

# Ukulele Kit Assembly Instructions

## Getting started

Welcome to ukulele building! The uke you're about to build is an easy kit; we've designed it so that you can create a quality ukulele with a minimum of tools. You don't need experience, either: the ukulele is a great way to get your start in instrument building. When you're done, you'll be happy to find that it sounds great, too!

Review these instructions before starting so you're sure you have everything you need, and you're familiar with the processes involved. If you're new to building, here's a tip that every instrument builder knows (or finds out the hard way!): Test the fit of any parts before you glue them. Dry-clamp to see that everything fits, then use glue.

Be safe with tools, glues, and finishes: wear eye protection, and use proper ventilation.

## Tools needed

The following tools and supplies are recommended. Though all of these tools aren't necessary to build your kit, they make many assembly steps easier. Where applicable, item numbers for ordering from Stewart-MacDonald are included.

### Tools

- Clamps (Cam, C, spring)
- Clothespins (24)
- Mill file
- Wood rasp
- Half-round bastard file (or sanding block)
- X-Acto hobby knife (sharp utility knife)
- Chisel
- Saw (circular or carpenter's, and a razor or back cut)
- Fret hammer #4895 (or light weight hammer with smooth head)
- Fret cutters #0619 (or wire cutters)
- Hand plane (or sharp utility knife and files)
- Phillips screwdriver
- Drill and drill bits
- 18" steel rule (or 18" straightedge and tape measure)
- Square

### Supplies

- Glue (Titebond #0620, super glue #20, Weld-on Binding Cement #1975 or model glue)
- Plywood (7" x 48" x 3/4")
- 1-1/2" finishing nails (24)
- 1-1/4" drywall screws (8)
- 2" angle brackets (2)
- 1/2" screws to fit angle brackets (2)
- Turnbuckle (1)
- Masking/binding tape #0677
- Pencil
- Waxed paper

## Supplies continued

- Sandpaper #5562 (80, 150, 220, 400, 600, 1000-grit)
- Weights
- Scraps of wood for cauls and sanding blocks
- Your choice of finish



## Parts

- 1 Fretwire (2)
- 2 Lining (4)
- 3 Top bracing (2)
- 4 Bridge plate
- 5 Bottom bracing (2)
- 6 Soundhole purfling
- 7 Saddle
- 8 Nut
- 9 Bridge screws
- 10 Bridge
- 11 Tie block trim
- 12 Strings
- 13 Bent sides
- 14 Neck
- 15 Tail block
- 16 Neck block
- 17 Fretboard
- 18 Back plate
- 19 Top plate
- 20 Tuning pegs
- 21 Rubber bands (2)

## First, build your assembly jig

This simple jig holds the ukulele for gluing, and ensures that the sides are properly squared up with the top and back.

Start with a 7" x 36" piece of 3/4" plywood. Cut a 7" x 11" piece for the jig's bottom. The two ends are 7" wide; one is a 2-1/4" piece, and the other is 2". You'll have plywood left over to use for clamping cauls and sanding blocks.

Before assembling the jig, draw a centerline down the length of the bottom piece. Measure accurately, because you'll use this line to guide you in building. Use a square to draw

two perpendicular lines for the end piece locations, 3/4" in from each end of the bottom piece (these marks will be 9-1/2" apart).

Very carefully cut out the body shape template printed in these instructions. Tracing around it, draw the body shape onto the bottom piece, aligning it with your centerline. The ends of this body shape should touch the two perpendicular lines you drew for the jig ends.

Save the body shape template; you will be using it again later.

A line on the body shape template marks the ukulele's waistline (3-7/8" from the neck end). Transfer this line to your assembly jig, keeping it perpendicular to the centerline. On this line, attach two angle brackets to support the sides and hold the waist in position. Use 1/2" screws to attach those brackets in position to just touch the waistline.

You're now ready to assemble the two ends of the jig. The 2" piece is for the neck end, and the 2-1/4" piece is for the tail end. Clamp one piece into position, using a square to be sure it's perpendicular to the centerline. Drill two pilot holes through the bottom piece, then disassemble and apply glue. Reclamp the piece in position and fasten it with two drywall screws. Repeat for the other end, and let the glue dry for a few hours.

When the glue has dried, draw the centerline onto the ends of the jig—continuing it from the bottom piece and onto the faces and tops of the ends. Keep the lines square—you'll use this centerline for aligning pieces during construction.



### Attach the neck and tail blocks

Line the jig with waxed paper, covering the bottom and ends to keep from accidentally gluing to the jig. Two thicknesses of waxed paper are a good idea, and they can be held in place with masking tape.

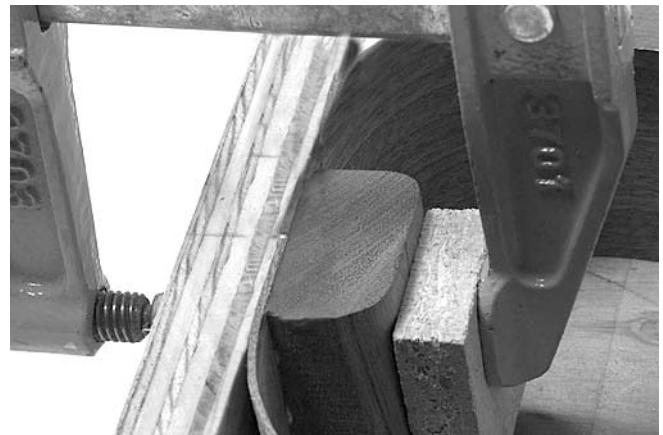
Locate the tail and neck blocks, and mark the centerpoint on the ends of the blocks. The thinner block with a beveled edge is the tail block; the neck block is the one that's shorter than the width of the sides.

The sides are a single bent piece that joins at the neck block. Before gluing, tape the two ends so they butt together and won't slide apart in the jig (use masking tape on the outside). Place the taped sides into the jig, pinching the waistline to fit inside the angle brackets. Make sure the sides are flush against the base of the jig. Carefully align the taped seam with the centerline on the end of the jig.

Dry-clamp the neck block in place, keeping it down flush against the bottom of the jig and aligned on center. Guided by the body shape on the base of the jig, adjust the sides to find the center point at the tail end. Align this on center, and dry-clamp the tail block in position (its beveled edge goes downward, facing in toward the center of the uke). On the edge of the bent side, mark the center point to help you realign these parts when you're gluing them.

At this point, the uke body is face-down in the assembly jig.

Once you're satisfied with the clamping setup, take it apart and apply Titebond glue to the head and tail blocks. Clamp everything back in place, and allow at least 3 hours drying time before removing the clamps.



### Attach the linings

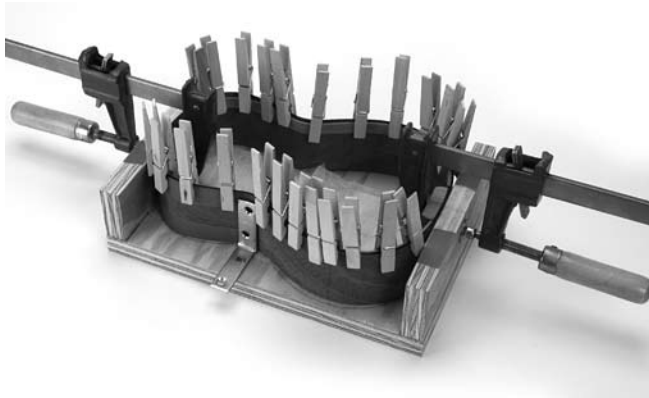
The linings are the thin shaped strips that follow the contour of the sides, adding greater gluing surface where the sides meet the back and the top. The neck block is not as tall as the tail block because this uke is designed with a tapered profile: the body's tail end is deeper than the neck end. As a result, the back-side linings will run at an angle from the tailblock down to the neck block.

Trim the linings so the ends fit against the neck and tail blocks, and dry clamp them using twelve clothespins per side. Adjust the linings to taper gradually from the tail to

neck block at the same angle on both the left and right sides. When you're satisfied with their position, make some pencil marks along the sides to help you reposition the linings when gluing up.

Glue the linings with Titebond and twelve clothespins per side. Allow the glue to dry for at least three hours, then remove the clothespins and clamps and flip the body over in the jig (face-up).

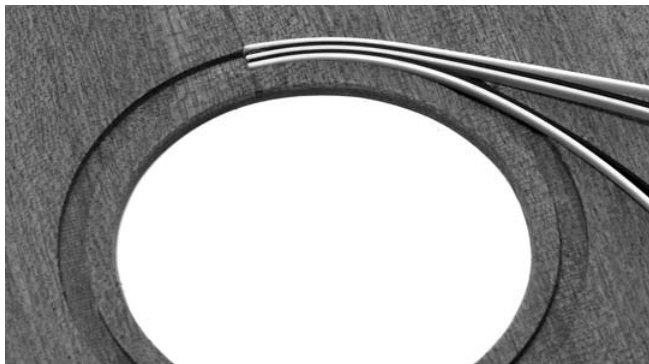
Now trim and fit the remaining two pieces of lining to the front side of the body, and glue them flush with the top edge of the sides.



### Install the soundhole purfling

Place the body shape template onto the soundboard, aligning it with the soundhole. Use a pencil to very lightly mark the centerline and trace the body profile onto the top.

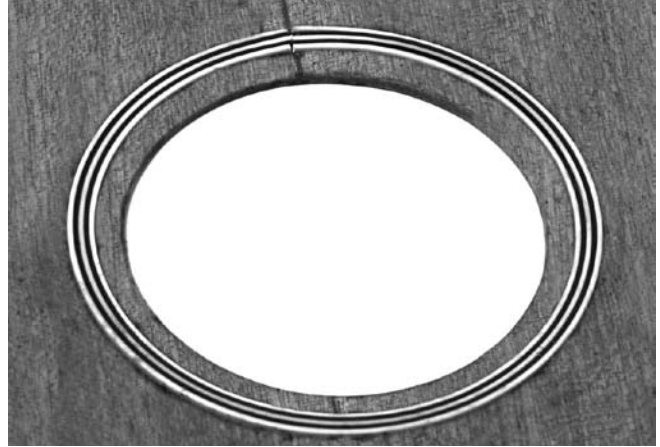
Hold the purfling strips in a stack, in this order: white-black-white-black-white. With a sharp X-Acto knife, trim the ends flush and square. Carefully set the strips into the channel, starting at the centerline at the top of the soundhole. When you complete the circle, carefully trim the purfling with an X-Acto knife. Take care when trimming the ends, because the fingerboard does not cover this butt-joint in the purfling. Better to cut the purfling a little too long, then recut, than to create a gap by trimming them too short.



Carefully remove the trimmed purfling strips, holding them together so that they don't shift. Starting at the top of the soundhole, apply binding cement into the purfling channel a few inches at a time as you press the soundhole purfling

into the channel. You must work fast, because the glue sets quickly and also causes the purfling to swell, making it a tighter fit in the channel. You may find it useful to wrap a small piece of waxed paper around your thumb to help press and guide the purfling into the channel.

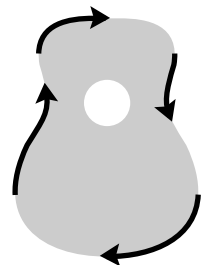
After you complete the circle, lay a piece of waxed paper over the purfling and place a heavy book or other flat weight on top to hold the purfling in place. Allow the glue to dry 2 hours, then sand smooth with 120-grit sand paper and a sanding block.



### Taper the sides and sand the linings

Next, you'll taper the sides to match the back linings that were glued in previously. This involves removing excess wood where the linings angle down to meet the neck block. When you've done this, the linings will be exposed and flush with the edge of the sides. We recommend using a small hand plane to shave off this wood, followed by sandpaper to smooth and level the edges. A rasp or other cutting tool could be used instead.

Be careful at this stage, because cutting too deeply can tear out a piece of the thin side wood. Note the illustration showing the direction to cut at each point in order to avoid tear-out.



Tape a full sheet of 80-grit sandpaper to a smooth, flat surface, and sand with a back-and-forth motion until the linings and sides are flush. Go slow and easy here: sanding with too much force can also tear out side wood. The final result will be an even, flat taper which will make a clean glue joint when the back goes on.



When the back edges are sanded, turn the body over and level-sand the top in the same way. Watch to make sure you keep things level, so you have equal depth on both the left and right sides.

### Trim the top and back

Using the body shape template, lightly pencil the centerline and body shape onto the back.

It's time to trim the top and back into approximate shape, leaving only a small amount of excess wood outside of the body profile (no more than 1/8"). Before cutting, check the shape you've drawn against the actual side assembly to be sure you'll leave enough wood for gluing after you trim the top and back. Carefully remove the excess wood using a coping saw, a utility knife and file. To avoid splitting the wood, cut in the same directions indicated above under "Taper the sides."

### Glue the top

Install 16-20 finishing nails around the base of the assembly jig, leaving about 1/2" exposed to hook rubber bands over.

Measure the difference in height between the neck block and tail block. Make a wooden shim of this thickness and tape it to the jig at the neck end. This will prop up the neck so the top edges are level when the uke is on its back.

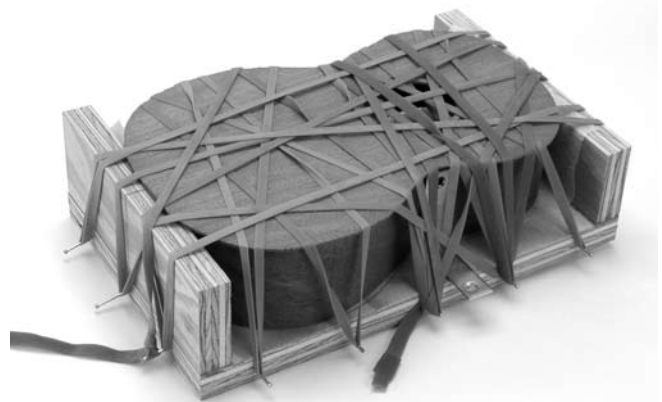
Line the jig with waxed paper so that you won't accidentally glue to the jig. When the body is in the jig, a turnbuckle will create tension between the neck and tail blocks, keeping them flush against the ends of the jig. Don't overtighten

the turnbuckle—use just enough tension to keep things in position. The angle brackets at the waist will maintain the body shape and the squareness of the sides.



Align the sides with the profile on the base of the jig. It may be necessary to drive a few finishing nails into the jig to hold the sides in a good symmetrical shape. Double-check your alignment with the centerline.

Place the top onto the body and align the centerline marks. Dry-clamp using the rubber binding bands to get familiar with the process before using glue. Start at the waist by tying the end of a rubber band to a nail. Stretch the band fairly taut (not enough tension to distort the body shape), and loop it around the nails in a crisscross pattern. When you reach the end of the first band, tie it to the nearest nail. Tie on the next rubber band and continue zigzagging until the top is well clamped.



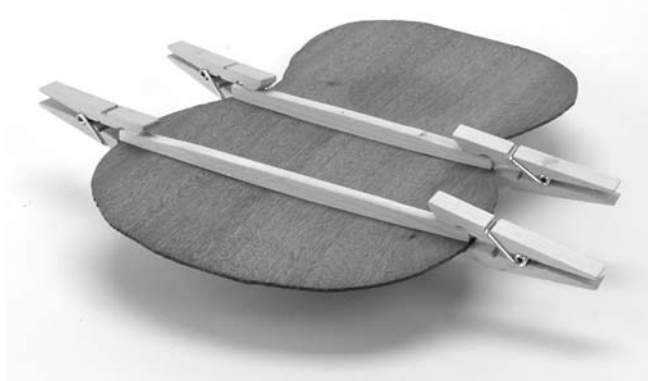
When you're comfortable with this process, untie the bands and spread a thin line of Titebond glue along the top edge of the lining. Center the top on the body again, making sure you have a bit of overhang all around edges. Use the rubber

band zigzag technique to clamp the top. You should be able to slide the top around a little if it moves while you're working. As you finish zigzagging, double-check the alignment before you tie off the rubber band. Allow 3 hours to dry.

### Bracing the back

The two bottom braces each have a slight arc from end to end. This curve will create a gentle arch to the back of your ukulele.

Referring to the body template, dry-clamp the braces onto the back using spring clamps or clothespins on the ends. When you're happy your clamping setup, apply Titebond glue to the braces, and clamp them in place. Allow 3 hours to dry.



### Add a label

You may want to put a label inside your uke with your name and the date you built it. There are lots of options, from a handwritten signature and date right on the wood, to something created on your computer and printed onto sticky-back label paper. The body shape template shows the location of the soundhole for positioning your label.

### Glue the top braces

Remove the body from the jig. Trim the top braces to size, using the body shape template as a guide to position. Trim each brace to fit snugly against the lining, and use your chisel to taper the ends of the braces. Place the bridge plate in position as shown on the template.



With the body on a flat surface, dry-clamp using scrap wood for cauls to cover the braces and bridge plate. Use clamps for gluing, or a heavy object can provide the clamping pressure.



When you're comfortable with your clamping setup, use Titebond glue and clamp the braces and bridge plate. Allow 3 hours to dry.

### Glue the back

Remove the neck block shim and any nails used on the bottom of the jig, and line the jig with fresh waxed paper. Place the body in the mold, top down, and align on center. You may want to use nails at the edges to keep it in position.

Use your chisel to carefully taper the ends of the back braces as you did on the top. They should be long enough to just fit inside the linings.

Spread glue evenly along the edges and position the back with the centerlines aligned, and a bit of overlap around all edges. Use the zigzag clamping technique with the rubber bands, and allow at least 12 hours to dry before moving to the next step.

### Trim the top and back plates

After the body assembly is thoroughly dry (at least 12 hours), it's time to trim and sand the top and back edges so they're flush with the sides.

Very carefully remove the excess wood using a hand plane, rasps, files, and sandpaper. Don't final-sand the edges or corners at this time. This will be done after the neck has been attached.

### Install the frets

Cut the frets 1/4" longer than the fingerboard width, so they will overhang the edges by 1/8". For hammering the frets, you'll need a work surface that's flat and hard. A fret hammer is recommended, because it's gentler on the frets than a carpenter's hammer. If you're careful, a carpenter's hammer will do: if it has a clean, smooth striking surface.

Work on one fret at a time. Seat the ends of the fret in the slots by tapping them down at each edge of the fretboard. This leaves the center curved up above the fret slot. Next, tap the fret from end to end, seating it into the slot.



As each fret is seated, nip the overhanging ends close to the sides of the fretboard (approximately 1/64"). Leaving a little overhand helps you avoid marring the wood. Fret nippers are ideal for this job, and provide a clean, flush cut. Wire cutters will do if you don't have fret nippers.

After all the frets are installed, place a flat hardwood block on top of the frets and hammer on the block to further seat the frets.

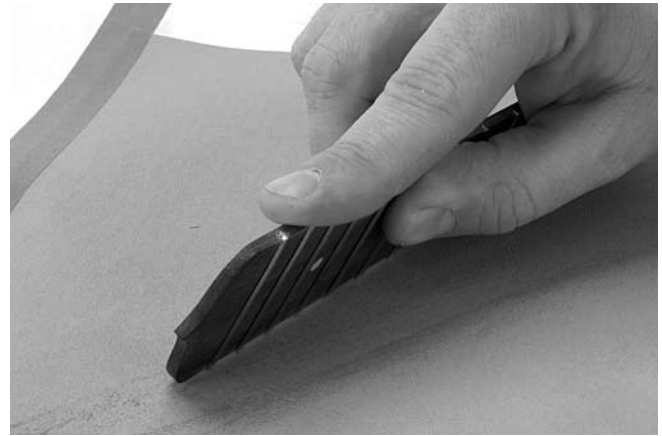
The fretboard will now have a slight back-bow from the pressure of the metal fret tangs in the slots. Remove this bow by gently "massaging" the fretboard, curving it in the opposite direction. Place a shim beneath one end of the fretboard and press the board down against the table top. This seats the frets more securely as the fretboard flattens out. Press gently: too much force can crack the fretboard at one of the slots.

### File and sand the fret ends

With a smooth mill file or 150-grit sandpaper taped to a flat surface, remove the overhanging fret ends, making them flush to the fretboard.



Next, hold the file at an angle and put a beveled shape onto the fret ends. An angle of 60-degrees is about right, but the steepness of this bevel is a matter of personal preference.



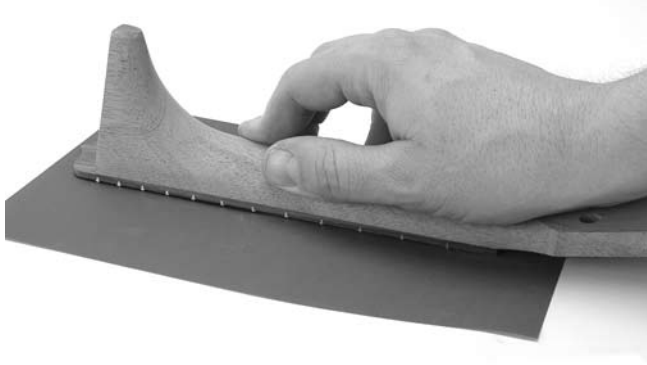
### Attach the fingerboard to the neck

To attach the fretboard to the neck, spread glue on the upper side of the neck where the fretboard will be placed. Position the fretboard on the neck with the 12th fret at the heel edge, and wrap a rubber band around the full length, starting at the nut line. It is very important to have the 12th fret right at the edge of the heel of the neck. Let the glue dry for at least 3 hours before removing the rubber band. Clamp the peghead to the workbench. Using a micro file or finish rasp, file the neck flush to the fretboard sides. Finish with 220-grit sandpaper.



### Level and polish the frets

Lightly smooth the frets with a smooth mill file, a carborundum stone, or a hard block with 400-grit sandpaper. A few gentle passes should be all it takes, and the result will be a tiny flat mark on each fret top. Check with a straightedge to see that the frets are level, and use a hardwood block with 600-grit sandpaper to remove any filing marks.



Finally, smooth the frets with a piece of 1000-grit sandpaper wrapped around two fingers. The action of your fingers over the frets will round them a little while it burnishes and polishes the tops. Roll over the fret ends also to polish them and remove any burrs.



### Attach the neck to the body

Align the centerline on the top with the center point of the fingerboard, and flip the instrument face-down. Make a pencil mark where the neck's heel extends beyond the back. Saw or file away this excess wood from the heel at the same angle as the taper of the back.

To make a clean, tight neck joint, tape a piece of 80-grit sandpaper onto the body at the neck location. Scribble with a pencil onto the gluing surface of the neck heel. Hold the neck against the sandpaper on the body, and make short side-to-side sanding strokes, keeping the fingerboard flush against the top. This will sand the body shape into the neck,

making it ready for a good tight glue joint. Take your time and work carefully; you want to remove only enough wood to allow uniform contact with the body.



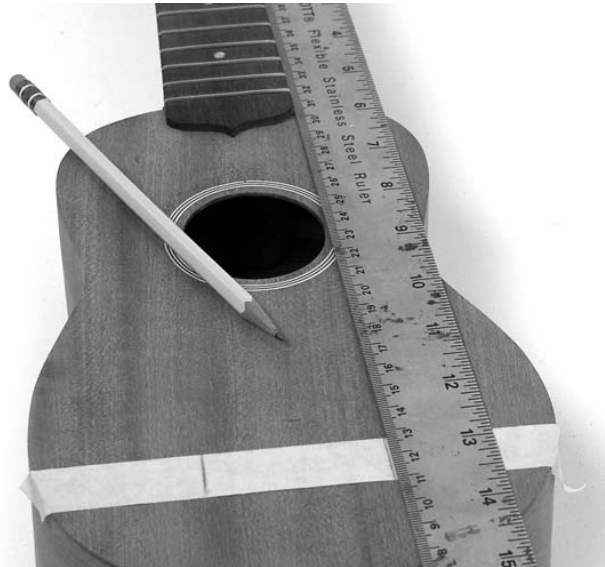
Now that the heel fits the body, align the fingerboard with the centerline on the top. Make a pencil outline of the heel on the side of the body. Remove the neck and mask the gluing area with masking tape. The tape will guide you in positioning the neck when gluing it.



Dry-clip the neck using a clamp on the fingerboard where it overlaps the body. Use scrap wood to protect the fingerboard and the back. Then wrap rubber bands around the body and neck heel. When you're ready to glue, spread Titebond onto the neck and fingerboard extension where it contacts the body. Reclamp and allow to dry for at least 3 hours.

### Locate the bridge

The location of the bridge is very important for accurate tuning. This ukulele uses a distance of 13-3/4" from the nut end of the fingerboard to the center of the bridge saddle. Using a ruler or tape measure along each side of the fingerboard, make two small pencil marks on the top, 13-3/4" from the nut. Draw a very light pencil line connecting these marks and extending about 1/2" beyond each mark, making sure it's at a right angle to the centerline. This line indicates where the bridge saddle will be, not the edge of the bridge, and the 1/2" extensions of the line will be seen on either end of the bridge (to be sanded away later).



Position the bridge with the saddle slot centered over this pencil line, and place a piece of masking tape along the bottom edge of the bridge. Center the bridge by extending straightedges from both sides of the fingerboard. When it's centered, use masking tape to mark the left and right ends of the bridge.

There are two holes in the bridge for mounting screws. With the bridge centered, mark the top with a pencil through the two screw holes. Remove the bridge and drill two 1/16" diameter holes.

Apply Titebond glue to the underside of the bridge and carefully place the bridge in position. Insert and tighten the two screws. Next, fit the tie block trim piece onto the bridge to cover the screws. Glue the tie block trim with Titebond and allow the bridge assembly to dry for 3 hours.

### Apply the finish

There are lots of ways to finish your ukulele, from simple to complex. For directions on fancy finishes, refer to the Stewart-MacDonald catalog or website to find books on the subject. These instructions are for creating a plain and simple protective finish, which is easy for first-time builders.

### About final sanding

Sand all the wood surfaces with 320-grit, gently rounding any sharp edges (including the lip of the soundhole and the sharp edges of the peghead).

Damp-sand all surfaces to raise the grain. Do this by dipping a rag in warm water, then squeeze out the excess. Wipe the wood with the damp rag to raise the wood fibers. Allow the wood to dry for an hour or so, then sand away the raised fibers with 320-grit sandpaper. Repeat this damp-sanding process a second time. Damp-sanding prevents the grain from rising later during finishing, which would result in a rough surface when finished.

Mask the fingerboard and bridge before applying finish.

### Clear finish using ColorTone Brushing Varnish

1. Mix well prior to use. Stir gently, do not shake to minimize bubbles.

2. Sand grain-filled wood with a minimum of 320-grit sandpaper. Remove dust with a soft cloth. Do not use wax/oil tack cloths. Wash the surface with Naphtha or denatured alcohol to remove any oils.

3. Apply thinned varnish as a sealer. Thin with up to 50% water. Apply 2 to 3 coats of sealer 2-hours apart. Scuff sand the first coat with 320-grit paper. Let it dry overnight. Scuff sand the dried sealer with 320-grit.

4. Apply varnish topcoats at a rate of no more than 3 coats per day, 2-3-hours apart. Coats applied within this time frame require no sanding in between. ColorTone Brushing Varnish is applied with a brush straight from the can. We recommend a polyester bristle brush 1-1/2" to 2" wide (available at local hardware stores).

5. Let dry overnight. Sand with 320-grit, being careful not to sand through, especially if there is color under the finish. Apply three more coats as in #4.

6. Let dry overnight. Attempt a complete level sanding with 800-grit paper. If this is not possible without sanding through the finish, repeat #4. Once a successful level sanding is accomplished, brush on two final coats.

7. The finish will cure best in a warm, dry area. Final chemical cure takes 200-hours.

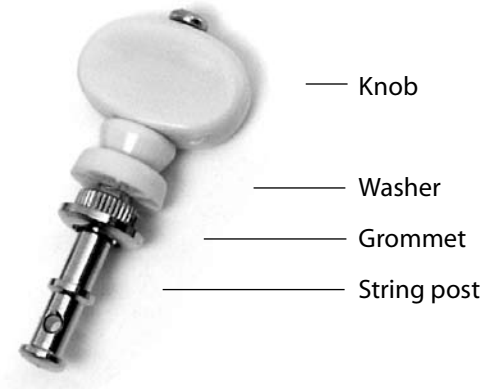
8. Wet-sand the cured finish with 800-grit or finer. Buff with coarse buffing compound, then with medium. Use fine buffing compound for the highest gloss (optional).

Clean the brush immediately after each application, with soap and water. For transparent colors, add ColorTone Concentrated Liquid Stains to varnish. For hot/dry conditions, reduce the varnish with ColorTone Waterbase Retarder. Add 5-15% retarder as needed to slow drying.



### Install the tuning pegs

Each tuning peg has a metal grommet which is installed in the face of the peghead. Place the grommet first, then insert the string post from the back. Slide the washer and knob onto the post, and tighten the assembly with a philips screwdriver. Don't overtighten; the knobs should be snug, but not difficult to turn.

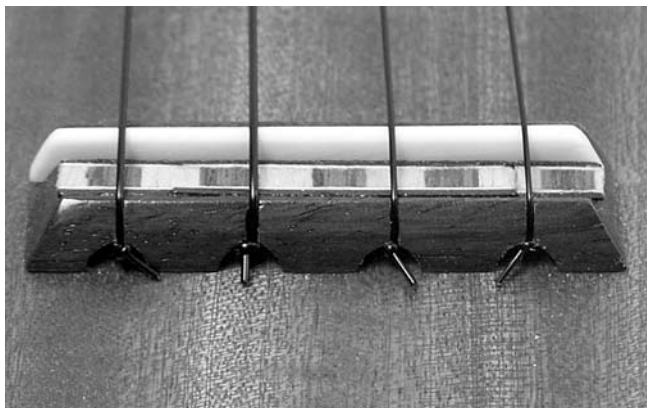


### Install the nut

Glue the nut into position at the upper end of the fretboard with thick super glue. Only one or two drops are necessary. Allow at least 3 minutes for the super glue to set.

### Install the strings & tuning

Tie a knot in one end of each string, and pull it tight. Trim the excess, leaving a 1/8" tail from the knot. Anchor each knot into one slot of the bridge and pull tight to seat it. Thread the other end of the string through the hole of one tuner and tighten the string. Leave three or four complete wraps around the tuning post. If the tuner slips under tension, simply tighten the Phillips screw in the tuner knob.



The strings provided are for standard ukulele tuning: G C E A (from left to right).

G String: The first string on the left as you face the uke. Use the 2nd thickest string, running from the 1st bridge slot to the lower tuner on the left side. Tighten with just enough tension to take the slack out as it settles into the nut slot.

C String: The second string from the left. Use the thickest string, and the top-left tuner. This string is usually tuned to "Middle C".

E String: The 3rd string from the left. Use the 3rd thickest string and the top-right tuner.

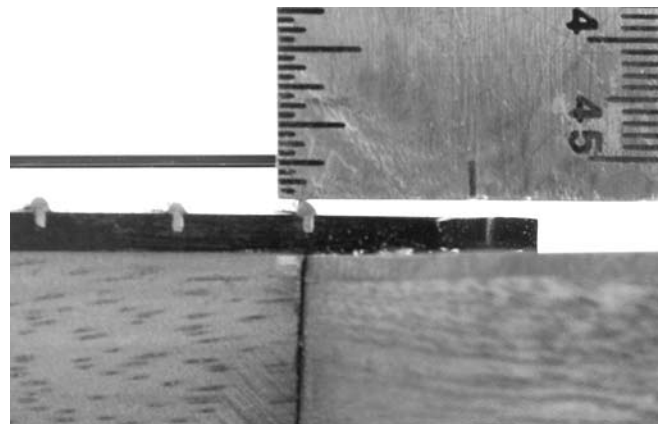
A String: The 4th string from the left. Use the thinnest string and the bottom-right tuner.

Tighten the strings until they are in tune. (To remember the G C E A order: "Great Care Ensures Accuracy." If you've ever heard someone tuning and singing a melody to "My Dog Has Fleas," that's ukulele tuning.) Expect to have to retune frequently until new strings have had some time to settle in.

### Set the string action

The height of the strings over the frets is called the "action." This height is controlled by the nut and saddle. The string action at the first fret should be 1/16" and the string action at the last fret should be 5/32".

For example, the distance from the "G" string and the first fret should be 1/16". If you don't have nut-slotting saws, you can adjust this slot with a fine-tooth hacksaw blade. Check the height of the string at the 12th fret: this should be 1/8" - 3/16". To adjust this height, sand material off the bottom of the saddle. Only the nut adjustment will be needed for the other strings.



That's it! You've built a ukulele, and you're ready to play! Welcome to the world of instrument building!



Ukulele body shape template and bracing pattern

