# Campfire

## Mandolin Kit

**#5160 Assembly Instructions**

Stewart-MacDonald

**www.stewmac.com**

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## Getting started

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

Review these instructions before starting, so you're sure you have everything you need. 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 to assemble your kit. Though all of these tools aren't necessary to build your kit, they make many assembly steps easier and more professional. In some cases, ways to use simple objects instead of buying tools are suggested. Where applicable, item numbers for ordering from Stewart-MacDonald are included.

**Tools**

Clamps (Cam, C, spring)
Spool clamps #0683 (see "Glue the top on" for options)
Kerfing clamps (or clothespins)
Drill and bits: 9/32", 1/16", 1/4"
Rat-tail file (or small dowel wrapped with sandpaper)
Mill file
Half-round bastard file (or sanding block)
Nut files (or small .015" razor saw #3597):
- .042" width #0833
- .028" width #0830
- .016" width #0827

X-acto blade (sharp knife )
Chisel
Flux brush (for spreading glue)
Straightedge #3799
Ruler in the 64ths #4898
Saw (razor or back cut)
Fret hammer #4895 (or light weight hammer with smooth head)
Fret cutters #0619 (or wire cutters)
Hand plane (or knife and file)
3/8" socket and flathead screwdriver
Capo

**Supplies**

Glue (Titebond #0620, superglue #0020, and epoxy #5174)
Masking/binding tape #0677
Pencil
Wax paper
Sandpaper #5562 (80, 150, 220, 400, 600, 1000-grit)
Cleaner (lighter fluid or acetone)
Weights
Finish of choice

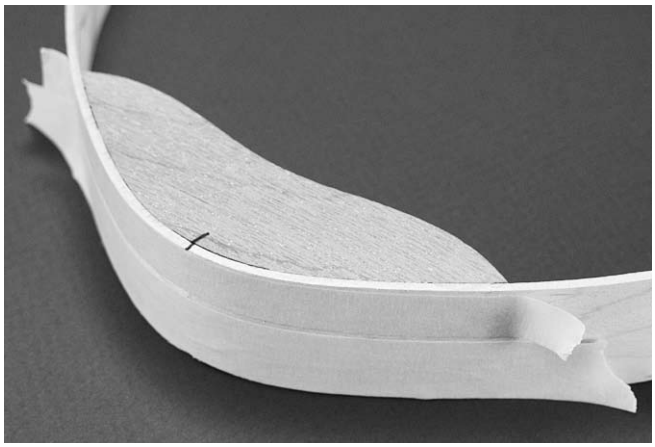
**Parts**

A-style tuners #0759, #0750, or #0768
Tailpiece #0735, or #0731
Strings #0765, #1430, #1431, or #1432

## Kit parts list

Patterns (set of 2)
White pearl dot (6)
Strap buttons, chrome (set of 2)
Nut blank
White side dot material (plastic rod)
Kerfed lining (4 pieces)
Rubber band
Campfire back
Campfire sides
Campfire top
Campfire neck (with neck bolt, nut and washer)
Steel reinforcement bar
Top brace set (4 pieces)
Back brace
Fretwire (2 pieces)
Neck block
Tail block
Neck block caul
Soundhole reinforcement patch
Bridge blank
Tail block caul
Rosewood fingerboard

## Assemble the neck and tail blocks to the sides

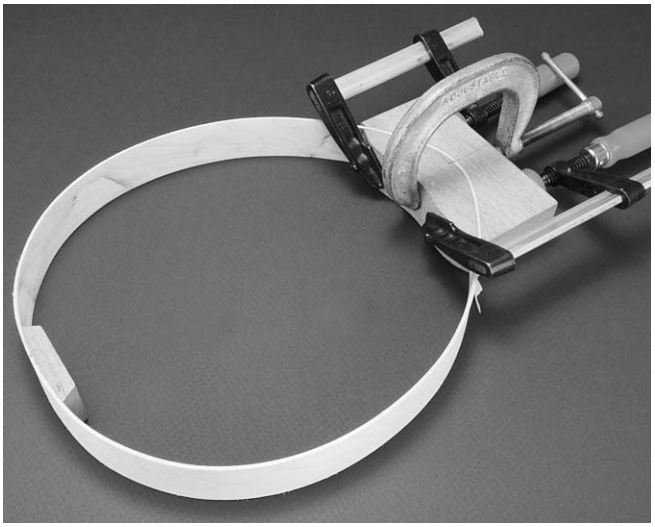


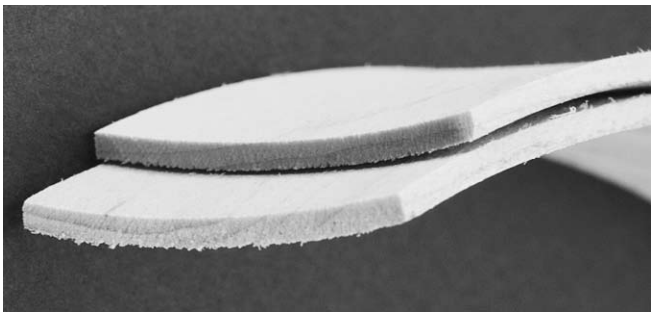
Draw centerlines on the edges of both blocks for aligning the side seams. Masking tape stretched over the butted ends of the sides will hold them tightly together for gluing.

Glue the sides to the neck block first. We've provided cauls shaped to match the neck block and tailblock. Use two or three clamps to apply pressure to all parts of the assembly. Before using glue, dry-clamp the parts together for practice. Align the seam with your marked centerlines. Work on a flat surface so your mandolin is flat and level when you add the back and top later.

The masking tape that holds the sides together also keeps the caul from accidentally becoming glued to the sides. A strip of waxed paper between the caul and the sides is also a good idea.

Allow the Tightbond  to dry for 3 hours. When the neck block is dry, glue the tail block in the same way. (If you have enough clamps, glue both at the same time.)





You may find that the thin wood sides have some "cupping" (curvature). This is to be expected, and is not a problem. It will lessen after gluing, and will be sanded away before you're done.

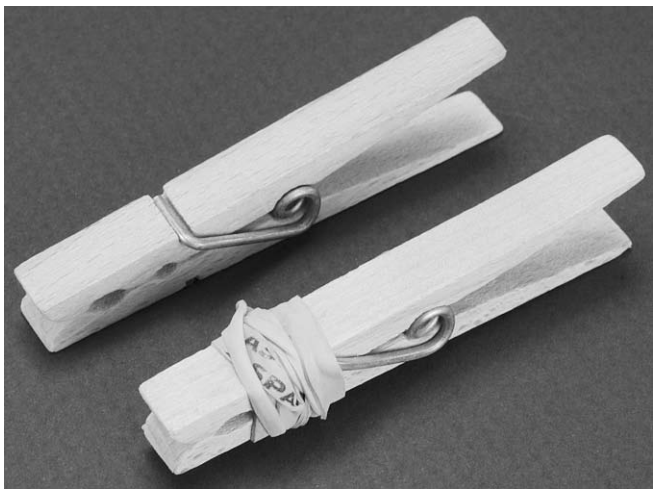
## Drill the mounting bolt hole

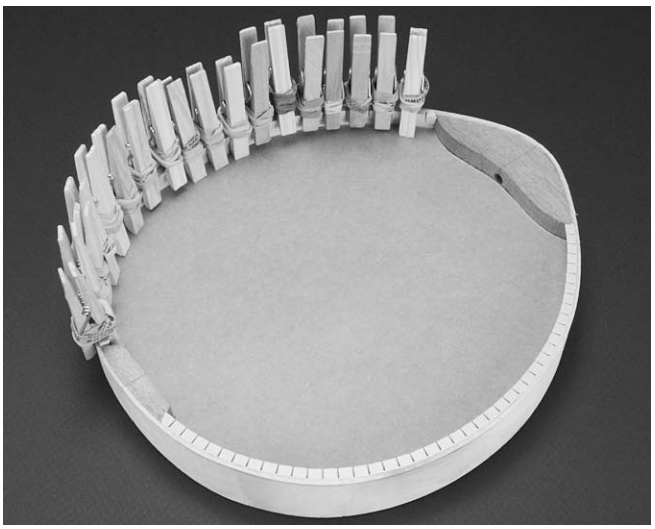
With the sides glued on, the mounting hole in the neck block is covered. Drill this hole through the sides with a 9/32" bit using the neck block hole to guide the drill. There probably won't be room to fit your drill inside the side assembly, so drill this hole by turning the bit in your fingertips. Clean up any rough edges with a rat-tail file or a small dowel wrapped with sandpaper.

## Cut the cardboard mold

During the first stages of construction, the side assembly is held in shape with a mold. Create this mold from the sheet of cardboard supplied. Use the paper template to carefully cut the cardboard to shape. Press this into the side assembly.

## Install the kerfed linings



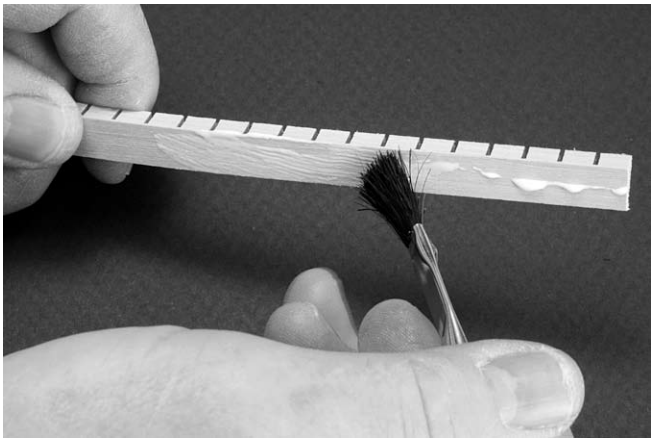


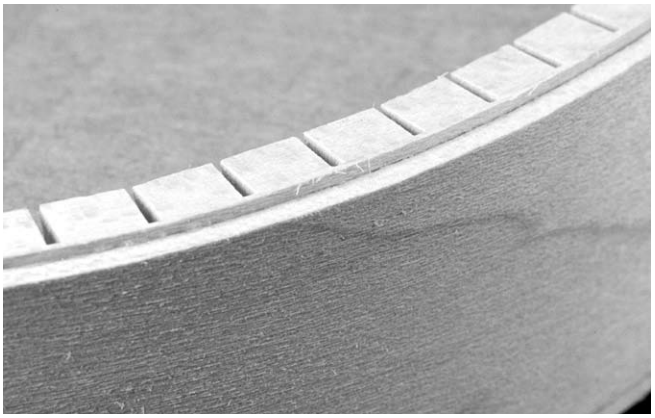
Trim the kerfed linings to length, test-fitting the four pieces between the neck block and tail block without glue. When gluing, you will clamp the linings in place using clothespins. Use as many clothespins as can be fit, placing them very close together. Some clothespins have weak springs, and can be strengthened by wrapping each with a rubber band.

When you're ready, spread glue on one section of kerfed lining and clamp it in place. A plumber's flux brush (hardware store item) spreads glue to the right thickness: under clamping pressure, you should get just a slight squeeze-out of glue, making cleanup easy.

Glue the kerfed lining so it extends 1/32" above the top edge of the sides. Install the next section of lining the same way. If you have enough clothespins, you can do one full side of the mandolin at the same time.

When the first side is dry, remove the clothespins and glue the remaining linings on the other side of the mandolin.





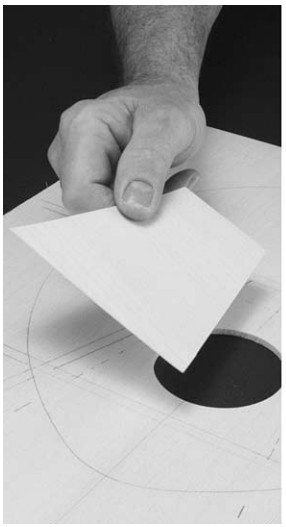
## Transfer the bracing patterns to the top and back

Choose which side of the top and which side of the back will be on the outside of the mandolin.

Transfer the top and back shapes to the wood. The simplest way is to cut the blueprint and trace around it. With the blueprint in place, mark the brace locations and connecting points. A couple of pin pricks through the blueprint will mark the wood – connect those dots with pencil lines. Press lightly!

## Glue the soundhole patch in place

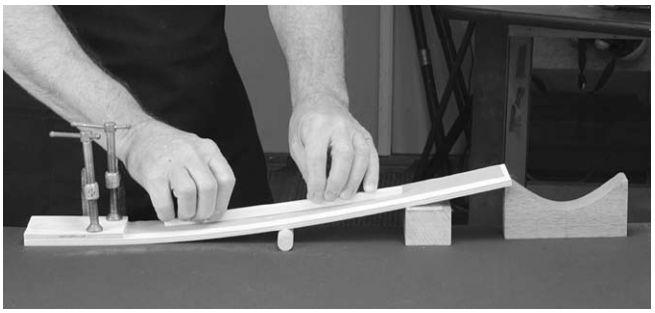
Mark a centerline on the soundhole patch, and use a sharp knife to trim it to the shape shown in the blueprint. Be sure to position the patch so its grain is at right angles to the grain of the top. Center the cut patch over the soundhole as indicated on the blueprint (it will butt up to the position of the forward top brace). Glue it in place using a weight for clamping pressure: cut a scrap wood caul in the shape of the patch and put a sheet of waxed paper between the caul and the patch. Add weight to the caul and allow it to dry for at least an hour.



## Shape the braces with the sanding stick

The “sanding stick” of 1/4" plywood is supplied for shaping the curved braces, and will also be used later for sanding the kerfed linings. The main sanding stick is 20" long, and there is also a second piece 4" long.

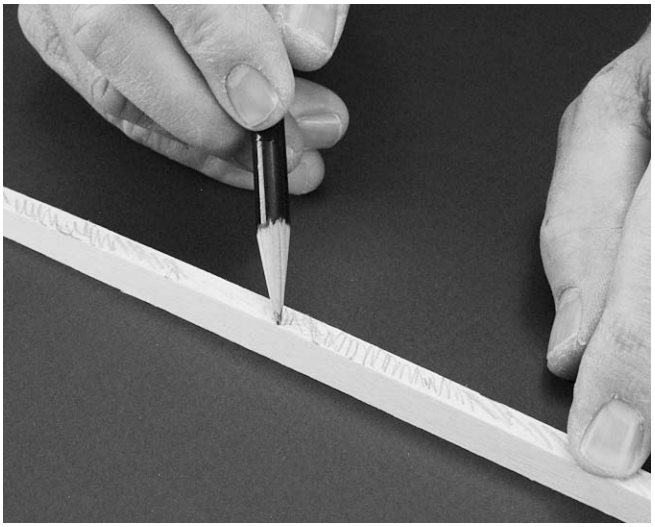
Clamp one end of the 20" piece to the edge of a table using two clamps, with the 4" piece as a caul. Bend the opposite end of the stick up off the table by approximately 2-3/8", creating a curve. Prop the end up with a wooden block, then add two more props to support the middle of the curve. The result is a supported curve which has about an 8’ radius to match the brace curves. This radius is adjustable by moving the wooden block.



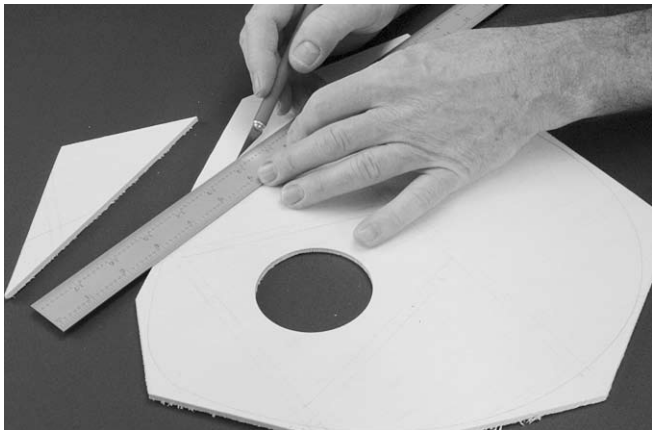
Attach a strip of 80-grit sandpaper to cover the sanding stick using glue, double-stick tape, or self-adhesive sandpaper. Sand the bottom of one brace, comparing the curve to the blueprint. Move the supports under the sanding stick until you have the curve you need, then sand all braces to match the blueprint.

Use a diagonal sanding motion rather than a straight line; this will keep the sandpaper from loading up with sawdust. Brush or vacuum the dust away frequently.

To see if you're sanding the braces evenly, lightly scribble over the entire surface to be sanded with a pencil. Check the pencil marks as you sand. Uneven sanding will leave patches of pencil.



## Rough-out the top and back

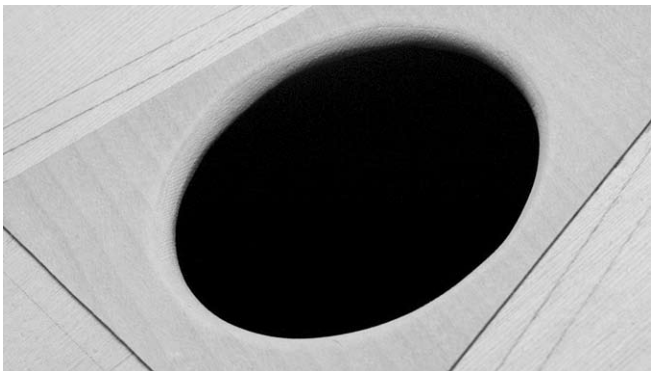


If you have a bandsaw or coping saw, use it to cut the top and back into approximate shape. Follow outside the final shape of the mandolin, leaving about 1/8" of extra wood all around (this overhanging wood will be trimmed away after the top and back are glued on). It's also easy to rough in the top without a saw by using a straightedge and sharp utility knife. Make numerous straight cuts around the top until you have the rough shape.

The maple back is too difficult to cut with a knife, but you can use a backsaw or hacksaw to trim it to shape in the same way. Save the larger scraps — they make good cauls for protecting surfaces when clamping.

Cut out the soundhole by removing the thin patch wood with a sharp knife. For good results, do this in two passes: first rough-cut the hole without coming quite up to the edge, then carefully pare away the wood following the shape of the soundhole.

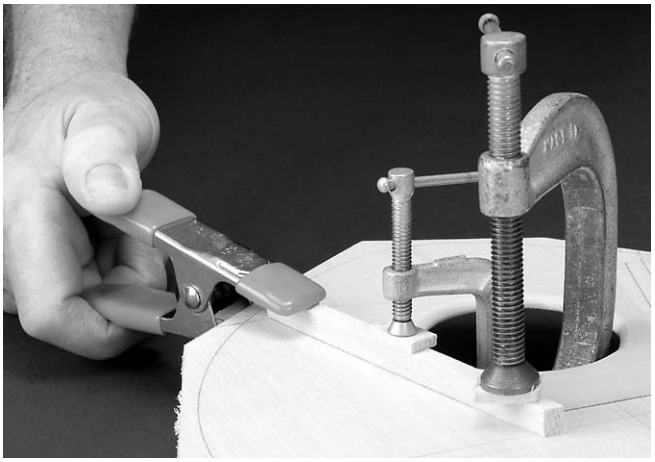
With a file or 150-grit sandpaper, lightly bevel and smooth the underside of the soundhole and soundhole patch.



## Glue on the short top braces

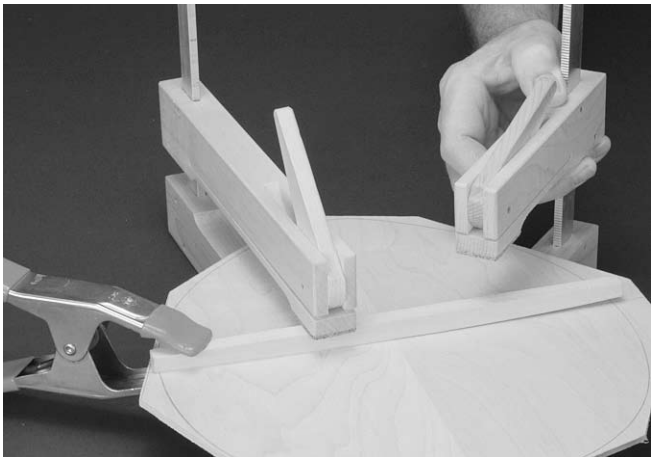
Cut the short top braces to length, and trim their ends to the angle shown in the blueprint. Note that 1/8" of each end will overlap onto the cross braces. Apply glue and clamp the braces in place with 3 clamps. Start clamping at one end, then clamp the center, and clamp the other end last (this method allows the top to bend and match the curve of the brace).

Use wood scraps as cauls to protect the top from the clamp jaws.



## Glue on the back brace

Glue the back brace on using three or four clamps in the same method: working from one end to the other to retain the arch.



## Sand the kerfed linings

The raised kerfed linings and neck/tail blocks need to be sanded to meet the sides at a slight angle. This angle allows the linings to match the arched top and back for gluing. Use the sanding stick to do this: attach a 7" strip of fresh 80-grit sandpaper to the 20" stick. Fasten this piece of sandpaper about 7" in from the end of the stick.

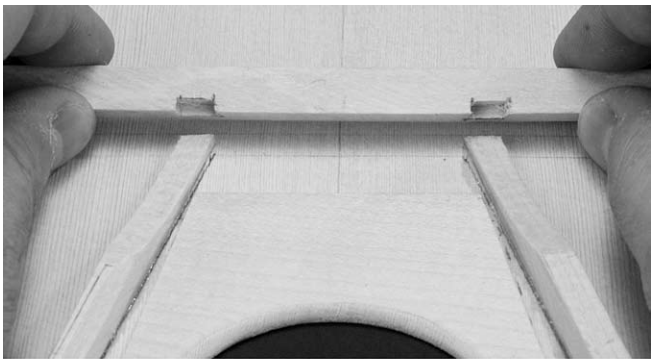
At the opposite end of the stick, fasten the 4" piece of plywood with glue or double-stick tape. This raised section will rest on one side of the mandolin rim while the sandpaper works on the opposite side. The thickness of this plywood piece raises the sanding stick to an angle, so the sanding creates the necessary angle for gluing the top and back.

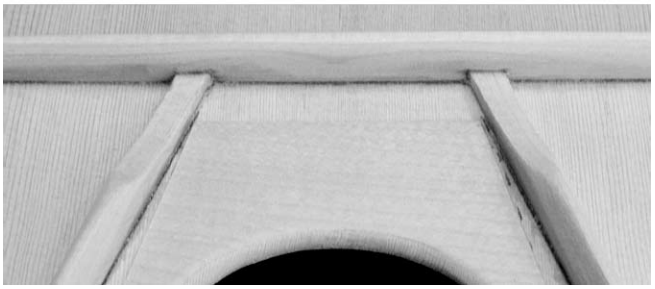
While sanding, keep the 4" shim block on the rim of the instrument, and work the sandpaper on the edge directly opposite. Keep the sanding stick positioned across the center of the mandolin, and work your way around the circle of the rim. Don't stay too long on any spot: keep moving as if your sanding stick were the hands of a clock. Put pencil marks on the linings and blocks and sand until the marks are gone.

## Glue the cross braces onto the top

Cut two notches into the top cross braces as shown on the blueprint. Use a new, sharp razor knife blade for this, and make the cuts lightly and carefully — deepening them by degree until you can pry out the notch. Use 4 clamps to glue each brace in place. Again, work from one end across in order to retain the top radius.

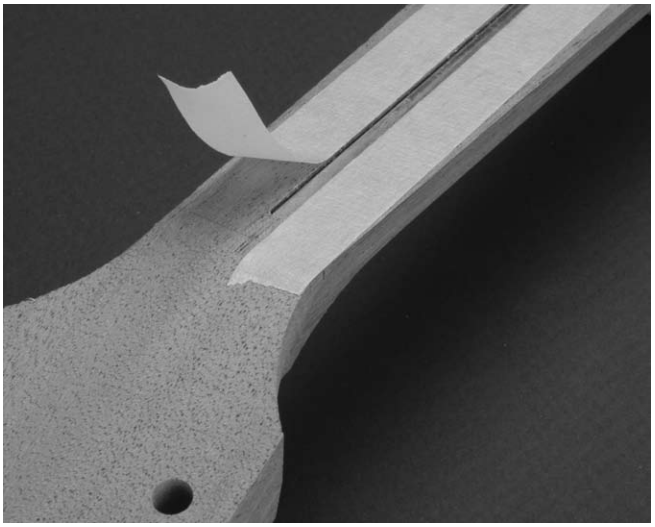
(While the glued braces are drying, it's a good time to start work on the neck.)





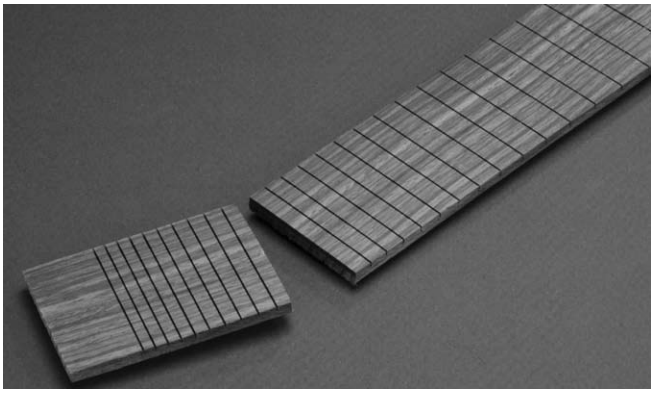
## Install the steel reinforcement bar in the neck

Clean and degrease the steel reinforcement bar with lighter fluid or acetone. Place masking tape on each side of the channel for the reinforcement bar to keep any glue squeeze-out off of the surface of the neck. Spread epoxy glue into the channel and press the reinforcement bar in place. Make sure that it is flush with the neck surface and not extending above the channel (which would interfere with gluing the fretboard later). Wipe off the excess epoxy and remove the tape. Let it dry according to the glue manufacturer's instructions.

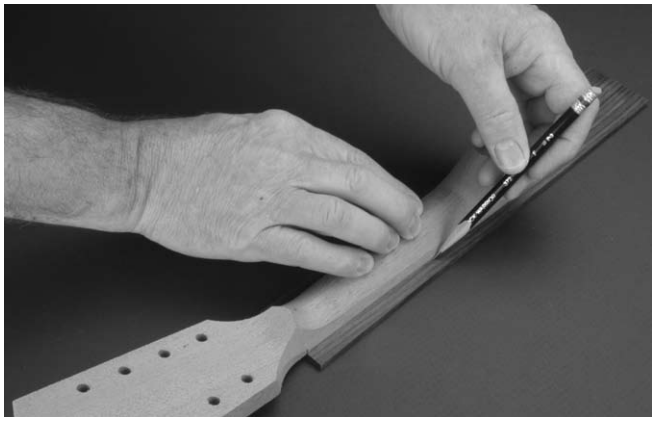


## Trim the fretboard to length

With a razor saw, or other small back saw, cut off the fretboard at the 19th fret slot (leaving 18 slots available for frets). Sand and file the end of the fretboard to remove any saw marks. Save the cut-off piece to practice fretting on later.



## Plane the fretboard taper



On the face of the neck (where the fretboard will go), pencil a line 3/16" back from the break angle of the peghead. This 3/16" area is where the nut will stand. Lay the neck face down on the back of the fretboard, and align the end of the fretboard with your pencil mark. Center the neck on the fretboard and trace the neck shape onto the back of the fretboard.

Clamp the fretboard face down on a riser block as illustrated, and use a small block plane laid on its side to plane the tapered edges until the pencil line is just starting to disappear. There should be little or no overhang of the fretboard to the edges of the neck.

## Inlay the white side dots

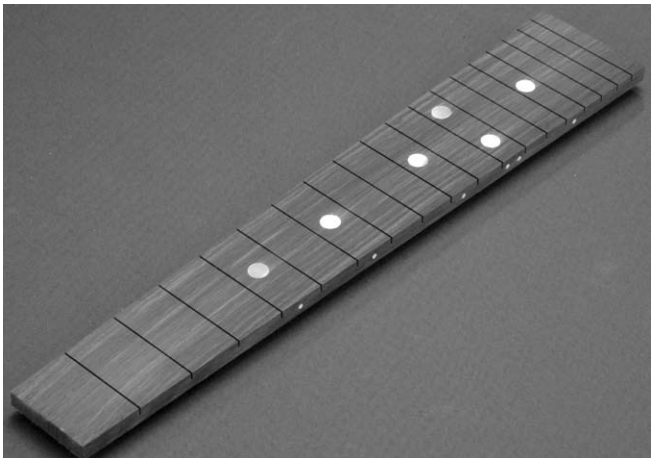
On the edge of the fretboard, drill 1/16" holes for the side dot markers. A single dot will mark frets 5, 7, 10 and 15, and two dots will mark the 12th fret. Center the dots between the fret slots (the dot for fret 5 will be centered between fret slots 4 and 5, etc.). At the 12th fret, drill two holes 1/4" apart.

The side dots are created with the thin white rod. Place a drop of superglue in one of the holes, push the white rod in, and nip it off so a small amount is left protruding from the hole. Do this with the remaining holes, one at a time (superglue dries fast).

## Inlay the pearl position markers

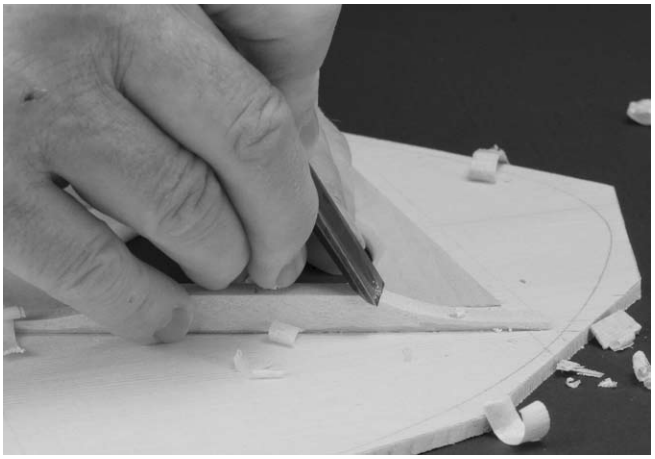
Drill 1/4" holes for single pearl inlays at frets 5, 7, 10, and 15. Drill two holes for two inlays at the 12th fret. A brad-point drill bit is preferable because it creates a flat-bottomed hole, but a regular twist drill bit will work. Be careful to drill only very slightly deeper than the thickness of the dots.

Glue the dots in with Titebond or superglue, pressing them flush to the fretboard surface with a flat block. Don't press them lower than the surface.

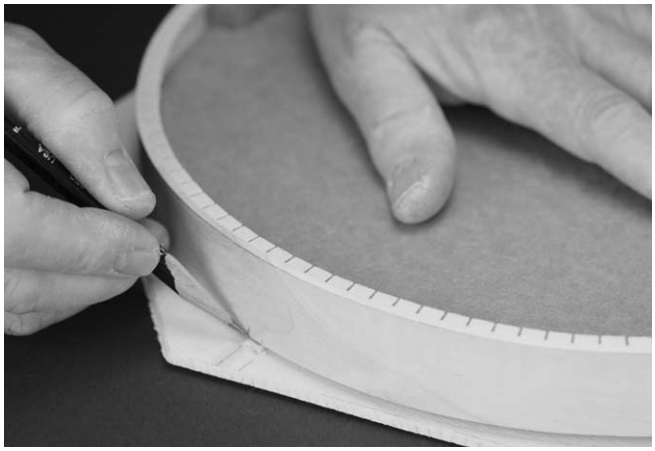


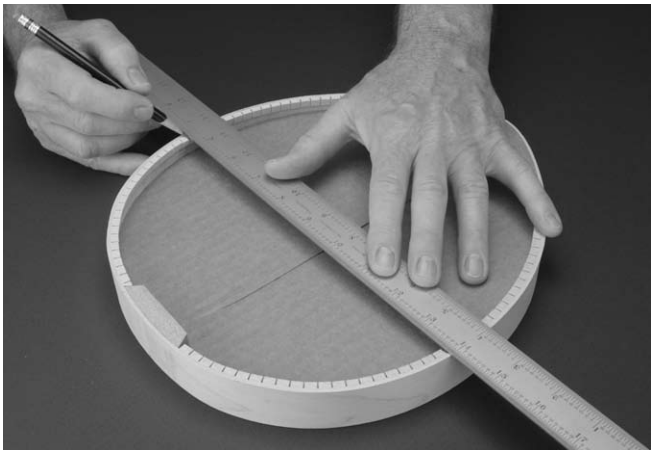
## Shape the braces

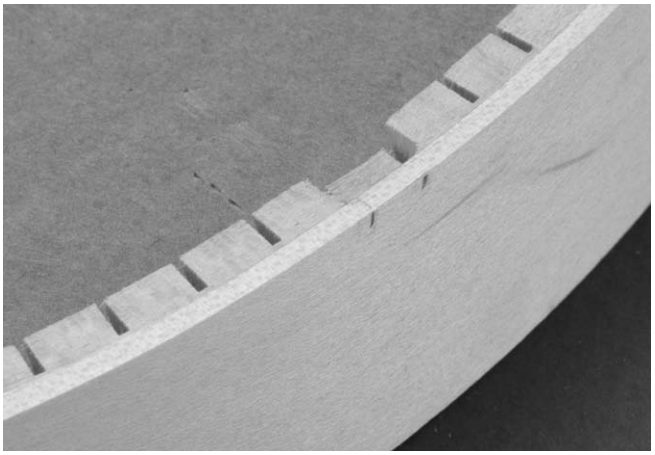
Now that the glue holding the braces is dry, shape them to match the blueprint by using a sharp chisel. If the chisel digs into the spruce and wants to split it, cut from the opposite direction. Sand the braces to remove any chisel marks using 150-grit. Try to leave the end of each brace with a smooth, clean chisel cut.



## Fit the top to the side assembly







First, note that the neck-mounting hole is not centered vertically in the neck block. This hole is positioned closer to the back of the mandolin. Be sure that you fit the top to the side farthest from this bolt-hole.

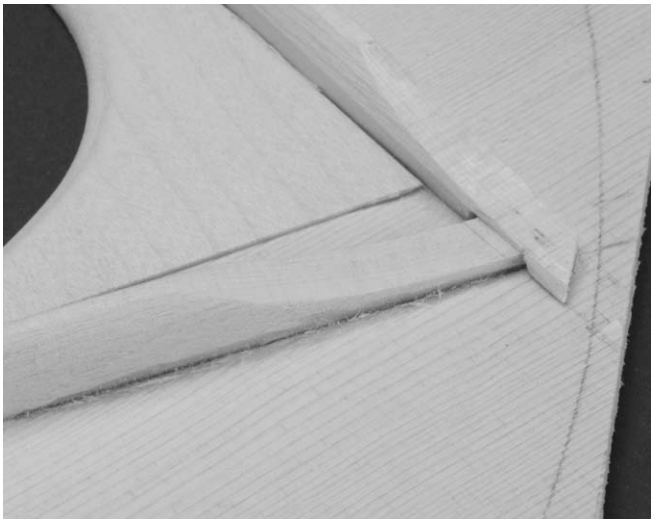
Place the top onto the side assembly, matching the centerlines, and lightly clamp the top to the neck block and tail block to hold it in place.

In pencil, mark lightly on the sides where the ends of the braces meet the sides. Also pencil the shape of the sides onto the ends of the braces for trimming.

Remove the top and lay a straightedge across the side assembly and line it up with the marks. Pencil the brace location across the kerfed lining. Use a sharp razor knife to carefully cut flat-bottomed notches, 1/8" deep, where the braces will rest in the kerfed lining (4 notches in all). Don't expect a perfect notch: you are bound to have at least one empty kerf slot falling right where you are trying to cut.

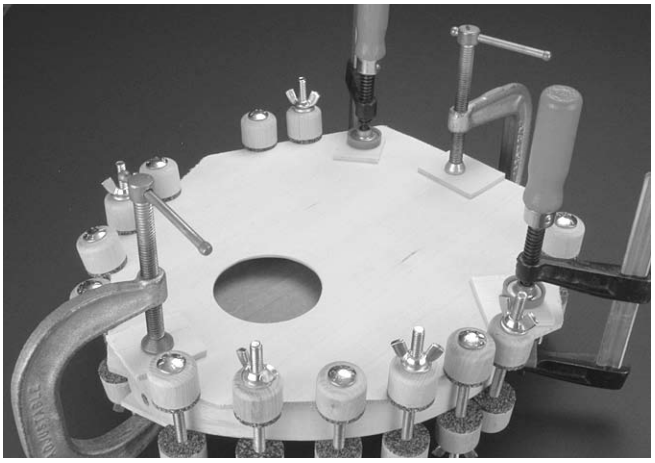
Use a razor saw to trim the ends of the braces. The pencil lines you drew on the braces mark the outer edge of the

sides. You want the braces to be hidden inside the sides, so make your saw-cut about 1/8" inside of those pencil lines. The braces will fall into the notches in the kerfed lining and butt up to the sides.



## Glue the top on

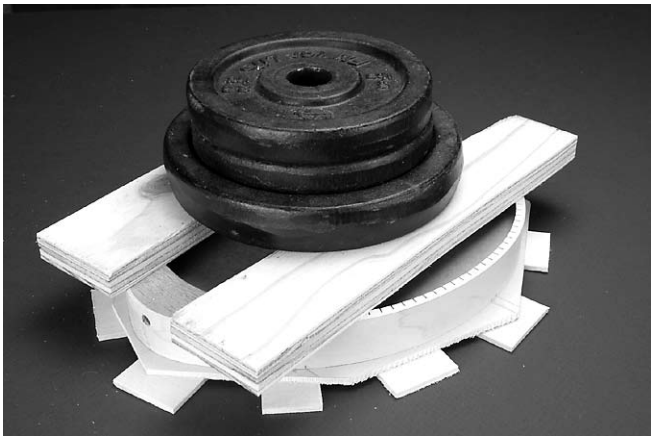
With the kerfed lining notched accurately, the top will snap into place. Before gluing, dry-clamp to check the fit and trim the notches or brace ends if needed.



**Gluing method 1: Clamps**
Spread Titebond glue on the tops of the linings and neck/tail blocks. Place a clamp at each end first, then clamp around the perimeter. Use as many clamps per side as you can fit, and remember to use scrap wood cauls to protect the surface from the clamps. Spool clamps are ideal for gluing tops and backs. They're inexpensive, and designed for this job.

Spool clamps can be made using 8" all thread rods, wing nuts, drilled wooden spools and cork or leather lining pads.

When all the clamps are on, re-clamp the neck and tail block. Remove their clamps and reapply them, being sure that their wooden cauls are spreading the pressure across the entire block. If you have extra clamps, use two — especially on the larger neck block.



**Gluing method 2: Weights**
Using the pressure of weights is an alternative to clamping. Place the top face-down on a ring of wood scraps left over from shaping the back. These equal-thickness scraps raise the rim of the mandolin to accommodate the arch of the top. Check to see that each scrap is positioned to make contact with the perimeter of the mandolin. Apply glue and place the side assembly in position. Lay two boards across the rim lengthwise and lay your weight onto these boards. Look carefully for a bit of glue squeeze-out to show that pressure is applied at all points.

## Level the fretboard

Level the pearl dots, and the fretboard surface, with a smooth mill file. Then sand it using a scrap wood sanding block with 150-, then 220-grit paper. File and sand the side dots flush also.

## Install the frets

Cut the frets to lengths 1/4" wider than the fingerboard (so they will overhang the edges by 1/8"). You will have enough extra fretwire to practice fretting on the fretboard cutoff supplied.

The frets are gently hammered into the fret slots. Pick a hard, solid, flat work surface to do this. Use the cut-off piece of fretboard to practice fretting before working on the real thing. A fret hammer is recommended — it will have the correct weight and surface hardness to drive in frets without damaging them. If you don't have a fret hammer, use a light weight hammer with a smooth, clean head surface.

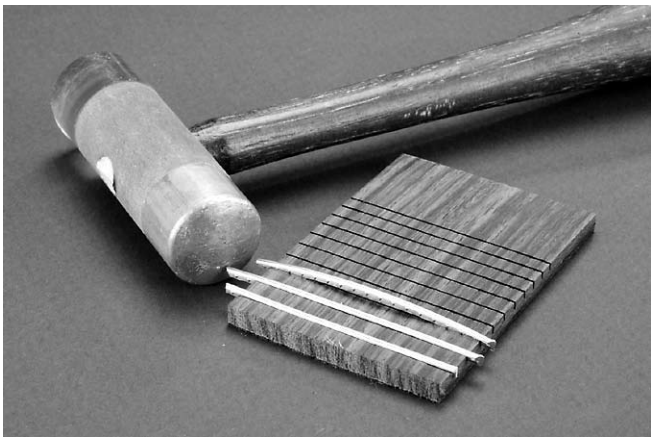
First, seat the ends of the frets by tapping them down at each edge of the fretboard. This will leave the center of the fret curved up above the fret slot. Next, work across the fret with the hammer, seating it into the slot.

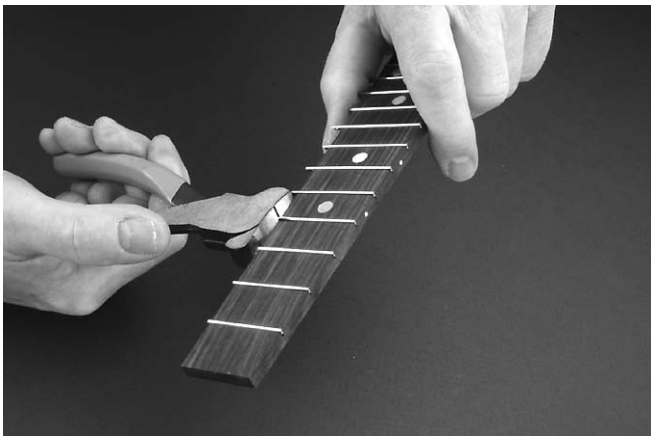
When each fret is seated, nip the overhanging ends approximately 1/64" away from the side of the fretboard (to avoid marring the wood). Fret nippers are ideal for this purpose, providing a clean, flush cut. Wire cutters will do the job if you don't have fret nippers.

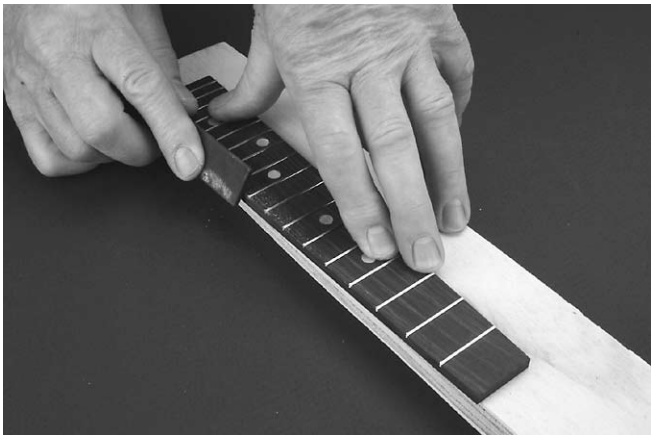
When all the frets are installed, place a flat hardwood block on top of the frets and hammer on the block to further seat the frets.

The frets pressed into the slots will slightly curve the fretboard into a back-bow. 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 will seat the frets more securely, and the fretboard will flatten out. Press gently on the board without much force: overdoing it could crack the fretboard at one of the slots.

With a smooth mill file, 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° is about right, but the steepness of this bevel is a matter of personal preference.

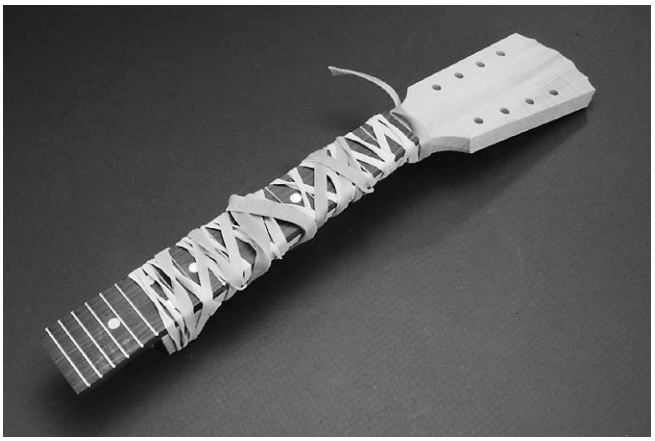






## Install the fretboard

Be sure the gluing surface of the neck is clean, smooth, and free of epoxy from the reinforcement bar. Spread Titebond glue, align the fingerboard with the penciled nut line, and wrap the board firmly to the neck using the supplied rubber strip. A rubber strip is a "self-centering" clamp which allows a little wiggling into position before the glue sets.



## Remove the cardboard mold

Use a razor knife to cut and remove the cardboard inner mold.

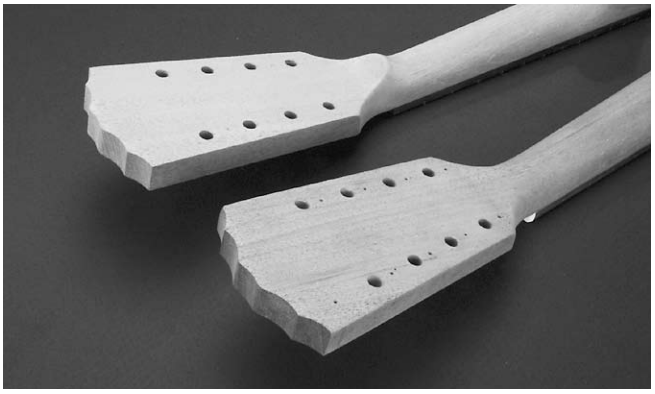
## Fit and glue the back on

Follow the same procedure to fit the back brace into the kerfing that you did with the top: clamp it in place, locate the notches and cut them, trim the brace ends, and glue the brace on the back using clamps or weights.

## Shape the neck

When the fretboard has dried, use a half-round bastard file or a sanding block to smooth the shape of the neck and make the fretboard edges flush. Block-sand the neck with 150-grit, then 220-grit sandpaper.

Where the neck meets the peghead there is a carved "V" shape called the volute. This shape is not essential to the strength of the neck, whether you leave it or remove it is just a matter of the style you prefer. We have pictured both options to help you decide.



## 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.

## Install the tuners

With lighter fluid, clean the tuning keys (not included) to remove grease or oil, then dry them. Mark the mounting hole locations with an awl. Drill the screw holes to match your mounting screws (usually a 1/16" hole). Use a piece of masking tape on the drill bit to mark the screw-hole depth.

Bushings may be supplied with the tuners you choose. They are not really necessary, and to properly install them requires a special drill bit or reamer.

## Trim the top and back overhang and sand the body

It's time to shape the edges of the top and back to match the sides. If your rough-shaping of the top and back left a lot of wood exposed, you'll want to saw it away now so that you have a small overhang around the sides (approximately 1/8"). Remove the overhang with a hand plane, or a knife and file. Trim with the grain, to avoid splitting the wood.

Protect the sides with a layer or two of masking tape in case you slip, then remove the tape when you sand the edges. Use the sanding stick with 80-grit on one end and 150-grit on the other to smooth the edges and round any flat spots on the sides. Sand carefully, and sand as little as possible in the neck block area, to avoid changing the shape for neck-fitting. Use the 80-grit for shaping if necessary, but switch to 150-grit for smoothing as soon as you can.

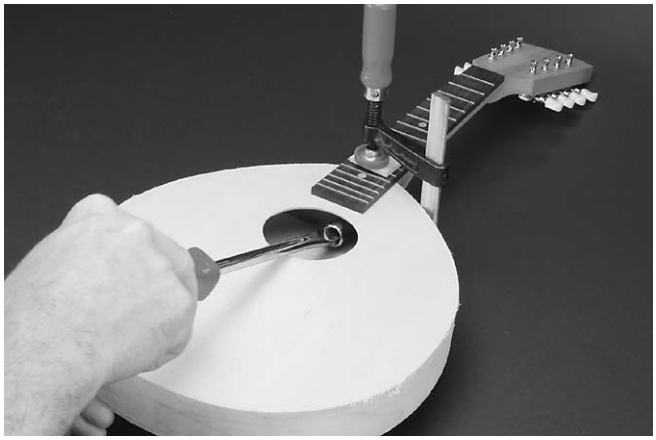
## Fit the neck to the body

Place masking tape on the top across the tail block so you can mark the centerline on it with a pencil. When applying tape to the top, keep in mind that some tapes have very aggressive adhesive, and can pull out wood fibers when the tape is removed. Use a low-tack tape, or press the tape to your shirt prior to use so that it is less tacky.

Lightly install the neck, using the washer and bolt, and then gently clamp the fretboard extension down onto the top. Make the neck just finger-tight at this stage so that if you need to shift its position, a tap will do it. The neck bolt can be reached with a 3/8" socket turned by a flat-blade screwdriver, but don't overtighten it at this stage.

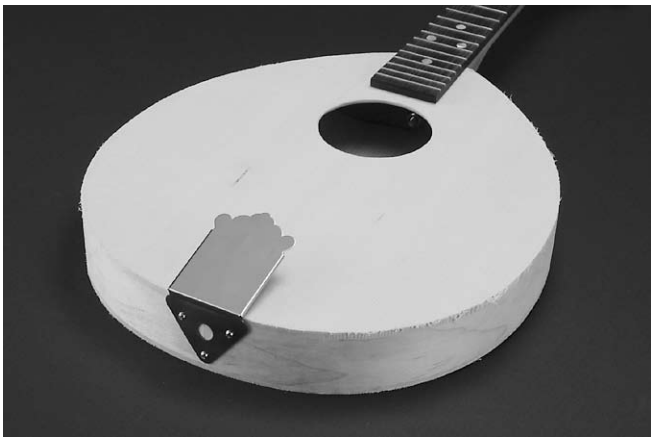
Lay a straightedge against the fretboard, extending over the tape at the tail block. Measure from the straightedge to the centerline, and then do the same on the opposite side. If the measurements are not equal, the neck is not centered. Gently push or tap the neck to correct any misalignment. Once the neck is aligned, tighten the neck bolt more snugly (at this point, finger pressure should still be all that's needed).

If the neck won't align with the center, use a rat-tail file to enlarge the mounting hole slightly so that the neck can move further to that side.



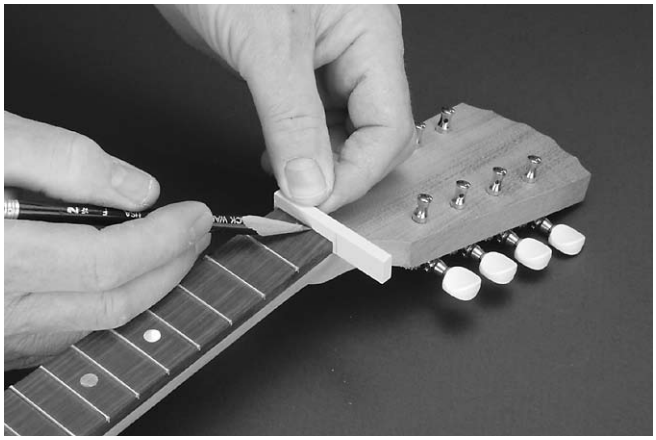
## Install the tailpiece

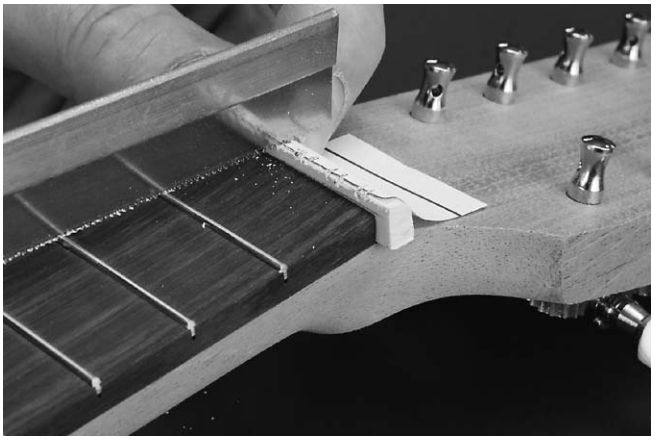
Aline the tailpiece of your choice (not included) and its mounting holes on the center seam at the end block. Centerpunch the holes, and drill them with a 1/16" bit. Install the screws.



## Fit the nut

With 150-grit sandpaper laid on a flat surface, sand the blank nut blank until it is uniformly 3/16" thick. Check with a square to be sure that the surface that faces the fretboard is square to the bottom of the nut.





Place the nut blank on the 3/16" flat of the neck and mark the ends where the nut overhangs the sides of the fretboard. Draw a sharp line across the fretboard surface onto the nut.

Remove the nut and draw another line 5/64" above the one showing the fretboard height. Clamp the nut in a vise, or butt it up against a bench stop made of wood fastened to the work surface. File the nut down to the higher pencil line. The 5/64" height above the fretboard leaves enough room for string slots 1/32" deep to hold the strings above the fret tops. The clearance between the bottom of the strings and the top of the first fret will be .016". This is a roughed-in spec, later you may lower it as desired.

Cut out the paper nut and bridge templates provided, and use them to lay out the shapes and string positions exactly. Center the template on the nut, and use a sharp pencil to mark the string slots.

Scratch starter notches into the pencil marks with a sharp scribe, and then use your smallest razor saw or nut file to begin the slots. The three nut file sizes we use on a mandolin nut are: .042" (G string); .028" (D string); .016" (A and E strings).

A set of gauged saws is the ideal way to cut string slots, but one single saw can do the whole job. Our .015" Gauged Saw will cut the E & A slots easily, and then by rolling the saw from side to side you can enlarge the slots for the heavier strings.

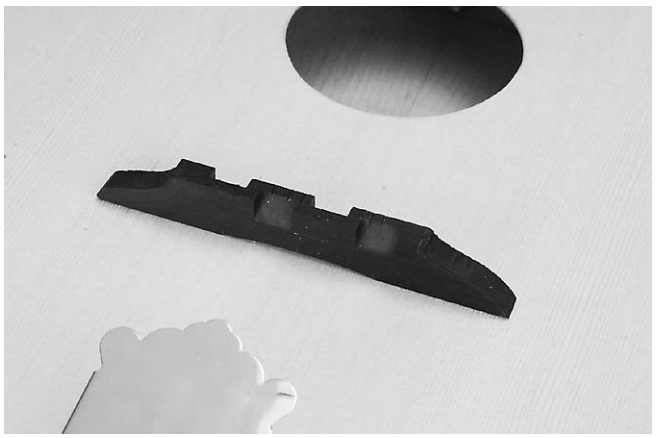
File the string notches straight downward (don't drift to the side, which would change the spacing) until the slots meet the "rough-in" specs. From that point leave the slots alone until the bridge is fitteds and notched and you have strings installed.

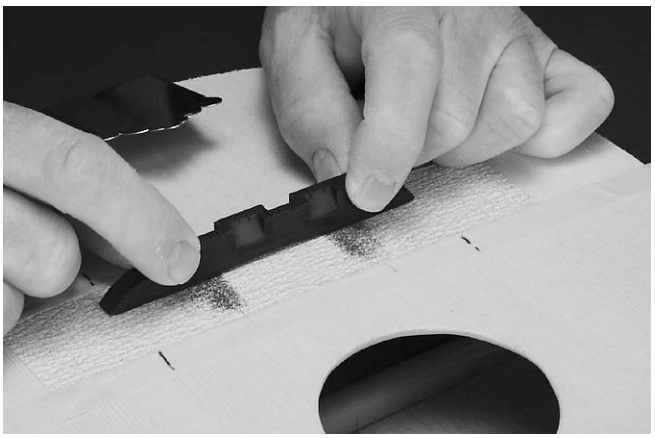
## Fit the bridge

Trace the bridge shape from the paper template onto the blank, and cut the contours on the ends and the underside. Sand the curves smooth.

String tension, not glue, holds the bridge to the top. The bridge bottom needs to fit the curved top. To get a good fit, sand the bottom of the bridge by laying a strip of 150-grit sandpaper on the top, and move the bridge back and forth on it sideways. With short strokes, sand the shape of the top into the bridge feet. The correct location for the bridge is 13-61/64" from the nut edge (closest to the bridge) to the bridge edge (closest to the nut).

Using the paper template for reference, lay out and cut the string notches in the bridge. The proper depth is one-half the diameter of each string.



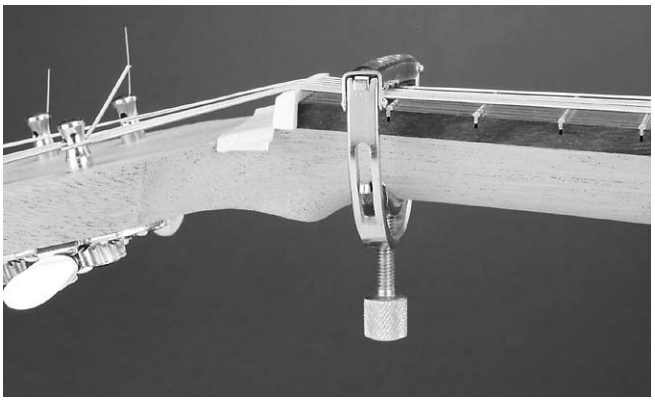


## Adjust the string height

Set the nut in place. A piece of masking tape on the back of the nut (away from the fretboard) will help keep the nut up against the fingerboard while you work. Later, glue will hold the nut in place.

Install the strings and tune to pitch (GG DD AA EE). At this point, the nut is only roughed in, and it is a bit high. For this reason, clamp a capo at the first fret to pull the strings down to simulate a lower action. With the capo in place, measure the string height at the 12th fret. The clearance between the bottom of the strings and the top of the 12th fret should be approximately 3/32". If it is too high, cut the bridge slots deeper.

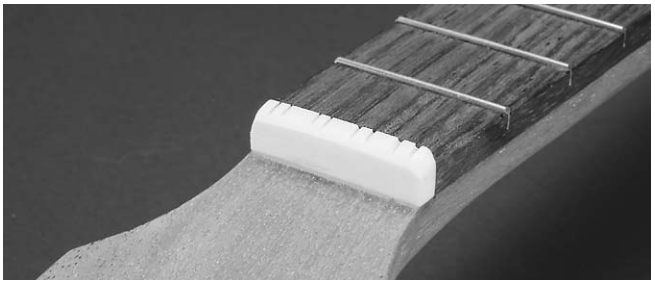
When the string height at the 12th fret is correct, remove the capo and lower the string slots at the nut until the gap over the first fret looks comfortable. When the nut slots are at final depth, the bottoms of the strings should be approximately .010" above the frets.



If the nut slots are deeper than half the diameter of the strings, remove a little material from the top of the nut. As you file or saw the nut slots, if they get too deep to cut cleanly, stop and remove some excess material from the top of the nut.

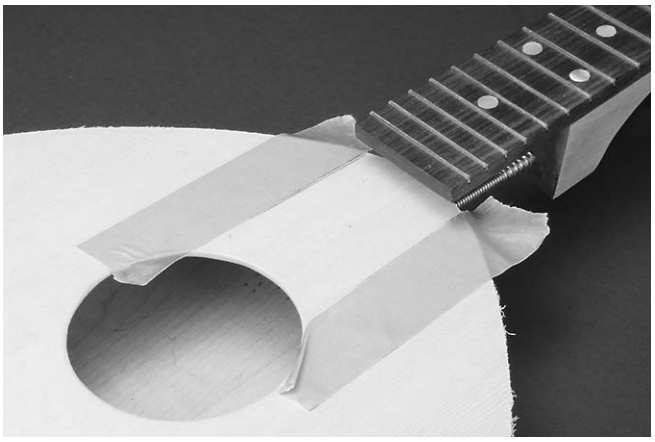
## Finish shaping the nut

When the nut slots are finished, de-tune the strings and remove any excess nut material. Use a smooth file and 220-grit sandpaper to smooth the nut and give it a final shape. Put two beads of Titebond glue on the 3/16" flat where the nut will sit, and position the nut there. Lightly tension the strings, keeping the nut square. The string tension will hold the nut in place while the glue dries.



## Disassemble for finishing

Remove the strings and hardware. Before removing the neck, place tape along each side of fretboard where it overlaps the top. The tape will record the position of the neck. Remove the neck, and mark the top with pencil inside the taped area to show where the sides of the fingerboard were. Later, the pencil marks will help you return the neck to the same position during reassembly (the neck will cover the pencil marks).



## Finishing

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

## Final sanding

Sand all the wood surfaces to 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. Dip a rag in warm water, then squeeze out the water. Use the rag to dampen the wood. This will raise the wood fibers. Allow the wood to dry for an hour or so, then sand away the raised fibers with 220-grit sandpaper. Repeat this damp-sanding process a second time. Forcing the grain to rise by damp-sanding prevents it from rising later during finishing, which would result in a rough surface when finish is applied.

## About staining

If you choose to use color, use our ColorTone waterbase stain, and put the color on the wood (not in the finish).

Wiping the stain on is easiest, but spraying a stain gives more uniform results. Stain will soak into end-grain — especially the contours of the neck — and can produce a blotchy look. For this reason, finishers often dampen end-grain areas with water before applying the stain so that less stain is absorbed.

## Apply the finish

If this is your first experience with finishing, we recommend using a brush-on waterbase varnish. Stewart-MacDonald's ColorTone Brushing Varnish is formulated for this type of finishing. If using a different product, follow the instructions supplied.

Here are instructions for brushing a clear finish with 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, 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).

Notes about this finish: 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.

## Reassembly and final setup

Replace the neck in the same position as before, using your pencil lines as a guide. Dry-clamp the neck and double-check its alignment with the tailpiece and bridge before tightening it.

The bridge is held in place by the string tension, and no glue is used. The correct location for the bridge is 13-61/64" from the nut edge (closest to the bridge) to bridge edge (closest to the nut).

The portion of the fretboard which overlaps the top is called the extension, and on some mandolins this extension is glued to the top. You might choose to do this, but it is not necessary with the Campfire.

Now you're ready to string up your mandolin and play! Congratulations!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