

# 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.

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

<b>Compression</b>	Insert / Send
<b>Reverb</b>	Insert / Send
<b>Delay</b>	Insert / Send
<b>Noise Gate</b>	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

<b>ARTIST</b>		<b>SONG</b>			
	<b>Reverb</b>	<b>Compression</b>	<b>Delay</b>	<b>Chorus</b>	<b>Noise Gate</b>
Vocal					
Drums					
Bass					
Guitar					
Keyboards					
Other					
Other					

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

# 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.

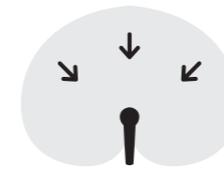
If you are working in a recording studio with a live room then you shouldn't have to worry about acoustics too much, as this should have been part of the studio design. However, if you are not recording in a properly designed room, then you may need to do something yourself. If a room is too live – i.e. 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!

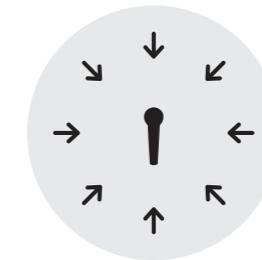
## MICROPHONE TYPES

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.



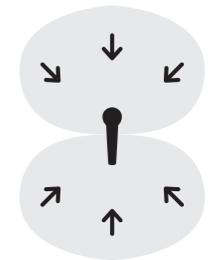
### Cardioid

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](http://www.dfes.gov.uk/ukonlinecentres) Find Internet access that's close to you.

#### MORE INFORMATION AND LINKS

- [www.futuremusic.co.uk](http://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](http://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](http://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](http://www.remixmag.com)**  
News, reviews, features and links to other sites. Includes features on equipment aimed at djs and remixers.
- [www.dv247.com](http://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](http://www.hammersound.net/audiobasics/audiobasics.html#DA_Theory)**  
The basics of digital audio explained
- [www.crownaudio.com/mic\\_htm/tips/mictip2.htm](http://www.crownaudio.com/mic_htm/tips/mictip2.htm)**  
Microphone pickup patterns and general information
- [www.scottymoore.net/studio\\_sun.html](http://www.scottymoore.net/studio_sun.html)**  
History of Sun records and the Memphis recording service
- [www.bbc.co.uk/radio/onemusic](http://www.bbc.co.uk/radio/onemusic)**
- [www.discogs.com](http://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