Bluegrass RESOMASTER

Resonator Guitar Kit

Assembly Instructions

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Getting started

Welcome to guitar building! You're about to build a great square-neck resonator guitar — the instrument that puts the blues in bluegrass!

We designed this kit with the small shop builder and a modest tool budget in mind. For power tools, we used a small laminate router and an electric hand drill. With the exception of a few specialty guitarmaking tools, such as several nut-slotting files, we used standard woodshop hand tools. These included a chisel, rasp, half-round bastard file, small razor saw, a sharp knife, a couple of rulers, and a long straightedge. Of course, we used some clamps (8 cam clamps, 24 spool clamps and 50 clothespins), but that's all.

Please read these instructions before building your guitar. It's important for you to "dry run" the fitting, gluing, clamping and finishing operations before trying them for real. Also, it's very important to acclimate the wood to your building environment. The ideal temperature is 70-80° Fahrenheit, with a controlled relative humidity of 45-50%. The kit wood should be laid out and allowed to "equalize" for one week in your shop. Flip the wood daily to minimize excessive warping. Depending upon your location and the season, you may need to humidify or dehumidify your shop to maintain the desired relative humidity. It's a good idea to use a thermometer/hygrometer to monitor your shop's climate (our Digital Hygrometer is accurate and inexpensive). If you're unable to control the relative humidity in your shop, we discourage building the guitar during the transition from dry to wet seasons, or vice versa. The radical change in humidity can cause serious complications from cracks or warping.

Neck assembly and body assembly are two separate processes. So, you can work on the neck while glue is drying on the body, and vice versa.

Use a flat workboard approximately 24" x 36" x 3/4" for keeping the body flat during assembly. Plywood is your best bet, and Baltic birch is an ideal choice. We used a flat basswood drafting board.

Be safe when using tools, glues, and chemicals. Wear eye protection and gloves when needed, and always use proper ventilation.

Assembling the body

Gluing the sides to the neck block and tail block

Determine the center of the neck block and tail block and draw centerlines in pencil on their outer faces (their gluing surfaces) and on the tops and bottoms of the blocks.

Place the bent sides on the flat workboard to approximate the shape of your guitar. The top of your guitar will be facing down (either edge of the sides can be used as top or back). One at a time, glue the sides to the neck and tail block. No trimming to length is necessary; simply butt the ends tightly together on the centerlines penciled on the blocks.

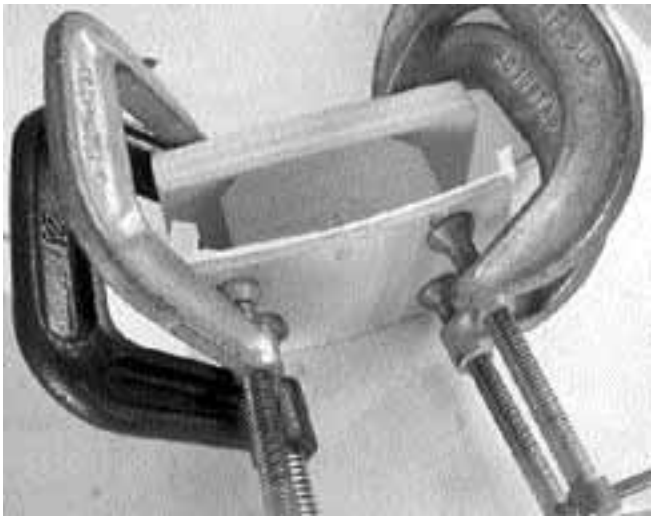
Throughout these instructions we will use clamping "cauls" to protect the wood from clamp marks, and to apply even pressure over a glue joint. The outer (gluing) surface of the neck block is flat, so use a flat caul when you clamp it. However, the tail block is radiused. The simplest clamping caul for squeezing the sides against the radiused tail block is a scrap of 1/4" plywood or wall paneling as the outer curved caul, and a scrap wood caul on the backside of the tail block.

The neck block and tail block have beveled corners on their inner sides. The inner backing caul at the tail block should be wider than the block itself so the clamps put pressure where it's needed to pull the sides into the curve **(1)**. The 1/4" outer caul, being longer than the block, flexes and forms the sides to the block. A layer of wax paper between the sides and the caul will keep them from being glued together accidentally. During gluing, the neck block and tail-block should rest flat on the work surface, and flush with the face down top edge of the sides. A weighted block of wood laid across the sides helps keep them flat on the table during gluing.

TIP: Use a glue brush

Applying glue with a brush eliminates most of the glue squeeze-out because the brush spreads just the right amount of glue. We use are flux brushes, inexpensive hardware store items used in plumbing. Or, you can spread the glue with your finger!

After the neck and tail blocks are installed and the glue has dried, use a 9/32" drill bit to drill through the sides to open up the neck block's bolt holes. Clamp a piece of scrap wood over the sides before drilling to minimize tear-out as the bit breaks through the fragile side wood.



1. The simplest clamping caul for squeezing the sides against the radiused tail block is a scrap of 1/4" plywood or wall paneling as the outer curved caul, and a wooden caul on the backside of the tail block.

Making the inner-body form and waist clamp

The two pieces of heavyweight cardboard supplied with the kit are for creating a guitarmaking form to support the body during the early stages of building.

Using the paper pattern, cut two matching pieces in the shape of the guitar body. Cut carefully on the lines of the pattern, leaving no extra cardboard outside the lines.

Build the cardboard form inside the guitar body. First, place two scraps of 3/4" plywood onto the work surface inside the guitar. This will lift the cardboard form up to make room for the kerfed linings, which will be installed later. Lay the first cardboard piece onto the 3/4" plywood inside the guitar body.

Next, glue several 3/4" thick blocks of scrap wood onto the cardboard, and then glue the second piece of cardboard onto them. Now the two cardboard forms are fastened together with blocks of wood between them, creating a three-dimensional form for supporting the guitar sides **(2)**.

Now use the paper pattern to make the U-shaped "waist clamp" from 3/4" plywood. The purpose of the waist clamp is to hold the guitar's waist tight to the inner cardboard mold, maintaining a constant shape until the back is glued on.

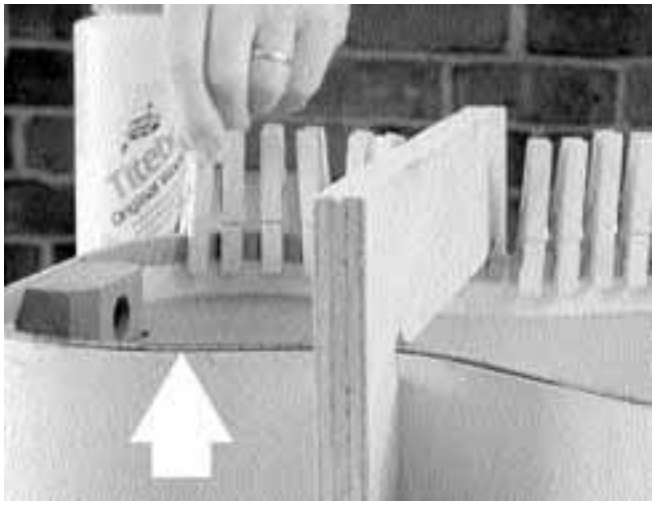
Use a file to smoothly round the two inner edges of the waist clamp. Square edges wouldn't slide over the tight curve of the guitar sides at the waist, and they could crack the wood.

2. The two cardboard forms are fastened together with blocks of wood between them, creating a three-dimensional form for supporting the guitar sides.

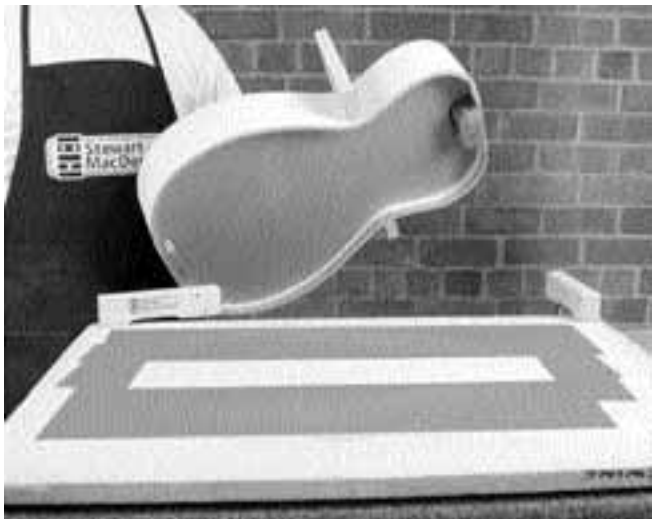
Install the waist clamp from the backside of the guitar. (Later, after the top's installed, you'll switch the waist clamp to the top side). When sliding the waist clamp on, hold the guitar sides tight against the cardboard form to avoid cracking the sides. If the fit is too tight, remove small amounts from each side of the U-shape until the waist clamp slides snugly onto the waist, but not so tightly that it's hard to remove.

Installing the kerfed lining ("kerfing")

With Titebond glue, and clothespins as clamps, install the kerfing on the top and back. The kerfing should start at the inner edge of the neck block and run to the inner edge of the tail block. Leave the kerfing raised slightly, approximately 1/64", above the side's edges, both top and back **(3)**. This guarantees that the kerfing will be flush with the top edge of the sides after sanding (as described next), and makes up for any possible misalignment during gluing. In guitar building it's safest to err slightly on the high side — you can always remove wood, but it's hard to put it back! Let the glue dry at least 4 hours.



3. The kerfing is installed with 1/64" exposure above the side's edges.



4. Apply adhesive-backed 80-grit sandpaper (or non-stick sandpaper and double-stick tape) to an area of the workboard.

5. Try using a weighted board placed across the top side of the rim for uniform downward pressure.

Apply adhesive-backed 80-grit sandpaper (or non-stick sandpaper and double-stick tape) to an area of the workboard as shown in the picture **(4)**. Don't cover the entire board, just a large enough area so that the kerfing and sides contact the sandpaper as you move the side assembly, face down, in small circles to level the kerfed lining. Mark the gluing surfaces of the sides, kerfing, neck block, and tail block all the way around with a pencil. Check your sanding progress often; when the sandpaper begins to remove the pencil marks around the entire top, the kerfed lining will be level with the sides. Try using a weighted board placed across the top side of the rim for uniform downward pressure **(5)**.

Installing the top

Choose the best looking surface of the guitar top as the outside surface. There two small centering holes at each end of the guitar top. Center a long straightedge on these holes, and lightly pencil an erasable centerline on the top.

Next, glue on the top. The most important thing you must do is to line up the front (machined) edge of the top with the sides at the neck block. The top and sides must be flush there. This alignment locates the soundwell, and with it, accurate intonation. There should not be ANY top overhang in this area! (If, by accident, you glue on the top so that it overhangs the sides at the neck block read "Appendix 2: Intonation Check" at the end of these instructions before continuing.)

With the waist clamp still installed from the rear, line up the top's centerline with the centerlines you drew on the neck and tail blocks. Start clamping in the waist area, within several inches of either side of the waist clamp, using spool clamps to gently hold the top in place **(6)**. Clamp the tail block, using two cam clamps or bar clamps and a caul to spread the clamp pressure. Next, clamp the neck block. Use an accurate square to be sure that the neck block is square to the top as you clamp. Use the same type of clamps and caul that you

6. Start clamping in the waist area, for several inches to either side of the waist clamp, using spool clamps to gently hold the top in place.

used on the tail block. Follow with spool clamps spaced evenly around the sides. With spool clamps close on either side of the waist clamp, you should have good glue squeeze-out at the waist. Leave the waist clamp in place, and let the glue dry at least 5 hours.

TIP: Spool clamps

Spool clamps can be made using 8" all thread rods, wing nuts, drilled wooden spools and cork or leather lining pads. They're also available in our catalog.

Remove the waist clamp temporarily to make room for a router. With the top glued on, notice that the sides have gained great stability, even with the waist clamp removed. Use a flush-cutting ball-bearing router bit to remove the top overhang in the waist clamp area (any slight burnish marks left by the ball-bearing will sand off easily). Later, after the back is glued on, you'll remove the rest of the top overhang. For now, the top overhang will match the back overhang, making it easier to align the spool clamps.

Sanding the back kerfing

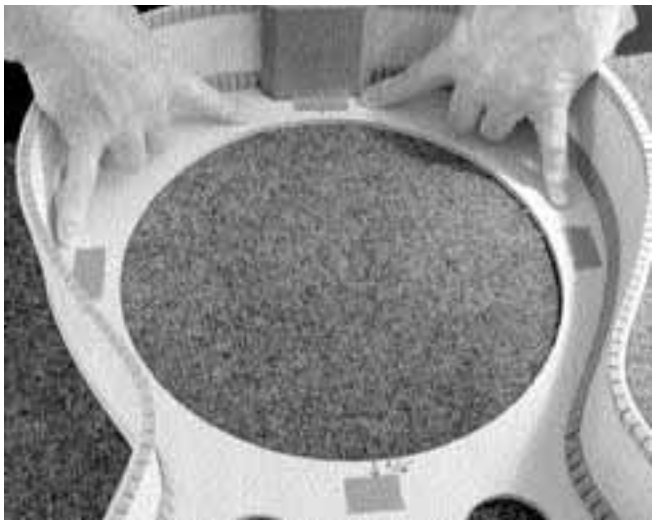
Since you need to remove the cardboard inner form before you can install the soundwell, sand the back kerfing now while the body is still relatively rigid.

Re-install the waist clamp from the top side. Place the guitar on the sandpaper workboard with the back side down. Sand the back kerfing flush just as you did the top, until the sandpaper just "kisses" the penciled edge of the sides.

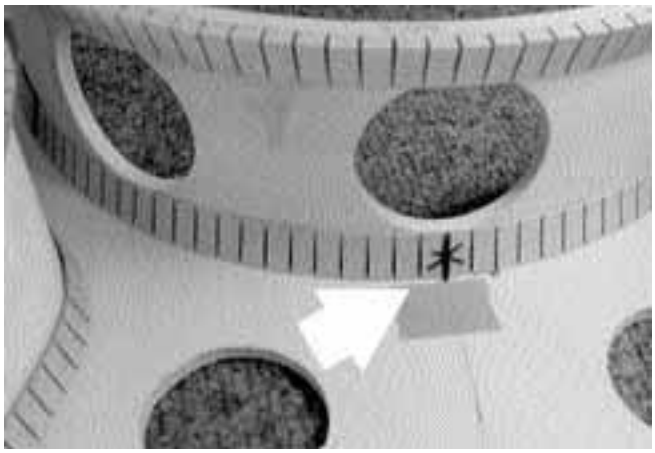
Installing the soundwell

The edges of the soundwell connect the top and back, and kerfing is needed on these edges to provide enough gluing surface. Install kerfing on the outside of the soundwell, once again raised a slight 1/64" above the edge **(7)** for flush-sanding on the flat sanding board. Flush-sand only one kerfed edge of the soundwell — the edge that glues to the top — and then flush-sand the back edge after the soundwell is glued to the top. Sanding the soundwell kerfing in two stages lets you carefully flush-sand the well with the back.

7. Flush-sand only one kerfed edge of the sound well — the edge that glues to the top — then flush-sand the back edge after the sound well is glued to the top.



8. Masking tape placed at four opposite points helps you align the sound well.



9. The sound well should center with an approximate 1/16" gap exposed between the outer edge of the kerfing and the masking tape.

To align the soundwell concentrically with the hole in the top, measure 5/16" out from the edge of the hole at four opposite points, and place a piece of tape at each point as a marker **(8)**. The soundwell should be installed with one of the soundwell's "tone holes" (air-movement holes) in line with the center of the guitar top — this hole provides access for your wrench when you bolt on the neck. The soundwell's kerfing should almost touch the four masking tape markers for alignment **(9)**. The 5/16" measurements will leave about a 1/16" gap exposed between the outer edge of the kerfing and the tape.

Important: Dry-clamp the soundwell to the top, and check to see that the exposed ledge created by the edge of the soundwell measures the same all around the hole in the top **(10)**. This ledge supports the cone and the spider; it's not very wide, so you must carefully center the soundwell when gluing.

When the top/top alignment looks right, and is still dry-clamped in position, pencil a mark around the kerfing on the inside of the top as a quick reference for gluing the parts together. Apply Titebond glue, and clamp the soundwell to the top with spool clamps **(11)**.

10. This ledge supports the cone and the spider; it's not very wide, so you must carefully center the sound well when gluing.

11. Apply Titebond glue, and clamp the sound well to the top with spool clamps.

Installing the back

With the soundwell glued to the top, the body assembly is now very stable, and you can remove the waist clamp. Mark the soundwell edge and the kerfing with pencil, and sand it as you did the top and back. Put pressure in the center over the soundwell, and not on the outer edges. You'll sand away the pencil marks quickly, so don't work too hard!

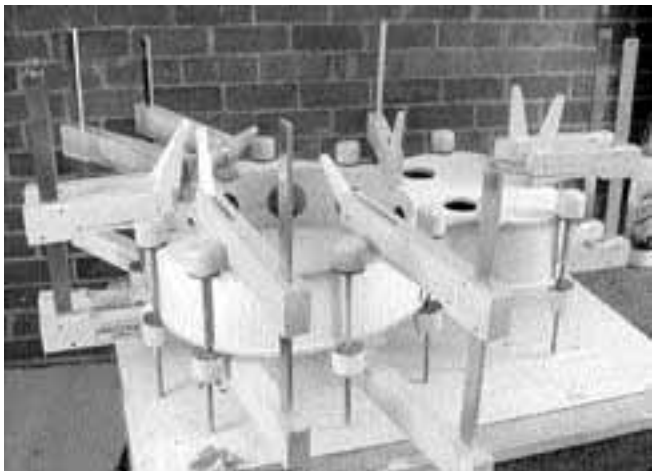
To check that the soundwell is level with the back kerfing, rest the body face down on your bench and place a straightedge across the soundwell kerfing. Rotate the straightedge in a complete circle on the soundwell, and watch the gap between the straightedge and the back kerfing: you'll see where it doesn't touch the back kerfing. Perhaps those areas will need a little extra pressure as you sand — mark them with pencil as you did the top and back, and watch for the pencil marks to disappear as you sand. Check your progress until the straightedge contacts the side kerfing and the soundwell kerfing evenly. The body is ready for the back to be glued on.

At this point, you should have retained squareness between the top and sides. Squareness is especially important at the neck block in order to have the right playability later. If you are out of square now, it can't be by much. If you are, make a note of it and adjust for that when you glue on the back, by pushing or pulling the neck block and sides into square.

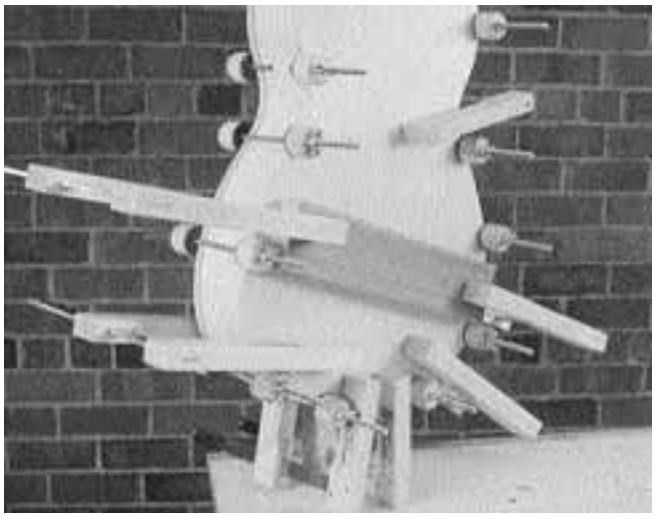
Install the back as you did the top. You don't need the waist clamp, but it won't hurt to use. Start clamping at the waist and sides, glue the tail block first, and the neck block last **(12)**. This is your last opportunity to square the neck block to the top if needed.

To add extra pressure in the soundwell area, clamp a flat board across the back **(13)**. A little glue squeeze-out is a sign that you have a good glue joint.

When the glue has dried, use the flush-cutting router bit to trim the overhang from the top and back.



12. A good back clamping setup.

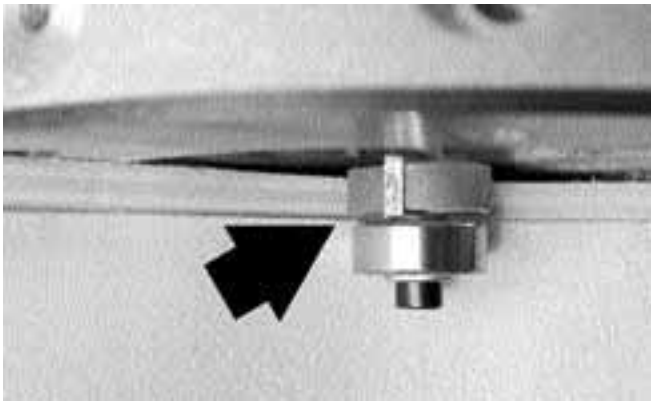


13. To add extra pressure in the sound well area, clamp a flat board across the back.

Routing for binding

The binding supplied with your kit measures approximately 1/4" x .060". Use StewMac's Binding Router Cutter Set, with the largest ball-bearing installed **(14)**. This setup will rout a ledge of approximately .060" for the binding width. Set the height of the router bit's cut at 15/64", or slightly more than the thickness of the plywood guitar top/back, so the binding hides the laminated edge of the plywood.

Rest the router squarely on the guitar's top or back, and rout a clean ledge for the binding. Be careful along the edge of the soundwell because the router could tip easily with such a small surface to rest on. It's a good idea to practice routing on scrap plywood or other wood to get a feel for the router bit's cut.



14. Set the height of the router bit's cut at 15/64", or slightly more than the thickness of the plywood, so the binding hides the laminated edge of the plywood.

Installing the binding

One strip of binding is not long enough to go completely around the guitar, so you must use two strips and bind one half of the top or back at a time. Bind both halves of the top first, to practice getting a tight seam where the two bindings meet. (The seam between the top bindings will be hidden by the tailpiece, but on the back side the seam will show.) With clean hands and careful work, it's possible to produce an invisible glue line between two pieces of binding by melting the seam together with Weld-On 16, the solvent-based glue recommended for this work.

Start binding at the center seam of the tail block end. Trim the binding square at the starting point **(15)** so that the butt-jointed seam between the two halves is tight. Use Weld-On 16 glue in the channel and strong masking tape to hold the binding in place. Weld-On 16 glue sets quickly, so glue and tape in three or four short sections, working toward the neck block **(16)**.

Let the glue dry 24 hours before removing the masking tape. Pull the tape off at a 45° angle to lessen the chance of pulling up wood fibers. If you heat the tape lightly with a hair dryer held 8 inches away, it will soften the sticky tape and allow it to pull free easily.

15. Trim the binding square at the starting point so that the butt-jointed seam between the two halves is tight.

16. Apply glue and tape, working in short sections.

17. Use a sharp scraper to flush the binding to the wood.

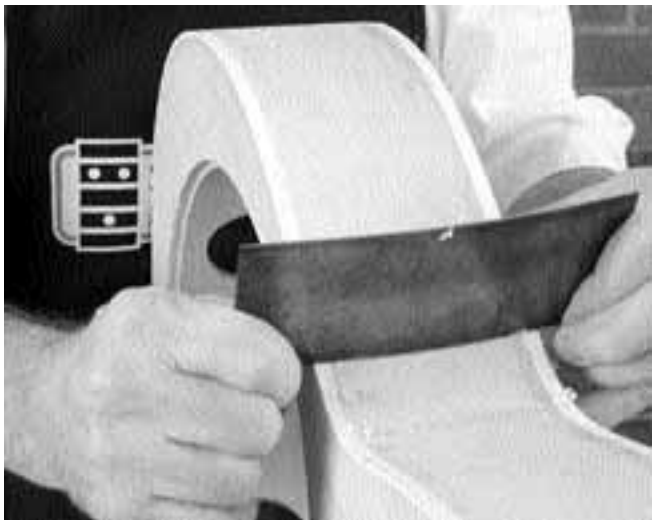
18. The router bit will cut slightly deeper than the actual thickness of the binding — perhaps by as much .007".

When the tape's removed, the binding will be slightly taller than the routed channel. Use a sharp scraper to flush the binding to the wood. Be careful not to dig into the top or back as you scrape **(17)**.

The router bit will cut slightly deeper than the actual thickness of the binding — perhaps by as much .007" — so don't be surprised if the binding's not quite flush to the sides **(18)**. The extra depth makes up for any slight unevenness that may result from hand-held routing.

Scrape the wood to meet the binding all around the sides **(19)**. Combine scraping with sanding, using a backing block and 150-grit Fre-Cut® sandpaper. Try to sand only the wood, not the binding, since 150-grit sandpaper will leave scratches. When close to being flush, switch to 220-grit Fre-Cut® sandpaper, and sand the sides, back, and top smooth. The top and back are made from high quality plywood, and other than cleaning up marks that you make with tools, the plywood requires very little finish sanding.

Before final sanding, use a flat block and 100-grit Fre-Cut® sandpaper to flatten only the area of the sides at the neck block where the flat "cheeks" of the neck heel will mate with the sides **(20)**. (Think of the end of the neck heel, where it meets the guitar sides, as having two surfaces called "cheeks" — a treble cheek and a bass cheek — i.e. a cheek on each side of the mounting bolts that are on the centerline.) Clean up any coarse sanding marks with 220-grit.



19. Scrape the wood to meet the binding all around the sides.

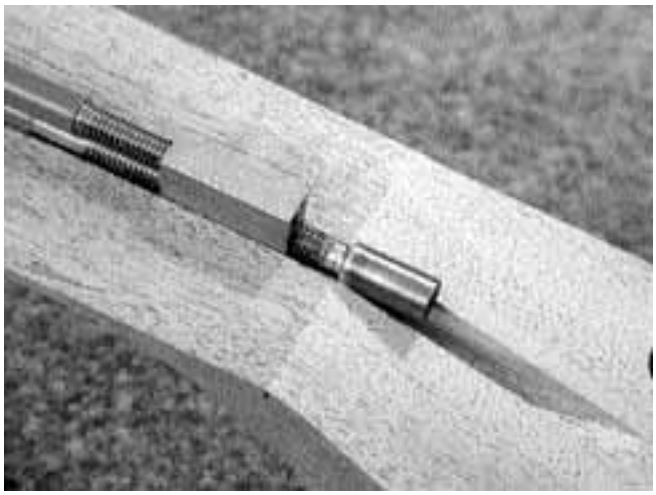
20. Use a flat block and 80- or 100-grit Fre-Cut®sandpaper to flatten only the area of the sides at the neck block where it mates with the flat cheeks of the neck.

Assembling the neck

Installing the truss rod

The truss rod is installed so that it adjusts at the peghead end. This makes it easy to adjust the truss rod under string tension.

Roll the rods simultaneously between your thumb and fingers to adjust them until the thread in the upper half of the brass lug (the rod without the adjusting nut welded to it) is flush with the face of the lug, and not protruding excessively.

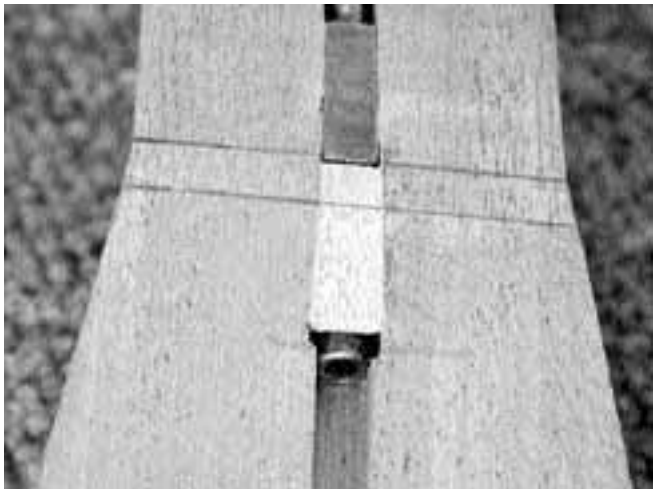


21. Align the back edge of the adjusting nut with the break line of the peghead angle.

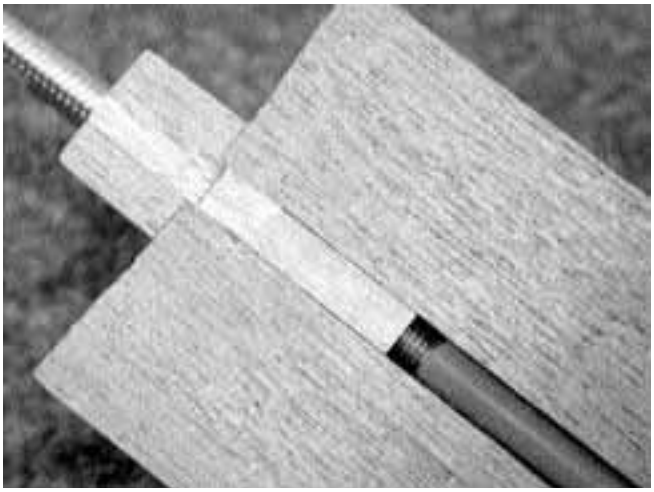
Align the back edge of the adjusting nut with the break line of the peghead angle. **(21)**. This locates the front edge of the truss rod's brass lug just under the end of the fretboard. A flat area of approximately 7/32" will remain between the end of the fretboard and the break angle of the peghead — this is where the bone string nut will be installed.

The adjusting nut is slightly wider than the slot machined into the neck. Chisel a slight clearance in the slot walls until the adjusting nut fits to the bottom of the channel.

Install the rod, adjusting nut facing down. Glue in a piece of the supplied filler strip over the adjusting nut **(22)** and the exposed truss rod threads, between the brass lug and the rear of the adjusting nut. The filler strip will support the bone string nut, which will be installed later. Of course, keep glue off the truss rod threads. When the glue is dry, chisel the filler strip flush with the surface of the neck. Glue a filler strip at the opposite end of the rod too, to fill the remaining empty channel, and trim it flush **(23)**.



22. The filler strip will support the bone string nut, which will be installed later.



23. Glue a filler strip at the opposite end of the rod too, to fill the remaining empty channel, and trim it flush.

Shaping the fingerboard

The fingerboard has 24 fret slots, more than are needed for a resonator guitar. Trim off the fingerboard at the 20th fret slot.

Draw a pencil line across the back of the fingerboard to mark the location of the 12th fret slot. The end of the neck's fingerboard gluing surface, at the top of the heel, will line up with this mark when the fingerboard is glued on. Align the heel with the mark, center the neck on the fingerboard, and draw the profile of the neck onto the fingerboard **(24)**. Extend the lines using a straightedge and white or yellow-lead pencil.

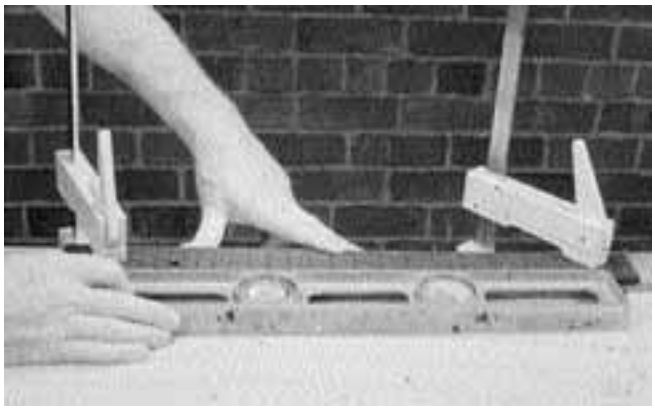
Trim the fingerboard profile close to the pencil lines using a band saw, coping saw, or a hand plane.

The edges of the fingerboard must be smoothed after they're trimmed. On your flat work surface, rest the fingerboard, backside down, on a spacer block approximately 1/4" thick and as long and wide as the fingerboard. Slide the fingerboard slightly off the edge of the spacer block so that one long edge overhangs.

With a long flat sanding block, sand the overhanging fretboard edge lengthwise to remove any trimming marks. We used a carpenter's level with 100-grit sandpaper double-stick taped to its thin edge. Clamped and sanded in this fashion, the fretboard will not only be straight end-to-end, but the edge will be sanded at 90° to the work surface as well **(25)**. Reverse the procedure for the other edge of the fingerboard.

Clamped and sanded in this fashion, the fretboard will not only be straight end-to-end, but the edge will be sanded at 90° as well.

24. Draw the profile of the neck's taper onto the fingerboard using a white pencil.



25. Clamped and sanded in this fashion, the fretboard will not only be straight end-to-end, but the edge will be sanded at 90° as well.

Inlaying the fingerboard

Traditionally, single dot inlays are installed behind frets 5, 7, 9, 12, 15, 17, and 19. Frets 15 and 19 get two inlays each. These will cover the four mounting screws that hold the fingerboard to the top. You won't inlay frets 15 and 19 until later, after the guitar is finished.

Lightly draw a centerline down the fingerboard in pencil. Use an awl to mark for drilling along this centerline, measuring halfway between the appropriate frets.

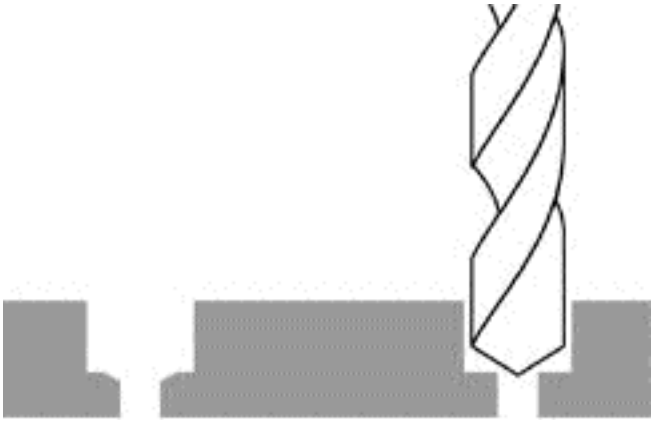
Drill 1/4" holes for each inlay, using a brad-point drill bit. Go *slightly* deeper than the thickness of the dots. Be extremely careful to keep the drill bit from "hogging" into the wood and accidentally drilling all the way through (practice on scrap)!

As mentioned, frets 15 and 19 are drilled for double inlays. They're spaced 1-3/8" apart (11/16" to each side of the centerline), and centered between the frets.

Within the four 1/4" holes, just barely start a secondary hole with a 7/32" twist drill (not a brad-point) **(26)**. These secondary holes bevel the bottom of the 1/4" holes to form the right shape for the fingerboard mounting screws. These holes are difficult to drill without overdoing it, so practice on scrap! This chamfering is very delicate; the slightest turn of the drill bit will produce the desired shape.

Next, drill 1/8" holes through these chamfered holes at frets 15 and 19 for the four mounting screws to pass through the fingerboard during final assembly.

Put on your protective safety glasses! Then, one at a time, place a drop of medium-viscosity superglue in each drilled hole and set the dot inlay in place. By using a piece of clear acrylic as a caul (lightly waxed with paste-wax), you can apply pressure without sticking to the superglue, and still be able to see when the inlay is flush. Remember not to inlay at frets 15 and 19! You may need to tap gently on the caul with a hammer to seat the dot inlays. Don't overdo the superglue, and you won't have a messy fretboard to clean up. Flush the inlays to the fingerboard using a smooth mill file and a sanding block. Sand equally from end to end so you don't change the flat surface of the fretboard.



26. Create chamfers within the four 1/4" holes using a 7/32" twist drill.

Installing side dots

A 1/16"-diameter plastic dowel is included with your kit for making side dot fret position markers along the bass edge of the fingerboard (for right-handed players, that is). Install them now at frets 5, 7, 9, 12, 15, 17, and 19. The 12th fret often gets two dots, spaced evenly between the 11th and 12th frets, but some makers use only one. Often, side dots are not used past the 12th fret — the choice is yours.

Clamp the fretboard on edge, mark the centers of each hole with an awl, and carefully drill the holes with a sharp 1/16" drill bit. Drill square to the fingerboard edge at all times.

Nip short lengths from the plastic inlay dowel and superglue them into the drilled holes — they should extend out slightly above the surface. When dry, file and sand the dots smooth.

TIP: Smooth side dots

Clamp the fingerboard back on the spacer block used earlier for truing the edge of the fingerboard, and re-sand the edges lightly with the carpenter's level and 220-grit sandpaper.

Fretting the fingerboard

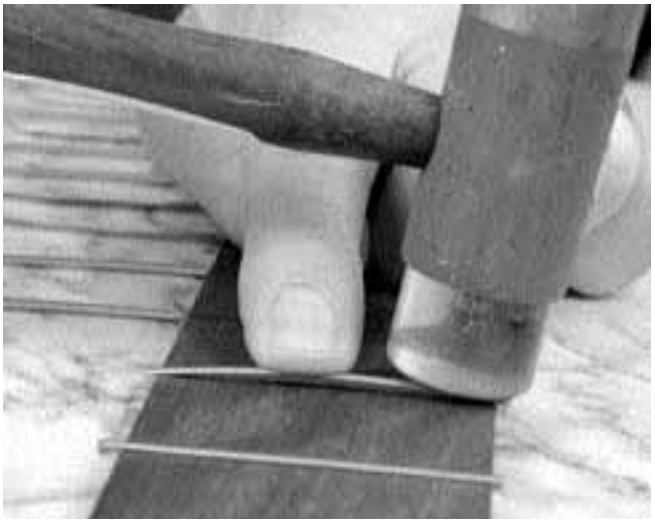
A scrap piece of unfretted fingerboard has been included with your kit. Measure out the frets you will actually use on your fretboard, and use the leftover fretwire to test your skills on the scrap.

Drill 19 holes in a block of scrap wood to keep the frets in order as you cut them to length. Using flush-cutting fret nippers, cut the pre-radiused fretwire to length, allowing an overhang of 1/8" on each side of the fingerboard.

Clamp the fretboard flat to a solid surface. We fretted on a flat, 1-1/4" thick chunk of marble —a piece of plywood resting on a cement floor would work well, too. Set the fretwire on the slot; since it's curved, only the ends will enter the slot. With your finger, balance the wire to keep it from tipping and prying up a chunk of wood as you tap the two ends into the fret slot with a hammer **(27)**. Once the two fret ends are embedded in the fret slot, the fret is unlikely to tip as you hammer it home.

Hammer back and forth across the fretboard in short, sharp blows. Use the face of the hammer, not an edge, and try not to hit the fretboard on either side of a fret. The fret tang, with its diamond-shaped barbs, embeds itself into the fingerboard as the fret straightens end-to-end from the hammer blows.

Test to see that the frets are seated well by prying on an overhanging end with your fingernail. Loose frets can be firmed up with superglue run into one end of the fret slot. Keep the fretboard tilted at an angle to keep the glue from getting onto the fretboard. Or, an option is to tape off the fretboard on each side of a slot and run a bead of Titebond into the slot before hammering in the fret. If you use Titebond, let the frets dry overnight before nipping and filing their ends.



27. Keep the wire from tipping and prying up wood as you tap the two ends into the fret slot with a hammer.

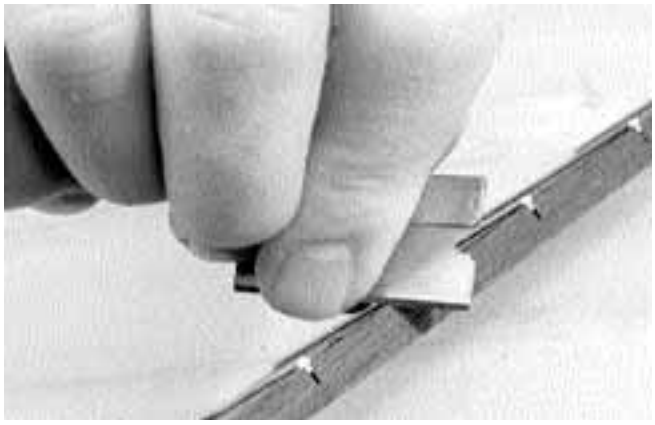
When the frets are firm and the glue is dry, nip them almost flush with the fingerboard edge. Do not nip right up to the edge, or the nippers will pull into the fingerboard and possibly unseat a fret end.

Use a smooth mill file to flush the fret ends to the edge of the fingerboard. Then use the same file, held at an angle, to file the fret-end bevels **(28)**. Choose a bevel that suits you — perhaps between 45° and 60°. Stop when the file hits the wood.

Blunt the top edges of the fingerboard on the bass and treble sides with a single-edge razor blade **(29)**. Later, when you glue on the fingerboard using a rubber band clamp, there will be no sharp edge to break the rubber band.

The fingerboard is now ready to be glued to the neck.

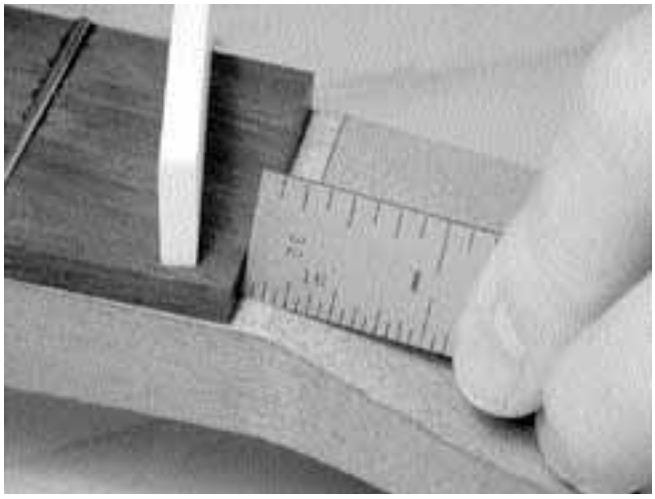
28. To bevel the fret ends, use a smooth mill file held at an angle.



29. Blunt the sharp top edges of the fingerboard on the bass and treble sides with a single-edge razor blade.

Installing the fingerboard

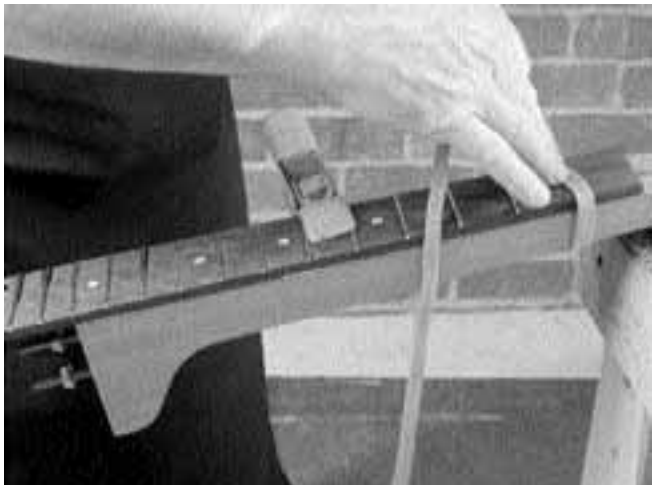
There should be a flat area approximately 3/16" to 7/32" wide left between the end of the fingerboard and the break angle of the peghead. This is where the bone nut will rest **(30)**.



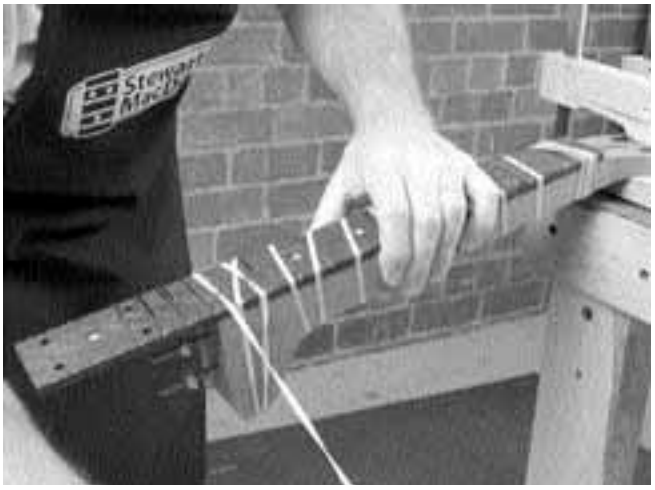
30. The bone nut will rest on the flat area approximately 3/16" to 7/32" wide, left between the end of the fingerboard and the break angle of the peghead.

Install the fingerboard with Titebond glue. To get just the right glue coverage, spread it with a flux brush. Work the glue up to the edge of the truss rod channel, and then draw it away from the edge with the flux brush to keep glue squeeze-out from getting into the channel.

Place the fingerboard onto the evenly-glued neck surface and center the 12th fret slot directly over the edge of the neck heel. Hold the fingerboard in place temporarily with a spring clamp **(31)** as you start to wrap with the rubber bands supplied with your kit. Tie the rubber band at the peghead and wrap from end-to-end and back again. Get plenty of wraps on the heel **(32**). You may find that one rubber band is all that's needed for the job. You can a shift the fingerboard slightly from side-to-side as you wrap, but usually the board will center itself nicely.



31. Hold the fingerboard in place temporarily with a spring clamp as you start to wrap with the rubber bands supplied with your kit.



32. Get plenty of wraps on the heel.

Installing the peghead overlay

When the fingerboard's dry, remove the rubber band clamp.

The bone nut blank should be smooth-walled, square-bottomed, and of uniform thickness. If it needs smoothing or thicknessing, sand it with 100- and 220-grit sandpaper, double-stick taped to a flat surface.

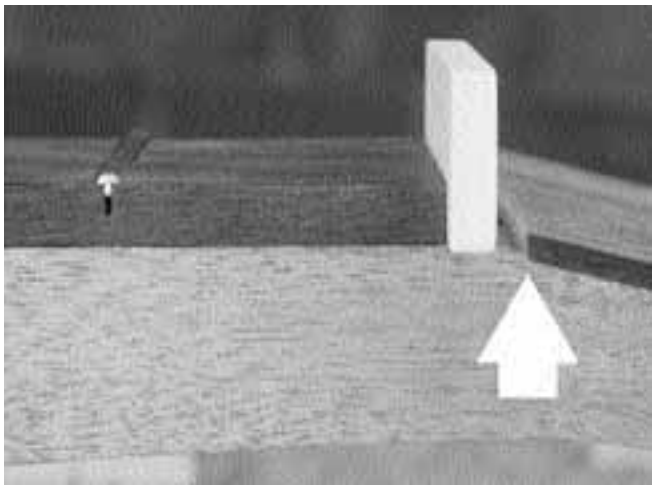
Place the nut blank on the flat ledge that remains between the end of the fingerboard and the break angle of the peghead. File or sand a 14° angle on one end of the peghead overlay so that it butts flush and tight up to the back edge of the nut **(33)**. Once the overlay is glued on, the space between the overlay and the fingerboard will be a perfectly-sized channel for the nut.

Dry-clamp the overlay in place. With a pencil, mark a point 1-9/16" from the back edge of the nut, centered on the peghead's width. Drill a 1/4" hole at that point. This is the access hole for the truss rod.

Remove the clamps from the overlay. Hold the overlay in one hand and elongate the hole by slowly tilting the overlay against a running drill bit **(34)**. You may want to practice this on a piece of scrap (there's plenty of excess overlay that gets trimmed away, so practice on that). You'll end up with an elongated access hole for the 1/8" Allen wrench that adjusts the peghead.

Mark the peghead shape on the overlay. Trim away most of the excess, to within 1/8" all around the peghead. Use protective cauls on the face and rear of the peghead, and glue on the overlay. Keep the overlay pressed tightly against the nut during alignment.

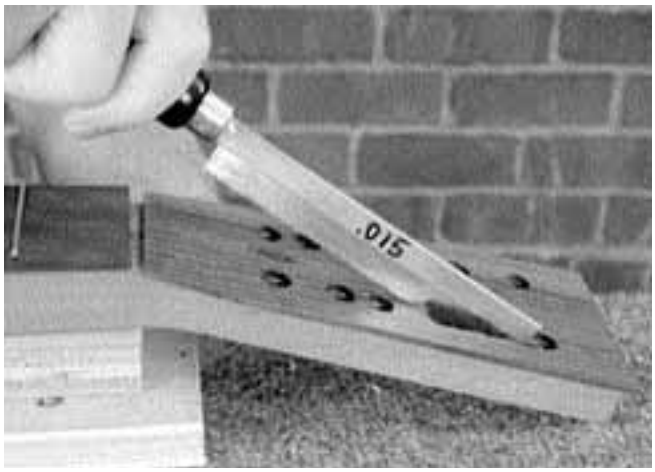
When the glue's dry, clamp the peghead firmly, face down, on a scrap of plywood. Use a 7/16" bit to drill holes against each end of the tuning machine channels (the channel will keep the drill bit lined up), and then drill several holes in between these holes in the remainder of each channel **(35)** to eliminate as much of the wood as possible.



33. File or sand a 14° angle on one end of the overlay so that it fits flush and tight to the nut.

34. Hold the overlay in one hand and elongate the hole by slowly tilting the overlay against the running drill bit.

35. Use a 7/16" drill bit to drill holes against each end of the tuning machine channels.

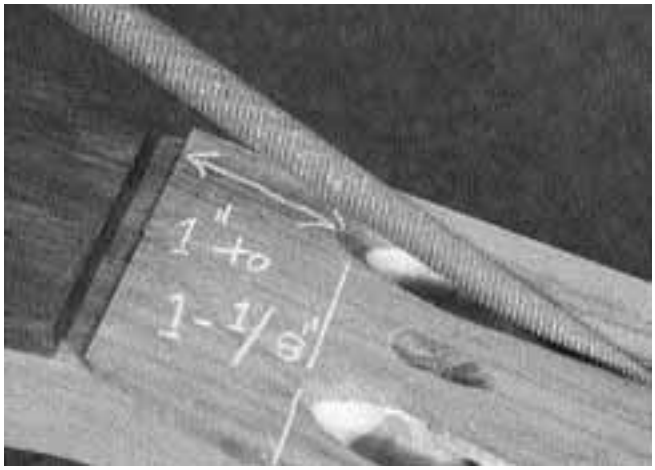


36. Saw, chisel and file away the chaff left by drilling, until the channel walls are smooth.

Saw, chisel, and file away the chaff left by drilling, until the channel walls are smooth **(36)**. Then carve and file ramps at the nut end of each channel, so the strings don't rub the wood on their way to the tuning posts. The shape of the ramps is up to you, but they extend approximately 1" to 1-1/8" from the back side of the nut **(37)**.

Carve and file away the overhanging peghead overlay, and then sand the peghead face and sides smooth with 150-grit Fre-Cut® sandpaper.

Use a file and sandpaper to round off the square machined edges of the neck and heel **(38)**. Leave the neck mostly the way it is supplied, in the traditional squared-off style of the instrument.



37. Carve and file ramps at the nut end of each channel so the strings don't rub wood on their way to the tuning posts.

38. Use a file and sandpaper to round off the square machined edges of the neck and heel.

Fitting the tuning machines

The tuner holes are pre-drilled with a distance between the tuning post centers of 1-3/8". This is a common measurement, and a variety of tuners will fit this hole spacing.

Set the tuners in the peghead, and use an awl or other sharp tool to mark the mounting screw holes. Remove the tuners, and drill the holes with a 1/16" bit. Mark the drill bit with a piece of masking tape as a depth stop.

You may need to cut off the end of the tuner mounting screws if they're too long for the thin outer walls of the slotted peghead. First use the untrimmed screws to "tap" the thread for each hole, and then cut their ends off and install the tuners temporarily, so you can fit the neck to the body.

Final assembly and setup

The guitar must be assembled and set up completely before applying a finish, and then dismantled for finishing.

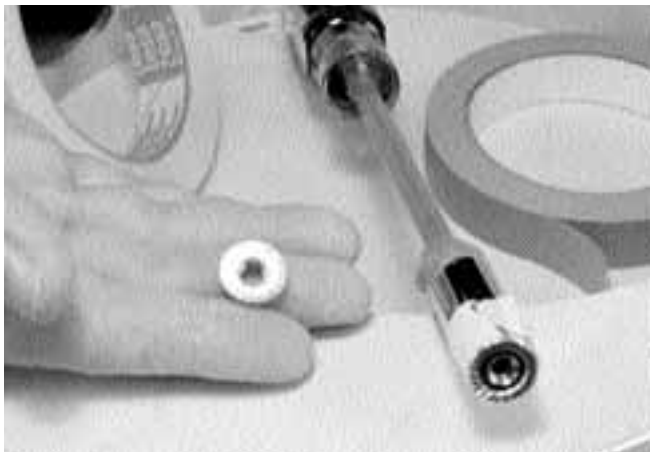
Place the neck mounting bolts through the neck block holes in the body. Press the heel against the shoulders, and then hold the neck in place as you install the two hex nuts. Tighten the hex nuts just snug enough to hold the neck, because you may need to move the neck a little.

Don't use a socket wrench with a right angle drive to tighten the nuts onto the neck bolts — you could get too much torque and possibly crack the heel, or pull a bolt out of the heel!

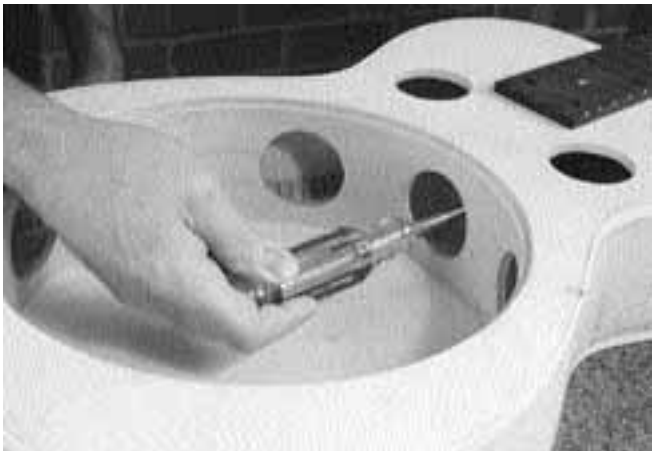
Instead, make your own nut driver as we did. We made a long-handled nut driver from a deep-well, square-drive 7/16" socket, and a #3 Phillips screwdriver that fit the 1/4" drive perfectly **(39)**. Use tape to hold the socket onto the screwdriver shaft (or do a little grinding and the screwdriver tip will force in there permanently).

Also use a small piece of tape to hold the hex nut into the socket as you reach into the body to start the nut onto the bolt. Don't over-tighten the nuts — the amount of pressure you can apply with your thumb and fingers is probably plenty **(40)**.

Check that the neck is on center to the top's centerline by holding a long straightedge against the edges of the fingerboard and extending to the tail block. Do this on both the bass and treble sides, one edge of the fingerboard at a time. Make pencil marks representing this fingerboard projection, and then measure in from each mark to the center. Ideally, these two measurements will be the same. Our treble side was about 1/32" too close to the center, so we removed the neck and used a rat-tail file to slightly enlarge the holes in the neck block. This allowed us to move the neck over a tiny bit toward the treble side.



39. We made a long-handled nut driver from a deep-well, square-drive 7/16" socket, and a #3 Phillips screwdriver that fit the 1/4" drive perfectly.



40. The amount of pressure you can apply with your thumb and fingers is probably plenty.

Fitting the cone

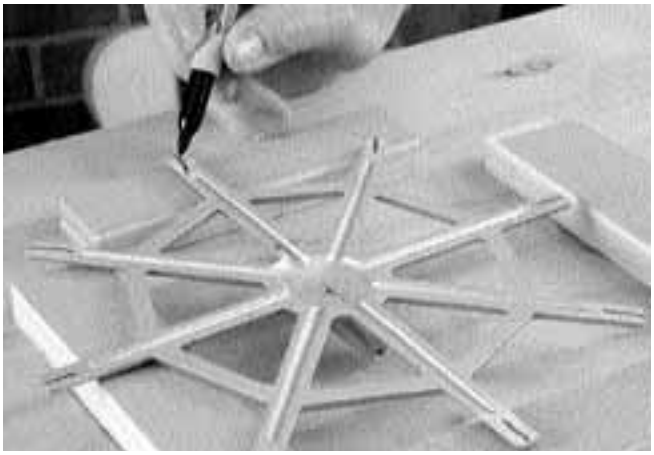
For a more accurate neck alignment check, you must install the cone, spider, saddle, tailpiece, and the two outside strings. Before installing the cone, scrape off any glue residue from the soundwell rim where the cone will rest, so the cone will seat on a flat surface. Set the cone on the rim. Rotate it until you find the point where it rocks the least; this is the cone's "sweet-spot." Use a felt marker to mark the front of the cone on center, pointing directly toward the neck **(41)**.

41. Set the cone on the rim. Rotate it until you find the cone's "sweet-spot." Mark the front of the cone with a felt marker.

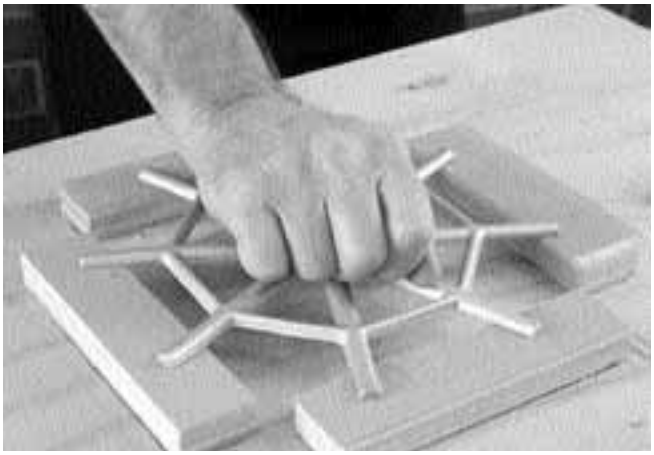
Truing the spider's "legs"

The legs of a new spider are seldom perfectly aligned when resting on a flat surface. They need to be adjusted to fit. Using double-stick tape, fasten four pieces of 3/4" plywood in a rectangular pattern on your flat workboard, as shown in the photo. Space the blocks so the spider's legs are in contact with the upper surfaces of the blocks, and then fasten 80-grit sandpaper to these surfaces with double-stick-tape.

With a black felt marker, blacken the underside of the spider on every leg **(42)**. You can follow your sanding progress by watching the ink on the feet. One good sanding technique is to sand in small circles; another good technique is to use a clockwise/counterclockwise turn of the wrist in a short, abbreviated motion. Use even pressure when sanding the legs, until all the marker is removed **(43)**. The metal dust on the sanding blocks will show you which feet need the most attention.

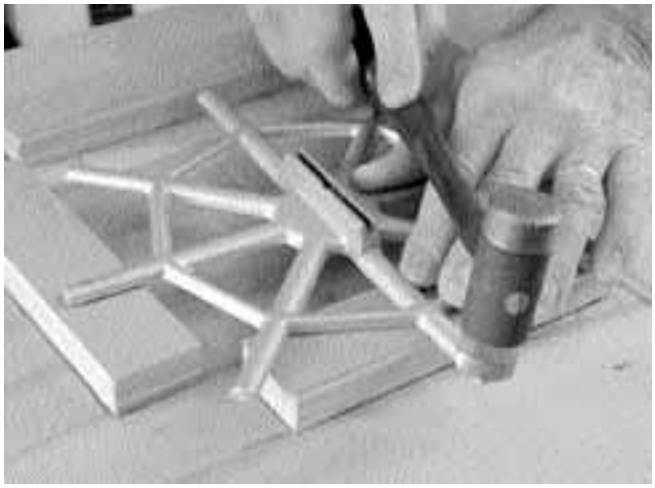


42. Blacken the underside of the spider on every leg.



43. Use even pressure when sanding the legs, until all the marker is removed.

Some spider castings will have one or two legs that are quite high. Gently tap the outer edge of the offending leg. The "web" of the spider must be supported when you tap. You can easily break off a leg, so don't overdo it. Better to move the leg just a little bit, and finish getting the fit you need by sanding **(44)**.



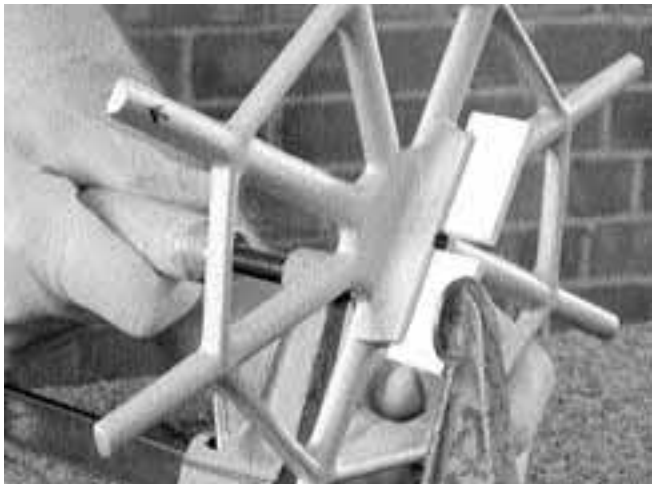
44. Gently tap the outer edge of the offending leg. The "web" of the spider must be supported when you tap.

Installing the saddle

When all the spider legs rest on a flat surface, install the saddle. The saddle blank is supplied oversize for custom fitting. Sand it on either the kerfing sanding board used earlier, or on one of the new sanding blocks used for the spider's legs. Sand off any harsh marks, check the thickness often with calipers, and leave the saddle perhaps .001" or .002" thicker than the slot in the spider, so it will be a press-fit.

When the saddle blank fits the slot, cut the saddle in half and use a clamp to squeeze the two pieces into the slot, with a caul to protect the delicate spider casting at the rear. Leave a gap between the two saddle halves that's just wide enough to let you see the screw hole in the bottom of the saddle slot **(45)**.

Set the cone into the soundwell with the ink mark facing forward, and rest the spider on the cone. Lightly install the screw between the saddle halves, and tighten it into the cone until it's just snug. From this snug point, turn the screw one more full turn.

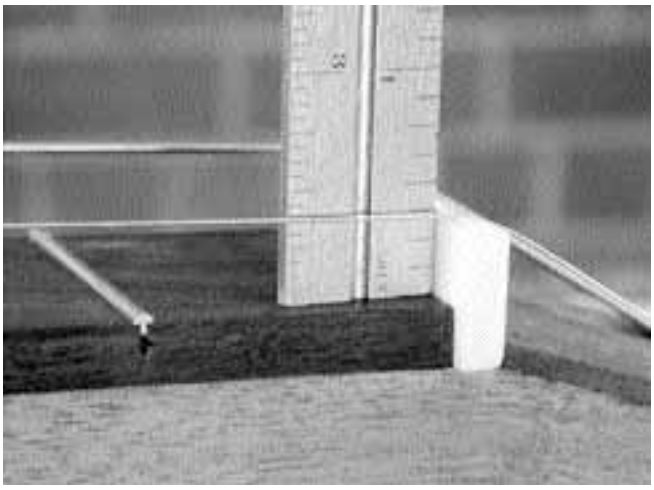


45. Between the two saddle pieces, leave a gap that's just wide enough to show the screw hole in the bottom of the saddle slot.

Installing the nut

For lap-steel playing, the final string height at the nut will be approximately 3/8" from the bottom of the strings to the fingerboard. The strings should be level on their top surfaces for using the steel bar while playing, so the clearances under the strings will vary as the string diameters vary. Place the nut in the nut slot (the overhang on each side is OK right now), measure 1/32" above the final 3/8" distance from the fretboard (for nut slot depth), and mark that line (3/8" + 1/32" = 13/32") in pencil across the top of the nut. Remove the nut and file off the excess material down to the pencil mark. Gently round the back side of the nut so the string approaches the front edge of the nut gradually — following this slightly round angle — and has its final contact, or "take off," point at the very front edge of the nut.

46. Temporarily clamp the tailpiece to the body, aligned on center.



47. Keep the strings on the high side of 3/8" as you start out.

Temporarily clamp the tailpiece to the body, **(46)** aligned on center. Place the nut back in the slot, and install the two outside strings into the tailpiece and over the bridge saddle. Space the strings 1-11/16" apart, located equally from the center of the nut blank. Make pencil marks on each side of the strings, move the strings aside, and with razor saws and/or nut slotting files, cut "starter" slots to hold the strings in place. Keep on the high side of your 3/8" string height for now **(47)**.

Spacing the strings at the saddle

Center the cone in the soundwell with equal space all around. At the saddle, space the strings 2-1/4" apart, located equally from the center of the saddle, and cut starter notches to hold them. Don't put too much tension on the strings, since the tailpiece is not permanently attached yet. Notice that the 2-1/4" spacing at the saddle is close to the spacing of the string holes in the tailpiece, making it a relatively straight string run from tailpiece to saddle.

The string alignment will help you determine if the neck, cone, saddle, and tailpiece are centered with each other. If you have been accurate up to this point, the cone should be centered in the well with a gap of approximately 1/16" all around the perimeter, and little or no off-center string pull toward either the bass or treble side. A small amount of string pull to one side or the other is OK, and the 1/16" gap between the cone and the soundwell wall allows for such slight misalignment.

If the alignment of all the parts looks good, drill a 7/64" hole and fasten the tailpiece to the body with the screw and strap button supplied. If the tailpiece needs to move a small amount toward either the bass or treble side to line up with the saddle and neck centerline, it is OK. (A "small amount" would be 1/32" to 1/16" maximum). If you need to move the tailpiece more than that amount, the neck is incorrectly fit to the body, and may correction. (See "Appendix 1: Neck Fitting Details" on page 31).

Setting the string height

Up to this point, with two strings on, but not tuned to pitch, our own guitar had a string clearance between the bottom of the strings and the top of the 12th fret of 19/32" — that's 3/32" higher than 9/16". This is quite tall. In fact, if the cover plate were installed, the strings might even touch the underside of the cover plate's hand rest.

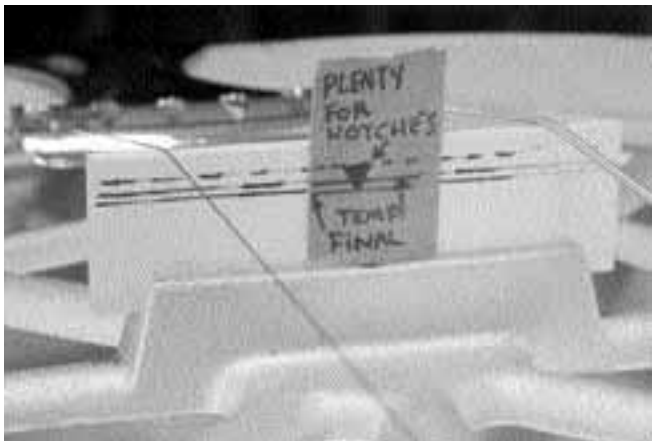
The preferred final string height at the 12th fret is approximately 7/16". So, we had to lower our strings a full 3/32" at the 12th fret.

TIP: String action formula

The formula for lowering action is to determine the amount you wish to lower the strings at the 12th fret, and remove twice that amount from the saddle. We needed to drop the strings at the saddle approximately 3/16".

The photo **(48)** shows three lines marked on a piece of tape placed on the saddle. From the bottom up, they are: 1) the theoretical final height of the string notches determined by the formula, which in our case measured approximately 3/8" above the casting; 2) a "temp" mark above the "final" mark indicating the wood needed for a notch deep enough to hold the strings); 3) a third mark (the dotted line) that is a rough height to start working from.

The distance from the bottom "final" line to the top of the saddle was approximately 3/16", or the theoretical amount to be removed. Of course your measurements may or may not



48. Approach the final action height slowly. Otherwise, you may waste a saddle blank.

be exactly the same as ours. It wouldn't have made sense to cut notches that deep in order to reach the bottom; therefore, we removed all the wood above the dotted line and started lowering the outside strings, a bit at a time, until the string clearance at the 12th fret was close to 7/16", but taller by about 1/32".

At this point it's important to note two things: 1) You are not tuned to pitch with all the strings on. Full string tension compresses the cone and lowers the action. This is why you need to be cautious and remain on the high side of the final depth at this point. 2) The final (approximate) measurement of 7/16" taken at the 12th fret will be the distance from the fingerboard to the top of the strings, so they are all in the same plane for the steel bar to slide over.

Install the remaining strings

Install the remaining strings and tighten them only enough to stay in place when you space them across the saddle. You'll have to hold the strings in place at the nut while you mark on each side of them in pencil for a preliminary nut spacing.

A good starting point for string spacing at the nut (and the saddle) is to divide the space between the centers of the two outside strings by 5, and then mark that measurement in pencil five times across the top of the nut. This is "equal string spacing on centers." This is just a starting point, so make slight starter cuts; just enough to hold the strings in place temporarily on these five marks.

From this point, you can move the strings side-to-side (as you move them downward as well) by using razor saws and nut slotting files held on their sides. Make small cuts to move the strings sideways in the direction needed to get a spacing that looks right to you. We prefer to spread the wound strings a little further from each other to make up for their thicker diameters, and to squeeze the unwound strings a little closer together. The end product is a *proportional* string spacing that takes into account the diameters of the strings, and has a uniform look. As you work, create just enough notch depths to hold the strings securely, but don't lower them to their final depths yet. Just cut good starter slots.

Cut the saddle notches

Next, go to the saddle and space the strings as you did at the nut (divide by five, then move the strings around until the spacing looks right). Lower all the strings at the saddle to match the depth of the two outside strings that are already cut reasonably close to their final depth. We left our strings high by at least 1/32", the approximate amount that the cone might compress (although not all cones compress) under full string tension. If we had gone directly to the final measurement without all the strings installed, we would have been low by 1/32" because our cone did compress.

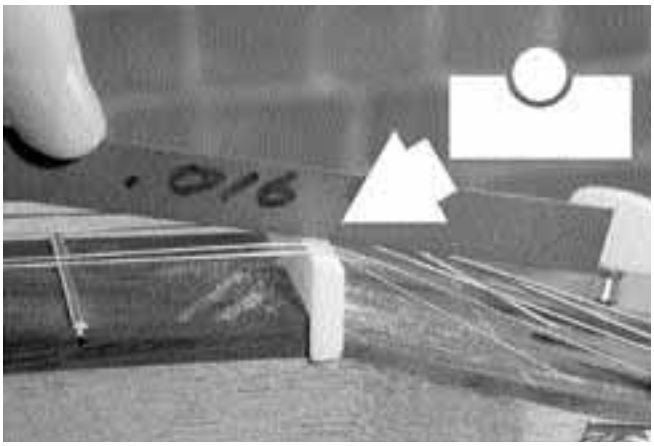
Tune to pitch

Now you should tune to pitch and finish lowering the slots at the nut and saddle. After tuning to pitch, tighten the spider/cone mounting screw an additional full turn. The first full turn made earlier was with no pressure on the cone; the second turn is now required because the added string tension compresses the saddle and the spider enough that the screw loosens). The most common bluegrass tuning, from bass string to treble string, is G-B-D-G-B-D.

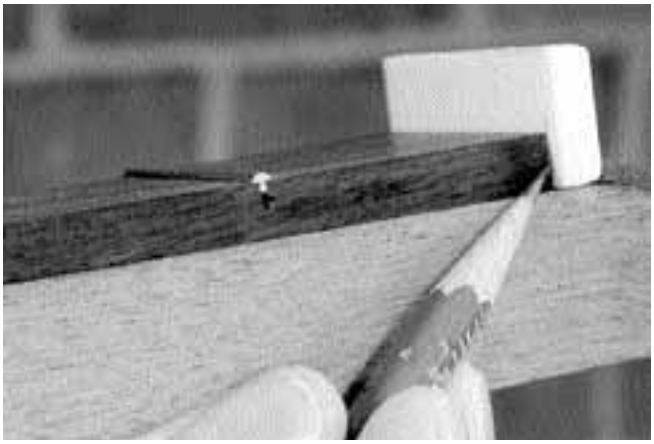
Lower each string one at a time, de-tuning enough that you can lift it out of its slot to work. Do the nut end first, because it's easy (you don't have far to go). Using nut-slotting files and/or small razor saws **(49)**, simply lower each string until approximately half of its diameter is cut into the bone nut. The tops of all the strings should be even with a straightedge placed across them. Since you are tuned to pitch, you will need to de-tune each string a fair amount in order to lift it free from its slot so you can work.

While you're at it, make sharp pencil lines where the nut overhangs the fingerboard **(50)**. Later, when you dismantle the guitar for finishing, you'll use a file to remove the overhang and give the nut its final shape before sanding and polishing it smooth.

At the saddle, slowly lower the strings, checking the 12th fret clearance often, until the approximate 7/16" clearance is met and the tops of the strings are in line with a straightedge.



49. Using nut-slotting files and/or small razor saws, lower each string until approximately half its diameter is cut into the bone nut.



50. With a sharp pencil, mark lines where the nut overhangs the fingerboard.

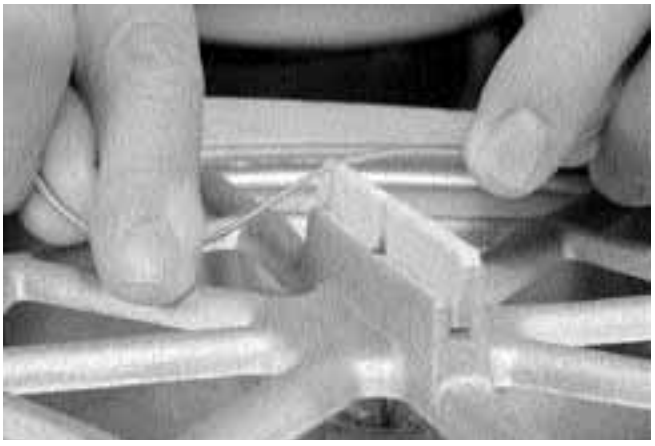
Install the fingerboard mounting screws

When you reach the final string height, before removing the strings to continue, drill the 5/64" mounting screw holes into the top behind frets 15 and 19. Drill on center down through the dot inlay holes. By drilling with the neck at tension, you will get the tightest fit of the fingerboard extension over the top.

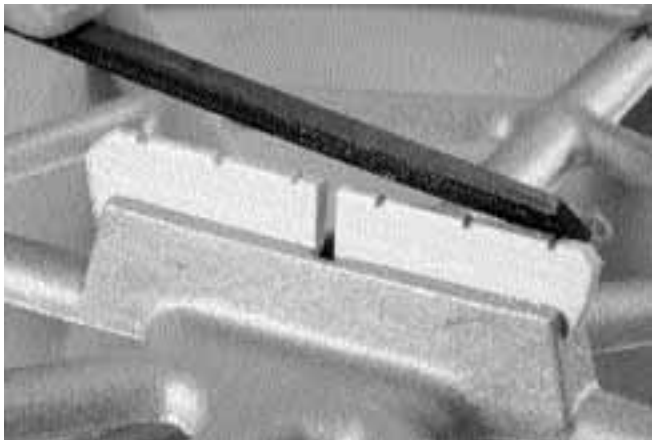
Install the screws to cut their threads into the top while the fingerboard is under tension, and then remove the screws until final assembly.

Burnish the saddle slots

Here's a nice saddle-shaping tip from world-famous resonator builder Tim Scheerhorn: Remove the strings and burnish each slot with a guitar string of the same gauge that you intend to use, working the string back and forth through the slot **(51)**. For the two unwound treble string slots, use a .020" unwound string for both string slots. This will create the diameter of each string in the saddle, harden the contact area, create good back-angle for the string to rise up to the saddle, and guarantees an accurate contact point at approximately the center of the saddle. Remove all the excess top material from the saddle, and trim the ends at a taper to get rid of the blocky overhang **(52)**.



51. Burnish the saddle slots by working the strings back and forth through the slots.

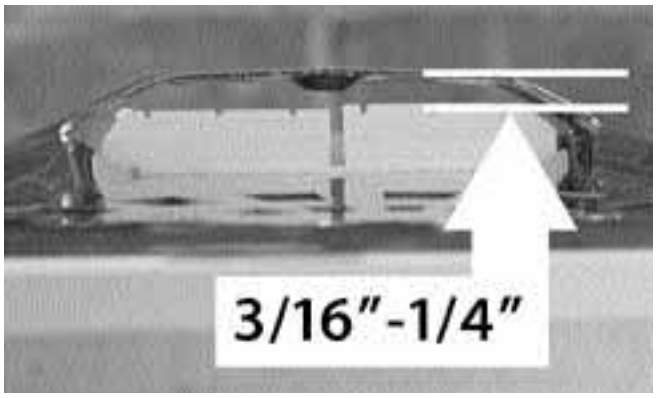


52. Remove all the excess top material from the saddle, and trim the ends at a taper to get rid of the blocky overhang.

Installing the cover plate

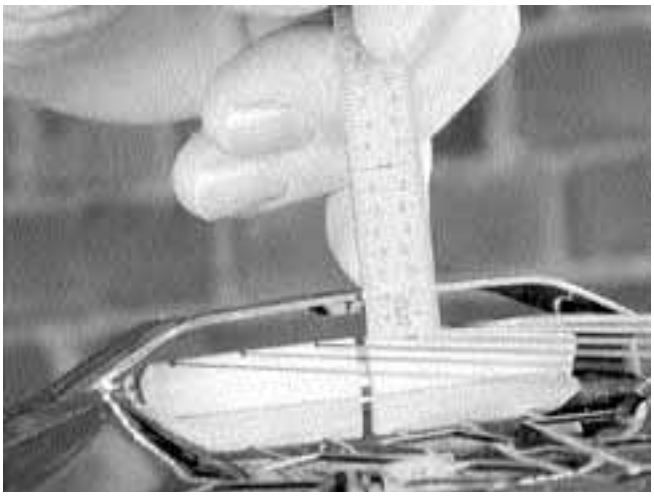
With the strings removed, locate the cover plate and drill its mounting screw holes. Set the cover plate on the guitar top; you should see plenty of space (from 3/16" to 1/4") between the saddle top and the underside of the hand rest **(53)**. Measure out 3/8" from the soundwell lip at four equally-spaced points, and place pieces of masking tape as markers. The cover plate should center between the markers **(54)**, until an equal amount of wood shows between the cover plate and the tape at all four points.

Tape the cover plate down, and pencil the outline of the screw clearance holes onto the top. Remove the cover plate and drill the holes with a 1/16" bit. Install the cover plate with the mounting screws, and string the guitar to pitch. This will be your final check before dismantling the guitar for finishing. Under string tension, our Bluegrass Resomaster showed a clearance of 1/4" from the top of the strings to the underside of the hand rest **(55)**.



53. Set the cover plate on the guitar top; you should see from 3/16" to 1/4" between the saddle top and the underside of the hand rest.

54. The cover plate should center between the markers.



55. Under string tension, our Blues Resomaster showed a clearance of 1/4" from the top of the strings to the underside of the hand rest.

Finishing with a traditional sunburst

At this point you can disassemble the guitar for finishing. Final-shape the nut now, too: file off the overhang, round the corners and the back side, and use at least 400-grit Fre-Cut® to smooth it. Place a couple drops of glue in the nut slot and glue the nut in place. The neck finish will cover the ends of the nut for a professional look.

When your guitar is finished, well-cured, and rubbed-out, reassemble it, string it up, tune it up and play it. Good job!

If you finish the neck and body separately, you'll do a better job of sanding and buffing. When the neck's attached, it's more difficult to fill the grain, sand, and buff around the neck/body joint. Also, lacquer tends to build up in that area, and unsightly air bubbles may become trapped there.

The quality of your finish work is certainly important to the appearance of your guitar. A thin "non-professional" finish won't necessarily harm the sound of your guitar, however. If the following instructions seem beyond your skills (they're probably not), or if they seem to be more work than you'd like, you can simply apply a low-gloss wipe-on finish by hand, consisting of a couple of coats of waterbase lacquer or freshly-mixed shellac. This will seal the wood and protect it from the elements, and you'll be playing your new guitar a lot sooner.

The following instructions, for spraying an aerosol nitrocellulose lacquer finish, are pretty close to foolproof and don't involve an investment in shop spraying equipment.

For your convenience, we have included wood scraps that match the wood your guitar is built with, so you can practice staining and pore-filling. You can practice applying your clear coats on these scraps as well.

There's a lot of finishing information in our book, *Guitar Finishing Step-By-Step*, and many customers are glad they studied the book before finishing their first guitar. In brief though, here are some pointers and a finishing schedule to follow.

Dos and don'ts

Do practice on scrap wood until your finishing technique has been perfected. If you'd like your guitar to look as good as it sounds, don't rush!

Do use a backing block or pad when sanding the guitar body. It helps maintain a level surface. On round surfaces, use a flexible rubber backing pad, a thick piece of felt or leather, or fold the sandpaper three or four times to give it firmness with flexibility.

Don't apply more than three coats of lacquer per day. Spray an initial light misting or "tack" coat, followed several minutes later by a heavier wet coat. The tack coat gives the wet coat better adherence and lessens the chance of a run or sag in the finish.

Do let the finish cure for 10-14 days or longer prior to final sanding and buffing.

Do have thinner around for cleanup. Aerosol lacquers require no thinner, of course, but it's nice to have thinner on hand. If you decide to use spray equipment, always thin nitrocellulose lacquers with nitrocellulose thinner only.

Do wipe the aerosol tip often. Aerosol lacquers have a tendency to spit if the tip gets clogged. Also, you can clean the tip by turning the can upside down and spraying until the spray stream stops. It's recommended that you do this each time you are done spraying in order to keep the tip clean.

Do buy a can of aerosol blush eraser for lifting the bluish haze that can occur when moisture is trapped in the lacquer finish. Blushing can result from humid conditions, or if the coat is sprayed too heavily.

Do let the surface dry for 24 hours if you get a run in the finish. Then level-sand the problem area. If you touch wet lacquer, you'll leave a deep impression which will be much more difficult to fix.

Sanding the body

All the wood surfaces should be fine sanded up to 220-grit. Use Fre-Cut® paper on a wooden block lined with thin leather or felt (or use a rubber sanding block). Start by sanding the body. For the solid wood sides, as mentioned earlier, the sandpaper should be no coarser than 150-grit, and you should switch quickly to 220-grit. (For the plywood top and back, use 220-grit sandpaper only). Sand in the direction of the grain, not across it. After the first 220-grit sanding, dampen the entire surface lightly with a water-dampened (not soaked!) cloth to raise the grain. Let it dry, and sand again with 220-grit. Blow off and vacuum the wood dust.

Filling fret ends and sanding the neck

Before sanding the neck, "drop-fill" the small slot spaces under the fret ends. Use fine rosewood sawdust in either Titebond or superglue. We used a toothpick to apply the glue/sawdust mixture. After drying, the small mounds of glue were sanded flush. If you don't fill the ends of the fret slots, holes will remain which the lacquer finish won't fill.

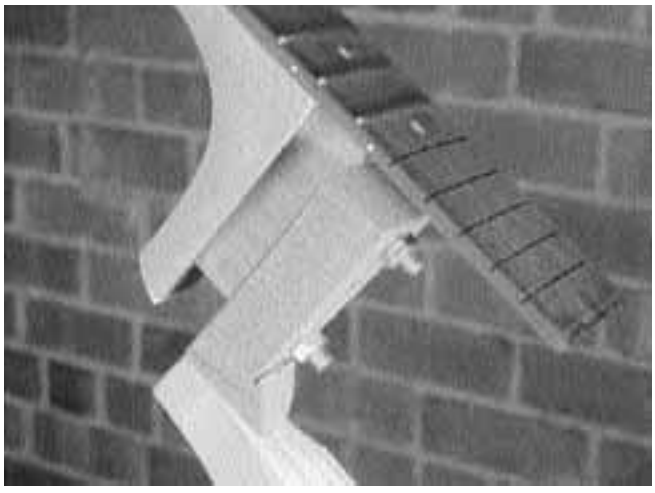
The neck needs extra sanding and grain-raising in the end grain areas of the heel, and the "ears" and the end of the peghead. Sand up to 320-grit, dampening to raise the grain. Do this several times, so the end grain pores will absorb stain more uniformly for a better appearance.

Finish the wood preparation by wiping the neck and body with a rag, dampened (not soaked) with naphtha, to degrease all the surfaces to be finished. Handle the unfinished wood parts with clean gloves from now on.

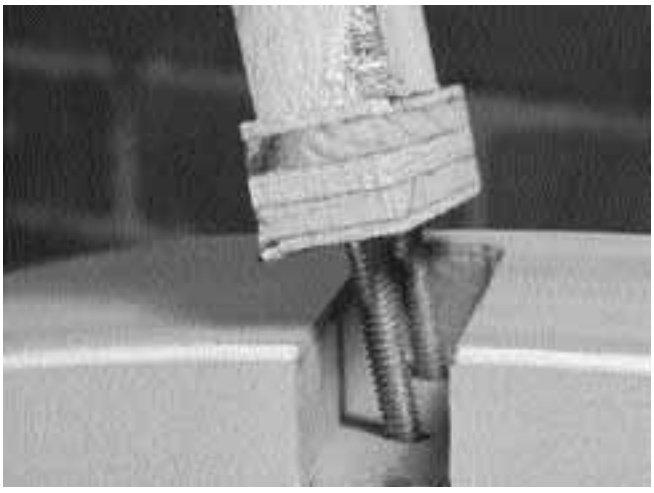
Making hangers and masking the neck and body

To fasten a spraying handle to a bolt-on neck, drill two holes in a scrap wood handle to match the bolt spacing **(56)**. Tape over the exposed nuts to protect them from lacquer. Or, as an alternative, simply hold the neck at the center, spray the peghead, the heel, and a good portion of the neck up to where you are holding it. Loop an S-shaped wire hanger through a tuner hole and hang the neck for spraying the center area. You can also rest the neck fretboard-down on a riser block and spray it in the horizontal position. Use the two holes in the neck block to bolt a handle onto the guitar body **(57)**.

Apply masking tape to cover the areas that won't be stained or finished: the fretboard playing surface, the sides of the fretboard (to be unmasked after staining), the nut, the neck joint surfaces on the neck and body, the underside of the fretboard extension, and the interior of the body. To seal the body interior, stuff paper into the two small sound holes until it closes these openings. Make a cardboard disc the same diameter as the soundwell opening (approximately 10-5/8") and press it into the opening. The cardboard should be large enough to stay in place by itself.



56. A scrap wood spraying handle for a bolt-on neck.



57. Use the two holes in the neck block to bolt a handle onto the guitar body.

Staining

Wear plastic gloves when handling stains. The mahogany neck (and the rosewood peghead overlay, if you wish) should be stained. We recommend our ColorTone liquid stains in an equal mix of tobacco brown and red mahogany. Add 25 drops of each color to each ounce of water to produce a warm dark stain. For a lighter, redder color, you can use just the red mahogany at 50 drops per ounce of water. Test these stains on sanded scrap mahogany first.

TIP: Filler instead of stain

You can also use waterbase paste filler to color the bare mahogany while filling the pores, and skip the stain entirely. Test this on scrap mahogany and see if you like the somewhat lighter appearance.

One or two ounces of mixed stain is plenty for a neck. Pour the stain into a shallow bowl. Wet a soft clean cloth with stain and apply it in long uniform strokes in the direction of the wood grain. It shouldn't take more than a minute to stain the neck. Stain the peghead veneer, too: it's easier than trying to mask it.

Let the stain dry for half a day. Then unmask the sides of the fretboard. The fretboard's playing surface, neck joint areas, the nut, and the underside of the fretboard extension should remain masked.

Applying a wash coat sealer

Remember to wear clean cotton gloves whenever you touch the wood. Lacquer is highly flammable, so always work in a dry, well-ventilated area, away from open flames or sparks. Be sure to wear an appropriate respirator while spraying.

Spray one uniform "wash coat" of clear lacquer on the neck. A wash coat is a very light coat, so it won't cause runs. The wash coat seals the stain or the natural color in the wood, and keeps the upcoming coat of paste filler from producing a smudged look. Sealed in this fashion, only the open pores of the wood accept the filler. Let the wash coat dry overnight.

Filling the wood grain

We recommend our ColorTone waterbase brown paste filler for filling and leveling the open grain pores of the rosewood peghead overlay and the mahogany neck. Because it dries fast, you won't be able to fill all the neck's surfaces at once, so work in stages. Practice on scrap pieces before starting on the guitar. The wet filler should be packed into the pores with a rubber squeegee held at a 45° angle across the grain (an old credit card makes a great squeegee). Within minutes the filler will start to harden and look hazy. Wipe off the excess, working across the grain, with a clean lint-free cloth. At any time during the grain-filling process, you can use a rag lightly dampened with water to soften any filler that's hardening too quickly. When the wood pores have been filled and wiped level, a bit of blotchy, hazy residue will probably remain on the surface. Let the wood dry overnight. Light sanding with 320-grit Fre-Cut® may be required to remove any remaining buildup of filler on the wood surface. Try to avoid sanding through the wash coat into the stained mahogany. If you do sand through an area, wipe a little stain on it and wipe off the excess.

Sunbursting the body

On this style of instrument, it's traditional to sunburst or stain the light wood body to a dark brown color. To accomplish this, first spray a base coat of lacquer for the color to lie on. The body has been damp-sanded but still has an irregular surface due to the wood grain and its hard and soft nature, and grain pores. The maple sides, and the birch top and back of the body are "closed grain" woods. They require no filler, but they still need leveling to get that glossy guitar look. Spray three coats of aerosol lacquer on the entire masked body, allowing 45 minutes between coats, and let it dry overnight.

When dry, sand with 320-grit Fre-Cut® sandpaper to achieve a level, uniformly dull look over the entire body. With only three coats you may not be able to do this. Watch your sanding, and if you are sanding through to bare wood, stop and spray another three coats just like above. Try to level sand again when dry. At this point you should be able to sand most of the shiny spots dull. If there are just a few deep ones that won't cooperate, use a brush to drop-fill them with some lacquer rather than spraying the whole body again. Now is when the quality of your wood preparation will really start to show.

Level those spots you drop-filled, and get ready to mix colors. You can use the same ColorTone liquid stains to mix into clear lacquer for coloring the body. For the light center of the sunburst, use Vintage Amber. Make up two ounces of vintage amber shading lacquer by adding 50 to 100 drops of concentrated stain to two ounces of thinned clear gloss lacquer (a little thinner might be needed here to get a sprayable mixture). Test the strength of the mixture on scrap to determine if you have reached the color intensity you want. You have the option of spraying a couple of coats of the shader to build the color coat in several passes, rather than mixing a stain that might be too dark.

Put the shader into a Preval sprayer. Spray the amber color in the center of the top and back, and on the sides where the upper and lower shoulders reach their maximum width. Based on your color, and on how much you spray, a second or third coat might be necessary. It's not necessary, or even recommended, to spray the entire body with the yellow. Just spray the center of the burst, and fade out as you reach the point where the color changes. Next, mix the Tobacco Brown as you did the Vintage Amber. You'll probably need 3 or 4 ounces of this color, since there is more area to cover with the dark brown. Put this mix into your Preval sprayer, and spray the outer edges of the sunburst. You can leave a narrow band for Red Mahogany, or skip it and blend the Tobacco Brown right into the Amber. We recommend the red mahogany for its pleasing look. If you choose to do it, mix two ounces of this color as above, and blend or shade it between the dark brown and the amber. Practice on scrap, and your first attempt will be more successful.

After overnight drying, carefully scrape off the color to reveal the plastic binding beneath (the sunburst has covered the binding as well as the wood). Use an X-acto blade, single-edge razor blade, or utility knife blade as a scraper. Hold the scraper between your thumb and fingers with a short section of the blade exposed. With your thumb, finger, or knuckle controlling the depth, you can keep from scraping deeper than the binding and into the colored wood. Too much scraping will create a deep ledge that the following finish will not be able to fill.

Now go on to the lacquer spraying schedule below.

Lacquer spraying schedule

Day One: Spray three wet (not runny) clear coats on the neck and body, an hour between coats, and let them dry overnight.

Day Two: Lightly "scuff-sand" the neck with 320-grit Fre-Cut® paper to knock off the high spots in the finish (on flat areas, be sure to use a backing pad on the sandpaper). Sand just enough to "open" the finish; don't try to sand out every shiny spot or sunken area in the lacquer. Clean off the sanding residue. Now spray the neck with three uniform coats of clear lacquer, one hour between coats. You now have six coats on the neck and three coats on the body. Let the guitar dry overnight.

Day Three: Lightly scuff-sand the finish with 320-grit paper again, and clean off the residue. You can be slightly more aggressive in flattening the sprayed surface now, but be careful on the curves of the neck, and on any of the edges of the neck and body (it's easy to sand through the edges). Don't try to sand out all the shiny spots yet. This sanding will release solvent from the finish and help it to cure. Let the finish dry for two more days.

Day Six: Once again, spray three wet clear coats, one hour apart, on the neck. Spray two wet clear coats, one hour apart, on the body. Let the finish dry overnight.

Day Seven: Scuff-sand the finish with 320-grit again. This time most of the shiny spots will disappear, leaving a uniformly dull look. Spray three more clear coats on the neck, one hour apart. Spray two more coats, one hour apart, on the body. Allow overnight drying.

Day Eight: Lightly scuff-sand the finish with 600-grit Fre-Cut® sandpaper, to help the solvent escape. The neck and body should now be left in a warm dry location for two weeks to let the finish harden and shrink.

Wet-sanding and rubbing out the finish

Dry-sand the neck and body to a flat, dull sheen with 800-grit Fre-Cut® sandpaper. Clean the residue off the sandpaper often by rubbing it against a scrap of carpet. Any "orange-peel" texture (caused by lacquer shrinkage as the solvents cure out of the finish) should be removed, but don't oversand. When all the little shiny low spots in the lacquer have been removed, you're ready to go to the next step.

Wet-sand with 1200-grit micro-finishing paper and water to bring the finish to a smooth satin surface that's ready for final polishing. Excess water and residue should be wiped off the finish often with a clean dry soft cloth as you work. Rinse the sandpaper in soapy water often, to remove hard specks that can scratch the finish. (Note: Soak the micro-finishing paper in water overnight before use. It will scratch less and last longer.)

Using soft cloths, or an electric hand drill with foam polishing pads (a separate pad for each compound), rub out the fine wet-sanding scratches to a final gloss with medium and fine polishing compounds. You can follow this with swirl remover if desired. Clean off the residue left by the polishes, remove the remaining masking tape from the neck, and remove the soundhole masking materials.

You're ready to put the guitar back together — just as you've done once already — only this time, you can play it as much as you want because the wood is now protected! Have fun with your new Bluegrass Resomaster!

Appendix 1: Neck-fitting details

Ideally, the top and sides of your guitar are square to each other: meeting at a 90° angle, especially at the neck block. When they are square, little or no neck fitting should be necessary on your guitar. This is because of the wide, flat, neck heel-to-body joint, and the accurate machining of the neck angle. It's conceivable, however, that the neck block could be installed out of square, or the top glued on with the soundwell a little off center. In that case you would need to alter the angle of the neck slightly so that the strings meet the saddle with plenty of clearance at the hand rest, or else "tip" the neck to align it with the centerline of the guitar.

The following is more information than you're likely to need, but if you happen to get into neck alignment problems, the principles outlined here will come in handy. Use this information to adjust the angle of the neck in any direction.

The "cheeks" of the neck heel set the neck angle

Since the top and sides at the neck block are square, the angle of the neck in relation to the saddle is controlled by the angle of the neck heel as it contacts the sides of the body. Think of the end of the neck heel, where it meets the guitar sides, as having two surfaces called "cheeks" — a treble cheek and a bass cheek — on either side of the centered mounting bolts.

The top edge of the cheeks is the pivot point between the neck and body. This controls the neck angle as viewed from the side. Removing wood from the upper part of the cheeks will raise the neck; removing wood from the bottom will lower it. As viewed from the front, taking wood from either side only will move the neck in that direction.

When the neck bolts are tightened, the cheeks pull tight against the body. Only the outer edges of the cheeks need to make contact with the body, and it's these edges that actually determine the neck angle **(58)**.

If the edges of the cheek need adjustment, you would first remove the inner part of the cheeks with a chisel and leave a flat untouched area of about 1/8" to 3/16" wide around the outer edges of the bass side, treble side, and bottom of the cheeks. After undercutting the cheeks this way, it's easy to remove a little wood from the outer contact edges to adjust the neck alignment.

To make an adjustment, first mark the outer (contact) edges of the cheeks with a pencil. Using a sharp chisel, remove wood from the remaining inner area up to the bolts. Be careful not to ruin your chisel when paring wood away from the two neck bolts!

It's important to note that removing wood from the upper part of the neck cheek edges will not only raise the neck, but will also move the neck toward the bridge slightly. If the 12th fret moves toward the bridge the intonation will sharpen: this is a good reason for taking the option of checking the neck's fit before installing the fingerboard. (See "Appendix 2: Intonation check," on page 34).

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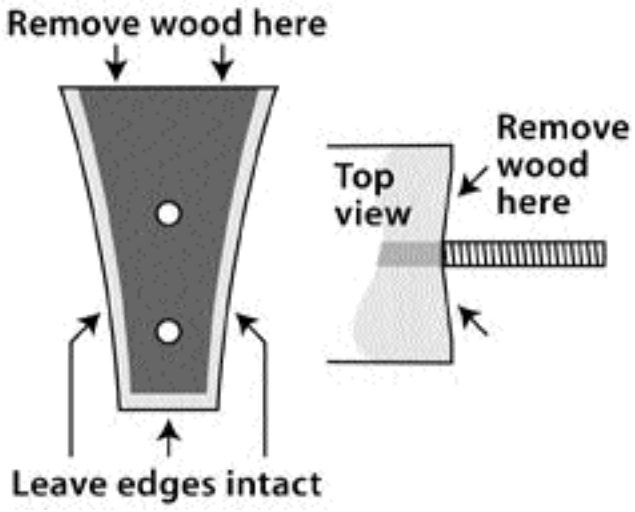


Neck adjustment: side-to-side

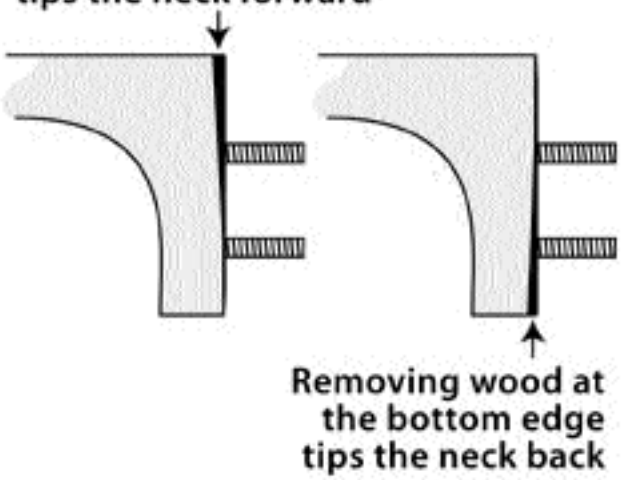
One area that may need to have a small amount of wood removed is the treble or bass cheek. Wood removed here controls the "side-to-side" alignment of the neck to the centerline. If the neck is misaligned side-to-side, one of the outside strings will be too close to the edge of the fretboard. The removal of a tiny amount of wood is all it takes to make an adjustment here. Remove this bit of wood uniformly across the contact area on one cheek to tip the neck in the proper direction (this won't change the neck angle when viewed from the side of the body). To check the alignment, use a long straightedge laid against both the treble and bass sides of the fretboard and extending to the centerline of the top at the tail block end: the straightedge should measure the same distance from the centerline on either side.

If the neck is off-center by only 1/32" or less, don't try to correct it. Remember that a tiny bit of wood removal makes a big difference in the neck 's relationship to the centerline!

Neck adjustment: tilt the neck back

The most common adjustment is removing wood from the bottom of the cheeks. Removing wood from the bottom of the heel on both the treble and bass sides equally will tip the neck back **(59)**. Remove the wood in a wedge shape, which tapers to zero at the top edge of the cheeks.

59.



Use the formula in "Understanding neck angle geometry" to determine how much wood to remove. With a sharp pencil and a straightedge, mark the area to be chiseled away in a straight line from the bottom of the heel to the zero point at the top. Continue this line across the heel cap and up the opposite side. These lines may be tricky to draw, because they must taper away to nothing ó to the zero point at the top of the heel.

With a sharp chisel, remove about half of the measured amount of wood. Don't overdo it: set the neck into the body and check the fit. You'll finish the shaping with sandpaper — preferably 100-grit emery cloth (cloth-backed sandpaper). Loosen the neck joint and slide a strip of this sandpaper or emery cloth between the cheek and the body, with the abrasive side facing the cheek. Slide the strip almost — but not quite — to the top edge of the heel (this top edge should be left intact). Hold the heel against the guitar body and pull the strip out toward you (pictured). This removes a little bit of wood while conforming to the shape of the guitar body. Shake the sawdust off the sanding strip and repeat the procedure on the opposite cheek. Sand equally from side to side. If you need to remove a lot of wood, make two or three passes before changing to the other cheek. The fit will change rapidly, so check your progress frequently.

A small ledge of unsanded wood will remain on the bottom of the heel between the sanded cheeks. Either "pull-sand" it with the strip, or use a sharp chisel to remove it.

Neck adjustment: tilt the neck up

If the neck block was mistakenly tipped forward when glued in place, the neck may be "overset" too far away from the body. In this case, the straightedge laid on the fretboard will extend too far above the center of the hand rest. Removing wood from the top of the heel on both the treble and bass sides equally will bring the neck up so the straightedge comes down to slightly above center at the hand rest.

Use the formula in "Understanding neck angle geometry" to determine how much wood to remove. With a sharp pencil and a straightedge, mark the area to be chiseled away in a straight line from the top of the heel to the zero point at the bottom. Repeat this line on the opposite side.

The sandpaper strip described above won't work here because the fretboard is in the way, so you'll need to use a sharp chisel to remove the long taper of wood on each cheek. Cut in the direction of the top edges. A final light, downward pull of the sandpaper strip will clean up any marks left by the chisel.

Understanding neck angle geometry

Here's the way to determine how much wood must be removed from the cheeks for the correct neck angle at the bridge. Always remove wood gradually and check your progress frequently. A little adjustment goes a long way! Our example measurements below are based on the scale length of this guitar: 25 inches.

The measurement we want is **X** — the amount of wood to remove from the heel to change the neck angle so that a straightedge laid on the frets will be flush with the top of the bridge **(60)**.

A = How far the straightedge falls below the top of the bridge. In this example: 1/8" (.125").

B = The heel length from the fretboard bottom to the heel cap. In this example: 3" (3.0").

C = The distance from the neck/body joint to the saddle. In this example, that's at the 14th fret, and **C** = 12-1/2" (12.5").

X = **A** x **B** (÷) **C**

In this case, those numbers are .125" x 3.0" ÷ 12.5" = .030". So in our example **X** = .030" which is almost 1/32". This is the amount to remove at the bottom of the heel.

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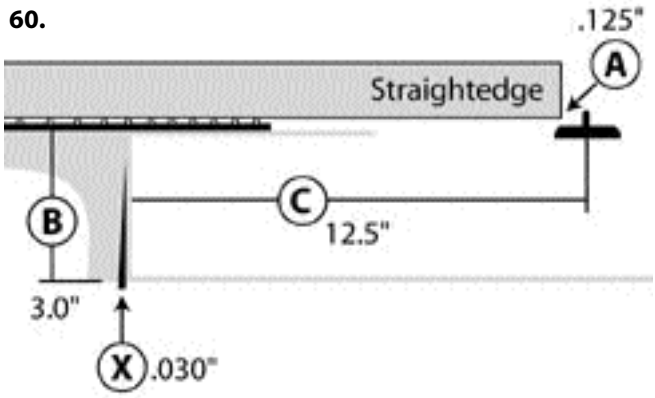

Appendix 2: Intonation check (optional)

When you build a standard acoustic guitar the bridge is glued on last, so you can move it in order to position the saddle for good intonation. Resonator guitars are different because the saddle position is determined by the fixed location of the cone resting in the soundwell. The cone — and saddle with it — can be moved forward or backward about 1/16" within the soundwell, but that's it. You can guarantee good intonation by never removing wood from the top edge of the neck cheeks, and by careful placement of the fingerboard.

However, if you did need to make neck-fitting adjustments, and if you moved the neck toward the bridge at all, you should check the placement of the fingerboard's 12th fret before gluing the fingerboard onto the neck. Here's what to do:

When the neck fitting passes inspection, leave the neck bolted into the body in order to check the lengthwise placement of the fingerboard — specifically the location of the 12th (octave) fret in relation to the saddle. This relationship makes for good or bad intonation.

Since you haven't glued the fingerboard on yet, you can slide it forward or backward a little, to control the distance between the 12th fret and the saddle. (You also have a little adjustment at the saddle, since the cone will slide forward or back about 1/16".)

If you do slide the fingerboard, the flat area where the string nut is located will become wider or narrower, and you'll need to fit the nut accordingly. Also, the fingerboard edges may no longer be perfectly flush with the sides of the neck. (Simply shape the edges of the fingerboard and neck to match using a file and sandpaper.)

If minimal wood was removed at the cheeks, locate the fingerboard so that the 12th fret lines up with the point where the neck cheeks join the body. At the peghead end there should be approximately 3/16" of flat area left between the end of the fingerboard and the break angle of the peghead. This is where the bone nut will rest, and it may be as large as 1/4" or as small as 1/8" if the fingerboard is moved forward or backward for intonation adjustment.

To get accurate intonation, the distance from the 12th fret to the saddle should be approximately 1/8" longer than the distance from the 12th fret to the nut. Since your guitar's scale length is 25", the distance from the 12th fret and the nut is 12-1/2". Add 1/8" to get the desired distance from the 12th fret to the saddle: 12-5/8".

This extra 1/8" is called "compensation," and makes up for the slightly longer string length caused by the strings as they rise up to the saddle, and for the fact that strings tend to go sharp when they are pressed down to the fret. If you located the saddle at the uncompensated distance from the 12th fret, the intonation would be sharp.

Center the cone in the soundwell, then locate the 12th fret by loosening the spring clamps, and sliding the fingerboard forward or backward until the 12th fret measures the compensated 12-5/8" distance from the center of the saddle. When the 12th fret is where you want it, and with the spring clamps holding the fingerboard on, place a piece of masking tape on the neck surface at the nut end of the fingerboard — use this tape as an index to butt the fingerboard up to when you glue it on.