



The Components: Part 2

In this article, I'll be discussing part 2 of the component selection focusing on the electronics. And we'll put the finishing touches on our electric guitar plan.

If you'll remember in the last article, I encouraged you to purchase and measure all of the components for your guitar before jumping into construction. I want to reiterate that advice. It's vital to do this in order to assure the playability of your hard work. And like a dad always told me, measure twice and cut once!

Ok, with that out of the way, let's take a look at the electronic components you'll need purchase. First on the list are the most exciting items you'll consider, the pickups. No other part will have as much impact on how your guitar will sound than the pickup. And for that reason, they tend to be regarded with quite a bit of controversy. It seems there are almost as many opinions about pickup design and selection as there are varieties on the market. But to keep this podcast on track, I'll stick to a basic explanation of how they work and give you just the information you'll need to make the right choice.

A pickup is really a very simple device. It consists of magnetized pole pieces, one for each string, which are inserted into a bobbin and wrapped in thin copper wire. This assembly is called a coil. The way they work is equally simple to explain. When a string is plucked, it vibrates over the pole piece, which in turn vibrates the magnetic field. All this vibrating generates an electrical

current in the copper wire, which can be converted to sound when the guitar is plugged into a speaker.

There are a lot of ways you can narrow down your choice of pickups, but I think the best way is to first lump them into one two categories, those that hum and those that don't. What I'm talking about here is a low-frequency humming sound that certain pickups produce when the guitar is plugged into a speaker even if it's just sitting there and not being played. Normally this effect is associated with single-coil pickups. Some people are willing to put up with the hum in order to get the unique single-coil tone, but most players would rather eliminate it altogether. Pickups, which avoid this problem, are known as dual-coil humbuckers because they buck the hum. They consist of two coils, each one having its own bobbin of copper wire wrapped in the opposite direction of the other, thereby canceling out the hum.



Typical Single-Coil Pickups

After you've decided whether to go with a single coil or a humbucker configuration, you can start to look at the specs for different pickups to determine which choice would work best for you. Remember, the style of music you play will factor into this decision. What you'll need to be looking at is the pickup's DC resistance and the type of magnet it uses.

DC resistance is supposed to be a measurement of how much resistance a given length of wire possess. However, the number used to indicate this measurement is actually the amount of electricity making it through the wire as measured in ohms. The higher the number, the more power the pickup is capable of sending out. Most pickups on the market today, measure anywhere from 4.5 to over 20 ohms. But keep in mind that a higher output will usually mean less tone on the treble side.

The type of magnet used in a pickup may seem unimportant since magnets are all the same, right? Wrong. There are a multitude of different types of magnets out there and many are finding their way into pickups as manufacturers discover the impact they have on tone. The most common magnets are Alnico 5 and ceramic. Alnico 5--made of aluminum, nickel and cobalt--is desired for its warm, well-rounded tone, while ceramic helps to preserve the potential loss of treble in high-output pickups.

If you plan to use more than one pickup, you'll want to think about power output in terms of where the pickups will be installed on the guitar. The bridge pickup usually needs to be a bit more powerful than the neck pickup because the amplitude of string vibration decreases dramatically where the string meets the bridge. The key here is to choose a set of pickups so their power output will achieve balance according to the amount of string vibration happening above them.



Typical Humbucker Pickups



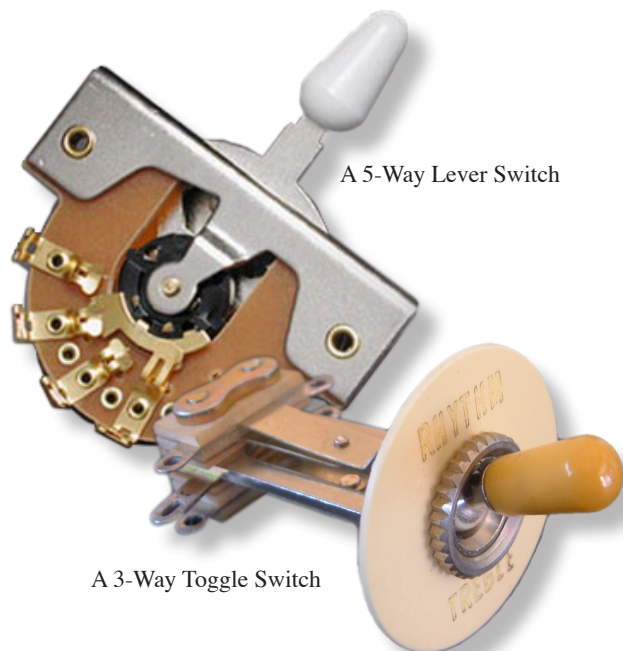
Active Humbucker

Another type of pickup worth considering is the active pickup. Available as either single-coil or humbuckers, the active pickups differ from their passive cousins by including a battery-powered pre-amp and other circuitry designed to shape the sound. The advantage of these types of pickups is their tremendous power output, making them very popular among hard rock and heavy metal guitarists. However, careful consideration must be given to wiring, amp selection and playing style in order to get the most from these pickups.

Regardless of the type of pickups you decide to purchase, you'll need to measure the width, length, height and mounting arrangement in order to add them to your plan. Try to keep the pickup cavities no more than a 1/16 of an inch larger in width and length than the pickup itself. And if you're going to install trim rings, make sure the cavities aren't going to be too big for the rings to cover.

I could blather on about pickups, but I think I've covered the basics you'll need to know when making your choice. Now let's move on to the pickup selector switch.

The pickup selector switch, as its name implies, is designed to allow you to choose which pickup or combination of pickups you want to hear from while



A 5-Way Lever Switch

A 3-Way Toggle Switch

playing. For example, if your guitar will be equipped with three single-coils, you'd probably want to use a 5-way selector switch. This will allow you to choose the bridge by itself, the middle by itself or the neck by itself. The other two positions will give you the choice of combining the bridge and middle or the neck and middle pickups. Each position will produce a slightly different tone. Think of it as having 5 guitars in one!

If you go with a pair of humbuckers, at the very least you'll need a 3-way switch to select the bridge by itself, the neck by itself or both together. You could also opt for a 5-way switch, which will allow for coil tapping as long as your humbuckers are equipped with 4-wire leads. Coil tapping allows you to split your dual-coil pickup into a single-coil configuration. Unfortunately, I don't have time to cover all of the wiring options in detail, but you can find a wide variety of schematics on the internet to help you decide.

Placement of the switch is really a matter of personal choice. However, make sure it doesn't interfere with playability. But, keep in mind, that the switch will require a cavity, routed into the body, for it to reside in. Be careful not to put the switch in a spot where there may not be enough room for its cavity.

Now let's move on to the next components on the list, the volume and tone controls.

Unless you want to keep running back to your amp every time you need to change either volume or tone, you'll need to add controls directly to your guitar in order to accomplish this. What you'll need is a couple of potentiometers or pots as they're most often called. A pot is a small rotary mechanism designed to bleed off either volume or treble when wired to the pickups. And like any other guitar component, there are several varieties to choose from. Some applications require specific types of pots, like active pickups, while others leave the choice to the builder. However, it's important to understand the differences before making your purchase. Otherwise you might not like the way the tone or volume changes when you turn the knob.

For most applications, the pots you'll be looking at are rated with either 250k or 500k ohm resistance. Without going into too much detail, 250k pots are usually paired with single coil pickups while humbuckers tend to work best with 500k. Active pickups, on the other hand, usually require 25k pots. You'll also notice pots are rated as either linear or audio. This rating refers to how the pot tapers volume and tone. I prefer pots with an audio taper as they seem to do the job more gradually when you turn the knob as opposed to linear pots. Whatever your case may be, I'd recommend checking with your pickups manufacturer to find out what they recommend.

Before you make your selection, you'll need to decide whether to purchase regular or mini sized pots. Mini pots are great for small cavities where space is limited. However, regular pots are a bit easier to handle during installation. Also you can choose either a long or short shaft design. Use a long shaft if you need to run it up through more than 1/8 inch of wood. The short shafts are fine if the pot will mount directly beneath a pickguard.



A Regular, Short Shaft, 500k Pot

The last item on our list is the output jack. To plug your guitar into an amplifier, you'll need a 1/4 inch version. There are two varieties to choose from, mono or stereo. Most electric guitars feature a mono jack since the amp and speaker are mono. However, guitars equipped with active pickups require a stereo jack in order to wire the battery.

The most important factor regarding the jack is where it will be installed on the guitar. Obviously, you'll want to choose a location that is out of the way yet secure. There are a variety of plates available to mount the jack and the one you choose will likely be based on personal preference. Just make sure you position the jack in close proximity to the control cavity with access for the wiring.

Well that about covers the basics of component selection. I know some of you maybe wondering about what kind of wire and capacitors to use. And of course, what about the guitar strings? I'll cover those items in more detail in the seventh article when I discuss wiring and your guitar's final setup.

Once you have all of your components purchased and measured, you can finalize your drawing. At this stage, it's important to carefully plan the location of your control cavities with respect to the pickups. Keep in mind the cavities need to be connected in order to wire everything together. You can do this by drilling $\frac{1}{4}$ inch holes using an electric hand drill and a long bit. If you have to angle the bit to drill from one cavity to another, be very aware of the angle so you won't miss the cavity you're aiming for or drill out one side of the guitar or the other!

1/4 Inch Mono Output Jack



Just Some Of The Jack plates
You Can Choose From

In the next article, I'll be discussing my favorite topic, wood selection and its impact on tone. Until then, get all those parts together and finish your plan.

For more information about electric guitar building, be sure to visit my web site at eguitarplans.com. There you find a selection of unique and original electric guitar plans available for download at a very reasonable price.

In the next article, I'll discuss my favorite subject; wood and it's impact on tone and appearance.

