STUDIO HARP

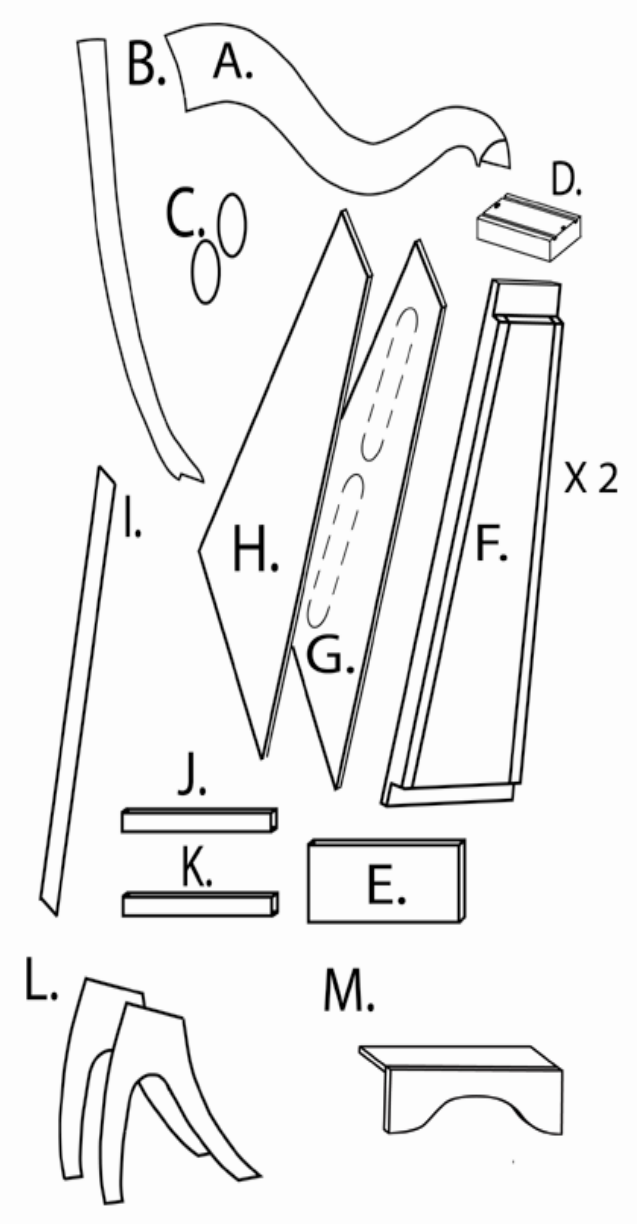
MUSICMAKER'S KITS, INC.
14525 61st st Ct N
PO BOX 2117
STILLWATER, MN 55082-3117

(651) 439-9120
EMAIL: info@harpkit.com

STUDIO HARP

PARTS LIST:

a) Neck
b) Pillar
c) 2 overlay pieces
d) Top
e) Base
f) 2 Sides
g) Back (lam cherry/walnut)
h) soundboard (lam. birch)
i) soundboard reinforcement bar
j) Bottom trim, front
k) Bottom trim, back
l) 2 TALL LEGS
m) Leg spacer for TALL LEGS



HARDWARE:

24 standard tuning pins
5 tuning pins w/enlarged whole
29 threaded guide pins
29 medium brass eyelets
3/16” drill bit (unless neck is pre-drilled)
5/32” drill bit (unless neck is pre-drilled)
1/8” drill bit for soundboard
1 package nails (1/4” oz)
8 wood screws, 1-5/8”
2 cherry wood plugs, 3/8”
1 Wood knob
1 Carriage bolt, 1/4" X 2-1/2"
1 wood plug, 3/4"
1 T-nut, 1/4" (installed in base piece "E")
L-handle tuning wrench
set of 29 nylon harp strings
1 set assembly instructions

TALL LEGS
(6) 3/8” plugs
(6) 1-5/8” screws

BEFORE YOU BEGIN

Please take the time to check over the parts of our kit now, to make sure everything is there. If you discover a problem, call us right away so we can rectify it quickly without causing you much delay in your project. We also suggest skimming through the entire directions before beginning, just to get an overview of the project. You may decide that you need to gather more tools or purchase a few optional decorations or accessories to enhance the finished instrument. Now is a good time to make such decisions so you can avoid delays later when you reach those steps of construction.

NOTE ABOUT GLUE

DO NOT ASSEMBLE THIS PROJECT WITH EPOXY OR SUPERGLUE OR HOT MELT GLUE!

Find a good woodworking glue. Many luthiers (guitar & violin makers) still use the natural hide glues that have been around for centuries, carrying on a fine old tradition, but that does not mean that you must do the same. We build this instrument with modern woodworking adhesives (such as Elmer's Carpenter's Wood Glue or Titebond) because they hold the parts even more securely than the old hide glues. The few advantages that some people claim with hide glue are more than offset by the strength, durability, ease of application, and availability of the modern woodworking adhesives.

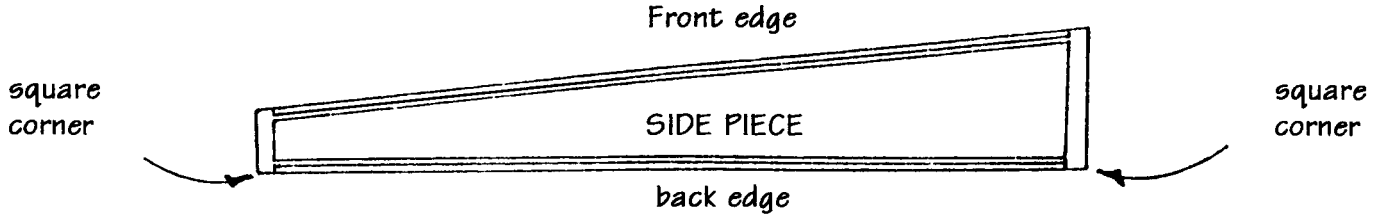
When gluing parts together, be sure to put enough glue on the joint to wet the entire surfaces to be joined. A good sign of proper gluing is that a little excess will squeeze out around the joint when clamping pressure is applied. Too little glue may cause the parts to separate later, whereas too much glue makes things messy. We always keep a damp rag handy for quick cleanup, as necessary. It is especially helpful to keep your fingers clean while gluing, because gluey fingerprints have the embarrassing tendency to appear on the finished product in places you never expected. Most woodworking adhesives "set" sufficiently after 30 minutes of clamping to allow you to proceed. Check your dispenser for recommended drying times.

ASSEMBLY INSTRUCTIONS:

THE HARP FRAME

_____1. You will use the two SIDES, the TOP, and the BASE for assembling the main frame of the soundchamber. Notice that the two SIDES are right and left, and you'll want to arrange the pieces so that they will fit the TOP and BASE pieces properly. Set it up without glue first to make sure everything fits well.

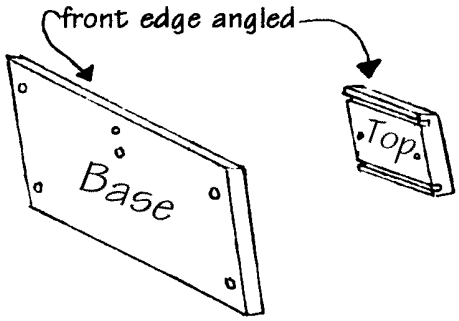
IMPORTANT: There is a FRONT and a BACK to this frame. Take care to identify them so you glue the parts together in the proper orientation.



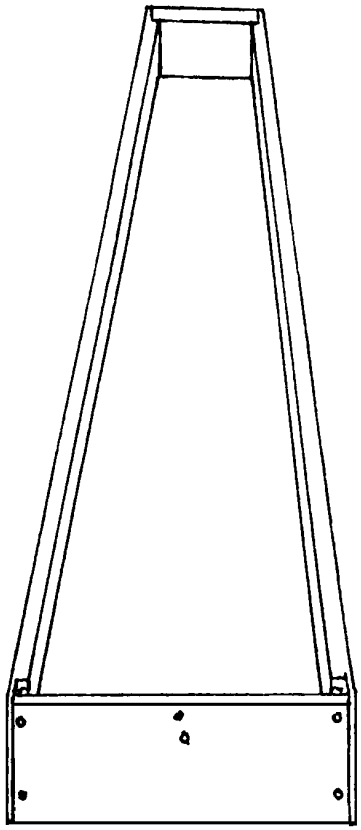
⇒ The front edge of each SIDE is cut at a slight angle, whereas the back edge is square relative to each end.

⇒ The front edge of the BASE has two extra holes drilled into it for fastening the PILLAR.

⇒ The front edge of the TOP is cut at a slight angle, whereas the back is square.



_____2. When satisfied with the fit, use a 7/64" drill bit to bore pilot holes through the TOP piece into the SIDES so that the screws will draw the parts together firmly. Assemble the TOP to the SIDES with glue and screws (1-5/8").

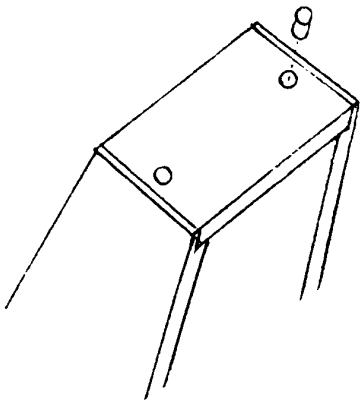


_____3. Double check the fit of the BASE to the bottom of the harp frame. The BASE is meant to fit between the slots in the sides. This will allow you to slide the SOUNDBOARD and BACK into place from the bottom.

NOTE: There are six holes already drilled through the BASE piece and they are countersunk on the outside, so when you put the BASE on, the countersunk side should be facing outward.

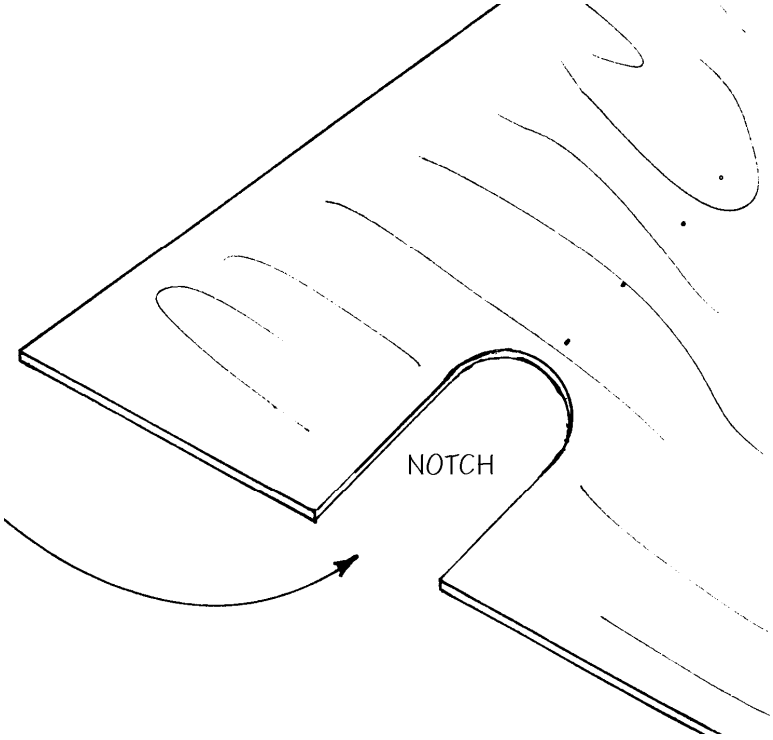
When satisfied with the fit, use a 7/64" drill bit to bore pilot holes though the BASE piece into the SIDES at the positions of the four corner holes in the BASE.

Assemble the BASE to the two SIDES with glue and screws (1-5/8").



_____4. Glue two CHERRY WOOD PLUGS into the TOP, covering the screws, just for looks. Sand these plugs flush with the surface of the TOP when they are dry.

THE SOUNDBOARD



_____5. To prepare the SOUNDBOARD, cut the notch at the wide end, as drawn on the wood. Sand the edges of the notch now, while they are easy to work on (see step #12 for hint on sanding the inside curves).

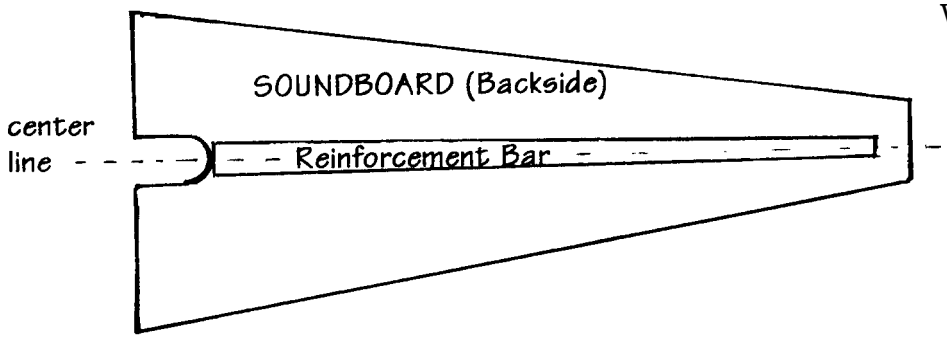
SAVE THE CUT-OUT FROM THIS NOTCH - YOU WILL USE PART OF IT LATER ON.

Point of Interest

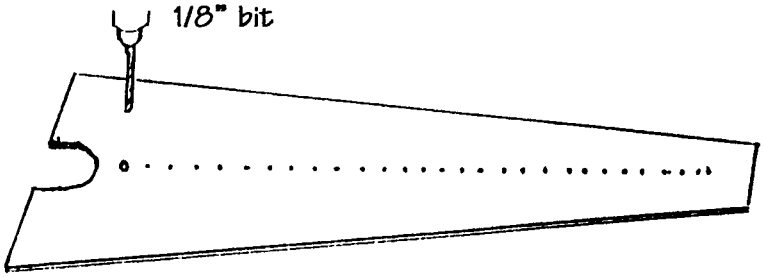
Many people ask us why we do not use solid wood for our harp soundboards. The reason is that we get much more strength from laminated wood than from solid, and no trouble with cracking. The soundboard provided with this kit is made of a special "AIRCRAFT BIRCH", a 5-ply laminated hardwood with amazing strength and resonating properties. It is made specifically for the model airplane industry, for lightweight, super-strong frame construction, but we have found it to be ideal for harp soundboards, especially on our smaller harps. In fact, our tests have shown that we can get by with a thinner soundboard and minimal center bracing by using this material instead of solid wood, and this reduces weight and increases the volume of the instrument.

_____6. Notice the punch marks for the strings down the center of one side of the SOUNDBOARD. Consider this the front side of the SOUNDBOARD.

Lay the SOUNDBOARD on your work table with the front side facing down, and mark a center line from top to bottom. Center the REINFORCEMENT BAR (long thin strip of hardwood) on the back of the SOUNDBOARD, so it touches the top of the NOTCH that you just cut. Draw a pencil line around it to mark the proper position, and then take the time to lightly sand the REINFORCEMENT BAR to remove any rough edges.



When satisfied with the position, glue the REINFORCEMENT BAR to the inside of the SOUNDBOARD, using some clamps or weights to hold the parts together firmly until dry (about 30 minutes).



_____7. Drill all 29 holes with the 1/8" (smallest) drill bit provided, all the way through the SOUNDBOARD and the REINFORCEMENT BAR. These holes are drilled straight down at each punch-mark, not at an angle. NOTE: If you ordered the Optional strings, use a 5/32" bit for the four bottom holes.

_____8. If the front of the SOUNDBOARD needs sanding or cleaning, do that now, before installing it. Just be careful not to sand too much, because the top layer of wood is VERY THIN! Sand with the grain, using fine sandpaper (320-400 grit) to prepare this surface.

NOTE: We also suggest that you sign your name and date on the back of the soundboard so that you will be able to see it through the access holes in the BACK.

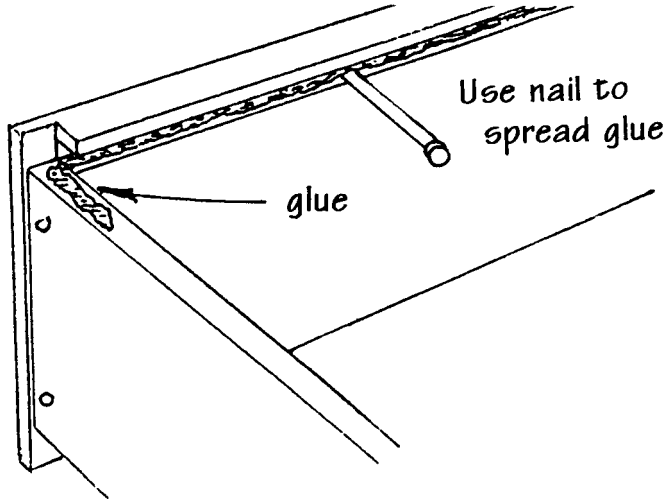
_____9. Test fit the SOUNDBOARD to the harp frame. It will overlap the BASE slightly, but you can trim off the excess later. You may have a little difficulty slipping the edges of the SOUNDBOARD into the slots of the SIDES. If so, you may taper the edges of the SOUNDBOARD a little to get them to fit the slots. Use coarse paper (80-100 grit) to sand the backside (inside) of these edges until they fit.

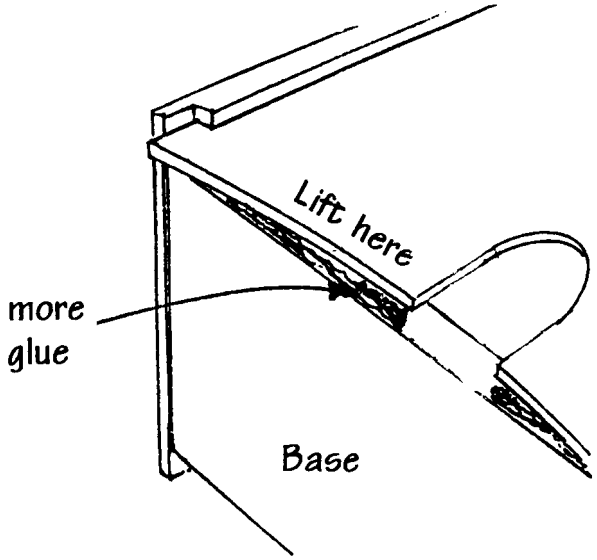
IMPORTANT: The SOUNDBOARD must fit all the way into the frame for maximum strength. The slot in the TOP of the frame is 3/16" deep. We recommend making a pencil mark 3/16" from the

top of the SOUNDBOARD and making sure that mark reaches the TOP of the frame when the SOUNDBOARD is installed. If necessary, you may trim the sides of the SOUNDBOARD in order to get it to fit all the way into place.

HELPFUL HINT
Before gluing the SOUNDBOARD or BACK into place, get two clean rags wet, and have them readily available for cleaning up excess glue that squeezes out of the joints. The second rag should be used to "scrub" the affected area, just to make sure all glue residue is removed. This will help save you beaucoup time toward the end of this project when you are preparing to apply the finish.

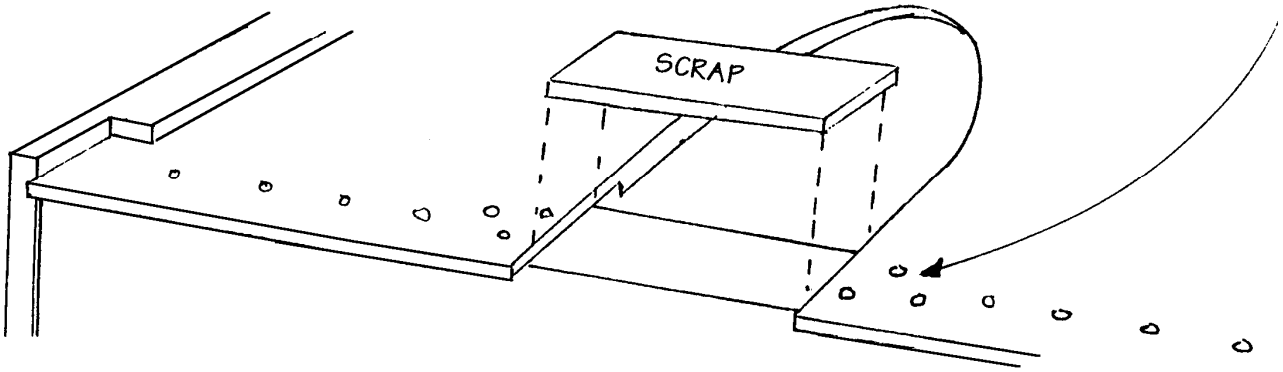
____10. When satisfied with the fit, squirt glue into the slots of both SIDES and the TOP, as well as putting some near the corners of the BASE. Use enough glue to ensure maximum strength, and spread it around in the slots with a nail so the SOUNDBOARD will be held by all surfaces it contacts. Then slide the SOUNDBOARD into place.





Lift the bottom lip of the SOUNDBOARD and squirt some glue under that as well. Then use several of the small nails provided to secure the SOUNDBOARD to the BASE. It's a good idea to add a couple of extra nails near the notch, as shown, because there is a lot of tension and stress at this point. (Don't worry, the nails will be covered over later).

_____11. Use part of the scrap that came from cutting the notch in the SOUNDBOARD to fill the gap at the bottom of the harp. Just glue and nail it to the BASE, as shown

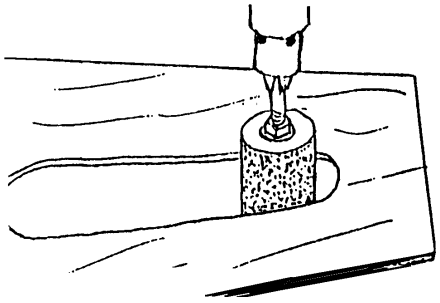


THE BACK

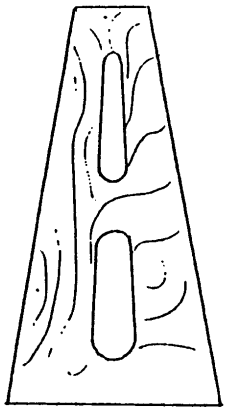
POINT OF INTEREST

The back material is laminated especially for us with the reddish cherry wood on one face and the darker brown walnut wood on the other. This allows you to choose which wood to show outward on your project. It also makes our parts more interchangeable when we offer the same instrument in two different woods.

____12. Prepare the BACK of the harp by cutting the access holes as drawn on the wood. Use a saber saw, hand coping saw, or a jig saw with a fine tooth blade in it to avoid chipping. Drill a pilot hole inside the outline so that you can get your saw blade in, and then saw slowly, taking your time, keeping the blade just inside the penciled line. Then sand the holes right to the line and smooth out any irregularities.



HINT: A drum sanding attachment to your drill (2" diameter, #80-grit sandpaper) is a great little tool for eliminating the rough spots and rounding things out.



POINT OF INTEREST

The large holes in the back of the harp are meant primarily for easy access to the strings. They have very little, if any, affect on the sound of the instrument. You may alter the shape of these holes if you like, to make them more ornate. Some people cut heart shapes, cloverleaf patterns, or a leafy vine. We would caution, however, that you make the holes large enough to permit easy stringing. You need not necessarily be able to reach your entire hand through the holes, but you must at least be able to get a finger or two inside so as to fish out the end of a harp string that is being pushed through from the front of the SOUNDBOARD.

_____13. Select which face of the BACK that you want to show outward on the harp, and test-fit the BACK by sliding it into place in the SIDES, from the bottom up. It should overlap the BASE slightly, but you can trim off the excess later. When satisfied with the fit, remove the BACK and squeeze a bead of glue into the slots of the frame and install the BACK in the same way as you did the SOUNDBOARD. Lift the bottom lip of the BACK and squirt some glue along the edge of the BASE. Then nail the BACK to the BASE.

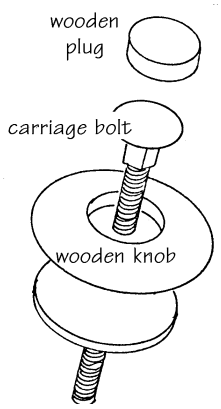
NOTE: Pound the nails in fully on the SOUNDBOARD and the BACK so that there is a slight dimple in the wood. This will keep them from interfering with the BOTTOM TRIM strip to be installed next.

_____14. Now you can cover the ugly nails at both front and back of the soundchamber, using the BOTTOM TRIM pieces provided. Note that one TRIM piece is beveled along one edge. Use this piece for the front. Trim both pieces carefully to length (we use a disk sander for careful trimming) so they fit snugly into place. Don't worry about excess width extending below the BASE - that can be sanded off later.

Glue both trim pieces on, using clamps or tape to hold them until dry.

_____15. When the TRIM pieces are dry, use coarse sandpaper(80-100 grit) to remove excess wood hanging over the BASE, and to round over all the sharp corners of the soundchamber. Nicely rounded corners will make this harp more comfortable to hold.

THE WOODEN KNOB

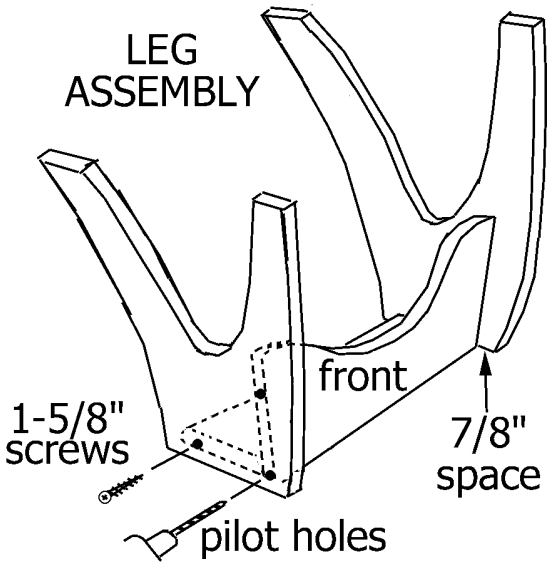


_____16. Tap the 2-1/2" CARRIAGE BOLT firmly into the WOODEN KNOB and then glue the 3/4" diameter WOOD PLUG over the head of the bolt, as shown to the right.

Sand WOOD PLUG flush with top surface of KNOB.

THE TALL LEGS

_____17. Test fit the LEG SPACER to the two legs, upside down on a flat surface, as shown. Note that the front of the SPACER should be set back 7/8" from the front of the LEGS. Use the 7/64” drill bit to bore the pilot holes for the screws. Then glue and screw the LEGS to the SPACER.



_____18. Glue wood plugs over the screws, and sand flush when dry.

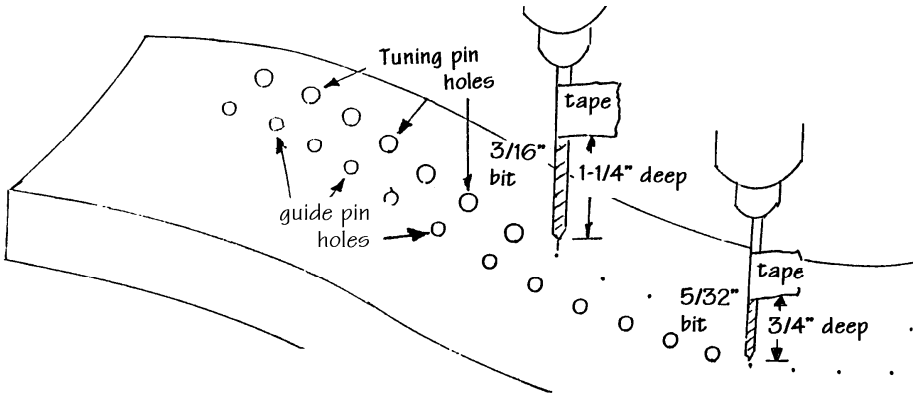
Now you can fasten the LEGS to the bottom of the harp, screwing the WOODEN KNOB through the LEG ASSEMBLY into the T-NUT in the BASE of the harp to hold the legs firmly to the harp.

THE NECK AND PILLAR

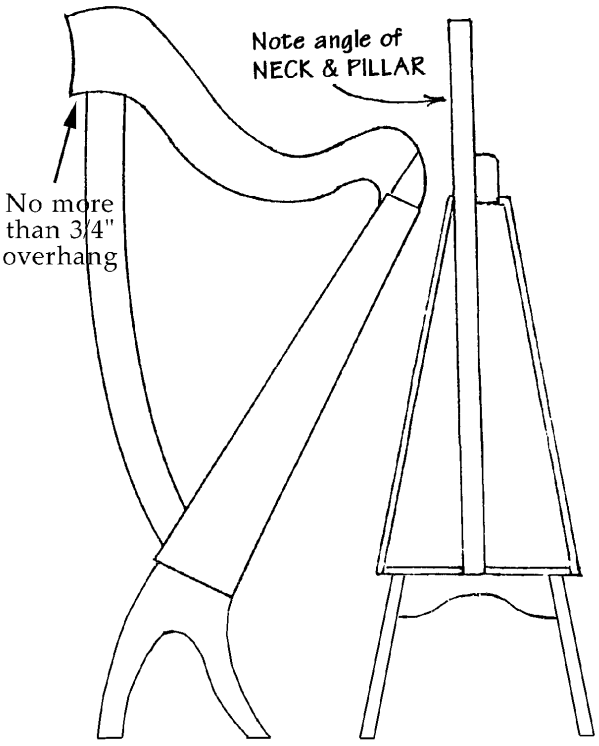
POINT OF INTEREST

Many people ask why we use laminated maple for the NECK of this harp instead of solid hardwood. The reason is that the strings exert nearly 700 pounds of force trying to break the wood, and, with such a deeply curved shape, there is bound to be at least one weak point where the grain would be quite short across the NECK, and that is where it would break if the wood were solid (straight grain). So the modern solution to this dilemma is to laminate thin layers of hardwood together, having each layer with the grain going a different direction. That way there are always some strong layers of wood in any given section of the NECK, regardless of the curves. You can rest assured that this harp is nearly indestructible with this laminated maple material.

_____19. If your kit is not pre-drilled, you will find small pricks in the wood, along one side of the NECK. The points nearer the top edge are for tuning pins and will be drilled with the 3/16" drill bit included in the kit. You will want to drill those 1 ¼" deep.



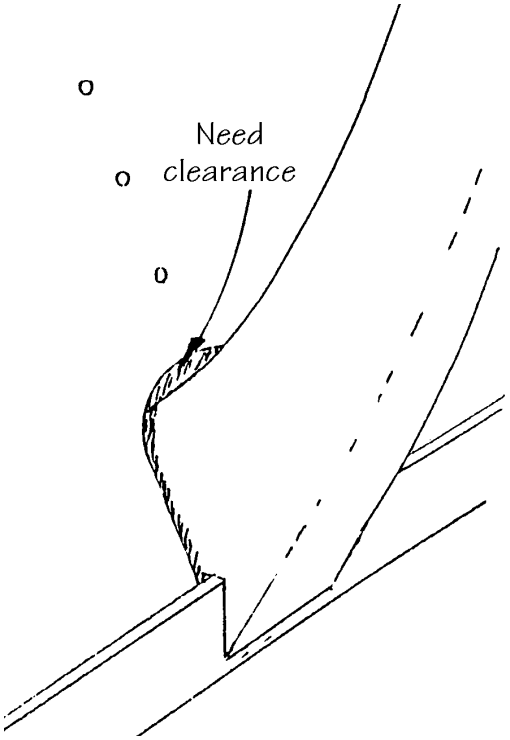
If you haven't access to a drill press, try to hold your hand-drill as straight as you can so the holes are uniform and perpendicular to the wood. It is good to have a second person help eye your drilling to make sure you hold the drill straight.



HINT: Wrap masking tape around your drill bit leaving 1 ¼" exposed.

_____20. The line of marks that is nearer the lower edge of the wood is for the guide pins. Use the 5/32" drill bit for these holes, and drill them only ¾" deep.

_____21. Test fit the NECK and PILLAR to the soundchamber, as shown. We like the front of the NECK to extend no more than 3/4" beyond the PILLAR, just for appearance, but you may adjust the position as you please. When you have it in the desired spot, check the fit of the joint at the top of the PILLAR. We use a disk sander to make adjustments here, as necessary, to achieve a nice close match in the two parts.



Look carefully at the back end of the NECK as well. We like the NECK to fit the top of the soundbox nicely too. Again, you may use a disk sander to adjust the back of the NECK or the top of the soundchamber, if necessary.

STOP!!

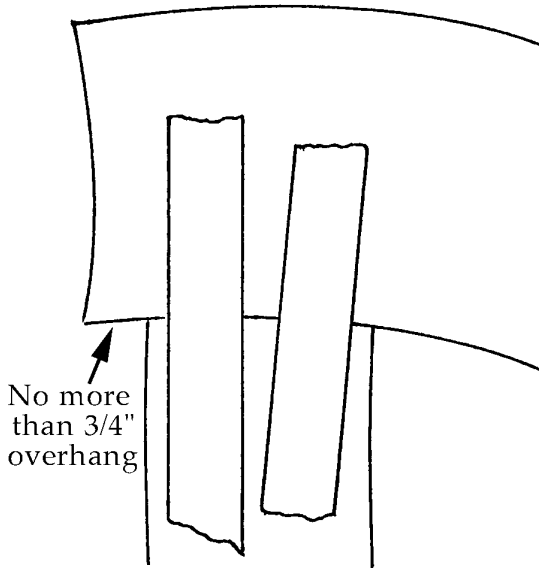
Some people have glued the NECK and PILLAR together without following the next instructions, resulting in trouble.

PLEASE PROCEED ONLY AS DIRECTED!

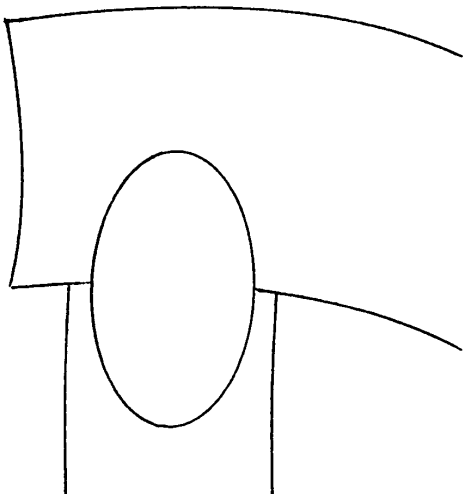
You must glue the neck and pillar together WHILE THEY ARE STANDING IN POSITION on the harp.

Otherwise you cannot be certain they will fit back into place again.

Check also for clearance around the PILLAR where it enters the notch in the SOUNDBOARD. You do not want the PILLAR to actually touch the SOUNDBOARD, or it will dampen the vibrations. If necessary, enlarge the notch with a file, or reduce the size of the PILLAR in order to ensure clearance in the notch.



_____22. With the NECK and PILLAR resting in position on the harp, glue the NECK to the PILLAR, using masking tape to hold the parts still until dry. No, this is not a very sturdy joint yet, but you will be adding OVERLAYS to the outside of this joint next.



_____23. When this temporary glue joint is dry, remove the masking tape and glue one OVERLAY piece to each side of the joint for final strength. It is easiest to glue just one at a time, because these things tend to slide around when you try to clamp them. Use at least two clamps to hold the OVERLAY in place until the glue dries. This is an important joint, so you must clamp the OVERLAYS firmly.

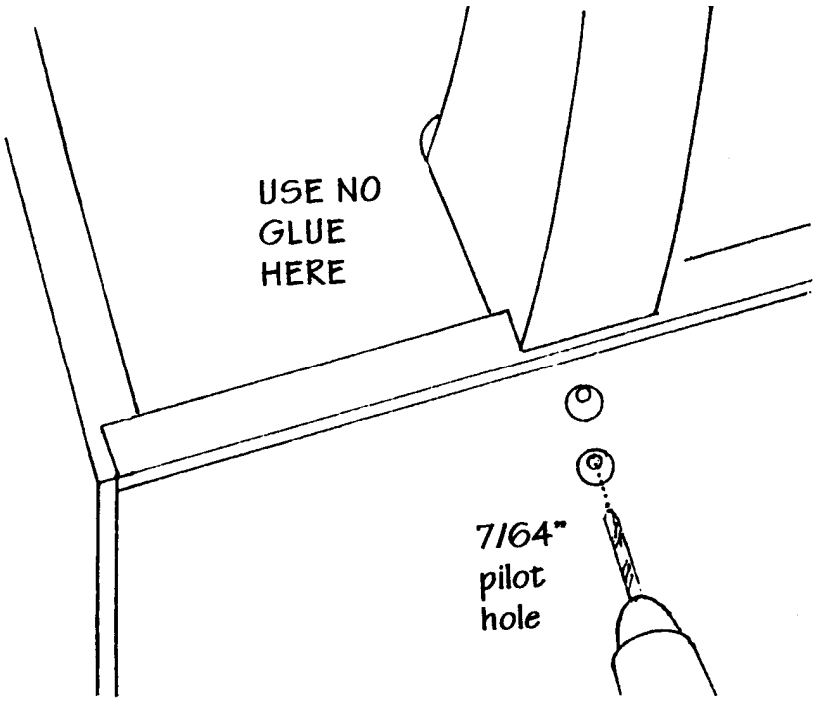
When the first OVERLAY piece has dried for at least 30 minutes, you may remove the clamps and put the other one in position on the other side so it mirrors the first. Clamp it in place until dry.

POINT OF INTEREST
Many people ask why we don't have dowels in the NECK/PILLAR joint. Doweling this joint would not hurt anything, but it is a difficult and unnecessary step. We have designed this instrument so that the string tension actually holds the parts together. The only force that needs to be held in check is the torque from the strings all pulling from one side of the NECK. They want to tip the NECK over. Adding dowels would not help prevent this motion, so we use decorative wood overlays on the outside of the NECK/PILLAR joint. When properly glued in place, they are stronger than dowels embedded in the inside.

_____24. Now your NECK and PILLAR have become one piece that fits perfectly onto the harp box, yet it can be easily removed. You will not be doing any more gluing from here on - everything else will be held together with screws and string tension!

_____25 Lay the harp body on its back, with the base facing you, and hold the PILLAR/NECK in position on the harp. Make sure the SOUNDBOARD does not touch the PILLAR—that would dampen the vibration.

You'll want to drill 7/64" pilot holes up into the bottom of the PILLAR through those holes in the BASE. One at a time, start with the upper hole closest to the notch, and after making sure the pillar is centered in the notch, drill through that upper hole into the PILLAR. Insert a 1 5/8" screw into that hole and tighten, then drill the second hole into the pillar and insert another 1-5/8" screw.



SANDING AND FINISHING

_____26. Now is the time for final sanding. Remove the FEET and the NECK/PILLAR assembly from the soundchamber so they are easier to work on. An electric orbital sander makes quick work of this step, whereas sanding by hand may take some time. Begin with a medium (150-180 grit) sandpaper and use it to work on rough spots and places where machining marks are still noticeable. If sanding by hand, always sand in the same direction as the grain of the wood, if possible. Otherwise you end up scratching the surface even more.

Clean up all rough corners, glue smudges, and any other areas that need attention on the soundchamber. This is the part of the project that separates the Hatfields from the McCoys. Do not rush through it! One sign of poor craftsmanship is glue spots around the joints or gluey fingerprints anywhere on the wood. Dried glue is hard to see now, but it will stand out like spinach in your teeth once the finish is applied.

Go over the entire instrument one more time with fine (220 grit) sandpaper to remove any scratches left by the coarser paper. Hold the instrument up to the light in different ways to check for roughness and/or glue smudges.

_____27. This is a good time to decorate your harp before the final finish is applied. Decorative inlay, decals, hand painting, drawing or wood burning, etc. can add a special creative and personal touch. We like to glue a small decorative rosette in the middle of the OVERLAYS for a nice touch of class. See our MUSICMAKER'S CATALOG for designs available.

_____28. Dust all parts with a clean rag before applying the finish.

_____29. Apply the finish of your choice. Here are a few guidelines on selecting a good protective coating:

STAIN -- STAINS are coloring agents and should only be used if you dislike the natural color of the wood. We usually do not apply stains to our projects, especially when they are made with naturally beautiful hardwoods such as cherry or walnut. These woods look very nice with just a clear finish. But, if you want to color the wood differently, your staining should be accomplished before applying a surface finish such as oil, varnish, or lacquer. We like ANILINE DYES for darkening the wood without osbcuring the grain. Our 3-color powdered dyes (code *FINI-40)* can be mixed with denatured alcohol to the desired shade. The advantage of these dyes are quick drying time, deep colors, even penetration, and the opportunity to create a "sunburst" shading effect.

OIL -- An oil finish will give your wood a low luster appearance, bringing out the natural color of the grain, but it tends soak into the wood and appear dry and "thirsty" after awhile. The principal advantage of an oil finish is that it can be applied and wiped dry immediately, so you can proceed to installing hardware (and strings) right away. The disadvantages of oil are that it usually does not give much surface protection or sheen, although there are some brands that include waxes and/or varnishes to give more surface build-up and luster.

VARNISH -- Any regular varnish will work fine on this project, but we recommend our wipe-on polyurethane called MUSICMAKER'S INSTRUMENT FINISH. Our complete finishing kit (code *FINI-20)* includes detailed instructions, sandpaper sheets, tack cloth, foam applicator, and lint-free wiping cloth, along with a pint can of semi-gloss polyurethane varnish. The advantages of finish are its simple application, durability, and deep, soft luster. It also works well for protecting Heat Transfer decorations.

LACQUER -- Many professional instrument makers still use lacquer for their finish. The most readily available lacquer is called Deft Clear Wood Finish. It is best to purchase a can of liquid to brush on as a sealer coat first, and then use an aerosol can of the same product to spray on the final coats. The advantage of this finish is its quick drying time, but the disadvantage is the strong odor of the toxic lacquer fumes.

CAUTION: Lacquer finish will not work over Heat Transfer decorations -- it dissolves the toner.

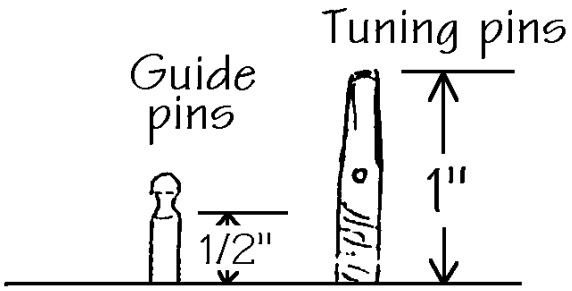
POINT OF INTEREST

Some people ask about finishing the inside of the soundchamber. We do not recommend trying it. Guitars and violins are never finished on the inside, so this instrument need not be sealed on the inside either. We understand people's concern about the effects of humidity on the wood, but even the best varnish or lacquer does not hermetically seal the wood. It blocks spilled milk from soaking in, but it does not prevent the wood from "breathing" moisture vapor from the surrounding air.

INSTALLING THE HARDWARE

_____30. Attaching the hardware is easier to do if the PILLAR/NECK piece is separated from the SOUNDBOX. Place a towel on your work table (under the NECK) to protect the wood while you work.

Find the brass GUIDE PINS and pound them into the lower row of holes drilled into the neck. The groove of these pins should be about ½" above the wood. Note that these are threaded, so you can adjust the height later if necessary, to accommodate sharping levers. **(just be sure to use a #1 philips bit!)**



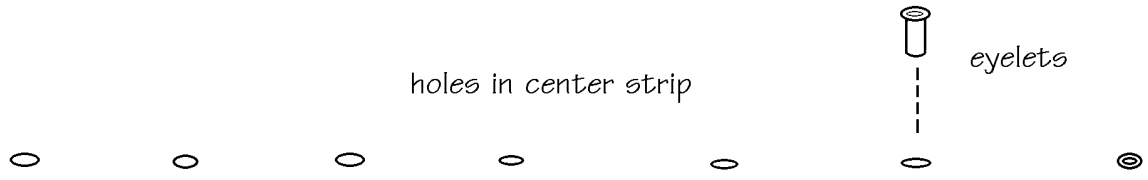
_____31. Pound the TUNING PINS into the upper row of the holes into the neck, using the five with the enlarged holes in the front of the harp where the thickest (.060" diameter) strings will be.

NOTE: If you are installing our OPTIONAL STRINGS (G-g tuning), then the enlarged hole pins should be installed for strings #19, 20, 21, 22, and 29.

Be sure the threaded end goes into the wood. Pound them into the wood about ¾" so they stand about 1" above the wood.

NOTE: If you pound a tuning pin in too deep, you can raise it back up by turning it counter-clockwise with the tuning wrench.

_____32. Find the brass EYELETS and push them into the holes in the front of the SOUNDBOARD. These act as string guides.



_____33. Now you may assemble the wood parts back together again, using screws to attach the FEET and the NECK/PILLAR assembly to the soundchamber.

"But," you ask, "what happens to the back of the NECK that is not fastened to the top of the soundchamber?" The string tension will draw those parts together so tightly that you'll not be able to move them once the harp is in tune.

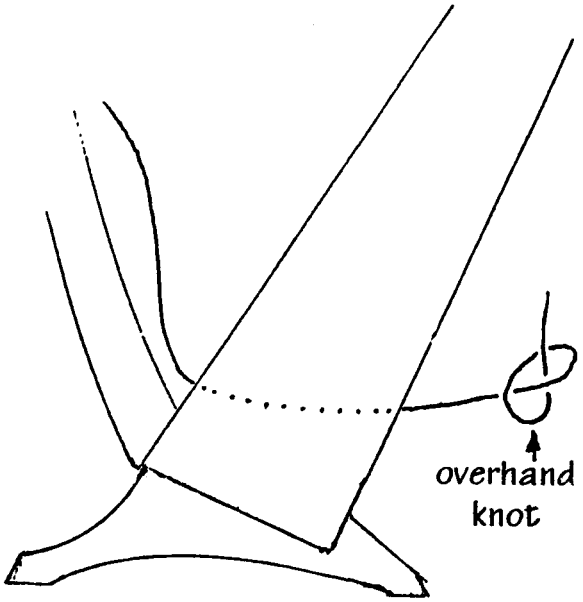
STRINGING AND TUNING

Stringing a harp is somewhat of an art. We recommend that you read through these last pages of directions completely before beginning, so you know what to expect. It is not uncommon for people to call us in a panic because their harp either a) won't stay in tune, or b) keeps breaking its strings. But careful installation will do much to eliminate these problems. We string this model harp regularly and tune it up to concert pitch right away with rarely a broken string. But it takes a little patience and concentration.

The strings are numbered from #1 (the smallest) to #29 (the largest). Some are colored to help as you play: "C" strings are red and "F" strings are blue.

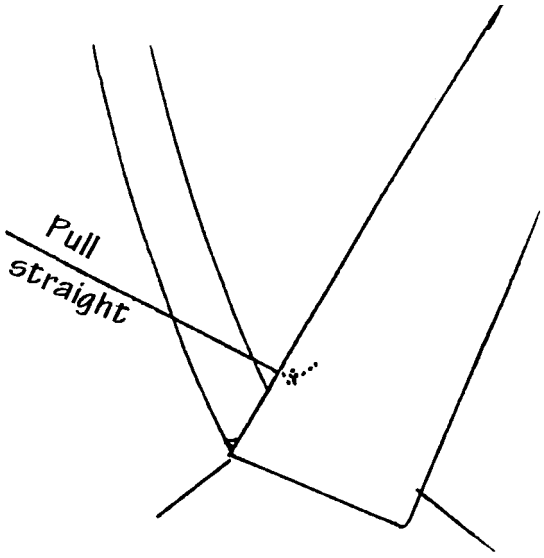
NOTE: If the color on the strings should happen to fade, you can restore it with permanent marker.

_____36. Start stringing at the bass (longest) end of the harp with #29. Push either end of the string through the lowest hole in the SOUNDBOARD from front to back. If it is a tight fit, you can trim the end at a taper with a sharp knife of scissors. Reach into the back of the harp and find the end. Tie a simple overhand knot at the end.



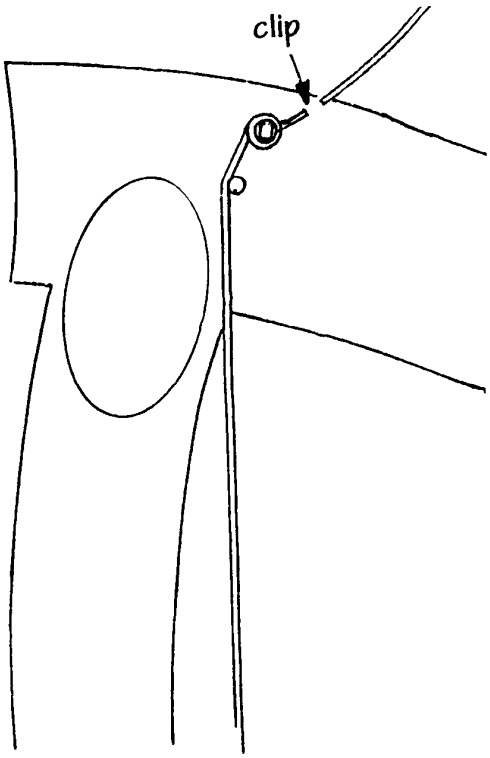
Put a drop of Superglue or Krazy glue on the knot, then pull the knot tightly against the inside of the SOUNDBOARD (right away, before the glue has set up). You are not trying to glue the string into the harp, just adhere the nylon windings together at the knot. This will ensure that the slippery nylon will not continue to slip and come untied when the string is tuned up to pitch.

NOTE: PULL STRAIGHT THROUGH THE HOLE, NOT AT AN ANGLE, SO AS TO AVOID SCRATCHING THE NYLON AGAINST THE BRASS EYELET.



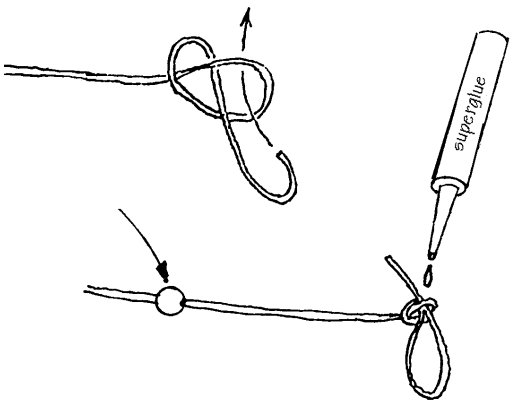
Thread the other end of the string though the last TUNING PIN near the NECK/PILLAR joint. Pull it through the PIN until there is only a little slack in the string. How much slack? About 2-4 inches. You'll catch on—too much slack makes for a bulky accumulation of string around the tuning pin, and too little means you won't have enough to even wrap once around the pin. You want to have about 2 to 4 wraps of string around each tuning pin for security.

Turn the PIN clockwise with the tuning wrench as you take up the slack with the other hand, guiding the string as it winds around the pin. As the string begins to tighten, place it in the groove of the GUIDE PIN.

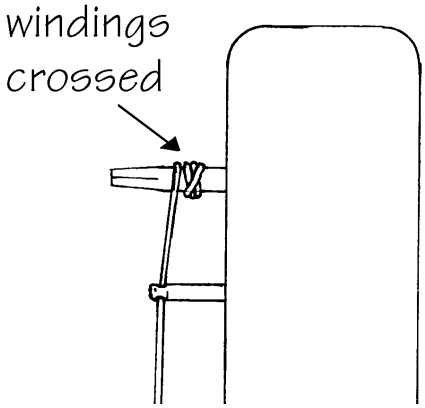


Helpful Hint

Do not accumulate a lot of windings of string around the TUNING PINS, especially with the thick bass (low) strings. They become bulky and cumbersome. If you have that problem, turn the TUNING PIN backwards to unwind the string, then pull more of the string through the hole and tighten again.



Once the string is satisfactorily installed, you may clip off the excess nylon close to the pin (leave ¼" stub), and tune the string up to its proper pitch (no, it won't stay in tune yet, but it helps to begin stretching it right away).



_____37. Install all five of the large (.060") strings this same way, taking care to put the red one in the third hole from the bottom. We have included one spare clear string in each bundle in case you break one.

_____38. Install the next seven strings (.050") in the same way, starting with the blue one, and taking care to place the red one in the tenth hole from the bottom.

_____39. When you come to the mid-range strings (size.040"), thread a small plastic bead onto the string, as shown, and then tie the bottom knot a little differently to give it more bulk. Start with the same overhand knot, but before tightening it, push the loose end part way back into the knot, just to add one more thickness of string to the knot.

IMPORTANT: It is necessary to also anchor the tops of these .040" strings (and all the lighter ones) securely to the tuning pins, as follows:

Guide one or two windings of string on the tuning pin, then guide the next winding over the others so the string helps "pinch" itself tightly to the PIN as you tune it up to pitch. If you don't do this, you will surely experience string slippage and breakage, especially in the upper half of the instrument.

FLASH INTERRUPTION

When about half the strings are installed, double check the position of the NECK on top of the soundchamber. Center it nicely now, before the string tension draws the parts together too tightly.

_____40. The next two sizes of strings (sizes .036" and .032") are thinner and more fragile. Take care to avoid scratching them as you install them.. Work your way up the harp, installing strings in this manner, keeping them in proper numerical order.

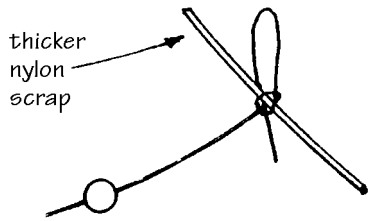
PANIC ALERT

When the strings begin to pull on the SOUNDBOARD, you may notice two things:

a) The SOUNDBOARD will begin to bulge outward a little;

b) You may hear some "crackling" sounds from excess glue that is fracturing inside the frame. Not to worry -- this is normal and harmless. It is not the wood that is breaking, but just excess beads of glue that have hardened on the surface.

_____41. The last five strings are the most delicate. Take your time with them. This strand is so thin that even a double knot will sometimes pull through the hole in the bead. The solution is to insert a short piece of thicker nylon into the knot to make it bulkier, as shown.



When all the strings are installed, tune them up to pitch again and allow the instrument to adjust itself to the tension.

Many people are not certain if they are tuning their harp strings to the correct octave. Tuning the strings an octave too low will result in flabby harp strings that don't provide much volume. Tuning the strings too high will cause strings to break. To make sure you are tuning your harp strings to the correct octave, you can double-check the pitch on our website with our "online tuner". **www.harpkit.com/freetuner**

The strings should all be tuned to the natural C major scale (white keys on the piano). All the red strings will be C notes and the blue ones F notes. Middle C is string number 20 from the top, or the tenth string from the bottom.

NOTE: It will take several tunings before the harp will stay in tune. Be patient! It should get better each day. One technique for accelerating the settling of strings is to slide your fingers up and down each string while pulling on it. BE CAREFUL! This activity generates heat quickly, so don't burn your fingers with the friction. But a little heat is good, because it helps the nylon stretch out quickly to its final shape. This should hasten the tuning stability at least a little, but be prepared for MUCHOS tuning for the first month!

CONGRATULATIONS! We hope you have enjoyed building this harp and that you enjoy many years of musical pleasure from playing it. We stock a good number of teaching materials and accessories for your instrument to help you get started. Just call us for more information or for placing an order.

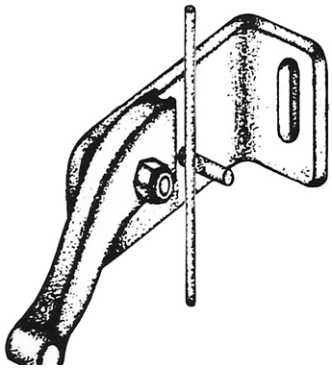
SHARPING LEVERS

Sharping levers are used on folk harps to facilitate key changes. Installing a lever over a string allows you to raise the pitch of that string one-half step by engaging the cam against the string. Thus an F-string can be raised to F# by a simple flick of the lever. Similarly, a B-string may be tuned to Bb so that the lever will raise it to a B-natural and release it back to a B-flat, as needed.

Most folk harp players set the key signature (sharps or flats) on the harp before starting each piece of music. For the key of G, you would engage the levers on all the F strings to produce the F# needed for that key (making sure all other notes on the harp are natural). If the following piece were then to be played in the key of F, you would then release the levers on all the F strings to produce F-natural, and also release all the B-string levers to produce Bb.

You may install a lever over every string on the harp, although, if you think you may never use all of them, it would be more cost-effective to select which keys you think you are most likely to use, and then install only the levers necessary for those keys.

KEY OF G:	requires F#
KEY OF D:	requires F# and C#
KEY OF A:	requires F# and C# and G#
KEY OF C:	requires no sharps or flats
KEY OF F:	requires Bb
KEY OF Bb:	requires Bb and Eb
KEY OF Eb:	requires Bb and Eb and Ab



MUSICMAKER'S KITS, INC.
PO BOX 2117
STILLWATER, MN 55082-3117
(651) 439-9120
email: info@harpkit.com

STUDIO HARP

STUDSTRG	FULL SET OF 29 STRINGS

STRING	NOTE	GAUGE	CODE	COLOR	VIBRATING LENGTH	SHARPING LEVER SIZE
1	A6	.025	NYL025	clear	4-1/4”	00
2	G6	.025	NYL025	clear	5”	00
3	F6	.025	NYL025	blue	5-3/4”	00
4	E6	.025	NYL025	clear	6-3/8”	00
5	D6	.025	NYL025	clear	7-1/8”	0
6	C6	.032	NYL032	red	7-7/8”	0
7	B5	.032	NYL032	clear	8-3/8”	0
8	A5	.032	NYL032	clear	9-1/8”	0
9	G5	.036	NYL036	clear	9-7/8”	0
10	F5	.036	NYL036	blue	10-3/4	0
11	E5	.036	NYL036	clear	11-1/2	0
12	D5	.036	NYL036	clear	12-3/8	0
13	C5	.040	NYL040	red	13-3/8	4
14	B4	.040	NYL040	clear	14-1/2	4
15	A4	.040	NYL040	clear	15-1/2	4
16	G4	.040	NYL040	clear	16-3/4	4
17	F4	.040	NYL040	blue	18”	4
18	E4	.050	NYL050	clear	19-1/2	7
19	D4	.050	NYL050	clear	21-1/4	7
20	Middle C4	.050	NYL050	red	23”	7
21	B3	.050	NYL050	clear	25-1/4	7
22	A3	.050	NYL050	clear	27-3/4	7
23	G3	.050	NYL050	clear	29-3/4	7
24	F3	.050	NYL050	blue	31-5/8	7
25	E3	.060	NYL060	clear	33-1/4	9
26	D3	.060	NYL060	clear	34-7/8	9
27	C3	.060	NYL060	red	36-1/4	9
28	B2	.060	NYL060	clear	37-1/2	9
29	A2	.060	NYL060	clear	38-5/8	9

20 String beads are included for preventing strings from pulling through soundboard.

MUSICMAKER’S KITS INC
P.O. BOX 2117
STILLWATER, MN 55082
(651) 439-9120 info@harpkit.com

OPTIONAL TUNING STUDIO HARP (G to g)

STUDSTRGOP	FULL SET OF 29 STRINGS

STRING	NOTE	GAUGE	CODE	COLOR	VIBRATING LENGTH	SHARPING LEVER SIZE
1	G6	.025	NYL025	clear	4-1/4”	00
2	F6	.025	NYL025	blue	5”	00
3	E6	.025	NYL025	clear	5-3/4”	00
4	D6	.025	NYL025	clear	6-3/8”	00
5	C6	.025	NYL025	red	7-1/8”	0
6	B5	.032	NYL032	clear	7-7/8”	0
7	A5	.032	NYL032	clear	8-3/8”	0
8	G5	.032	NYL032	clear	9-1/8”	0
9	F5	.036	NYL036	blue	9-7/8”	0
10	E5	.036	NYL036	clear	10-3/4	0
11	D5	.036	NYL036	clear	11-1/2	0
12	C5	.040	NYL040	red	12-3/8	4
13	B4	.040	NYL040	clear	13-3/8	4
14	A4	.040	NYL040	clear	14-1/2	4
15	G4	.050	NYL050	clear	15-1/2	4
16	F4	.050	NYL050	blue	16-3/4	4
17	E4	.050	NYL050	clear	18”	4
18	D4	.050	NYL050	clear	19-1/2	7
19	Middle C4	.060	NYL060	red	21-1/4	9
20	B3	.060	NYL060	clear	23”	9
21	A3	.060	NYL060	clear	25-1/4	9
22	G3	.060	NYL060	clear	27-3/4	9
23	F3	.045/.010	WRAP-1	blue	29-3/4	9
24	E3	.045/.013	WRAP-2	clear	31-5/8	9
25	D3	.050/.013	WRAP-3	clear	33-1/4	9
26	C3	.050/.015	WRAP-4	red	34-7/8	9
27	B2	.050/.015	WRAP-5	clear	36-1/4	9
28	A2	.050/.018	WRAP-6	clear	37-1/2	9
29	G2	.055/.018	WRAP-7	clear	38-5/8	9

18 String beads are included for preventing strings from pulling through soundboard holes.
4 large eyelets are included for the bottom 4 strings (drill soundboard holes to 5/32” dia)

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