The Components: Part 1

In this article I'll be discussing component selection and why it has to be done before you start cutting any wood. I'll also give you the information you'll need to finish the plan we started in the last article.

As I began to write this, it occurred to me that there was way too much info to cram into one article. Therefore, I've decided to split it into two parts. In part one I'll cover all of the components related to an electric guitar's scale. And in part 2, I'll cover the electronics.

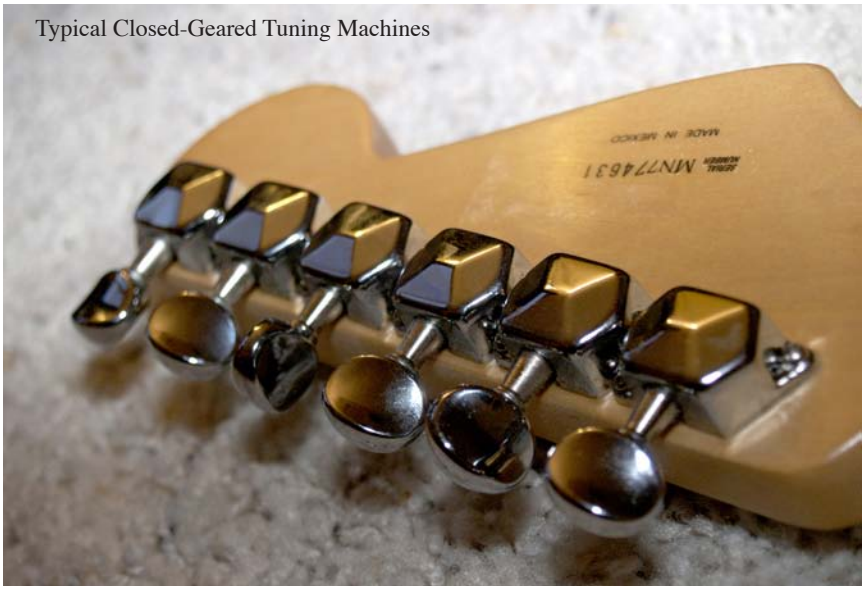
"Measure twice and cut once." My dad gave me that piece of advice a long time ago and I can certain vouch for its usefulness when building electric guitars. In fact, I'll probably repeat it often as we proceed through this series of articles. So how does it relate to component selection? Well, for one thing, if you neglect to measure the dimensions of the parts you're going to use, there's a good chance you'll run into to problems down the road. Hopefully, by the end of this article, you'll understand what I mean.

I think the best way to proceed will be to explain each component option from one end of the guitar to the other. Even though there are a lot of different electric guitar designs out there, for the sake of simplicity I'm going to focus on a more traditional solid body design, one that uses peghead rather than a headless approach. Maybe down the road I'll do a article aimed at alternative designs. But for now, let's start with the peghead.

The pegs--more commonly referred to as tuning machines--come in a variety of styles. You can choose from open geared, which are usually found on acoustic guitars, or closed geared where the mechanisim is covered. For electric guitars, I recommend the latter as they tend to stand up better to abuse. You'll notice as you shop for tuning machines, there are several different styles with names like Kluson, Grover, Schaller and Gotoh. I'm not going to recommend specific brands, but I will suggest you go with reputable names because some of the off brand parts don't perform very well. You'll spend more, but you'll be glad you did. However, regardless of the tuning machines you end up choosing, you'll need to be aware of two specifications; the tuning ratio and the diameter of the hole required to mount the tuner to the peghead.

As far as tuning ratio is concerned, when you see numbers like 14:1 or 18:1, that's how many times you have to turn the peg to achieve one full turn of the string post. In other words, for a 14:1 ratio, you'll turn the peg 14 times to get one turn of the string post. The greater the number of turns, the finer the tuning capability while the less number of turns will tune the strings faster. The choice is up to you.

With regards to the holes needed to mount the tuning machines in the peghead, you'll need to measure the post to determine their size. Don't rely on the



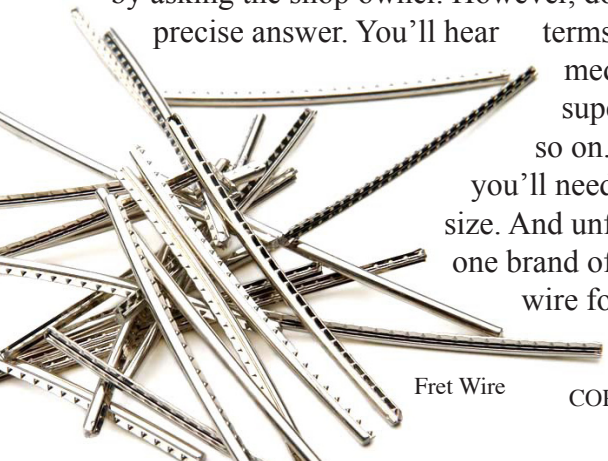
Typical Closed-Geared Tuning Machines

manufacturer's specs for this. Get a pair of digital calipers to get an accurate diameter. And remember, the tuning machine needs to fit snuggly. If it's loose, you might hear a buzz when you play the string.

Now let's move on to the nut. Like the tuning machines, there are a lot of choices here. The nut can be made from a variety of materials, but I'd recommend bone for a fixed bridge guitar, or graphite if you plan to use a tremolo. However, there is no hard and fast rule here. I've had great success with brass, but the slots can be a real pain to cut. Other choices you might consider are locking nuts, which are almost required for locking tremolo designs and roller nuts. Again, the choice is yours. But you will need to be aware of the nuts width and string spread. Use your digital calipers to measure the nut's width. That dimension will also be your fretboard width at the nut. Now you'll be able to mark the start of the fretboard on your plan. As far as the string spread is concerned, I can't stress its importance enough with regards to the nut and the bridge. If you fail to mark the position of the strings on your plan, you'll run the risk of the strings falling off the edges of the fretboard! And you won't know this until final assembly. So do yourself a favor and either purchase an accurate nut slot ruler or go online and search for a nut slot calculator. Once you've determined the position of the string slots on the nut, you'll be able to mark them on your plan. Ok, so now we know the width of the fretboard at the nut, but what about at the heel? I'll get to that in a minute. First lets talk about fret wire.

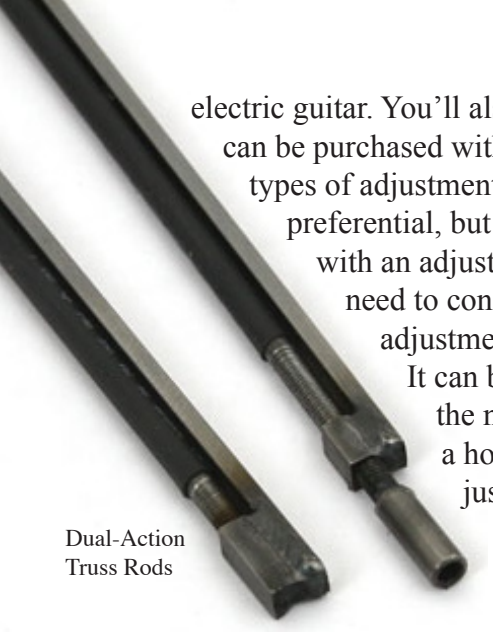

Homemade Bone Nut

Remember in the last article I asked you the measure the height and width of the frets you like the most? Chances are if you did take some measurements, their pretty rough. After all it isn't easy to check the dimensions of fret wire that has already been installed. A possible alternative would be to check the size of the frets by looking up the guitar's specifications or by asking the shop owner. However, don't expect a precise answer. You'll hear terms like jumbo, medium jumbo, super jumbo and so on. But, what you'll need is the actual size. And unfortunately, one brand of jumbo fret wire for example, may be a different dimension than another brand of jumbo. This is where experience pays big dividends. However, if you're not sure which size is the closest to your preference, you'll have to make an educated guess. Make sure whomever you buy from will allow you to exchange the wire until you get what you want. For one electric guitar, you'll need to plan on buying about 6 feet of wire. Check to be sure it has a nickel silver content of 18%. Otherwise the wire may be too soft for a steel stringed instrument. Now if you're really hard on frets, you might consider stainless steel fret wire. It's a little tougher to file the edges smooth, but worth the extra life expectancy.


Fret Wire

The next component in our list is one that you can't readily see. In fact I know a lot of guitar players who don't even know it's there. I'm talking about the truss rod.

Buried in the center of the guitar's neck, the truss rod acts to stabilize the neck against excessive bow. There are two common types of truss rods; the single-action and the dual-action. The single-action is designed to counter the effect of string tension while the dual-action has the added benefit of eliminating the impact of seasonal climate changes. For our purposes, I recommend the dual-action for easy of installation and wider range of adjustability. When you purchase your dual-action truss rod, make sure its length is suitable for an electric guitar. It should be between 17 and 19" long. Don't make the mistake of buying a truss rod intended for a bass guitar, as they are too long for an



Dual-Action Truss Rods

electric guitar. You'll also notice truss rods can be purchased with a variety of different types of adjustment nuts. The choice is preferential, but make sure it comes with an adjustment tool. Also, you'll need to consider how access to the adjustment nut will be achieved. It can be through a hole in the neck's heel or through a hole in the peghead just below the nut. I recommend the latter as it's a little easier to get at.

Now we're going to move off the neck and onto the body. Here we'll explore the last component in an electric guitars scale: The bridge

While there are variety of bridges to choose from, they tend to fall into two distinct categories: fixed or tremolo. Lets start by examining the fixed designs.

The most common fixed bridges are the tune-o-matic and the hardtail. The tune-o-matic is basically a metal trough that sits on the body parallel to the nut and is supported by adjustable posts at both ends. Filling the trough are saddles, notched to hold the strings and held place with screws. These screws are used to move the saddles back and forth to intonate each string. To change the height of the strings requires raising or lowering the bridge by adjusting the posts. The advantage of this design is its simplicity. Tune-o-matics are relatively easy to install and adjust. The disadvantage, however, is that you can't adjust the individual saddles for height. For that reason, it's very important to match your fretboard's radius with that of the bridge's saddle radius. I'll explain fretboard radius in a future article when I describe building the neck. But for now, if you choose to use a tune-o-matic, make sure you know what the saddle radius is. Also, if you decide to go with a tune-o-matic, you'll need to select one of two methods for securing the strings to the guitar's body. One way is with a matching tailpiece, which sits behind the bridge and secures the end of the string. The other way requires drilling holes through the body behind the bridge for the string to pass through enroute to the saddles. Steel ferrules are pressed into these holes in back of the body in order to secure the ends of the string.

On the other hand, the hardtail bridge consists of saddle blocks held to a metal plate by spring loaded intonation screws. Like the tune-o-matic, these screws move the saddles back and forth. A notch in the front of the saddle supports the string while tiny screws on both sides of the notch adjust the saddle's height. The advantage of this design is that the individual saddles can be adjusted for height. Therefore, fretboard radius is less of an issue. You can choose either a top loader hardtail where the string is secure to the back of the bridge's baseplate or you can opt for a through-the-body design where the string is secured to the backside of the body by steel ferruels before being threaded up through holes and into the saddles.

Tremolo bridges are designed to do basically the same job as the fixed bridge. They support the end of the guitar's scale. However, they possess one unique feature in that they are designed to pivot up and down. This is accomplished by means of a metal bar often referred to as either the tremolo bar or the whammy bar. Moving the bridge up and down in this manner changes the pitch of the strings. Not everyone appreciates this effect, but imagine what Eddy Van Halen's or Jimi Hendix's music would've sounded like without the tremolo. There are a number of tremolo

A Tune-O-Matic Bridge With Roller Saddles

designs out there these days. The most common include the Bigsby, the Fender and the Floyd Rose.

Floyd Rose Locking Tremolo System

The Bigsby is really just an armature that replaces the tailpiece behind a tune-o-matic bridge. The Fender floating tremolo, uses the same design as the hardtail bridge, but adds springs and an arm. And finally the Floyd Rose approaches the tremolo concept as a complete bridge to nut system.

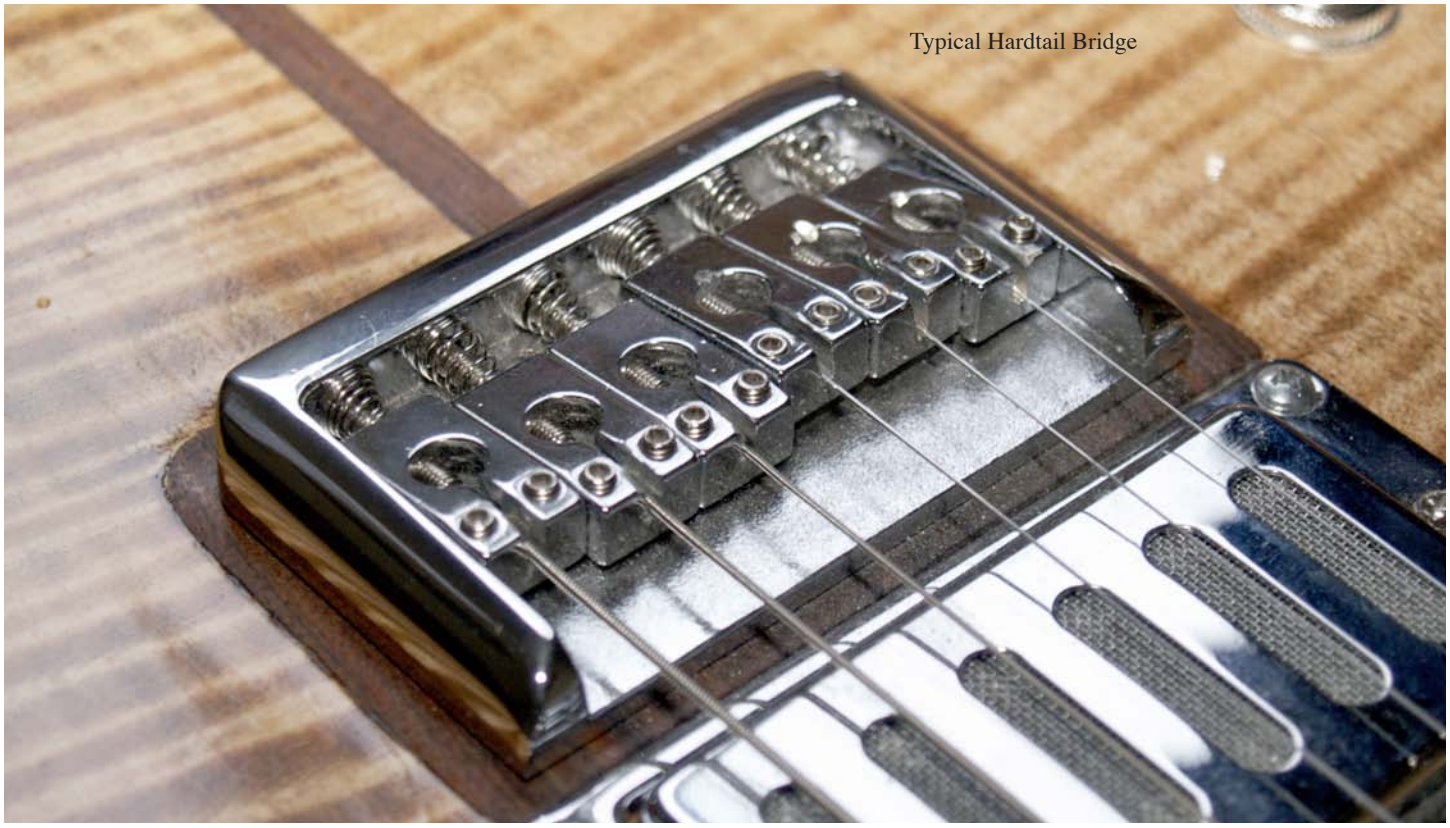
The easiest tremolo design to install is the Bigsby. It simply bolts to the top of the guitar's body. But make sure you know if the one you're purchasing is intended for a flat top guitar or an arch top. The Fender design requires a pocket to be routed into the back of the guitar below the top of the body where the bridge is attached. The purpose of the cavity is to hold the springs necessary to keep the bridge in a neutral position

Steel String Ferrules

when the tremolo is not being used. While the Fender approach is reasonably sound, there are those who complain that guitars with this type of bridge have trouble staying in tune. If you select either the Bigsby or the Fender, you'll want to consider a slippery graphite nut.

The Floyd Rose locking system was designed to address the problem of keeping a tremolo-equipped guitar in tune. After the strings are installed and the basic tuning is complete, the strings are locked into

Bigsby Tremolo



Typical Hardtail Bridge

place at the nut. Then, final tuning is performed at the bridge. When the job is done, the whole scale is locked down. The tremolo can now be used without having to constantly tune the guitar. The only disadvantage of this design is the complex routing necessary to install the bridge. However, in my opinion, there really isn't much of a difference between doing a little routing and a lot.

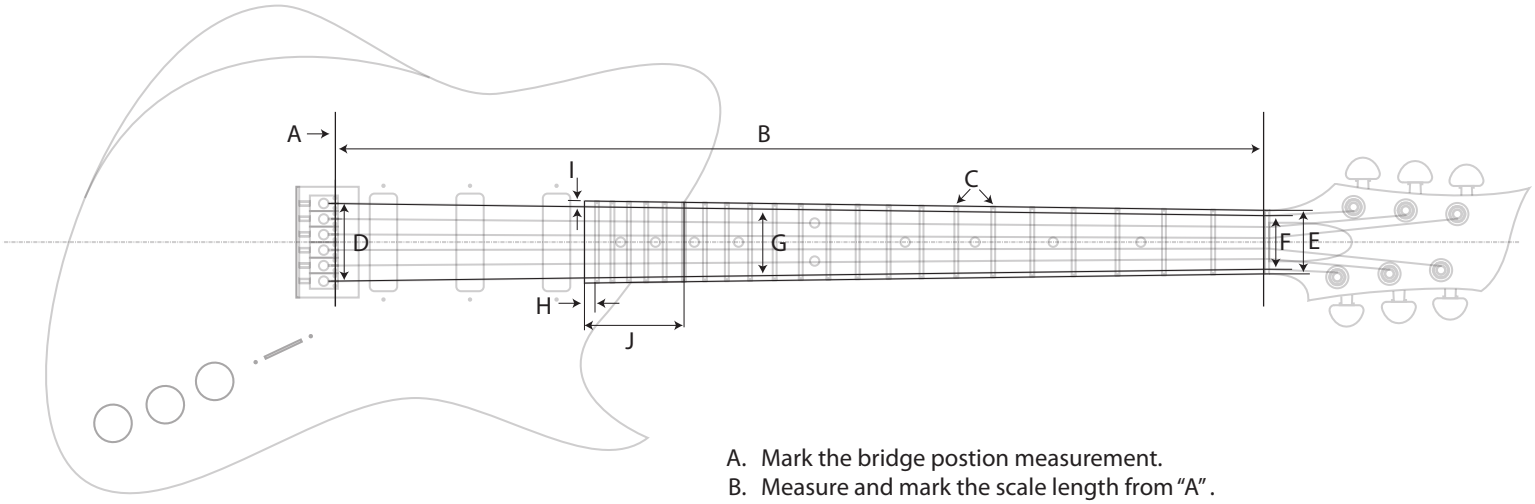
Regardless of the type of bridge you choose, the single most important piece of advice I can give you is to be aware of the string spread. You'll need to know the distance from the high "e" to the low "e" strings. This number will help you to determine the width of your fretboard at the heel. To do this, take the overall string-spread dimension and mark it along the bridge placement measurement. Then, by connecting the marks you just made with the corresponding slot marks at the nut, you'll have the placement of both "e" strings. Now you can draw the entire fretboard making sure its width extends past the strings on both sides. Add 3/8" to the last fret and you'll have the heel end of the fretboard. Also, you'll want to draw the other strings as well. By adding them to your plan, you'll be able to make better decisions about pickup choice and placement since ideally you'll want the strings directly over the pole pieces.

At this stage, you should be able to position the outline of the body more accurately in your plan. Position it so the neck overlaps the body by at least 2.5." This will give the neck's heel the contact it needs for a strong joint and good tone.

Be sure to visit my web site at www.eguitarplans.com and check out the low-cost plans I have available on the order page. They're a great option for those of you who don't have the tools necessary to draw up your own plans.

In the next article, we'll be taking a look at the electrical components you'll need to consider for your guitar. Until then, keep working on your plan and start shopping for those parts!

How To Layout Your Guitar By Measuring The Components



A. Mark the bridge postion measurement.
B. Measure and mark the scale length from "A".
C. Mark the fret positions from the nut.
D. Mark the outer string spread at the bridge.
E. Mark the nut width.
F. Mark the outer nut slots.
G. Connect "D" to "F" to show the high and low e string positions.
H. Add 3/8 inch to the last fret to mark the heel of the fretboard.
I. Draw a line from the heel of the fretboard to the outer edge of the nut. Make sure these lines are about 1/4 of an inch outside both strings. However, be aware the line will probably run slightly closer to the strings as it approaches the nut.
J. The neck should overlap the body by at least 2-1/2 inches.