Introduction

I had built an acoustic guitar a few years back which was a lot of work (see craigandheather.net/cgitpage.html if you are interested in seeing the process) but I wasn't aware I wanted to build an electric guitar until I got an email (www.stewmac.com/tsarchive/ts0180.html) from the Stewart-MacDonald company describing how to build what is probably the easiest electric guitar one can build. The guitar they described was easer to build than most electric guitars for two main reasons:

1. It utilized a pre-built electric guitar neck with frets already installed and already finished. Using a pre-built neck cuts days or weeks out of the guitar making process.
2. The body was a simple rectangle instead of the more complex shaped bodies found on most electric guitars.

As soon as I saw this I knew I had to build one. I remembered that Bo Diddley played a rectangular guitar so I knew I would be in good company. The Gretsch music company even made rectangular guitars for a while. The guitar I had in mind would have the neck and the playability of a Fender Telecaster / Stratocaster electric guitar with the pickups and hardware of a Gibson Les Paul guitar. A crossover guitar so to speak. If you are not familiar with Telecaster (Tele), Stratocaster (Strat) or Les Paul guitars look them up on wikipedia.org. Wikipedia is also a great resource for looking up any guitar terms used in this article that you are unfamiliar with.

Convinced I should build one, I immediately started thinking about all of the individual pieces/ parts that make up an electric guitar: the neck, the tuning heads, the neck screws, the neck plate, the pickups, switches, controls, etc. As you can imagine the list gets long very quickly. I toyed with the idea of buying a used electric guitar and scavenging the parts from that but I couldn't bring myself to dismantle a perfectly good instrument. In the end I decided to buy all of the parts individually even though that would cost a little more. I stumbled upon a site called GuitarFetish.com which offered most of the guitar parts I would need at reasonable prices. So I made up a rather long list of components (see Table One) and placed the order (total of $280 in Dec 2012). With that done I started to think about how to build the body of the guitar.

Electric guitar bodies are usually made with some kind of hardwood. Guitar building forums have endless debates about which woods are best. Many insist the more dense the wood is, the better sustain the guitar will have. Originally I wanted to make the guitar body out of black walnut but I couldn't find a board locally that was thick enough and not seriously warped.

Instead I purchased a beautiful, perfectly straight two inch thick piece of Sapele

(Entandrophragma cylindricum) wood from Woodcraft. Sapele is a tropical African hardwood (also known as sapelli or aboudikro) used by many guitar manufactures because of its tonal properties. The sapele board I bought was not wide enough for my guitar body so I had to glue 1 1/2" pieces to each side of the wooden blank as the finished size of the guitar blank/body was to be 9 1/2” x 17”. Photo One shows the clamps holding the glued up pieces together.

After the glue dried, Photo Two, I ran the blank through my planer to remove the glue residue and to flatten the top and bottom.

Next step was to machine a dado (slot) around the blank's perimeter using dado blades on my table saw. This was necessary because I wanted to inlay white ash around the body for an artistic touch. The light colored ash contrasts nicely with the dark Sapele. I did the same thing with the ash trim for a coffee table I built and it always gets comments from the people who see it. Of course this is an optional step you wouldn't have to do if you build a guitar like this.

I mitered the ash corners to 45 degrees and fit the ash into the dado. In Photo Three I'm gluing the ash into the Sapele body. After the glue dried I trimmed up the body edges on the table saw so the ash was flush with the Sapele as can be seen in many of the following photos.

You might be asking yourself at this point if I had plans I was working from to build this guitar and the answer would be no. I did, however, know the most important piece of information about the guitar I was building and that was its scale length (which is a function of the Fender style neck I chose to use). Scale length is the distance from the nut of the guitar (above the first fret) to the bridge of the guitar. In my case that was to be 25.5”. It is absolutely critical that the distance from the nut to the 12th fret be exactly equal to the distance from the 12th fret to the bridge of the guitar. If not, the guitar will have bad intonation which in severe cases can make the guitar unplayable. Luckily the bridge I selected was adjustable which makes getting the scale length correct much easier. So the guitar dimensions evolved as follows. First I laid out and machined the neck cavity so I could insert the neck into the body. Next, I measured 12.75” from the 12th fret and drew a line for where the bridge would be placed. I placed the tailpiece 1.5” behind the bridge line and the bridge pickup position 1.5” in front of the bridge. Finally, the neck pickup was positioned as close as possible to the end of the neck. Placement of the control cavity, strap buttons and output jack are not critical so I placed them where I thought they looked and would work best.

I built custom templates for my router for the neck cavity and for the pickup cavities (Pre-made templates can be purchased from stewmac.com). I used a flush cutting router bit with the bearing on the shaft towards the router. The bearing rides on the template to make the correctly shaped cavities. This was kinda of a pain because you cannot cut the full depth of the cavities in a single pass so I had to elevate the template on spacers, make a cutting pass, lower the template a little make another pass and then remove the spacers under the template and make a final pass.

I machined cavities for the neck, both pickups and for the guitar's control panel. My guitar will have simple controls like a Fender Telecaster guitar. A three position pickup selector switch, a volume and a tone control.

If you look closely at Photo Four you can see pencil lines on the tape. The vertical line at a small angle from vertical is for placement of the bridge. The bass side of the bridge must be offset an additional 1/8 inch for proper intonation. Photo Five shows how the neck fits tightly into the body.

In Photo Six you can see I have drilled out the holes for the tuning keys and mounted them and also drilled the four holes in the body for the neck plate. This type of guitar is referred to as a "bolt on neck" guitar as opposed to a guitar where the neck is glued permanently to the body. The four gold neck screws will pass through a gold metal neck plate then through the body of the guitar and into the wood of the neck. In this picture you can also see that I beveled all of the hard edges on the body at a 45 degree angle. This makes the guitar more comfortable to play.

The final machining steps shown in Photo Seven were to drill holes for the bridge supports, the mounting holes for the pickups and for the control panel. What you cannot see in this photo is that I had to drill holes/tunnels between the pickups and the control cavity and between the bridge support hole and the control cavity so I could run the electrical wires that I will eventually hook up to make the guitar function. I also drilled a 7/8" hole in the bottom of the guitar for the output jack. I had to drill a tunnel for this connection as well. Finally I applied five coats of Tung Oil finish to bring out the nice Sapele wood grain. The neck, as mentioned, was already finished. Photo Eight show the back of the body after finishing.

With machining and finishing completed I mounted the major components into the body and pulled the wires into the control cavity making sure I placed the neck pickup next to the neck and the bridge pickup next to the bridge as they are different. See Photo Nine.

The electronic portion of an electric guitar is really very simple (see the schematic in Figure One) and consist of a three position selector 2P3T switch which selects the neck pickup (for a more bassy sound) in the forward position, the bridge pickup (for more treble) in the rear position and both pickups together in the middle position. The middle volume control controls the overall volume of the guitar and the tone control rolls off the highs (via a 1st order R-C lowpass filter) as it is rotated counter-clockwise.

You can see the finished wiring of the controls in Photo Ten. The two black wires are connections to the pickups. The middle heavy wire is the ground for the bridge which is necessary or the guitar will hum when you touch the strings. The wire on the left is the shielded wire going to the output jack. The orange item between the pots is a 0.047 uF capacitor for the tone control. NOTE: it is very important to have a single ground point for all of the wiring as that helps to eliminate ground loops and hum. Here, all ground connections are soldered to the back of the volume pot.

Photo 11 shows the output jack wired up and Photo 12 show it mounted into place. Photo 13 shows the string tree I used for the E and B strings. Its function is to pull these string downward off of the nut so the strings don't come out of the nut grooves when the guitar is being played hard.

Photos 14, 15, 16 and 17 provide various views of the completed guitar. Isn't it pretty ? In my opinion it turned out very well.

Additional photos and build information for this guitar is available on my website at:

Conclusions

Building this guitar, while not your typical Nuts and Volts build it yourself project, was a lot of fun. Due to the simplicity of design, a guitar like this can be built by most people with sufficient motivation. If you don't possess the necessary tools or the woodworking skills required maybe a friend or family member does and they can help you build one.

This guitar was not inexpensive to make but much of the expense was a result of my choices of guitar components. Two top of the line humbucker pickups instead of one and the use of gold colored hardware drove the price up considerably. I decided I was only going to do this once so I might as well use high quality components.

Was it worth it ? Definitely yes! Not only do I have a one of a kind guitar that I can say I built but I also have a wonderful sounding instrument that I will get years of use out of. If you are interested in hearing how this guitar sounds go to:

craigandheather.net/songsilike2013cd.html

There are the songs off of my latest CD. Every electric guitar part on every song was played on the guitar you see here. Proof enough that you too can build an electric guitar that sounds every bit as good as one you would buy for probably about one tenth the cost. And of course the pride that comes from building it yourself is priceless.

Resources

The following companies supply guitar information, guitar parts, tools to make guitars, guitar kits, etc.

Company	Website	Description
Warmoth	www.warmoth.com	Electric guitar and electric bass bodies, necks and assorted hardware made in the USA.
Guitar Fetish	www.guitarfetish.com	Suppliers of all things guitar from parts to complete guitars.
Stewart-MacDonald	www.stewmac.com	Supplier of guitar parts, luthier tools to make guitars and acoustic and electric guitar kits and much more.

Company	Website	Description
Allparts Music Corporation	www.allparts.com	Supplier of electric guitar parts and accessories.
Greasy Groove, Inc.	www.greasygroove.com	Supplier of electric guitar parts and stylish accessories.

Bio

Craig lives in the mountains of Colorado and can be contacted at calhjh@gmail.com. When not messing around with music, electronics, computer projects, wood working or beer brewing, he plays in a rock and roll band and does a solo musical act around Colorado Springs.

Table One

Guitar Hardware Components

NOTE: all components purchased from guitarfetish.com except as noted.

Quantity	Item	Part Number	Description
1	Pre-made neck	TLCGMP	Clear gloss finished Telecaster neck with maple fingerboard
1	Gold neck plate	K02	Gold neck plate with screws
1	Tuneomatic Bridge	B06	Large bushing Tuneomatic style gold bridge
1 set	Tuners	E17	Gold Gotoh style 14:1 tuners
1	Control Plate	K05	Telecaster gold vintage style control plate
1 pair	Strap buttons	K32	Gold strap buttons with screws
1 pair	String Trees	K35	Gold string trees. Only used 1 of the 2.
1	Tailpiece	GTS09GD	Gold tailpiece with mounting studs
1	Neck Pickup	H182	Gold neck mini humbucker pickup
1	Bridge Pickup	H183	Gold bridge mini humbucker pickup
1	Pickup Selector Switch	F24F167	3 Way Telecaster style pickup selector switch with screws and black top hat tip. Switch is 2P3T.
1 pair	Knobs	A03	Gold knurled brass Telecaster knobs for split shaft pots
2	Pots	F22	Full size 250K audio taper pots (potentiometers)
1	Capacitor	F36	.047uf Sprague orange drop capacitor
1	1/4” Output Jack	F17	1/4” mono output jack
1	Output Jack Mount	4283-G	Gold Electrosocket jack mount purchased from stewmac.com.

Figure One
The Guitar's Schematic

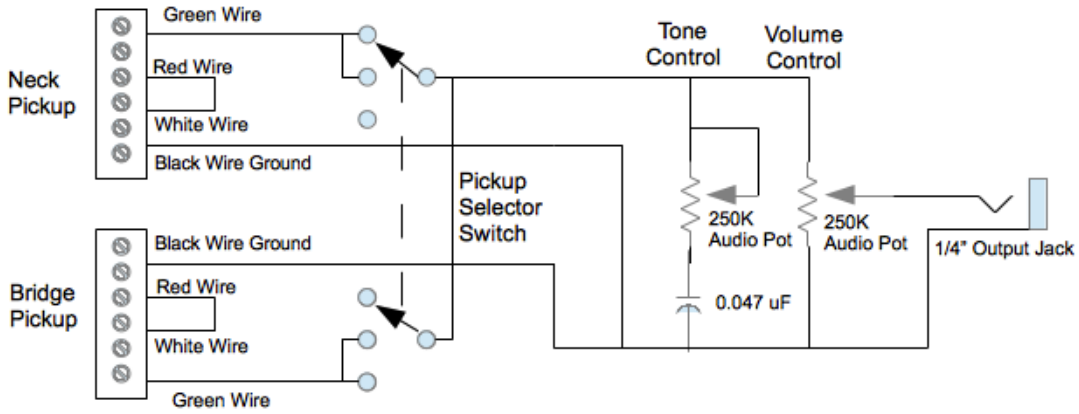

Photo One

Gluing Up the Sapele Guitar Body

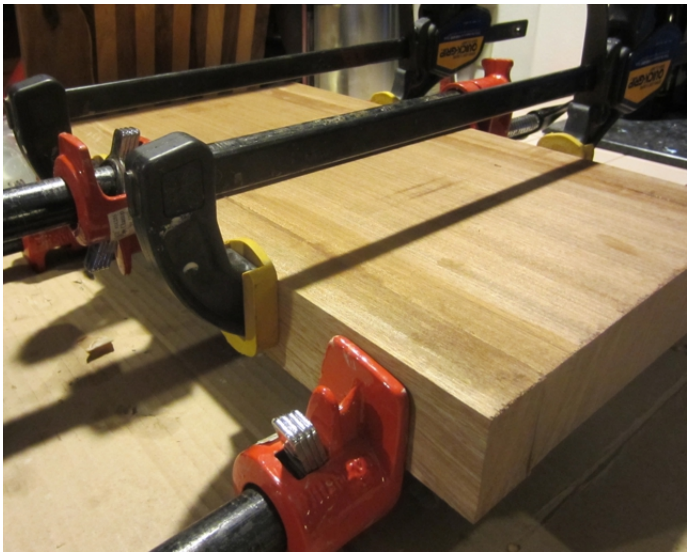

Photo Two

After the Glue Dried but Before Planing

Photo Three

Gluing of the Ash Inlaid Strip Around the Body

Photo Four

Machining of the Body Almost Complete

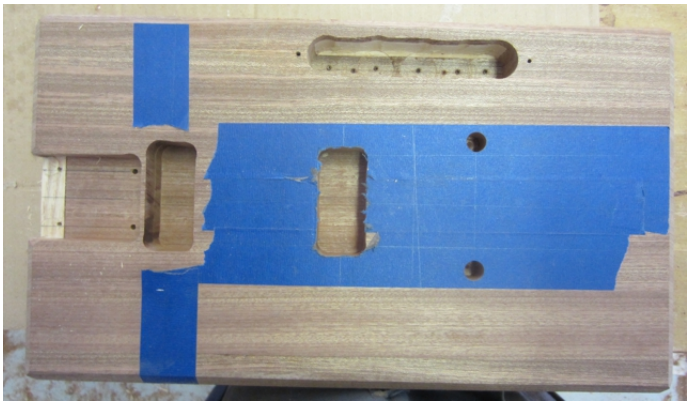

Photo Five

Closeup of Neck in Neck Cavity and Adjacent Neck Pickup Cavity

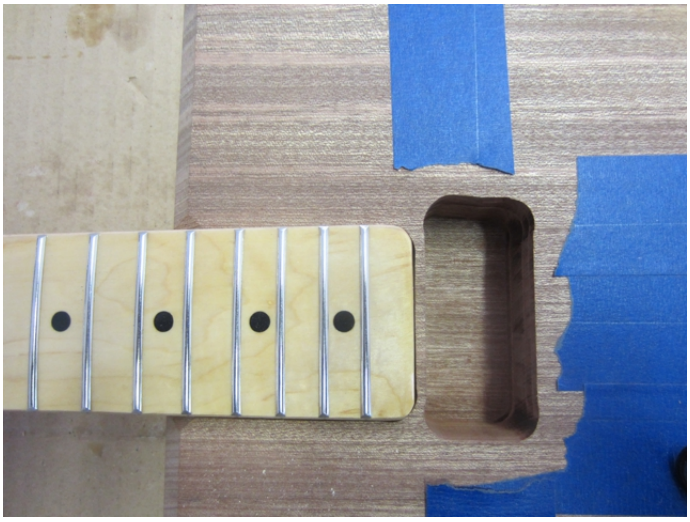

Photo Six

Fitting the Neck to the Body and the Drilled and Mounted Tuning Keys

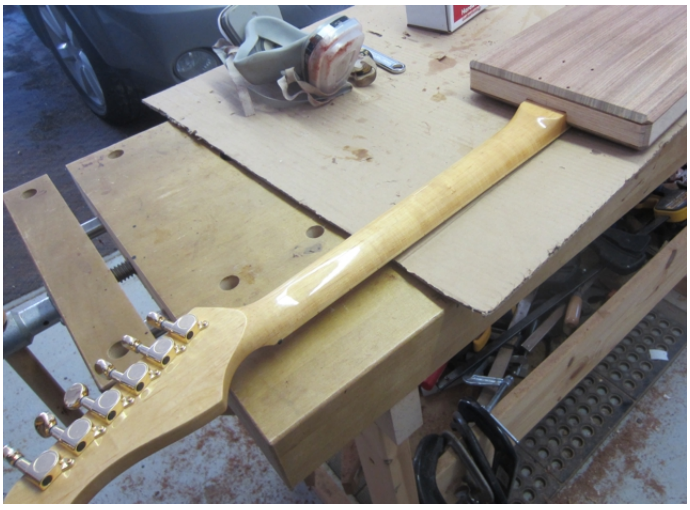

Photo Seven

Body After Application of Tung Oil Finish

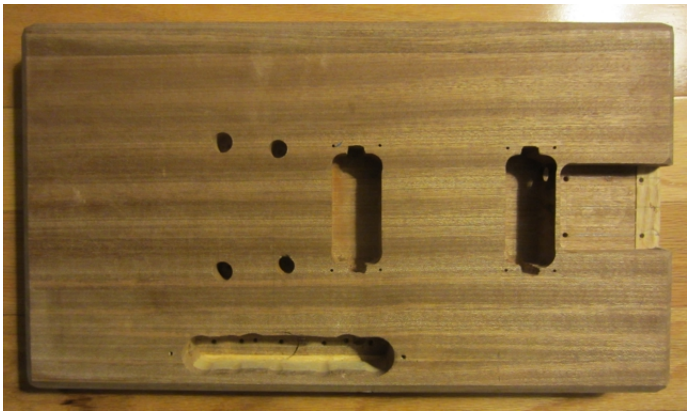

Photo Eight

Rear of Body After Finishing. Note Neck Screw Holes

Photo Nine

Installation of Tailpiece, Bridge and Pickups

Photo Ten

Control Cavity Wiring Completed. Note All Ground Connections to Back of Volume Pot

Photo 11

Output Jack Wired Up

Photo 12

Output Jack Mounted in Place

Photo 13

String Tree Mounted for the E and B Strings

Photo 14

Finished Guitar with Strings and All

Photo 15

Closeup View of Guitar Body

Photo 16

View From Rear of Guitar. Rear Strap Button Visible

Photo 17

Top View of Guitar. Neck Plate and Front Strap Button Visible