A Guide to Guitar Effects

A Guitarist’s Guide to Effects

How to Categorize and Order the Boxes in Your Signal Chain

By Jon Chappell

Most guitarists have an intuitive sense as to where basic effects should go in their signal chain. If you have two pedals, a distortion unit and a digital delay, you would naturally put the distortion before the delay (the guitar goes into the distortion, the distortion into the delay, and the delay into the amp). But the more pedals you use, the trickier it gets, and some truly bizarre gizmos—like a digital whammy pedal—might put you at a loss to explain just why effects go where they do relative to others in the chain.

Additionally some processors (such as EQs and reverbs) can go in different places in the chain, depending on the desired effect. And in one very famous example, the debate is still raging about whether the wah-wah goes before or after the distortion (Hendrix put his before, though conventional wisdom says the wah should follow).

Now, you might be thinking, "Gee I know in which order the basic pedals should go, but I guess I don't really know why."

Before we discuss which categories of effects go where they do in the chain, take this pop quiz (I hear you groan) to determine your effect-ordering mettle. Order the effects below from 1 to 10, with 1 being the first effect the guitar plugs into, and 10 being the effect whose output goes into the amp. Place letters next to the numbered slots to indicate which effect goes the proper order. No text-messaging among yourselves for hints.
1. __  A. EQ  
2. __  B. Distortion  
3. __  C. Chorus/Flanger  
4. __  D. Noise Gate  
5. __  E. Digital Reverb  
6. __  F. Volume Pedal  
7. __  G. Preamp  
8. __  H. Compressor  
9. __  I. Delay  
10. __  J. Wah-wah Pedal  

Here are the answers, showing the "correct" order of the 10 effects above: 1) G, Preamp; 2) H, Compressor; 3) B, Distortion; 4) J, Wah-wah pedal; 5) C, Chorus/Flanger; 6) I, Delay; 7) A, EQ; 8) D, Noise Gate; 9) F, Volume Pedal; 10) E, Digital Reverb.

Don't deduct any points if you had the delay before the chorus/flanger; that one's a toss-up. Also acceptable is to put the EQ just after the compressor. And really, the EQ in any signal chain is sort of a "free space," so it can go almost anywhere.

If you got more than four effects out of order, or if you realized in taking this quiz that you just got lucky with the placement, it may help to break the above effects into categories and then explore why certain categories come before others in a signal chain. Roughly speaking, I name the categories as follows, in the order that the guitar signal encounters them:

- Signal Conditioners
- Time-Based Effects
- Ambient Processors
- Other Effects
Here's what's included in each main category:

**Signal Conditioners.** These include all gain-based and EQ-based effects. Conditioners don't set out to change the basic nature of a sound, except to increase the gain, either in the signal's entirety (preamps) or selectively (by frequency band, as in an EQ).

**Preamps** listen to the signal and boost it as faithfully as possible with as little coloring as possible—unless in the process of preamping the tone is changed naturally (as happens when, say, tube-based preamps are run hot). Usually preamps have EQ and other controls, preamps go first in the chain so they can receive a signal with the highest possible integrity, even if their purpose is to create a distorted sound.

**Compressors** reduce the dynamic range of a signal by attenuating levels that exceed a certain, defined point (called threshold). Guitarists often use compressors to increase sustain, but that's sort of an "overuse" of the effect—though it sounds great!

The primary design of a compressor is to deliver a consistent, predictable level without significantly altering the signal's tone. But with heavy compression, some high-frequency content is lost, which you can put back in with EQ (either on the compressor itself or with an outboard effect).

**Distortion.** It may be hard to imagine your Blues Driver (shown in Fig. 1) as a "mere signal conditioner," because its effect is so dramatic. However, technically, its influence is limited to the gain stage of the signal. In other words, it doesn't set out to change the signal, it just pushes its gain past the breaking point of the circuitry's ability to reproduce it faithfully.
**EQ**, also known as equalizers, can also be though of as gain boosters, except that they apply their boosting to only a portion of the signal, defined by frequency or frequency range.

Graphic EQs are used for broad-band applications, while parametrics can be dialed in to very specific ranges (usually defined by parts of an octave), and even to a single frequency. Except in "severe" cases, like a wah-wah pedal and a phase shifter, EQs don't dramatically change a signal's overall sound, and are often used fore corrective measures (to rectify a frequency-reproducing deficiency in another component).

**Wah-Wah pedals** are active EQ circuits whose range is varied by means of a foot pedal. They apply a resonant-frequency peak that sweeps through the high-mid region (around 500 Hz—2 kHz), emulating somewhat the sound of a human voice.

![Blues Driver](image)

*Fig. 1: The Blues Driver is a distortion device, and therefore goes right after a preamp or a compressor.*

You can use a wah many ways: as a slowly opening and closing filter over a soaring lead solo; as the *wacka-wacka* disco effect popularized in the '70s accomplished by rocking the pedal while strumming muted strings; as a gently undulating modulation effect; or as a filter, with the treadle held in a fixed position. An envelope-followed filter (called "envelope filter" or "envelope follower" and shown in Fig. 2) is an electronic touch-sensitive wah (play soft and it goes *wohl*, play hard and it goes *whack*), and so should go in place of or adjacent to the wah.
Wahs would typically go after gain boosters, but Jimi Hendrix put his first, so there's a classic example of someone whose music wasn't hurt by not following the rules. A wah is one example of an effect that some recording guitarists will use on a "re-amped" or previously recorded clean track. (For more on re-amping, check out Craig Anderton's in-depth article "Re-Amping Basics for Guitar."

**Tip:** If you're recording—and your foot-rockin' chops are not up to snuff—consider recording a track of un-wahed guitar, then play back the track through the wah (focusing your efforts on just the wah—you can even use your hands) and record onto a new track.

**MODULATION AND TIME-BASED EFFECTS**

A surprising amount of sonic variety comes from effects that alter a signal using time distortion. Time-based effects, by definition, combine the original signal with a time-manipulated version, and that's why these effects work well in an amp's parallel loop or from a mixer's aux send jack.

You always want a portion of the original signal in the equation. Time-based effects take the original signal, sample it (through digital recording), stagger it in time, and combine it
somehow with the original. You might not think of the swimmy chorus sound as being related to loop recording a la Brian May, but they're two ends of the same spectrum.

**Choruses/Flangers** are interchangeable as far as effect-ordering. You probably wouldn't use them both at the same time in orthodox situations. Chorus is the more subtle of the two effects, usually consisting of a delay of 1-50 milliseconds, and is often used in stereo. Flangers, like the one shown in Fig. 3, are more dramatic, whooshy and vintage sounding. Put these after signal conditioners but before the delay and reverb.

![Flanger](image)

*Fig. 3: Flangers and choruses are time-based effects and go after gain-based effects.*

**Pitch Shifters** are sometimes referred to generically as "harmonizers," but that's actually a trademark name under Eventide's control. A pitch shifter actually takes the second signal and defuses it slightly in increments of cents (hundredths of a semitone). Mild pitch shift settings yield chorus-like effects; drastic ones come in the form of musical intervals, like 3rds, 4ths, and 5ths. Intelligent pitch shifters will alter an interval to fit a certain key or scale, so you can play in harmony with yourself (like the twin-guitar leads of classic southern rock bands).

**Delay.** With the advent of digital reverb, it's important to distinguish delay as a rather artificial effect compared to the more natural-sounding echo that reverb produces. Delay is a discrete, or separate, repeat of the original signal at a specified interval (in milliseconds)
after the original. Delay yields a spacious sound when used with times higher than 100 milliseconds or so. Settings of about 125 and above produce "slapback," a popular rockabilly effect, and longer times (around 300 ms) yield a soaring, cavernous sound.

Also included on a delay unit are Feedback (how many times the effected signal is fed into the delay channel), Modulation (a filter sweep that adds a chorus-like sound), and, on a stereo delay, panning controls for a "ping-pong" effect. A delay goes at the very end of the chain, just before the reverb, unless it's substituting for a reverb, in which case it goes last.

**AMBIENT PROCESSORS: REVERB AND DELAY**

When used conventionally, reverb and delay (which serves double-duty as a time-based effect, described in the previous section) act as ambient effects, and so are placed at the very end of the chain. (Some pedals, like the RV-3 in Fig. 4, combine delay and reverb.) The reasoning is that this is the most natural way we hear sound—in an environment which these effects are simulating. It doesn't make as much sense to add swirly chorus onto the tail of a long reverb as it does to add reverb to a chorused sound. If special effects are required, though—notably a rhythmic repeat in the delay or a gated reverb a la the Phil Collins snare sound—these units can be placed further up the chain.

*Fig. 4: This RV-3 combines delay and reverb, and so should be used as an ambient effect—going after the modulation effects.*
**Tip:** If you’re using reverb as a studio sideman, you must clear it with the recording engineer, in case he has his own plans for ambient treatment.

If you are recording yourself, try to add reverb at the midtown stage, as you may change your mind about the ambient treatment once all the instruments are in place in the mix. "Printing," or recording, with effects can't be undone once it's on tape.

When recording, guitarists like to hear reverb to get the right feel, and most mixers allow you to "monitor" effects without printing them, which means you hear them through the headphones or speakers, but they don't go to tape. If you have only one reverb unit but need to use two reverb programs simultaneously (e.g., small room on rhythm guitar, large hall on lead solo), you may have to print with effects when tracking.

**OTHER EFFECTS**

There are other effects that may not fall neatly into one of the above categories, but we can at least place them in the chain. A phase shifter sounds a lot like a flanger, but is really more of an EQ-based effect than a time-based one. Nevertheless, it should go where flangers, choruses, and pitch shifters go—after signal conditioners and true EQ-based effects.

Octavers, or octave dividers (shown in Fig. 5), behave like doublers, except that the doubled signal is usually one or two (or both at once) octaves up or down.

An octave effect can be achieved with a pitch shifter, so put your octaver in the vicinity of other time-based effects. Exciters, such as the BBE Sonic Stomp, are EQ-based devices that are intended to sparkle up an entire sound, so put those at the end (but before the reverb to preserve the natural EQ roll-off effect programmed into a reverb’s algorithm).
Fig. 5: An octave divider was a favorite effect of Jimi Hendrix. It's a popular way to fatten up single-line solo passages.

Tip: If you use heavy effects, though, exciters can sometimes sound too "steely" if placed after the time-based effects, because they interact with the chorused frequencies rather than the raw signal's. If that's the case move your exciter up front.

Noise Gates (or a "noise suppressor," as the unit in Fig. 6 is called) are designed to shut down the audio path until a certain level is achieved. This keeps noisy guitars from buzzing through quiet or silent passages. These typically go just before the reverb, because you want your guitar signal to cut off while the last ring-out of the reverb is still trailing away. Placing the noise gate after the reverb might cause an unnatural shoop sound as the gate slams the audio path shut during the reverb tail. But again, you could use this unorthodox sound to your advantage. Phil Collins did it in the '80s with his snare sound, and rap and hip-hop used it a generation later.
Fig. 6: A noise gate, or noise suppressor, should come just before the reverb (if you have one in your chain) so that it can cut off the guitar signal but leave the reverb tail intact for a natural sound.

**EFFECT ORDERING: TWO APPROACHES**

Figure 7 shows a typical setup of a few effects. This is an actual promotional photo of a Boss multi-effects pedalboard. Note that compressor and distortion appear first, and the time-based effects appear last. In this setup, the EQ is in the middle, which shows that an EQ can go anywhere. It's the universal effects ambassador.

Fig. 7: This all-Boss-configured pedalboard shows gain-based, modulation, and time-based/ambient effects in the proper order. The EQ (in the middle here) can go almost anywhere in the chain.
A more comprehensive approach to effects is shown in the schematic treatment of Fig. 8. This is also the 10 effects featured in the quiz at the beginning of this article. Often you wouldn't have two similar effects on simultaneously, but you might want to have them both available, so you can have both of them in the chain and swap their order without making a difference. Keep in mind, though, that placing all your effects inline, even when they aren't active, can degrade your signal significantly—especially with stompboxes that don't feature a hardwire bybass—so using a switcher (the employs a star network model, rather than a daisy chain, as an inline setup does) is worth investigating.

Fig. 8: A schematic of the proper ordering of numerous effects of different types. This is the diagram of the answers to the quiz in the first part of the article. The dotted line shows that it's okay to put the wah in front of the distortion (thanks to Jimi).
CONCLUSION

And as Jimi Hendrix showed us, you don't always have to follow the rules. You can't hurt anything electronically, and the suggested method only tries to protect the integrity of the original signal. But try out the "right" way first, and then proceed to mix and match your effects until you achieve the desired results—which may have nothing to do with preserving the signal.