

# SMART HARP KIT



**MUSICMAKER'S KITS, INC.**

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# SMART HARP KIT

## Pre-Cut Kit Parts Supplied:

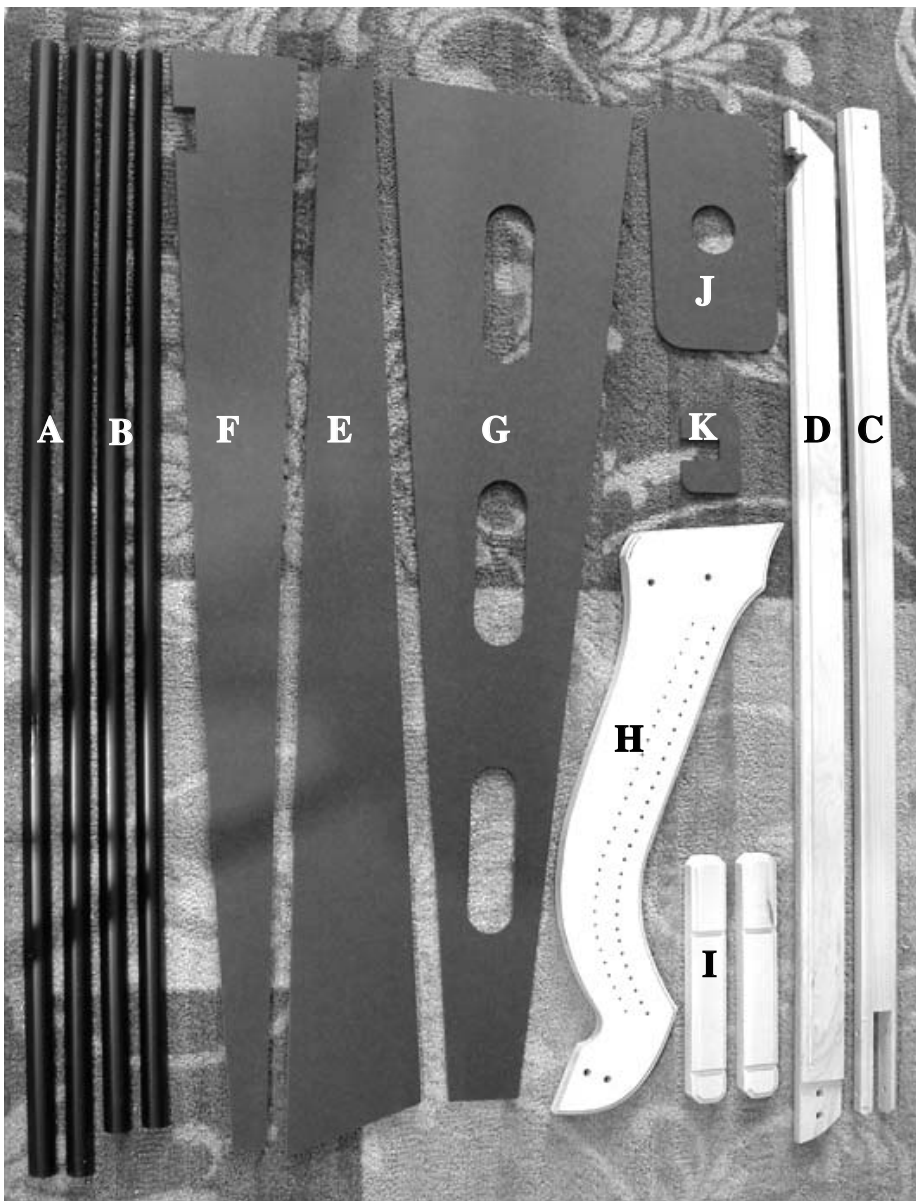
- A - Front Corner Mouldings
- B - Rear Corner Mouldings
- C - Pillar
- D - String Rib
- E - 2 Side Panels
- F - 2 Front Panels
- G - Back Panel
- H - Neck
- I - 2 Feet
- J - Bottom Panel
- K - Top Cap

## Hardware Parts Supplied:

- 29 Zither Pins
- 29 Guide Pins, threaded
- 29 Eyelets, large
- 4 Sets Barrel Screws (2 long, 2 short)
- 1 Wood screw, 2-1/2"
- 1 set of 29 strings
- 1 Tuning Wrench
- 4 Felt pads for feet
- 1 Set of Assembly Instructions

## Tools & Supplies You Will Need:

- Sandpaper (medium & fine grits)
- Clear Varnish
- Hammer
- Square
- Electric hand drill
- #1 Phillips screwdriver bit
- Hot Glue Gun
- Black Duct Tape
- Superglue
- Electronic Tuner (optional)



## ASSEMBLY INSTRUCTIONS

\_\_\_\_ 1. Please check over your kit parts to make sure you have everything. Contact us right away if you are missing parts so we can rectify the problem without causing too much delay for you.

\_\_\_\_ 2. Begin by sanding all the wood parts. Look especially for machining marks and burned spots from our tools. These should sand out nicely with a medium sandpaper (150-180 grit). Try to work your sandpaper parallel with the grain as much as possible, as this avoids adding scratches to the wood. Note: The only part of the String Rib that will show on the finished harp is the rounded front edge. No need to sand the rest of it.

\_\_\_\_3. In most woodworking projects we do not apply finish to the wood parts until after gluing them together because regular glue will not stick to a finished surface, but this project uses only hot-melt glue, and that type of glue works fine on finished surfaces. So you can go ahead and apply the finish of your choice to all the wood parts before assembling the harp. Here are some suggestions:

**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. 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 varnish or lacquer.

**OIL** -- Avoid an oil finish. It takes too long to fully dry. You'll have trouble getting the hot-melt glue to hold the front panels in place if the oil is still damp or tacky.

**VARNISH** -- Any regular varnish will work fine on this project. Choose a satin or semi-gloss polyurethane varnish for quick and easy success. We offer a wipe-on polyurethane called MUSICMAKER'S INSTRUMENT FINISH. Our complete finishing kit includes sandpaper sheets, tack cloth, foam applicator, and lint-free wiping cloth, along with a pint can of semi-gloss polyurethane varnish (instructions printed right on the can). The advantages of this finish are its simple application, durability, and deep, soft luster.

**LACQUER** -- Many professional instrument makers 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.

\_\_\_\_4. Apply at least two thin coats of finish, sanding between them with fine sandpaper (300-600 grit). This should give you a nice smooth protective coating. **Don't try to form a lake of finish on the wood!** Let the first coat soak in and dry overnight. Do not apply the second coat until the first coat is completely dry and sanded smooth. If it is not fully dry in 8 hours, be patient and wait until it no longer feels sticky or gummy to the touch. Your second coat can be very thin and light, and it should dry more quickly than the first. If you don't like the results after two coats, sand lightly again and apply a third coat. You can apply as many coats as you like.

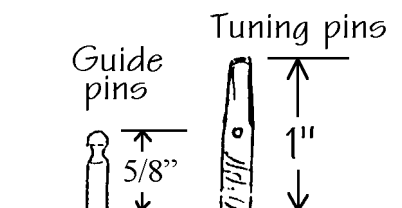
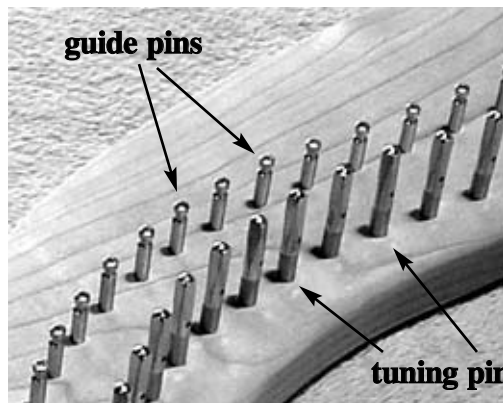
\_\_\_\_5. Once the finishing is done, you can install the hardware pins in the neck.

Begin with the threaded Guide Pins. **Lubricate these pins by scraping the threads across some candle wax.** Use a hammer to pound them partway into the row of smaller holes drilled into the neck, then a #1 Phillips screwdriver to screw them in until the head of the pin is about 5/8" above the wood.

NOTE: Our Threaded Guide Pins are adjustable in depth, allowing you to change the space between the harp string and the wood surface of the neck, using a #1 Phillips screwdriver. This will be important later if you decide to install sharpening levers for quick key changes.

\_\_\_\_6. Find the 29 Tuning Pins in your kit. **DO NOT LUBRICATE THE THREADS OF THE TUNING PINS!** Pound the Tuning pins into the row of larger holes in the neck. Be sure the threaded end goes into the wood. Pound them into the wood about 3/4" 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.



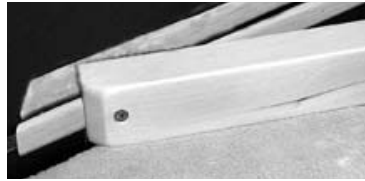


longer bolts here

\_\_\_\_7. Use the longer bolts to fasten the neck to the pillar and the shorter ones to connect the neck to the string rib using the the four barrel connectors provided. Tighten these bolts hand-tight at first.



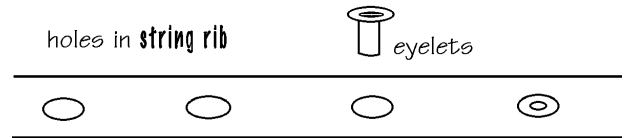
shorter bolts here



\_\_\_\_8. Install the wood screw through the base of the pillar into the pre-drilled pilot hole in the string rib. Once the frame is assembled properly, go back and tighten all the bolts. It is important to the life of your harp to have these fasteners fully tightened.

## INSTALLING STRINGS

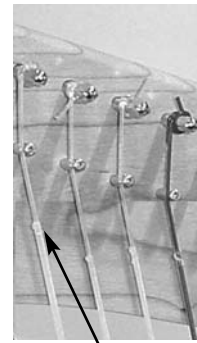
\_\_\_\_9. It is easiest to install the strings before adding the foam core body. To prepare for installing the strings, find the 29 brass Eyelets and push them into the holes in the front of the string rib. The eyelets act as string guides, protecting the wood from being dented by the strings when they are brought up to tension.



\_\_\_\_10. 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 to ask why their harp won't stay in tune. Careful installation will do much to stabilize the strings.

The strings are numbered from 1 (for the shortest) to 29 (for the longest), and they are color-coded to help guide you as you play. "C" strings are all red, and "F" strings are blue.

Note that the bottom bass strings are compound (wound) strings that are already tied with a leather washer at one end. The core of the string extends beyond the wound part on purpose. We don't want the wrapped portion to reach the tuning pin. See photo at right.



wrap ends below pins

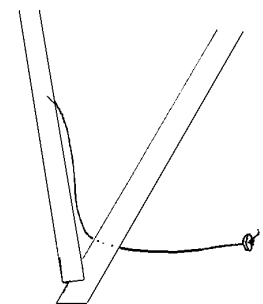
\_\_\_\_11. Gather the following tools for this operation:

- Set of harp strings with plastic beads
- Tube of Superglue or Krazy glue

- Scissors
- Tuning wrench

\_\_\_\_12. Start at the bass (longest) end of the harp with #29. Push the end of the string through the lowest hole in the string rib from back to front.

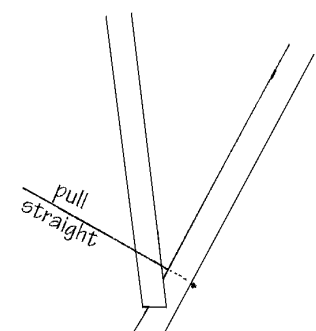
Then pull the knot tightly against the inside of the string rib, as shown.

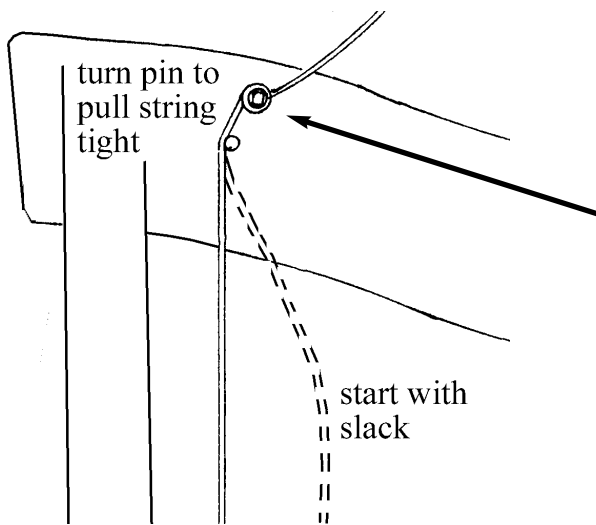


**NOTE: PULL STRAIGHT THROUGH THE HOLE, NOT AT AN ANGLE, TO AVOID SCRATCHING THE NYLON AGAINST THE BRASS EYELET.**

Thread the other end of the string through the last tuning pin at the point of the NECK. Pull it through the PIN until there is some slack below the pin.

Turn the pin clockwise with the tuning wrench and guide the windings of the string downward toward the wood. As the string begins to tighten, place it in the groove of the guide pin.





Install all the wound strings in the proper order this way.

**HINT:** Do not accumulate a lot of windings of string around the tuning pins, especially in the bass. They become bulky and cumbersome. If you find yourself with that problem, turn the tuning pin backwards to unwind the string, then pull more slack through the hole before tightening again

13. When you come to the first plain nylon string (.050" diameter), push it through from the front of the harp and pull the end partway out the back of the harp, so you can thread a plastic bead onto the string and tie a simple overhand knot, as shown.

**NOTE:** We use an oversize drill for boring the holes through the string rib in order to achieve consistent accuracy. We supply plastic beads for you to use as "washers" on each plain nylon string, so your knots won't pull through those big holes. Please use a bead on each string!

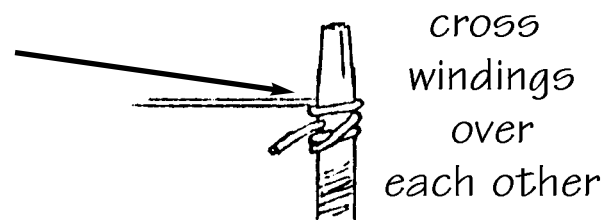
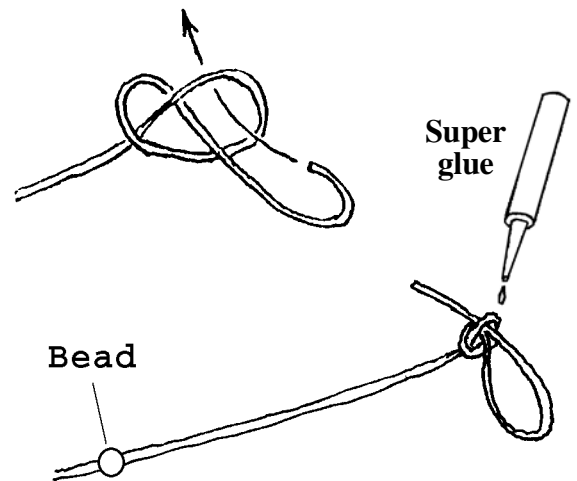
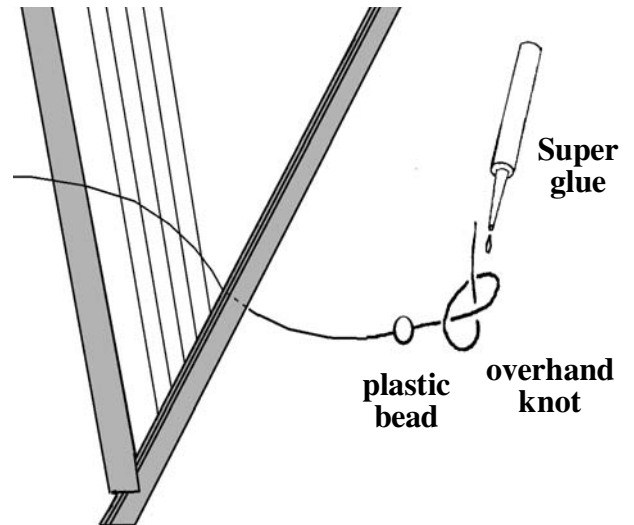
You'd think this would be enough of a knot to secure the string, but nylon is very slippery, so we always pull the knot tightly against the inside of the harp and then retrieve it from inside the harp so we can put a drop of Superglue on top of the knot. This prevents the nylon from slowly untying itself under tension.

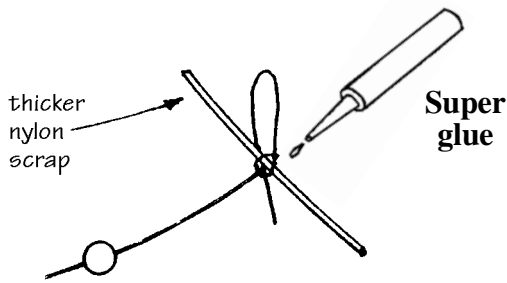
14. Install all three .050" diameter strings in proper order (a clear, a blue, and a clear). Notice that we pack a spare clear one in case you have difficulty. Save the spare of each diameter for emergency replacements, just in case of breakage.

When you get to the next size (.040" diameter), you'll need to alter the knot slightly. Start with the same overhand knot, but before you pull it completely tight, push the loose end part way back into the knot, just to add one more thickness of string to the knot, as shown. This will ensure that the knot cannot be pulled through the plastic bead when you tune the harp up to pitch. Be sure to add a drop of Superglue.

15. We also like to anchor the tops of these lighter strings securely to the tuning pins as follows: Make one or two windings of string around the tuning pin, then cross the next winding over the others so the string cinches itself tightly around the PIN. Otherwise you may experience string slippage and breakage, especially in the upper half of the instrument.

**CAUTION:** Nylon strings are somewhat fragile, especially in the upper octaves. Try to avoid scratching them as you install them. Most string breakage occurs at the tuning pin, when the string is pulled forcefully around the sharp corner of the small hole in the metal. You can minimize the problem by installing the string carefully and by crossing the windings before applying too much tension to the strings, so the nylon does not begin to slip back through the hole under tension and become damaged.





\_\_\_\_\_16. When you come to the lightest strings (.025" diameter), you will need to add a short piece of heavier string into the knot in order to make the knot bulky enough to keep from pulling through the hole in the plastic bead. Just use some scraps of excess nylon from the bottom strings. Don't forget the Superglue....

**CAUTION: Don't tune the harp up to pitch yet because the tension will bend the string rib and make it more difficult to install the foam core body parts. Wait until the body is attached to tune up the harp.**

\_\_\_\_\_17. **(Optional)** If you want to decorate the body of the instrument with hand painting or stenciling, it might be easier to do that before assembling the flat panels. Decide which faces of the parts will show outward, so you make sure to orient your decorations properly. These lightweight panels have a stiff surface on each side which is very suitable for painting. Acrylic paints will probably work the best on this material.

If you have a child who wants to attach stickers or glitter for special customization, that might be easier to do after the body is assembled, so you don't interfere with the fit of the corner mouldings.

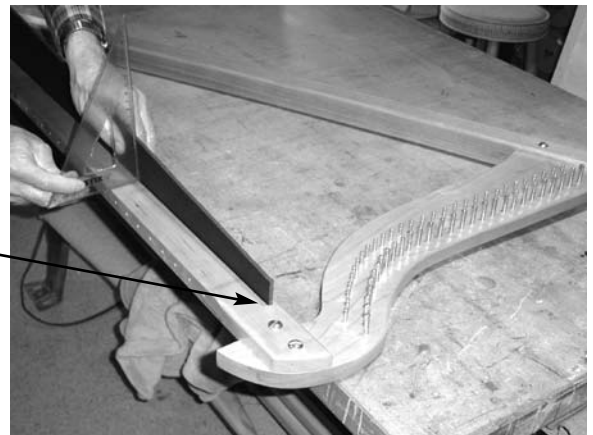
\_\_\_\_\_18. Now you can begin attaching the body pieces to the harp. You'll need a hot-melt glue gun and a couple long glue sticks for this first operation. (We bought a very nice glue gun at Walmart for less than \$10.00.) Find something square to help you make sure to install these two front panels nice and straight.

Lay the harp frame on its side on a table and check the fit of one of the front panels in the groove of the string rib, as shown. The narrow end should fit all the way up to the end of the slot near the neck, and the notch at the wide end should fit around the pillar. Notice that the slot is wider than the panel material. This is intentional, to make the parts easy to assemble. You'll want to push the front panel against the front edge of the slot to make it look best on the outside of the body.



Narrow end of front fits all the way to the top of the slot.

Notch in panel should fit around pillar.

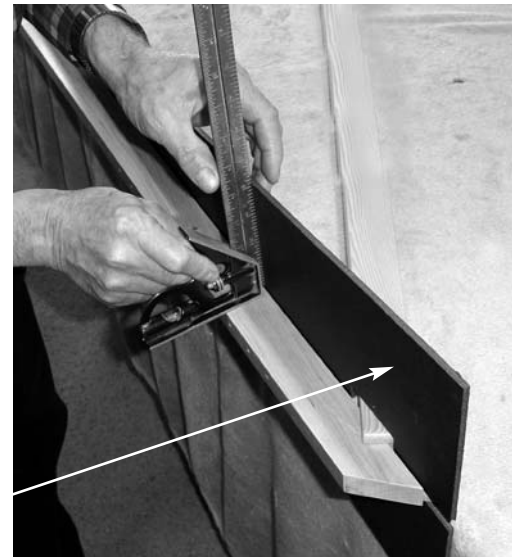
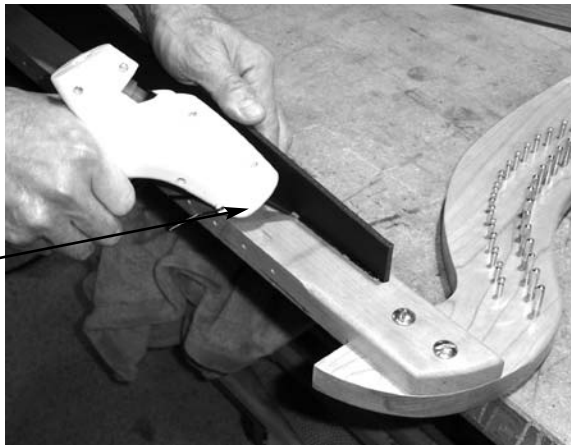


When satisfied with the fit of the front panel, heat up your glue gun and squirt a bead of glue into the slot, all the way from the neck to the bottom end, below the pillar.

Before the glue cools, fit the front panel in place and push it forward so the outer surface is up against the front of the slot. Use your square to make sure to hold this panel perpendicular to the string rib until the glue cools and hardens (just a minute or so).



When the panel stands firmly by itself, run another bead of hot glue down the inside edge of the slot to secure the back surface of the panel to the wood.



Let the glue cool down before flipping the harp frame over and gluing the other front panel in the same way.

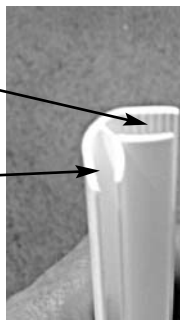
Now you can un-plug the glue gun for awhile.

\_\_\_\_ 19. Find the plastic corners that are long enough to fit the entire length of the front panels, and fit them onto the panels as shown.

HINT: This plastic moulding will slide onto the first panel very easily, but it will be more challenging to insert the adjacent panel.

To make it easier to install the moulding on the panels, we rub candle wax inside the moulding channels to provide a little lubrication.

**Rub candle wax inside the channels of the moulding to make them slide on more easily.**



**Orient the corner moulding so the opening aims toward the back of the harp. That's where the sides will fit.**

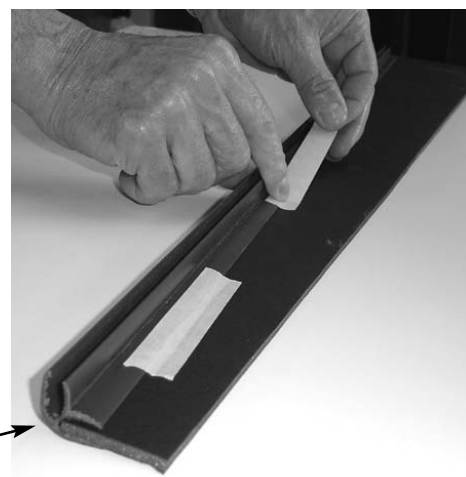


Take care to fit the top end flush with the top of the front panel. You can trim the bottom of the corner pieces later if you wish.

\_\_\_\_ 20. Notice that we are not using glue in the corners of the harp. We like **black duct tape** on the inside best. The illustrations here show masking tape for contrast so you can see it in the photo, but black tape looks much nicer. Almost too simple, isn't it?

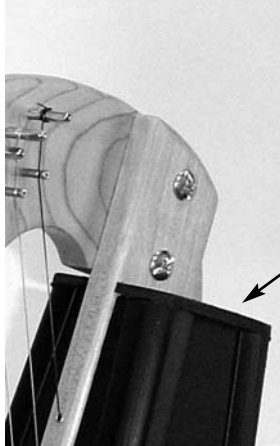
Don't try to apply one long continuous strip of tape -- start with a few short strips to hold the parts snugly, and then fill in between them with longer lengths of tape.

**Fit the end of the corner piece flush with the panel at the top of the harp.**



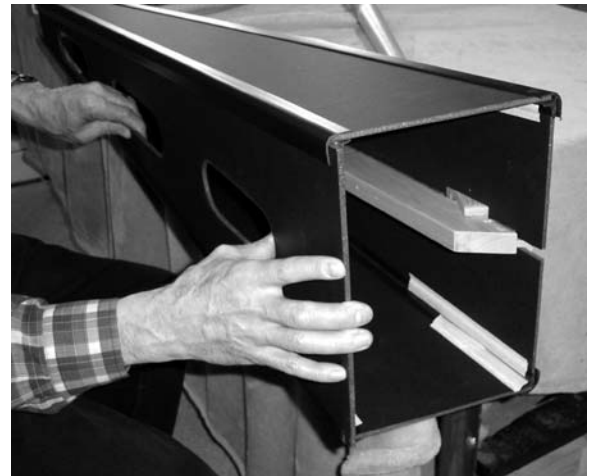


21. Now that you understand the system, you can proceed to install both front corners, and then fit the side panels in place as shown at left. Use masking tape to hold each panel firmly at the corners.

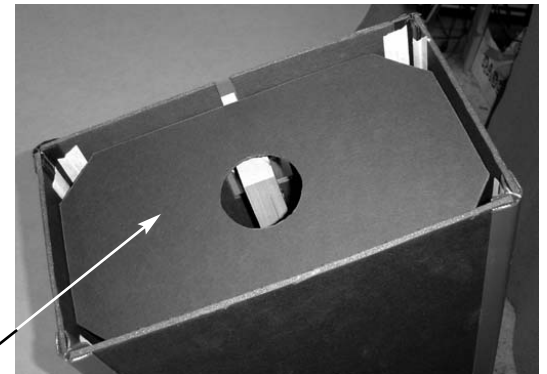


Take care to align the corner mouldings and side panels even with the front panels at the top so you have a nice level space for fitting the top cap piece later.

22. The back panel will be your last piece of the puzzle. This is the hardest piece to install, but Mike Nielsen came up with a great suggestion: Install a corner molding onto one side of the back and one side of the harp body first, pushing the back panel all the way the into place. Then slide the last corner molding into both the side and back panels at one time (here's where a little candle wax in the channels makes a big difference). You won't need a lot of tape on these corners -- just reach in as far as you can from the bottom to place some strips of tape.



23. Once the back panel is taped in place, you can use a razor knife to trim the excess corner mouldings at each end, if you wish, but this is not necessary. The plastic is kind of difficult material to cut, so we usually leave the excess at the bottom....



24. We provide a pre-cut base panel for purposes of stabilizing the body at the bottom. Check the fit of this piece. It should fit 1/2" or more down inside the body, as shown.

You'll need to trim the front and back edges at a slight angle to make the base fit into position. You should push it in a good 1/2" so it stabilizes the four sides of the body.

base



\_\_\_\_25. When satisfied with the fit of the base, heat up your glue gun again and run a bead of hot glue around the perimeter to hold it in place.

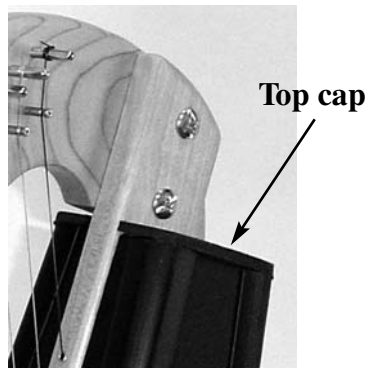
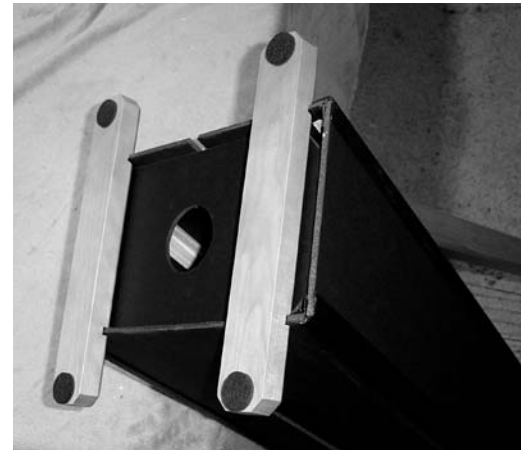


\_\_\_\_26. Check the fit of the feet at the bottom of the harp. Notice that one slot is angled to fit the front panel, and the other is cut straight for the back. These slots are intentionally wider than necessary to give you some wiggle room.

When you determine just how the feet will fit, squirt hot glue into each slot and fit the feet in place at the bottom of the foam core, as close to the corners as possible.

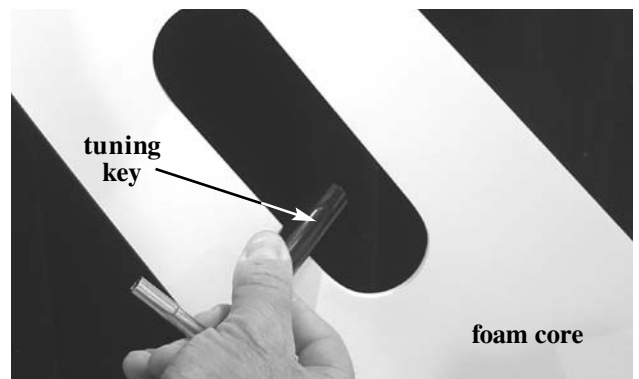


\_\_\_\_27. Add felt pads to each end of the feet as shown.



\_\_\_\_28. Now you can stand the harp on its feet and finish off the top of the box. Test fit the top cap to make sure it fits nicely. It has a center cutout that should fit around the string rib. Use hot glue to fasten the top cap in place.

\_\_\_\_29. If you find that the edges of the access holes in the back are sharp to your fingers, you can round them over with the handle of your tuning key, as shown, or with fine sandpaper, both on the inside and outside lip of each hole. Hold the tuning key handle (or sandpaper) at an angle and just rub it evenly around the circumference of each access hole. This will make it easier on your hands when you carry the harp or reach inside the body.



\_\_\_\_30. When the body is installed, tighten the strings up to pitch and allow the instrument to adjust itself to the tension. 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. Consult the string chart to see where Middle C is located.

**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 produce clear sounds. 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.harpkits.com/freetuner](http://www.harpkits.com/freetuner)**

NOTE: It will take 20-30 tunings for the harp to stabilize. Be patient! Nylon strings take awhile to stretch out, and the string rib will bow up as you continue to tighten the strings.

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 to help you get started playing. 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 at a string allows you to raise the pitch of that string one-half step by lifting the handle. 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 B-natural and release it back to 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# notes 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 at every string on the harp, or, if you think you won't 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.

**Sharping Levers are shown in our catalog and on our web site.**

<b>KEY OF E:</b>	<b>requires F# and C# and G# and D#</b>
<b>KEY OF A:</b>	<b>requires F# and C# and G#</b>
<b>KEY OF D:</b>	<b>requires F# and C#</b>
<b>KEY OF G:</b>	<b>requires F#</b>
<b>KEY OF C:</b>	<b>requires no sharps or flats</b>
<b>KEY OF F:</b>	<b>requires Bb</b>
<b>KEY OF Bb:</b>	<b>requires Bb and Eb</b>
<b>KEY OF Eb:</b>	<b>requires Bb and Eb and Ab</b>

## **ACCESSORIES FOR YOUR HARP**

**SMARTBAG** Nylon Gig Bag for Smart Harp (with shoulder strap)  
**CA-30** Chromatic Electronic Tuner  
**TUNERCORD** External pickup & cord for tuner  
**SMARTSTRG** Spare set of 29 strings  
**plus many books, CDs, and DVDs on playing the harp**

**See Website for Current Pricing**

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**[www.harpkit.com](http://www.harpkit.com)**

