

How to Make a Cigar Box Ukulele

Making a Cigar Box Ukulele is not terribly difficult. You need time, patience and some basic wood working tools.



The Uke is well-suited to Cigar Box treatment. The overall size and volume of a standard Ukulele is approximately the same as many readily available cigar boxes.

A Little About Ukuleles

The Ukulele was developed in the Hawaiian Islands, and is featured in Hawaiian music. The Ukulele has transcended its origins, and can be used to play many kinds of music.

The Ukulele normally appears in 4 sizes. Here is a reference chart:

Size Name	Scale Length	Length Overall	Body Length
Soprano (standard)	13" (33cm)	21" (53cm)	9-1/2"
Concert	15" (38cm)	23" (58cm)	11"
Tenor	17" (43cm)	26" (66cm)	12"
Baritone	19" (48cm)	30" (76cm)	14"

Scale Length is the distance measured from the Nut to the Bridge. This is the length of the vibrating part of the string.

Overall Length is the length of the instrument from top to bottom (not counting an end button

if present).

Body Length is approximate. It may be a little longer, but may not be much shorter.

First, Select a good Cigar Box.

Select the Ukulele size you want to make, and locate a cigar box in the necessary size.

The box should be in good condition, and must be wood. Cardboard boxes will not work.

Solid cedar boxes are better than plywood boxes, but plywood is OK.

For a standard ukulele, your box size should be approximately 10" L x 6"W x 2-1/2"D.

Locate wood to make the neck, and other materials.

The wood to make the neck should be good quality clear wood. Avoid knots and significant flaws. Select a hardwood such as Mahogany, Koa, Cherry, Walnut, Maple or Oak. Poplar will work, but doesn't take stain well. Avoid lightweight woods such as Pine.

Your piece must be at least approximately Overall Length minus Body Length, plus 1" for the tenon. It must be wider than the fingerboard will be. It must be deep enough to form the Heel.

Here is a basic neck pattern for a standard Uke. Scale this up for the larger sizes. (To be provided.)

You will also need wood to make other parts. Here is a list of parts you will make with suggested materials:

Neck: Mahogany, Koa, Cherry, Walnut, Oak, Maple.

Fingerboard: Rosewood, Mahogany, Ebony, Maple.

Bridge: Maple, Rosewood, Ebony, Walnut.

Head Veneer (Optional): Figured hard wood.

Saddle and Nut: Ebony, Bone, Hard Plastic

Braces (internal): Spruce, Mahogany, White Pine.

You will also need Tuners and Strings.

Make a Plan

Lay out the Uke on paper and compare your plan to the box and materials you have assembled. Be sure it will all work before you invest a lot of time and ef-

fort. This is the best time to make adjustments.

If possible, locate a standard Uke to copy, or follow some of the links at the end of this article for design information.

About Planning and Accuracy

Old time carpenters will tell you that you can only get the accuracy that you plan for. In fact, you always get less. Another sad fact of wood working is that accuracy erodes and errors multiply.

Your fine point pencil mark may be only $1/32$ " wide, but extended 12" you may be off $1/8$ ".

I can't distill years of woodworking experience here, but I urge you to think about and plan for accuracy, and to anticipate and plan to prevent the many ways a process can go wrong.

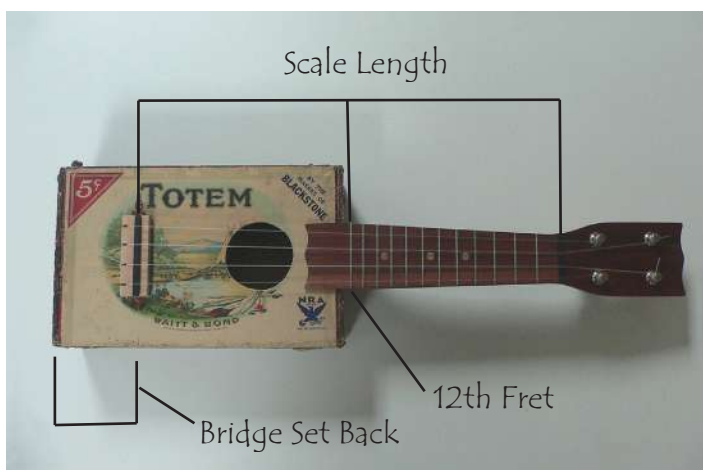
Invest the time to make adjustable jigs to hold your work piece, and make several practice cuts on scrap material before committing to the final cut on your project.

Plan the Scale

On Ukuleles, the neck typically joins the body at the 12th fret. You may choose some other dimension, such as the 14th fret.

Decide where the neck will join the body. Draft on a piece of paper the size of your box, the scale length, where the neck joins the body, and the size and shape of the Head.

Be sure that the Bridge will attach to the box at a good point, approximately 2-4" in from the end of the box.



Plan the Head

The Head of the instrument is the flat part on the end of the neck where the tuners are attached.

There are several things to keep in mind when planning the head.

Angle: The head should angle back from the neck. This causes the strings to bend over the Nut, holding them tightly in place during play. The head angle is typically approximately 3-5°. If the Head is not angled, you may need to use "string trees", such as are seen on Fender electric guitars.

Shape: the Head shape should be aesthetically pleasing. You can copy a shape you like or make one of your own. Head shapes are often "signatures" of instrument makers.

Size: The Head must be large enough to accommodate the tuners. The buttons must not interfere with each other, and you must have room for your fingers. Measure the buttons on your tuners, and draw circles that size on your head design to check that the tuners will fit. Modify your head design if necessary.

Thickness: Tuners are designed to operate over a specific thickness. Check the specifications of your tuners, or test install on a piece of scrap to confirm the ideal head thickness before shaping the head.

Assemble the Neck

Assemble a basic board that will be the neck. You may glue on blocks that will make up the heel. You may glue on a piece that will be the head. You may glue on "ears" to make the head wider. There are several ways to assemble the basic neck piece.

Mark the center line of the neck. Be sure that the edges are parallel with the center line.

Cut the Nut Slot

Mount the neck on a miter slide, and cut a groove for the nut. The groove should be $1/8$ " wide, and across the neck at the point where you want the nut to go. If possible, use a dado blade to get a flat bottomed groove.

Rough out the neck

Cut out the neck in basically the size and shape needed. Leave extra wood at the margins for later finishing. Leave the Fingerboard surface flat. Strike a center line down the middle of the piece. Mount the neck blank and cut the neck tenon.

Attaching the Neck to the Body

There are 4 basic methods of attaching the neck to the body, appropriate to Ukuleles. They are:

Set Neck: The neck is attached to the body using a physical joint, such as mortise and tenon. Think classic acoustic guitar.

Bolt On: The neck is held to the body using mechanical fasteners, such as screws or bolts. Think Fender electric guitar.

Tension Rod: The neck is attached to the body using one or two support rods. Think banjo.

Thru Neck: The neck extends through the body. The body is constructed of "wings" glued to the extended neck to widen it. Think electric guitars and basses.

There is also a fifth method, strut support, which I use with cigar box fiddles. This method is not appropriate for Ukuleles. The strut support method is currently Patent Pending.

The method described here uses set neck technology.

Prepare the Neck Block

The box must be reinforced at the area where the neck will attach. I like to elongate the neck block to also support the forward edge of the cigar box lid. This is optional, depending on the construction of the box you are using.

After shaping the neck block, glue and clamp it into place.

Cut the Mortise

Mount the box on the mortising jig, aligning the center line of the box with the center of the jig. Ensure that the jig is exactly flush with the surface of the end of the box to which the neck will be attached.

Cut the mortise in the box.

Cut the Neck Tenon

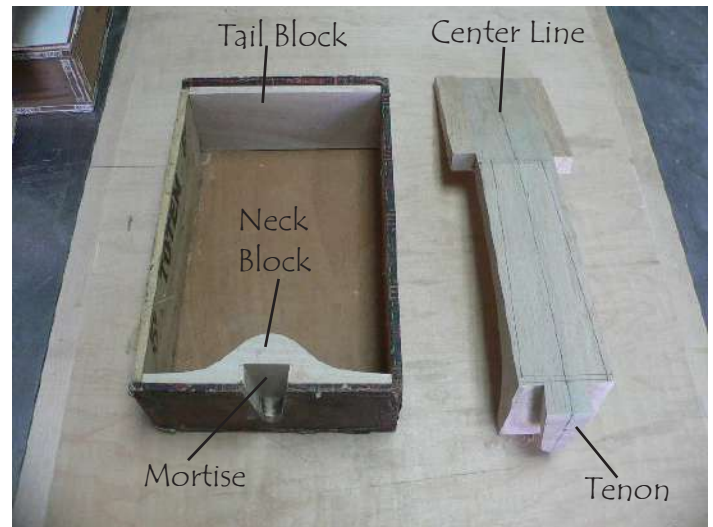
Make a cross cut at the tenon end of the neck blank. This cut must be exactly perpendicular (at 90° angle) to the center line. Do not cut off a lot of material, trim the end only.

Mount the neck blank to the tenoning jig. The center line of the neck blank must be exactly centered on the jig. The trimmed end must be exactly flush to the surface of the jig.

Cut the tenon on the end of the neck using a router.

Test fit the tenon into the mortise, and adjust as necessary.

(More information and photos on this process to come.)



Make the Finger Board

Prepare a piece of fingerboard material approximately 1/8" thick to be the fingerboard.

Mark the fret positions on the fingerboard blank. You may copy from an existing instrument, or use a scale or calculator.

Mount the fingerboard blank in the miter box, ensuring that the center line of the fingerboard is exactly perpendicular to the saw.

Adjust the cutting depth of the saw. Install a test fret to be sure you have the depth right. Cut all frets on the fingerboard.

Drill for the markers. Ukuleles are usually marked at the 5th, 7th and 10th fret. You can mark them any way you like.

Drill 5mm holes for purchased pearl dots, or 1/4" for inseting wood dowel dots or make custom cuts for your own inlay design.

Glue the fingerboard to the neck blank. Be sure the center lines are exactly lined up. Be sure the upper edge of the fingerboard aligns with the edge of the nut slot.

Make the Top

Test install the neck.



Lay the top on the body, and mark where the Bridge and sound hole will be.

Measure the distance from the lower edge of the nut to the center of the 12th fret. This is $\frac{1}{2}$ the scale length. Measure an equal distance from the 12th fret to a point on the top on the box. This is where the upper edge of the Bridge saddle must be.

For your ukulele to play in tune, it is critical that the 12th fret be positioned exactly $\frac{1}{2}$ way between the nut and the Bridge saddle. Measure from the inner edges of the nut and saddle, since you are concerned about the vibrating length of the string.

Decide where you want the sound hole to be. On a Soprano Ukulele, the sound hole should be approximately 1- $\frac{3}{4}$ " in diameter. You may want to adjust the position and shape of the sound hole, but the overall area of the opening(s) should be approximately 5-1 $\frac{1}{2}$ ".

Cut the sound hole, being careful to maintain clean, crisp edges. Optionally, you can finish the edges with black paint or clear lacquer. If your box is paper covered, be aware that finish applied to the sound hole edges may bleed under the paper. Test finish on a cut off piece before finishing the top.

Bracing the Top

The Top must be braced to resist bending under the force of the strings.

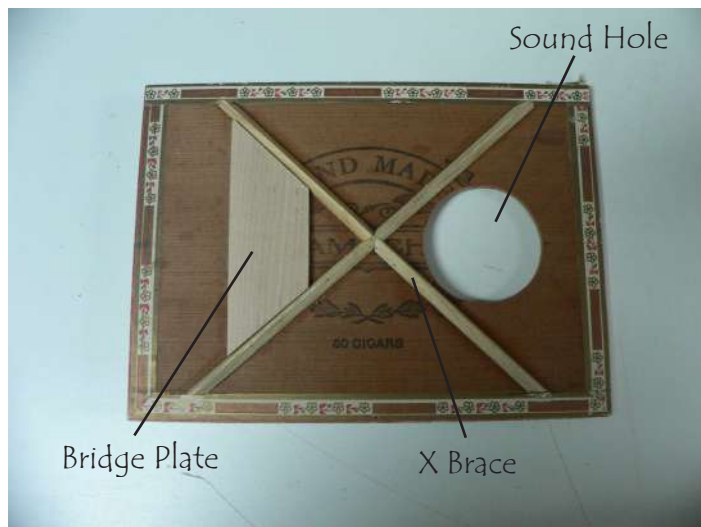
Many bracing patterns are possible. You can look at bracing patterns used on guitars and other instruments for ideas. I choose to use a simple X brace.

On the underside of the top, mark where the sound hole will be. Mark where the neck block and edge braces contact the top.

Draft where you want the braces to be, based on the open areas of the top.

Braces should be approximately $\frac{1}{4}$ " wide by $\frac{1}{2}$ " high. They should be made of light wood, such as Spruce, clear Pine or Mahogany. You may want to taper or scallop the braces. The intention is to main-

tain the strength of the braces while reducing the mass of the braces. Lighter braces will vibrate more easily, but will have less structural strength.



Install the Bridge Plate (Optional)

Bridge plates are typically used in stringed instruments that use Bridge pins. The plate is not strictly necessary in a ukulele, if you are not using Bridge pins.

The Bridge plate does strengthen the top directly under the Bridge, and helps to resist bellying and distortion.

Optionally, if you use screws or bolts to help hold the Bridge on, the Bridge plate is a useful support.

The Bridge plate should be approximately $\frac{1}{8}$ " thick, and should be durable wood, such as Maple. It should be shaped to fit directly under the Bridge and to fit between the braces. It should be slightly larger than the Bridge footprint.

Shape the Neck

Using wood shop tools, shape the neck.



I use chisels for rough shaping, then progress to the belt sander, then hand shaping with flexible shaft

tool, files and scrapers.

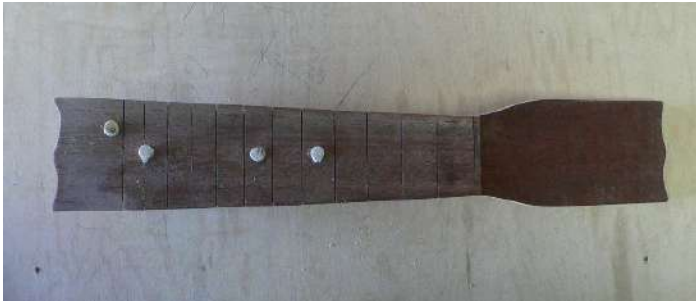
Be sure the shape is symmetrical to the center line.

Be sure to create a pleasing shape that fits your hand, and blends smoothly into the head and heel.



Install the Position Markers and Frets

Install the position markers into the holes previously drilled in the fingerboard. Sand smooth.



Install the frets into the frets slots. Clip the fret wire to length and press or tap into the slots. Tip: brush a small amount of water into the fret slots to soften the wood fibers before pressing in the frets.



Dressing the Frets

Clip the ends of the frets using a nipper.

I smooth the ends of the frets on my bench top belt sander using 120 grit sandpaper. Carefully hold the edges of the neck on the paper gradually allowing the fret ends to be sanded smooth. Do not sand into the neck edge. Roll the ends of the frets on the belt, rounding them off. Run your hand along the edge of the neck to feel for sharp edges. Most sharp edges should be sanded off.

Ukulele necks typically are flat. Wrap a piece of 400 grit sand paper over a dead flat piece of hard wood. The block must be at least as long as 1/2 the scale length. Rub this sanding block up and down on the frets to level them. Pay careful attention to level the frets without removing too much material.

Use jeweler's files to dress the edges of the frets to remove any remaining burrs.

Finish the Neck

Finishing the neck will require extensive sanding, and several days of drying time between coats. Start on finishing the neck now to save time, as you finish the boxes.

There are a lot of options for finishing your neck. Here is a method that has worked well for me:

Sand the neck to 120 grit (textured woods like Koa, Mahogany, Oak) or finer (dense woods like Hard Maple).

Wipe on a coat Mineral Spirits. Look for flaws in sanding, and repair any sanding flaws. Wipe on Mineral Spirits to clean the wood. Allow to evaporate completely.

Wipe on a layer of Tung Oil. Let dry overnight.

If you want to shade the color, wipe on a coat of

oil based varnish. If the color is OK, wipe on another layer of Tung Oil. Allow to dry overnight.

Spray with a thin layer of satin finish spray Lacquer. Let dry for two hours.

Lightly sand with a "scrunge" to remove fine bumps in the finish. (A "scrunge" is a very fine grit scouring pad available at your home supplier.) Do not sand through the Lacquer. Wipe with a damp cloth to remove particles.

Spray on another layer of Lacquer. Allow to dry overnight.

Drill the Holes for the Tuners



Find a piece of scrap material the same thickness as your Ukulele head. Drill and test install a tuner. Check to be sure the tuners will install properly. WARNING: Be sure to drill the correct size holes for your tuners. Considerable pressure will be applied to the tuners over the life of the instrument. They must be installed properly. Using your head plan, mark for the tuners and drill the holes. TIP: Clamp a piece of scrap wood to the back side of the head to prevent tear out as the drill bit comes through. Touch up any roughness around the holes.

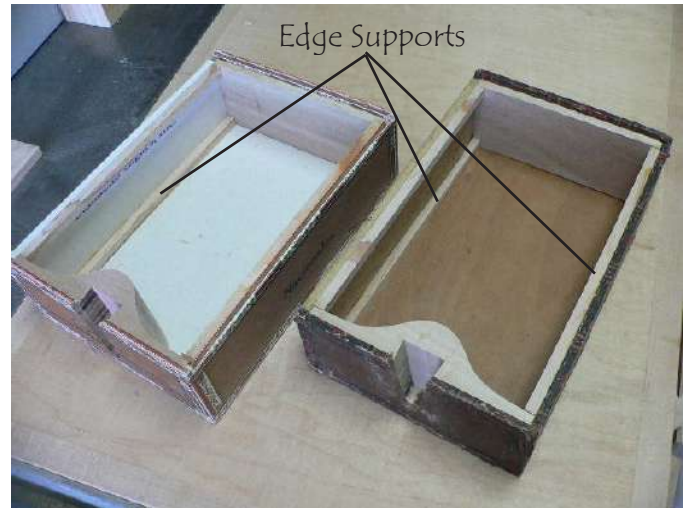
Complete the box

The box must be reinforced to withstand the forces applied to it by the strings. Those forces will try to bend the box upward, and will try to compress the box along its length.

Depending on the construction of the cigar box, the lid will be forced downward.

Make and install a tail support. In typical ukuleles, this is a block. With a cigar box, a thin piece, about 3/16" thick mounted at the lower end of the box will support the lid, and will form a base for the side supports.

Install corner supports, approximately 1/4" x 1/4" along the interior edges of the box. These supports should extend from end to end, and be securely glued and clamped in place.



Test fit the Neck

Test fit the Neck to the Box, including the Top. This is how your Uke is going to turn out.

Alignment: The center line of the neck must be identical with the center line of the body. If you cut the mortise and tenon properly, this is not a problem. If they do not align, now is the time to fix it. To fix it, it is generally easier to reshape the tenon, than the mortise. Do not accept a less than ideal fit. You will be living with this joint for as long as you own the instrument.

Fit: The fit of the joint must be tight and secure. Remember that the strings will be pulling up on the neck. Do not accept a joint that will not mechanically resist string pull. "Mechanically" means the fit of the wood, not the power of the glue.

Height: The Fingerboard extends over the box. The height of the Neck must be such that the fingerboard contacts the surface of the box, or is slightly above it.

Action: Place a straight edge on the neck running over the body. Imagine that the edge represents your strings. Place a 1/8" shim where the nut will be. Lift the straight edge up and observe the "action" of the instrument. The action is the string height over the fingerboard. Determine how high your Bridge will be to achieve the desired action. Remember that the Bridge must incorporate a saddle.

Make the Bridge, Saddle and Nut

Using a piece of hardwood, fabricate a Bridge. Cut slots for the strings and saddle. The Bridge should be approximately 2-1/2" Long, by 3/4" Wide, by approximately 1/2" Deep. These dimensions will vary depending on your action.

Cut a 1/8" wide groove across the Bridge to hold the saddle.

To attach the strings, drill 4 "half holes" in the underside of the back edge of the Bridge. I clamp the Bridge blank to a similar sized scrap piece, then drill a hole at the seam. This results in a "half hole" on the bottom surface of the Bridge. This provides a place to jam the knotted end of the string.

Cut short slots through the half holes, not quite to the saddle groove.

Make a saddle out of ebony, bone or other hard material. The saddle should be 1/8" thick. It should be approximately 1/4" high and long enough to fit in the Bridge from end to end. It should be beveled on the upper edge to guide the strings over it. It should fit snugly in the saddle groove.

Test fit sample strings to be sure the knotted end will jam in the half hole, and be guided in the slot over the saddle. Test fit the saddle.

Sand and finish the Bridge.

Make a nut in the same way as the saddle, only smaller to fit the nut slot.

Confirm the location of the Bridge on the top. If your box is paper covered, cut around the Bridge, and scrape off the paper. You want the Bridge to mount directly to the wood of the top. This will result in a more secure glue joint, and more vibrations being transmitted directly to the wood of the top. Glue and clamp the Bridge to the top.



Assemble the instrument

Test assemble one more time.

Apply glue to the neck tenon and insert partially into the neck block mortise. Apply glue around the top edges of the box. Place the box top in position.

Press the neck into place using light but firm clamping pressure. Clamp around the edges of the top.



Adjust the Action

With a pencil, mark on the nut where the strings will be. Cut grooves using a small round jeweler's file.

Lay a straight edge on the Nut and Saddle to determine the action. Reduce the height of the saddle until you have nearly reached the desired string height.

Mark the path of each of the four strings over the saddle. Cut string grooves, using a small round jeweler's file.

Further action adjustment can be made after the strings are installed.



Install the Tuners

Install the tuners according to manufacturer's instructions. In most cases, the post fits into a washer, then through the head from the front. A back piece then one or two more washers are added. The button is then put on the post and held in place with a machine screw. Tighten or loosen the machine screw to adjust the tightness of the tuner.

Install the Strings

Tie a jam knot (figure *) in the end of each string. Fit the jam knot into the half hole at the bottom

edge of the Bridge. Guide the string over the Bridge and saddle.

Wrap the string several times around the tuning post. Insert the free end of the string through the hole in the tuning post. Wrap the end of the string half way around the post and insert the end through the hole one more time. Turn the tuning key to put tension on the string. Check both ends to be sure it is secure. Continue until all 4 strings are installed.

Fine tune the Action

Check each string height. You can lower the height of either end by filing the slot at the nut or saddle. Use a small round file to produce a rounded, smooth slot. Remember you can easily lower the string height, but you will have to start over with the nut or saddle if you go too deep. Be patient, you can always continue this adjustment later.

Useful Resources

Here are links to some resources you will find interesting and useful:

Ukuleles by Kawika (David C. Hurd) is a respected builder located in Hilo, Hawaii. David has made perhaps hundreds of extremely fine traditional and unique Ukuleles. He is also respected as a scholar, historian, collector and restorer of fine Ukes. His highly recommended book "Left Brain Lutherie..." is extremely thorough and useful.

This site contains very useful reference information for building your Cigar Box Uke. (<http://www.ukuleles.com/>).

Ukulele Hall of Fame Museum is a wonderful repository of Ukulele instruments, artifacts and information that provide a wonderful resource into the lore and history of this instrument. Do not miss it! (<http://www.ukulele.org/>).

Please visit my Cigar Box Fiddle site at
www.CarolinaFiddle.com



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