

Part II.



1. Preparing & Installing Key Chest & Keys
5. Crank & Knob Assembly
6. Peg Head Carving
7. Applying Finish
8. Attaching Key chest to Body
13. Installing Wheel, Shaft, Bearings,
& Crank Assembly
16. Trompette & Bourdon Bridge
Installation
19. Installation of Tail Piece
21. Installing Tangents & Key chest Lid
23. Key Chest Lid, Hinge ,& Magnets

Part II

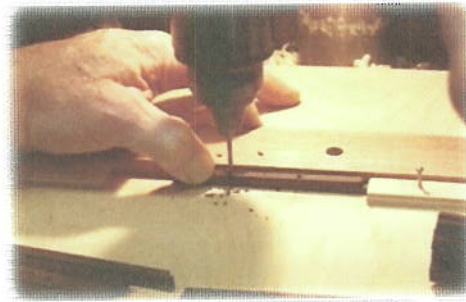
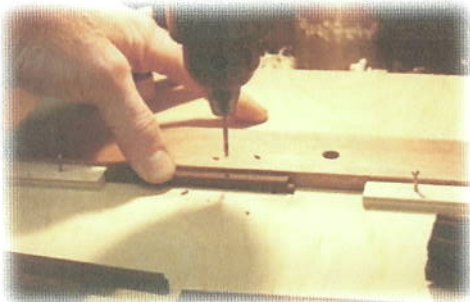
Key Chest & Keys

Preliminary step; take out key chest parts. Compare to plan and familiarize yourself with the parts. In kit, key chest comes glued up including peg head and end block.

1. □ Preparing keys for tangents

- Remember there are 2 lengths of keys, the shorter set are for the upper row.
While the upper and lower keys are a different length, distances of holes from the square end (opposite of the button end) will be identical.
- if using **metal** tangents, using the plan view Z, mark holes at $1 \frac{21}{32}$ " and $2 \frac{19}{32}$ " in the keys for drilling
- If using **wood** tangents, mark holes at $2 \frac{5}{8}$ " and $1 \frac{5}{8}$ " from square end (opposite of the button end) of key. Wood tangents are 1" apart.
- Drill tangent holes in keys using a number 43 drill.

Pictured below is our process for drilling tangent holes in keys using a small fence and stop block system to assure accurate placement of holes. Right stop block will have to be moved 1/8" when



- Tap the holes with a 4-40 tap being careful to keep tap at a right angle with the key

2. □ Fitting keys to key chest : Key tab on top for upper row of keys & key tab on bottom on lower row of keys.

1. Key stock: Using a sanding block to keep flat surfaces flat, lightly sand key stock and very lightly sand (break) sharp edges.



1

Using an exacto/hobby knife, carefully remove any remaining glue from corners of key holes

Using a small file or sanding stick, fit each key to its holes by sanding the holes so that each key fits easily but not too loose. Do not sand dark inlaid surface if your key chest has a dark trim piece. **Be sure** to sand holes in both sides of key chest for each key at one time being careful to hold file or sanding stick straight. (see picture) It is important that each key is lined up horizontally. Remember keys must fit so that they neither bind nor slap when played.

Each key is fitted to a specific hole. Number them so that when the instrument is finished, each key can be returned to the hole fitted for it. Number each row of keys beginning at the peg head end as they are fitted. Place number on bottom of key so as to be unseen when key chest is opened.

For easy fingering, some buttons need to be offset from the key center line. To do this, key 5 in the lower row needs a small triangular piece glued on **right** side and keys 11, 12, & 13 need a small triangle glued on the **left**.

The relationship between the top and bottom row of buttons is very important for proper fingering. The button spaces of the upper and lower rows should nearly align between buttons 2&3, 5&6, 9&10, on lower row (these are the B&C,E&F, B&C notes).

Be sure that keys are inserted so that tabs for buttons are on lower side for lower keys and upper for upper row of keys. (consulting plans for these steps is very important).

3. □ Preparing and installing buttons

Lay out dark and light sticks of button stock. The dark stock is for the lower row of buttons.

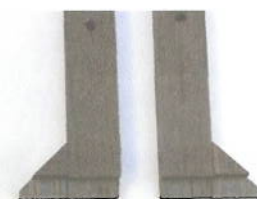
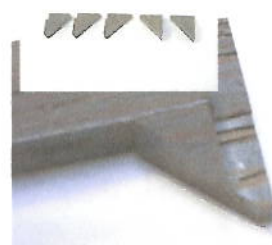
- Dimensions for cutting buttons:

Lower row; #1@1 1/8", #2@1", #3&4@13/16", #5&6@ 3/4", #7&8@11/16", #9-13@19/32"

Upper row; #1&2@1 1/2", #3@1 5/16", #4@1 1/8",
#5@ 1 1/16", #6@ 13/16", #7@ 7/8", #8@13/16",
#9
@ 5/8.

Working on lower /dark row:

- Remove keys 5,11,12,&13 from key chest and place on flat surface covered with kitchen plastic wrap
- Using 12 minute epoxy, glue key offset triangles onto right side of the 5th key and to the left side of keys 11, 12, & 13 of bottom row. Be careful to keep triangles flush with key surface.
- Sand off excess glue
- Put keys back in key chest
- Dry fit entire row of buttons on keys before gluing in place. Adjust as needed for Lay out work space
- Use 30 minute epoxy
- Starting with 4th black button positioned flush with the left side of the 4th key, continue to glue buttons spaced 1/16" apart working to the right.
Add black buttons #5-9 spacing them 1/16" apart from the 4th key
- Next glue the black buttons on one key at a time starting with the 9th button as you maintain 1/16" spacing from the 8th key. You may use the 10th key for alignment, being careful not to glue 10th key to the 9th button.
Give epoxy time to harden before adding next button.



You may find it easier to do only a few keys at a time so work at your own pace and comfort level. Since the epoxy is slow curing, you will want to check occasionally that the buttons are staying where you want them as they can slide about for awhile. Remember to keep them aligned and straight with 1/16" be-

Check the buttons while epoxy is drying making sure they fit properly, are straight and evenly spaced, and with no rubbing. When hard, lightly sand to remove any glue from area.

Beware of the key and button closeness which makes it very easy to glue the blocked keys together! See pictures on next page...

Now to the upper row

4. Preparing and installing upper row of buttons

- **Install all upper keys with the button tab up/on top**
- Remove upper row keys 9 & 10 from key chest and place on flat surface covered with kitchen plastic wrap
- Using 12 minute epoxy, glue key offset triangles onto to the left side of keys 9 & 10 of top row. Be careful to keep triangle pieces flush with key surface.
- Sand off excess glue
- install in key chest
 - starting with 5th white button positioned flush with the left side of the 5th key
 - continue to add white buttons spaced 1/16th apart working to the right
- then install the white buttons on the keys to the left of the 5th key working to your left until all buttons are in place in the top row
- check the buttons that they are straight, evenly spaced, with no rubbing
- mix 30 minute epoxy
- using a toothpick to apply epoxy, glue the row of white buttons in place while following process above.
- since the epoxy is slow hardening you will want to check occasionally that the buttons are staying where you want them.

On the offset keys, the push clearance" [my term] needed between a depressed key and an un-depressed key in g/c tuning we like to see 5/16 and 7/16" for d/g. To do this usually requires making the triangles smaller and/or cutting some small reliefs into the keychest side to accommodate them. Also, the keys can be set up so that the ends are flush with the non button side of the keychest. This will gain you about 2/16" if you need it. You may need to do all of the above to get the job done. When you are doing the travel adjustments to the upper register keys it is not necessary to have as much travel as the keys are not pushed as hard or as far and 1/16" less is enough.



We make sure that we have the required travel by trimming the offset triangle to make it smaller and yet retaining the 45 degree angle. Next we insert the adjacent key that is to be trimmed to the fitted key and pencil in the 45 degree angle to be cut on the button and/or key so that the key travels the needed distance with at least 1/32" side clearance. This is then cut on the saw leaving the line to file and sand to.

5 Finishing Keys & Buttons

Sand off sharp edges on buttons. Some players like the buttons to be arced; The picture on the right shows laying out the arc with an arcing template and sanding.

The non-button key ends are finished with a decorative diamond pattern. This can be done with a file or sanding block by filing a 45degree angle on each edge. It is easiest to see on the plan.

We use a spray lacquer like Deft Sealer (sold at Home Depot) to protect and seal the keys & buttons so they don't swell and contract as much with humidity changes.

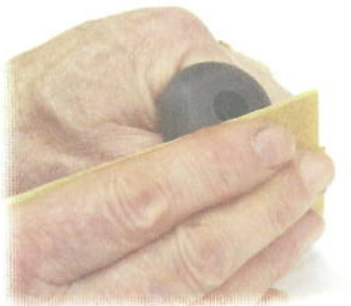


Crank & Knob Assembly

Preliminary step; take out crank assembly parts. Compare to plan and familiarize yourself with the parts.

1. □ Preparing knob. In the kit, most or all of this will be done for you.

- Sand knob up to at least 220 grit, removing all machining marks and sharp edges
- Knob should be very smooth. Some finishes especially stain will make imperfections more visible
- Put epoxy in the glue groove on the outside the delrin bushing
- Insert bushing into the knob crank side first. Stop when there is 1/32" still protruding
- Sit it bulb side down until epoxy hardens, so glue flows evenly around the groove and into the wood
- Knob is ready to be finished with rest of parts.



Peg Head Carving and Holes for Tuners

Peg head must be final carved and sanded before applying finish to key chest.

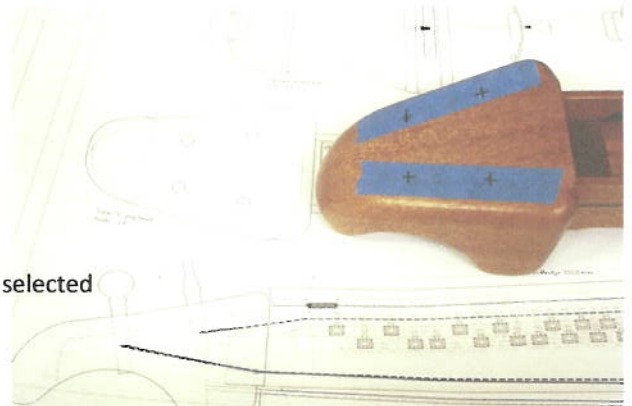
The peg head is an area that can be shaped and carved if you like to try your hand at it. Here is a peg head that we did for a 6 string Monarch, but many designs can be used of your own making. Be sure that there is enough wood thickness after you are done so that it is strong enough to keep from collapsing with string pressure and also be able to hold the tuners properly. You may just want to smooth the peg head just the way it is and not bother with carving it at all. This is just fine and it works either way. We use small saws, chisels, rough and fine files and coarse and fine sandpaper to shape the peg head.

Here are some pictures of one that we carved and one just sanded.



Preliminary step; Read this section of manual. Compare to plan and familiarize yourself with the steps.

- Lay out peg head for 4 strings or 6 strings according to plan.
- Mark placements on a strip of painters tape
- Using a punch, mark the centers for the holes and remove the tape.
- Determine what size hole to drill for the tuners you have selected
Bass tuners – $35/64$ " Measure to confirm
Viola pegs – $11/32$ " Measure to confirm
Banjo tuners – $3/8$ " Measure to confirm



With a good clean cutting drill bit, drill the clearance holes for the tuners you have chosen to use.

It is helpful to use a back up board behind the area you are drilling to prevent wood breakout in the area where the drill breaks through.



Applying Finish

The finish on your instrument provides protection and stability for the wood. When you think about it there is a lot of traveling that an instrument is expected to do and it still needs to look and sound good when it arrives. However it needs to be balanced with the fact that a lighter finish is better acoustically than a thick or heavy one.

There are many good finishes available including Danish oil, lacquers, Oil varnish etc.

We use nitrocellulose lacquer because it is easy to use and repair if damaged. Its light weight is good on acoustic instruments. This is a good time to apply finish to tail piece, knob, key chest and any other pieces to be finished.

Parts Needing to be Finished: Body, Key chest and cover, keys and buttons (if not already done), bridges optional, Wheel cover, wheel cover anchor blocks, tail piece, Knob, and sympathetic string blocks if you chose this option. Check all of these pieces and make sure that they are sanded, ready for finishing. Lay out wheel cover anchor block stock, mark and cut it, sand and fit it according to plans before finishing it.
(page 2, part 3)

General rules for a good finish

Your final surface will only be as good as the surface you begin with

Work up from 120 grit sand paper to 220 grit making sure to remove any traces of glue and sanding marks. Always finish sanding **with** the grain, removing all cross grain sanding marks

Choose the finish that best meets your needs and application ability. Read labels carefully

Work in a clean dust free environment as much as possible when finishing

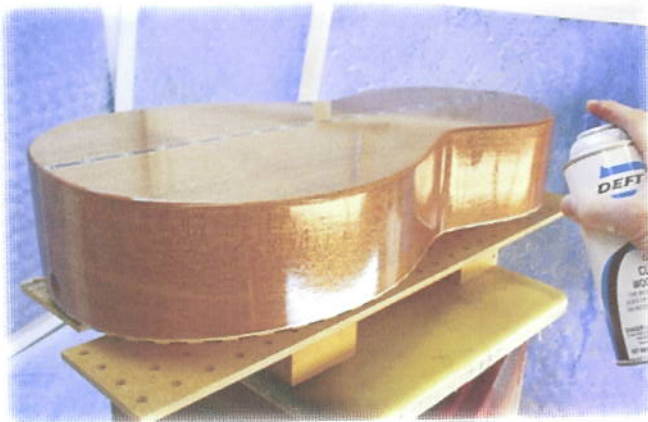
Avoid runs and orange peel by keeping the recommended distance from the surface and applying light coats if spraying finish

Be sure that each coat is entirely dry before sanding and applying the next coat. When using a sprayed lacquer sanding is good between every two or three thin coats. Be careful not to sand through to the wood

Finishing your instrument

We finish our instruments with a sprayed nitrocellulose lacquer in our spray booth. We use the aerosol application shown below only for small touch ups. Different finishes have different rules for application so we suggest you consider this and then use the medium most agreeable to you. Read the directions on the container carefully. You can also find finishing instructions in wood working books, magazines, and the inter-net. We will be glad to answer any questions you may have by e-mail or phone.

Remember, light sanding between each 2 or 3 coats when using lacquer may seem tedious but will give you the professional finish your hurdy-gurdy deserves.



Attaching Key Chest To Body

Preliminary step; take out parts. Compare to plan and familiarize yourself with the parts, plans, and steps.

In preparing key chest for installation, you will lay a piece of sand paper, rough side up, on the top of the finish on your instrument. Be very careful to remove any loose grit from the paper surface before laying it on the Gurdy top and again gently remove any loose grit that may have fallen onto the top. Even the smallest amount may scratch the surface you have so carefully finished.

1. Fitting and placement of key chest

- Glue and clamp $\frac{3}{4} \times 7/16 \times 3$ " spacer block on bottom of wheel end of the key chest according to plan.



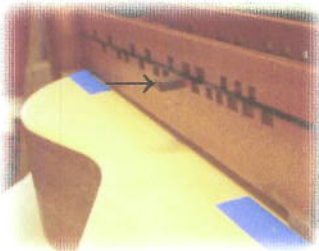
When glue is hard, fit key chest block to arced top of instrument by putting a sheet of 120 grit sand paper on top of instrument, grit side up over center line rubbing key chest back and forth length wise on the paper until

you have the arc of the top sanded in the block.

This is a very gentle arc and will take very little sanding.

Remove sand paper and gently clean all grit off top before moving to next step.

- Determine left and right exact position of key chest on instrument by centering with wheel shaft and peg head block, When centered use painters tape to mark left and right exact position.
- Put lower 7th key in key chest,



At this point you may either temporarily install the wheel for measuring and placement of key chest or consider it your final installation. However you need to protect the wheel from any damage, and may decide to remove it after the measurements are taken and re-install it in the final assembly section. See pages....for instructions.

2. Fitting and placement of chanter bridge

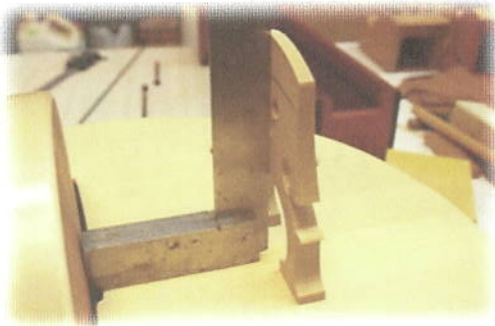
Fitting and locating the chanter bridge temporarily will give you the position of the key chest lengthwise along center line. Bridge will be permanently installed later. See bridge installation section.

Sand bridge feet to fit instrument in same manner as the key chest block so that:

Bridge face toward wheel is at a 90 degree angle to the top of instrument.

Feet are in full contact with the arc of the instrument top

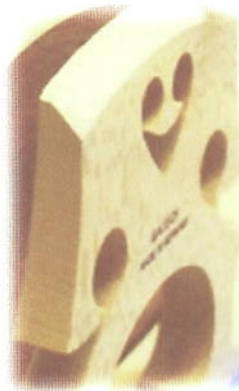
Light pencil markings will let you know when all of the surface has been sanded.



Set bridge next to wheel and mark height 1/8" above wheel as pictured here.

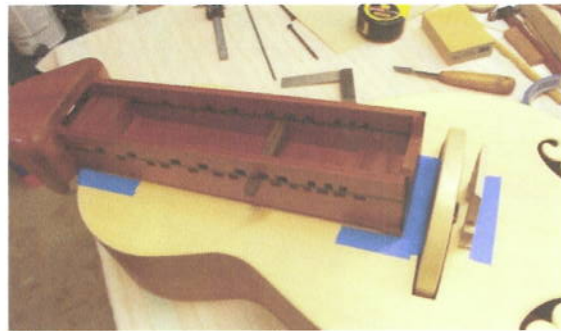
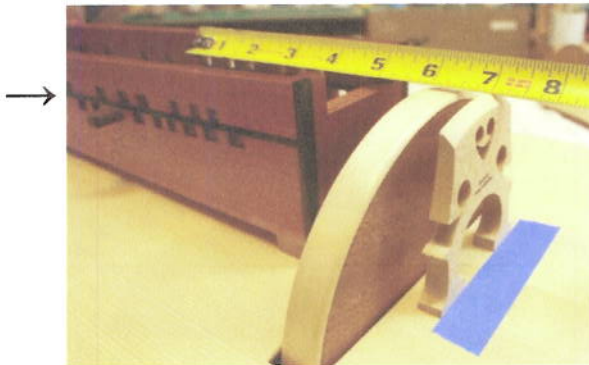
Cut off excess,

Taper from back side as pictured with sanding block or file and sand smooth.



Lay out chanter bridge position according to plan. There should be about a $\frac{5}{8}$ " space between the top of bridge and wheel). Mark with painters tape.

The distance between center of 7th key along string path to the top of bridge must be $6 \frac{15}{16}$ " Move key chest as needed to get this exact measurement. This is your final position of key chest. Mark front position with tape. See picture below.



3. □ Mounting key chest to top. Set chanter bridge aside until needed in final setup.

Check plan for position of screw & mark with center punch,

Drill $\frac{9}{64}$ " hole for $3 \frac{3}{4}$ " long screw that goes through peg head into peg head block in the body. Use counter sink bit to accommodate the flat head screw.



Take key chest off body and enlarge screw hole in peg head by re-drilling the hole using an $\frac{11}{64}$ " bit. Cut cork to $1" \times 3" \times \frac{1}{16}"$ size and put cork in position at peg head, between key chest and instrument top. You may glue cork to key chest first. Place key chest in position on instrument.



Lightly wax screw for easy insertion, put in hole, and tighten firmly

Drill two 5/16" holes for the 1 5/16" dowel pins at the front inside corners of the key chest going through the key chest block (which you glued on in step 1) 3/8" deep (including the top thickness) into the brace below. You may need to angle the drill toward the brace to hit the brace center.



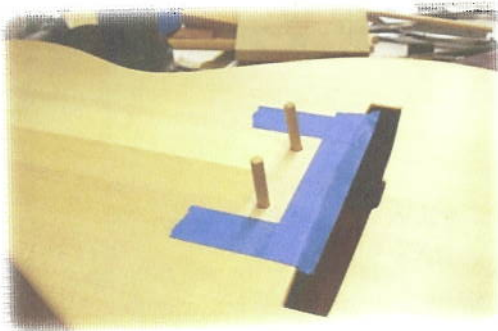
Remove long screw and mark back of key chest block with tape. Finish taping area around spacer block with blue painters tape. Set key chest aside and scrape all finish off the area inside of blue tape in preparation for gluing.



Scoring the edge of the area to be scraped with an exacto knife helps stay in area.



Use felt tip marker to darken one end of the dowel pins. This will be the end exposed in the key chest and makes them less visible. Lay out all parts and epoxy or glue for final assembly. We prefer the epoxy for its strength and filling potential for any gaps. Dry fit all pieces and make any last minute adjustments. Remove back piece of tape, but leave the other 3 sides to help with alignment and keep glue off the instrument surface.



Put epoxy on scrapped area, in both top and key chest holes, and on dowels. Assemble key chest over dowels and onto top. Put long screw back in and tighten well. Wipe off excess glue from around outside of key chest block (use q-tip for under key chest). Check fit and use clamp to hold it tight. Remove all tape before epoxy fully hardens.

4.□ Mounting adjustable nut in key chest

Nut should look something like this when installation is completed.

Check nut height with plan. It may need some sanding on bottom to get the correct angle for the strings.



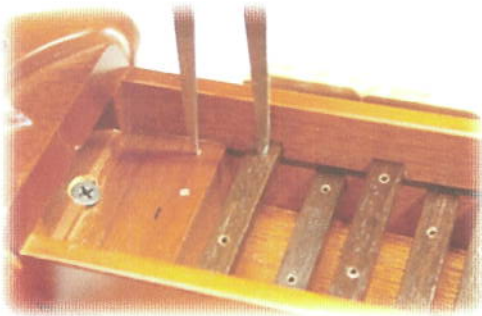
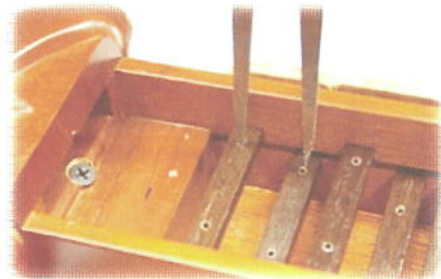
Position nut by:

Using dividing tool or some other instrument for duplicating a measurement, take the measurement between the two tangent holes closest to the nut position as shown in this picture

Add 1/16" and mark this position on nut mounting block.

Transpose this measurement to side of key chest for easier visibility.

This is where the front edge of the ebony piece in the nut sits.



Align front of ebony strip with the mark

Using a scribe or pointed tool, mark the place to drill the 1/16" hole in the center of the elongated nut holes. This will allow you to adjust the nut later when you tune your instrument.



Mark depth of hole needed with painters tape on your 1/16" drill bit

Drill two holes for mounting the nut.

Install 2 brass screws

If ebony piece is loose in the nut, glue it in.

Installing Wheel, Shaft, Bearings, & Crank Assembly

We will describe installing the wheel, shaft, and bearings here so you will have them in place for the key chest and bridge placements. We find it much easier and safer to remove them once the measurements are determined and marked until the final set up. Any damage to the wheel at this point can seriously affect your instrument. If you are an experienced builder you may choose to leave them in place and work around them.

Preliminary step; carefully read this section of manual. Compare parts to plan and familiarize yourself with the following steps. **When installing, note that the wheel hub ID is threaded on one end and bored to 3/8 on the other end. The shaft goes into the 3/8 bored end first. This is crucial to the correct orientation and fit of the wheel!**

1.□ Installing wheel, shaft, and bearing

Using a little grease from capsule in kit, put grease in the nose bearing as pictured & install the ball by either dropping it in the nose bearing with the peg head of instrument down or placing the ball in the bearing tool and letting it run down into the nose bearing.



○ Temporarily install the crank on the shaft and tighten the brass acorn nut on the shaft to prevent stripping brass threads. If using the “S” crank upgrade, no nut is necessary.

Hold the wheel in position and put shaft through end block into wheel hub
 Thread shaft into wheel and hand tighten
 Push assembly forward until shaft will go no farther and see if the wheel is centered in the opening front to back. If not centered, note which way and how much the wheel needs to go to be centered. Unthread and remove the shaft, and remove the wheel. Using the guide, adjust the nose bearing with the bearing tool to get it centered. Reinstall wheel shaft as above. Notice the block under the crank end of the pictured instrument. This will prevent the ball from falling loose in the instrument.



When wheel is centered remove crank nut & crank

Lightly grease the 45 degree chamfer in the tail block bearing & put the bearing on over the shaft.

Carefully thread tail block bearing into tail block using bearing tool as needed until the bearing is seated on the shaft. There should be just a little friction on the wheel. Test the wheel to make sure it is firmly in place by lightly grasping it and trying to pull it out of place.



2.□ Assembling and installing knob and crank

Using tooth pick spread a thin layer of grease from capsule inside knob bushing and under the head of the standoff bolt.
 Also put a little on the end of the bushing that touches the crank.



Put standoff bolt through knob so that head fits into the recess and thread into crank
Tighten lightly with allen wrench and install and tighten retainer nut. (*if you upgraded to the "S crank" see instructions below)



Carefully remove any excess bolt extending beyond nut



*If you up graded to the s-crank (pictured here), you will not need the nut to retain the standoff bolt or the nut to retain the crank on the shaft.



When the wheel, bearing, & shaft installation is done properly and the bearings are adjusted correctly, you should be able to flip the crank and get at 6-8 complete revolutions of the wheel.

Trompette & Bourdon and Chanter Bridge Installation

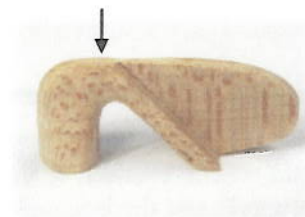
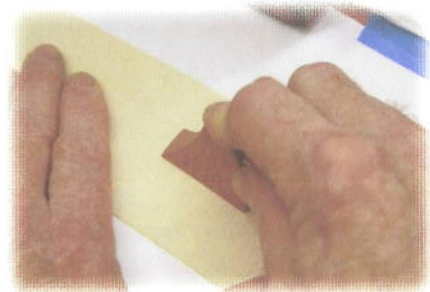
Preliminary step; take out parts. Compare to plan and familiarize yourself with the parts.

We usually install bridges as pictured below after the finish is on and well dried. It will mean that any surface to be glued will need the finish carefully scraped off. Glue does not adhere well to a finished surface! Either way you will need to use painters tape to protect the wood around the areas to be glued. Glue on the bare wood will leave light spots if finish is applied afterward. Glue on the finish will also leave discoloration. We have found blue painters tape to be our best friend when applying glue to any surface. We also suggest that you do your bridge installation before installing the tail piece. Unfortunately pictures below show the tail piece already in place but it only gets in the way and can just as well be put in place later.

1. □ Preparing for bridge installation

- Sand and round over sharp edges on bridges
 - sand underside of bridge surfaces to the contour of the top of the instrument by placing a piece of 120 grit sanding paper on that area of the top and sliding the bridge back and forth until it matches the contour of the top. **Be careful not to scratch the top with stray sanding grit.**
 - Lay out bridge position according to plan measuring from where the string enters the peg head block to the front of the trompette and bourdon bridges and put a piece of painters tape down marking that line
 - tape outline of base position on instrument top
 - We use two 5/16" blocks of wood to hold a straight edge in place while we position the bridge left and right in relationship to the center line of the instrument.
 - With the Straight edge laying exactly flat on the 3 degree band of the wheel, position the bridge and dog so that the edge of the ruler goes over the correct string position on the dog.
 - Bridge must be positioned so that the straight edge is over the top of the dog where string rests.
 - Tape surface at either end of bridge outline.
- Pictured here is a double buzzing bridge. Your instrument has a single buzzing bridge but the steps are the same.**

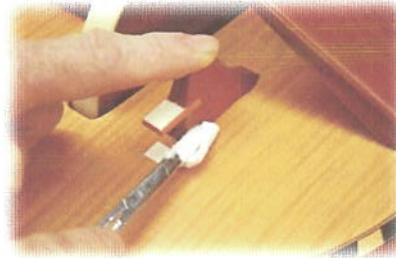
This is a good time to also glue the Chanter bridge in place, doing one bridge at a time to assure correct positioning and clean up of glue residue.



Carefully tape around all pieces to be glued, keeping tight to the edges.



If your instrument has finished surface, scrape **all** finish from the surface to be glued.

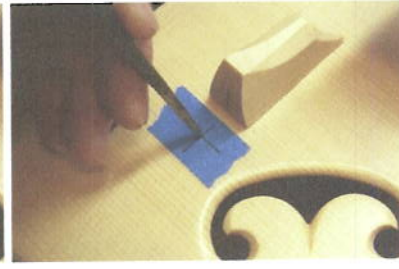
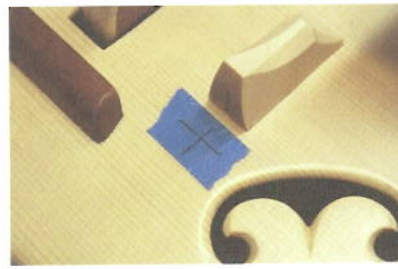


Position the trompette and drone /bourdon bridges according to the plan and put 4" pieces of tape one on each side of the bridges. Use either epoxy or yellow glue to install the bridges in place. Make sure no glue or epoxy is in the dog notch. Clean carefully around edges of bridge especially if you use epoxy



These pictures show a 6 string double bridge kit. Kits are available in several combinations of strings and dogs so pictures may not reflect your specific kit. The assembly instructions however are the same unless otherwise noted.

Dogs are shown here with a bone plate. Kits unless otherwise ordered, will have a 5/16" pearl dot instead.



2.

Inlay pearl dot:

Install dog in bridge over a piece of painters tape

Mark the center of the foot on the tape

Use a punch mark the center of the hole for drilling

If you have a drill press with a depth stop for drilling then you will be able to use it to drill the desired depth hole without danger of drilling through the top. This is a good tool to use if possible. Set up the depth stop on the drill press for a 1/10" deep hole in the top and test drill a piece of wood with the 5/16" forester bit to check for a good fit on the dot and a clean cut hole.

a hole. Protect instrument back from scraping on the drill press table and be very careful not to drill through the sound board!



If you plan to make the hole with a hand drill then test drill a piece of wood with the 5/16" forester bit to check for a good fit on the dot and a clean cut hole and to see if you can control the depth of the hole.

If you cannot control the hole depth or the bit doesn't work well then do not try to install the dot. The dog will work just fine without the dot to buzz on.

If you can control the depth and the hole is a good fit for the dot then continue and drill the hole 1/10" to the exact depth of the dot exercising great care to not drill through the top.



Remove the tape for drilling

Use a forstner or brad point clean cutting 5/16" bit,

Drill a flat bottom hole the depth of the dot,
centered at foot of the dog.

Confirm that the hole is as deep or deeper than the dot thickness

Glue in the dot with 12 Minute epoxy and press it into place with a soft flat piece of wood so it goes in flush with the surface and not below the surface.



Carefully wipe off excess glue without disturbing position of the dot. If dot moves reposition it with the soft flat piece of wood.



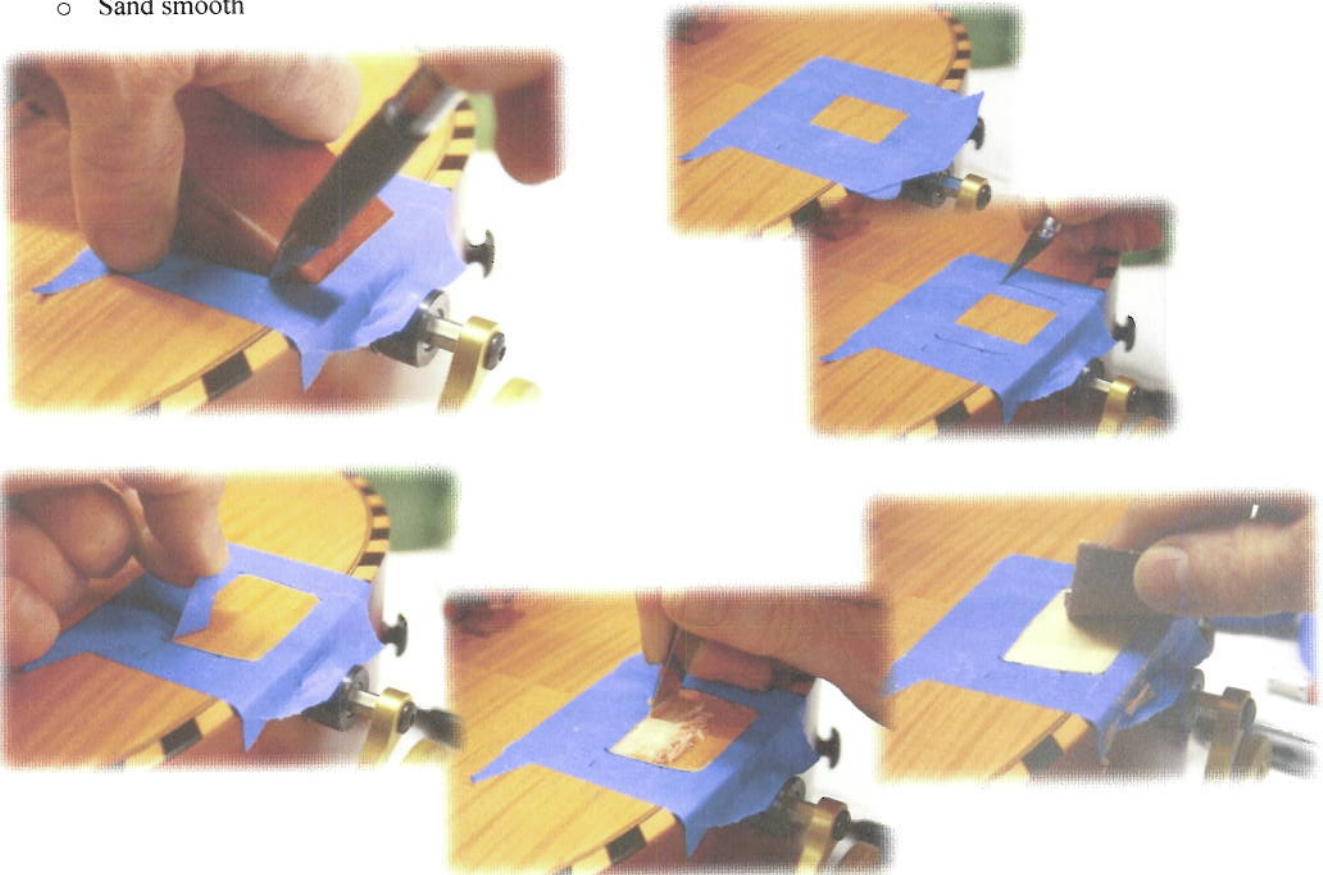
Installing Tail Piece

As with many aspects of this kit, there are several ways to do many of the installations. Some are the result of experience and others are the result of inexperience. We will always tell you how we prefer to do it and if there is a simpler way we will defer to that. Our top line gurdies use the following mount for the tail blocks. There are two other ways that work as well. The only drawback is their visibility. You may glue the block in place on the flat surface and then use two pins or two screws put in from the top to secure the installation. Both are simpler and less fussy, but do show from the top of the instrument. Further instructions are at the end of this section. You will notice that we have lacquered/finished this instrument before mounting various bridges, tail block, etc.

Preliminary step; take out parts. Compare to plan and familiarize yourself with the parts.

1. □ Preparing top for tail piece

- Mark exact location of tail piece according to plan set
- Outline surface to be glued with blue painters tape
- Mark base of tail piece and trim tape to match
- Score with craft or exacto knife
- Peel off excess tape and scrape finish off the area to be glued
- Sand smooth



Locate and drill dowel holes $\frac{5}{16}$ " deep in under side of tail piece with $\frac{1}{4}$ " bit being careful not to break through surface.

Put locator buttons in place and mark position of dowel holes in top.

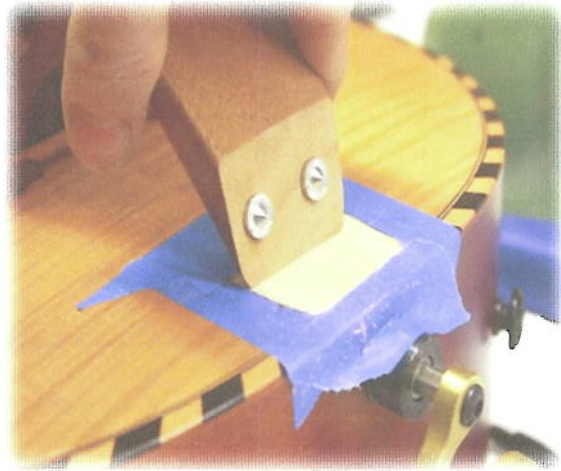
Drill dowel holes $\frac{1}{4}$ " x $\frac{5}{8}$ " deep

Dry fit dowels in tail piece and top.

When fit is good, glue dowels in top and tail piece

Hold tight in place until glue hardens a bit.

Clean excess epoxy from around base and remove tape before epoxy hardens.



Clean excess epoxy from around base and remove tape

Alternative instillations:

1. Using drywall screws

Holding tailpiece in place, Pre drill and counter sink for two $1\frac{1}{4}$ " dry wall screws through tail piece and into the end block.

Secure tailpiece in place with the screws & gluing as above.

While this is an easier method, you may want to cover screw heads with a thin screw cap or other creative form of disguise.

2. Using brass rod

Glue tailpiece in place

Drill through tail piece & top into tail block for two $\frac{1}{8}$ " x $1\frac{1}{4}$ " brass rods (not included).

Epoxy rods in place and trim and file rods flush

Preparing and Installing Tangents



Preliminary step; Compare to plan and familiarize yourself with the parts

Before you begin: We have included wood tangents in the Monarch Kit for both economical and ease of installation reasons. If you upgraded to the metal tangents, go to section 2. Both wood and metal tangents come in two heights. The taller tangents go on the lower row of keys. It is much easier to install the lower row of tall tangents first and then the upper row. Also be careful to put the keys in the hole they were fitted to (this is where the numbers come in handy) and with the button end on the correct side of the key chest. The safest way is to look carefully at the plans. In both types of tangents it is important that the screws are started in straight. Since you have already drilled and tapped the holes, there should be minimal resistance. If they go in hard, stop and check for alignment. In some cases we have used pictures of a different gurdy to illustrate a certain point so if the picture doesn't look exactly like your Monarch don't worry!

1. □ Installing Wood Tangents

Put lower row keys in their corresponding holes.

- Check plans to make sure that the buttons are on the correct side of your instrument. It is discouraging to discover later that you have to take all the tangents off and turn the keys around.
- Using Phillips screwdriver, put screw through the wood tangent and into the hole in the key. Tighten lightly.
Tall $3/4^{\text{th}}$ " tangents go in lower row of keys. It is easiest to do these first.
- Next install shorter tangents($3/8^{\text{th}}$ ") in upper row of keys.
We will adjust the tangents later in the tuning section.
- Cut and carefully glue felt or adhesive backed foam strip on top inside edge of key chest on button side being careful not to get glue near keys. This picture is not a Monarch but shows the placement of the felt or foam strip. This strip provides a sound dampening bumper for the Tangents.



2. □ Installing Metal Tangents

This is best done before the lid is installed. Ignore picture!

Beginning with the **lower row**, put lower row keys in their corresponding holes. **Be sure that the tab on the button end is Down.**

Check plans to make sure that the buttons are on the correct side of your instrument. It is discouraging to discover later that you have to take all the tangents off and turn keys around.

Using the allen wrench put a 4-40 socket head tangent screw into hole, gently tighten down on 3/4" tangent foot.



The row of tangents closest to the buttons are installed all the way against the screw.

The row of tangents farthest from the buttons are installed about 1/8" out from the screw on the adjustable foot. This allows for tangent adjustment in both directions.



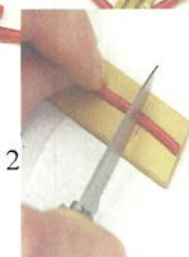
Next install shorter tangents in upper row of keys.

Remember: Do not tighten hard and if there is any resistance, check alignment. We will adjust these in the tuning section.

Cut and carefully glue felt or foam strip on top inside edge of key chest on button side being careful not to get glue near keys. This picture is not a Monarch but shows the placement of the foam or felt strip. The strip provides a dampening bumper for the tangents.



If you are using sleeves on your tangents: The sleeves shown here allow another form of adjustment. They can be used for muting string contact noise, which will progressively lesson with the softer sleeves. The softer sleeves also make it easier to slur from one note to another. Tangents are fine with no sleeves if you want more of a treble sound. If using heat shrink tubing cut it to length and use a match or lighter to shrink the tubing on the tangent as shown. Install heat shrink sleeves before mounting tangents in the instrument.



Key Chest Hinge & Magnet Installation

Preliminary step; set out coil hinges, key chest, and lid. Compare to plan and familiarize yourself with parts. Small conventional hinges may be used in place of the traditional wound hinges.

Remember key chest gets hinged on **opposite** side of the key buttons. We found it easiest to install tangents before installing lid.

Installing hinges on lid

1. □ Cutting hinge mortises

- Confirm that hinges are same size as pictured on plan set
If not, lay out each individual hinge according to the size of that hinge but keep them in the same general place that the plan calls for.
- Mark hinge placement using knife to notch ends of hinge recess
- Cut recesses at a 45 degree angle.
We like to do a series of shallow notches to control the depth of cut and then clean out the notched area. You could also use a file to make these recesses.
- Cut depth should be a little less than 1/2 the diameter of the hinge



Please notice due to the construction of the wound hinge, One set of legs is a little wider. Be sure that your hinge orientation is consistent through out the hinge installation process.



Drilling holes

2. □

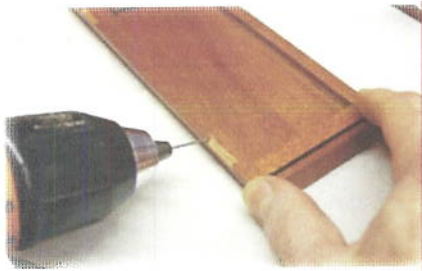
- Laying the actual hinge legs in the mortise, mark and center punch for drilling the holes.



- Use a drill bit just a little larger than the hinge wire size to drill the holes.

Holes need to be at an angle that allows for curling the hinge ends once mounted.
The angle must incorporate enough stock to prevent the hinge from breaking wood loose.

Installing hinges on key chest body



Please notice due to the construction of the wound hinge, One set of legs is a little wider. Be sure that your hinge orientation is consistent throughout the hinge installation process.



1. □ Cutting hinge mortises in key chest

Position the lid on key chest

Mark hinge placement using knife to notch ends of hinge recess
Cut recesses at a 45 degree angle.

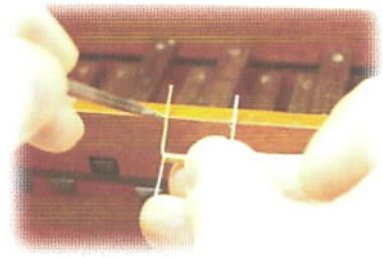
We like to do a series of shallow notches to control the depth of cut and then clean out the notched area. You could also use a file to make these recesses. Cut depth should be a little less than 1/2 the diameter of the hinge



2. □ Drilling holes

Laying the actual hinge legs in the mortise, mark and center punch for drilling the holes.

Use a drill bit just a little larger than the hinge wire size to drill the holes. Holes need to be at about a 30 degree angle to allow for curling the hinge ends once mounted and leave enough stock to prevent the hinge from breaking loose.



Cut all legs to the same length keeping them as long as possible
Round over sharp edges
to test fit, gently push legs into holes



Insert each hinge into its slot in the lid, pushing the legs in the correct holes. Using a pair of needle nose pliers, twist the end of each leg to form a circle.



3. □ Key chest magnet closure installation

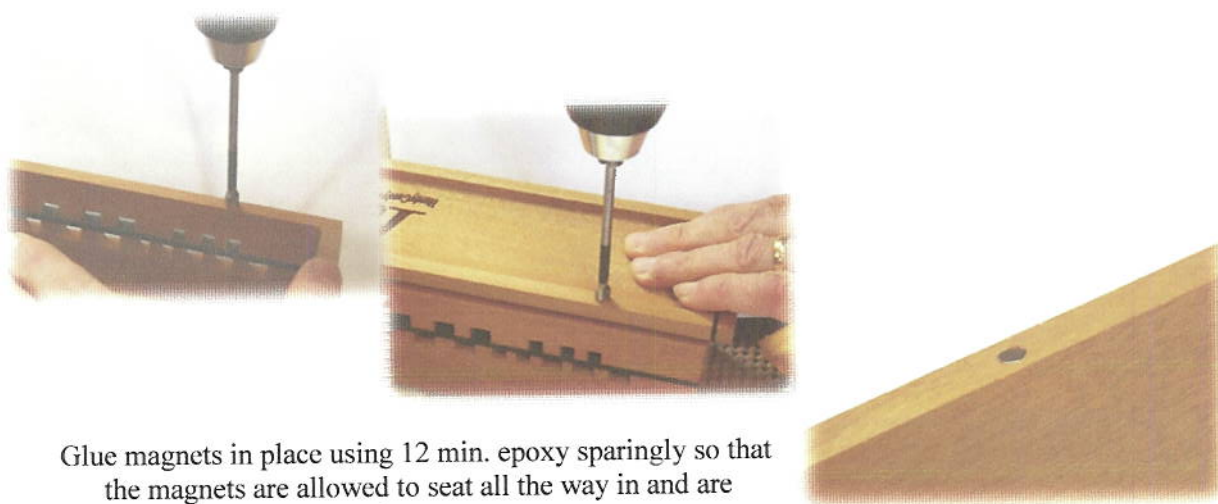
Rare earth magnets are a good way to keep your key chest closed and they allow for quick easy access to the inside of the key chest where we usually store cotton in the nut area.

Two 1/4" magnets will be installed that work together to do the job

Mark magnet position in both the key chest side (button side) and corresponding lid position

Drill with 1/4" clean drilling forester bit about 1/8" deep to allow the magnet to be flush with the surface.

Center picture shows lid upside down on key chest . No reason, we just flipped it over for convenience.



Glue magnets in place using 12 min. epoxy sparingly so that the magnets are allowed to seat all the way in and are not held up by too much epoxy.

