

Bass & Electric Guitar



Swansea College of Art

Founded 1853

MMusTech Level 4
The Studio Engineer
Handout #8



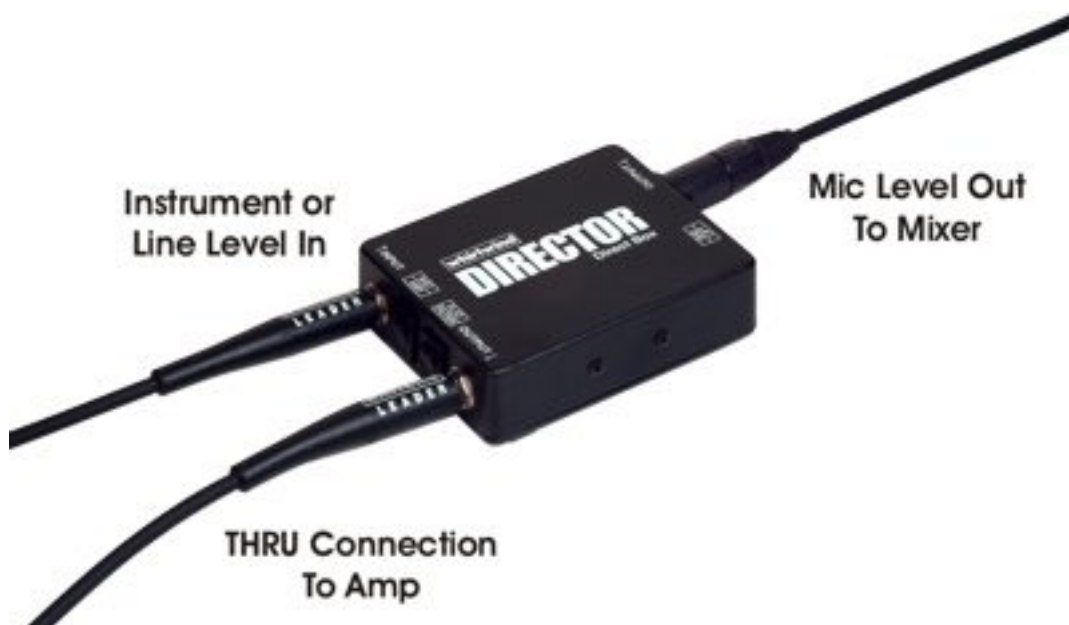
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The science of recording bass guitars and electric guitars is very simple; the art of it however, that can take a lifetime. The methods for these are both in the same handout as the process is very similar.

DI – Direct Input

Direct Input, or DI, is the method of plugging the guitar or bass directly into the recording device. This *can* be done directly, but it is often a better choice to use a DI box for several reasons. The first reason is impedance; The guitars put out a different level of signal to what most mixers like – DI boxes fix this issue. The other reason is for practicality. If you plug a guitar straight into a mixing desk then you can no longer plug it into the amp... ok, so that's not strictly true, you can send a copy of the signal back out of the mixer through an auxiliary and then send that to the guitar amp, but there's a far quicker and easier option. A DI box has (at least) 2 outputs. The first takes the input and sends it through an XLR cable, which we will pick up at the mixing desk. The other is known as *thru*. This is a ¼" Jack output which we can then send to the pedalboard or amplifier¹.



We use this method for 2 reasons. Firstly it gives us a *clean* signal. This means that we capture the player's performance without all the electrics getting involved. This is useful if, when listening back at a later date you notice that there was a hum from the amp that you didn't want, you can then re-amp the clean signal into another amplifier and re-record it without having to drag the musician back into the studio. The second reason is more particular to bass than electric guitar. The amplification and effects process can (often intentionally) remove a lot of clarity and detail from what is being played. It's a very common

¹ It's not uncommon to have a second DI box placed after the pedalboard but before the amplifier to get a copy of the fully affected but non-amplified version of the sound.

thing when mixing to use a mix between the clean signal and the amplified signal of a bass guitar – this allows us to hear the big sound of the bass amplifier whilst being able to hear the more intricate parts of playing that an amplifier might smother.

Amp Microphones

The other sound we need to get from bass and electric guitars is the sound of the amplifier. The general rule is to place a microphone (or a selection of microphones) in front of the speaker cones and adjust position/angle to taste. The notes below are aimed at electric guitar. The theories all apply to bass guitar amplifiers too, we just tend to use different microphones.

Electric Guitar

Anytime you are recording a guitar or bass cabinet, you are confronted with the acoustic nature of loudspeakers. A single loudspeaker is directional and displays different frequency characteristics at different angles and distances.

On-axis at the center of a speaker tends to produce the most “bite”, while off-axis or edge placement of the microphone produces a more “mellow” sound. A cabinet with multiple loudspeakers has an even more complex output, especially if it has different speakers for bass and treble. As with most acoustic instruments, the desired sound develops at some distance away from the speaker.

The most common approach is to close-mic an individual speaker. This is a habit people develop from viewing or doing live sound. In the live sound environment, most audio sources are close-miked to achieve the highest direct to ambient pickup ratios. Using unidirectional mics for close miking maximizes off-axis sound rejection as well. These elements lead to reduction of potential feedback opportunities. In the recording environment, the loudspeaker cabinet can be isolated and distant-mic techniques can be used to capture a more representative sound. Often, by using both a close and a distant (more than a few feet) mic placement at the same time, it is possible to record a sound which has a controllable balance between “presence” and “ambience”.

Placement of loudspeaker cabinets can also have a significant effect on their sound. Putting cabinets on carpets can reduce brightness, while raising them off the floor can reduce low end. Open-back cabinets can be miked from behind as well as from the front. The distance from the cabinet to walls or other objects can also vary the sound. Again, move the instrument and the mic(s) around until you achieve something that you like!
(Shure.co.uk)

Microphone Placement	Tonal Balance	Comments
1.) 4 inches from grille cloth at center of speaker cone	Natural, well-balanced	Small microphone desk stand may be used if loudspeaker is close to floor.
2.) 1 inch from grille cloth at center of speaker cone	Bassy	Minimizes feedback and leakage.
3.) Off-center with respect to speaker cone	Dull or mellow	Microphone closer to edge of speaker cone results in duller sound. Reduces amplifier hiss noise.
4.) 3 feet from center of speaker cone	Thin, reduced bass	Picks up more room ambiance and leakage.
3 & 4.) Good two-mic technique	Natural	Use condenser microphone for position 4 – adjust spacing to minimize phase issues.
Miniature microphone draped over amp in front of speaker	Emphasized midrange	Easy setup, minimizes leakage.
Microphone placed behind open back cabinet	Depends on position	Can be combined with mic in front of cabinet, but be careful of phase cancellation.

(Shure.co.uk)

Getting It Right At Source

About the only thing that all these producers have tended to agree on across the board is that you should try to get your guitar sound as good as you can before you even think about recording. "The stupidest thing that any musician can do," remarks Tony Platt, "is to just plug in and play and say 'make that sound good'. It doesn't work like that. I will always say to the guitar player, for instance, 'Is that sound coming out of your amplifier the sound you want to hear? If it isn't, show me what it is and we'll try to get somewhere close to that before we even put a microphone on.' It's a waste of everybody's time to sit there tweaking stuff until somebody says 'Oh that's good.'"

There is clearly a great deal that the guitarist can do for the sound by changing guitars, strings and amps, but from the perspective of the recording engineer it's also important to think about how the guitar cab is interacting with the room it's in. For example, Roy Thomas Baker mentions that he sometimes sets up the same guitar cab in different rooms because of the effect on the sound. Even if you're restricted to one room, a number of producers suggest trying out different positions of the amp in the room. Tony Visconti: "It's not so much that you're miking a guitar — you're miking a guitar in a room. I had a cellist in here recently, and I moved her until I got a good sound. Once I put her in one particular corner, her cello just sang — the room just filled up with the low end, and the sound exploded! A person who hasn't had years of experience might not have thought of doing that, but I could tell there was something lacking when she was in the centre of the room. That's mic technique. It's not so much the instrument; the room is very much part of the sound." (Soundonsound.co.uk)

Dynamic Mics For Electric Guitar

When it comes to recording electric guitar, Jay Graydon's views on mic choice are pretty clear: "I have tried so many dynamic mics over the years, and always come back to the Shure SM57." He's not alone: this robust, cardioid, dynamic microphone is more often mentioned in relation to electric-guitar recording than any other.

Why such a strong preference? These days, force of habit has got to be part of the answer, but there is also a lot about the microphone's frequency response which suits guitar recording. For a start, the sub-200Hz response roll-off reduces low-end cabinet 'thumps', which might otherwise conflict with the kick drum and bass in the mix. This also compensates for proximity boost when the mic is used very close to the speaker cone. However, there's also a slight 'suckout' at 300-500Hz, an area where muddiness can easily occur, and a broad 2-12kHz presence peak, which adds bite and helps the guitars cut through the rest of the track.

Sennheiser's cardioid MD421 crops up almost as frequently in interviews, and has a wider frequency response, none of the low mid-range suckout, and an even heftier sensitivity boost upwards of 1kHz. This microphone also has a larger diaphragm than the SM57, and the off-axis response anomalies of the larger diaphragm, in particular, give a different character to the sound. Although obviously very popular, this mic seems more often to be used in combination with other mics than on its own.

The same goes for Electrovoice's RE20, which counts Steve Albini, John Fry, and especially Glenn Kolotkin amongst its friends. "I like to use RE20s on most amplifiers when they're available", says Glenn, "because the quality is great and they can take really high levels. They're very directional and they're great for rock and roll." The mic also exhibits an unusually wide and flat frequency response and is specially designed to resist proximity effect. (soundonsound.co.uk)

Condensers & Ribbons

Alan Parsons: "I always use condenser mics on a guitar amp, never dynamics — they're too telephoney. That's an unfair expression for a very good dynamic mic, but by comparison to a condenser, you're not going to get the bottom end." While this stance is more hard-line than that of most engineers, condenser mics are, of course, regularly used for recording electric guitars. However, in practice they rarely seem to be used on their own and are very often lined up alongside the trusty SM57.

Large-diaphragm models are popular, with Neumann mics particularly favoured. The famous U87 studio workhorse is probably the most commonly mentioned, but it's by no means the only contender. Eddie Kramer, Steve Albini and John Leckie single out its predecessor, the U67, for example, while both of the earlier U47 models (valve and FET) receive name checks from people such as Steven Street, Glenn Kolotkin, Butch Vig and Bruce Botnick (note that U47s were marketed under both Neumann and Telefunken brand-names, but they're essentially the same mics). Neumann aren't the only game in town, though: AKG's C414B-ULS is probably joint most popular large-diaphragm model alongside the U87.

The characteristics that producers most often seem to be looking for in

these mics are their extended frequency response, especially at the low end, and the slightly softer, more diffuse sound imparted by the large diaphragm. These mics also tend to boost the 5-15kHz region, but this boost is rapidly lost as you move off-axis (it is inherently difficult to design a large-diaphragm capsule with an even off-axis frequency response).

Small-diaphragm condenser mics, on the other hand, tend to have flatter frequency plots and a better-behaved off-axis response, giving a sound sometimes described as more focused, but they seem to be less commonly chosen by the interviewees than large-diaphragm ones. Neumann's KM84 seems to be the most regular choice of small-diaphragm condenser, and numbers John Fry and Bill Price amongst its high-profile users, while Sennheiser's MKH40 warrants a particular mention from Mike Hedges: "I started using *[these mics]* when I was working with the Beautiful South. I started off with two and now have more than 20. I think they were originally designed for classical recording, because they have very high gain and very low noise. This means that you can get a very clean sound. They also accept massive amounts of volume, so you can put one against a guitar amp on full and it will take it." Hedges' concern about the ability of the microphone to handle the sheer volume of some guitar amps is echoed by several of the other producers, who make a point of mentioning that they switch in a condenser's 10dB pad when recording electric guitars.

Surprisingly, perhaps, given their reputation for fragility, ribbon mics also seem to be widely used for electric guitar, with models from Beyerdynamic, Coles, RCA and Royer all putting in appearances. Producers using ribbons include Thom Panunzio, Joe Barresi, Steve Albini, Ed Cherney, Bill Bottrell and Butch Vig — Eddie Kramer even goes as far as to say that "to me, the best guitar mic is the Beyer M160, which I've used for 30 years on Hendrix, on Zeppelin, on everybody."

One trait of most ribbon mics is the figure-of-eight polar response, and this is often exceptionally consistent across the frequency range. This polar pattern means, of course, that ribbons tend to pick up a little more room ambience than cardioids, given that the polar pattern is as sensitive behind the diaphragm as it is in front. Ribbon mics are also often characterised as sounding 'smoother' compared with typical condenser microphones, partly because their construction avoids the high-frequency diaphragm resonances normally inherent in condenser designs.

Other Techniques

There are other methods that are occasionally applied to recording guitars. Some of these include placing a microphone behind the speaker cabinet (this works especially well with open-back cabinets), room microphones (mono works fine for this, but feel free to experiment with stereo pairs to get a wider sound), placing a microphone next to the actual guitar itself to pick up the strumming, placing a microphone outside of the room that the amplifier is situated in, and I've even submerged a microphone in a container of water to record bass. All of these techniques have different effects and, as always, recording is a little bit of science and a whole lot of art; experiment and discover.