for second hand gear. The "Search" for articles from past issues is very useful.
- www.computermusic.co.uk
good info on the basic computer based set up for music. Tutorials on music software. Reviews of readers' demos.
- www.remixmag.com
news, reviews, features and links to other sites. Includes features on equipment aimed at djs and remixers.
- www.bbc.co.uk/radio/onemusic

HARDWARE

- www.dv247.com
Digital Village – studio equipment and computer soundcards etc
- www.microdirect.co.uk
suppliers of computer hardware and software
- www.sub.co.uk
Red Submarine – suppliers of music computers
- www.carillondirect.com
Carillon - suppliers of music PC's
- www.apple.com/uk
Apple – suppliers of Apple Mac computers
- www.dabs.com
suppliers of computer hardware and software
- www.crucial.com/uk
computer memory suppliers – this website has an easy to use memory finder

SOFTWARE

- www.kvr-vst.com
information on commercial, shareware and freeware software for music technology
- www.databaseaudio.co.uk
database of freeware audio software
- www.emagic.de/education/practice/logicfun.php?lang=EN
free download of logic fun (for Mac)
- www.audiomidi.com/master.cfm?CID=20
information on software effect and instrument standards
- www.onlimedia.com/products/smartbackup
backup software
- windows.about.com/cs/dualboot/
information on dual booting a PC

MAGAZINES & BOOKS

- Future Music**
All the latest hi tech equipment is reviewed, plus studio and remixing tips.
- Sound On Sound**
More general studio technology features. Good tips and techniques from professionals.
- Computer Music.**
Magazine specifically for making music with computers. Usually has a free CD with samples and software.
- The Mix**
- Last Night A DJ Saved My Life**
Frank Broughton and Bill Brewster
Publisher : Headline
ISBN : 0747262306
The history of the DJ. Their rise to prominence in today's music scene. Covers most dance music genres.

MORE TASKS

- 1 Put together a specification for a music production setup with a budget of £3000.
- 2 Look at the manufacturers' websites for the following software products:
Steinberg Cubase SX
Digidesign Pro Tools
Propellerheads Reason
There are on-line magazines, free downloads, forums and fix-its and much more.
- 3 Find out what courses are available locally in music technology. What are the hours, fees and qualifications? You don't always need a course to learn, remember you can get a lot from books, magazines, the Internet and other music tech users – but a course does offer structure, facilities and a qualification. Search under www.hotcourses.co.uk or by looking at local college websites.
- 4 Find and read a copy of the following magazines (it's simple and worthwhile!)
Sound on Sound
Computer Music
Future Music
Can you find people who can share the cost with you of buying these every month?

PRODUCTION

WHAT IS IT?

Production is the process of getting a sound recording made. This chapter gives you an introduction to production, including the role of a producer and an insight into different production styles.

WHY DO I NEED TO KNOW ABOUT THIS?

Music production is a critical part of the music industry. Understanding some of the processes by which sound recordings are produced is useful for all musicians and DJs.

YOU MUST HAND IN YOUR WORK BY TO



HOW LONG
should this assignment take?

Every person works at his / her own pace.
As a guide, spend 5 hours reading and preparing for the projects and another 3 hours writing your answers and discussing them with your tutor.



HOW
will I be assessed?

Your tutor will assess your work. He / she will give you feedback on how you have done. If you have not completed the work, you will be given the chance to do further work to bring it "up to scratch". For more details, please refer to your MOLP's own guidance.



WHAT
do I do now?

Read the **TASKS** below.
Then read the **NOTES AND GUIDANCE** section
Carry out the **TASKS**

TASKS

1
a) Look at the credits on an album from your music collection.
Write down the following information:

- Artist**
- Title**
- Producer**
- Engineer**
- Mastering Suite or engineer**

b) Do you own anything else that this producer worked on?
Find out about their back catalogue using the Internet.
Are they associated with a particular scene or label or do they work on a range of styles?

c) Can you hear any common features of their work?
What impact do you think they have in the making of an album?

2 Name an influential producer whose work you admire.
What acts have they been involved with?
Do they work closely with another person?
What genre do they specialise in, if any?
Why do you like their work?

3 Place these activities and the individuals involved into the most likely column of this table.

Rehearsal **running order** **record B.V.s**
tweak instrument levels **Arrangement** **mix engineer**
Session musician **mastering engineer** **programmer**

Pre - Production	Recording	Final Mix / Post-Production

4 Using magazines or the Internet find an interview with a producer. Write down any tips they give and mention the album they were discussing.

5 Tick true or false next to these descriptions of a producer's job. A producer's job is...

To play on the album	True	False
To help decide on overall direction	True	False
To add lots of new parts	True	False
To programme	True	False
To get the best out of the musicians	True	False
To hear good takes	True	False
To own the studio	True	False
To be able to spot "hooks"	True	False
To write the songs	True	False

6 Which route towards being a producer would be your choice? Outline the steps you would need to take and set goals in the order you need to achieve them. Find out the names of nearby recording studios large enough to take on staff, this may influence your choice of route!

7 Mark yourself next to this following list of attributes and skills. How can you make improvements where you score badly? Do you think you need all of the abilities listed here to be a producer?

Attribute or Skill	Mark yourself /10	How can you make improvements?
--------------------	-------------------	--------------------------------

Ability to spot a good tune		
-----------------------------	--	--

Ability to organise		
---------------------	--	--

Communication skills		
----------------------	--	--

Knowledge of what instruments do		
----------------------------------	--	--

Knowledge of recording studios		
--------------------------------	--	--

Calmness under pressure		
-------------------------	--	--

Understanding of different genres		
-----------------------------------	--	--

Musicianship		
--------------	--	--

Knowledge of favourite genre		
------------------------------	--	--

8 Write down a producer who works in each of the following genres. Also choose features that are important in the production for each genre.

Genre	Producer	Important Elements
-------	----------	--------------------

Rock		
------	--	--

Urban Hip-Hop RnB		
-------------------------	--	--

Jazz Country Blues		
--------------------------	--	--

Film		
------	--	--

9 Think about the production of your own material by considering these questions.

How many tracks do you want to produce?

How much time do you need to prepare (for example, rehearsal or pre-production)?

Identify a studio and cost up the studio and engineer time.

10 Produce your own demo or a demo for a local act. Try to work with at least one other musician. Write down some of the important decisions you made and why.

Did you have to change anything in the process? Get feedback from the people you worked with about your input and how you helped them through the recording process.

What can you learn for next time?

Now hand in this worksheet to your tutor. Go to the 'more tasks' section for extra projects.

WHAT IS A RECORD PRODUCER?

A producer is the person who gets the record or CD made! They are responsible for delivering the final sound recording to the client

They bring together the creative, technical and organisational talents needed to get the final master recording. They will have to deal with all the people and problems along the way.

The producer will have the “vision” of how the end result should sound and know how to achieve it, even who will need to be brought in to help. The musical direction and target audience will be clear in the producer’s mind before recording starts.

Whatever the musical genre, the producer’s role is the same. They have to capture a mood and a performance and deliver the songs to the listener in the best way.

If you want to be involved in creating music whilst working with others, but not being in the limelight, then producing could be for you!



WHY DO WE NEED PRODUCERS?

A producer might have a particular area of expertise that will be useful during the recording process, for example, knowing the genre of music inside out.

They may be talented with string arrangements or just give respected, valued opinion in the many decisions that will affect the music.

A producer with a good reputation or proven track record could help an artist to get a deal, secure radio play or even sell more CD’s. There are many instances of a producer having a “purple patch” where everyone wants to work with them and all the releases they are involved with become hits.



WHAT DOES A PRODUCER DO?

A producer helps get the songs, instrumentation and arrangement right before going to the studio, (this is known as pre-production), then directs and encourages the musicians through the recording process. He/she may employ additional musicians.

He/she will help to choose sounds that fit together and suit the project.

He/she will take care of the technical requirements of the recording or work with an engineer to do this.

He/she will oversee the final mix and mastering stage up to delivery of finished product.

It is the producer's responsibility to make this happen within the budget and to meet the deadline set by the record company, or whoever is paying the bill.

The 5th Beatle. George Martin's work in the studio with the Beatles often had him referred to as the fifth band member. Such is the close relationship between some bands and their producers.

WHAT DIFFERENCES ARE THERE WITH MODERN PRODUCERS?

The main thing to change in recent times is that the producer will take on a lot of jobs themselves rather than overseeing others. Nowadays it is common for the writer to be the artist, engineer, programmer and producer. This will all often happen in their own "bedroom" studio.

Traditionally a producer would take care of every track on an album, but recently, especially with pop acts, several producers can work on the same project.

A traditional producer would take what the artist has and enhance it, whereas many of today's breed of producers will imprint their own sound onto the act.

WHO DOES A PRODUCER WORK WITH?

Firstly, the producer will work with the act. This can be a solo singer or a band of musicians. In some cases the artist will produce themselves, if they have written the material and know their market, but they do need professional production skills.

The producer is often appointed by a record company to ensure smooth running of what can be an expensive process. Also, the record company want to make sure they get the album they want and can sell, so a producer will liaise with the A&R department.

In a similar way, the producer will need to keep the artist's manager happy. The producer will choose an engineer to work with the equipment and get the best out of it. Sometimes more than one engineer is employed, one to assist during recording and another to do the final mix-down.

After the album is made a mastering engineer is also used to make sure the sound of the vinyl or CD is as good as possible. Session musicians are booked to add something special to certain tracks. These can be extra backing singers, real string players, brass sections or anything else to give a new flavour to the recording.



ACT

Can be a solo singer or a band of musicians.

LABEL A&R

Wants producer to ensure smooth running of project and make sure they get the album they want and can sell.

MANAGER

Producer will need to keep the band's manager happy and agree on direction.

ENGINEERS

Specialists can be employed at various stages.
Recording
Final Mix
Mastering

SESSION MUSICIANS

Booked to add something special to certain tracks. These can be extra backing singers, real string players, brass sections etc.

PROGRAMMER

A sort of session musician. The instrument is their computer programming ability.

WHAT ELSE DOES A PRODUCER NEED TO KNOW ABOUT?

A producer need not be a musician, but should understand what different instruments do and how they interact, in order to give guidance to musicians.

Similarly, a producer need not be an engineer, but should understand the recording studio well.

The producer will also need to be aware of budgets.

A producer could be a talent spotter or A&R person. They often discover an act and help them become successful.

SEPARATE COMMENT:

Production Companies
Successful producers will put together a team of writers, engineers, programmers and producers. They can then put out a large volume of work all carrying the hallmark of the key hit maker. They will cultivate or simply manufacture their own acts, which will be licensed to a label. In addition, they could be manager and label too. Such organisations will have a “song bank” ready for the latest pop sensation that approaches them. The Scandinavian 90’s pop production houses were good examples of this, and Stock Aitken and Waterman in the 80’s. Well before this, Phil Spector used the same formula for Motown.
Who are the latest hit Production Companies? Find out!

HOW DO I BECOME A RECORD PRODUCER?

There are three obvious routes into being a record producer. The first way is to be taken on as an apprentice in an existing studio. This is called being a “tape op”, literally a tape operator. Cleaning up, making tea and running errands would all be part of the job. Whilst doing this they would gradually learn how things in the studio work, then practise when there were no sessions booked in and eventually be given the chance to engineer or produce themselves. This position still exists in many commercial studios. The job can be boring and the hours long, but if you are bright and enthusiastic you can progress after serving your apprenticeship.

The second option, which is becoming more and more common, is to buy your own small studio set up and gradually build this up, producing your own material and that of friends to gain experience. The price of computer based studio equipment means this is now an achievable goal. You can teach yourself programming, engineering and production skills.

It is also possible for someone to drift towards being a producer through working within a band or the industry and gaining enough knowledge to take up the task. This is an obvious career move for older musicians.

WHAT PERSONAL QUALITIES WILL I NEED?

Able to work long hours in a studio environment, whilst remaining positive and focused.

Good communication skills to stay in tune with the variety of people around you and in contact by phone.

You must be a calming influence. Recording studios can cost a lot of money. You need to be the one to take the pressure out of the situation.

A producer needs to inspire and motivate, in order to get the best from the musicians.

You will need to be tactful where suggestions you make might not be too well received!

Having “good ears” to know what sounds right and be able to spot good “takes”.

➤ WORKBOOK 3 – CREATING – CHAPTER 3



PRE – PRODUCTION

Pre-production is the process by which you get a song ready to go into the studio.

The producer will make suggestions about song choices, overall direction, arrangements and things to be added or left out. They will also highlight the key elements or hooks and plan how to bring them out in the final mix.

Possible problems can also be spotted early and worked on.

As with remixing, it is useful to have reference CDs and sound library to help keep the target audience in mind.

THE RECORDING PROCESS

Whether recording takes place in a home studio or in a large live room, it is the producer who sets the tone throughout. The producer will dictate the mood and atmosphere and most good albums are made in a positive environment.

This is also the time where an engineer is on board to get the sounds needed and to help with the more technical side of things. Unless, of course, YOU are the engineer as well.

If budget allows you will have selected a studio that is helpful to the vibe you wish to create and capable of giving the sound you expect.

Some producers carry a rack of favourite gear with them wherever they work, they know it inside out and can use it to quickly obtain good results.



Record drums, bass and rhythm guitars in a studio with a good live room; try to record complete takes to get a live feel. Then do the more time consuming instruments, such as vocals and other guitars, using your own set up. This way you can benefit from the flexibility of hard disk recording and get the best of both worlds.

It is usual to approach recording the rhythm part first. Due to the fact that a drum kit takes so long to set up, with a good sound, the producer will often record the drums and bass for every track on the album before moving on.

The groove and sound of the rhythm track, in any style of music, are enough to identify the genre, therefore they need to be spot on from the start. Once the foundation is in place we move on to guitars, keyboards, strings, samples and the other instruments used to build up the tracks.

Plan ahead to achieve the following:

Sounds that suit the chosen genre.

e.g. Indie guitars - jangly. Metal guitars - heavy and distorted.

Lead lines that stand out from the rhythm track.

Clarity and definition, not mush.

A spread across the frequency spectrum we hear, not feeling top or bass heavy.

Making one sound more rounded or dull will make it easier to make the next one sound bright.

Quote:

“With singers you need to ‘paint the sky blue for them’, make them feel that everything is going to be just fine. Don’t say ‘that take wasn’t good enough’, say ‘great, but I’m sure you can do even better.’”

Where performances are required, it is the producer’s job to get the best from the musicians. It is no use to anyone having an expensive mic in front of a singer if the delivery of the song is shabby.

FINAL MIX, POST-PRODUCTION AND MASTERING

If we look at getting the best from the vocalist in particular, then the same principles can be applied to other band members. Take away the pressure and maintain a relaxed approach, and make them comfortable. Often the first takes are the best, so don't miss them.

TIP

Don't erase the guide vocal. It may well have something special, because the singer didn't get "red light fever".

Cycle round tricky sections until you're sure you have them.

Have a copy of the lyrics and tick off each section of the song when you have a good take.

Get four to six takes and edit the best parts together to give a whole pass. This can be done with multi-tracks too, it is called a composite vocal and is achieved by running the several takes and un-muting the best parts as they are "bounced" to another track.

If things aren't going well, leave it and come back later. Avoid ruining the performer's confidence with repeat failures.

Don't leave all the vocal recordings to the end of the project.

Novice singers sing sharp when given headphones. Wearing only one ear of the "cans" will help correct this, but remember to pan the backing track to the enclosed ear to avoid "spillage" on the mic.

Always be aware that sometimes musicians will sing or play TOO MUCH! Try to limit them to what is necessary!

SEPARATE COMMENT:

Bring guitarists into the control room with a long lead to their amp. They will feel less isolated and you can interact more with them.

Freddie Mercury and Bernard Sumner (New Order) sang many of their vocals in the control room, without headphones!

Clever phase reversal was used to achieve this: Record the vocal with the mic central between the speakers. Record the signal from the mic with just backing track playing. Reverse phase of second take and play against vocal take, hopefully the backing tracks will cancel out.

Once all the raw material has been collected from the contributing musicians, it all needs editing and getting ready for the mix engineer.

It is essential to be organised and label everything clearly, especially on computer hard drives, where erasing a month's drum takes is all too easy and could prove very costly.

If someone else is going to complete the mix, they have to be able to follow what you have recorded and carry on from there.

If you are going to do the mix yourself, it would be advisable to take some time away before starting so you can be fresh to the work. A mix engineer would generally look at mixing a track a day.

Work that takes place after final mix is sometimes called "Post-Production".

On album projects a running order needs to be settled on. Having a solid opening track, which sets the scene for what is to come, is normal procedure. Also, leave the listener with something enigmatic at the end of the album.

Occasionally you may want to edit one or more of the finished tracks, perhaps they are too long or need an extra chorus or maybe a fade out is needed.

Mastering can be done on your home computer if you are making cds yourself. Where budget permits, or if vinyl is needed, a visit to a mastering suite is a necessity. See Chapter 1 in this workbook for more information.

Quote:

"I'm always relieved when I deliver the album, it means I've managed to get through another project without the band realising how little I really knew and that I'm still just getting away with it!"

Quote:

"Engineer and a producer is like football coach and manager. The coach looks after the technical side of things like passing, movement and practicing set pieces. Whereas the manager motivates the players, picks the team and decides how they'll play."

PRODUCING FOR DIFFERENT GENRES

ROCK

Most rock producers now embrace new technology, and the majority of traditional sounding rock albums have been made using expensive Pro-Tools systems. The advantages of multiple takes, easy editing, portability and ever improving software processing will make this a continuing trend.

The rock genre covers many styles, but BIG sounding drums and guitars are usually sought after. The aim is to make stadium sized power leap from the speakers, with the listener imagining a wall of Marshall Amplifiers. Complex studio techniques are employed to achieve this. For example, a part we hear as one powerful guitar may in fact be a composite of many playing the same thing.

The “Amp-Farm” plug-in effect is one advancement used heavily. Dozens of guitar amp and speaker combinations can be called up and manipulated for a huge range of convincing sounds.

URBAN/HIP-HOP/RnB

Typically the artist will be singers or rappers working with a producer. The producer will normally take at least part of the songwriting, programming and engineering roles, including final mix. Most of the musical content will be programmed, though occasionally session musicians will be brought in. A sampled motif is often used as the musical hook.

For Hip-Hop, the drums will be heavier and dirtier than for RnB. The vocals will often take the form of a rap. The rap ingredient means that recognisable chord progressions are rare, choruses are less prominent and verses are longer. The overall sound will be grittier and tougher than RnB.

RnB often relies heavily on lavish vocal productions with many backing vocals evident. Snippets of vocal are sampled and dropped into the rhythm track or repeated to give little hooks. To help the vocal melody, RnB will tend to be more musical than Hip-Hop and less reliant on a single repeated sample.

DANCE

In dance music genres we find almost exclusively the writer/producer single person set up. A singer will be hired to front the project where necessary, but are interchangeable in most cases.

The producer should have a good knowledge of club culture and what works for DJs.

Different factions come and go very quickly and having your finger on the pulse to stay ahead of the game is important.

POP

Pop music is generally seen to be a watered down version of any of the above genres. This makes them more accessible to a bigger audience and less offensive to radio stations, who wish to keep advertisers happy.

Occasionally surprising chart entries make us re-think our pop music definition. After all it is literally “music that is popular”.

JAZZ

The jazz music producer may want to capture the close, intimate atmosphere of a small club, where you sense the emotion and personal connection with the musicians and vocalist.

The essence of this kind of production is capturing the performances and setting the tone. Getting the musicians to play as a unit and interact with each other helps to achieve this.

FILM/GAME/TV

Again, the producer will be writer, engineer and producer. They may have their own studio of a high standard, equipped with costly sample cds to create lush string sections or other “real” instruments.

They will create the soundtrack in line with images on screen, the brief given and the budget allowed to finish the work. Big budget film scores invariably have orchestral sections, whereas computer games tend to have limited budgets and resources for music.

CLASSICAL

There are no overdubs used in classical recordings. Therefore the producer must seek out the suitable auditorium and work primarily with mic placement.

The producer must recreate the experience of being sat in the venue listening to the orchestra play through the work.

WANT TO KNOW MORE?

LINKS

New Deal for Musicians has no responsibility for or control of the following sites. The inclusion of any site does not necessarily imply New Deal for Musicians approval of the site. To access any of the sites please type in the address into a browser or search using keywords from the name of the link.

www.dfes.gov.uk/ukonlinecentres Find Internet access that's close to you.

WEB LINKS

- www.futuremusic.co.uk**
Essentially about equipment, but some interviews with artists and producers
- www.soundonsound.com**
Absolutely tons of interviews with producers, where they talk about their work. Also tips and techniques and equipment reviews. Use the search engine.
- www.recordproduction.com**
Video interviews with producers.
- www.music-recording.com/production.html**
Interviews and short articles on production and studio techniques. Many adverts to avoid!
- www.remixmag.com**
On line magazine specialising in urban and "electronic" styles. Articles on producers, artists and equipment.
- <http://emusician.com>**
Articles about the recording process, but more from an engineering perspective.
- <http://mixonline.com>**
More articles and interviews.
- www.digitalprosound.com**
Plenty of tips and gear reviews. Got to the "features" and "techniques" menus.
- <http://audacity.sourceforge.net/about.php>**
Free software for audio manipulation, including basic editing and mastering processes.
- www.tonyvisconti.com**
Articles about production from an expert. Has insider knowledge about the production of many famous albums.
- www.mixthis.com**
This dreadful looking site is the work of rock producer Bob Clearmountain. Well worth a visit for the studio tour though.
- www.bbc.co.uk/music/parents/careersguide/production_engin.shtml**
Basic overview of what a producer does, includes an interview with Steve Levine.
- www.bbc.co.uk**
Use the search engine to find articles about producers.
- www.bbc.co.uk/radio1/onemusic/**

BOOKS & MAGAZINES

- Behind The Glass**
Howard Massey
Publisher : Backbeat UK
ISBN : 0879306149
"Behind the Glass" referring to the window separating the live room from the control room. Many top producers discuss techniques used on the big names.
- Good Vibrations: History of Record Production**
Mark Cunningham
Publisher : Sanctuary Publishing
ISBN : 1860742424
Tracks the evolution of recording through the years. Features artists' and producer's anecdotes.
- Insidetracks : A First-Hand History of Popular Music from the World's Greatest Record Producers and Engineers**
Richard Buskin
Publisher : Quill
ISBN : 0380807459
A collection of interviews with producers and engineers, gives behind the scenes insight.
- Recording and Production Techniques**
Paul White
Publisher : Sanctuary Publishing
ISBN : 1860744435
Contains everything from microphone placement to final mix. Easy to drop into to and use as a reference during your work.
- The Art of Music Production**
Richard Burgess
Publisher : Omnibus Press
ISBN : 0711990107
Recently updated to include more modern technology.
- How to Become a Record Producer**
David Mellor
Publisher : PC Publishing
ISBN : 1870775481
Works through many aspects of the producer's world.
- Sound On Sound**
Essentially full of recording equipment reviews, but always has a couple of features on techniques used and interviews with producers.
- Future Music**
Concentrates more on the computer driven music maker. Equipment reviews, tips and interviews.

MORE TASKS

- 1 Write down what you understand by the terms “well produced”, “over produced” and “big production”.
- 2 Describe how a producer’s role is different from that of an “engineer”, “programmer” and “remixer”.
- 3 For an exercise in post-production, pick an album from your music collection. Try a different running order to the one you are used to. How does it affect your enjoyment of the album? If possible try an edit on one or more of the tracks. Also try altering the gaps between tracks or using fade outs, even fade ins! Experiment with a range of compression, EQ and other mastering tools using computer software.
- 4 Make a list of differences between how an album would have been produced in the 60’s or 70’s to how an album is usually made today.

MANUFACTURE

WHAT IS IT?

This chapter is about what you can do with your recordings once they are mastered.

We will start with an overview of the different destinations for recordings, from sending a demo to record companies to selling online.

We will look at packaging of your recordings, and then we will look at CD duplication, from doing it yourself with a computer to getting thousands of copies manufactured.

This will be continued by looking at DVD and surround sound, as these are the audio formats of the future.

The chapter will conclude by looking at MP3 and internet audio.

WHY DO I NEED TO KNOW ABOUT THIS?

If you are in a band, or are a composer, performer or producer, at some point you will want to send some CD's out, or get your songs or recordings on the internet.

There are a variety of ways of duplicating and manufacturing CD's, so this chapter will explain the differences and help you decide between them.

DVD, surround sound and internet audio are the growth technologies in the music industry and knowing about these will ensure you stay on top of the game as a producer, musician or engineer. If you can encode for the internet you can sell your music. It is that simple!

YOU MUST HAND IN YOUR WORK BY TO



HOW LONG
should this assignment take?

Every person works at his/her own pace. As a guide, spend 2 hours reading and making notes, another 2 hours to write your answers and a further hour to discuss them with your MOLP tutor.



HOW
will I be assessed?

Your tutor will assess your work. He/she will give you feedback on how you have done. If you have not completed the work, you will be given the chance to do further work to pass this assignment.



WHAT
do I do now?

Read the TASKS section below to get an overview of this project. Then read the NOTES AND GUIDANCE section for help. Carry out the TASKS.

TASKS

1 Tick the boxes below to show what stage you are at

- I have written my own music
- I have access to recording facilities
- Some of my music is recorded
- My music is recorded and mixed
- I already have my music on a CD
- My music is available on the internet

2 Recorded music, make a list here of 6 things you can do to take it further.

3 Answer the following questions, circling True or False for each

Dub plates can only be played once True False

CDs can be duplicated on most home computers True False

Packaging of a CD is unimportant True False

It is not possible to use DVD's as they are too expensive True False

4 Press packs are a good way of giving people information about yourself. In the box below write what you would include in a press pack.

e.g. Biography

5 Now in the box below write a brief musical biography of you or your band. Put in details of gigs you've played, recordings you've done, any special events etc.

6 Branding is as important for a band or artist as it is for a business. In the boxes below analyse two artists or bands branding and how they use it. For example, do they have a logo or special way of writing their name? Does it appear on all their promotional information?

BAND/ARTIST 1

Describe the branding

How is it used?

BAND/ARTIST 2

Describe the branding

How is it used?

7 For each of the types of packaging below, list 2 advantages and 2 disadvantages.

Format	Advantage	Disadvantage
CD Jewel Case		
Cardboard Sleeve		
Plastic Sleeve		

8 What is the cheapest way of duplicating CDs?

9 Answer the following questions, circling True or False for each.

Pressed CD's are of a lower quality than CDRs	True	False
You can label CDs with a special printer	True	False
It would cost roughly £200 to have CDs copied with jewel cases	True	False
A glass master is necessary for CDR duplication	True	False
It is cheaper to use CD manufacture for more than 1000 CDs	True	False

10 Give three reasons below why surround sound is becoming more popular.

1)

2)

3)

11 If you were to make a website for yourself or your band, plan below what you would include on it.

12 Answer the following questions, circling True or False for each.

You can make a website with Microsoft Word	True	False
Websites are uploaded using a FTP client	True	False
You have to pay for webspace	True	False
MP3's are larger than wave files	True	False
It takes 2 hours to download a wave file of a song with a dial up modem	True	False
MP3 uses technology called perceptual coding	True	False

13 Give three reasons why people like MP3s.

1)

2)

3)

14 Develop and cost a plan for producing 1000 CDs of your music, packaged in a jewel case with a 4 page booklet. Remember to include design costs.

WHAT WILL YOU DO WITH YOUR RECORDING?

Writing and recording music is often a labour of love. Once you have a completed recording of your blood, sweat and tears, what will you do with it? Clearly you want people to hear it, but how and where?

GIVE AWAY CDs

SELL CDs

UPLOAD it to your website

Get it played on the **RADIO**

Get it on **TV** or **FILM**

Look for record **CONTRACT, MANAGEMENT** or **PUBLISHING DEAL**

Sell it on a **DIGITAL DISTRIBUTION** website

Film some video footage and put the two together on a **DVD**

Make some **RECORDS** for DJs to play in clubs

If you are going to chase a record contract, or look for a manager, then you need CDs and accompanying material (photos, press cuttings, biographies etc) to send out. This can be costly, and often produces no result. You need to be careful where you are sending your work, and ensure you have a contact name or person waiting to receive it, or it may end up in a bin.

If you are going to try to reach more people and promote yourself, which of course can be done whilst trying to obtain a record contract, then you have a wide variety of options.

You could get some CDs manufactured and sell them at your gigs.
You could send your CD to music venues and bars to help get gigs.
You could sign up with one or more online distribution services, who will put your music on their website for paid download (or free download) and then you can direct people there to buy your music.
You could put your music and some video content on a DVD and sell or give that out to fans and venues.

If you want to give your track to a DJ to play out in clubs, then you will probably want it on a record. You can get an acetate made for about £50 that will play around 20 – 50 times. These are also called dub plates.

Pretty much all of the above require money and/or time, so bear that in mind when choosing what to do. The following sections will help to inform you of the costs of these activities and what to consider when choosing.

➤ **WORKBOOK 6 – MARKETING, PROMOTION AND DISTRIBUTION**

PACKAGING

If you are going to make a physical product, such as a CD or DVD, then you need to decide how to package it. CDs can come in a jewel case, a slim case or a sleeve. DVDs come in a DVD case, or any of the CD options.

If you are going to send the recording to record companies or to venues then it is a good idea to accompany it with a Press Pack. Press packs include your demo, a biography of the band or artist, photo's, gig and demo reviews and gig dates. They give people more information than a CD on its own would, and if they are presented well they can help attract people to your band.

If you are going to put your recording online rather than making a physical product then you may still need the press pack materials, as photos, biographies etc can often be uploaded to the digital distribution websites.

Look in workbook 6 for more information on how to design, brand and market your package.

➤ WORKBOOK 6 – MARKETING, PROMOTION AND DISTRIBUTION – CHAPTER 3

ON BODY DESIGN

You will probably want to put some information or images on the face of the CD, and this is called on body printing. For more information on how to do this, go to

➤ WORKBOOK 6 – MARKETING, PROMOTION AND DISTRIBUTION – CHAPTER 3

I DON'T WANT TO PAY FOR JEWEL CASES

If you aren't using jewel cases, then your options are clear plastic or paper sleeves, or a slim case with a j-card in.

If you are using a sleeve (whether paper or clear plastic), a cheap way of putting your information on is to print onto a sticker, and stick the sticker to the sleeve.

WHAT INFORMATION DO I NEED?

What you decide to put on your packaging is totally up to you, but most CDs tend to have similar information.

- Band/artist name
- CD title
- Tracklist
- Details of members of band/artist
- Details of who composed what
- Contact information
- Pictures
- Copyright statement

It is a good idea to put a copyright statement on a CD that will be given away or sold. Generally copyright statements say something like;

©2004 The Band. Unauthorised copying, hiring, lending, public performance and broadcasting of this prohibited. The copyright in this sound recording and artwork is owned by The Band.

This statement merely says that The Band owns the recording and people are not allowed to copy, lend, perform or broadcast it.

Copyright is a very important subject in the recording industry.

➤ WORKBOOK 7 – COPYRIGHT, LEGAL AND MANAGEMENT

JEWEL CASE



SLIM CASE



PLASTIC SLEEVE



CARD SLEEVE



DVD CASE



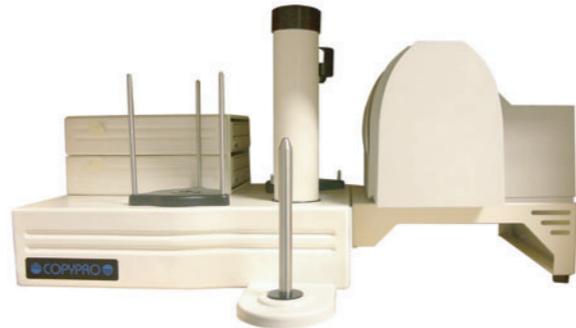
CD DUPLICATION

The cheapest method of duplicating CDs is to do it yourself. You can use a computer with a CD writer in it, and print the artwork on a computer printer. Alternatively, if you have some money to spend, you could buy a CD duplicator which will copy one disc onto blank discs automatically.

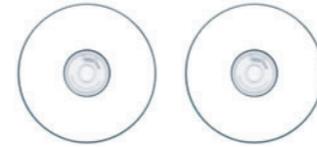
CD duplicator



COPYPRO CD duplicator



VESTAX VRX 2000 Vinyl Recorder



COMPUTER DUPLICATION

If you have a PC or a Mac with a CD writer built in, then you can simply buy a spindle of 100 blank discs for £15 and put one after another into the CD writer. It is time consuming, but saves a lot of money.

STANDALONE DUPLICATORS

Alternatively you can buy standalone CD or DVD duplicators that have 1, 3, 5, 7 etc drives for copying on to. 1 to 3 CD copiers cost around £350.

If you know you will be copying lots of CD's, then you can buy an automated copier. These have robot arms and one or two drives. You load a spindle of 50 CDs at once, and the copier will automatically copy one or two discs at once, then pick another off the pile with the robot arm. However, these cost around £1000, and more with a printer.



HOME LABELLING

You can buy CD labels and an applicator to help put labels on, which you print on with a normal inkjet printer.

Another option is to buy a CD printer, which come in a variety of shapes and sizes. The cheapest is a one disc thermal printer, which prints one colour only (although you can choose the colour). These need special coated discs (£25 for 100), but if you keep the design simple the results can be very good. These are around £60.

For full colour on body printing you need an inkjet CD printer, and these start at £300.

Some standalone duplicators come with cd printing as well, but these start at £1500.

Obviously you can use your normal printer to print the booklet and inlay for the CD case, but you should get fairly thick paper so it isn't too flimsy. Paper is measured by weight, and you will want something like 100gsm weight.

There is one further option, which is to buy pre-printed blank CDs, and buy printed booklets. Then all you need to do is to copy the CDs. Pre-printed blank CDs cost around 90p per CD, and printed booklets cost around 85p for a four page booklet.



SHORT RUN CD DUPLICATION

Short run CD duplication is when a company uses standalone duplicators and printers to produce your CD's. A short run is anything less than 500, so for 500 or more CD's you should choose CD manufacture. Duplicated CD's aren't quite as good as manufactured CD's, as they are based on CDR's which don't last as long, and aren't as compatible as manufactured CD's. However, they are cheaper and are used by many bands, artists and companies. Prices for duplication are based on the quantity of CD's required, the printing required and what packaging you have chosen. The prices below are to give an indication, and are sourced from www.amstore.co.uk. As can be seen, it is more cost effective to get more done at once.

Packing	Plastic Sleeve	Slim CD Case	Jewel Case	Card Wallet	No packaging
Printing	2 page booklet (No book deduct £0.12)	2 page booklet or J-card (No book deduct £0.12)	4 page book	On-body & Wallet printed	On-body printed
Quantity					
25+	£2.44	£2.50	£3.21	N/A	£2.06
100+	£1.97	£2.07	£2.46	£3.35	£1.56
300+	£1.79	£1.92	£2.17	£1.99	£1.37

These prices are per CD, and are correct at time of printing, including VAT.



LARGE RUN CD MANUFACTURE

CD manufacture is a completely different process. As the process involves making a glass master and stamping discs, it is not cost effective to make less than 500. Prices for manufacture are based on the quantity of CD's required, the printing required and what packaging you have chosen. The prices below are to give an indication, and are sourced from www.amstore.co.uk

Packing	Plastic Sleeve	Slim CD Case	Jewel Case	Card Wallet	No packaging
Printing	2 page booklet (No book deduct £0.12)	2 page booklet or J-card (No book deduct £0.12)	4 page book	On-body & Wallet printed	On-body printed
Quantity					
500+	£1.47	£1.62	£1.70	£1.80	£1.26
2000+	£0.65	£0.73	£0.76	£0.69	£0.43
5000+	£0.56	£0.63	£0.67	£0.56	£0.39

These prices are per CD, and are correct at time of printing, including VAT.

WHAT WILL I NEED TO SEND?

Once you have chosen whether you will have your CD's duplicated or manufactured, and decided on the packaging, you need to send the manufacturer the contents of the CD and artwork. The easiest way to send this is in the post, on CDR. Ensure you send at least 2 copies of the CD as it is to be duplicated (i.e. the master), and the easiest way to send the artwork is as data on a CD. Each manufacturer is different in terms of what formats of artwork they will accept, so its best to ask them. Generally PDF or Adobe Photoshop files are accepted. You may need to sign a disclaimer to say that you own the copyright to the recording and composition before they will process your order.

DVD AND SURROUND SOUND

A big growth area in the music industry at the moment is DVD audio and surround sound. This is partly due to the increase in online sales and the corresponding drop in CD sales. The second reason is that home cinema is dropping in cost all the time, and you can now buy a DVD player complete with 5.1 surround sound for less than £100.

Producing a DVD with stereo audio and video can now be done with a digital camcorder and a PC or Mac with a DVD writer.

Once you have created your DVD you can duplicate or manufacture it in the same way as described for CDs above, although the costs are slightly higher for DVD.

SURROUND SOUND

If you are interested in recording and mixing in surround sound, then you will have to use DVD Video, DVD Audio or SACD as the master. The easiest of these formats to use at home, and the most playable is DVD Video (normal DVD's).

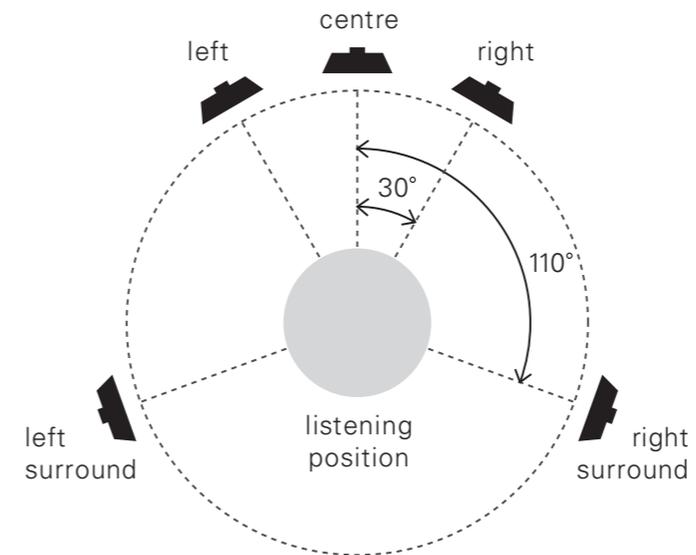
There are a variety of formats of surround sound, but the most common and the one that is compatible with most home cinema systems is Dolby Digital 5.1.

The 5.1 refers to the amount of speakers. The positioning of the speakers is shown in the diagram alongside, and although this diagram is for DVD-Audio, it works very well for Dolby Digital as well.

The 5.1 refers to the subwoofer, which handles just bass (below 100Hz), and when mixing you can decide how much you send to the sub.

Most sequencers support surround sound mixing, although you will need some more advanced hardware for your computer to hear the mix.

SURROUND SOUND DIAGRAM



MP3 AND INTERNET AUDIO

Another popular option for getting your music out there is the Internet. Most bands and artists have their own website, and many choose to put free downloads of their songs on them. Obviously having your own website is a good thing in many ways; it is a central place for people to find out information about you, you can list your gig dates on it, photos and other info. Having free downloads of your music is an incentive for people to come to your website, and it may help persuade them to buy other tracks from you.



HOW DO I CONVERT MY MUSIC INTO MP3'S?

Most audio editors and some sequencers have the ability to convert wave files into MP3's, and you can also download programs just for the job. Generally it is just a case of loading the wave file in, setting the type of MP3 (as there are varying qualities of MP3 file) and setting a name for the MP3. It doesn't take long to compress an MP3.

WHAT QUALITY SHOULD I CHOOSE?

MP3's can be made in a range of qualities, from ones that sound almost as good as the wave files, to ones that sound bad. The higher the quality, the bigger the file size.

If you want good quality MP3's, for example to be sold over the Internet, then choose 192Kbps.

If you want MP3's for streaming over the internet (i.e. that download whilst they are playing) then choose 64Kbps.

WHY DO PEOPLE WANT MP3'S?

MP3's are becoming more popular for a range of reasons;

- They are small files, and so take up less disk space than wave files
- They can be easily bought and downloaded from the internet
- They can be played on computers, some DVD players and the ever more popular portable MP3 players, such as the iPod

WHAT OTHER FORMATS ARE THERE?

There are a range of other formats that compress audio files in a similar way to MP3. The beauty of MP3 is that it is the most widely used and all computer audio players (such as iTunes, Media Player, Winamp) can play them. Other formats include WMA (Windows Media Player files), Real files (for playing with Real Player) and AAC files (as used by iTunes).

THE FUTURE

There is no doubt that compressed audio is here to stay.

What is also true is that video is going the same way. There are a variety of compressed video formats available, but the most common for the home user is DivX, which is the trade name of MPEG-4 (MP4).

Many DVD players will now play DivX discs as well as DVD's, and with DivX you can get an entire film on a CD rather than DVD, which makes it easier to download. Soon enough you will be able to watch a film trailer online and then pay for a download of the movie to your computer.

Ringtone sales are also becoming a popular way of distributing music, as with Puretones and MP3 playing phones it is possible to have an entire song in good quality as your ringtone. Revenue from these sales is making its way to the artists and composers, so it is one to watch out for.

Whatever the case, as a musician or producer it is best to embrace the new technology and try to keep on top of it.

WANT TO KNOW MORE?

LINKS

New Deal for Musicians has no responsibility for or control of the following sites. The inclusion of any site does not necessarily imply New Deal for Musicians approval of the site. To access any of the sites please type in the address into a browser or search using keywords from the name of the link.
www.dfes.gov.uk/ukonlinecentres Find Internet access that's close to you.

MORE INFORMATION AND LINKS

- www.futuremusic.co.uk**
Specialises in modern music technology, reviews, tips and techniques. Occasionally will contain competitions. Links to equipment manufacturers. Second hand gear listed.
- www.soundonsound.com**
More general studio equipment and techniques. Reader's ads for second hand gear. The "Search" for articles from past issues is very useful.
- www.computermusic.co.uk**
Good info on the basic computer based set up for music. Tutorials on music software. Reviews of readers demos.
- www.cd-uk.co.uk/information/templates_main.htm**
- www.worldlabel.com/Pages/cd_template.htm**
Downloadable templates for cd booklets and inlay
- http://cdrworld.co.uk/acatalog/CDR_World_CD_Jewel_Cases_15.html**
Website selling cd and dvd packaging
- www.uk.neato.com**
Suppliers of cd labels and software for printing them
- www.cd-writer.com**
Suppliers of cd duplicators and printers
- www.amstore.co.uk**
CD duplication and manufacture
- www.sounds-good.co.uk**
CD duplication and manufacture
- <http://electronics.howstuffworks.com/cd.htm>**
Information on how CD's work
- www.marcpeters.co.uk/How-to-make-a-DVD.html**
Information on authoring DVDs
- www.marcpeters.co.uk/free-dvd-creation.html**
Free software for authoring DVDs
- www.digital-digest.com/dvd/downloads/softencode.html**
Information and demo of Sonic Foundry Soft Encode
- <http://entertainment.howstuffworks.com/mp3.htm>**
Information on how MP3's work
- www.coolnerds.com/Newbies/kBmBgB/SizeAndSpeed.htm**
Information on file sizes, internet connection speeds and more
- www.ftpx.com**
shareware FTP client

BOOKS & MAGAZINES

- Future Music**
All the latest hi tech equipment is reviewed, plus studio and remixing tips.
- Sound On Sound**
More general studio technology features. Good tips and techniques from professionals.
- Computer Music**
Magazine specifically for making music with computers. Usually has a free CD with samples and software.
- The Mix**

MORE TASKS

- 1 Read workbook 6 – marketing, promotions and distribution for lots more information on how to make a good product.
- 2 Do some research on the many types of CD packaging available and make a fully costed action plan to produce a sophisticated product with a run of 500 units.
- 3 Develop your own website and upload all your music to it.
- 4 Gather prices and other information for pressing 1000 white label vinyl EPs. Compare this information from 2 UK based vinyl pressing businesses and from non-UK competitors.



Look at Eastern European businesses.

- 5 Gather prices and other information for duplicating 500 CDs with on-body printing of your own design, with either cardboard packaging, jewel cases or plastic wallets. Compare this information from 2 UK based duplication businesses – both local and national.
- 6 Find audio files in the following formats and listen to them
 - MP3
 - AIFF
 - FLAC
 - SHORTENWhat is the difference in quality of sound?
What is the difference in file size?
How would YOU save your audio for best effect in digital format?

LIVE SOUND

WHAT IS IT?

Live sound is the term used for ensuring that performers can be heard when performing in public. This chapter is about live sound from a musician and DJ's point of view, and aims to give an introduction into the sorts of equipment and systems available, and how to set it up and get a good sound.

We will start by looking at Public Address systems (PA's) and their uses.

We will then look in detail at situations where PAs are used and what you might need, including small (pub) gigs, karaoke and permanently installed PAs.

We will then look at techniques for getting a good sound. It will help if you have read chapter one before reading this section.

We will conclude by looking at Health and Safety, from a setting up and performance point of view.

WHY DO I NEED TO KNOW ABOUT THIS?

Playing live is an important part of the music industry, and the sound of the performance is critical. Understanding what makes up a PA and how to get the best out of it will help ensure that your live audience can hear you properly and help ensure you have a good gig.

The information in this chapter applies equally to DJs, Karaoke performers, bands and electronic musicians who perform live.

The health and safety aspect of this chapter is also highly important as some venues have very strict rules about health and safety and what you can and can't bring in.

YOU MUST HAND IN YOUR WORK BY TO



HOW LONG
should this assignment take?

Every person works at his/her own pace. As a guide, spend 2 hours reading and making notes, another 3 hours to write your answers and a further hour to discuss them with your MOLP tutor.



HOW
will I be assessed?

Your tutor will assess your work. He/she will give you feedback on how you have done. If you have not completed the work, you will be given the chance to do further work to pass this assignment.



WHAT
do I do now?

Read the TASKS section below to get an overview of this project. Then read the NOTES AND GUIDANCE section for help. Carry out the TASKS.

TASKS

1 In the box below, list 10 different situations and uses for PA equipment

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

2 The following is a list of possible PA equipment. Circle True or False for each to indicate whether it would be found in a PA.

Amplifier	True	False
DI Box	True	False
Recorder	True	False
Mixer	True	False
Control Surface	True	False
Subwoofer	True	False

3 In the box below explain what a Technical Rider is.

4 For each of the types of PA system below, list one advantage and one disadvantage.

Format	Advantage	Disadvantage
Active speakers and a mixer		
Powered mixer and passive PA speakers		
Amplifier and passive PA speakers and subwoofer		

5 For each instrument in the list below, write whether you would use a dynamic microphone, a condenser microphone or a DI box to get the best sound.

Acoustic Guitar	Dynamic / Condenser / DI Box
Electric Bass	Dynamic / Condenser / DI Box
Snare Drum	Dynamic / Condenser / DI Box
Keyboard	Dynamic / Condenser / DI Box
Vocal	Dynamic / Condenser / DI Box
Electric Guitar	Dynamic / Condenser / DI Box
Drum Overhead	Dynamic / Condenser / DI Box
DJ	Dynamic / Condenser / DI Box

6 Circle True or False for each of the statements below.

Larger woofers are better for producing lower frequencies	True	False
A crossover splits the sound into frequency bands	True	False
The power handling of a speaker shows what frequencies it can produce	True	False
Active speakers are better than passive speakers	True	False
Subwoofers are necessary when using a PA just for vocals	True	False
A wedge is an angled monitor speaker that goes on the stage	True	False

7 If you were a guitarist in a band, and were playing a gig at a pub, what instruments would you want to hear through your monitor?

8 Explain, in the box below, what feedback is and how it can be avoided.

9 For each of the PA components in the list below, write what it would connect to.

From	To
Microphone	
Powered Mixer	
Bass Guitar	
Amplifier	
DI Box	

10 On a separate sheet of paper, draw a stage plan indicating where the PA and monitors would be placed for a band playing in a pub type venue consisting of ;

2 singers, 2 keyboard players, 1 drummer, 1 bassist

11 Show on the following tick list your current experience of live sound.

- I have played in a band live on stage
- I am a DJ and have played live on stage
- I have helped set up a PA
- I have set up a PA system
- I have been a front of house engineer
- I own my own PA system

14 In the table below, specify what equipment you would buy for a PA for use for Pub gigs, for a band with;

1 lead vocal 4 backing vocals 2 electric guitarists 1 acoustic guitarist 1 electric bassist 1 drummer

Component	Quantity	Make	Model	Price	Why?

12 For the list of instruments below, write what processing and effects you could use in a live sound situation.

Instrument	Processing	Effect	Why?
Electric guitar			
Vocal			
Kick drum			
Snare drum			
DJ			
Bass guitar			

13 Circle True or False for each of the following statements.

Guitar amps should be as loud as possible on stage	True	False
PA systems should always be distorting	True	False
Graphic equalisers can be used to reduce feedback	True	False
Monitors shouldn't be louder than the front of house system	True	False
Most venues don't have much natural reverberation	True	False
The maximum vocal level should be obtained first	True	False

WHAT IS A PA SYSTEM?

A PA is a **Public Address system**. There are a wide variety of PA systems in existence, from small one speaker setups to 80 speaker flown systems as used at festivals such as Glastonbury.

PA systems are in use in venues, pubs, clubs, shopping centres, shops, restaurants, railway stations, stadiums and many other places. They were originally devised to enable announcers or public speakers to be heard – hence the name public address.

For the purposes of this chapter, we will be concentrating on the sorts of systems you would expect to use for small to medium size pubs and venues, from 10 to 2000 people.

PA systems are generally used for amplifying voices, as guitarists have loud guitar amps, bassists have bass amps and drums are just loud. However, as the gigs get bigger more and more gets put through the PA system, and hence the PA system grows in size. The largest PA's and situations require that all the instruments go into the PA, and that the PA also provides different on stage sound for each performer.

For the purposes of this chapter, PA systems will be split into mobile (or touring) systems, and installed systems. Some venues have their own systems installed, and others require that you bring your own or hire one.



WHAT ARE THE COMPONENT PARTS OF A PA SYSTEM?

A basic PA system consists of a microphone or some other source of sound (CD player etc), an amplifier and a loudspeaker.

At their most extreme, PA systems consist of racks of amplifiers, huge arrays of different types of loudspeakers, mixing desks, effects, microphones and lots of cable.

When PA systems are used for gigs, they often feature two sets of PA system in one – 'Front of house' sound, and Monitors (or 'on stage' sound). This is so that the audience can hear the music, and the band can hear each other. Most of this section will be about 'front of house' systems, but monitoring will be covered.

Now lets look at mobile and installed systems.

A lot of live music venues have an installed PA system with the cabling connected from the stage to the mixing desk. They often have their own engineer to operate the PA, and just require a spec sheet (specification sheet) or technical rider. This is simply a sheet of paper specifying what instruments will be played and what microphones will be required, so the engineer can sort out their connections and signal routing.

Mobile systems can be further divided into two categories – **ACTIVE** and **PASSIVE**.

ACTIVE SYSTEMS have the amplifiers built into the loudspeaker cabinets (such as the Mackie SRM450). There are good reasons for this; amplifiers are matched to the loudspeakers by the manufacturer and there is less to carry around and set up. You need to provide mains power for each loudspeaker this way, which often involves having long mains extension leads all over the place. It also can make upgrading or changing the system more difficult.

PASSIVE SYSTEMS are when the amplifier and loudspeaker are separate. You therefore have more to carry around and set up, but it gives more flexibility. They also allow for active equalisation and bi-amping which is when the signal is split into frequency bands and each band has its own amplifier and speakers. Most large systems are constructed in this way.

Passive systems can be further divided into systems that make use of a powered mixer, or systems that use a power amp and a mixer.

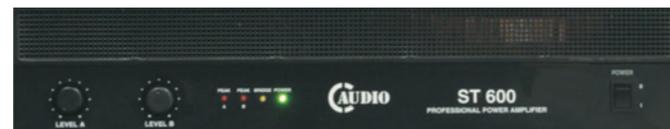
Amplifier Rack



TOP: Matrix 2U600 MOS-FET professional power amplifier



MIDDLE: C-Audio stereo power amplifier



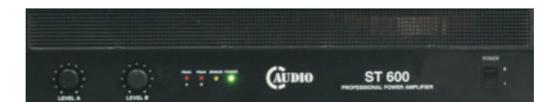
BOTTOM: CREST AUDIO CA12 power amplifier



Mackie active speaker



Passive speaker and power amplifier



MIXING DESKS are necessary as they enable you to plug several inputs into your PA, set different levels for each, adjust the tone (equaliser) and add effects.

Mixing desks and effects units are generally positioned at the back of the venue, facing the stage, in the 'front of house' position, enabling the engineer to hear all the sound from the stage and the PA.

POWERED MIXERS are mixing desks with built in amplifiers to power the speakers, thereby removing the need for any other amplification. Powered mixers tend to be used at the smaller end of the PA market, as the built in amplifiers aren't particularly powerful.

Phonic Power Pod 615 Powered Mixer



MIDAS Mixing desk



Master section from MIDAS Mixing desk



INPUT SOURCES

Once you have chosen your mixer, you need to get sound into it. This will be either from a microphone or a connection to some other source such as a DJ mixer or keyboard. Connections to sources such as this are generally made through Direct Inject boxes (DI Box), which are designed to match the level of a range of inputs to the level required by a mixing desk.

The table below outlines what sorts of connection or microphone you would expect to use for each sound source.

A large cable called a multicore is used to carry the signals to and from the stage. A multicore has a stage box at one end, with sockets to plug microphones and DI boxes into, and plugs at the other end to connect to the mixing desk.

MULTICORE



Source	Type	Example
Vocals	Dynamic microphone	Shure SM58
Electro-acoustic Guitar	DI Box	Behringer Ultra-DI DI100
Electric Guitar	Dynamic microphone	Shure SM58 or SM57
Electric Bass	DI Box	Behringer Ultra-DI DI100
Keyboard	DI Box	Behringer Ultra-DI DI100
DJ	DI Box	Behringer Ultra-DI DI100
Kick Drum	Dynamic microphone	AKG D112
Snare Drum	Dynamic microphone	Shure SM57
Tom tom	Dynamic microphone	Sennheiser MD421 or Shure SM57
Drum Overhead	Condenser microphone	AKG C451 or AKG C1000s

TYPES OF SPEAKERS

The most basic PA speakers consist of two drivers (individual speakers within a speaker cabinet are called drivers) – one for low frequencies and one for high frequencies. The low frequency drivers are called woofers, and the high frequency drivers are called tweeters. Typically, woofers are 10", 12", 15" or 18" diameters, with larger sizes capable of higher volumes and lower frequencies. The tweeters come in a range of styles and sizes, and are matched to the woofers. The sound entering the cabinet is split into high and low frequencies by a crossover.

The cheapest passive speakers would have a 10" woofer and 1" tweeter. The other specifications to be aware of are the power handling, which shows how powerful an amp they can accommodate, the frequency response, which shows what range of frequencies the speakers can produce (e.g. the B1020 are 55Hz to 18KHz) and the Sound Pressure Level (SPL) which shows how loud the speakers are per watt of power from the amp (e.g. the B1020 produce 95dB for 1 Watt at 1m distance).

Speakers go up in size and price from around £110, some have more drivers and some separate the frequencies into 3 bands (low, mid and high frequencies) and have a driver for each band. Active speakers are based on the same principles but have one or more built in amplifiers.

PA's that will be used in larger rooms or to amplify an entire band or DJ usually have Subwoofer speakers as well. These speakers are capable of producing lower frequencies than the speakers described above, and at a louder level. They usually have one or more 15" or 18" drivers.

Typically one subwoofer and one normal PA speaker are used for each side of the stage, with the normal speaker often positioned on a pole or directly on top of the subwoofer.

TOP : Passive PA speakers example 1
BOTTOM : Subwoofers



Passive PA speakers example 2



MONITORING (ON STAGE SOUND)

Once the front of house sound has been arranged, the next step is the sound on stage, or monitoring. This is essential for all music related PA applications, as the performers need to be able to hear what they are doing. For the smallest PA applications, only the vocal needs to be put into the monitors. At the other end of the scale, all the instruments need to be in the monitors, and each performer will want a different mix in their monitors.

The most common form of monitor is the wedge monitor. This is an angled speaker cabinet that is placed on the floor in front of the performer. Wedge monitors also come in active and passive varieties, so active wedges have built in amplifiers, and passive wedges need a separate amplifier.

Another common form of monitor is called a sidefill. These are stacks of speakers that are similar or the same as normal PA speakers, positioned at the sides of the stage pointing in at the performers. Another variation on this is the drumfill, which is the same as a sidefill but positioned next to the drummer so they can hear the other instruments. These are often large speakers to enable them to be heard over the noise of the drum kit.

In-ear monitors are becoming more popular now. These are basically in-ear headphones that are moulded to fit the ears of each performer. They enable much more accurate monitoring for the performer and help eliminate feedback. However, some performers don't like them as it feels more like being in the studio than being on stage. In-ear monitoring systems are usually wireless, and a set of one transmitter, one receiver and one set of headphones costs from £340.

FEEDBACK

Feedback is when a microphone picks up the sound from the PA or monitors, and the signal goes round in a circle, amplifying each time. The end result is a howl or squeal that sounds bad and is very loud. It is avoided by careful speaker placement and equalisation, as the feedback is often at a certain frequency that can be cut.

Wedge monitor example



BUYING SECOND HAND

It is quite common to buy PA equipment second hand.

There are many places to obtain second hand music equipment, from local papers, to websites, magazines to auctions. One of the most popular places now is ebay, the online auction site. It is possible to pick up some bargains, but when buying any music equipment second hand ensure you can test it before you pay. PA equipment can get quite battered and bruised and may require some maintenance.

There are some weblinks in the Want to know more? section that lead to second hand PA equipment listings.

SETTING IT ALL UP

SMALL (PUB) GIG

This section will describe a typical PA setup for a band in a small venue such as a pub. Let's assume a typical band line up;

Lead vocal, 2 x backing vocal, Drums, Electric guitar, Electric bass, Keyboard

The PA would normally provide amplification for the keyboards and the vocal, as the drums would be loud enough by themselves, and the guitarist and bassist's amplifiers would be loud enough on their own.

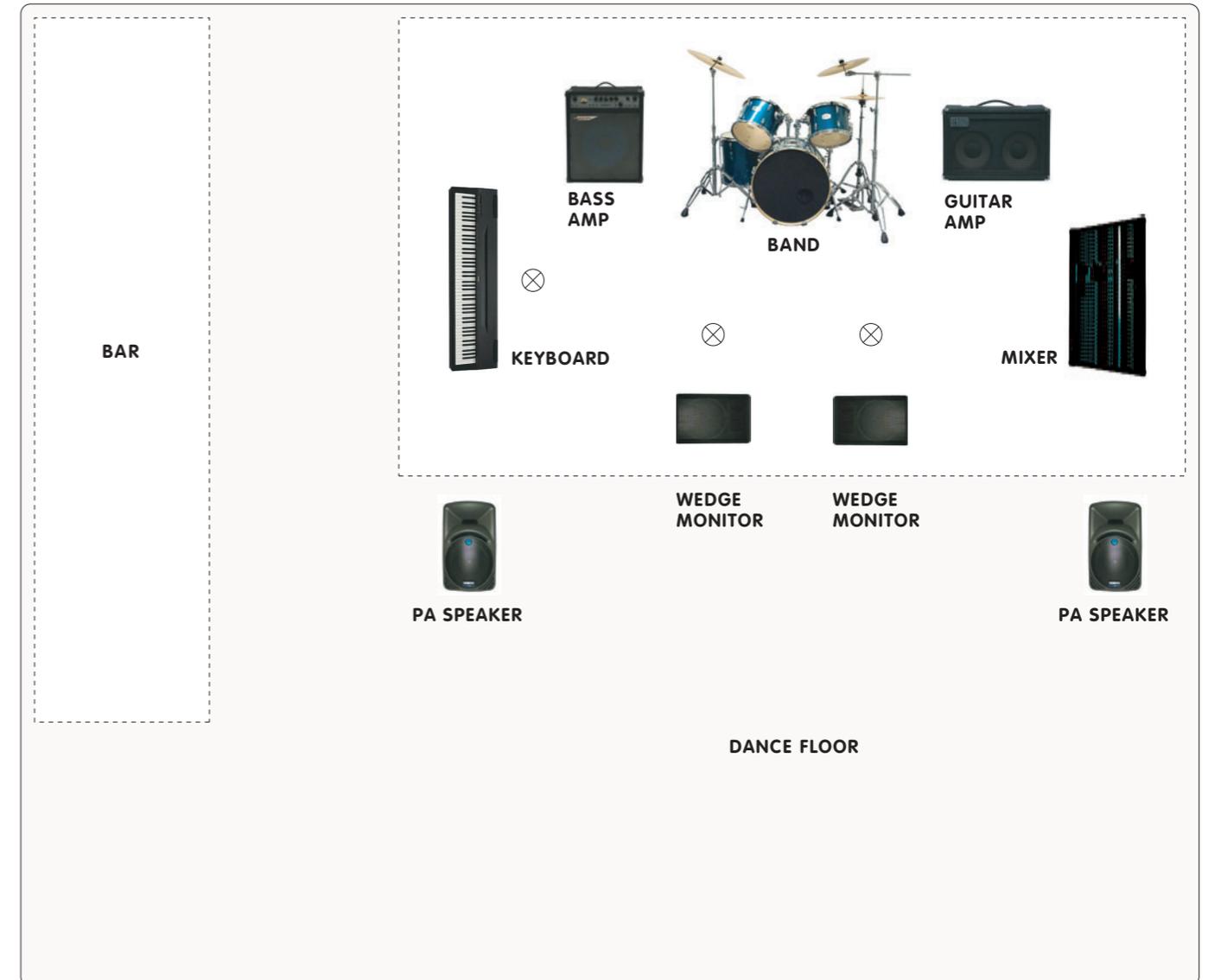
As the PA wouldn't be handling any bass or kick drum, a simple PA system consisting of 2 speakers each side, with 12" or 15" woofers and a tweeter would be sufficient. These would normally be placed on stands so that they are above the heads of people standing at the front. Monitoring would be necessary so that the performers can hear the vocal and keyboards, but as small venues tend to have small stages there would probably only be room for 2 wedge monitors.

For a gig such as this, a powered mixer, passive speakers, and a powered wedge monitor and a passive slave wedge would be ideal. You would need a mixer with a minimum of 4 channels, and it would need to have an aux send to be used to send a mix to the monitors.

The following is a list of equipment that would be ideal for this sort of live sound situation. The price is only an indication, and if equipment was bought second hand it would be cheaper.

Component	No.	Manufacturer	Price	Why
Powered mixer	1	Behringer	£250	250w per speaker output, 10 input channels
PA speaker	2	Behringer	£140 each	12" woofer, tweeter, 200w power handling
Active monitor	1	Carlsbro	£255	12" woofer, tweeter, 100w amplifier
Passive monitor	1	Carlsbro	N/A	Comes with active wedge
Microphones	3	Shure	£69 each	Industry standard live vocal mic
DI box	1	Behringer	£39	Robust build, good quality

£1031



NOTE : ⊗ MICROPHONE PLACEMENTS

KARAOKE

Karaoke or singers who perform with a backing track need a slightly different design of PA system. The PA would amplify everything, including the backing track (from a CD player or similar) and one or more microphones.

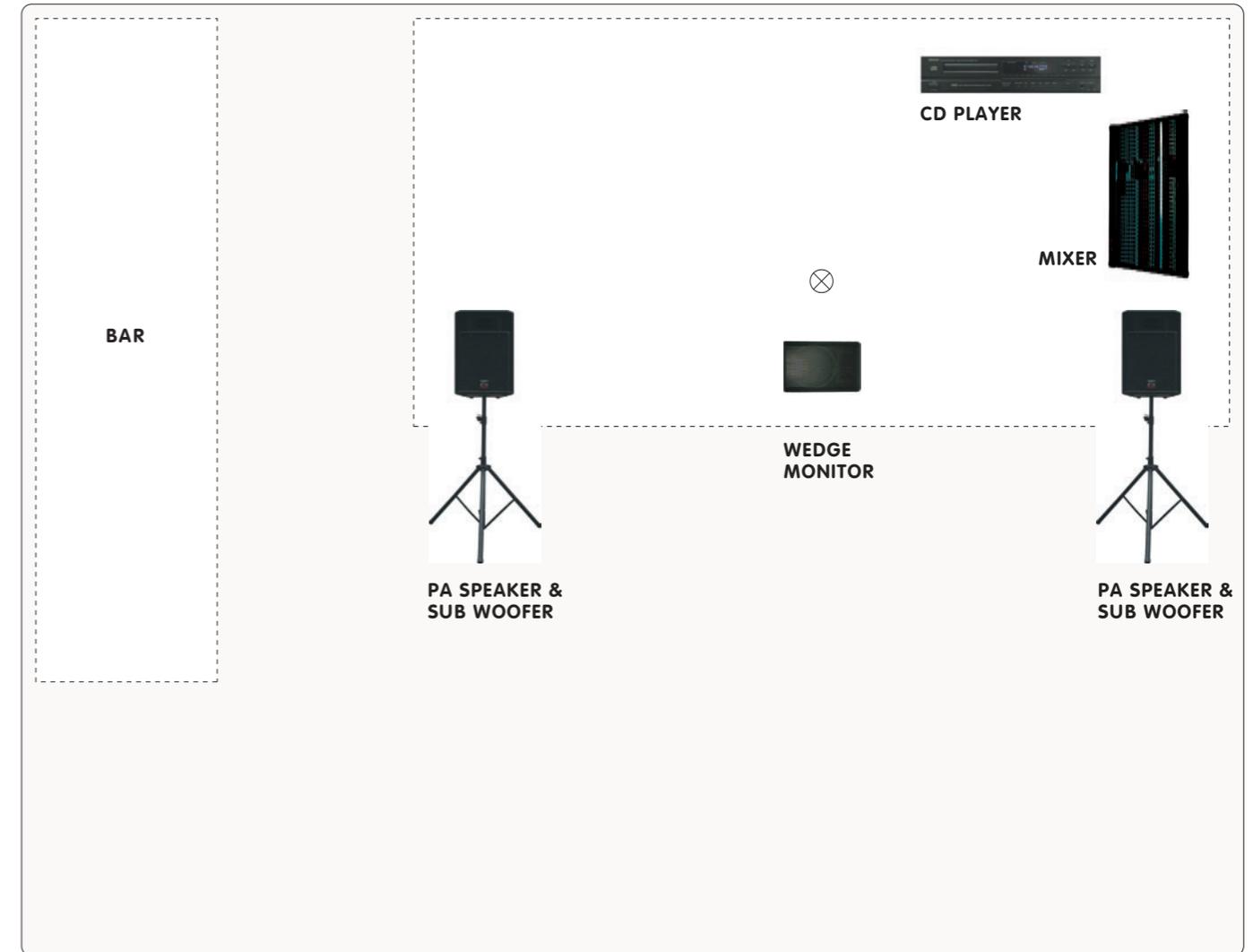
There would be a need for subwoofers, as the PA would be handling bass from the backing track.

Monitors would also be necessary as the performer would need to hear themselves and the backing track.

The ideal choice here would be an active PA – active speakers and subwoofers, an active monitor and a small mixing desk. This is because it is easier to set up and move around, and provides a good quality of sound.

The list in the table below is an indication of what you could use for this sort of situation. As before, this is not the only way that this job can be done.

Component	No.	Manufacturer	Price	Why
Mixer	1	Behringer	£120	4 mic inputs, CD player input, built in effects
Active PA speaker	2	Mackie	£1300 for 2	High quality bi-amped 400w speaker
Active monitor	1	Carlsbro	£175	12" active monitor
Microphones	1	Shure	£69	Industry standard live vocal mic
CD Player	1	Denon	£100	Rack mountable
			£3064	



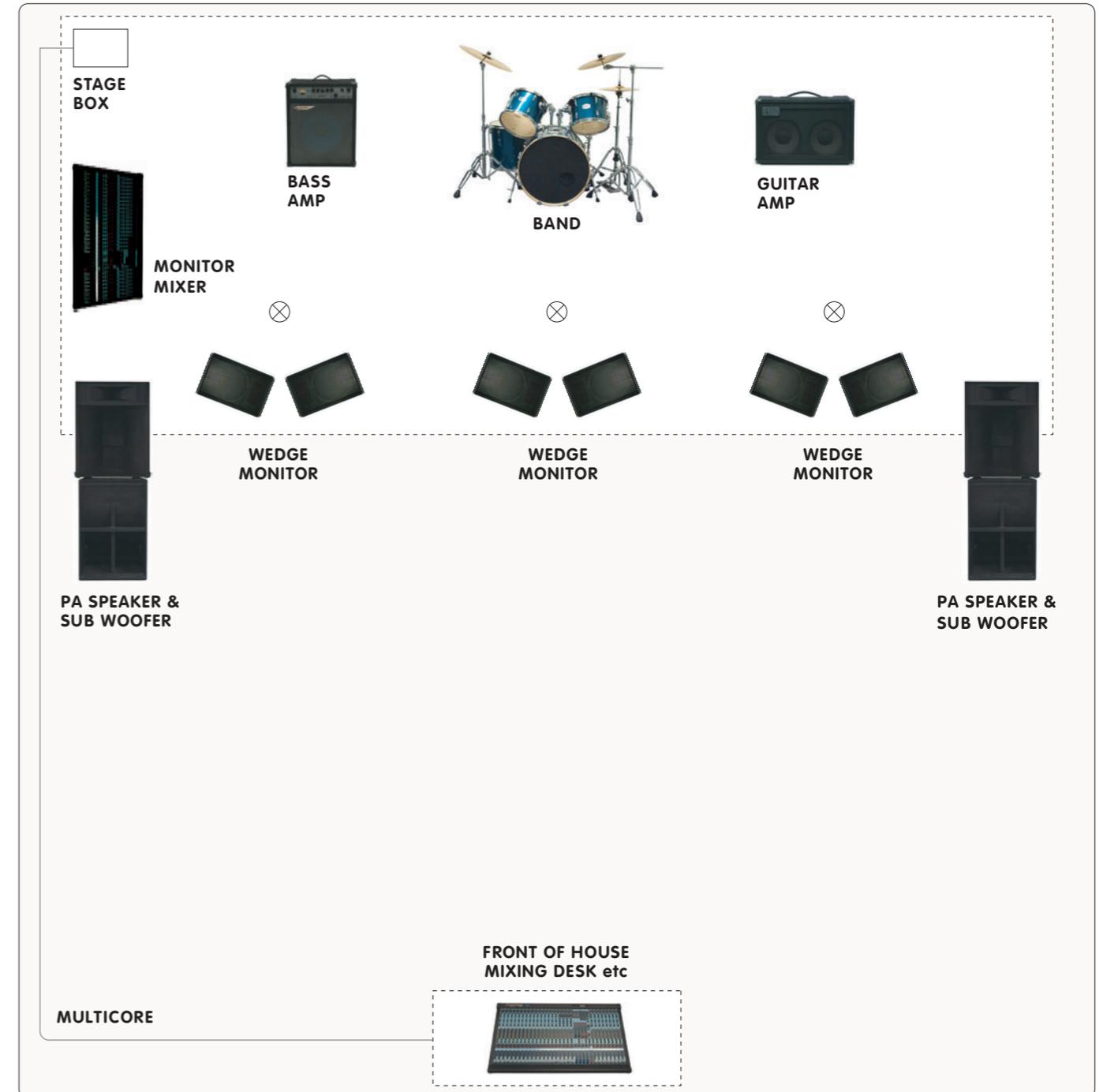
NOTE : ⊗ MICROPHONE PLACEMENTS

PERMANENT VENUE PA

The diagram represents the sort of equipment used in a permanent venue PA. In this situation, the front of house engineer would use one or more aux sends to send a feed to the monitors from each channel. In this way, different mixes for different monitors can be provided.

The front of house mixing desk would generally be set up in a convenient position, and would be accompanied by effects units, compressors, noise gates and graphic equalizers.

The stage box and multicore would normally be positioned at the back or side of the stage, ready to plug the microphones and DI boxes into.



NOTE : ⊗ MICROPHONE PLACEMENTS

GETTING THE RIGHT MIX

There are some basic principles for getting a good live sound.

Set up the PA and get the vocal as loud as you comfortably can without feedback. Then match the other instruments to this vocal level.

If you are putting the whole band through the PA, ensure that the amps on stage are not too loud, as

this will make getting the sound right through the PA difficult.

Ensure that the monitors are not too loud as this sound will interfere with the front of house sound.

Use this table to work out what types of effects or processing you need.

Instrument	Processing	Why	Effect	Why
Vocal	Compression	Keeps the level consistent and makes it easier to hear over other instruments	Reverb	Gives a sense of space to the mix, but use with care – not too long a reverb time
Bass guitar	Compression	Keeps the level consistent	None	Bass players can add their own effects on stage if they want them
Electric guitar	Maybe compression	Keeps the level consistent	None	Guitarists can add their own effects on stage if they want them
Acoustic guitar	Compression	Keeps the level consistent	Reverb	Gives a sense of space to the mix, but use with care
Keyboards	None		None	
Kick drum	Noise gate	Removes unwanted sound from the mic	None	
Snare drum	Noise gate	Removes unwanted sound from the mic	Reverb	Gives more depth to the snare, but use with care
Tom toms	Noise gate	Removes unwanted sound from the mic	Reverb	Gives more depth to the snare, but use with care
Drum overheads	None		None	
DJ	Limiting	Limiting is hard Compression which ensures that the PA isn't overloaded	None	

HEALTH & SAFETY

When performing live or running a PA in a venue there are many health and safety issues to be aware of. These include:

CROWD SAFETY

First Aid
Security
Capacity
Disabled Access
Ventilation
Slips and Trips
Fire Exits
The Door
Staff Safety

For more information on health and safety
➤ WORKBOOK 4 – PERFORMING – CHAPTER 4

ELECTRICAL SAFETY

PAT - Has equipment been tested?
RCDs - Residual Current Devices
Ventilation

FIRE SAFETY

Fire Exits
Fire Extinguishers
Fire Proofing – need to ensure any sets are fire proof

NOISE POLLUTION

Time curfew – some venues have a time limit on how late they can make noise
Volume (Decibel) limit – some venues have a maximum volume limit, and sometimes this is linked to the mains power to the stage, so that if the volume gets too loud the power is cut



WANT TO KNOW MORE?

LINKS

New Deal for Musicians has no responsibility for or control of the following sites. The inclusion of any site does not necessarily imply New Deal for Musicians approval of the site. To access any of the sites please type in the address into a browser or search using keywords from the name of the link.
www.dfes.gov.uk/ukonlinecentres Find Internet access that's close to you.

MORE INFORMATION AND LINKS

- www.futuremusic.co.uk**
specialises in modern music technology, reviews, tips and techniques. Occasionally will contain competitions. Links to equipment manufacturers. Second hand gear listed.
- www.soundonsound.com**
more general studio equipment and techniques. Reader's ads for second hand gear. The "Search" for articles from past issues is very useful.
- www.computermusic.co.uk**
good info on the basic computer based set up for music. Tutorials on music software. Reviews of readers demos.
- www.vocalist.org.uk/equipment.html**
Information on setting up and using PA systems as a vocalist
- www.dv247.com**
Suppliers of recording equipment and PA systems
- <http://backstageshop.co.uk>**
Suppliers of PA systems
- www.ebay.co.uk**
Online auction site – you can find all sorts of musical equipment and PA equipment here
- www.loot.com**
Second hand newspaper and online search
- www.concert-systems.com**
New and second hand PA system suppliers

MAGAZINES

- Future Music**
All the latest hi tech equipment is reviewed, plus studio and remixing tips.
- Sound On Sound**
More general studio technology features. Good tips and techniques from professionals.
- Sound On Sound Live**
Supplement magazine for live sound bundled with certain issues of Sound On Sound.
- Computer Music**
Magazine specifically for making music with computers. Usually has a free CD with samples and software.
- The Mix**
Professional Audio and Music Production magazine
- Broadcast Now**
The magazine for the broadcast industry
- Audio Media**
Professional Audio Magazine
- Pro Sound News**
Magazine for the professional sound industry
- Lighting & Sound International**
Magazine serving the broad range of the entertainment, presentation and events industries

BOOKS

- Live Sound Reinforcement**
Hunter-Stark
Publisher : Omnibus Press
ISBN : 0918371074
Detailed information on a wide range of PA systems and setup
- Basic Live Sound**
Paul White
Publisher : Sanctuary Publishing
ISBN : 1860742718
Good introductory book – applies professional live sound techniques to the working musician
- The Live Sound Manual – Ben Duncan**
Publisher : Backbeat UK
ISBN : 0879306998
All aspects of live sound covered in detail
- JBL Audio Engineering for Sound Reinforcement**
Publisher : Music Sales Limited
ISBN : 0634043552
Complete sound reinforcement reference book

MORE TASKS

- 1 Order a book on Live Sound from your local library to find out a lot more.
- 2 The way to get into live sound engineering is often by word of mouth. Get friendly with local bands and offer to go to rehearsals with them and set up their equipment. The next step is to accompany them to gigs and work with the in-house sound engineer as an assistant.
- 3 What is phantom power and what do you need to watch out for?
- 4 If you are regularly playing gigs, pay extra attention to how the PA system is set up.
- 5 Look in the yellow pages or search the Internet for local PA companies and see if you can offer yourself as unpaid work experience.
- 6 Where is the best place to position a microphone to amplify an acoustic guitar/flute/violin/saxophone?
- 7 You're on stage and your guitar sound dies. What do you check first?
 - a. The whole line, starting at your guitar
 - b. The whole line, starting at the mixer
 - c. Your guitar lead is still connected to the amp/DI box/stage box/Pedals or effects
 - d. The battery in your pedal
- 8 The sound is distorting on your vocals. What would you adjust on the mixing desk?
 - a. master fader
 - b. gain
 - c. pan
 - d. individual channel fader
 - e. mid EQ
- 9 There is no sound coming out of your left speaker. What is the likely cause?
- 10 There is no sound coming out of one channel. What do you need to check?

answers
1 Guitar: towards the neck or over the bridge, not over the sound hole
Flute: near the mouthpiece
Violin: near the bridge
Saxophone: near the bell
2 c 3 gain 4 The likely cause is that there is a poor connection of speaker cable at either end.
5 Connections: no mute on that channel; leads; active microphone switched on.

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Sound Advice

MU Musicians' Union

MPG Music Producers Guild

AIM Association of Independent Music

PRS Performing Right Society

MCPS Mechanical - Copyright Protection Society

MMF Music Managers Forum

BPI British Phonographic Industry

MPA Music Publishers Association

PPL / VPL Phonographic Performance Limited / Video Performance Limited

MIA Music Industries Association

PAMRA Performing Artists' Media Rights Association

BBC Radio 1

British Music Rights

British Academy of Composers and Songwriters

