

Creating The Perfect Mix

Recording is easy - it's the mixing process that can make or break a song. So put your fingers on the faders while we show you how to create the perfect mix...

Including
Top Ten Mixing Tips
Top Ten Mixing Mistakes



Brought to you by www.making-music.com
© Ian Waugh 2006

Ian Waugh is one of the UK's leading hi tech music writers. He has written for most of the major - and not so major - music magazines in the UK and many general computing titles both offline and online. His output numbers over 2,000 articles, features and reviews. He has written over a dozen books, several albums, and created both music software and music hardware manuals.

Science and art

Mixing is the art and science of combining individual tracks into a finished song. It is often more difficult than the original process of recording the tracks where a good Mic, good Mic positioning, good levels and inspired enthusiasm from the performer will often result in a good take. When recording you only have to concentrate one thing at a time. With mixing, you have to bring all the parts together to create a coherent and exciting whole.

What can make it doubly difficult is that you may well have to process, trim and dumb-down the perfect tracks you so lovingly crafted in order to create a mix that works well as a whole. This can sometimes be psychologically difficult to do as you desperately try to fit a twinkling guitar riff that took three days to record into the mix and can't stop it clashing with the hi hats. Knowing that you should roll off some of its twinkle to give the hats space in the audio spectrum is one thing but you may fight against it.



Cubase SX's mixer offers 'traditional' hardware mixer controls with the additional power of software flexibility.

So the first - and possibly only - rule of mixing is that the mix is king, the whole is absolutely, totally, completely and utterly greater than any individual track, and if a part must be sacrificed for the greater good of the mix you must be prepared to do the deed. Make balance, cohesion, clarity and definition your watchwords.

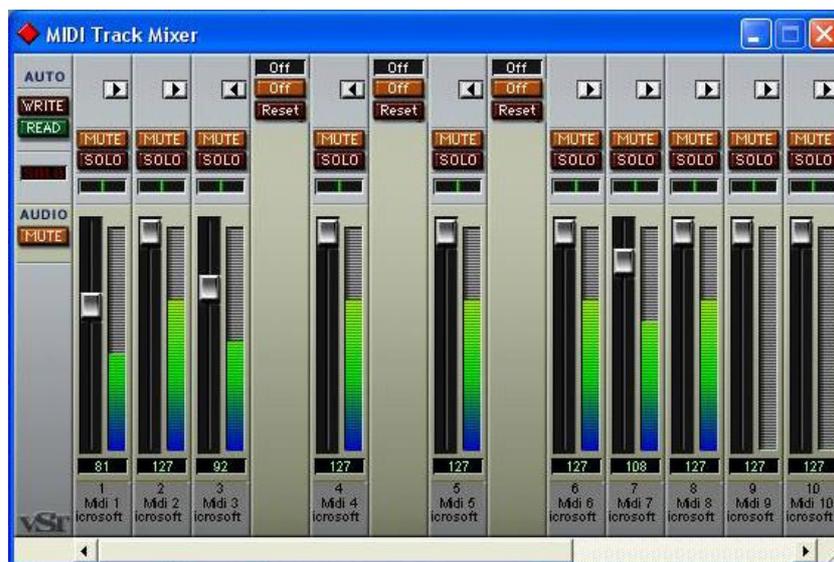
Jim'll mix it

Mixing begins with the recording process. A mix can only be as good as the original material and at the risk of battering you senseless with the most oft-quoted homily on the subject - you can't fix it in the mix. You may be able to make a bad recording less bad but you won't make it good so make sure every track has been recorded as well as it possibly can be.

When you have recorded all the tracks, save them somewhere safe. Although most modern sequencers practise non-destructive editing and processing, there may still be a process or two that can permanently alter the material, and you need to hedge against the possibility of a system crash so it's essential that you have a backup of the original material.

Also remember to save regularly, each time you make a significant change to the mix.

Name each save with an incrementing number or letter so you can go back to it at any previous stage. It's amazing how many people don't do this.



The same basic mixing principles apply to both MIDI and audio parts and you can mix MIDI tracks with Cubase's MIDI Mixer.

Speakers of the house

Whether you're working in a studio with a large mixing desk or in a project or home studio with computer software, the most important piece of equipment is a good set of monitor speakers. Computer speakers and hi fi speakers will not cut the mustard because they colour the sound in order to make it more appealing, perhaps by boosting the bass and the high end. In other words, certain frequencies go into the speaker but 'enhanced' frequencies come out. If you mix with such speakers, the mix will not sound the same on other speaker systems. Your aim is to create a mix that sounds good on any speaker system. Monitor speakers are designed to give a true representation of the sound by having a flat frequency response. In other words, the frequencies that go in should be the ones that come out.

But while you must mix on good monitors, it is also a good idea to listen to the mix through other speakers. Run it through your Home Theatre system, try it through a tiny radio speaker and play it in the car. Take it to a few friends and play it on their systems. You will clearly see how different speakers affect the sound and you may want to adjust the mix in response to what you hear.

Ear fatigue

Don't work with the mix for more than a few hours. A phenomenon called ear fatigue sets in which makes you less sensitive to certain frequencies and less able to make good mixing decisions. Taking a break is all part of the process.

Mix at a 'sensible' level, the sort of level that the average listener is going to use for listening. This will vary according to the type of music and is, of course, subjective to a degree. For example, most people do not listen to pop songs at full volume. However, if you're working on a

killer club anthem, feel free to turn up the heat but do remember that the mix will not sound the same at normal volumes and that probably includes radio play. And do take care of your ears - you only get one pair and when they go they're gone...

Whatever you do, do not mix with headphones. They will give you a totally false impression of the sound - guaranteed.

Good references

If you're mixing your own material you will probably know what you want the song to sound like. Chances are you probably have some commercial recordings in a similar style. Listen to a couple of favourite tracks and use them as a reference while mixing. Better yet, record one into your sequencer for quick and easy access. Use this reference recording to get a feel for the way the parts are balanced, how the audio spectrum is filled and how effects have been used. If you can create a similar feel, as well as having a good mix, the song will also have a good chance of working on other speaker systems.

Jolly mixtures

Before computers, the only way to mix a song was to sit at a mixing desk and manually adjust the faders and controls during playback. This required a not-inconsiderable amount of skill and engineers with more hands than the requisite two were in much demand. Many producers say this still gives them a good feel for the music when doing a mix but the advent of computer-based mixing has made the process both easier and more complex.

It's easier because you don't have to make any decisions in real time - all changes to all parameters can be automated. It's more complex because you have infinite control over every single aspect of the recording on a note by note - or sample by sample - basis. You can automate on-screen faders or draw volume and pan envelopes directly onto parts, and even effect parameters can be automated so they can be changed over time. For example, you could decrease the reverb in a vocal as it comes into the chorus to make it more up-front. But don't get nerdy about the power.



Logic Audio's mixing and production features make it a very powerful program for recording and mixing any kind of music.

This degree of control can be overwhelming but remember, the options are there to use only if you need them.

Start at the very beginning

There is no definitive way to begin a mix although there are a couple of common approaches. One is to set up a rough mix of volume levels and pan positions for all the tracks and then turn your attention to each track in turn. Another way is to put the rhythm section together first, add the vocals and then build the other parts around them.

When setting up a rough mix, some producers prefer to work in mono and then apply stereo positioning after the effects have been added. Others prefer to set stereo positions in the rough mix as this affects the perceptions of the sounds. Choose a method that seems right to you and suits the song, remembering that no individual track is more important than the mix itself.

After mixing a few tracks and getting a good result, you may want to go back and adjust a part if the track you've been working on has tilted the balance. While you have to keep an eye - and an ear - on the mix as a whole, don't be too quick to tinker with volume levels at this point unless something really throws them out of whack in which case you may need to take a step back, see what happened and maybe set up a new rough mix. Volume can be adjusted by compression and EQ, for example, and these may be better solutions than reaching for the fader.

When setting up the rough mix, concentrate on getting the volume levels right; don't try adding any processing at this stage.

Playing for position

Placing sounds in the stereo field is an essential part of the mixing process. It not only creates a sense of space and makes the music seem larger, but it can also help separate instruments and give the song balance.

With Surround Sound facilities now de facto in every sequencer program, you can now mix in 3D but that is another feature



Waves' PS22 StereoMaker can not only enhance existing stereo recordings but also create stereo images from mono sources.

altogether. However, the basic principles of mixing still apply whether you're mixing in stereo or Surround Sound. One thing you must do, however, is to test the mix on a mono speaker. Do this regularly to make sure the mix is on track.

The rhythm section is the foundation of most songs so you may like to start with that. Drums and bass are usually in the middle of the stereo field and there's a very good reason for this. As they contain most of the bass energy of a song, putting them off-centre can make them lose their power and make the mix sound off-balance. One potential problem here is if the bass and kick drum play at the same time they can obscure each other. One solution is to move the quietest one forward in time a few ticks so it plays first (depending on the groove you may prefer to move the loudest one back a few ticks). This uses an acoustic phenomena whereby if we hear two sounds of equal volume, one slightly before the other, we perceive that one to be the loudest.

Another solution is to use EQ (coming up) to give them their own place in the audio spectrum. Remember, too, as you mix that bass sounds appear louder at higher volumes.

You can position drums other than the kick drum slightly off-centre but one school of thought suggests you don't spread them out too far otherwise it will sound as if the drum set runs from one end of the 'stage' to the other. We haven't met a drummer with arms that long yet!

Having said that, it's quite common to hear drum fills panned across the stereo image or even successive hits on hit hat, for example, panned alternatively left and right. This would be impossible in a live situation but can be terribly effective and add interest to a recording.

Vocals are virtually always in the middle, too, and it's probably best not to mess with tradition here. You can pan effects from the vocal, such as reverb or echo, to left and right but make sure they are exactly balanced on both sides otherwise the vocals will sound off-balance.

Backing vocals can be off-centre. One idea is to place them equally left and right to 'fill out' the space behind the vocal. You could pan them to one side but be aware that you may need a sound at the other side to balance them.

A neat effect that works well with some types of music is to have a sound that pans dynamically across the stereo image at points throughout the song. This might be a bell-like sound, a little percussion groove or synth riff. In the rough mix, place this to one side at a low-ish volume or leave it out altogether and bring it into the mix towards the end of the processing phase.

Vocal mix

There are so many ways of recording, processing and mixing vocals that suggestions here can only be of a general nature. It's increasingly common to apply different sets of processes to the vocals. It's not always easy to know which will sound best in the mix and it's usual to put different effects on different tracks so you could end up with six or a dozen vocal alternatives. You can then switch back and forth between tracks while mixing to see which one works best.

Serious producers will often cut between takes to create a perfect composite vocal track and there's no reason why you can't cut between processed tracks, too, providing the result fits the song and mix, of course. If you're a fan of AutoTune, and want to double-track a vocal, don't apply AutoTune to both of them.

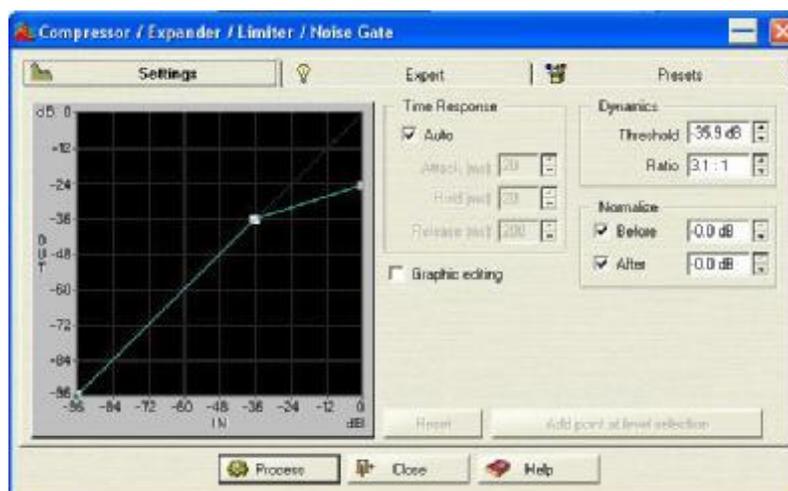
Squeezy does it

With a rough mix set up, it's time to apply the effects. As a rule of thumb, try compression first which should help make the mix a little tighter.

Compression is essential when mixing modern material, and virtually all tracks can benefit from a little compression. Some producers may not agree, and prefer not to compress a track unless it absolutely needs it while others will compress anything in a pair of trousers!

The problem with recording dynamic instruments is that they are, er, dynamic - their volume levels can waver all over the place putting them out of balance with the other tracks at various places throughout the mix.

During recording, you should strive to create as even a volume level as possible although it's almost impossible to do this with any kind of dynamic instrument. A little compression can even out the level making it easier to fit a track into the mix. But, as with most things in life and music, you must not overdo it. Too much compression will render a track flat with no dynamic range and it will lack interest.



In WaveLab's Compressor you can draw compression curves onto a graph to determine where the compression will begin and what the output levels will be.

Compression, by its nature, lowers the volume level of the sound so you need to compensate for this by increasing the volume. Do this in the compressor itself rather than using the mixer's faders. Some compressors have an automatic gain control which will help do this automatically.

Start with the rhythm parts - the drums and bass. If you have each drum on its own track you can tweak them individually. Drums can be quite difficult to mix because they contain a wide range of sounds at different frequencies, each performing different functions. Use compression on the kick drum and snare, which usually form the backbone of the rhythm, to tighten them and add punch. Try compression ratios of around 4:1 to 6:1 and an Attack time of 5-10ms for a tight, punchy sound and adjust until you get the result you want.

Other drums and percussion such as cymbals and congas may not require much compression as their job is not usually to add punch, but try it and see how they sound.

The bass line is another track that will inevitably benefit enormously from compression to stop it overloading the meters, to add punch and help it sit more easily in the mix. Live recordings of acoustic and electric basses will require more compression than synth basses which are often heavily compressed at source.

Vocals always need compression. They have the greatest dynamic range of any instrument and usually need to be pulled firmly into line in order to fit into the mix.

It's also worth remembering that it's usual to apply a dash of compression and limiting to the mix after it's been, er, mixed. In other words, during the mastering stage so you might want to leave a decibel or two in reserve for that.

Mixing vs mastering

Since we've mentioned mastering, a quick look at the difference between mixing and mastering will be useful.

While mixing is the process of combining individual tracks into a complete song, mastering functions are usually performed on the finished stereo mix to 'finish it off'. Mastering often involves compressing the whole track and, as such, this stage could arguably be said to be part of the mixing process, but mastering also involves judicious tweaking to ensure the track works on a range of playback systems. It also involves compiling songs into an album and making sure that all the songs have a similar balance and tonal quality. How many albums have you heard which feature songs out of balance with each other? That's poor mastering.

Spectrum fighters

One of the prime functions of mixing is to give each instrument a place in the audio spectrum. Many instruments occupy the same frequency range and one important mixing task is to separate them so they don't obscure each other and make the sound muddy or confused. We do this through the judicious use of EQ.

Typical problem areas include the kick drum and bass lines and it's vital to get this balance right. It's a good idea to select drum and bass sounds that don't clash if you can do so before recording. If they are similar, because they occupy such a small frequency range and generally have few harmonics, you may not have much room to cut and boost but this is what you may have to do to avoid muddiness. If the bass end is a little thin, try boosting just 1-2dB in the 80-120Hz area.



Waves C1 Parametric Compressor allows you to apply dynamics processing to selected frequency bands and it works on both mono and stereo signals.

You can't pan them to achieve separation in that way, and adding reverb to push one further back in the mix (reverb coming up next) will make the part wishy-washy. However, one trick is to use reverb pre-delay with a very short release time. This fools the ear into thinking the sound is further away.

Many small speaker systems have a lower frequency limit of around 80Hz so try to keep the lowest sounds above that range. This is where listening to your mix on alternative speaker systems can prove particularly useful.

EQ can also be used correctively. Try a high pass filter on tracks such as bass and kick drum to remove any low-end rumble.

Guitar-oriented music can be problematic as guitars can cover a large frequency range, particularly in the mid area. If two guitars are fighting for the same space, a typical solution is to cut the low frequencies of one and boost the high frequencies of another. If you solo the individual tracks they make well sound odd but remember that the mix is the prime concern here and if they fit together well, that's the important thing.

Be wary of using EQ on vocals as it can make them sound unnatural - unless, of course, you want that sort of effect. This is where you appreciate the benefits of making good recordings in the first place.

Cut 'n' boost

When using EQ, it's better to cut rather than boost, and it's worth mentioning a common scenario here so you will be aware of it should you start to fall into the trap. In order to make a sound stand out, an obvious ploy is to boost the EQ. This is fine but what can then happen is that the surrounding sounds seem dull by comparison so you start to boost those, too. The result is that you end up boosting *all* the parts so you're back to square one - except the mix now contains a lot of artificially high frequencies. Having said all that, if that's how you want your mix to sound, go for it!

Also remember that boosting EQ increases the amplitude of frequencies so the overall level of the part will increase. EQs tend not to have automatic gain compensation like compression so you will have to adjust the level manually. Conversely, if you cut a part its level will drop.

At this point you need to give your ears a rest and listen to the mix afresh. It's not uncommon at this stage of the mixing process to decide that the relative levels of the parts need readjusting. The danger here is that you lose the balance that you set up and have been working with. The solution is to use EQ to adjust volume, not the faders.

Again, we make use of a natural phenomenon. When we hear a sound from a distance, it is not as bright as the same sound up front. This is because as sound travels, high frequency energy dissipates more quickly than lower frequencies. Our ears tell us that a bright sound is closer than a dull sound. So, to reduce the volume of a part, apply a little EQ cut to make it seem further back in the mix. And to make a sound louder, boost the EQ a little. Notice the word 'little' here. Gently does it. Too much EQ will probably affect the sound in unwanted ways.

Open options

As a rule of thumb, don't add any effects at the recording stage unless a dash of compression is needed to get a good level. This keeps your options completely open for processing afterwards. You might think it's okay to add distortion or chorus, for example, to a part before mixing and of course you can, but try to apply the effect virtually - that is, without permanently changing the track. You might find that in the mix the track doesn't need as much of the effect as you thought and you can't remove it once it's become a fixture. Retain as much flexibility as you can.

Reverb is both one of the most useful effects and the most over-used. It can certainly make a track easier on the ear but too much will make the

sound muddy, lifeless and indistinct. One of the most common mixing errors is reverb overdose! There's a little mixing homily often said about reverb but it can be applied to other effects, too. That is, if you can hear the reverb, there's too much of it. You should only notice an effect when it's not there. Which is simply a way of saying, don't overdo it.

When using reverb, try using just one reverb for all the tracks. That's not to say that a collection of different reverbs won't work but listen out for 'ambiences' that clash.

From a distance

As well as 'enhancing' a sound, reverb is useful for positioning. When we hear sound that comes from a distance, it often has a degree of reverberation because it is bouncing off all the objects between the sound source and us. This is one of the 'clues' our ears use to pick up information about our environment. Applying reverb to a sound, then, will make it seem further away than the same sound with no reverb. This helps us to place sounds in a backwards/forwards orientation, even though we are mixing in a stereo (left/right) environment. Of course, with Surround Sound you can place sounds in a genuine 3D space.

If you want to 'wetten' a sound without swamping it with reverb, try a subtle delay or even a soft chorus effect. Don't make these run on forever as the tails can leak into following notes.

As reverb tends to 'fill out' the sound, it can sometimes clog the audio spectrum. If this happens, EQ the reverb tail to thin out the frequencies while retaining the reverb effect. Conversely, reverb can be used to fill in little gaps in the audio

spectrum, should you have any. The most common area for a hole is between the guitar and the low end bass and kick drum. If you find you have to swamp the recording with reverb to plug the gap, it's probably time to think about adding another part in that frequency range instead. Pads are good for this and most synths can produce pads to fit every frequency range.

You will inevitably want to use reverb on vocals but try delay instead. See how it works and how they compare. If you do need or want to apply



Cubase SX has many built-in effects including this Reverb which has graphic and easily adjustable parameters.

copious amounts of reverb to a vocal watch out for unwanted side effects such as sibilance. A de-esser can help here or try cutting around 12kHz.

Another little suggestion - if you do use reverb on the vocals, try not to use too much on the other accompaniment parts and vice versa. This will help the two stand out from each other.

As well as providing an echo effect, delay can often be used instead of reverb on instrumental parts. Rhythmic material will usually benefit if an effect's sync function is used to tie repeats to the song's tempo in the sequencer.



Wave's DeEsser allows you to attenuate specific high frequencies and it features wide and narrow focus for 'ess' and 'shh' sounds.

In the previous section it was suggested that EQ be used to help parts fit into the audio spectrum. Occasionally you may come across a part that is simply so big or full right across its frequency range that even after EQing it still dominates the area. This can happen particularly with guitars and pads. In such cases more drastic action is called for and one trick is to use a comb filter which, in a manner of speaking, punches holes in the sound, thereby thinning it out. There are dedicated comb filters on the market such as the one in GRM Tools (just be sure you use it to thin rather than fatten!). Many other effects can thin a sound, too, although they can change it in undesirable ways, too, but it's worth experimenting and getting to know exactly what your effects can do.

Going live

As well as working on studio tracks, you may also have occasion to mix a live recording. While the basics apply here, too, there are additional considerations. For example, unless it's a major production, you're likely to have fewer tracks to work with. Sounds will often spill or bleed from one part into another - the guitar tracks may have traces of drums in the background. The drums may not have been Miced individually so you won't have as much flexibility with the drum part. You must also be careful of panning so as not to create an artificially wide stage (or give the drummer unfeasibly long arms).

The parts will already have had effects added and, of course, on careful listening you may hear the odd 'fluff'. Use compression to 'even out' any parts that need it and use EQ to give parts their own share of the audio spectrum. Of course, if the sound engineer did his job properly, a large part of this will have already been done for you.

One feature of live recordings is that they often capture the excitement and spontaneity of the event and this is something you must strive to keep. Audience sounds may seem like a distraction but hopefully the engineer will have kept these to a minimum but they can be pressed into service at the end of tracks. Some studios specialise in live recordings and if you need to mix a live act it would do no harm to be involved in the recording, too.

Problem city

You need to decide when the mix is finished. It's possible to go on forever mixing and tweaking, and some people do, but twitching a fader up a point or panning a part another half degree to the left is little more than musical masturbation. If you find yourself doing this, the mix is either finished or there's something wrong with it.

If you've been tweaking because something is not right, solo each instrument in turn to see if there are any obvious problems, bearing in mind that previous EQing may well have changed the original sound and it doesn't mean that it's 'wrong'. Then listen to the mix without it and see if it sounds better. If it does you may need to substitute a different instrument or record the part again.

You may also have to face up to the fact that the arrangement is not up to scratch. Perhaps some sections are too busy. If you simply can't remove some parts, try pushing them further back in the mix. Most modern songs are not terribly complicated. Even symphonies that use dozens of musicians typically only have a melody, accompaniment, bass and rhythm arrangement.

Sneak tweaks

Finally, a couple of production tips you might like to try. If you are mixing an instrument section that plays together such as several brass parts, string instruments that form a string section, or the drum set with each drum on its own track, start by mixing the section on its own and then assign it to a Group so you can control the entire volume and pan position with just one fader channel.

To add excitement, speed up the track slightly as you go into the chorus section. It doesn't have to be much, just a few bpm. See if it improves your song.

Use a stereo enhancer to broaden the stereo image of your song and give it more depth and width.

Remember that thanks to mixer automation, you do not have to use one effect setting for an entire track. But also remember that this is an option not a requisite!

Ten Top Mixing Tips

1. Use good monitor speakers.
2. Listen to the mix on as many other systems as you can.
3. Always check the mix in mono.
4. Use a commercial recording in a similar style as a reference - and refer to it often.
5. Use your sequencer's automation functions for adjusting levels within the mix.
6. Do compress vocals. The vocalist who doesn't need compression hasn't been born yet.
7. Synchronise effects such as delay which have a sync feature to the sequencer's tempo.
8. After every substantial change to the mix - save it!
9. Remember that the mix is king and be prepared to sacrifice any track for its benefit.
10. You know what sound you want - let your ears lead.

Ten Top Mixing Mistakes

1. Do not add any effects at the recording stage unless some compression is necessary to get a good level.
2. Don't assume you can fix it in the mix.
3. Don't mix at high volumes unless you're mixing a club anthem. Mix at normal listening levels.
4. Don't use headphones for mixing. Ever!
5. Don't go overboard with effects.
6. Be especially careful not to overdo the reverb.
7. Do not mix for more than a few hours at a stretch. Give your ears a rest.
8. Don't use EQ to boost if you can use it to cut.
9. Don't over EQ the vocals as it can make them sound unnatural.
10. Don't let the artist near the studio during the mixing process - unless it happens to be you, or course

The suggestions and ideas presented here - they're not really 'rules' - are simply guidelines to help you through the mixing process.

When you know why certain things are done in a certain way you can experiment and try doing them in a different way. There is no right or wrong way to mix, only good and bad results so once you have a handle on the basics, do experiment.

It's your material and you know how you want it to sound so work towards that goal following your ears, your aspirations and your musical sensibilities.

Ian Waugh

If you have enjoyed this guide and found it helpful, please stop by at www.Making-Music.com for more tutorials, How To hints & tips, and music software and hardware reviews