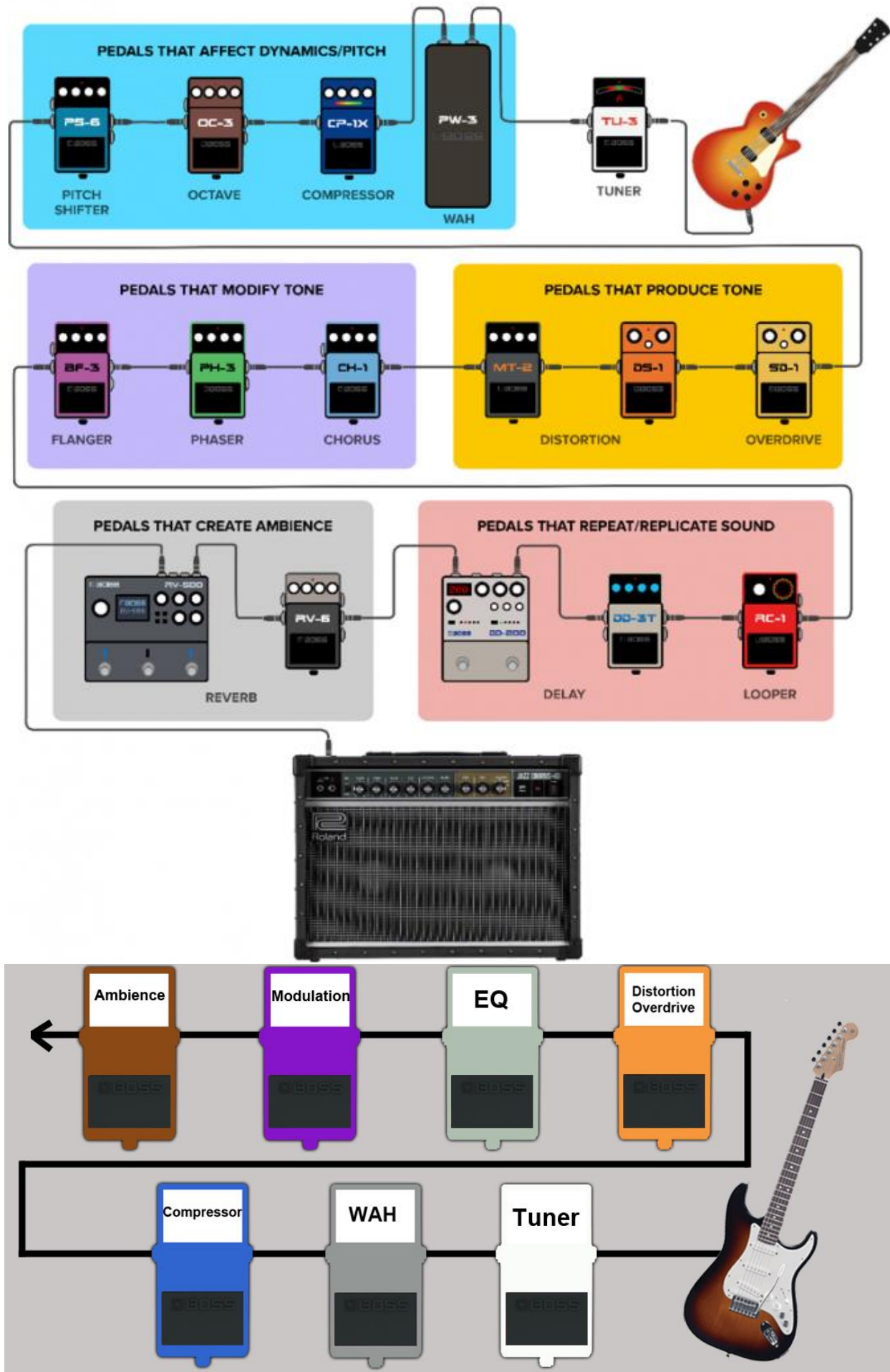


# SIGNAL CHAIN BASICS



# Basic Rules of Thumb for the Best Guitar Pedal Order

When putting together a pedalboard, there are a few basic concepts you should keep in mind.

- **Pitch-shifting effects** are best placed after the distortion unit unless they are special effects like a Whammy pedal.
- The **noise gate** can be placed either before or after the distortion block, depending on the noise characteristics of the distortion pedal and the desired effect.
- The same goes for the **equalizer** and **wah pedal**, both of which can perform different tasks depending on their placement.
- When a **volume pedal** is placed at the beginning of the effect chain, it determines the **input level** and thus also the amount of distortion. At the end of the chain, however, it controls the **overall volume**.
- To achieve the cleanest possible signal for tuning, it makes sense to place the **tuner** at the beginning of the effects chain.
- **Modulation, reverb, and delay effects** are usually placed at the end of the chain but can also offer interesting possibilities when placed before a preamp or distortion unit. In fact, this was common practice in the past due to the lack of loop-in paths.



## AMP WITHOUT FX LOOP

1. Wah Wah (Touch Wah, Envelope Filter)
2. Octaver (Whammy Pedal)
3. Dynamic Effects (Compressor, Limiter)
4. Pre Distortion EQ
5. Overdrive (Distortion, Fuzz)
6. Post Distortion EQ
7. Pitch Shifting Effects (e.g. Harmonizer)
8. Modulation Effects (Phaser, Chorus, Flanger)
9. Delay
10. Reverb
11. Amplifier





## AMP WITH FX LOOP

1. Wah Wah (Touch Wah, Envelope Filter)
2. Octaver (Whammy Pedal)
3. Dynamic Effects (Compressor, Limiter)
4. Pre Distortion EQ
5. Overdrive (Distortion, Fuzz)
- 5a. Preamp Stage (Amplifier Input)
- 5b. Amplifier Send
6. Post Distortion EQ
7. Pitch Shifting Effects (e.g. Harmonizer)
8. Modulation Effects (Phaser, Chorus, Flanger)
9. Delay
10. Reverb
11. Amplifier (Return Input)



# Pitch-shifting Effects

I use **pitch effects** in two positions in my signal chain. While something like a **Whammy pedal** makes most sense near the beginning of the chain, a **harmonizer**, which creates polyphonic sounds, is best put after the distortion unit. The **Octaver** is a different beast and its optimal placement varies depending on the specific pedal and what you want to achieve with it. Most like to use it at the beginning of the chain **(2)**, but it can also make sense to place it after the distortion **(7)**. Try it out!

# Best Guitar Pedal Order: Noise Gate

I deliberately didn't include a **noise gate** in the standard setups shown above, as it isn't really an effect. However, there are two options for positioning it in the chain if you decide to use one.

## Pre Distortion Noise Gate

On the one hand, you could place the gate right at the beginning before the wah pedal **(1)**. This way, the gate reacts directly to the pure input signal coming from the guitar. When the guitar is played, the gate is open; if no input signal is present, it is closed.

## Post Distortion Noise Gate

However, one of the problems that a noise gate can help solve is a noisy distortion pedal. A lot of noise can build up over the course of a signal chain. Overdrive, compressors, and the amp's preamp are some of the major culprits when it comes to noise. That's why many guitarists prefer to insert the gate post-distortion, either after the distortion pedals **(5)** or after the preamp **(5a)**.

For this purpose, some noise gates offer two separate circuits (e.g. ISP Decimator II, ISP Decimator Rack). These allow you to place one gate at the beginning and the other one after the distortion. Under no circumstances should a noise gate be placed at the very end of the chain because all it would do there is cut off your reverb or delay tails. In any case, the noise gate should always be placed before any delay or reverb pedals you might have.

# Where to put the EQ in a Guitar Effects Chain

For the **equalizer**, you've also got two main positions in the chain to choose from. And again, it's a matter of inserting it before or after the distortion, as this affects the sound in two fundamentally different ways. Some guitarists like to use both to their advantage and use two EQs simultaneously.

## Pre Distortion EQ

If you put the EQ before the distortion pedal, it affects the behavior of the distortion. This makes sense because it's the equalizer's job to raise or lower the level in certain frequency ranges. If you use the EQ to boost frequencies, the preamp or the overdrive/distortion that follows it receives a hotter signal and thus produces heavier distortion. For pre-distortion EQ, boosting frequencies usually produces better results than cutting them.

## Post Distortion EQ

In this position **(6)**, the EQ has no effect on the amount of distortion. Instead, you can use it to shape the sound that comes out of your distortion pedal. For example, if you want to create a mid-scoop sound with a high level of distortion, you should definitely insert the EQ after the distortion unit. A pre-distortion mid-scoop EQ would effectively reduce the amount of distortion – and that's usually not what we want.

# Best Guitar Pedal Order: Volume Pedal

I have chosen not to include the **volume pedal** in the guitar pedal order examples above. Strictly speaking, it isn't an effect, and again, there are several options to choose from, depending on what you want to achieve.

## Pre Distortion Volume Pedal

When placed before the distortion unit, a volume pedal affects the distortion behavior. In this position, it essentially works like the volume knob on the guitar, which allows you to reduce the amount of distortion by turning it down. If you want to do this with your foot, you should insert the volume pedal before the overdrive/distortion pedal **(5)** or preamp **(5a)**.

## Post Distortion Volume Pedal

Inserting the volume pedal after the distortion gives you a bit more flexibility. The pedal now acts as a master volume control. It has no effect on the amount of distortion and allows for the natural decay of delay or reverb tails. The advantage of this position (after the distortion **(5)** or preamp **(5b)**) is that you can use the volume knob on the guitar to set the amount of distortion while controlling the overall volume with your foot.

When using an amp with an effects loop, you should make sure that the loop is serial or that the effects mix is set to 100% wet. In a parallel effects loop, the signal would still be sent to the power amp, even when you pull back the volume pedal completely.

# Guitar Pedal Order: Where to put the Tuner

Needless to say, the best position for the **tuner** is at the very beginning of the signal chain. This ensures that it receives the cleanest possible signal from the guitar and doesn't display incorrect results due to other effects.

The catch is that some tuner pedals absorb quite a bit of level even when switched off, which is why it often isn't a good idea to have the signal passing through the tuner at all times. For the best possible results, you can use an **AB switch** to split the signal directly after the guitar and then send it to either the tuner or your effects and amp. However, the signal now passes through the AB switch constantly, which is why it's important to use a high-quality switch with minimal sound degradation – anything else wouldn't make sense.

If you have a **volume pedal** (see above), there might be another option. Many volume pedals offer a parallel tuner output that remains active even when the volume is turned all the way down. Besides giving you the option to tune silently, this keeps the tuner out of the direct signal path. However, you should make sure that no upstream pedals are activated that could interfere with pitch detection.

# Guitar Pedal Order: Exceptions and Special Cases

If you arrange your pedals according to these guidelines, nothing should go wrong. But there are of course a few exceptions and special cases.

## Wah after fuzz

Wah pedals are most commonly placed near the beginning of the chain. But unfortunately, this doesn't work properly in combination with certain fuzz effects. The worst-case scenario is that not much will be left of your wah effect if you run it through a fuzz. Certain other combinations of these types of pedals can produce strong oscillating tones, which are even more annoying.

The reason why fuzz and wah pedals aren't best friends is that their output and input impedances are too different. Jimi Hendrix supposedly used extremely long cables between his wah and fuzz to counteract the problem. But there are also photos where he connected the wah after the fuzz. If you really want to put the wah upstream of the fuzz, you can put a buffer amp between the two to avoid any potential problems. But again, there's no guarantee. Some fuzz pedals don't play nice at all and always want to be first in line. In any case, you should experiment with these configurations – don't just assume that either your wah or fuzz pedal is broken!

## Delay before preamp/overdrive

In the 50s and 60s, there were no amps with effect loops. If you wanted to use a delay for that authentic slapback echo, you had to put it in front of the amp. Furthermore, the amps at that time weren't blessed with high distortion levels, so this kind of setup resulted in a rather dirty sound, especially because the level boost of certain delays caused the amps to distort. This means that you can absolutely position the delay or even the reverb before the distortion for authentic rockabilly sounds, as long as you go easy on the gain.

## Phaser or flanger before preamp/overdrive

Some phaser or flanger pedals tend to raise the level due to their modulation behavior. Positioning these effects before the preamp or the overdrive/distortion pedal can create an interesting flavor of distortion. Again, just experiment with various guitar pedal orders and find out what works best for you.

# The 4 Cable Method (4CM) – What It Is and How To Use It Correctly

The 4 Cable Method (4CM), is a term usually heard in guitar-related conversations. It describes a way to connect your guitar to your effects pedals and amplifier. You connect using both your amplifier's **Input** and its **Effects Loop** at the same time.

The ability to run guitar effects either into the Input of the amplifier, or within its Effect Loop (SEND / RETURN) circuit, gives you different tonal results. This includes a big difference in how time-based effects (such as reverbs and delays) interact with your amplifier's overdrive channel.

To implement the 4 Cable Method, you'll need the following:

- 4 quality guitar cables. If you're using pedals, you'll also need patch leads for connecting them to each other.
- An amplifier with an effects loop. The effects loop jacks are found on the back of the amp. Look for the SEND / RETURN circuit.
- Your effects pedals **OR** a compatible Multi-Effects processor. So, to connect a Multi-Effects processor using 4CM, it will need to have EXTERNAL LOOP capability. That is, it needs its own SEND / RETURN jacks in addition to the usual INPUT and OUTPUT.
- A guitar!



## 4CM for Compact Pedals:

**RED CABLE 1**

Connects your guitar to the INPUT of the pedals you wish to use BEFORE the amplifier.

**GREEN CABLE 2**

Connects from the output of the above pedals, into the amplifier's INPUT jack.

**YELLOW CABLE 3**

Connects from the amplifier Effects Loop SEND, to the INPUT of the pedals you wish to place *after* the amplifier's sound processing.

**BLUE CABLE 4**

Connects from the OUTPUT of the above pedals to the amplifier's RETURN jack – to be sent directly to the power amp and speaker.

## 4CM for Multi-Effects Processors:



<b>RED CABLE 1</b>	Connects your guitar to the INPUT of the Multi-Effects processor.
<b>GREEN CABLE 2</b>	Connects from the Multi-Effects processor's External Loop SEND, into the amplifier's INPUT jack.
<b>YELLOW CABLE 3</b>	Connects from the amplifier's Effects Loop SEND, to the Multi-Effects processor's External Loop RETURN.
<b>BLUE CABLE 4</b>	Connects from the Multi-Effects Processor's OUTPUT, to the amplifier's RETURN jack – to be sent directly to the power amp and speaker.

**IMPORTANT** In order for this method to work correctly, you'll need to ensure that the External Loop of your Multi-Effects Processor is activated. You may need to do this for each individual preset/patch of your Multi-Effects Processor.

When connected in this manner, most modern Multi-Effects processors (such as the BOSS GT-100) will allow you to move each individual effect within a preset/patch to be placed before the amplifier's INPUT, or within its Effects Loop.

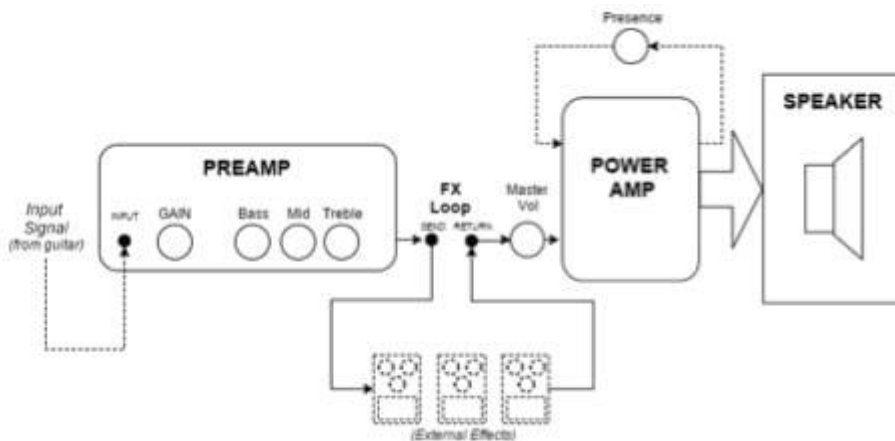
## The Reason.... why use 4CM?

4 Cable Method lets us place effects either *before* or *after* the amplifier's EQ section, and its internal overdrive/distortion effect (a.k.a. the gain stage).

Certain effects sound very different when placed before overdrive/distortion, or after. These differences are most obvious with time-based effects like reverb and delay. To a lesser extent, this includes modulation effects like phaser, flanger and chorus. For example, even a simple volume boost effect can work very differently, depending on whether it is placed before or after overdrive!

Why? A natural by-product of amplifier distortion is compression. So, the higher the level of preamp gain (distortion) used, the more compression appears. This alone is not a problem. In fact, it is this very compression that creates the great sustain that a high-gain guitar amp can achieve. But, the problem is that this massive compression can negatively affect the use of some guitar effects. Delay and reverb pedals for example, essentially compress to unusable levels when plugged into the INPUT of a high-gain guitar amplifier.

This very problem appeared during the high-gain guitar amp revolution of the 1980s. In order to use delay and reverb effects in high-gain amps, guitarists needed to place their effects after the preamp distortion, but before the power amp. Behold, the effects loop was born!



## The Effects Loop

The effects loop sits between your preamp and your power amp. As a result, it allows you to place effects *after* the amplifier has imparted its tonality (including internal amplifier overdrive). But, they will still be in the circuit *before* the signal reaches the power amp and speaker.

As we've described, the 4 Cable Method allows us to select whether we place our effects into the amplifier's INPUT (before the amp's internal overdrive) or into its EFFECTS LOOP (*after* the amp's internal overdrive) in order to achieve our desired tone.