

STUDIO ESSENTIALS

DISCOVERING DISTORTION

Distortion has a reputation as a dirty, noisy beast, a world away from the subtle frequency balancing we apply to our mixes. But what if using dirt could actually clean up your mix? **Stuart Bruce** explains the how, when and why of creative distortion

Distortion is a massively complex issue in the world of audio, so let's start with three dictionary definitions, two relating to audio and one to psychology.

Electronics put it like this:

- a. 'an undesired change in the shape of an electromagnetic wave or signal'
- b. 'the result of such a change in waveform, esp a loss of clarity in radio reception or sound reproduction'

Meanwhile in the psychological realm it's described as:

'a change in perception so that it does not correspond to reality'

Source – Collins English dictionary: Complete and Unabridged 10th edition. Copyright William Collins Sons Ltd.

If that were simply the case, this article would be entirely about how to avoid distortion and the seemingly negative effect it would have on recorded music, but it's a little more complex than that. While the

electronic definitions of distortion are true of our desire that listeners to our music hear it as accurately as possible, it's the psychological definition that bears more relevance to how we actually approach it. That "change in perception" is the basis of recorded music. Close mic'ing drums, vocals and guitars doesn't correspond to how we hear them in a room (I shall take it as a given that you don't spend a lot of time with your head in a bass drum). Distorting reality is what we do every time we record and as for it being undesirable, for the most part, it's exactly what we want.

The word distortion may summon up the image of darkly clad men with strangely shaped facial hair shaking their tousled locks before towers of groaning amplification, but in production terms, it's often the secret weapon which brings life and clarity to an otherwise problematic sound. The distortions described here cover the whole spectrum of music from the purely electronic to the purely acoustic.

THE EXPERT

Stuart Bruce
engineer,
producer



Stuart has lent his audio knowledge to projects all over the world, working with artists such as Yes, Bob Marley, Stevie Wonder, Duran Duran and Nik Kershaw. He's also the man working the console in the *Do They Know It's Christmas* video, so listen up!

So, if distortion is bad sometimes and good at others, where and how should we use it to get the best possible results both sonically and creatively?

Keeping it clean

Let's start with where it's bad. In terms of signal path, we don't want distortion in our A/D and D/A converters, we don't want it in our DAW systems (unless we are in control of it) and we certainly don't want it in our monitoring. For over a century, designers have tried and succeeded in coming up with fabulous designs which allow incredible levels of clarity in the amplification of audio signals. It's no surprise that the pages of this magazine are often full of praise for the sonic purity of many items under review. Having the highest possible quality system you can afford is always the best starting point, from your mics and pres right through to your speakers.

Good distortion comes in to play when you can control it, and having a clean signal path is the fundamental of being able to do just that.

Where it's good

Musical sounds are made up of fundamentals (the pitch that you hear) and a series of overtones and harmonics, which



Distortion doesn't always add character – we definitely want to avoid it at the conversion stage

give the sound its timbre. Some instruments, like pianos and the string family are full of them, especially the expensive ones. The difference between a cheap acoustic guitar and a Martin is often in the amount of these overtones and harmonics that the instrument gives. If an instrument sounds a bit dull it's often because these overtones are quiet. Distorting a sound brings out the harmonic structure, making it thicker and more complex. It pulls up the underlying overtones while leaving the fundamental pretty much where it is. Extreme distortion can completely destroy

the quality of the original sound, which may be exactly what you are looking for. However, if applied subtly, then it's quite possible to not perceive the distortion at all while benefiting from the enhanced harmonic colour that it gives.

Where it started

That dictionary description about distortion causing a loss of clarity can be pretty much stood on its head if you consider just how important the guitar amplifier has been through the history of Rock and Pop.

Imagine the likes of Led Zeppelin, AC/DC,

et al without their Voxes and Marshalls. The punch and presence that a good valve amp gives an electric guitar or bass allows it to cut through even the loudest and most aggressive of drummers.

The wonders of the valve aren't just restricted to instrument amplifiers. Back in the early days of Rock and Pop, every bit of audio circuitry was dependant on them, from mics to mixers to tape machines. Analogue tape wasn't the refined medium it ended up being – it sounded good but was noisy. Maximising level to tape meant less hiss so engineers were always pushing as

Fatten It Up

Sometimes a recorded sound just doesn't cut the mustard. An instrument that should sound full and rounded, ends up sounding thin. Listen to the two versions of the Oudu on the DVD and you will see what I mean. The original sounds thin, those rich warm tones that should be there are masked by a sharp and unpleasant high end. As soon as you try to put it into a track, what lows there are will be completely swamped by the rest of the music. You could try EQ and compression but that would be the long way round and involve a lot of fiddling. You can see from the screenshot below that instead, I've used two distortions, a bit of EQ and finally a Transient Designer.

Logic's distortion plug is great when used subtly to enhance percussive sounds, as is the Bitcrusher, which is second in the chain. The drive is set low on both of them and the tone control on

the distortion is at just over 2kHz, meaning that most of the action is going on in the mid to low frequencies. The Bitcrusher is set very clean and in this position helps to add a little 'air'.

The EQ knocks out a bit of the upper mid peak of the original sound and the Transient Designer just adds a touch more sustain to the low end. The result is a warm and fat sound much more capable of standing its ground. The next two audio examples are a talking drum and a drum kit. The originals of both sound great on their own but in the context of the tracks they come from, they didn't have quite enough poke to cut through. The talking drum has been put through the Logic distortion and EQ'd to bring out the highs. The extra depth and attack that the treated version has just can't be brought out by using compression alone as it will tend to

enhance the slightly dull nature of the original. The distortion adds just enough harmonic colour to make it sound fat and then you can EQ to taste in the mix.

The drum kit is a very different beast. It's programmed using Ocean Way drums that run in Kontakt player. The trick here is in fattening up some pretty dynamic kit elements without letting the distortion get out of control. The kick is pretty constant so the distortion alone is enough to make it big and fat, but the snare has a wide dynamic range because of the rolls. Instead of attacking directly with the saturation plug, it's been limited first. This reduces the dynamic range enough that the saturation never gets out of hand. The other trick here is to use saturation followed by a bitcrusher, and then more saturation. No one plug runs too hot. Finally, the ambience has saturation on that, with the EQ and

compression, makes the space around the kit sound bigger and more aggressive.



- > **Oudu No Dist:** A thin sounding Oudu
- > **Oudu With Dist:** The same Oudu fattened with subtle distortion.
- > **Talking Drum Clean:** A slightly dull Talking drum that won't cut through the mix.
- > **Talking Drum Logic Dist:** The same Talking drum given a bit more body and cut by simple distortion.
- > **Ocean Way No Distortion:** A good clean, open sounding kit.
- > **Ocean Way With Distortion:** The same kit fattened up using Kontakt's FX.
- > **Spacey Rhodes No Dist:** An effected Rhodes loop as it is.
- > **Spacey Rhodes Dist:** Now with more body courtesy of Logic's Distortion plug.



Double Distortion
Sculpt your distorted sound by using multiple plugs and EQ

Saturation
The trick is to keep the dynamics from creating an uneven saturation response

Running Hot

Natural distortion occurs when overloading a hardware signal path

If you're looking to get a bit more edge into your music and you have an analogue mixer or outboard EQ and compression, this is something to try. It doesn't matter what kind of desk as this works on anything from a Behringer to an SSL and the whole idea is to start thinking differently about gain structure. When mixing, ignore the meters (if lots of red lights bother you use gaffa tape) and try keeping the faders lower and cranking the line gains. You'll reach a point where the channel starts to distort. Unless you decide that you like that sound, back off the gain a tiny bit until the

distortion goes. Backing it off until it is just about clean means that that channel is 'running hot'. Set up your balance like this going through each channel individually and then set your mix with the faders lower so you don't overload the desk output, just the individual channels. Chances are, even with the same balance as running at 'safe' levels, your mix will sound different and quite often better.

Simply pushing the electronics to the edge of distortion changes the way they sound. It affects the whole sonic spectrum, although you may find it most noticeable in

the transients and the bottom end. The reason that you don't thrash the desk output is so that you can mix and match this technique. Some sounds will benefit from it and some won't. If the desk output is kept clean, you keep your options open. You can always try hitting it harder once you are set up. There are no rules except the fact that you need to like it.

You can do the same thing even if you only have outboard pres, EQ or compression. So long as you have input and output gains you can try sending sounds out of your DAW into the analogue chain, apply the techniques above and

record it back in. I do this all the time when mixing and it makes a big difference.

If you have a sound that works great when hot but has a few peaks which just put it into excessive distortion, try pulling them back with a bit of automation or use a software limiter before the analogue chain.

The more hard-edged Dance music and all the great rock of the late '80s and early to mid '90s owes more than a little to these techniques. Flashing red lights are only warnings that something is happening, you're the one who decides if it's good or not. Look at

how many compressors and mic pres out there are designed to overload. The Thermionic Culture Vulture, the Chandler Abbey Road and the Fearn pres are just a few. Learn how to push all your gear so you can get as many sounds out of it as possible.



ON THE DVD

> Heist digital Bounce: An excerpt from a file track bounced digitally.

> Heist Neve Running Hot: The same track mixed through a Neve summing mixer running hot. The same peak level as the digital version.



Running a signal close to peaking can induce pleasurable harmonic distortion artifacts



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Adding Clarity

Now we've gone through a few methods of creating distortion, let's talk about how we can apply some of these methods to add clarity. This is really about how to add mid range as that is where the 'bite' is. You will have noticed that a lot of engineers use the parallel method either with an analogue or a plug-in chain, or by using cheap and nasty sounding mics and speakers. All these devices can add a real spike to the mids. If you have a problem sound in a mix and your usual tricks aren't helping it cut

through, try adding some hard edged mid distortion.

Guitar amp emulations like Amplitube and Guitar Rig are especially wonderful at this. Use a bright setting with very little bass, or even put a hi-pass filter after the distortion so only the mids and highs are left. Even if the effect doesn't really have any of the note left in, it doesn't matter. It's only the presence you want. Using them in parallel gives you ultimate control over what they are doing and makes

any noise they add easier to automate out. It's particularly great on bass but can save any sound that refuses to respond to any other treatment.



> **Worse than Bef Dull Bass:** The original track with a solid but uninspiring bass sound.

> **Worse Than Bef Dist Bass:** The same track with parallel distortion added to the bass to make it cut through more.

Parallel Processing

Use distortion on an aux channel to beef up your mids



hard as they could at the edges of the tolerances of their equipment so that things were recorded as hot as possible. They soon realised that when you hit a mic pre or a tape machine hard, it sounded different. A little distortion would creep in and things would start to sound fatter and more exciting. Valve circuits and analogue tape distort with second order harmonics which tend to sound more natural to the human ear than the third order ones generated by transistor circuits. That's why guitar amps and loads of outboard gear are still made with valves.

Blues power

In certain genres, the distortion started to become a large part of the music, not just on the guitars but for everything. AM radio had a restricted bandwidth and people started to notice how much louder

those records sounded than the more restrained tones of the likes of Les Paul and Mary Ford.

In the '60s Pop didn't just draw on the music of the blues, it drew on the recorded sound too. Engineers started to push everything to the limits and beyond and the studio became another instrument in the band. Subtle (and in some cases, not so subtle) use of distortion has always been a part of the cutting edge of modern music and today is no exception.

Pedal power

Alongside developments in recording technology have come many great and varied stomp boxes, mostly aimed at guitarists. Of course, the exclusive use of these devices doesn't rest simply with those thrashers of the six strings, a pedal can be used on anything you like. Engineers also

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took a keen interest in them and it wasn't long before they were getting used on all kinds of sounds.

The 1980s brought us the joys of digital and FM synthesis in various guises, the most notable being the DX7. While many people relished the clean, bell-like tones of these machines, for some they were just too clinical. Digital clarity and analogue filth – a great combination. Further experimentation revealed distortion sounded great on any synth, as indeed did sending them through guitar amps and all the other range of pedals at your disposal.

Series or parallel?

When using a pedal on a guitar or synth, the signal passes through it meaning it's being

used in series. When you run it through a mixer, you can use a send and return configuration that means it's in parallel. Parallel distortion adds a whole other dimension to your sonic manipulations as you are blending the original clean signal with its distorted self.

Like in parallel compression, you get the benefits of both signals, the transients and sonic purity of the original coupled with the energy, aggression and power of the distortion. There are many tricks associated with this, most notably around drums where the distortion not only adds bite and aggression, but also brings up the sound of the recording room.

Even in subtle and subdued numbers, distortions can have their place. For

example, I often put the DI output of an acoustic guitar into an amp. With the acoustic mic'd up in one room, and the amp cranked up in another, I get a great clean sound from the guitar itself and use the ambience of the distorted amp to put some backspace into the sound. It's surprising how little of the ambient sound you need to make a big difference to the overall character. You don't just have to do it this way. If you don't own an analogue delay, you can emulate the sound by putting a crunchy pedal in front of a digital one. The results can be remarkably similar.

Cheap tricks

Another set of tricks used by some engineers involves the physical distortions resulting

The Future of Distortion

Living in the age of the DAW as we now are, automation gives us a whole new set of ways to control our FX, and distortion is one of them. Automating distortion plugs adds yet another level to how we can adapt musical parts to fit exactly what we need.

Listen to the two versions of the track called *Twister* and then look at the screenshot. This track was thrown together in a few minutes from some Apple Loops as I'm sure you will hear from the undistorted version. I then spent about 20 minutes messing with automating some distortions to give you a basic idea of what you can do. The chordal part and the bassline both have a bitcrusher with automated downsampling. The difference that automation makes is huge as it changes the emphasis of the groove, setting up a very different feel.

The Bebop drums have some multi-band distortion to fatten them up and the drum loop has a subtle distortion on the channel and then a second more aggressive one is faded in on an aux in parallel. The lead line has a bitcrusher followed by two distortions, each set to different levels of gain and EQ, and lastly there is a hi-pass filter to get rid of some of the low harmonics generated by all that gain, allowing it to sit in the right part of the mix.

As the sophistication of plug-ins continues to grow, we are starting to see more and more complex distortions on the market. Multi-band distortions are now becoming more available. iZotope's Trash is a great example, as is Audio Damage's Kombinat, but my weapon of choice is the Ohm Force Ohmicide. I love how you can set the crossover points

between the bands, the distortion type (and there are huge numbers to choose from) and then finely adjust lots of parameters in each band. Used subtly, it can warm up a sound adding some real analogue feel to even the coldest of parts, but when cranked, it turns into a raving beast.

Being able to add warmth or savage distortion to specific bands of a sound means that you can really emphasise the nuances or pull up hidden areas, particularly in loops. It's an exciting area of development that will only grow as producers, engineers and musicians find new ways to utilise distortions.



> **Twister No Dist:** The straight track with the loops clean. No FX.

- > **Twister With Dist 2:** The same track transformed using automated distortions.
- > **Ac Gtr Clean:** A good sounding acoustic that lacks a little energy.
- > **Ac Gtr Ohmicide:** The same guitar pumped up using Ohmicide. The distortion adds bite and depth but it doesn't sound distorted.
- > **Disco Bass No Dist:** A straight octave synth bassline that sounds fairly flat at the minute.
- > **Disco Bass Overdrive:** The same bassline fattened up with Ohmicide.
- > **Panderio Straight:** The original loop.
- > **Panderio Filter:** This time through a Logic distortion and hi-pass filter to give it a bit more cut and lose the bass.
- > **Panderio Ohmicide:** The multi-band approach with Ohmicide makes it easier to remove the low-end without a trace, removing the need for low-pass filtering.



Multi-band Dirt

Ohmicide features multi-band distortion processing functions

Automated Grit

Automating distortion can add new grooves and fill any mix holes

Parallel Distortion

Sending your signal out of the box and bringing it back on an auxiliary is a great way to add air, grit and depth to your sound

Here, we can apply identical methods to both analogue and digital. I have used this method for years and it can work on any sound. Because distortion can flatten out dynamics it can not only alter the sonic character of an instrument, but its groove too. Be prepared to spend some time automating out some of the inevitable noise that all that unbridled gain will bring out, as with extreme settings the hiss between the notes can become as loud as the sound itself, but hopefully you will find it well worth the effort. Extreme EQ settings can also make a huge difference, adding thundering lows and savage mids that you will never find by EQ and compression alone. Take a look at the best ways of sending to and returning from a pedal with your DAW or mixer in the boxes to the right.



ON THE DVD

- Drums Dist Par 1: The Ocean Way drums from earlier with parallel distortion from a Marshall Guv'nor
- Drums Dist Par 2: This time with an Ibanez Tube Screamer
- Drums Fuzz Par 1: With an Electro Harmonix Big Muff
- Drums Fuzz Par 2: Finally, the drums with a Coloursound Tone Bender.



1 If you already own a pair of DI boxes, great. If not you'll need to borrow or buy some. At least one of them has to be passive as this is what will get the output from your DAW into your pedal at the right impedance. Feeding the input of your pedal with a much lower impedance signal than it needs won't damage it, but you may find it sounds very different. If it sounds thin you will need to impedance match.



2 Using a send from your DAW, route that sound to an output and connect that to the output (yes, the output) XLR of the passive DI box. Take a jack out of the input of the passive DI and connect it to the input of your pedal(s). Plug the output of your pedal(s) to another DI and bring it back into your DAW via your usual chain. If you're using an analogue mixer, create the same DI chain but send from an aux out.



3 Now you can send either a single instrument or a mix of things into the distortion and blend in the resulting effected sound with the original source. If you are doing this only with a DAW, the returning input signal will be subject to latency and so it will be delayed to the original. I get round this problem by sending the original sound out of another DAW output and bringing it in on another input. Above is a similar layout, but in software.



4 Now all you need to do is have a good fiddle to see what extremes you have. Swap the phase of the returning signal as that can cause some very unexpected changes, try different levels of distortion, EQ and compress it, try delays, chorus and anything else you have lying about. If you power your pedals from a power supply with switchable voltages, try send only 6V or 3V instead of 9V. Distortion sounds very different with lower voltages.



5 If you have set this up through a mixer you could record the mixed signal back in. Recording back into the DAW will mean the signal is delayed by a tiny amount so you will need to line the recorded file(s) up with the original. The reason I record the original signal back in is that, if the distorted track has been well and truly smashed then it might be hard to match the waveform of that to the source.



6 Without using pedals at all you can do the same thing by using a distortion plug on an aux in your DAW. Latency won't be an issue and you can still go through EQ, compression and more FX just as you can in the analogue chain.



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from cheap, very small and even broken loudspeakers. Lots of guitar players in the early '60s couldn't get distortion from their amps (Selmer used to advertise their amps as impossible to distort) so they would razor their speakers. This entailed slitting the speaker with a razor blade which then buzzed along merrily causing something sounding remarkably like amp distortion.

Also, a lot of engineers send a dull snare out into a room through a cheap loudspeaker. They close mic it to get some presence and often take the ambience too. If you don't happen to have a beautiful live room at your disposal, a tiled bathroom is ideal. Why bother using digital ambience when you can have the real thing? It's great for livening up a sampled kit, but again, try it on anything. The other cheap things beloved of many engineers are microphones. There

are thousands of dreadful quality mics available to the serial distorter. Cable tie one to the front of a studio condenser and record both mics. The bad one might sound shocking on its own but mix a bit of it in with the expensive one and you can get some very radical effects.

So, whether you are looking to just add some warmth to an acoustic number or to turn your latest Dance track into a savage raging beast, you should have a good few new methods to check out. As with all aspects of making music, the only limits in how you use these tricks are your own imagination. Everything can go to 11, you just have to decide when and how to use it. **FM**

WANT TO KNOW MORE?

Listen to the samples on the DVD to hear Stuart's tips in action. Make sure you pick up **FM** next month for more techniques. **On sale 28th Oct**



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