

Cigar Box Ukulele

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Intro: Cigar Box Ukulele

For those who are buried in empty cigar boxes and lacking in ukuleles, this is for you.

A Brief History

Cigar box instruments date back to the 1800's, when cigars began to be packaged in smaller units in handy wooden boxes. The great depression caused an increase in the popularity of handmade instruments as an affordable option.

Resources

There are a lot of wonderful resources online, including plans from a 1920's magazine and some mail order kit instructions. The best resource I found was Steven Miller's step by step guide. Anyone considering making a cigar box uke should check out his guide



Step 1: Stuff You Need

Materials:

Cigar Box. If you have a choice, find one of solid wood. I found a cedar box with a plywood base. I paid 4\$ for mine, but it shouldn't really cost more than 2\$.

Wood for the neck and bridge - for a concert sized ukulele I needed a 14 x 2 x 2.5 inch block for the neck and head. The bridge will be about 2.5 x .5 x .75 inches. I used walnut, but any hardwood will do.

Wood for the lid supports: the cigar box will vibrate with the strings. The inside of the box must be braced with a wood light enough to allow the box to be springy but strong enough to keep it from warping. Steve Miller suggests spruce, but I used pine since I had some lying around.

Wood for the inside supports: These will go around the edges of the box for added strength and for a place to anchor the neck. I used some left over walnut.

Wood for the fretboard: I chose red oak. It will need to be approximately the length of the neck and ~1/8 thick.

Material for the saddle and nut: I used dominos, which I cut down to size. Another type of hard plastic or ebony will also work.

Material for the frets: I actually bought brass welding wire for the frets, but ended up inlaying crushed turquoise instead. If you choose to inlay crushed stone the ukulele will essentially be fretless, which will change the way you play it.

Fret markers: Ukes are usually marked at the 5th, 7th, and 10th frets. Pearl dots are traditional. I used a 3/8" wooden dowel.

Ukulele strings: see your local music store.

Tuners (set of 4): I took the tuners from a busted kid's electric guitar I got at a thrift shop. You can also buy them new from a music store. They cost about 14\$ for cheap ones up to 50\$ for fancy.

Wood Glue

Epoxy

Tung oil and mineral spirits (optional)

Steel Wool 0000 (optional)

Tools:

Clamps

Band Saw

Table Saw

Planer

Drill press (for the sound hole a large diameter bit is required)

Hand drill

Power sander

Dremel (I used the plastic cutting and engraving attachments)

Note about tools: I was lucky to have access to a woodshop, powertools, and someone who kept me from cutting off all of my fingers. With some ingenuity much of this can be done with hand tools and patience.



Step 2: Choosing a Ukulele type

The size of your cigar box will determine what type of ukulele will work best for your project. Uke's come in four sizes - Soprano, or standard, concert, tenor, and baritone. I chose a concert style, though my box was big enough for a tenor. For those who want a baritone ukulele, check out tewharau's fabulous instructable [Make a Baritone Ukulele from a \\$10 Toy Guitar](#).

The type of ukulele you choose will determine your scale length and how big your neck and fretboard will be. Measure your cigar box and look at the body length section of the chart to choose your uke size. The other measurements here are a guideline - the only measurements set in stone is your scale length.

SCALING DIMENSIONS - UKULELE				
MODEL	STANDARD	CONCERT	TENOR	BARITONE
TOTAL LENGTH	21 $\frac{1}{8}$ "	23 $\frac{1}{4}$ "	26 $\frac{1}{4}$ "	30 $\frac{1}{8}$ "
BODY LENGTH	9 $\frac{1}{2}$ "	11"	12 $\frac{1}{8}$ "	14"
BODY WIDTH				
UPPER	5"	5 $\frac{3}{8}$ "	6 $\frac{3}{8}$ "	7 $\frac{1}{2}$ "
LOWER	6 $\frac{7}{8}$ "	7 $\frac{3}{8}$ "	8 $\frac{1}{8}$ "	10"
DEPTH OF BODY				
UPPER	2"	2 $\frac{1}{4}$ "	2 $\frac{3}{8}$ "	2 $\frac{1}{2}$ "
LOWER	2 $\frac{1}{8}$ "	2 $\frac{3}{8}$ "	2 $\frac{5}{8}$ "	3 $\frac{3}{8}$ "
WIDTH OF FINGERBOARD				
AT NUT	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "
AT 12TH FRET	1 $\frac{1}{8}$ "	1 $\frac{1}{8}$ "	1 $\frac{1}{8}$ "	1 $\frac{1}{8}$ "
DIAMETER - SOUNDHOLE	1 $\frac{3}{4}$ "	2 $\frac{1}{8}$ "	2 $\frac{3}{8}$ "	2 $\frac{1}{2}$ "
SCALE LENGTH	13 $\frac{3}{8}$ "	14 $\frac{3}{4}$ "	17"	20 $\frac{1}{8}$ "

Step 3: Plan it out

I am an obsessive planner, so I took the time to draw out scale models of my ukulele-to-be. Then I re-drew the models in photoshop. The plans were incredibly helpful for cutting the shape of the neck, fretboard, and fret positions.

The Frets:

The positions of the frets depends on the scale length of the ukulele. The plans posted here (uke2, see below) are for a concert size. For fret position measurements, search "fret calculator" in google or go [here](#). For a concert size I used a 15" scale length with 17 frets.

The one crucial measurement is that the 12th fret must be half way between the scale length of your uke. The scale length is the vibrating length of the string and it is measured from the nut, which guides your strings to the tuners, and the bridge, which is located on the body. The 12th fret usually is located just where the neck joins the body, but really you can put it wherever you want.

The Neck-

The neck length will depend on where the neck joins the body. See step 2 for neck measurements (see width of fingerboard).

The Head-

The head shape is usually a trademark of an instrument maker. Search online for ideas. I chose a very simple square shape with rounded edges. The head should "dip" 3-5 degrees downward to add tension to the strings (see uke2total, below).

The body -

As mentioned earlier, the location of the bridge is set in stone. However, how far the fretboard extends onto the body and where the soundhole is located is up to you. Just be careful that the soundhole is not so close to the bridge that your hand will be crowded when playing.

File Downloads



uke2.pdf (2 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'uke2.pdf']



Step 4: Prepare the neck block

Unless you have a block of hardwood ready, you are going to have to prepare one. As you can see in the full body plans posted in step 3, the neck deepens as it reaches the body until it matches the cigar box. Mine was 2" deep. I needed 3 planks of walnut glued together to reach the right depth. The neck will join the body in a mortise and tenon joint - that is, it extends about an inch into the box where you can't see it. Be sure to account for that extra length before you cut your boards down to size!

First, plane the boards. They must be perfectly flat or they will not glue evenly. Plane the boards on the concave side until flat (watch your fingers!). Mark the flat side of the board. Then turn the boards 90 degrees and plane a thin edge - again, be careful with those fingers - until it is flat. Mark the planed edge. It is important that you have flat edges to measure from when cutting boards down to size on the tablesaw.

Cut the boards to the length you want and start gluing. I used Titebond ultimate wood glue. Cover the side of the plank with glue, making sure to glue all edges. Clamp the boards together, trying to keep the boards even. Wipe off excess glue as it oozes out of the boards with a damp wash cloth. Don't worry too much if they are a bit uneven or have bits of dry glue on them later - we will take care of all that later. Leave the glue to dry overnight.



Step 5: Cut the neck shape

For this step I used a band saw, but chisels and woodcarving tools would also work. First I removed the dried glue with a hand planer and cut off the uneven edges with a table saw. Then I printed out my photoshop plans and taped them onto the neck. Three cuts were required - two for the top view, and one for the side views. I cut the top view first, then taped the block back together and taped the side view plans onto the neck and cut again.

I left an inch at the end where the neck meets the body for the mortise and tenon joint that will come later.

Note about cutting on a band saw: When cutting a hardwood on a band saw, some pressure has to be applied to move the wood through the blade. I was not prepared for the moment when the wood slipped past the blade and the pressure was suddenly gone. When cutting slow down as you reach the end of a cut so the change in pressure does not whip your hand toward the blade.

Also, when cutting tight curves 'relief cuts' can make it a little easier. Just cut straight lines perpendicular to the curve, just barely reaching where the curve will be. Then as you cut the curve the wood will be cut away and will make turning the block easier.

At this point it is also a good idea to plan where your tuners will be and drill the required holes. The size will, of course, depend on your tuners. It is best to drill the holes before the neck is attached to the head as it is much easier to deal with a neck block than a combined neck and body. I used a drill press for this step.



Step 6: Prepare the body

So you have the basic neck shape taken care of. Leave it alone for now and start on the cigar box. First, remove any adhesive labels or tape. My box did not have a paper wrapping - if yours does your approach will differ from mine throughout this instructable. Pry off the hinges and set the lid aside for now.

The inside of the box has to be braced. On the side of the box that meets the neck I glued a block of walnut 1.5 inches deep into the box. It needs to be high enough to support the lid and reach to both sides of the box. A thinner piece - 0.25 inches - can be used to brace the back, since it won't vibrate as much and does not need to support the neck. For each side I cut two strips of walnut and glued them at the top and bottom of each side.

For an excellent example of body and lid supports, check out tashiandmo's beautiful slidehow of a cigar box guitar build [here](#). Steve Miller's guide also has some great pictures for this step.

Let the glue dry overnight.

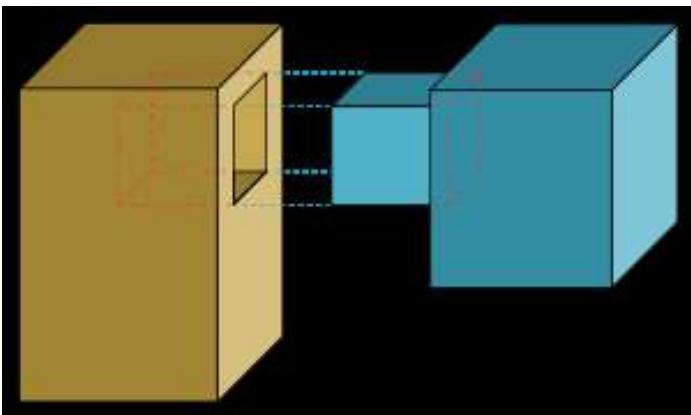
Step 7: Attach the neck

This step can be done several ways. I chose to follow Steve Miller's mortise and tenon method (see his tutorial for pictures). A mortise and tenon joint is kind of like a puzzle piece. A piece of the body with the walnut brace is hollowed out and a matching piece of the neck is carved so the two fit together like a puzzle. A jig can be bought or made for a drill press to make this process painless, but I accomplished it with a dremel, some wood carving tools, and someone who knew how to fix mistakes.

For those who do not have a drill press and need to do this by hand, I strongly suggest cutting out the basic shape of the tenon (the neck part) with a band saw so it will sit flush against the box. Always be aware of your neck measurements and make sure that you do not cut off so much that your neck becomes too short.

For added strength we drilled a hole through the walnut support and the tenon joint and inserted a dowel so it ran through the mortise and tenon and joined them together. Because my joint was loose, we also inlaid pine to make the joint tight. Because this step is optional (and hopefully unnecessary) I will not go into more detail here. Information about inlaying wood can be found online.

Glue the neck to the head.



Step 8: Prepare the fret board

Now that you have the basic neck and body put together, it is time to start thinking about a fretboard. The fretboard should sit on top of the neck and body and be about 1/8" thick. The thinnest I could find to buy was 1/4".

Anyone who has cut thin boards on a table saw knows that it is hard and scary. The thinner the wood, the more likely it is to bind and shoot it back toward you, not to mention that your hands are closer to the blade. If you use a table saw for this step, be careful and have someone to help you get the board through if it begins to bind.

Once the fret board piece was thin enough I measured out the fret positions and marked them on the board. Because the fret positions are usually calculated in decimal, I used photoshop to make a template and copied it onto the board rather than measuring them out. We once again used a table saw to cut the fret positions, lowering the blade until it just barely scored the wood where the fret would be. This meant that our frets were at least as wide as the blade, about 1/8" thick, which meant that the fret wire had to be at least that thick. The best option I found was brass welding wire.

The next step is to cut out the fret board shape. I used a band saw and a photoshop template (see step 3). The fret board will fit snugly to your neck, but once it is attached to the body a variety of designs are possible. Look online for ideas.

If you are interested in using wire for your frets, check out Steve Miller's excellent instructions (see intro). I chose to inlay turquoise, which helped take care of my fret width issue. For this step I mixed crushed turquoise and five minute epoxy, applied it into the groove a little higher than the fret board, and removed as much excess glue and turquoise as I could. For more detail about inlay techniques check out supersoftdrink's excellent instructable [here](#).

Note: if you use wire for your frets, the way you sand and finish your fret board may also differ from these instructions.

After the glue was dry I sanded the fret board until the excess glue was gone. If you are working with oak, you may notice that grooves appear in the oak as you sand. This is something inherent in the wood and not anything you can really do about.



Step 9: Prepare the lid

It's time to measure out once again where the bridge and sound hole will be. It is a good idea to double check, as the length of your neck may have changed when it was attached to the body. See step 3 for measurements.

The recommended sound hole diameter for a concert uke is 2 1/16". I had a 2" large diameter bit and made do (these bits cost around 12-15 \$). Mark the center of the box lengthwise and where the center of the sound hole will be. Where you put it is up to you - there are even designs where several small sound holes are cut instead of one large one. Cut with a drill press (or a drill if you are an intrepid soul).

The inside of the lid must also be braced, as it will endure a lot of pressure from the vibrating strings. A light but strong wood is good for this, as it will allow the lid to vibrate but will prevent any damage. I used pine because I had some lying around. I followed Steve Miller's X-brace design, cutting out two thin lengths of pine and fitting them to the box in an X, narrowing them at the center so they overlapped.

A bridge support can also be applied beneath where the bridge will be. This is optional, but it seemed like a good idea. I ended up gluing the bridge to the box, but it is possible to screw it in, in which case a good bridge support is crucial. I cut the bridge support so it fit snugly inside the X brace.

Glue the supports.



Step 10: Attach the lid and fret board

You may need to make some adjustments to your box supports to fit the lid. I had to cut down the height of my tenon because of the way my lid fit to the box. I also chose to sign the inside of the box, beneath the sound hole, before gluing down the lid.

Glue down the lid, let dry, and glue down the fret board. Your ukulele now looks like a ukulele. Congratulations!

Step 11: The nut, bridge, and saddle

A quick review for the music illiterate like myself:

The nut is the piece that will guide the strings from the neck to the head. It is usually made of plastic or ebony and consists of a strip of plastic with slits for the strings. The bridge is placed on the box and holds saddle and strings. The saddle is a piece of plastic that fits into the saddle and guides the strings over the bridge.

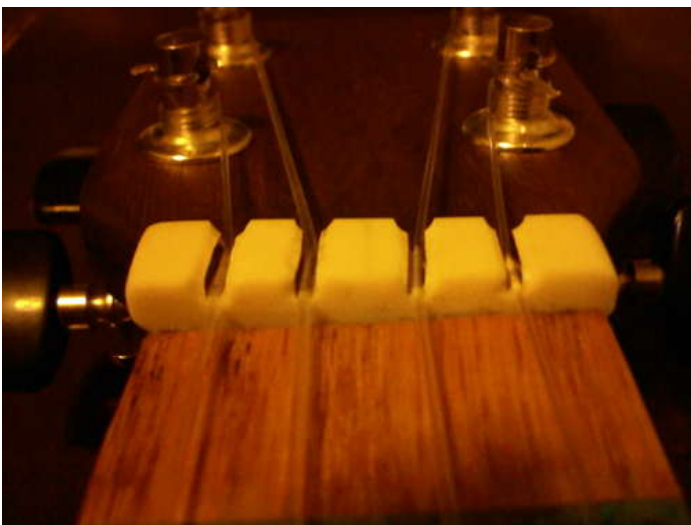
I thought about making a mold and melting plastic from plastic bags for the saddle and nut, but chose instead to destroy a few dominoes. Warning: cutting and sanding the dominoes will dull whatever you use to cut and sand them with. There is also a nasty burning plastic smell. Wear protection and work in a well ventilated area.

I used a combination of a band saw, dremel, and power sander to shape my nut and saddle. Pull out a guitar or look around at ukulele's to get an idea of what you need. An important idea here is action - that is, the height of the strings above the frets. It is hard to get a good idea of the action while everything is still loose and not put together, so leave cutting the grooves till later.

The bridge is a piece of wood approximately 2.5" long, 0.5" deep, and 0.75" long. A groove in the bridge holds the saddle, so the saddle sits partly in the bridge and partly above it. To make the bridge cut a block of wood to the desired dimensions. The strings will be housed in the bottom of the bridge in 'half holes.' To drill the half holes clamp the bridge to a similarly sized piece of wood and drill holes at the intersection. It is a good idea to test fit this idea with some ukulele strings. The holes must be large enough to fit the string but small enough to prevent it from coming loose.

When I actually put the strings on at the very end, I found it easiest just to tie a knot and string it through the bridge, so you can see the knotted ends of the strings when you look at the ukulele. You may want to modify this design if that is not what you want. A variety of bridge designs are possible, so look around if you are interested.

I want to emphasize that for this part it is really very helpful to have a model to work from. Any acoustic guitar or stringed instrument will give you a general idea. You can also choose to buy these parts if you are interested.



Step 12: Shaping the neck

Your ukulele body and neck can now be shaped in any way you want. I rounded out the base of my neck so it would fit comfortably in my hand. I took a lot of time with the overall shaping and found this to be one of the most enjoyable parts of building the uke. If you are interested, I used a power sander with 150 for the initial and 200 grit for the final shaping.

My box did not have a paper covering, and I planned to apply a finish to the entire instrument. So I very carefully sanded off the original finish, trying to keep the lettering intact.



Step 13: Inlay the fret markers

If you look at a guitar or ukulele you will see pearl dots in the frets at certain points. In ukulele's these markers are usually at the 5th, 7th, and 10th frets. Really you can put them anywhere you want. I also chose to mark them on the side, because I thought it would look cool and I enjoyed this process.

First choose a marker. I chose a wooden dowel for availability, and because the inlaid turquoise was flashy enough by itself. The dowel was 3/16" in diameter. Very, very, very carefully I marked and measured exactly where the markers would be and drilled holes with a drill press. I strongly recommend a drill press for this step, as a lot of work has already gone into the instrument and a drill press minimizes the possibility of catastrophic failure. I drilled the holes only about a quarter to a half inch deep.

Once the holes were drilled I cut the wooden dowel down to size for each hole, so there was enough poking out that I could pull it out with my fingers. Once all the holes had matching dowels I applied epoxy to the dowels, inserted them into the holes, and wiped the extra glue away with a damp cloth. After the glue dried I sanded the dowels down very gently with a dremel as close to the surface of the fret and neck as I could.

A final sanding will be applied later, so it does not have to be perfect yet.



Step 14: The final sanding

Before you finish the nut, bridge, and saddle and attach them to the instrument, sand the neck and body to your heart's content. For the neck I used 150 and 200 grit sandpaper. How you do this will vary by preference, but I chose to apply 150, wipe the instrument with a damp cloth, when dry apply 150 again, apply 200, wipe instrument with damp cloth, then let it dry and do a final touch with 200. Wetting the instrument raises the grain, which allows for a smoother finish when you apply tung oil. I really wanted to preserve the lettering on the box, so I limited the sanding to just enough to remove the finish. For this step I only used 200 grit and did not wet the box.



Step 15: Finish and apply nut, bridge, and saddle

This is where the instrument really begins to become an instrument. Remember that the distance between the nut and bridge is measured between the inner edges of the nut and bridge. That will be the vibrating length of your string. The 12th fret should be exactly in the middle.

I finished shaping the nut, saddle, and bridge with a dremel and power sander. Then I glued the saddle into the bridge with epoxy. I cut the slits for the strings with the thin cutter of a dremel, although a thin file would probably have been better. The action on my instrument is a little low - be careful when cutting the slits that the strings will not be so close to the frets that they buzz.

I was afraid there was not enough support to physically clamp the bridge onto the body, so I used epoxy. Same with the nut.

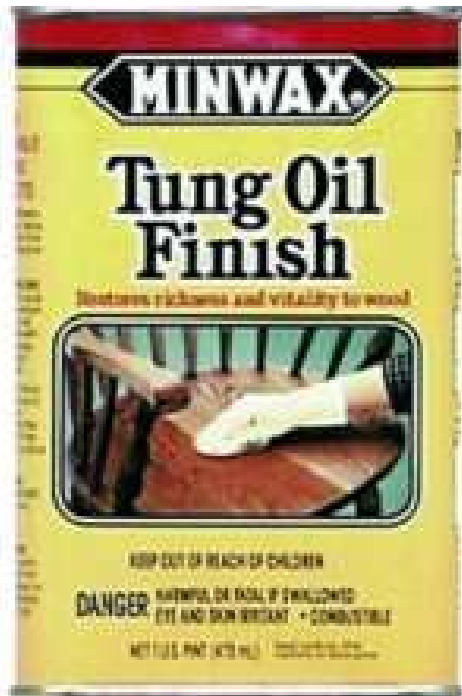
The uke is now nearly finished!



Step 16: Apply the finish

For a finish I used a mixture of 1/2 tung oil 100% pure and 1/2 mineral spirits. Mixing them together in a mason jar, I applied it to the instrument, rubbing it in with my hands. Then I wiped it off with a rag and waited for it to dry. After it was dry I rubbed the instrument with a piece of 0000 steel wool, just enough to roughen the surface. Then I wiped away the little woolly bits and repeated the process. Tung oil, rag, dry, steel wool, tung oil, rag. I applied seven coats because the saint teaching me uses seven as a rule.

Check to make sure that instrument is not becoming sticky as you apply tung oil. Plywood does not absorb the finish very well, and can become sticky if too many coats are applied. I did not have a problem with this although the bottom of my box was made of plywood.



Step 17: Finishing touches

That's right, this is the end. It is time to install the tuners and strings. Installing the tuners will vary for each instrument. I took the tuners from a thrift shop guitar, so I had to cut down the metal sheet that houses the tuning pegs with the metal cutter on a dremel. If you follow this example be sure to wear protection and watch out for fire hazards, this throws a lot of sparks.

For step by step instructions on how to restring your instrument, search online for tutorials. Be aware that for a couple of days the strings will not stay in tune very well.

An extra tip: If you buy D'Addario Pro Arte ukulele strings, you may find that the sleeves inside the package are labeled classical guitar strings. Every package at my music store was like this. They are the same strings, but you need to have them gaged to find the right notes for each string.

Congratulations! You are now short one cigar box and plus one ukulele. Go wow your friends with your shiny new instrument. Or, in my case, go learn how to play the ukulele!

