

PianoDisc

LPS

Installation Manual for the *PianoDisc Low Profile System*

Version 2.5

Nov. 2019

PianoDisc
4111 North Freeway Blvd.
Sacramento, Ca. 95834
www.pianodisc.com
(916) 567-9999 Fax (916)567-1941

TABLE OF CONTENTS

Table of Contents.....	Page 2
Introductory.....	Page 3
Step 1 - Disassemble the Piano.....	Page 4
Step 2- Remove the Keybed.....	Page 9
Step 3 – Measure the back key spacing for key solenoids.....	Page 13
Step 4 – Take keyframe measurements.....	Page 18
Step 5 – Create back rail bead on keyframe in necessary.....	Page 21
Step 6 – Cut the keyframe.....	Page 22
Step 7 – Mark the location of the solenoid rail slot.....	Page 24
Step 8 – Prepare to cut the solenoid slot.....	Page 28
Step 9 – Cut the solenoid slot.....	Page 29
Step 10 – Reinforce the keybed.....	Page 32
Step 11 – Assemble tray, end plates, solenoid rails and guide solenoids.....	Page 32
Step 12 –Locating and installing service tool inserts.....	Page 36
Step 13– Cut legs to fit solenoid slot.....	Page 37
Step 14 – Installing the trap work.....	Page 38
Step 15 – Adjust key solenoid plungers.....	Page 57
Step 16 – Installing key solenoids.....	Page 58
Step 17 – Plug in driver boards.....	Page 61
Step 18 – Setup for burn in.....	Page 63
Step 19 – Burn in the unit.....	Page 65
Step 20 – Install driver boards into tray assembly.....	Page 65
Step 21 – Drill hole thru belly rail for wires.....	Page 66
Step 22 – Mount CPU.....	Page 66
Step 23 – Mount the power supply.....	Page 67
Step 24 – Mount power strip.....	Page 68
Step 25 – Install keybed to piano.....	Page 69
Step 26 – Regulate action.....	Page 69
Step 28 – Set up communication with the PD system.....	Page 70
Step 29 – Adjust pedal solenoid.....	Page 71
Step 30 – Final check list.....	Page 71
Step 31 – Ground strap installation.....	Page 72
Appendix A – Keybed removal.....	Page 73
Addendum 1 – Steinway Sostenuto.....	Page 74
Addendum 2 – Keyframe modifications/shift lever.....	Page 75
Addendum 3 – Sostenuto Jig.....	Page 76
LP Service Tools.....	Page 77
PianoDisc Parts ID.....	Page 80

Low Profile PianoDisc Installation Manual

This installation manual will guide you through the process of fitting a PianoDisc reproducing piano system to virtually any grand piano. Along with the knowledge and experience gained from a PianoDisc Installation Seminar, this guide should be an invaluable resource.

Information contained in this manual is considered confidential by PianoDisc, and is for the sole use of PianoDisc Certified Technicians. It may not be reproduced, distributed or quoted in whole or in part without the express written permission of PianoDisc.

The installation instructions in this guide pertain only to the PianoDisc Low Profile Reproducing System. PianoDisc Reproducing Systems may ONLY be installed by technicians certified by PianoDisc as qualified to perform such installations. If you have come into possession of this manual and / or a Retrofit Kit and you are not a PianoDisc Certified Technician, DO NOT ATTEMPT TO PERFORM THIS INSTALLATION.

Installations not performed by a certified PianoDisc technician WILL NOT meet the requirements for warranty protection from PianoDisc and likely such an installation would also void the piano manufacturer's warranty. Installation mistakes may cause violations of FCC regulations that could result in an enforcement action by the FCC.

Technicians may be certified by attending a PianoDisc Installation Seminar. Another option for the technician is by attending an onsite training evaluation and certification class conducted by a PianoDisc Factory Installation Technician duly authorized to certify technicians.

A candidate for PianoDisc certification should be a Registered Piano Technician (RPT) and thus certified by the Piano Technicians Guild (PTG). A candidate who does not qualify under this rule will be evaluated on an individual basis with emphasis on total experience as a piano technician and possible previous experience in retrofitting pianos with other player piano mechanisms.

In the interest of continuous improvement, we encourage piano technicians to comment on this installation manual by writing to:

Piano Disc
4111 North Freeway Boulevard
Sacramento, CA 95834

You may also fax your comments to PianoDisc at this number. (916) 567-1941.

Technical support for PianoDisc Certified Technicians is available Monday through Friday, 8AM to Noon and 1PM to 5PM Pacific Time at (916) 567-9999.

1. Disassemble the piano

NOTE: Text in BLUE refers to keybeds that are removed from the piano.

A. Inspect the piano

- While the mover is still present, inspect the piano thoroughly pointing out any damage and the information should be documented on inspection form with the mover's signature.

NOTE: Once you sign off on the mover's paper work you assume any damage found on piano if not reported.

- It is also important record the damage on an inspection sheet and pictures if possible.

B. Remove the music desk, fallboard and keyslip from the piano.

- The music desk is easy to remove as it will typically just slide or lift out of the piano. It is a good idea to carefully place all case parts so they will not be damaged while the piano is being worked on.
- Some keyslips are held down by a wedge between the keyslip and the keyblocks. To remove this type of keyslip, remove the screws holding the keyblocks down against the keybed. Often there is a folding wing nut on the bottom of the keybed making this type of keyblock quite easy to remove. If the fallboard is not mounted on the keyblock remove the keyblocks from the piano and then remove the keyslip.

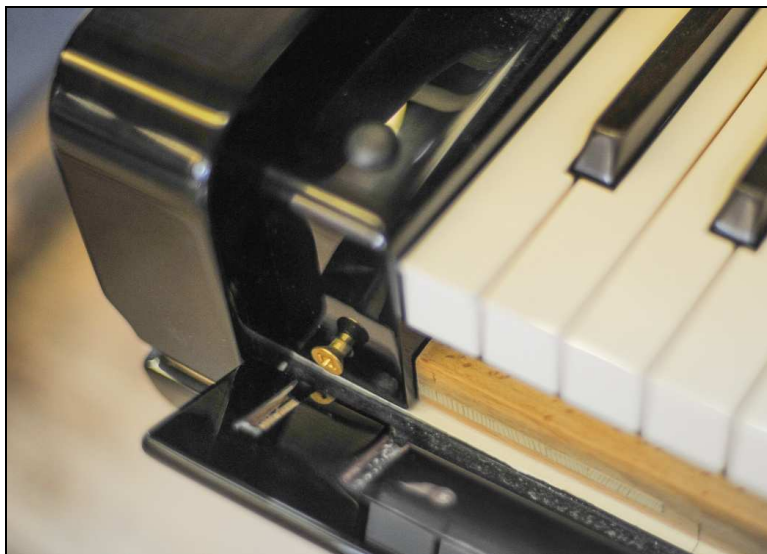


Illustration 1 – Keyslip & screw

- Another type of keyslip is designed with a slot in the back side of the keyslip that slides friction tight over a hidden screw in the end of the keyblock. On this style the keyslip will slide up and off the screw head in the end of the keyblocks. (See Ill. 1)

- Some fallboards are attached to the cheek blocks at each end of the keyboard. On this style the screws holding the cheek blocks must first be removed. Typically the screw is found directly underneath on the keybed. After the fasteners are removed, the fallboard and keyblocks are removed as a unit. Be careful as the keyblocks often come off the fallboard easily when the piano no longer prevents them from doing so.

C. Mark the location of the keyframe on the keybed.

- Make sure that during removal of the fallboard and keyblocks, the keyframe has not moved. If there is any doubt, put the keyblocks back into place and use the keyframe guides in the keyblock to position the action correctly. Gently remove the keyblocks being careful to not move the action. Draw a line around the keyframe on the keybed. This will help you place the keyframe correctly later in the process.



Illustration 2 - Marking front of keyframe

- Make side to side marks on the front rail to aid in positioning the keyframe later in the process. Get a piece of wood (anything will do) 1 (25mm) to 2 (50mm) inches square with a square end. (See Ill. 2) Mark 3 positioning lines between the front rail and the keybed equally spaced across the keyframe. Place the piece of wood against both the front rail and the keybed. Without moving the block of wood, use a pencil to mark a line on both the front rail and the keybed. These positioning lines will ensure that you will be able to place the action side to side later in the process.

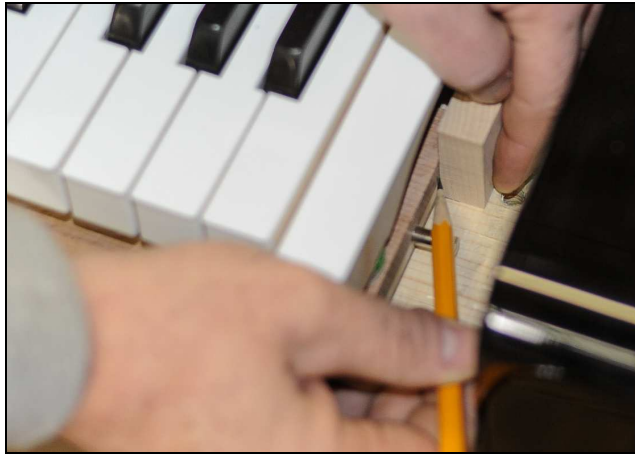


Illustration 3 - Marking side of keyframe

- Make front to back marks between the end of the keyframe and the keybed. These marks will help you position the keyframe accurately front to back later in the process. Remove the keyblocks without moving the keyframe. Using the same process as on the front rail, place the block of wood against both the keybed and the keyframe and make alignment marks for front to back positioning using a sharp pencil. Do this at both ends of the keyboard. (See Ill. 3)
- You now have the ability to easily position the keyframe on the keybed whenever that is needed during the process of installing a PianoDisc system in this piano.

D. Measure key height.



Illustration 4 - Measuring key height

E. Front Key Height.

- Key height is an important measurement that must be taken at this point. (See Ill. 4)
- Later you may need to set the height of the keys back to their original height.
- Use a ruler to measure from the top of the keytop to the top of the keybed.

F. Remove the action from the action cavity.

- With your hand vertical and the guide pins between your fingers, pull the action from the action cavity and place it on a workbench.
- If the piano arrives at your workshop on its side the action is nearly impossible to remove because the hammers are rotated up from the rest cushions. To solve this, you will need to tilt the piano in order to remove the action from the piano. Use a rubber mallet to tap on the keybed to help hammer settle to their rest position.
- New pianos shipped in a crate usually have the hammers tied down. If this is the case you can remove the action from the action compartment while the piano is still on its side.

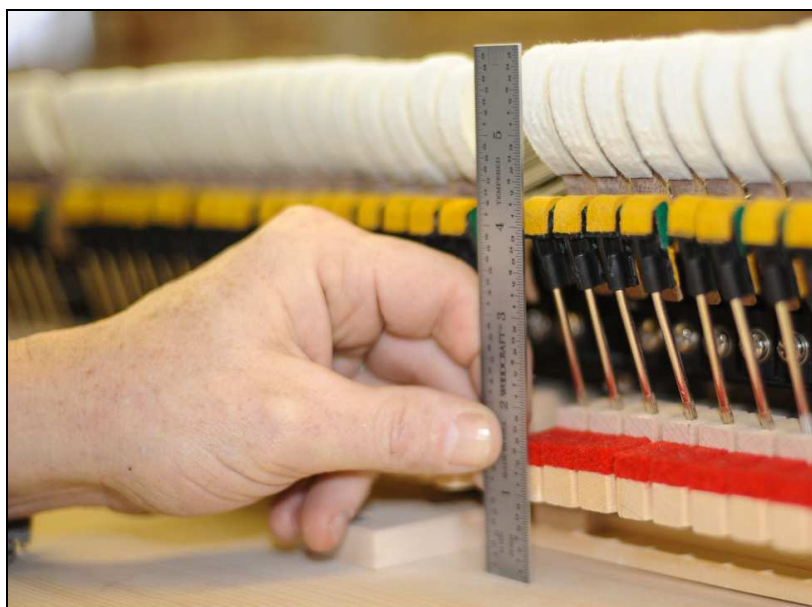


Illustration 5 - Measuring key height – back

G. Back Key Height.

- You will need this measurement later on to calculate the length of the solenoid plunger.
- Use a ruler to measure the distance between the bottom of the key and the keybed. Do this at the end of each section of the piano. Likely you will see variance in these numbers. (See Ill. 5)



Illustration 6 - Sostenuto hook

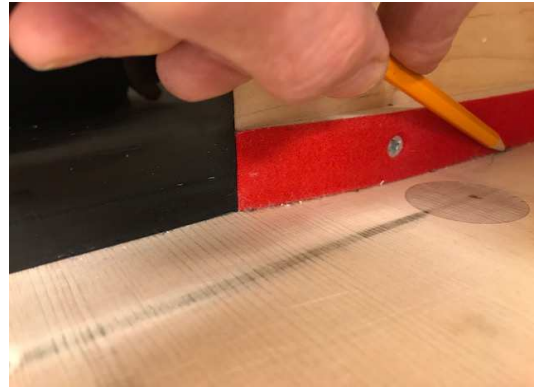


Illustration 6a – Draw line for reference

H. Mark the Center location of the sostenuto hook on the keybed and reference line at action stop.

- Disconnect the sostenuto pitman from the sostenuto hook.
- Use a 6" (15cm) rule to find the center of the sostenuto hook.
- With the square transfer this mark to the keybed. (See Ill. 6)
- Draw a reference line at the keyframe stop to locate keyframe to keybed for later use. (See Ill. 6a)

H. Lid removal.

- It is optional as to whether or not you remove the lid.
- Tape the hinge pins to the appropriate hinge to ensure that the hinge pins do not get lost during the installation.
- If you remove the lid, as with the other case parts, store in a safe location and in a safe manner so no damage will result.
- If you leave the lid on the piano secure the lid with a rubber band or soft cotton rope so it cannot fall.



Illustration 7 - Piano on side

I. Place the piano on its side.

- At this point, place the piano on a skid.



Illustration 8 – Outline leg on keybed



Illustration 8A – Mark leg location

J. Mark leg locations on the keybed and legs.

- With the piano on its side, use a pencil to draw the outline of the left and right legs.
- On the top of each leg mark the location on the piano. (See Ill. 8A)
 - Customarily, the bass keybed leg is #1, the treble keybed leg is #2 and the leg under the bass bridge is #3.
- This information will be indispensable later when portions of the legs will likely be cut away.

2. Remove the keybed (if possible).

A. Determine if keybed removal is possible.

- If possible, the job of installing a PianoDisc system is much easier if the piano allows you to remove the keybed from the instrument.
- Many, but by no means all, newer pianos allow removal of the keybed. A number of older pianos, as well as all Steinway pianos, do not.

B. Check Appendix A of this manual.

- Appendix A, page 74 of this manual contains a list of piano makes with easily removable keybeds.
- While PianoDisc has tried to help you out here, this list cannot possibly be all inclusive.
- However, if the piano you are working on is not on the list the keybed may still be removable.

C. If in doubt, check to see if the keybed is glued onto the rim and belly rail.

- If the keybed is not glued to the rim and belly rail you will be able to remove the keybed.
- If you find that the keybed is removable do so. Otherwise you will be working inside the action compartment rather than on the bench. On the bench is much more convenient and sensible if possible.

D. Set up locating pins for the keybed.

- Check to see if the manufacturer included position pins. (See Ill. 9)
 - It is important to get the keybed back to its original location.
 - Also, with the pins in place, it is much easier to remove and install the keybed.

- When you remove the keyed screws the locating pins will keep the keyed from falling until you are ready to physically move the keyed to a bench.



Illustration 9 - M&H locating pin



Illustration 10 – PianoDisc stainless steel locating pin

- Locate the PianoDisc stainless steel positioning pins in the kit. (See Ill. 10)
 - The pin is sturdy and because it is made from stainless steel will not corrode.
- Mark for two locating pins.
 - PianoDisc prefers location pins at the end of the arms.
- Note: Drilling the holes for the locating pins is a two-step process. The hole in the rim or the belly rail needs to be an interference fit, that is, the hole should be smaller than the pin by about $1/64''$ (.4mm). The hole in the keyed should be larger than the hole in the rim or belly rail, about the actual size of the pin.

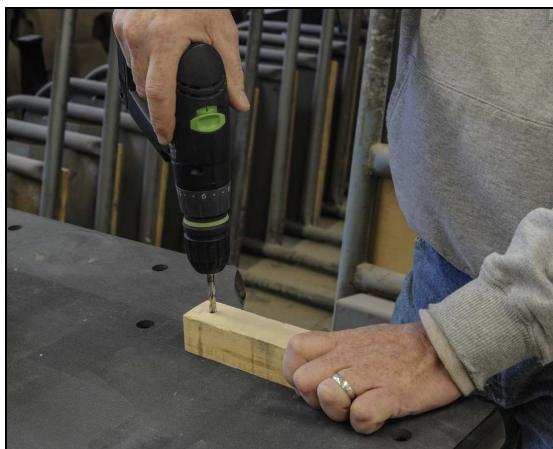


Illustration 11 - Wood drill guide

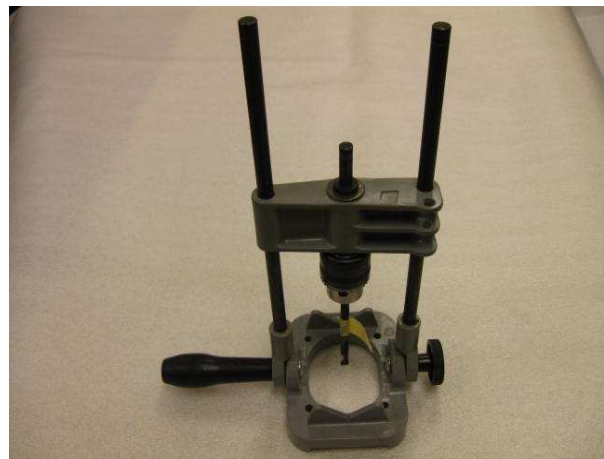


Illustration 12 – Store bought drill guide

- Drill the hole in the rim or belly rail.
 - Choose a drill bit about $1/64''$ (.4mm) smaller than the pin you intend to use.
 - Drill through the keyed so that the hole in the rim is about $1-1/2''$ (40mm) deep.
 - Make sure you drill in a true vertical to the keyed surface because angled pins will make your life quite difficult when removing and re-installing the keyed.
 - Use a drill guide to drill a straight hole. (See Ill. 11 and 12)

- Drill the clearance hole in the keybed.
 - Measure the thickness of the keybed.
 - Select a drill bit as close to the actual size of the locating pin.
 - Tape a flag on the drill bit so that the depth you drill corresponds to the thickness of the keybed.
- Drive the location pin into the hole until it is flush with the keybed.
 - When pounding in a locating pin it is important to not mushroom the head of the pin.
 - To this end use a hammer that is softer than the pin.
 - A good choice is a brass or plastic hammer.

E. Remove the keybed.

- Prepare saw horses, or some other support, on which to put the keybed after you remove it from the piano.
- Remember that the edges of the keybed are finished so be careful.
- Remove the screws holding the keybed onto the piano.
- Lift the keybed off the locating pins and place the keybed upside down on the saw horses.
 - A rubber mallet may be necessary.



Illustration 13 - Belly rail with pin

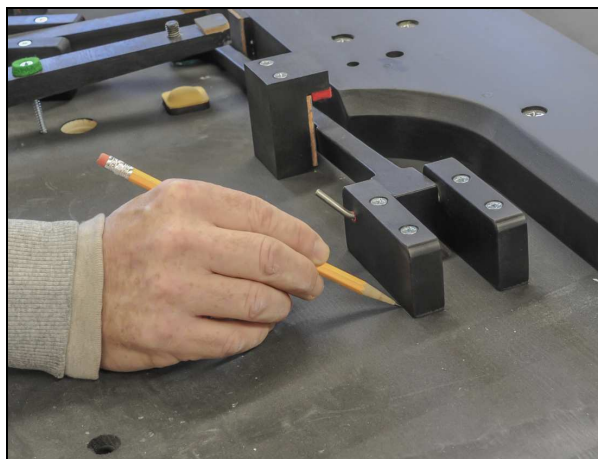


Illustration 14 - Mark shift lever blocks on keybed

F. Mark the location of the shift lever support blocks on the keybed.

- Draw a line around the blocks that support the shift lever. Later on you will use these lines to decide if you need to move the pedal lyre forward. (See Ill. 14)
- PianoDisc supplies **optional** metal shift lever bracket kit that can eliminate or minimize the moving of the shift lever and lyre. Not all pianos need this but nice to have on hand. (**Not supplied in kit.**)
 - The shift lever kit # 5650-21025 (\$15.00)



Illustration 14A Shift Lever Kit



Illustration 14B - Shift Lever Brackets Installed

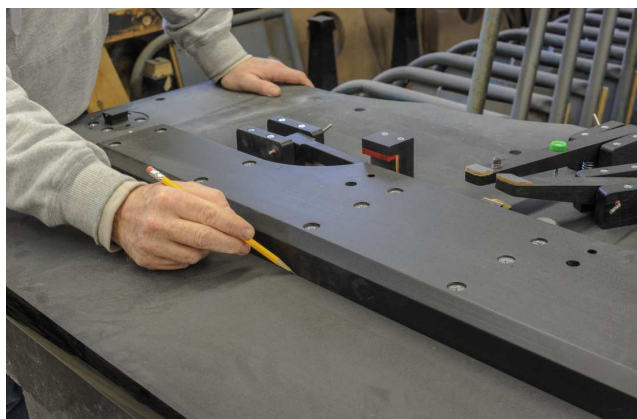


Illustration 15 - Draw line around keybed log

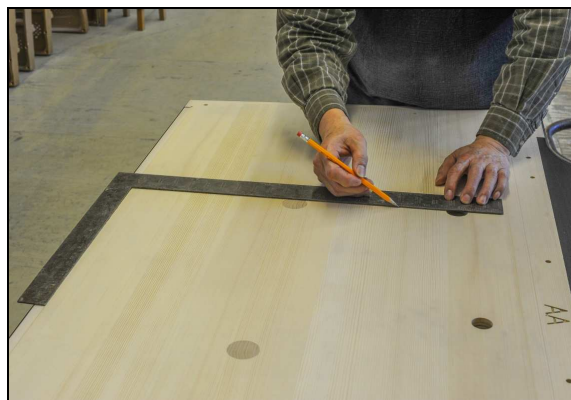


Illustration 16 - Mark Sostenuto pitman hole

G. Mark the location of the keybed log on the keybed.

- Draw a line around the keybed log on the keybed. This will allow you to move the lyre and keybed log a specific distance forward later on if needed. (See Ill. 15)

H. Remove trapwork.

- Remove all pedal trapwork from the bottom of the keybed.
- Mark a line 3" (76mm) forward from the center of the shift lever hole as a reference. Be very accurate with this measurement. At the 3" (76mm) location place an intersecting line. (See Ill. 16)
 - This is an important step as the hole for the shift lever may be removed by the key solenoid slot cut.

I. Measure and mark Sostenuto pitman hole on the keybed.

- Draw a line perpendicular to the front of the keybed through the center of the sostenuto pitman hole for future reference. It is best to place this reference line on the bottom of the keybed.
- It is not necessary to reference the location of the sustain hole as this will be determined by the sustain pedal solenoid location later.

J. Remove the action stack from the keyboard.

- Remove the top action screws and store the top action in a safe place.

3. Measure for key access

A. Determine if you must omit key solenoids.

- Typically, at the high and low ends of the piano, the PianoDisc unit will extend under the legs. To create the necessary room, some portion of the leg is cut away. Sometimes the customer objects or perhaps there are very high value custom art case legs. For whatever reason, if you are not able to cut the legs down for room, then you will need to omit key solenoids. It is no problem to drop 2 or 3 solenoids at each end of the piano. You will need to measure how far the leg protrudes under the keys and drop key solenoids accordingly so that the slot the PianoDisc system no longer extends under the legs.

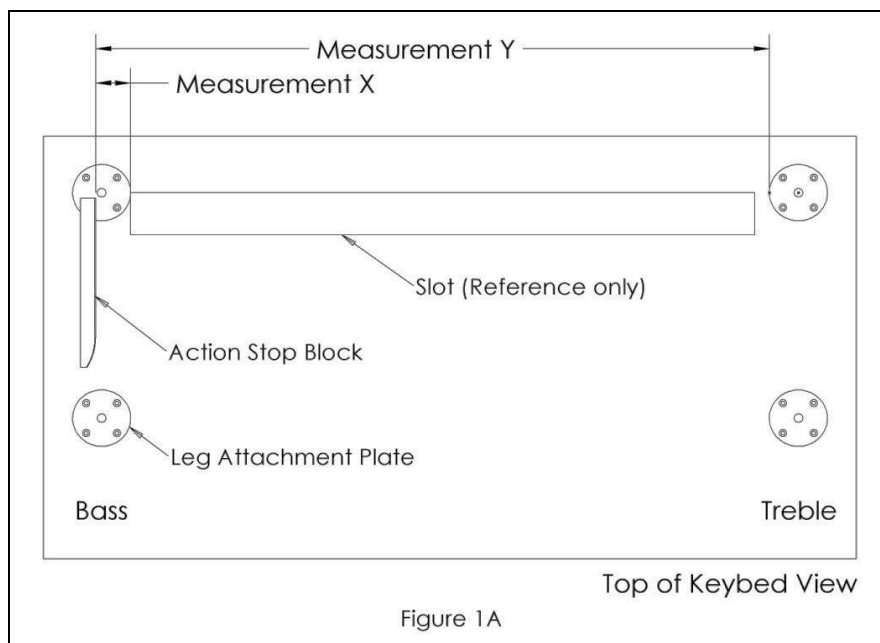


Figure 1A

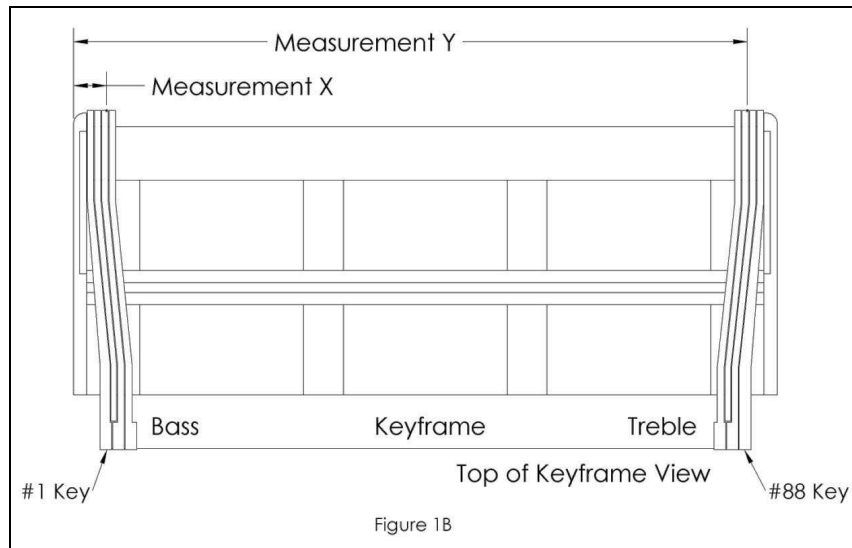


Figure 1B

- Sometimes the leg mounting system doesn't allow removal of material from the legs. A number of pianos attach the legs to the keybed with bolts that go through the leg top into metal plates embedded into the keybed. These plates cannot fall in the slot for solenoids otherwise you will lose one of the legs attachment points. In this case you will need to omit solenoids so as to keep the slot for the PianoDisc unit safely outside the leg mounting points.
- Use the following steps to determine your course of action.

In the piano

- Measure from the Action Stop Block to the treble side of the Leg Bolt Plate. This measurement should be taken parallel to the front of the keybed. This is measurement "X" in Figure 1A. Transfer this measurement to the keyframe. See Figure 1B.
- Measure from the Action Stop Block to the bass side of the treble Leg Bolt Plate. Again this measurement should be taken parallel to the front of the keybed. This is measurement "Y" in Figure 1A. Transfer this measurement to the keyframe. See Figure 1B.

NOTE: There must be 5/8" (16mm) from the side of the end key to the end of the solenoid slot for key solenoid access.

Keybed off the piano

- Mark a line on the keybed at each end of the slot. Same procedure as above - just be sure to locate keyframe side to side before deciding notes to be left out.
 - Place the keyframe on the keybed at the locating marks made earlier in step 1-C. (see below)



- Mark the keyframe for the number of notes that will be left off each end of the solenoid tray.

B. Making the key stick.

- At the front of the keys, notes are evenly spaced from left (bass) to right (treble). Typically notes are numbered starting at 1 in the bass to 88 in the treble.

Note: There are pianos that have more than 88 notes but the PianoDisc system only recognizes 1 - 88.

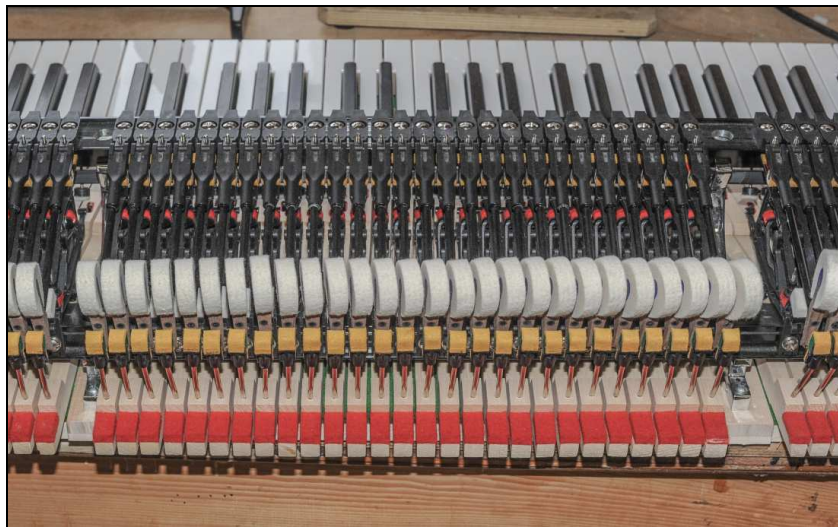


Illustration 17 - action Sections

- The back of the keys are divided into sections that correspond to plate bars in the piano. Often, but not always, there will be 4 sections. The bass is group 1, the tenor is group 2 (sometimes there are two tenor sections), the low treble is group 3 and the high treble is group 4. The spaces between these groups are referred to as breaks.

C. Decide how to deal with sections that have an odd number of notes.

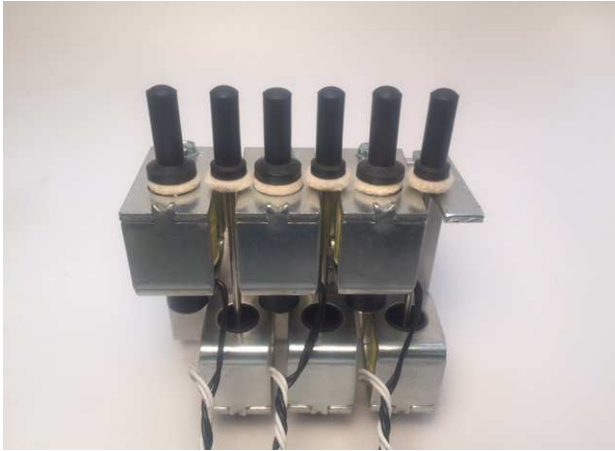


Illustration 18 – PD Standard PD systems

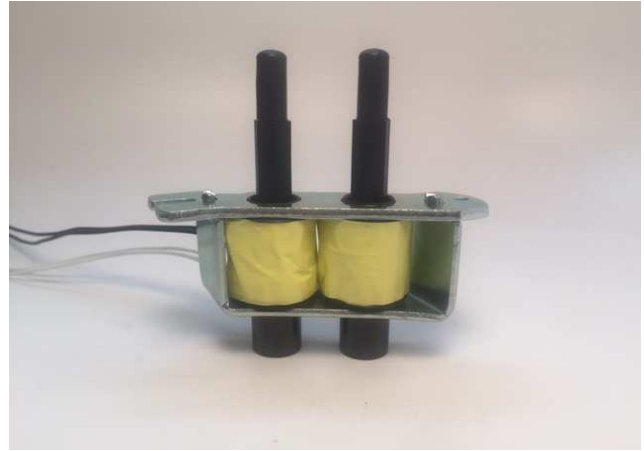


Illustration 19 – PD low profile solenoid

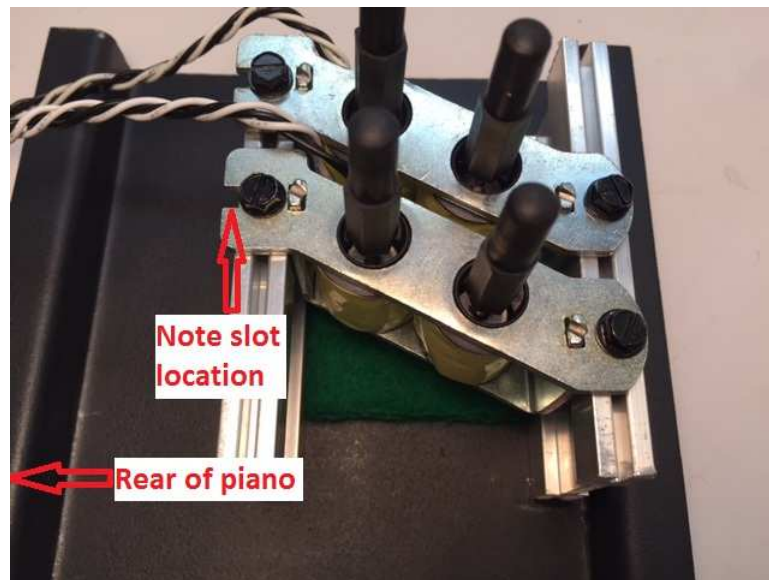


Illustration 20 – PD low profile solenoid rail systems

- There are important differences between the Low Profile PianoDisc System and the standard kit. The LP system has two rows of solenoids instead of one. The row closest to the capstans is referred to as front. The row closest to the end of the keys is referred to as back.
- Each solenoid bracket assembly mounts two solenoids. The bracket is designed so one end mounts on the front mounting rail and the other (slot side) mounts on the back mounting rail. The bracket positions the solenoids in two rows between the two mounting rails.
- The bracket is designed to be mounted at an angle so that the solenoid on the front rail falls under one key and the solenoid on the back rail falls under the next note higher in the piano. **It is not possible to mount the bracket at the opposite angle.**
- An important consideration to keep in mind is that it is important to keep the length of the slot in the keybed as short as possible. Among other reasons this minimizes the clearance cuts in the legs that will be required. To this end, solenoid bracket assemblies need to be mounted so that the end solenoid falls on the end key at the top and bottom of the scale.

- At the lowest note in the piano, usually note #1, this presents no problem as the solenoid for note 1 is the front solenoid and the solenoid for note 2 is on the back solenoid. All you need to do is mount the bracket at the appropriate angle and everything will work.
- At note 88, if there is an even number of notes in the section, there will be no problem as the last solenoid (the back solenoid) will fall on note 88.
- If you have omitted solenoids then the highest and lowest note numbers are where you will need to start numbering for the PD system.
- Not all sections have an even number of notes. If the note count is not even then the approach needs to be different. There are no single solenoid brackets, they all provide two solenoids. This means that in a section with an odd number of notes there will be one extra solenoid. If the front solenoid were to fall on note 88 the extra solenoid would fall on the non-existent note 89. This would require extra room in the slot and more material removed from the leg. While the system would likely work this is not a good idea.

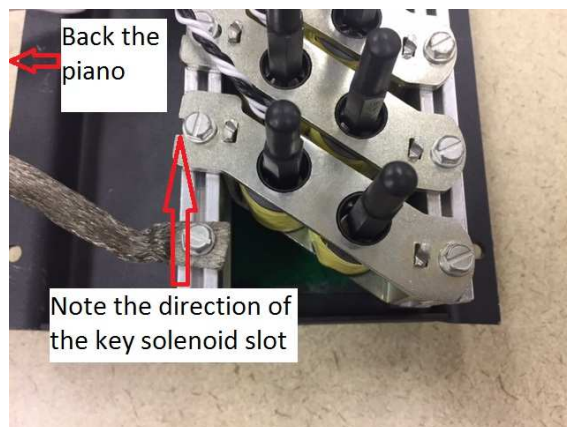


Illustration 21 – Direction of solenoid



Illustration 21A - extra solenoid in break

NOTE: Pictures above is ONLY for a reference – DO NOT assemble solenoid rails until instructed.

- It is better to match solenoids to keys in the high treble starting from note 88 and working down in the section. The extra solenoid will then fall in the break between the low treble and high treble. It is ok to have a back solenoid on say note 72 and a front solenoid in the break. (See Ill. 21A) Customarily, for any solenoid that will not operate a note you will simply cut the wire and remove the plunger. The kit will always provide spares so there will always be enough.
- Count the notes in each section. For those sections with an odd number of notes, decide where the extra solenoids will be placed. Once you have made these decisions you are ready to make a key scale stick.

NOTE: It may be necessary to omit a solenoid (at the starting point) if there is an odd number in the bass because of the sostenuto in the break area. This will mean that you would start with second key.

D. Make a scale stick from the back of the keys.

- You will need a stick of wood that is about 2" (50mm) longer than the distance from the outside of note 1 to the outside of note 88. This stick should be about ¼" (6mm) thick. The dimensions for length and thickness do not need to be precise.
- The width of the key scale stick should be 9/16" (14mm) because this is the available space between the solenoid rows when the diameter of the stems is taken into account. It is important to be reasonably accurate when cutting the width of the key scale stick otherwise there will not be ample room to space the solenoids apart.

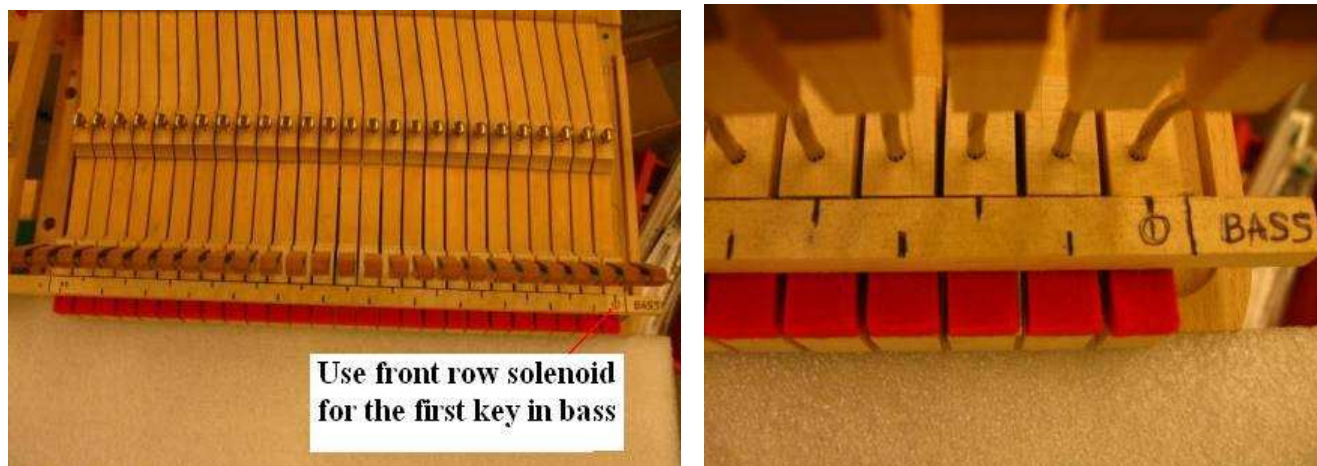


Illustration 22 - Marking scale stick

- Place the blank key scale stick on the back of the key approximately 3/8" (10mm) in from the back of the key. Tape the strip onto the keys so it is not able to move. Mark the bass end of the key scale stick so you do not accidentally set up the solenoids backwards later. (See Ill. 22)
- Mark the strip with a sharp pencil, on alternating sides, where the scale stick intersects the center of the key. Start at note 1 in the bass. Remember that when working on the back of the keys the bass keys are to your right. Mark note 1 on the front side of the strip, mark note 2 on the back side of the strip. (See Ill. 22) Mark all 88 notes in the piano in this fashion.

4. Measuring for keyframe cut

A. Remove the keys from the keyframe.

- Remove all keys from the keyframe except the end keys in each section.
- It is best to store them in order 1 to 88 as it makes re-assembly much easier.
- If the numbers on the keys are not easy to read, re-number the keys with a ball point pen behind the capstans so that the numbers do not show after the action is attached to the keyboard.

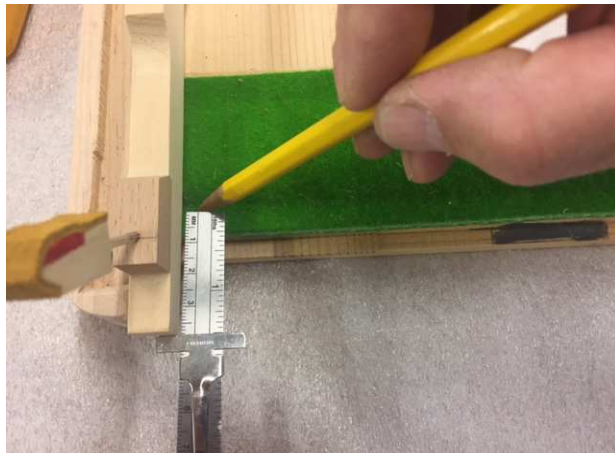


Illustration 23 – Marking keyframe cut location

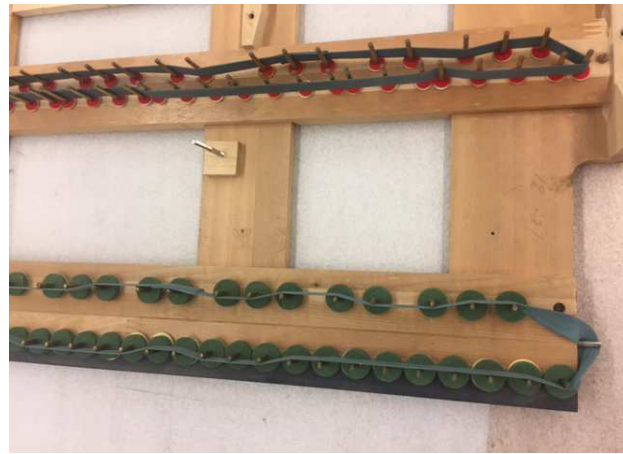


Illustration 23A – Rubber band for punchings

NOTE: When measuring to cut the key rest felt, if most of the felt will be cut away or there is no loose felt, just the glued on portion, then you should carefully remove the felt and re-locate forward to the cut line. Use a sharp chisel to remove the felt. It will be necessary to re-level keys later.

B. Mark the back rail cloth for the keyframe cut.

- Measure from the end of the first and last key in each section 1.5" (40mm) towards the front of the key. (See Ill. 23)
- Place a mark on the keyframe felt.
- This dimension will leave the keyframe hanging over in the slot area 11/16" (18mm). (See Ill. 24)
- The clearance from the keyframe to the front solenoid row will be about 3/8" (10mm).
- The purpose of this approach is to preserve as much of the keyframe as possible.
- Mark a straight line from the points with a straight edge.
- Use a lid rubber band to secure the balance and front rail punchings from falling off while the keyframe is inverted. (See Ill. 23A)
 - Weave the rubber band thru the front and balance rail pins for this purpose.

C. Mark the bottom of the back rail for the keyframe cut.

NOTE: The purpose of marking the keyframe cut line on the bottom of the keyframe is to see if there is support or not. The keyframe is cut from the top side.

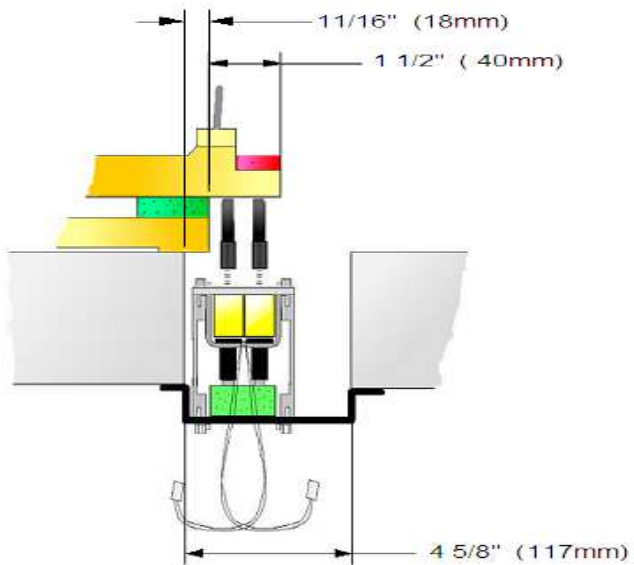


Illustration 24 – Keyframe/bed side profile



Illustration 25 - Bottom of keyframe

- Turn the keyframe upside down.
- Measure, from the end of the #1 and #88 keys, towards the front of the keys, 1.5" (40mm) and mark on the bottom of the keyframe. (See Ill. 24 and 25)
- This is the keyframe cut line.

NOTE: If less than 2" (50mm) width of rest rail is left, after keyframe cut, it is recommended that some Re-enforcement is added to the front of the rest rail before cutting the keyframe. You can actually use the piece of wood cut for the re-enforcement.

- Measure, from the end of the #1 and #88 keys, towards the front of the keys 2-5/16" (58mm).
- Mark this dimension on the bottom of the keyframe for the bead or keyframe support.
- Draw a line the length of the keyframe from key 1 to 88. (See Ill. 25)
- This line represents the front of the keybed slot.

NOTE: It may be necessary to extend the shift lever contact point on the keyframe. (See Addendum 2, page 78)

D. Determine if the back rail needs additional support after it is cut back to the required dimension.



Illustration 26 – Keyframe without support bead



Illustration 27 – Iron-on veneer shim

- Customarily, the bottom side of a keyframe is recessed by 1/8" (3mm) or so except for a relatively narrow strip on the front rail and on the back rail contact the keybed.
- This narrow strip is called the "bead".
- When the keyframe is cut back for PianoDisc installation this bead may be either too small or entirely removed leaving no support for the back rail on the keybed.
- If this is the case you will need to recreate the bead further in on the back rail.
- Measure the height of the old bead with calipers.

NOTE: Some pianos also have recessed areas in the keybed that needs to be taken into account. Kawai and Boston pianos are a perfect example of a recessed keybed.

- If this is so then it would be important to shim the keybed flush 1" (25mm) in front of the keybed cut line for proper support before cutting the slot. (See Ill. 31)

5. Create back rail bead on keyframe if required.

A. Prepare the shim

- There are a few different methods of replacing the bead or support.
 - Clear pine or softwood molding in a continuous 1" (25mm) wide strip. (See Ill. 28)
 - Place 5 – 1" (25mm) x 2" (50mm) pieces of softwood equally spaced on the keyframe.
 - Iron-on veneer in a continuous strip or 5 – 1" (25mm) x 2" (50mm) pieces equally spaced. (See Ill. 28 and 29)
 - The iron-on veneer comes with self adhesive which can be ironed on activating the glue.

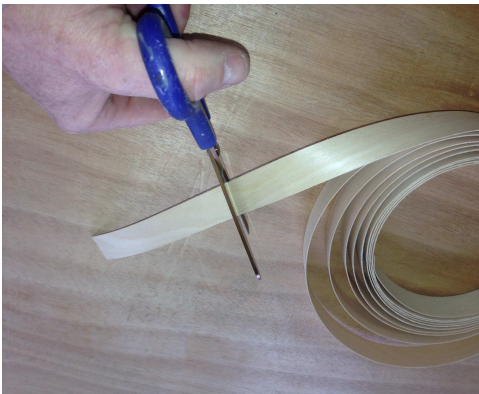


Illustration 28 – Iron on veneer



Illustration 29 - Ironing on veneer

B. Glue the shim onto the keyframe.

- Apply a thin coat of a quality structural wood glue.
 - In the United States "Titebond" is a brand name sold by Franklin that would be a good example.
- Apply glue to the new bead and clamp it to the keyframe.
 - Allow the glue to dry for about 1 hour.
 - Sand the shim to the correct height checking with a straight edge across the keyframe.



Illustration 30 - Back rail shim, soft wood



Illustration 31 – Installing support on Kawai

C. Kawai Keybeds

- Kawai and Boston pianos have a keybed cutout or recessed areas as you can see in Ill. 31. The best way to fix this is to build up the area for the new bead so there is a level contact surface.
 - Glue 1" shim stock of the appropriate thickness in the 2 cutout areas.
 - Using a straight edge, sand the shim so it is the same height as the surface of the keybed.

6. Cut the keyframe.

NOTE: Because of moving the shift lever forward, it is important to check the contact area on the keyframe. Please see the Addendum 2 on page 77 at the end of this manual for instructions.

A. Cut the back rail cloth.

- The back rail cloth needs to be cut back prior to cutting the keyframe.
- With a straight edge use a sharp knife or razor blade to cut the line you marked on the back rail cloth earlier.

B. Cut the back rail.

- Use a jig saw to cut the keyframe to the line previously marked.
- Remember, the keyframe will hang over the slot 11/16" (18mm) so that the keyframe is 3/8" (10mm) from the front row of solenoids. (See Ill. 37 on page 24)

NOTE: Some pictures will illustrate procedures with the keybed off even though the keybed is not removed and this is just for better clarification.

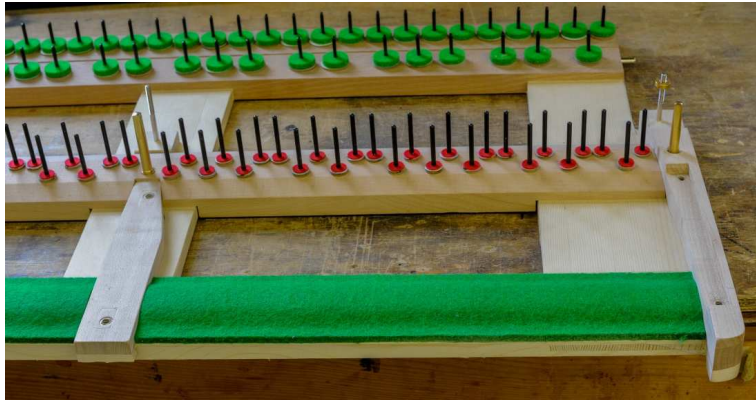


Illustration 32 - cleats extending behind the back rail

Caution: Make sure you do not cut the action cleats where it supports the action bracket.

C. Remove the keyed log.



Illustration 33 - Log removed



Illustration 34 - Keybed on bench

D. Turn keybed over so top side is up.

- Once the keybed log is removed turn the keybed over so the top side is up.
- You are now ready to measure the solenoid slot location

E. Remove the dag blocks.



Illustration 35 - Remove dag screws



Illustration 36 - Knock off dag

- Remove all screws that hold the dag blocks down.
- Use a chisel or wood block to knock the dag blocks off the keybed.

7. Mark the location for the solenoid slot

Note: Marking the starting location for the solenoid slot is the same whether the keybed comes off or not.

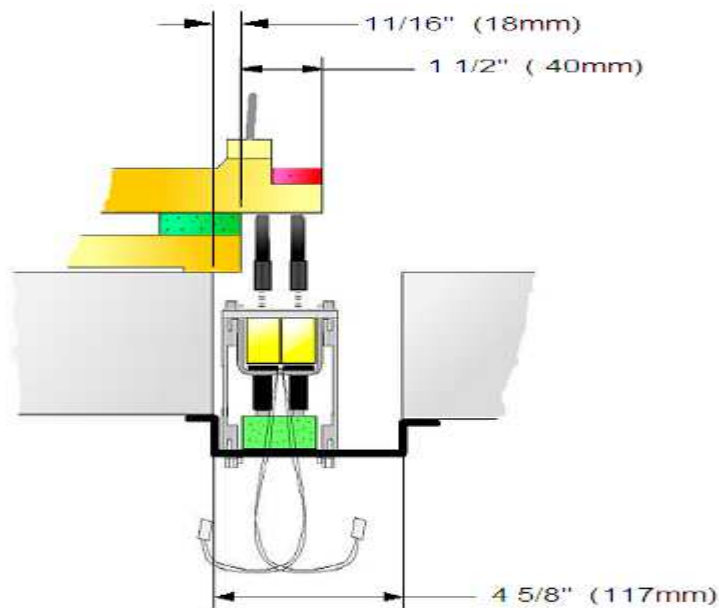


Illustration 37 - Side view of tray assembly, keybed and action

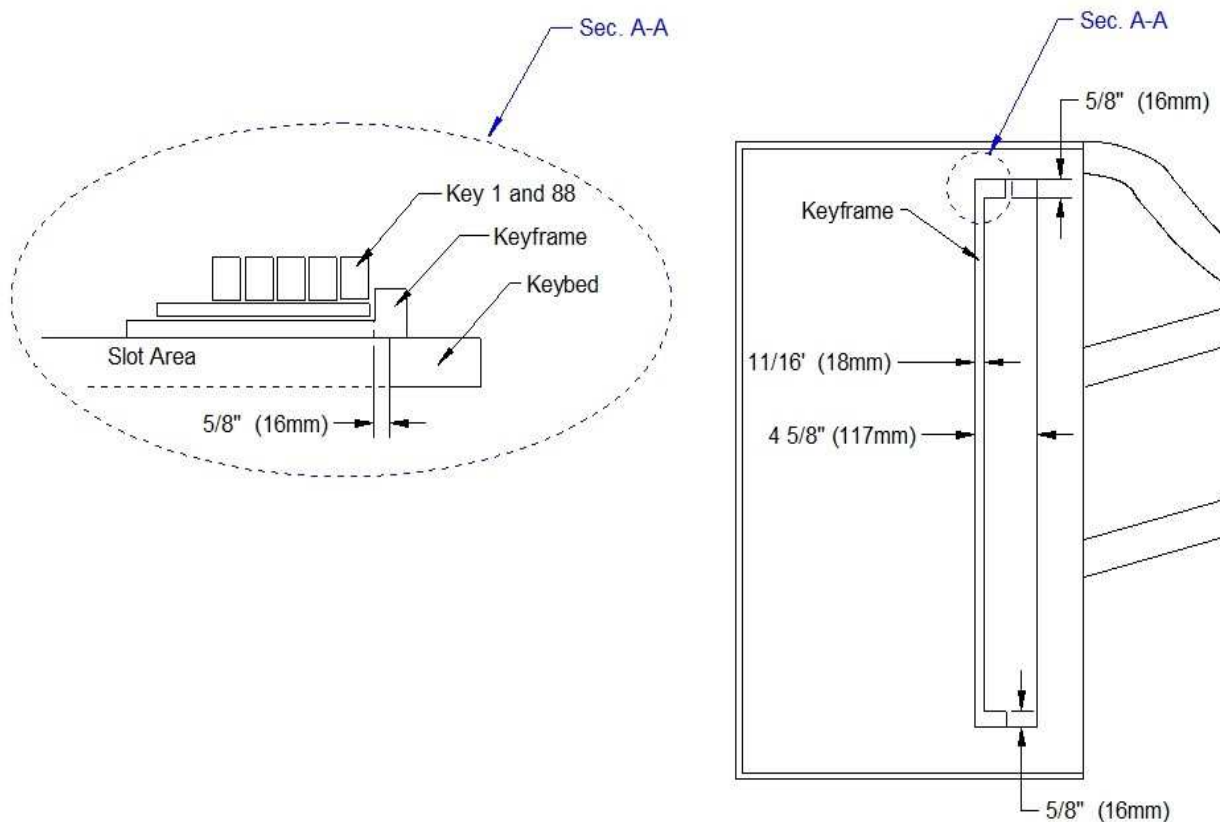


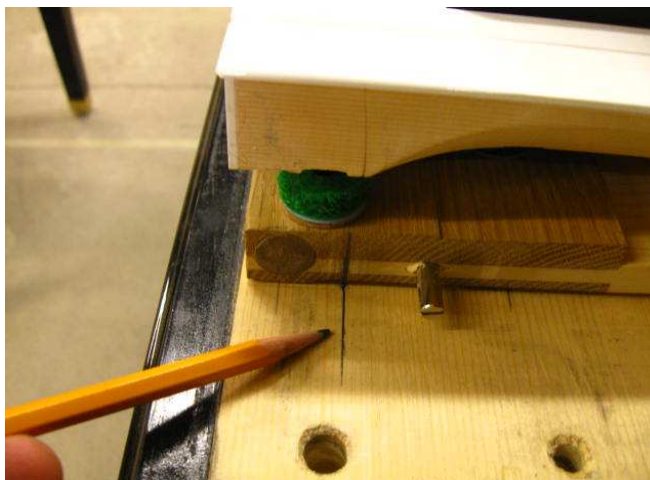
Illustration 38 - Bottom side of slot and keyframe dimension

A. For pianos with the keybed removed.

- Place the keyframe on the keybed and line up the marks made in 1-C. (Also see Ill. 39)
- Mark the keybed at the keyframe cut on the bass and treble ends. (See Ill. 40)

NOTE: If you have the Slot locating tool, this would be a good time to use and save some time. (See Ill. 43 and 44 on page 26).

- Mark the front keybed cut line.
 - Remove the keyframe.
 - Measure 11/16" (18mm) toward the front of the keybed to establish the front solenoid cut line. Do this at both the bass and treble ends. (See Ill. 41)



Ill. 39 – Align action with previous marks, front and side

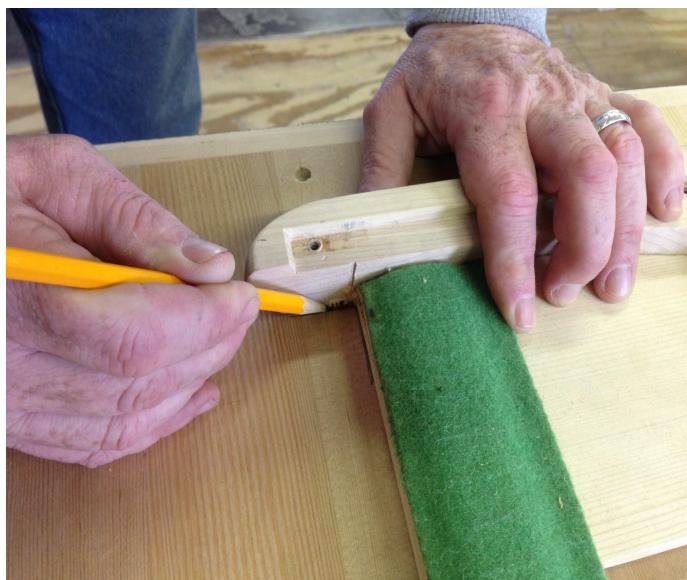


Illustration 40 - marking keyframe cut on keybed

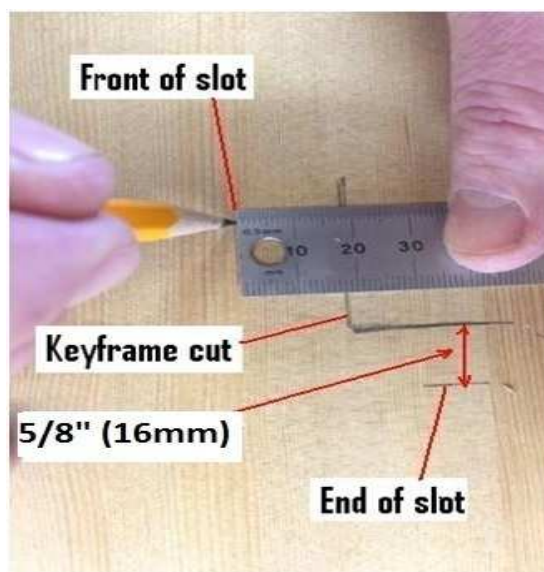


Illustration 41 - Marking front slot location

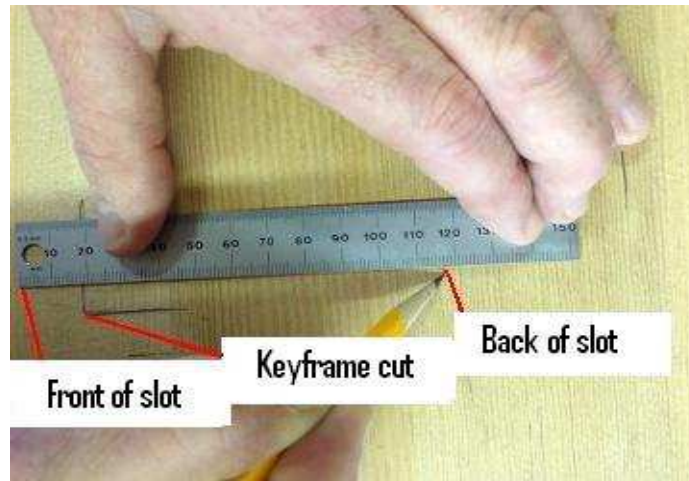


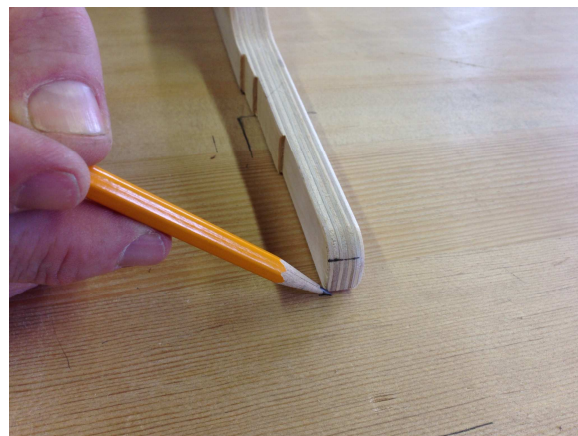
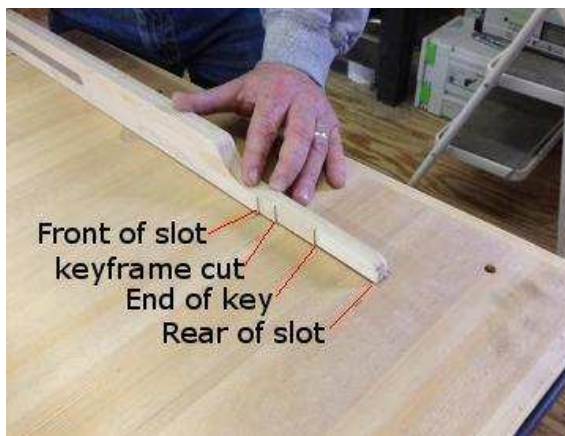
Illustration 42 – Marking back slot location

- Now measure 4-5/8" (117mm) to the rear of the piano to establish the back of the solenoid slot. Do this at both the bass and treble ends. (See Ill. 42)
- Connect both the front and rear solenoid slot lines. (See Ill. 45 and 46)
- Using the Slot locating tool to locate the slot.
 - Place the slot locating tool square against the edge of the keybed.
 - Align the slide with the end of keyframe mark. (See Ill. 43 and 44)
 - Loosen the wing nut and slide the slot marking slide so that the correct notch corresponds with the keyframe mark you made on the keybed. (See Ill. 43)
 - Tighten the wing nut to hold this measurement.
 - With a pencil, mark the keybed on the notches that define the back side and the front of the slot.
 - Do this measurement for both the treble and bass locations.
- Locating the end of the slot
 - From the end of keyframe mark on the keybed, add 5/8" (16mm) for additional room for the key solenoids. Do this for the bass and treble ends to establish the end of the slot. (see Ill. 47)

NOTE: If you need to drop more solenoids repeat step 3-A to define the top and bottom notes for the PianoDisc system and correct the scale stick.

- Make sure these marks are accurate as you will use these marks to define the front to back and end dimensions for the slot you will cut in the keybed.

NOTE: Make sure to verify your measurements before cutting!



Illustrations 43 & 44 - Slot marking tool



Illustration 45 - Marking front line for slot



Illustration 46 - Marking back line for slot

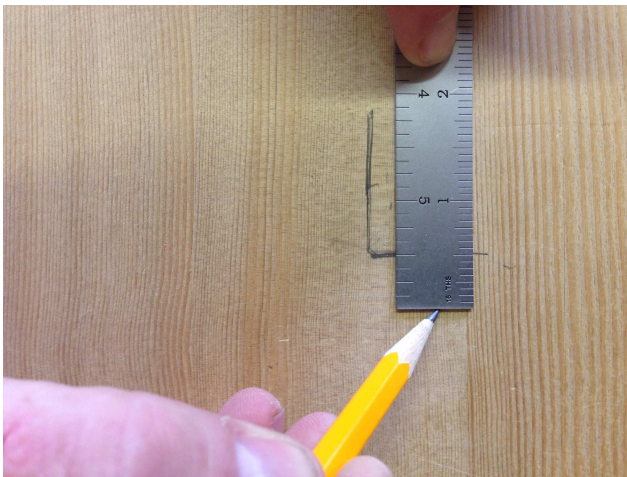


Illustration 47 - Marking end of slot



Illustration 48- Marking end slot cut

- Place the keyframe in the piano with the end blocks in place.
 - Mark a pencil line along the back edge of the keyframe cut. (See Ill. 40 – page 24)
 - Do this on the bass and treble ends only including the end cut of the keyframe.
 - Make sure these marks are accurate as you will use these marks to define the front to back dimensions for the slot you will cut in the keybed.
 - Remove the keyframe.
 - Transfer the keyframe line to the bottom side of the keybed.

NOTE: If you have the slot marking tool, this is a good time to use it.

- Use the Slot marking tool to locate the slot.
 - Place the slot marking tool inside the piano with the keybed square against the front edge of the keybed at the treble end. (see Ill. 43 – page 25)
 - Align the slide with the end of keyframe mark.

NOTE: You may be able to see the keyframe mark thru the strings.

- Loosen the wing nut and slide the slot marking slide so that the keyframe notch corresponds with the keyframe mark you made on the keybed.
- Tighten the wing nut to hold this measurement.
- Move the slot marking jig to the bottom side of the piano at the treble end.

- With a pencil, mark the keyframe location.
 - Drill a 1/8" (3mm) hole to verify that this is the correct location with the inside mark.
 - Now, repeat this measurement for the bass location as the measurement may not be the same as the treble. This is especially true on larger grand pianos.
- If the slot locating jig is not available use the following procedure.
 - Measure from the keyframe line on the keybed (treble end) to the front edge of the keybed and transfer this measurement to the bottom side on the keybed.
 - Do the same measurement at the bass end of the keybed.
 - Using a drill guide and drill a 1/8" (3mm) hole at the keyframe cut line to verify this is the correct location. Do this at the bass end.
 - Look inside the piano to see if the holes are on the keyframe cut line. If not, then correct the line on the bottom side of the keybed.
 - Now measure from the keyframe line 11/16" (18mm) forward to locate the front solenoid slot line. (See Ill. 41 – page 24)
 - Measure 4-5/8" (117mm) from the front solenoid slot line back to locate the rear solenoid slot line. (See Ill. 42 – page 24)
 - Make these same measurements at the bass end and then connect these vertical lines together creating the sides of the solenoid slot. (See Ill. 45 and 46 – page 26)
 - Locate the end of slot.
 - From the 1/8" (3mm) locating holes inside the piano, measure to the end of keyframe line and transfer this measurement to the bottom of the keybed. Do this for bass and treble ends.
 - Now add 5/8" (16mm) to the end of slot locations for additional room for key solenoids. (See Ill. 47 – page 26)
 - Connect the end of slot lines and you are ready to cut the slot. (See Ill. 48)
- NOTE: If you need to drop more solenoids repeat step 3-A to define the top and bottom notes for the PianoDisc system and correct the scale stick.**
- Make sure these marks are accurate as you will use these marks to define the front to back and end dimensions for the slot you will cut in the keybed.

8. Prepare to cut the solenoid slot.

NOTE: At this point it is best to plug the old shift lever hole if necessary. It would be difficult to fill this later after cutting the slot.

NOTE: It is good to invest in a plug cutting set. I cut different sizes of plugs from old keybed slots from previous pianos and use this for plugging old shift lever holes.

- **Plug the old shift lever hole in the keybed**
 - Create a wood plug for the old shift lever hole.
 - The plug may need to be sand down to fit hole.
 - When done there should be a slight snug fit, just enough room for glue
 - Use epoxy or wood glue to secure the plug into place.
 - Use wax paper and a board to make the plug come out flat with the rest of the keybed.

9. Cut the solenoid slot

NOTE: NEVER USE A “SAWS ALL” OR JIG SAW FOR CUTTING THE LONG SIDE SLOT CUTS. Only use a circular saw for a straight cut and the jig saw to finish the ends. A saws-all or jig saw will not produce a straight (90 degree wall) cut. It is also recommended to use a straight edge or guide for a straight cut.

A. For pianos with the keybed attached.

- **Drill the corners.**
 - Measure the thickness of the keybed.
 - Put a 3/8" (10mm) drill bit in an electric drill.
 - Set up a masking tape flag on the drill bit at the thickness of the keybed. This precaution will keep the drill bit from bursting out the other side causing splintering on the top side of the keybed.
 - Drill through the keybed making sure to keep the drill straight as possible.
 - Drill one corner at each end of the slot for the jig saw blade access. (See Ill.49)



Illustration 49 - Drilling corners

- Wedge the damper tray.
 - Wedge up the damper tray away from the saw blade.

NOTE: ALWAYS CUT THE ENDS OF SLOT FIRST. If the end cuts are done last, the jig saw blade may bind and the saw will come at you very quickly!

- **Cut ends of the solenoid slot.**
 - Use an electric jig saw. (See Ill. 50)
 - Place the jig saw in the drilled hole and check the depth of the saw blade so that it will not reach the wedged up damper action.
 - If the blade is too long you can grind off the blade for clearance if necessary. Jig saw blades come in different lengths.

- **Cut the sides of the solenoid slot.**

NOTE: It is best to use a guide for the circular for a straight and clean cut.

- Use a circular saw. (See Ill. 51 and 52)
- Set the depth of the saw blade so that it will cut through the keybed yet will not reach the wedged up damper tray.
- Cut both sides of the solenoid cut.
- **Finish the cuts and clean up corners.**
 - Use an electric jig saw and finish the circular saw cuts to the end of slot.
 - From both directions cut into the rounded corner so that the corner is square rather than round.
- **Smooth the cuts in the slot.**
 - Use a double cut file to clean up any rough spots.
 - Sand with 100 grit sandpaper to remove any splinters and finish with 220 grit.

B. For pianos with the keybed not attached.

- **Drill the access holes**
 - Put a 3/8" (10mm) drill bit in an electric drill.
 - Set up a masking tape flag on the drill bit at the thickness of the keybed. This precaution will keep the drill bit from bursting out the other side.
 - Drill one hole at each end of the slot for the jig saw blade access.
 - Drill through the keybed making sure to keep the drill straight. (See Ill. 49)



Illustration 50 - Cut ends of slot

- **Cut ends of the solenoid slot.**
 - Use an electric jig saw.
 - Saw both ends from the holes in the corners.
- **Cut the front side of the solenoid slot.**



Illustration 51 - Cutting front of slot



Illustration 52 - Front and back cuts for slot

- Use a circular saw and a guide so the saw will cut straight. (See Ill. 51)
- **Cut the back side of the solenoid slot.**
- **Finish cutting slot and clean up corners.**



Illustration 53 - Finish from circular saw cuts



Illustration 54 - Keybed with slot cut

- From the circular saw cuts, use a jig saw and cut to the corner of the solenoid slot. (See Ill. 53)
- Remove the remaining material from the cut.
- Make the corners square and straight.
- **Smooth the cuts in the slot.**
 - Use a double cut file to clean up any rough spots.
 - Sand with 100 grit sandpaper to remove any splinters.
 - Sand with 220 grit sandpaper to finish.

10. Reinforce the keybed.

A. On the old system.

- If the keybed was the traditional tongue and groove as in a Steinway, it was necessary to reinforce the keybed.
 - This was because the slot removed surrounding support to the plank in question and the old Rail Cover had no structural strength.

B. On the new Low Profile system.

- It is no longer necessary to reinforce the keybed.
- The tray, on which the system is mounted, is heavy gauge steel shaped like structural channel.
- Because the tray is so sturdy, when attached to the keybed, the tray reinforces the keybed, tongue and groove or otherwise.

11. Assemble the tray, solenoid rails and guide solenoids.

A. Calculate the length of the solenoid rails.



Illustration 55 - Mark rail from end



Illustration 56 - Key scale stick on rail

- Measure from the bass end of the rail $\frac{3}{4}$ " (19mm) and mark. (See Ill. 55) This is where the bottom note in the system will occur on the rail. This line represents the center of the plunger stem.
- Lay the key end scale stick on the rail lining up with bottom note. (See Ill. 56)
- Mark on the rail where the top note, in the system, will fall from the key end scale stick.
- Measure out from the top note mark $\frac{3}{4}$ " (19mm) and mark the rail. This is the end of the rail mark.
- The rail should be about 6mm shorter than the slot you defined. (See Ill. 58) Measure the length of the slot and the rail length just designed and confirm. If the numbers do not work, look for your error. Do not continue until any discrepancies are resolved.



Illustration 57 - Marking cut line on rails

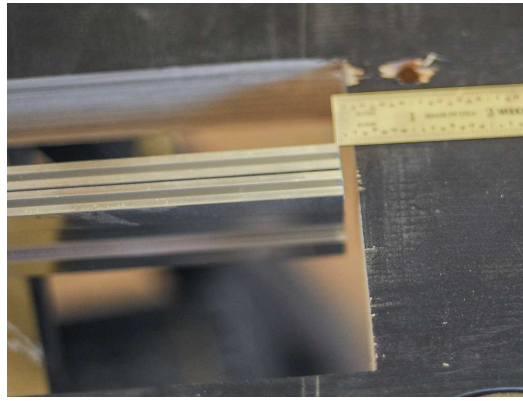


Illustration 58 - Rail $\frac{1}{4}$ " (6mm) shorter than slot

- Mark the second solenoid rail to the same length. (See Ill. 57)

B. Cut the rails.



Illustration 59 - Cutting rails

- Use a square and a pencil to mark a square cut line on both rails.
- Use a band saw to cut the rails.

C. Design the length of the tray.

- The tray should be the same length as the solenoid slot.
- Mark the length of the tray.

NOTE: Only cut the treble end of the tray

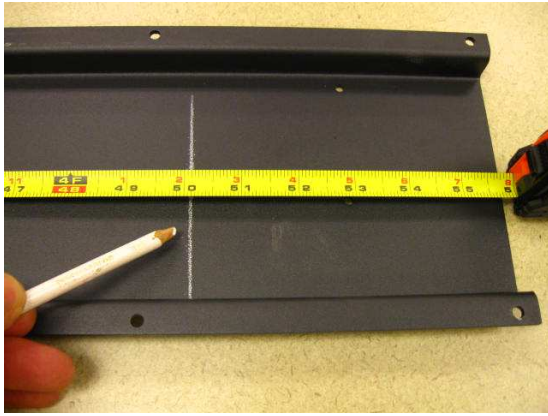


Illustration 60 – Marking the cut line of tray



Illustration 61 – Portable bandsaw

- Use a square and a white pencil to mark the cut line. (See Ill. 60) (**Treble end only**) The length of the tray should just cover the solenoid slot.

D. Cut the tray.

- Use a powered portable band saw or a metal cutting band saw to cut the tray to length.

NOTE: If you do not have a portable band saw it is a good investment and you will save allot time.

- File off the end of the tray and color with a permanent black marker.

E. Install tray end plates.

Install the tray end cover plates

- Locate the tray end cover plates in the kit. (See Ill. 62)
 - Place the end cover plates at the end of the tray, mark screw locations and center punch the holes.
 - Drill a 1/8" (3.2mm) hole thru the tray and then back thru the tray from the outside to clean up metal debris.
 - The 1/8" (3.2mm) is just an access hole and the screw will thread into the cover plate.
 - Attach the end plates with the screws supplied. (See Ill. 63)



Illustration 62 – Mark end plate holes



Illustration 63 – End plate installed

F. Mount the solenoid rails on the tray.

NOTE: It is important to lower the torque setting of the cordless drill to keep from breaking screws. The key solenoid screws are rated for 25 in. lbs. with a breaking point of about 45 in. lbs.

- To check the torque setting on you drill, do this simple test.
 - Set your drill to a given torque setting, (10 or 12).
 - Place a scrap piece of solenoid rail into a vice, place a key solenoid on the rail and secure with a screw.
 - Check the torque of the screw with a dial type torque wrench. Adjust your drill torque if necessary.

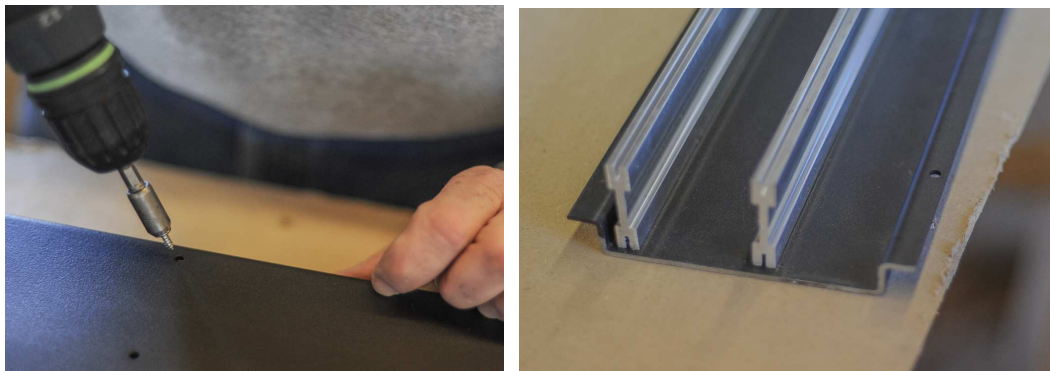


Illustration 64 - Mount solenoid rails on tray

- Position both solenoid rails in from each end by 1/8" (3mm).
- Use 6 hex screws through the mounting holes in the tray to attach each rail. (see Ill. 64)

G. Mounting end key solenoid assemblies.

NOTE: Temporally place the solenoid rest felt in the tray for the support of the plunger as you must drill the sutain and sostenuto holes before securing the felt to the tray.

- Mount the bass solenoid so that the "center" of the lowest note in the system is 3/4" (19mm) in from the end of the rail.
- Put the first and last keys on the keyframe operated by key solenoids.
- Put the keyframe inside the piano with the end blocks in place.
- Place the end solenoids on the rails for locating tray placement (See Ill. 65)

NOTE: Do not install key solenoids until step 16 after you have drilled the trapwork holes in the solenoid tray.

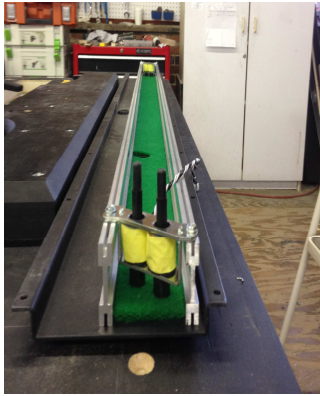


Illustration 65 - guide solenoids

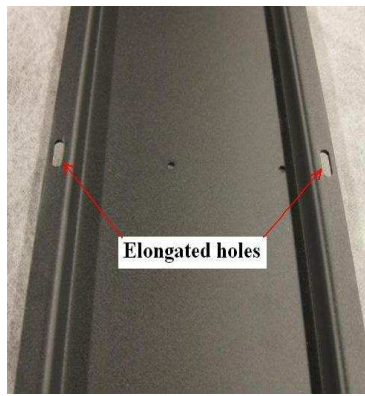


Illustration 65A – Elongated screw holes

- Place the tray in the slot and locate the tray assembly up and down so that the solenoid plungers are as close to centered of the end keys.
- Check the back row solenoid for 3/8" (6mm) on to the end of key.
- Verify the alignment is correct looking from the top thru the strings and action cavity.
- Place 2 mounting screws into each end of the tray assembly.
 - Use the elongated holes at each end for some adjustment.
 - When you have the correct tray location, draw a line around the tray.

12. Locating and installing Service Tool Inserts

NOTE: *PianoDisc* supplies Low Profile Maintenance Tools that makes servicing the LP System very easy. Also along with these tools you will receive 4 threaded inserts, enough for 1 grand piano. Normally 4 inserts come with each LP kit. (See complete installation and use of tools on page 81)

A. Mark the location for the threaded inserts.

- With the solenoid tray in place, measure 8.25" (20.5cm) from the end of the tray and place a mark.
- At the 8.25" (20.5cm) distance, measure 1.5" (38mm) from the tray and mark for threaded insert.
- A simple jig can be made to locate the insert locations. (See Ill. 67)

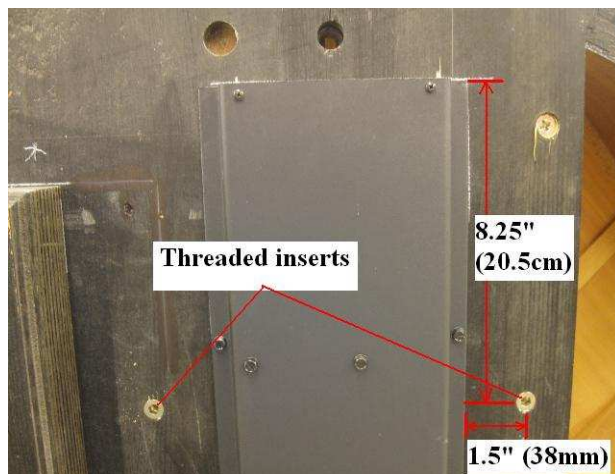


Illustration 66 – Threaded Inserts

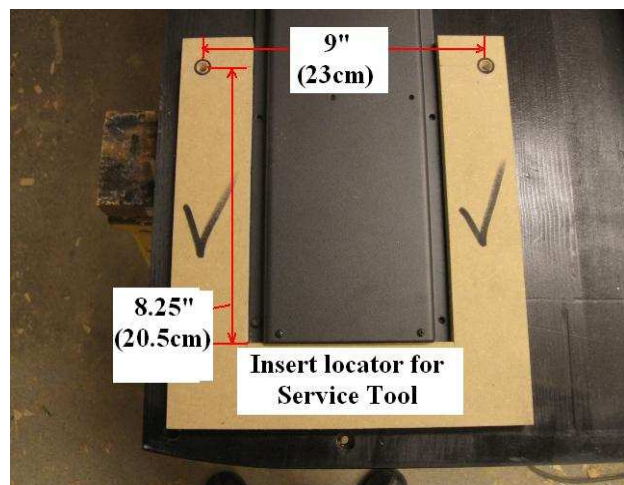


Illustration 67 - Jig for Threaded Inserts

- Drill a 5/16" (8mm) hole 3/4" (19mm) deep into the keybed for the threaded insert.
- Install the threaded insert flush with a 5mm Allen wrench. (See Ill. 68 and 69)



Illustration 68 – Threaded Insert



Illustration 69 – Insert installed into Keybed

13. Cut legs to clear the solenoid tray

A. Get the appropriate legs for the bass and treble sides of the keybed.

- Usually the manufacturer designates the location of the legs.
- If the manufacturer did not designate the location of the legs it means when the piano was made that the legs would work in any of the three locations.
- After PianoDisc installation, this is no longer true. Once you modify legs for PianoDisc, all three legs will become unique and thus will only work when attached in their designated locations.

B. Attach legs to the keybed and mark for the tray location



Illustration 70 - Legs attached to keybed



Illustration 71 - Prepare to cut legs

- Attach the bass and treble legs to the keybed. (See Ill. 70)
- Mark the leg with an awl allowing 1/8" (3mm) of clearance from the tray line. Mark both bass and treble locations. Then transfer lines to the top of the leg with a white pencil. (See Ill. 71)

NOTE: If the leg is attached to the keybed with a wedged interlock, you may need to add an additional 3/8" (10mm) so that the leg can be installed or removed from the piano.

C. Cut the legs

NOTE: A convenient leg cutting stand can be built to support the legs while cutting. (See Ill. 71)

- Secure the leg so it cannot move during cutting.
- Use an electric jig saw to cut the legs.
 - Some legs it may be necessary to use a pull saw due to the thickness of the legs.

NOTE: A band saw can be used if there is a flat surface on the leg for the saw table.

- If the band saw is used then it will be necessary to place tape on the top finished area and transfer the line to this side.
- File and sand the area of the leg cut.
- Stain or paint the cut area of the leg to seal and match the appearance of the leg.

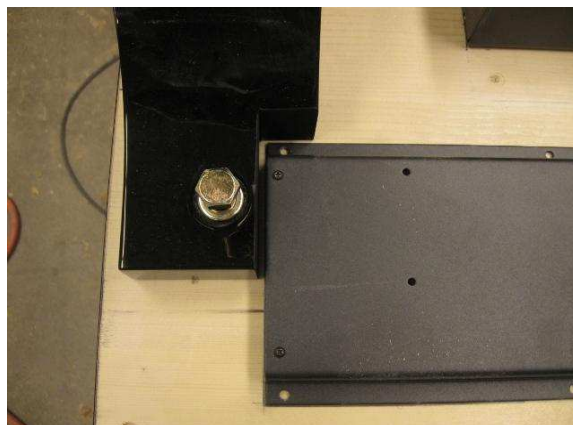


Illustration 72 – Place legs on keybed and check for fit

14. Installing the Trapwork.

NOTE: PianoDisc requires that only the trapwork supplied in this kit (for sustain and sostenuto) is to be use on each installation. Using the original piano trapwork or other fabrications is not authorized. Only the original shift lever is to be used.

NOTE: PianoDisc now offers a metal shift lever bracket (NOT INCLUDED IN KIT) that will minimize the area for the bracket and may eliminate or minimize the moving of the lyre. (See Ill. below)

- The shift lever bracket kit (Part #5650-21025) comes with the parts pictured on the left below.
- The plastic spacers can be cut to duplicate the original height of the shift lever. It is recommended to use a bandsaw to cut the plastic spacers and then file or sand the cut. It is difficult to cut down with a belt sander as it is hard to keep flat or square.
- Use the original pivot pin and drill bracket bushings to the correct size.



Shift Lever Kit



Shift Lever Kit installed

A. Locate the shift lever in relation to the cover tray.

- Locate the 3" (75mm) line drawn on the bottom of the keybed for the shift lever center on page 12, in step 2-H. If the center line is on the top of the keybed then transfer to the bottom side.
- Hold the shift lever assembly, with the mounting blocks attached, 1/16" (1.5mm) from the cover tray flange line established on page 35, step F-11.
- Mark the center location for the shift lever hole on the 3" (75mm) line.
- Figure from the 3" (75mm) mark the amount the shift lever was moved from the original location.
- This will be the same distance to move the lyre log.

B. Drilling Shift lever hole

- Prepare for drilling.
 - Mark the center of the hole with a center punch.
 - Cover the spot where the drill will emerge on the top of the keybed with a piece of soft wood.
 - Wedge a piece of wood between the keybed and pin block to keep from splintering.
 - Drill the new shift lever hole.
 - Use a 1-1/2" (38mm) Forstner drill bit or a hole saw.
 - Drill through the keybed making sure to drill horizontally until you are into the protective piece of wood. A drill guide is recommended.
 - Remove the protective piece of wood.

C. Mount the lyre log on the keybed

- Place the log on the keybed at the new location.
 - The new log location is determined by the amount the shift lever needs to move.
 - Mark the hole locations and pilot the screw holes.
 - Flag the drill bit with tape slightly less than thickness of the keybed.
 - Drill the pilot holes and mount the lyre log to the new location.

D. Mount the tray assembly on the keybed.

- Attach the tray to the keybed.
 - Place the tray at the outlined location from page 35, step 11 – F.
 - Re-check the alignment of the solenoids to the first and last keys.
 - Re-position the tray if necessary.

On the bench

- Place the first and last keys on the keyframe.
- Support the ends of the keybed with saw horses so that you can position the tray assembly under the keys.
- Place the keyframe on the keybed using the marks you made to locate the keyframe.
- Using a cart or table to support tray assembly, locate the tray front to back in the solenoid slot such that the vertical steel surface of the tray is aligned with the front edge of the solenoid slot.
- Elevate the tray assembly so the tray flange is against the keybed.
- Locate the tray assembly left to right so that the solenoids are centered under the end keys. The back row of solenoid tip should be 3/8" (6mm) on to the keys.
- Install 2 mounting screws into the elongated holes at each end of the tray.

Note: The 2 elongated screw holes at each end of the tray aid in aligning key solenoids to the keys.

- If this is the correct placement, the tray can stay on permanently.

E. Mount the keybed to the piano.

- Place the keybed on the piano with the tray assembly attached.
- Secure the keybed with 1 screw at each end.
- Place the keyframe into the piano with end blocks in place.
- Re-check the solenoid to key alignment and re-adjust if necessary.

D. Mounting the shift lever

NOTE: Ideally this is the best way to re-locate the shift lever on the keybed. Because of the leverage of the shift lever, even a small error is potentially a big problem. It is impossible to know where the shift lever should be positioned left to right or in this case, up and down since it is on its side.

NOTE: Because of moving the shift lever forward it may be necessary to add support to the keyframe. See Addendum 2 on page 75.

- Center the domed nut on the lyre rod.
- Center the shift lever front to back in the hole.
- Make sure the shift lever pad is aligned correctly with the pedal rod.
- Slide the shift lever up until it engages the keyframe.
- Secure shift lever with the original screws.
- Check to make sure that there is no slack between the shift lever and the keyframe.
 - Correct now if you have this problem.

E. Calculating and making sustain lever

Note on using the right equipment: When drilling the trapwork it is best to use a drill press to drill all the holes accurately at 90 degrees.

NOTE: The following trapwork parts are supplied in the kit for the sustain and sostenuto trapwork.

1. 2 pieces of maple wood – 1"(25mm)x 1"(25mm) x 24" (61cm).
2. 2 metal pivot brackets.
3. 8 - #8 x 1" black hexhead bracket mounting screws.

- Place the lyre on the piano.
- Choose a good location for the pedal solenoid on one of the beams under the piano.
 - Look for the straightest location and being careful of obstacles as in pedal lyre supports. See proportions in Ill. 75 – page 41. Always use the measurement of 6" (15cm) from the lever pivot pin to the center of the pedal solenoid dowel. Only in rare cases as in large pianos would this be different.

H. Installing the pedal solenoid

NOTE: It may be necessary to place a block of wood on the beam as a spacer for better alignment. (See Ill. 74)

- **Locating and installing the pedal solenoid.**
 - Glue felt, supplied with solenoid, to the side of the pedal solenoid to cushion between the beam and solenoid.
 - Center the sustain lever over the solenoid rail cover outline.
 - Place the pedal solenoid on the beam aligning with the 6" (15cm) location established in the previous step.
 - Attach the pedal solenoid with the 4 black screws, #6x1" (25mm) supplied in the kit.



Illustration 74 – Mounting pedal solenoid

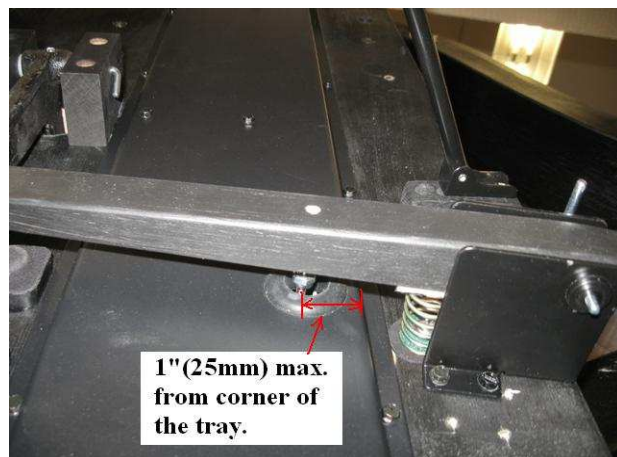


Illustration 74A – Max. distance for threaded rod

NOTE: It is important that the sustain pitman rod is no more than 1" (25mm) from the tray corner. See Ill. 74A. The issue is the key driver board is too close to the sustain rod.

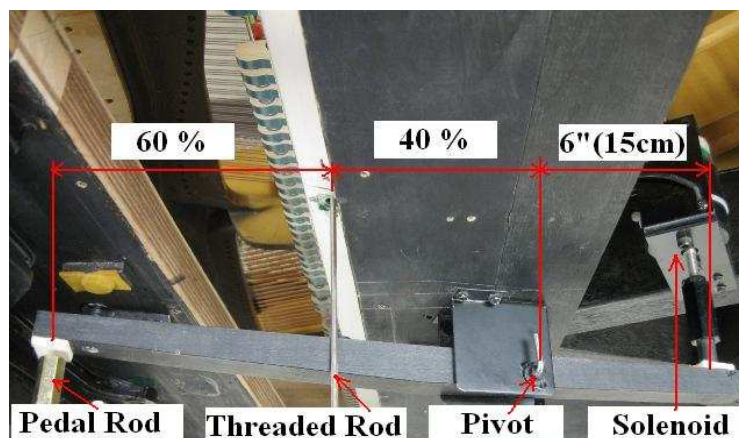


Illustration 75 - sustain lever dimensions

- The distance from the sustain pedal rod to the new hole location on the damper tray should be 60% and 40% from the damper tray/threaded rod to the lever pivot. From pivot point to the sustain pedal solenoid location will be an additional 6" (15cm). Please refer to illustration 75.

NOTE: On some concern grand pianos the wood beam arrangement may not allow the pedal solenoid to be placed at the 6" (15cm) location. In this case, just place the pedal solenoid as close as you can to the 6" (15cm) location.

- Once the lever is cut to size, paint it to match the original color.



Illustration 76 – finished and unfinished sustain lever

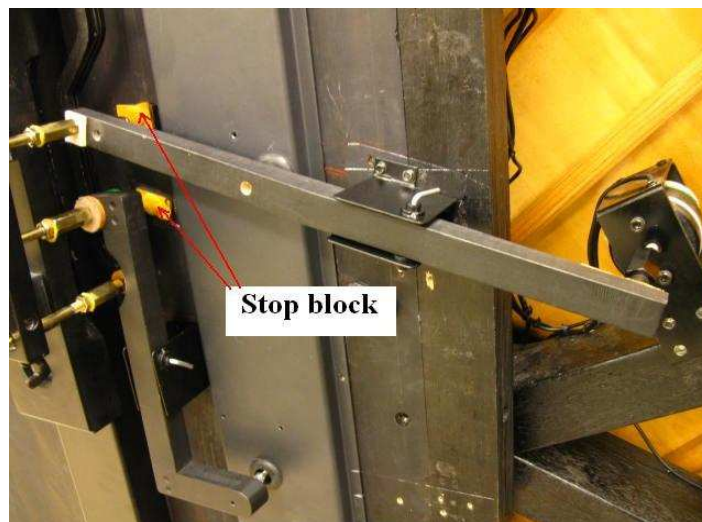


Illustration 77 – Finished installed sustain lever

- **Installing the stop block and stop screw.**

This is a method of adjustment that all Mason & Hamlin Pianos are now equipped with. The idea is to make the stop screw easy to access. The stop pad is used for the stop screw.

- Mark the location for the glide bolt.
 - Locate the glides and stop blocks in the kit.
 - Place the glide bolt 1" (25mm) behind the lyre rod contact point. (See Ill. 78)
 - Drill a 5/16" (8mm) hole and tap with a 3/8" (9.5mm)-16 tap.
 - Install the glide bolt into the lever.
 - Locate the position for the stop block under the glide and glue in place on the keybed.
 - Make final adjustments later.

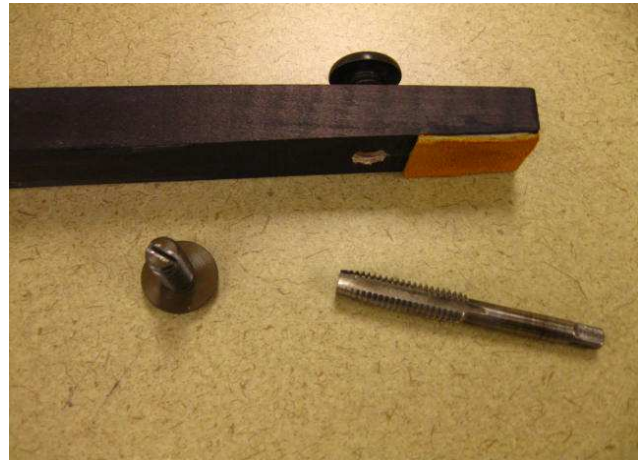
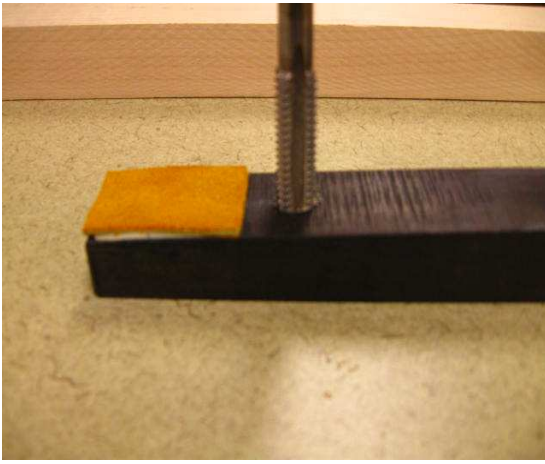


Illustration 78 - Stop glide and tap

NOTE: Run the tap into the hole to create the threads so that the stop glide turns with minimal resistance as the glide is aluminum. Use candle wax for a lubricant. If the glide is too loose, use a mix of wood glue and water (50/50 mix) to glue size the hole.

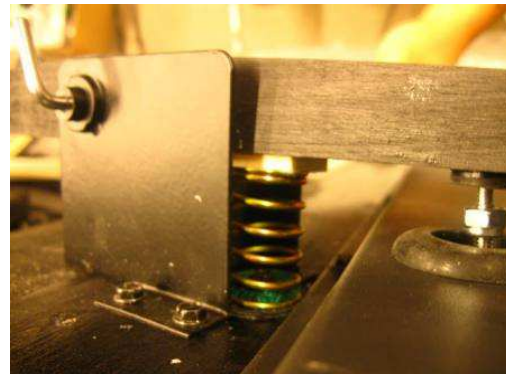
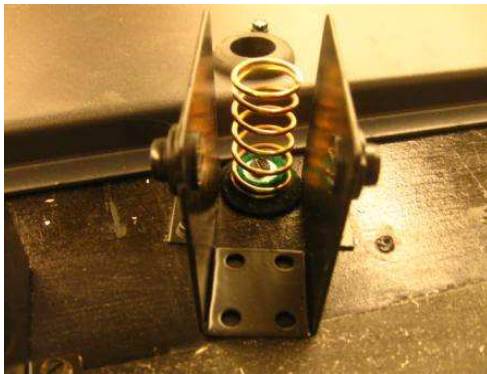


Illustration 79 – Sustain lever spring

- **Installing the pedal lever spring**

NOTE: The spring and leather will prevent the spring from making any kind of undesirable noise while the felt will keep the spring aligned.

- Mark the location for the sustain return spring. Usually the ideal location is 1"-2" from the pivot pin. (see Ill. 79)
- Install the leather/felt at this location on the keybed with the screw and washer provided.
- Note how the screw and washer, when tightened, make a snug fit for the spring.
- Place the spring on the leather and install lever locating the spring contact point on the lever.
- Remove the lever and glue on the $\frac{3}{4}$ " (19mm x 1" (25mm) white felt at the spring location. (See Ill. 79)
 - Use a contact type cement glue for the white felt.

Pianos with no support beam

In this case, it is necessary to install a beam of wood to mount the sustain solenoid and possibly a speaker. Use a 4" (10cm) x 6" (15cm) piece of wood attached by metal "L" brackets on the belly rail. At the rear end of the piano use glue and attach to the leg base console with two screws. (See Illustration 80)

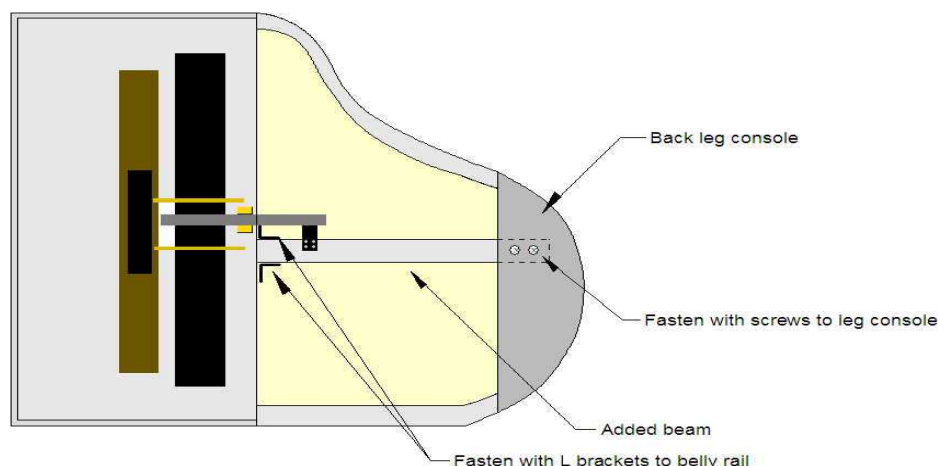


Illustration 80 - Pianos without support beams

I. Finish preparing of Sustain lever

- **Installing the rubber grommet in the damper tray.**
 - With the sustain lever back in place look down the sustain lever and at the damper tray, mark the location to drill a 23/64" (9 mm) hole for a rubber grommet.
 - Locate the rubber grommet, supplied in the kit, and glue in the grommet with contact cement or super glue.
 - Center the sustain pedal rod on the lyre and center the 3/4 inch (19mm) nut on the pedal solenoid. This is important for adjustability later.
- **Place the appropriate felt and spacer (if necessary) between the sustain lever & pedal rod.**
 - The front part of the lever should have either leather or felt placed between the lyre pedal rod and the lever.
- **Prepare the threaded rod.**
 - Place a self locking nut on the 8/32" (6.5 mm) rod with 1/2" (13 mm) of rod exposed.
 - Glue a flat washer onto the nut for more support area. Use super glue or contact cement.
 - Measuring and cutting the threaded rod. (See Ill. 81)
 - Place the threaded rod (nut end) into the grommet on the damper tray.
 - Now pull the dampers down to the strings and the damper tray up to the damper levers.
 - Now, mark the threaded rod, to be cut off flush with the bottom of the sustain lever.
 - At the same time, mark the location where threaded rod hole will be drilled on the sustain lever.
 - Cut the threaded rod to the make flush with the bottom of damper lever.
 - File off the threads and install a self locking nut at the distance of 3/4" (19mm) and glue a flat washer to the nut with contact cement.

NOTE: It is important that the sustain threaded rod is placed no more than 1" (25mm) from the back side of the solenoid slot. Past this point would come too close to the key driver board.

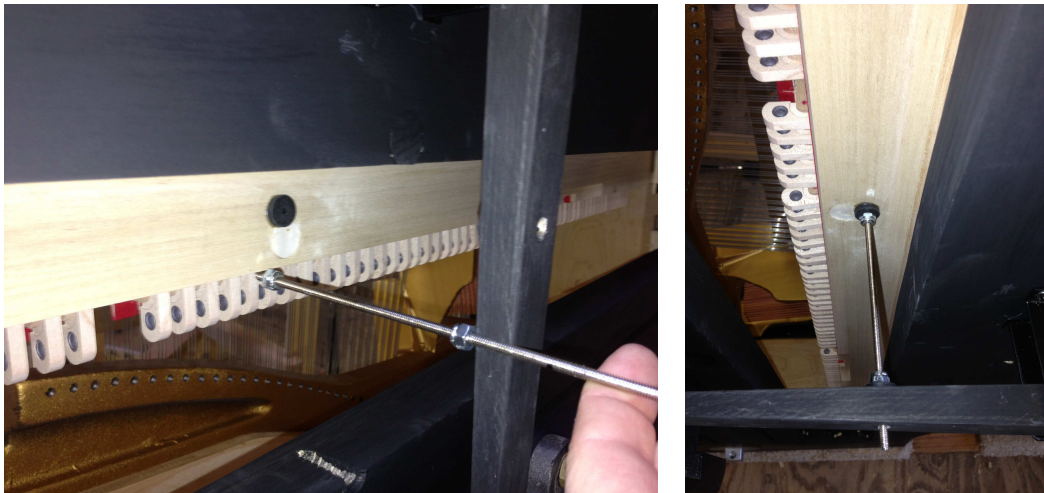


Illustration 81 – Finding length and placement of the sustain pitman rod

- **Drilling lever for threaded rod hole.**
 - Remove the threaded rod and sustain lever.
 - With a ¼" (6mm) drill bit, drill thru the sustain lever where the pitman will be located.
 - Now with a 23/64" (9mm) drill bit, drill **halfway through** the ¼" (6mm) hole you just drilled through the lever. (See Ill. 81, previous page)
 - Glue the grommet in place with C & A (super) glue or contact cement.
- **Locating and installing sustain pedal return spring.**
 - On most pianos, the sustain pedal feels lighter than the original trapwork. To replace the same feel to the pedal, a spring can be added to the sustain pedal as follows:
 - Remove the bottom of the lyre and the sustain pedal. (See Ill. 82)
 - Drill a 1" (25 mm) hole ½" (13 mm) deep into the lyre.
 - Felt the circumference to the hole with thin felt.
 - Place the spring in the hole and reassemble the lyre.

NOTE: The sustain access hole thru the solenoid tray will be drilled at the same time as the sostenuto. The same location procedure is used on both rod locations.

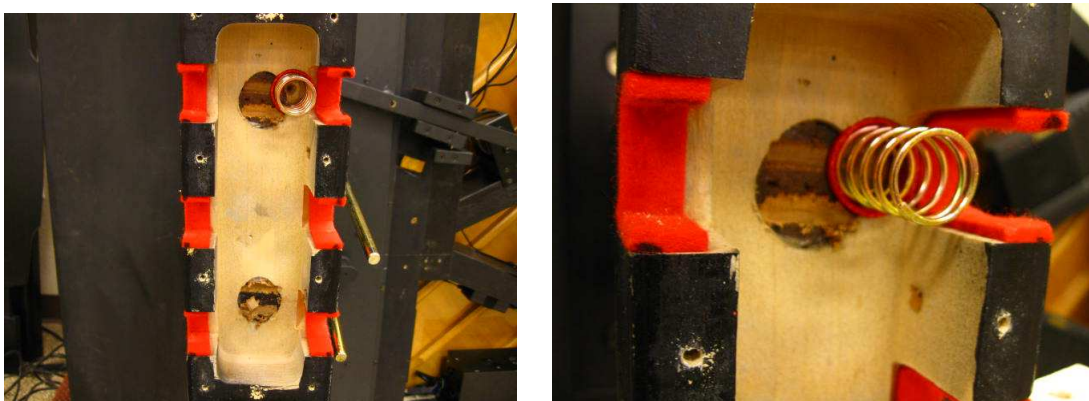


Illustration 82 – Installation of sustain pedal spring

J. Making and Installing the sostenuto lever

Please Note: PianoDisc requires a working sostenuto on all pianos if so equipped.

NOTE: For American Steinway pianos with the sostenuto bar on the action, please refer to Addendum 1 on page 76 at the end of this manual.

NOTE: The following trapwork parts are supplied in the kit for the sustain and sostenuto trapwork.

1. 2 pieces of maple wood – 1"(25mm)x 1"(25mm) x 24" (61cm).
 2. 2 metal pivot brackets.
 3. 8 - #8 x 1" black hexhead mounting screws.
- Check the sostenuto rod installed in the piano to decide if it is a push type or pull type sostenuto.
Note: With pull type the clip is on the front side. With a push type the clip is on the rear side of the sostenuto rod. Please refer to the following illustration.

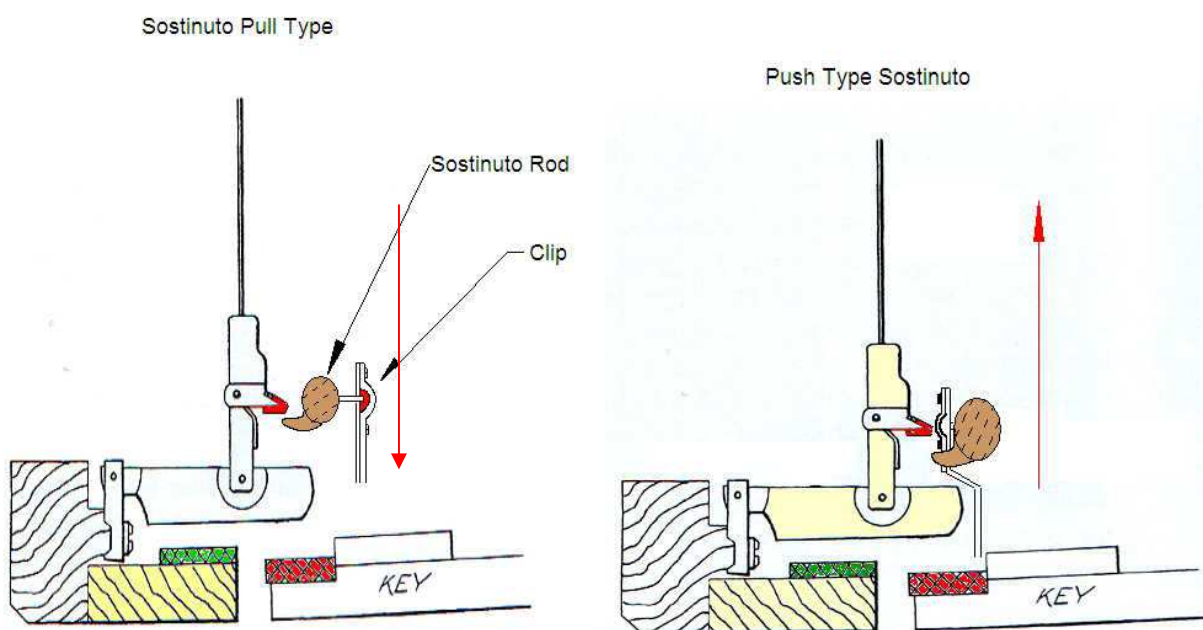


Illustration 83 - Sostenuto push and pull example

The following will provide a description of how you can locate the fulcrum / pivot location of any lever to convert the lever from a push to a pull type configuration.

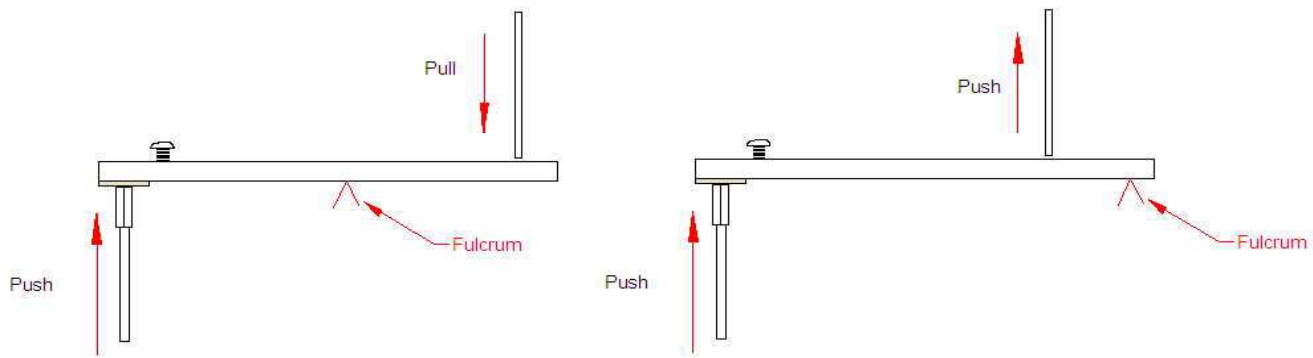


Illustration 84 -Single lever push/pull

Push or pull type sostenuto

NOTE: This procedure below of locating the hole location thru the solenoid tray is for either push or pull sostenuto systems.

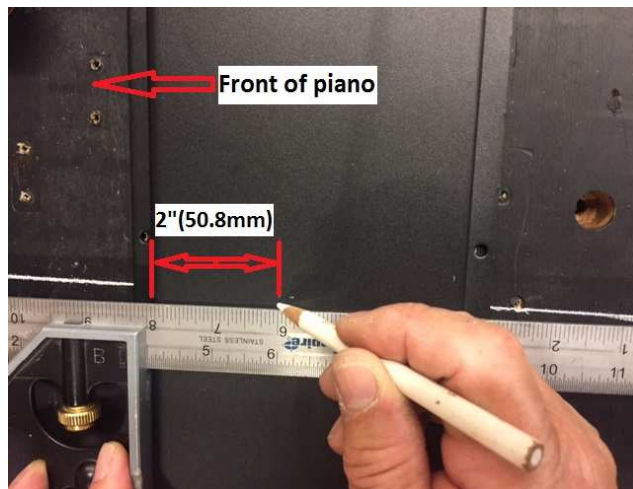


Illustration 85 – Sostenuto hole location



Illustration 86 – Carbide drill for tray hole

Locating the sostenuto hole location.

- Place a square across the solenoid tray at the line drawn at the sostenuto hole location in step 2 –I on page 13. (See Ill. 85)
- At 2" (50.8mm) place a mark for drilling the access hole. This is the best location that is between the two solenoid rails.
- Drill a 1" hole with a carbide drill bit and an electric cord drill.

NOTE: The Carbide drill can be purchased from Blair Equipment Company, part # - 14732. (See Ill. 86)
It can also be found at Home Depot in the electrical department



Illustration 87 – Sostenuto hole drilled with grommet in place

Making the push type Sostenuto Trapwork

NOTE: For American Steinway pianos please go to the Addendum 1 on page 76 at the end of this manual for additional information. PianoDisc designed and supplies a Sostenuto kit (PN. 5600-01000) for \$15.00 which attaches to the solenoid tray.

- Mount the rail cover back on the keybed with two screws at each end, making sure it is in the permanent location.
- There are two methods of making the trapwork; making a paper pattern or an adjustable jig. First we will show the paper pattern and then the jig that you can build.
- You will need to make a pattern of the sostenuto lever. (See Ill. 88)
- Use paper or a transparent material to create the pattern. It will take some observation and calculation to determine the shape needed.
- Place the pattern as shown on the keybed and draw the shape needed on the paper.

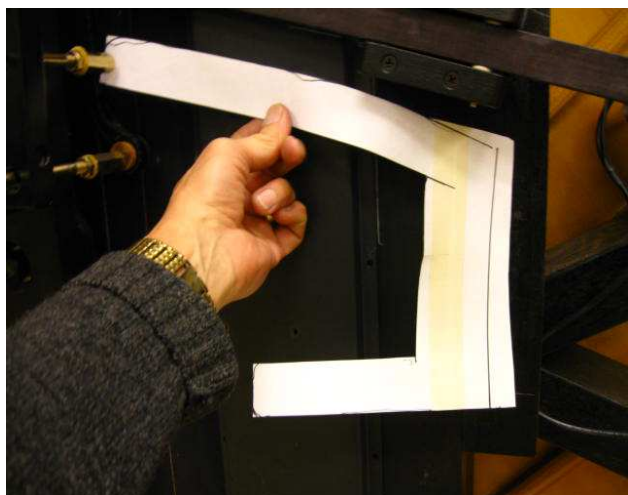


Illustration 88 - Sostenuto Pattern

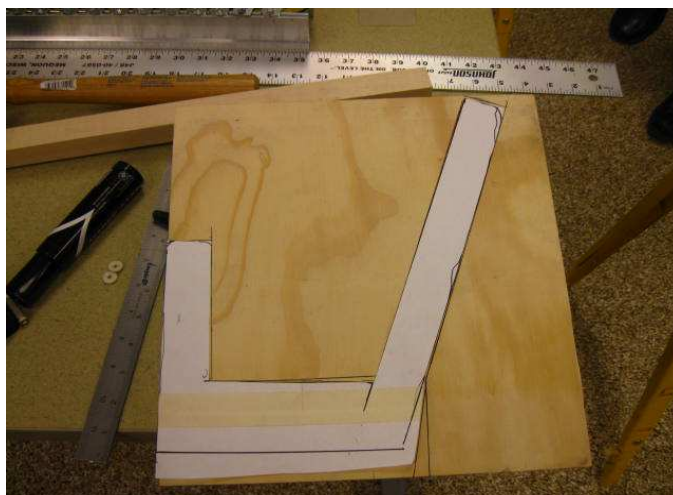


Illustration 89 - Sostenuto Pattern on plywood

- Once you have finished the pattern, transfer to a piece of plywood. (See Ill. 89) The plywood is not supplied in the kit and we recommend that you use a good quality plywood such as Baltic birch. Use a thickness of $\frac{3}{4}$ "(19mm)-1"(25mm) plywood.
- Cut out the plywood pattern and sand to create a look more symmetrical and appealing to the overall visual appearance.
- Here is an optional jig that you can make which can speed up the process of making the trapwork. (See Ill. 90)
-



Ill. 90 – Adjustable sostenuto jig (push type)

NOTE: There are instructions on how to build the jig on page 81 – Addendum 4.

- Since this lever shape is made of plywood, you will need to place a hardwood support (supplied in the kit) for the pivot pins.
- Cut the hardwood to the length needed and glue to the plywood with a simple butt joint secured with two wood screws. (See Ill. 91)
 - Make sure the glued surface is rough for a good glue joint. Use 60 or 80 grit sandpaper to rough up wood surface.
 - Use a 2”(50mm) wood screw the two pieces together.
 - Drill an access hole thru the plywood
 - Glue the two pieces together with clamps.
 - Drill a pilot hole into the hardwood to the correct depth. Be careful not to make the hole too small. Install the two screws.

NOTE: A good glue joint is sufficient but the screws are added security. I find it is much easier to glue the two pieces together, drill the pilot holes for screws and then install the screws.

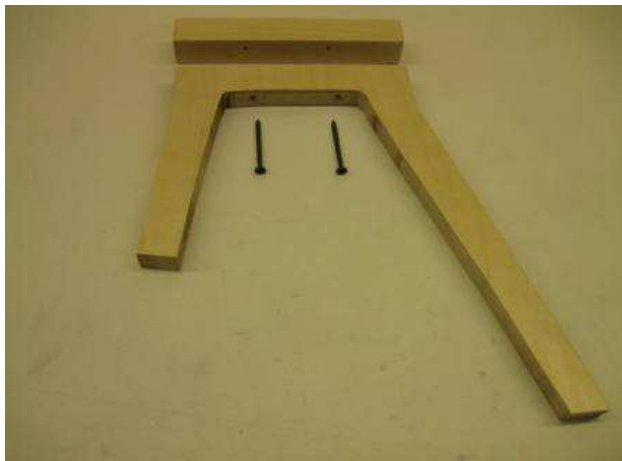
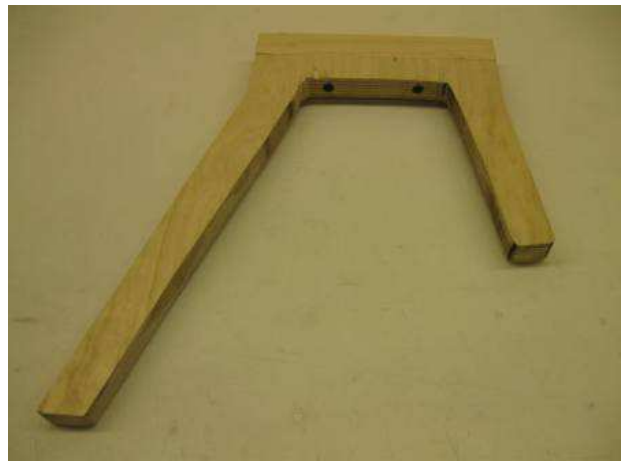


Illustration 91 – Sostenuto lever-unassembled



Illustratio 92– Sostenuto lever assembled

- Once the lever is cut and assembled it is ready for the final additions.
 - Round off all corners and sand all surfaces for painting.
 - Paint the lever black or other color that will match the color of the original trapwork.
 - Locate the metal pivot bracket and pins in the kit. (See Ill. 93& 94)



Illustration 93 – Trapwork bracket cut in half



Illustration 94 – Cut trapwork pin in half

- The single bracket will need to be cut in half to create two brackets. (See Ill. 95)
- The single pin in Illustration 94 will also need to be cut in half to create 2 – 1" (25mm) pins to be attached to each side of the trapwork lever.
- Drill an 11/64" (4.36mm) hole ½" (13mm) deep into the hard wood at each end of the lever for the pivot pins.
- Glue each 1" pin into the hardwood with epoxy for a good secure fit.
- Add the glide stop screw.
 - Place the glide bolt 1" (25mm) behind the lyre rod contact point.
 - Drill a 5/16" (8mm) hole and tap with a 3/8" (10mm)-16 tap. (Please refer to Ill. 78, page 42)
 - Install the glide bolt into the lever.
 - Locate the position for the stop block and glue in place.

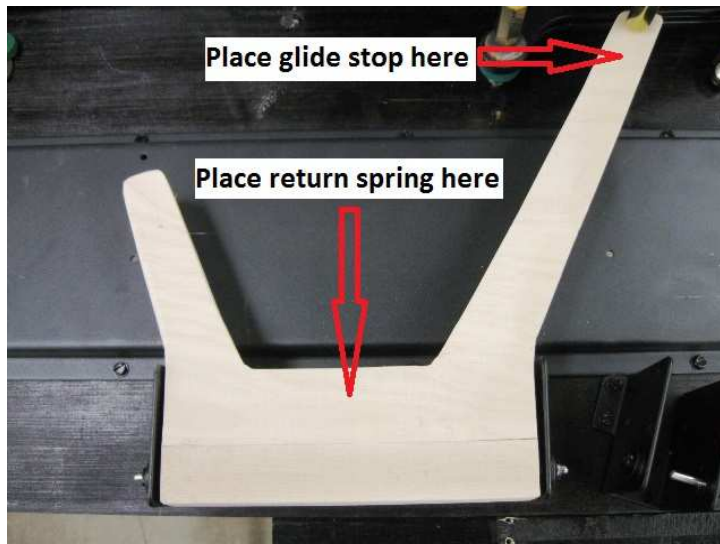


Illustration 95 – Sostenuto lever spring and glide

- Install a return spring towards the back of the lever. (Please refer to the following illustration on page 42 and see Ill. 95).
- Locate a piece of felt in the kit and add to the location where the lever will rest on the lyre rod.
- A hole is drilled in the lever to accommodate the threaded rod.

Note: When the threaded rod is attached to the lever there will be a felt washer, a metal washer and a lock nut on each side of the lever that will hold the threaded rod securely to the lever.

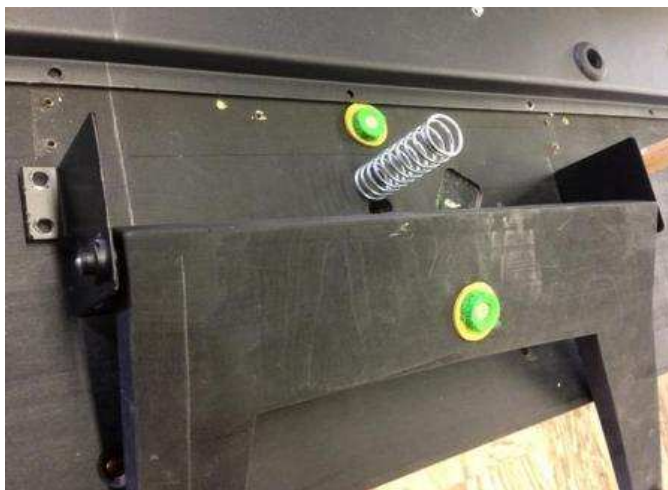


Illustration 96 – Sostenuto spring location



Illustration 97 - Sostenuto lever installed

Pull style sostenuto

The pull style sostenuto is a single lever system which will work on most pianos. PianoDisc has provided the lever and pivot bracket in the kit. The following instructions will aid you in assembling and installing this lever.

- Locate the hard wood lever and bracket in the kit.
- Measure the total length of the lever from the pedal rod to the contact point on the sostenuto rod.
- Drill the 5/32" (4mm) pivot hole half the distance of the lever. (See Ill. 98)
- Install the lever into the bracket with the pivot pin provided.
- Place the lever on the keybed aligning with the pedal rod and mark for the clearance of the shift pedal if necessary. (See Ill. 99)

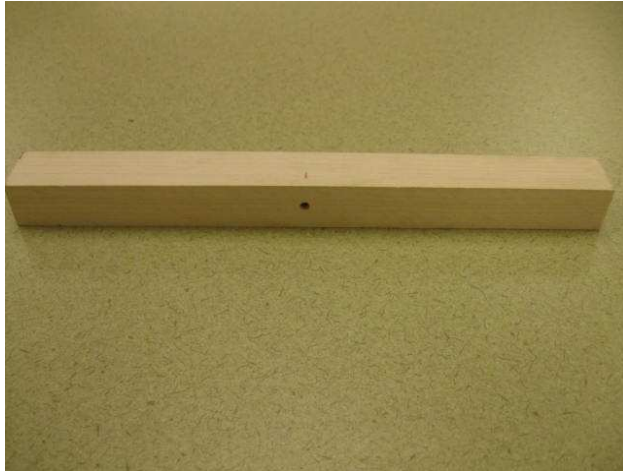


Illustration 98 - Sostenuto pull lever

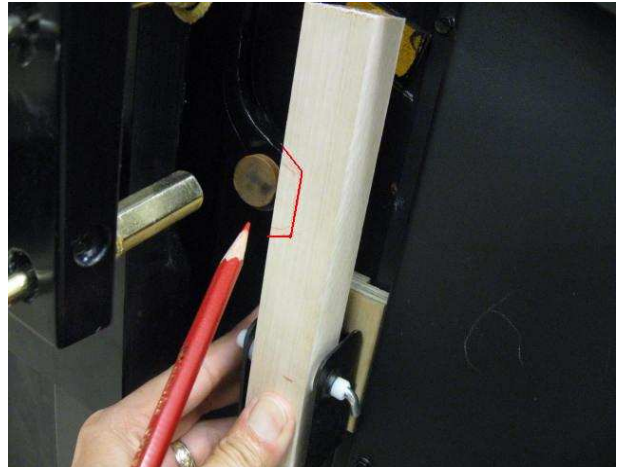


Illustration 99 - Sostenuto lever

- Now using the excess wood from the lever supplied, make a lap joint to extend to contact the pedal rod. (See Ill. 100)
- Make the cut on the two pieces of wood and attach the lap joint with wood glue and screws. (See Ill. 101)

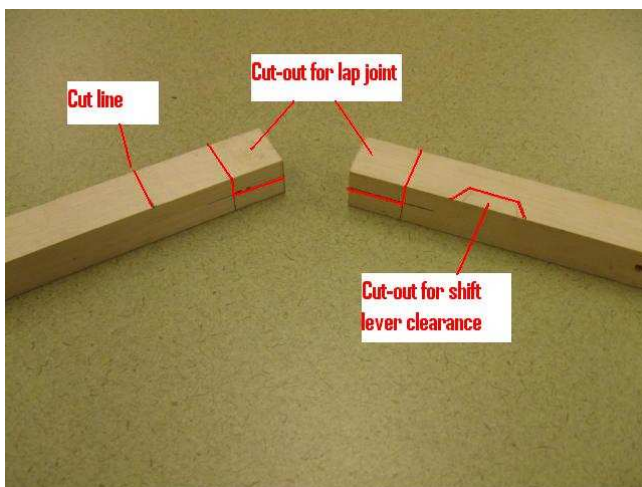


Illustration 100 - Sostenuto lever

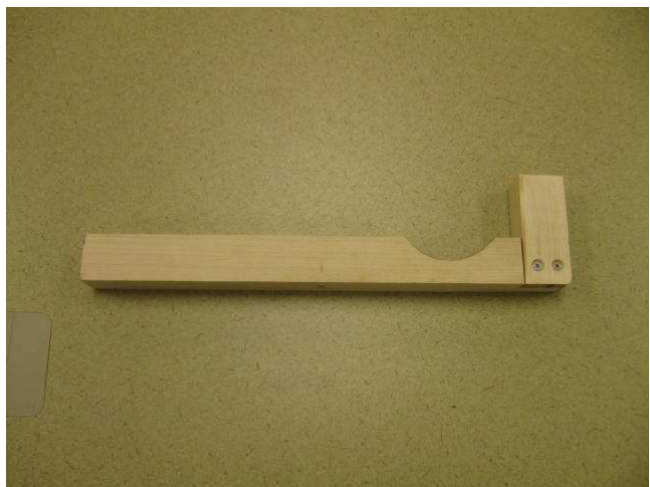


Illustration 101 - Sostenuto lever

- Place the lever back on the keyed and measure for the distance to the sostenuto rod.
- Using the excess wood from the levers supplied, make the lap joint, glue and screw together. (See Ill. 102-106)

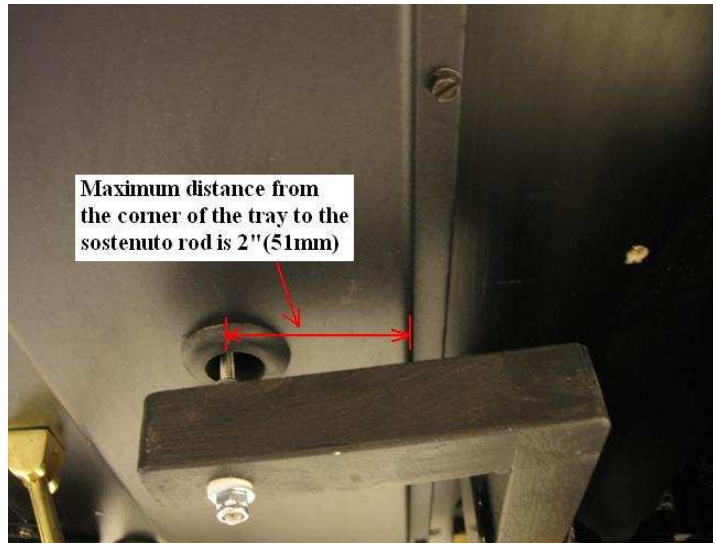
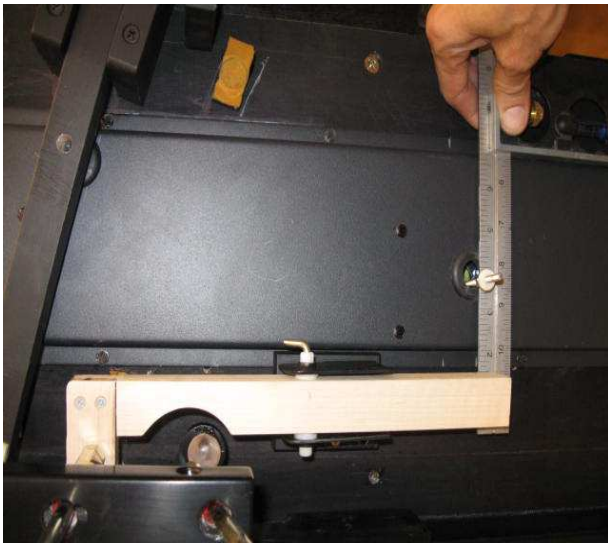


Illustration 102 - Sostenuto lever

Sand the lever rounding off the sharp edges and paint to the desired finish.

- Glue on the felt for the pedal rod contact and felt for the stop screw.
- Attach the lever to the piano. (See Ill. 106)

NOTE: The maximum distance for the threaded rod from the front corner of the tray is 2" (51mm)

Past this point the solenoid rail is a problem.

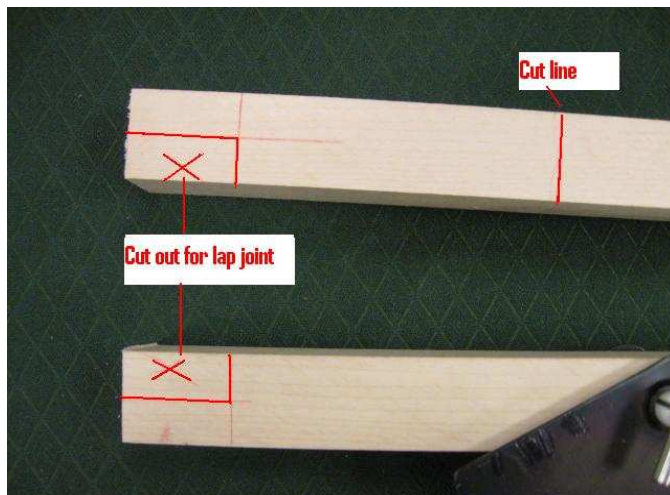


Illustration 103 - Sostenuto lever lap joint



Illustration 104 - Sostenuto lever assembled



Illustration 105 - Finished sostenuto lever



Illustration 106 - Lever Installed

- **Adding the adjustable glide bolt and stop block**

- The adjustable glide bolt should be located just slightly behind the lyre rod towards the tray.
 - Mark the location for the glide bolt
 - Drill a 5/16" (8mm) hole and tap with a 3/8" (10mm)-16 tap. (see Ill. 107)
 - Install the glide bolt into the lever. (See Ill. 108)
- Locate the position for the stop block and glue in place.
- Make final adjustments later.

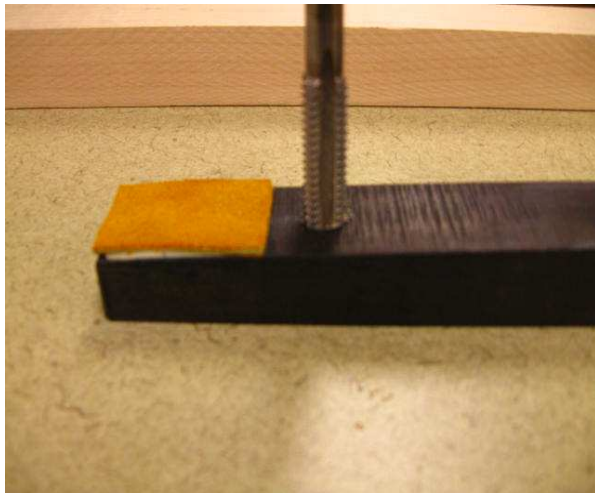


Illustration 107 - Taping for glide stop

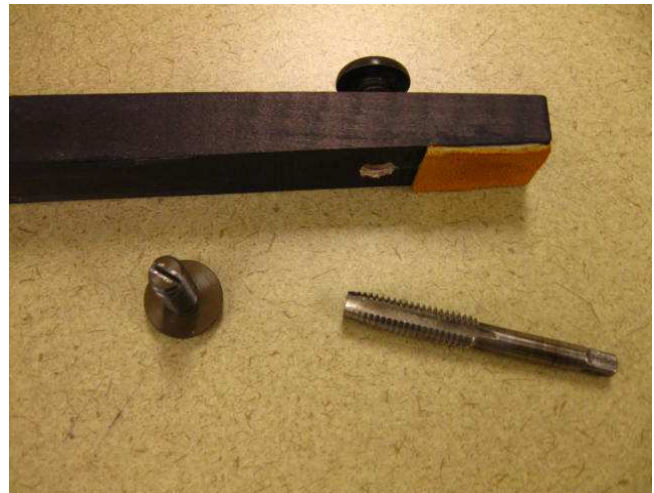


Illustration 108 - Glide stop installed

- **Installing the pedal lever spring**

NOTE: The spring and leather will prevent the spring from making any undesirable noise while the felt will keep the spring aligned.

- Locate the 1-1/8" (28.5mm) leather punching and 11/16" (17.5mm) felt punching, mounting screw and washer in the kit.
- Select the location for the spring, usually next to the stop screw at the lap joint location.
- Attach the felt/leather with the screw and washer provided. (See Ill. 109)
- Note how the screw and washer, when tightened, will make a snug fit for the spring.
- Locate the white felt, 3/4" (19mm) x 1" (25mm) in the trapwork baggie. This felt is place on the lever to cushion the spring. (See Ill. 110) Secure the felt with C&A or contact cement.



Illustration 109 Return spring installed



Illustration 110 – Return spring finished

Attaching the threaded rod to the sostenuto coupler

Before proceeding, it is important to determine exactly how the sostenuto linkage is connected on the particular piano you are working on. The sostenuto coupler varies a great deal from one piano to another. In examples A thru C, the rod connects in various ways. In example A, use a 5/8" x 2 1/2" (16 mm x 76 mm) wood dowel to make the connection. (See Ill. 111 to 113)

- Approximately half of the rod must be cut off.
- Using the correct size of die, thread 1" (25mm) of the rod.
- Then use the correct size of drill bit (interference fit) to drill the dowel.
- Use super glue on the rods during assembly for a permanent bond.

Example A

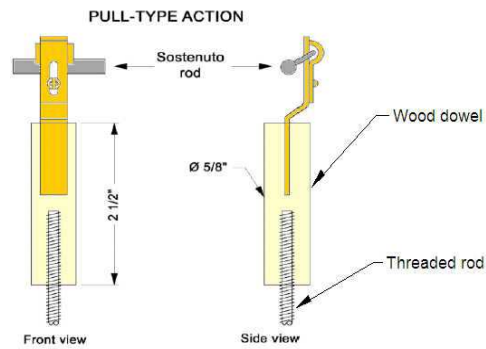


Illustration 111 – Sostenuto connect with super glue and wood dowel

Example B

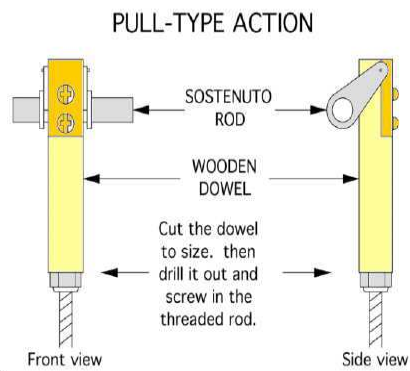


Illustration 112 – Sostenuto rod secured into dowel with super glue

Example C

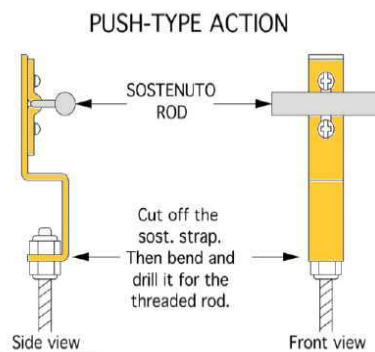


Illustration 113 - Sostenuto rod is secured with two nuts.

15. Adjusting the key solenoid plungers

Keybed that is not removable

A. The key solenoid plungers will arrive pre-assembled. You will need to adjust the key solenoid plungers.

NOTE: It is best to do this adjustment after the piano is on its legs. So, when the piano is on its legs refer back to this page and adjust the plunger tip height.

- Place two keys on each section of the piano choosing one key for the front row solenoid and one key for the back solenoid. Do this for each section. Also place a solenoid plunger for those keys.
- Place the action into the piano and with the key in the “rest position”, adjust each plunger to the bottom of the keys. These will be your samples, so do not mix them up.

NOTE: I suggest taking samples from each section because there is sometimes a difference between sections.

- Now carefully remove the plungers and use these as your sample heights.
- Use the Key Plunger Tool to adjust the plungers. (see Ill. 114)

Keybeds that are removable

With the keybed on the saw horses and the solenoid tray attached in its final location, a fine adjustment is easy to accomplish at this time.

A. Place the keys on the keyframe and attach the stack or top action.

- Place action on the keybed with the end blocks and the correct side to side location.
- Place a key solenoid plunger in a solenoid and adjust the height.
- This will be the sample for all the plunger heights rough adjustment.
- The object here is to get as close to the key as possible without contact. A gap of .020” (.50mm) is acceptable. Remember that you will gain loose motion or gap as the plunger rest felt compacts.
- For the final adjustment of the plunger heights, do the following for the best results:
 - Place the pre-adjusted plungers into the front row of key solenoids.
 - Place the action on the keybed, with the stack installed with end blocks.
 - Holding the plunger stem with needle nose pliers and adjust tip with your fingers to the key.
 - Next, place plungers into the back row of key solenoids and do the same adjust.
 - This is the best way to adjust as sometimes the keys are not the same height from the front to back row of solenoids.



Illustration 114 – Key Plunger Tool

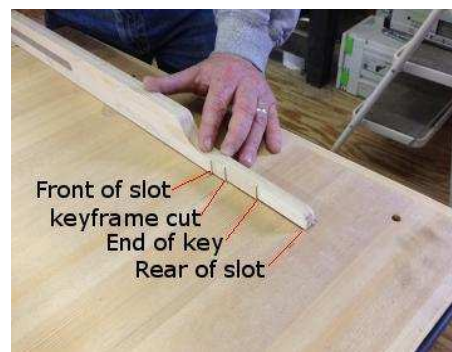


Illustration 114A – Slot locating jig

PianoDisc supplies the two tools above as a kit (Part # 5700-10000) for \$50.00.

16. Install key solenoids

Install the tray end cover plates

- Locate the tray end cover plates in the kit. (See Ill. 118)
 - Place the end cover plates at the end of the tray and center punch the hole locations.
 - Drill an 1/8" (3.2mm) hole thru the tray and then back thru the tray from the outside to clean up metal debris.
 - The 1/8" (3.2mm) is just an access hole and the screw will thread into the cover plate.
 - Attach the end plates with the screws supplied. (See Ill. 119)

Illustration 118 – Tray end cover plate

Illustration 119 – End cover plate installed

NOTE: For removable keybeds - Once the trapwork holes are drilled the solenoid tray can be re-attached to keybed and remain there permanently.

B. Install the key solenoid felt.

Locate the key solenoid felt in the kit.

- Cut the felt the same length as the solenoid rails
- Place the felt on the tray between the rails.
- Because the sostenuto hole is in the break area just cut the felt into two pieces. The picture shows a hole but this is not necessary. (See Ill. 120)
- Secure the felt in the tray at the ends with rubber silicone. (See Ill. 120)



Illustration 120 – Installing key solenoid felt Illustration 121 - Mount solenoid pairs on rails

C. Mount the solenoids to the rails.

- Place the correct number of solenoids on each section.
- Place the scale stick on the tray aligning with the end of section solenoids. (See Ill. 122)
- Align and attach all key solenoids.
- Mount the remaining solenoids so that the lowest note in the system is $\frac{1}{2}$ " (13mm) in from the end of the rail.
- Attach the screw to the front rail.
- Set the rest of the solenoid bracket assemblies with plungers on the rails.

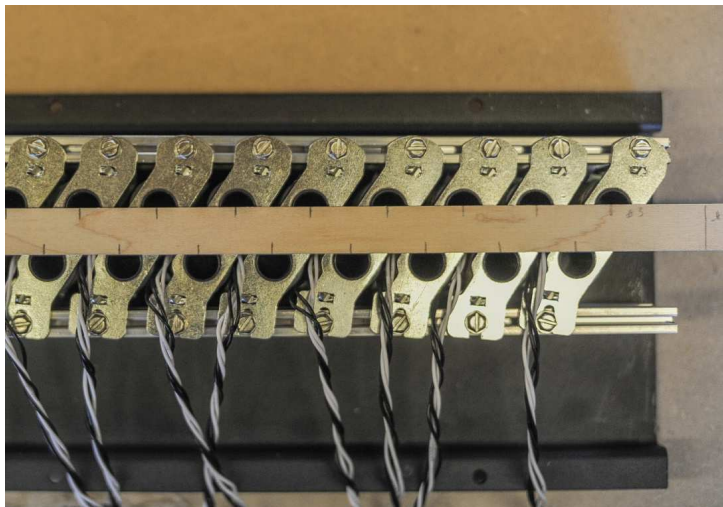


Illustration 122 - Use scale stick to locate solenoids

- Lay the key scale stick between the rows of plunger stems.

- Move the front and back solenoids so they align with the key end scale stick.
- Fasten the solenoid bracket to both rails using a hex screw provided in the kit.
- **Cut the wires from solenoids that will not be used.**



Illustration 123 - Cutting wires on unused solenoids.

- You will not insert plungers in these solenoids either.

NOTE: If the keybed is off the piano, it is best to place the tray back on the keybed and install the key solenoids. After burn-in the keybed and solenoid system go on the piano as an assembly. It is best to have two people for this job.

- **Twist the wires on each solenoid set**



Illustration 124 - Hook in drill



Illustration 125 - Twist solenoid wires

- Take a damper wire or similar diameter and bend a hook in the end of the wire.
- Place the wire in a drill. (See Ill. 124)
- With the hook, twist the solenoid wire 4 to 5 full turns for all solenoids. (See Ill. 125)

CAUTION: Be careful not to pull too hard on the connector while twisting wires as the wires can be pulled out of the plug.

17. Plug in key driver boards

NOTE: All three key driver boards are identical. Always start at the bass end when plugging in key solenoids. Note the position of the key driver board in Ill. 126 & 127.

A. Position driver boards for assembly.

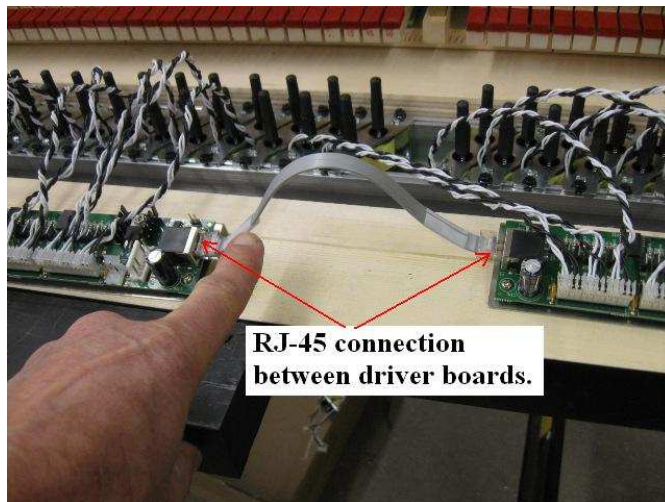
- Lay the driver boards on the bench on the appropriate side of the tray.
- The driver boards will mount vertically in the space between the solenoids and the edge of the tray.
 - Do not mount the driver boards until after burn-in.

B. Plug solenoids into the driver boards.

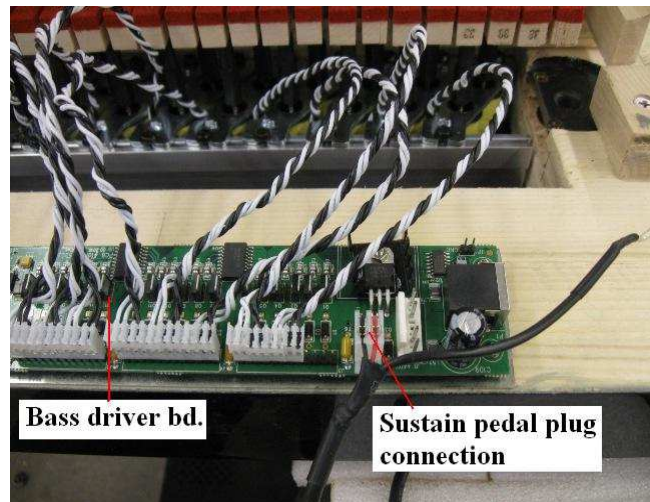
Remember that if you have omitted solenoids with keys, you need to plug the lowest note in the system onto the appropriate pins for that note on the key driver board.

- If you omitted two notes from the bass end, then you will leave the first four pins of the driver board empty.
- Pay attention in crossing breaks as the color pattern may not be black/white as you have become accustomed to in the past, it may be two white or black wires together.

C. Connect the data cables between the driver boards.



RJ-45 connection
between driver boards.



Bass driver bd.

Sustain pedal plug
connection

Illustration 126 - Connecting data cables

Illustration 127 – Pedal solenoid connection

- The data cables that go between the driver boards are gray, relatively short and have RJ-45 connectors. (See Ill. 126)
 - The data cables go between driver boards 1 and 2 and between driver boards 2 and 3.
 - These data cables deliver 12 VDC to operate the boards, 5 VDC and data to play the music.

D. Connect the Power / Data cable for the sustain pedal solenoid.

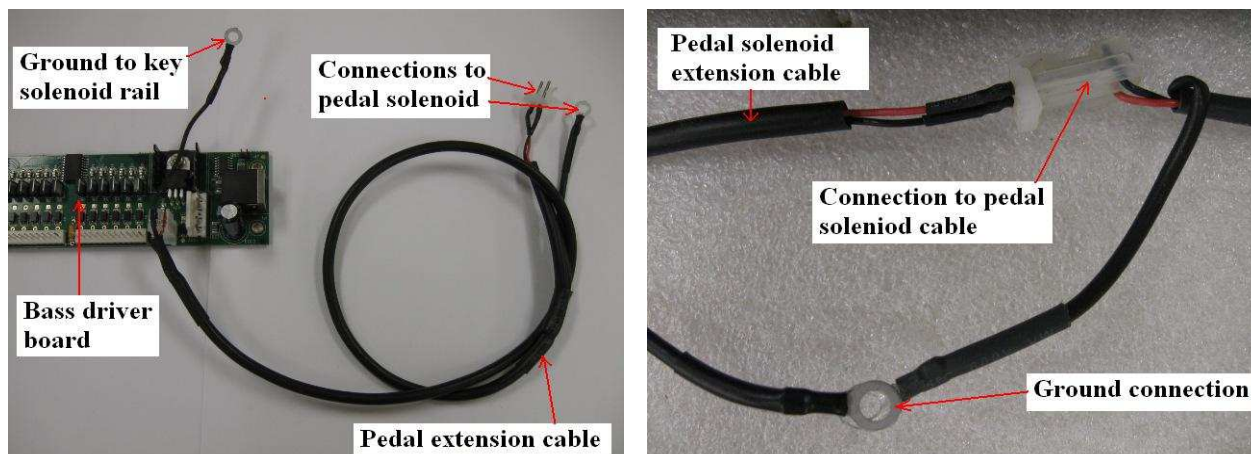


Illustration 128 - Connecting power/data cable and ground for sustain pedal solenoid

- This is an extension cable about 24" (2cm) long, black with a two pin connector and a ground connection on each end.

Note: This pedal extension cable is very important for installing the keybed and servicing the system. It provides a disconnect point when lowering the solenoid tray.

- On the driver board, connect the two pin connector to the bass driver board.
 - The socket will be right next to the power connector on the driver board.
 - Connect the ground wire to the solenoid rail. (See Ill. 134)
- Connect of other end to the pedal solenoid cable. (See Ill. 128)
 - Connect the extension cable 2 pin power plug into the pedal solenoid cable.

E. Connect the 42 Volt power ribbon cable between the board

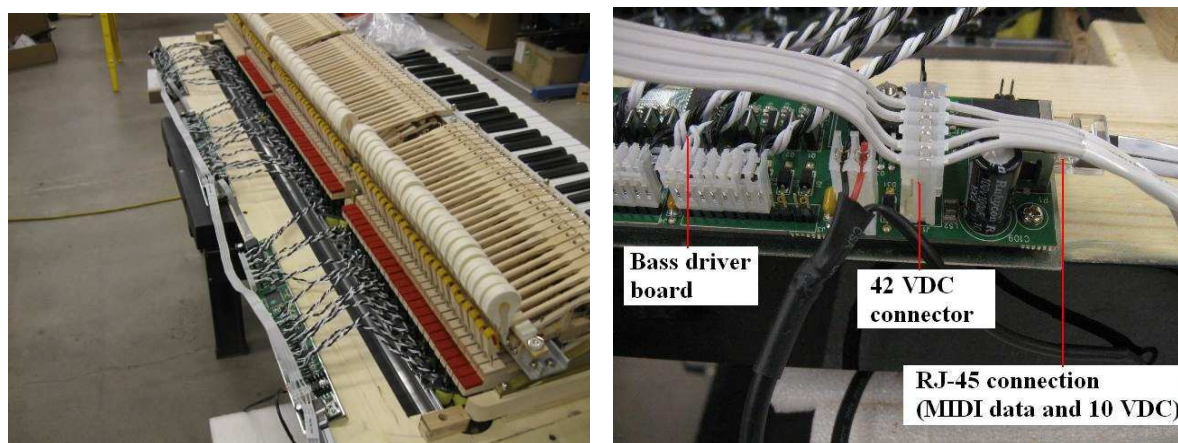


Illustration 129 - connecting 42v cable

- There are three white plugs that go into the driver boards and one black plug that goes to the power supply. This cable supplies the 42 VDC for the key solenoid operation.
 - Plug the end white plug into each driver board. (See Ill. 129)
 - The remaining black plug will go into the power supply.

18. Setup for burn in.

A. Setup a power supply, an IQ box, and a CPU on the bench.

- These should be close to the tray and solenoid assembly so the cords will reach.

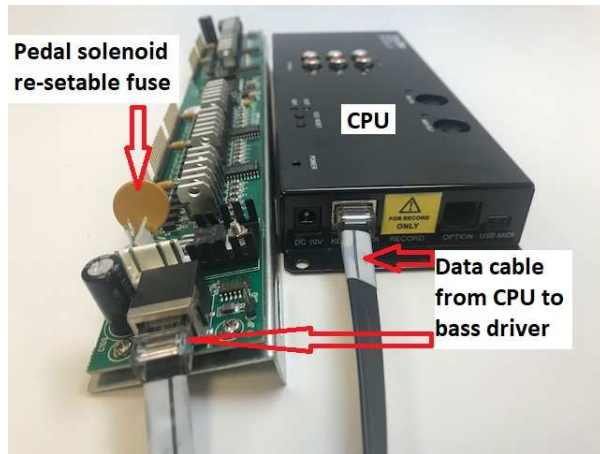


Illustration 130 - Connecting data

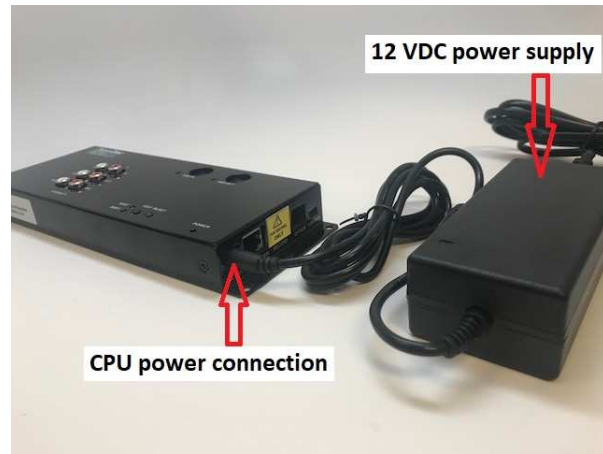


Illustration 131- Connecting 12 VDC power

B. Connect data to the CPU.

- Attach the RJ-45 flat data cable from the bass driver board to the CPU. (see Ill. 130)
 - This is a flat ribbon cable and must be in this position.

C. Connect power to the CPU.

- Connect the 12 Volt power cable from the power supply to the CPU.

D. Connect power (42V) to the driver boards.

- Connect the black plug on the 42 Volt grey ribbon cable into the power supply.

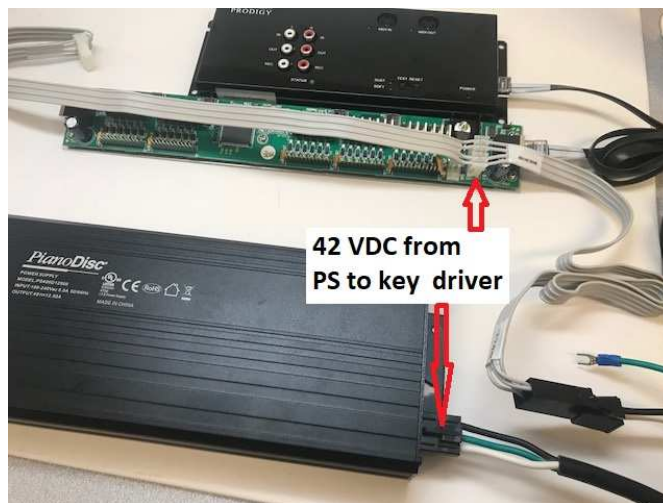


Illustration 132 - Connecting 42v power to driver board

19. Burn in the unit

A. The purpose of burn-in is to test the electronic parts for a period on time. We suggest at least 8 hours. At PianoDisc we run them over night.

- Use a burn in disc to run the PD system for 24 hours.

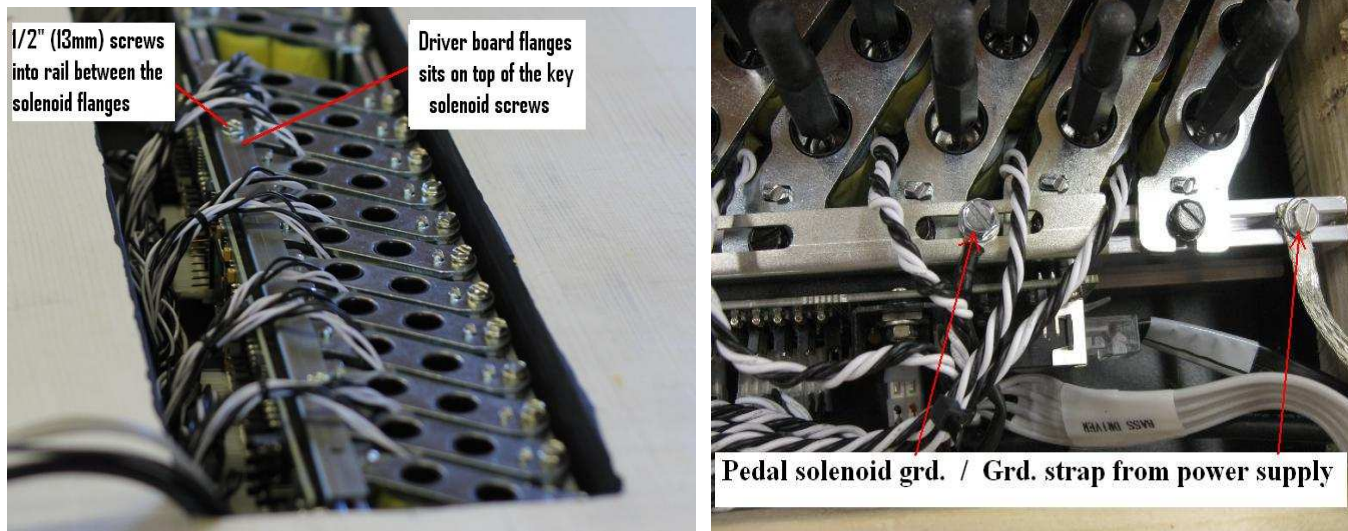


Illustration 134 – Driver boards attached to rail

20. Install driver boards into the tray assembly

NOTE: The driver boards are mounted onto the back side of the back solenoid rail. (See Ill. 134) The mounting flange on the driver board bracket is slotted to easily position between the solenoid brackets. Use two mounting screws, #6½" (13mm) hexhead, on each driver board into the back solenoid rail to mount. Make sure to connect the pedal solenoid ground to the driver board mounting screw on the bass driver board. (See Ill. – 134)

NOTE: Make sure all cables are plugged into the driver boards before securing them to the solenoid rail.

A. **Position the Tenor driver board.**

- Position the tenor driver board so that the sustain pitman hole falls in the area where there nothing protruding from the circuit board.

B. **Position the bass and treble driver boards.**

- Position the bass and treble driver boards so the wires are not stressed on either end.

C. **Attach to the driver boards to the back solenoid rail.**

- Locate the driver board mounting screws in the kit, #6x1/2" (13mm) and mount the solenoid driver boards to the back solenoid rail.

D. **Route wires in tray.**

- Route the data wires.
 - Make sure adequate clearance is maintained and they fit neatly into the slot.
 - Make sure the external data cable is coming out the bass end of the tray assembly.
- Route the solenoid wires.

- Bundle solenoid wires so they are neat and tidy.
 - Make sure the solenoid wires fall in the cut out in the solenoid bracket neatly.
- Route the 40V power cable
 - Make sure the cable clears all obstructions.
 - Make sure the black power cord is attached.

21. Drill hole thru belly rail for wires

A. Mark the hole in the belly rail for keyed not removable

- The center of the hole should be about 2"- 5" in from the end of the slot in the keyed.
 - If notes are left off this hole location will vary; it depends on the bass driver board location.
 - Once the driver boards are attached to the solenoid tray, measure from the end of the tray to the bass driver board and this will be the distance for the hole in the belly rail.
- Look inside the piano making sure there is nothing in the way of the drilling location.
- Drill the hole with a 1" (25mm) Forstner bit. (See Ill. 135 & 136)

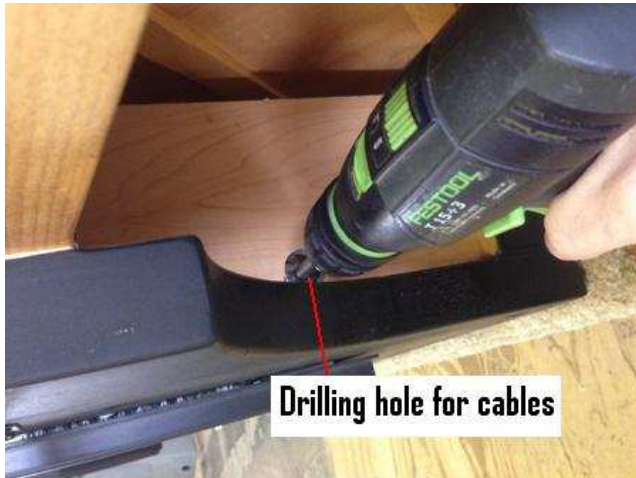


Illustration 135 – Drilling hole in belly rail

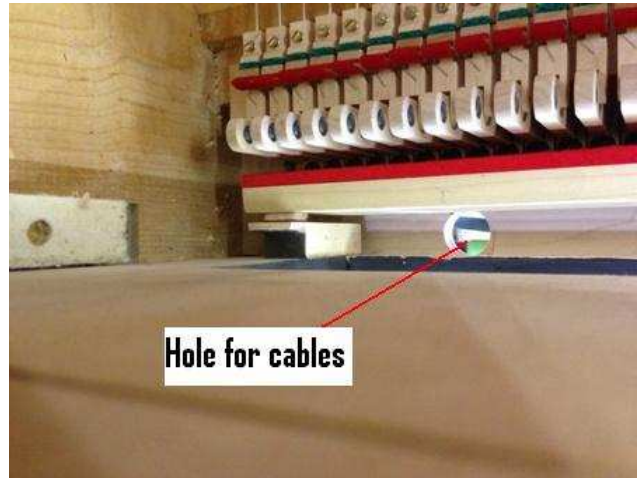


Illustration 136 – Hole in belly rail

22. Mount the CPU.

A. Position the CPU.

- Usually the CPU is mounted on a beam or the back side of the belly rail close to the hole you cut in the belly rail to route wires.
- If the belly rail is not a good location then place the CPU on the side of a beam.

B. Mount the CPU.

- Attach the CPU with the screws provided and include the ground strap under the CPU from the power supply. (See Ground strap installation – Page 72, Ill. 143)

23. Mount the power supplies

Note: On current PianoDisc units there are two power supplies. The larger power supply provides 42V DC to the solenoids. The smaller power supply provides 12V DC to the CPU and other electronics.



Illustration 137 - 42V Power supply mounted to rim



Illustration 138 – 12V power supply on rim

A. Position the 42V power supply.

- Position the 42V power supply on the rim on the bass side of the piano unless the piano requires you to mount it somewhere else.
- If the piano will not permit then location the 42V power supply as close as possible to the wire holes on some other physical feature of the piano like the rim or a rim strut.

B. Mount the 42V power supply.

- Attach the 42V power supply with the screws provided including the ground strap under the power supply. (See step 30 – Ground strap installation)

C. Position the 12V power supply.

- Position the 12V power supply on a rim strut close to the main power supply.

D. Mount the 12V power supply.

- Attach the 12V power supply with the Velcro provided for this purpose.
 - Place the Velcro at the desired location and secure with 2 staple.
 - Secure each cable with twist ties or zip ties with eyelets supplied in the kit. (See Ill. 138)

24. Mount the power strip.

A. Position the power strip.

- Usually the power strip is mounted on a rim of the piano. (See Ill. 139)
- This would imply the power cord for the PianoDisc unit would come down the back leg.



Illustration 139 - power strip mounting slots



Illustration 139A – Power strip attached

B. Mount the power strip

- Attach the power strip with the 2 screws provided and secure in place with a screw at the end or side. (See Ill. 139) Power strips have different mounting slot configurations.
 - The end screw or side will prevent the plug strip from sliding off the mounting screws.



Illustration 140 – Speaker mounted to beam

C. Mounting the speakers

- Remove the speakers from the box and locate the mounting hardware.
- Put the speaker on the beam at the selected location as close to the sound board as possible.
- Mount the bracket on the appropriate set of screw holes at the side of the speaker. Use the silver self tapping screws supplied to mount the bracket to the speaker.
- Mount the speaker with 4 screws, black Phillip head screws to the beam. (See Ill. 140)
- Connect the power cable to the speaker and the multi plug strip. Connect the RCA cable to the speaker and make sure to keep this cable away from the AC power cable.

NOTE: Never run audio cables together with AC power cables as this will cause noise in the speaker.

25. Installing keybed to the piano

A. This is a job for 2 people as the keybed gained some weight with the key solenoid assembly attached.

- Place a large piano moving rubber band around the key solenoid plungers to prevent them from falling out while installing the keybed. (See Ill. 142)
- Prepare yourself with a rubber mallet close at hand and a clear path.

NOTE: Just before placing the keybed on the guide pins, make sure to route the cables into the belly rail hole.

- Carefully, two people pick up the keybed and place on to the guide pins.
- Use the rubber mallet to tap the keybed into place and secure with the original screws.

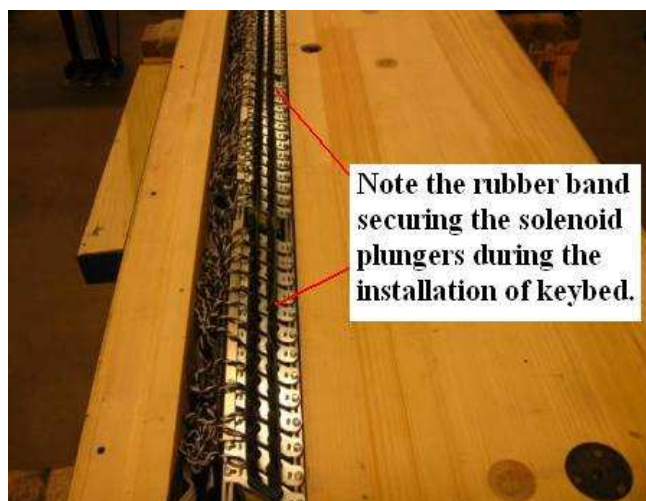


Illustration 142 – Securing key solenoid plunger with rubber band

26. Regulate action.

Note: A PianoDisc system will not perform as it should if the piano is not regulated properly. Since a number of things have been done to the action it is necessary to re-regulate the action even if it was perfect when it arrived.

A. Restore key height to the original settings.

- Bed the keyframe.
 - The front rail should have no knocks.
 - The back rail should be broadly down with no areas up in the air.
 - The glide bolts should be set so that the weight of the keys is supported at the balance rail by the glide bolts.
- Level and dip the keyboard.
 - Use the measurement taken earlier.
 - Reset back key height using cardboard shims under the back rail cloth.
 - Reset front key height by re-leveling the keyboard.
 - Set the front key height to the measurements taken earlier.

- Set the sharp key height to ½" (12.7mm) above the white keys after the white keys are leveled.
- Set key dip as before.
 - Usually the white key dip will be between .390" (9.9mm) to .394 (10mm).
 - Regulate notes C-40 & C#-41.
 - Adjust hammer line so you achieve .040" (1mm) after touch with 1/16" (1.6mm) letoff and 1/8" (3.2mm) drop.
 - Set the sharp dip so that the after touch is identical to the white keys.
- Lubricate action with Teflon Powder.
- Align the hammers to the strings.
- Align repetitions to the knuckles.
- Align and square backchecks to the hammer tails.
- Set initial balancier height so that the jack is flush with the balancier.
- Set initial hammer line to the dimension needed when setting sharp dip.
- Regulate jack position in relation to the knuckle.
- Regulate let-off.
- Regulate drop.
- Measure after touch.
 - Put a .040" (1mm) front rail punching on top of the cloth front rail punching.
 - If after touch is .040" (1mm), a weighted touch block will bring the jack to the point of tripping without actually doing so.
 - The slightest additional compression of the front rail punching will result in the jack tripping.
 - If the jack in these circumstances does not trip then there is less than .040" (1mm) after touch
 - If the jacktrips easily then there is more than .040" (1mm) of after touch.
- If after touch is not to spec, set second hammer line either up or down so that after touch is about .040" (1mm).
- Check drop and adjust as required.
- Regulate backchecks for checking.
- Regulate repetition springs for a controlled rise.
- Regulate balancier height so the hammer just winks.
- Clean up hammer line.
- Clean up drop.

28. Setting up communication with the PianoDisc system.

NOTE: PianoDisc has a free setup App that you can do all the setup with any I-devise. Just download the App from the Apple Store. The Prodigy system is Bluetooth ready and all the set-up can now be done within the PD calibration app.

Note: PianoDisc offers upgrades for legacy PianoDisc systems, please contact your PianoDisc sales rep. for information.

29. Adjust the pedal solenoid.

Note: Adjust the stroke of the pedal solenoid so that dampers are lifted off the string 1/8" (3mm). There may be times when, as a result of poor regulation or worn parts, the stroke in the pedal solenoid must be set higher. The shorter the stroke on the pedal solenoid the less heat will develop and less noise.

A. Adjust the sustain pedal solenoid.

- Go to the pedal strike force test in the PD set-up App.
 - Press the "test" button.
 - Observe the wedge damper lift.
- Adjust the damper lift.
 - Turn the Hex Thrust nut (3/4" (19mm), against the lever, to adjust damper lift.
 - From the bottom, counter-clockwise will get you more lift.
 - Clockwise will get you less lift.
 - When lift is correct tighten the 9/16" (14mm) lock nut.

B. Adjust pedal solenoid stop pad.

Note: The stop pad is circular felt pad that limits the pedal solenoids return distance. It has a threaded rod going through the bracket controlling the stroke of the pedal solenoid. A lock nut holds the adjustment so that it will not change.

When the pedal solenoid is mounted in the piano and the piano is on the floor, the felt pad is on the "top" side of the solenoid next to the sound board.

- Loosen lock nut with a 9/16" (14mm) wrench.
- Turn the pedal solenoid stop pad until you achieve a small amount of loose motion. Just enough loose motion for damper follow on the bass strings and tighten the lock nut.

C. Adjust the pedal rod for minimal free play between the damper tray and the underlever.

- Use the appropriate wrenches to loosen the lock nut on the sustain pedal rod.
- Adjust the long cap nut up or down until there is minimal travel before the dampers start to lift off the strings.
 - You may find it necessary to adjust the pickup of the dampers if they are not lifting evenly.

30. Final check list.

A. Use the PD set-up app to verify that all

- Verify that all solenoids, keys and pedals are functioning properly.

B. Secure and neatly arrange all cables and cords to the beams with the proper fasteners.

C. Check the components to ensure that they are securely installed.

D. Check the solenoids to ensure that all of the hammers are in the rest position.

E. Check that all key solenoids are functioning properly.

- Operate the system for at least 12 hours continuously.
- Recheck the piano and the PianoDisc system for proper operation after 12 hours of burn in.

NOTE: NEVER PERFORM LEARN ON HOT KEY SOLENOIDS. ALWAYS WAIT 2 HOURS BEFORE LEARNING OR SETTING THE LOW VOLUME OF EACH NOTE.

31. Ground Strap Installation

ESD Strap Installation – Grand Pianos Low Profile System

There are 2 - ESD straps that are included with the kit.

1. The #1 ground strap is a 30" (76cm) strap that should be attached from the bottom side of the power supply to the bottom side of the CPU. (See Ill. 143)

Note: There's a location on the under side of the power supply and CPU that has exposed metal. Please make sure that the ESD strap makes contact with the surface that is exposed.

2. The #2 ground strap is a 18" (46cm) strap that attaches to the #1 strap, with a small screw, and then should attach, thru the belly rail hole, to the solenoid rail. (See Ill. 143 & 144, next page)
3. Connect the Pedal solenoid ground wire to the driver board screw. (See Ill. 144)

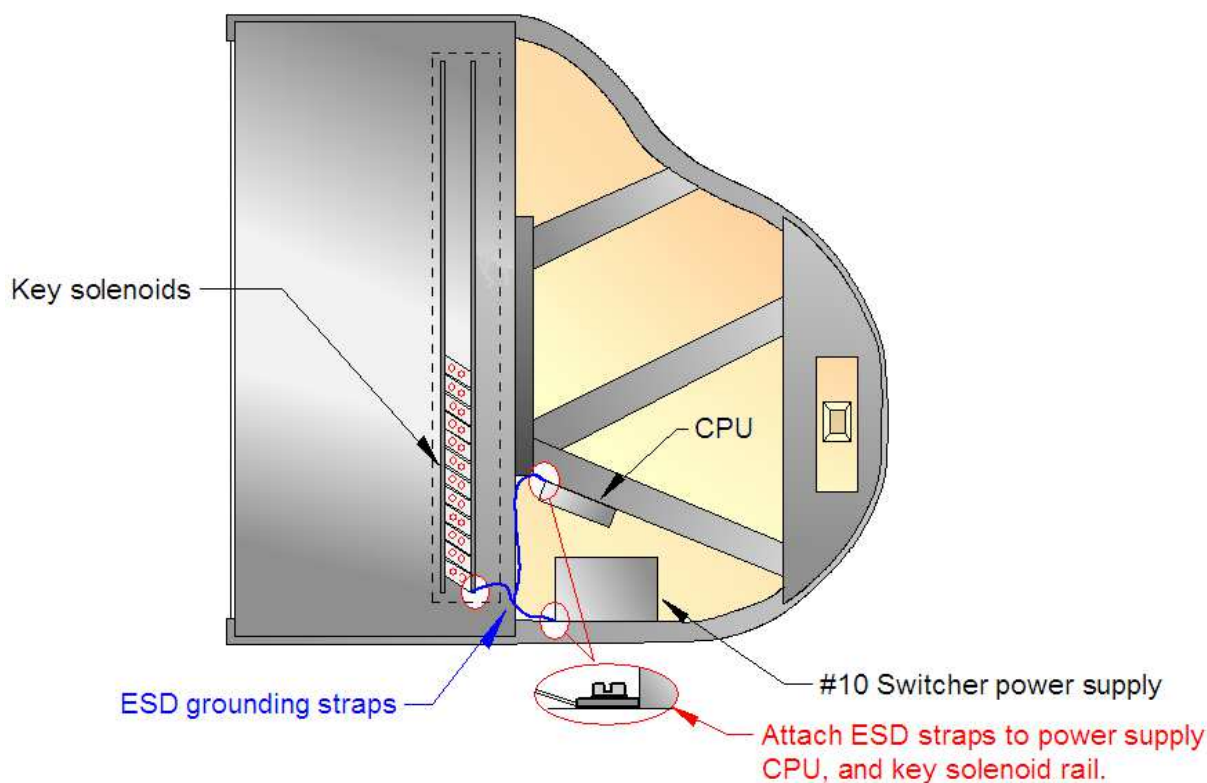


Illustration 143 – ESD ground strap locations

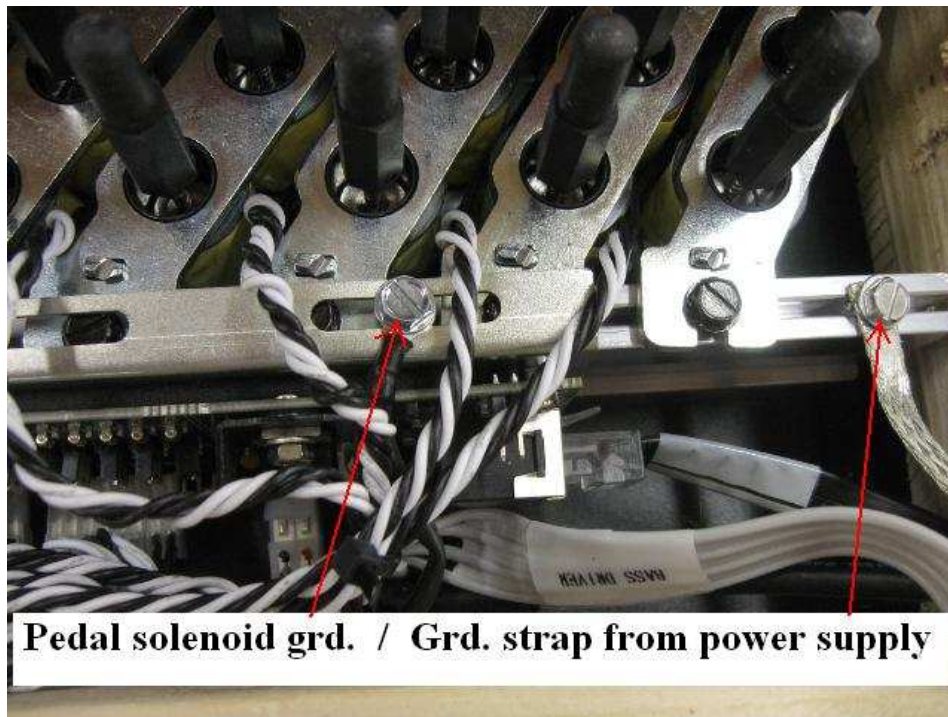


Illustration 144 - ESD ground strap to solenoid rail- bass end

Appendix A - Keybed removal

Grand pianos with removable keybeds in production today

Boston
 Estonia
 Fazioli
 Kawai
 Petrof
 Pearl River
 Mason & Hamlin
 Samick
 Yamaha
 Young Chang

Grand Pianos with non-removable keybeds in production today

Steinway and Sons
 Sauter
 Forester
 Schimmel
 Steingraeber
 Blunthner
 Walter
 Playel

Addendum 1 - Steinway Sostenuto

The American Steinway sostenuto is different than most other pianos because they mount the sostenuto on the top action instead of the belly rail. Also they use the keybed to guide a dowel that contacts a wooden linkage called a “monkey”. Since the cutting of the keybed removes this guide hole we must find another guide. PianoDisc designed and supplies a Sostenuto kit (PN. 5600-01000) for \$15.00 which attaches to the solenoid tray. (See Ill. 1 & 2)

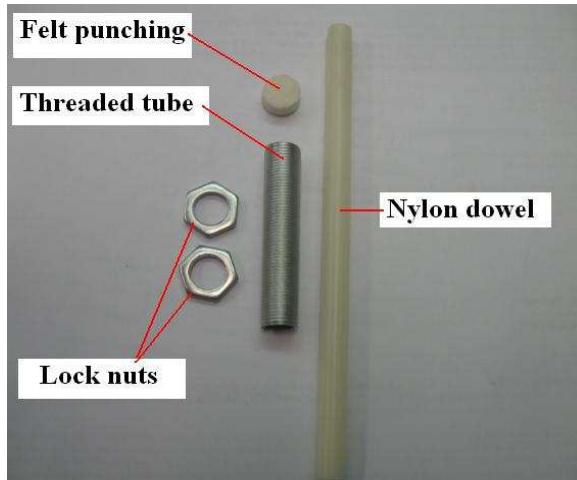


Illustration 1 – Steinway Sost. Kit

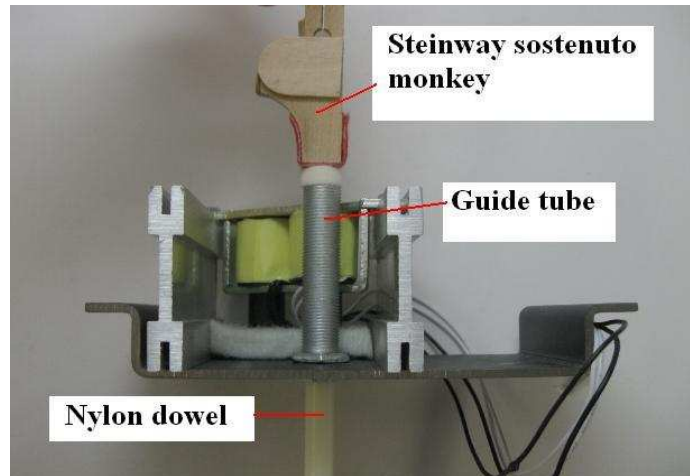


Illustration 2 – Mock-up of sostenuto

A. Preparing to install the Steinway sostenuto guide

- Place a mark on the scale stick for the location of the sostenuto. (See Ill. 3)



Illustration 3 – Location for sostenuto monkey

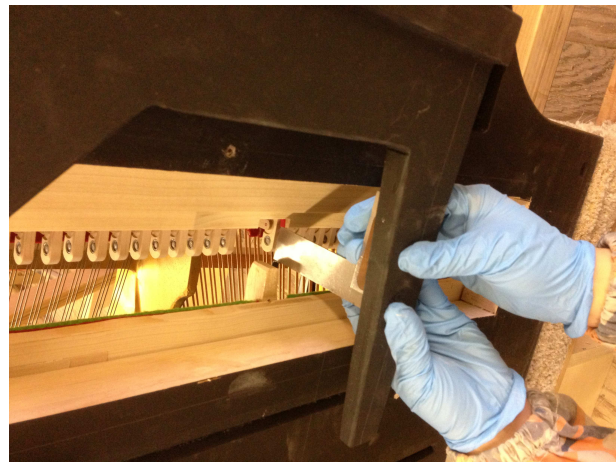


Illustration 4 – Locating the pitman to lever

- With the trapwork lever in the correct position, use a square and mark the location for the pitman rod to contact the lever. (See Ill. 4 & 5)



Illustration 5 – Locating the pitman to lever

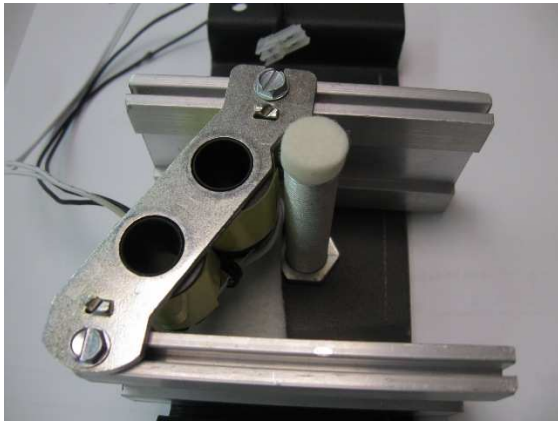


Illustration 6 – Placement of sost. guide on tray

- This assembly will be placed into the solenoid tray at the break to activate the monkey. (See Ill. 6)
- Glue the ½" (13mm) felt punching on the end of the nylon dowel with contact cement.
- Once the hole has been drilled, secure the threaded tube into the tray.
- Once the sostenuto lever is in the correct position against the lyre, cut the nylon rod to the correct length. Before cutting nylon rod add the thickness of a piece of felt between the nylon rod and wood lever.

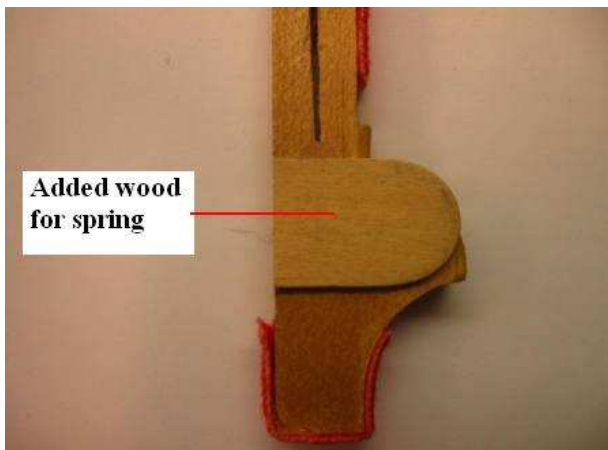


Illustration 7 & 8 – Placing wood on monkey

- Glue on thin wood or veneer to the sides of the monkey to secure the spring. (See Ill. 7 & 8)
 - Because the guides for the monkey were removed from the cutting of the slot this is a simple method of controlling the spring and position of the monkey.
- Drill a ½" (13mm) hole in the tray at the selected location for the threaded tube.
 - Drill a 1/8" (3mm) pilot hole through the tray first.
 - Now drill a ½" (13mm) hole through the tray.
 - Place the threaded tube into the tray hole and secure with the two nuts. (See Ill. 6)
- Roll up a piece of 220 sandpaper and sand off any rough edges on the threaded tube.



Illustration 10 – Replacing the cut out of the keys

B. Modify the keys

- Because of the guides for the monkey, the key were cut away at the bottom. This wood must be replaced for the key solenoids.
 - Use some scrap soft wood to glue on the keys.
 - Glue pieces of wood on the keys keeping the grain running the same direction. (See Ill. 10)
 - After glue is dry, dress down the keys forming the original shape of the keys.
 -

Addendum 2 - Keyframe modifications/Shift lever

Because of the moving forward of the shift lever it is necessary to move the hardwood contact point on the keyframe. (See Ill. 1 & 2)

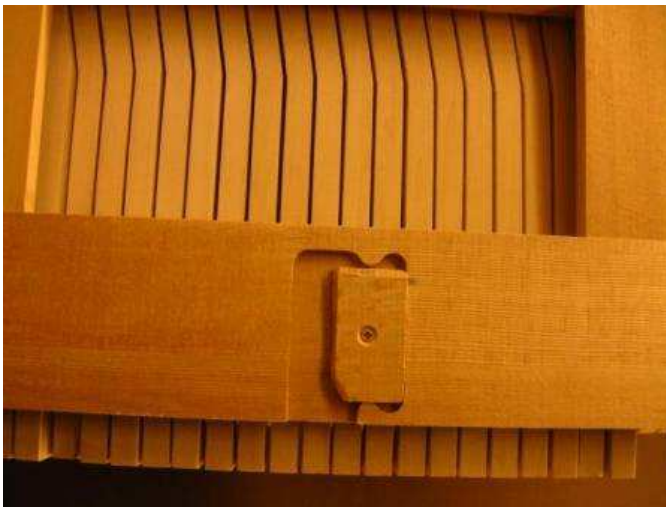


Illustration 1 – Before keyframe modification

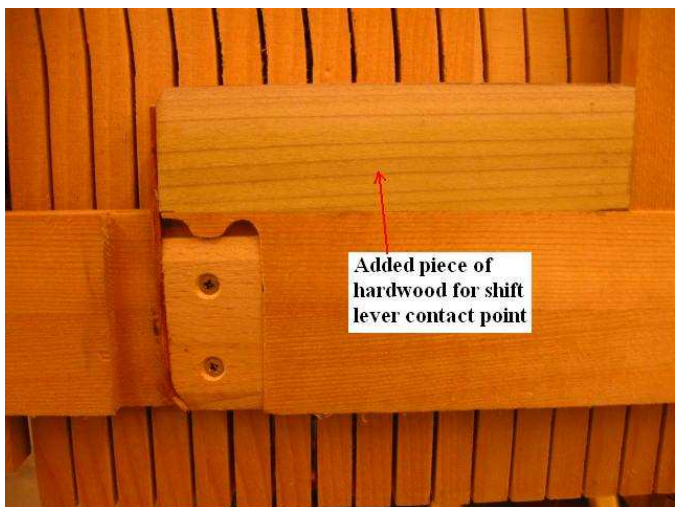
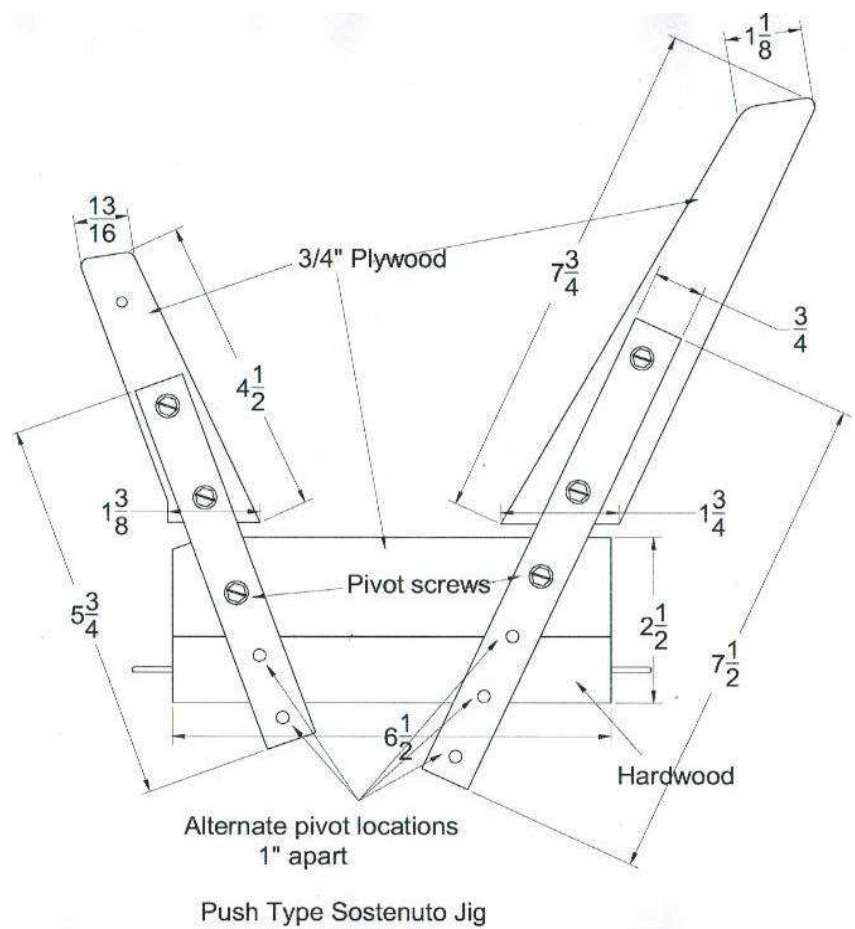


Illustration 2 – After adding hardwood

Addendum 3 – Sostenuto Jig

The sostenuto jig can be made out of any solid wood just follow the dimensions below.



Picture or adjustable sostenuto

Servicing the LPS

The electronics of the “LPS” HP system are the same as the “Standard” HP system except for the different configuration of the solenoid rail so trouble shooting will be very much the same. The exception is accessing the key solenoids and driver boards on the LPS. We have introduced service tools for lowering the key solenoid tray. (See picture below) These tools (2) will allow an individual to lower the tray in a very controlled manner gaining access to the driver board as well as the key solenoids.

LP Maintenance Tools

(Low Profile Maintenance Tools)

PianoDisc offering the Low Profile Maintenance Tools that makes servicing the LP System very easy. (Part # 5650-15002) Also along with these tools you will receive 4 extra threaded inserts. This is for a situation that a piano may not be equipped with threaded inserts.

How to Use the LP Maintenance Tools

1. The LP Maintenance tools attach to the bottom of the grand piano key bed to lower the PianoDisc LPS tray safely with complete control. (See Ill. 1)



Illustration 1 – LP Maintenance tools

2. First it is important to install the 4 threaded inserts into the key bed of the piano.
3. Four threaded inserts now come in each LP kit for installing during installation into the piano.



Illustration 2 – Allen key and insert



Illustration 3 – Insert in key bed

4. Looking under the piano, place the LP Maintenance tool on either side of the key solenoid tray, about 8" from the end. With the tool evenly spaced between the tray, place a mark on the key bed marking the location of the threaded knob screws.

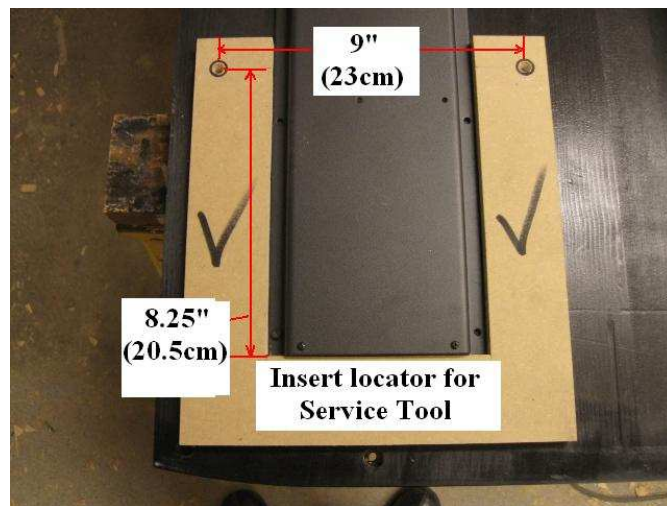


Illustration 4 – Jig for installing tool inserts

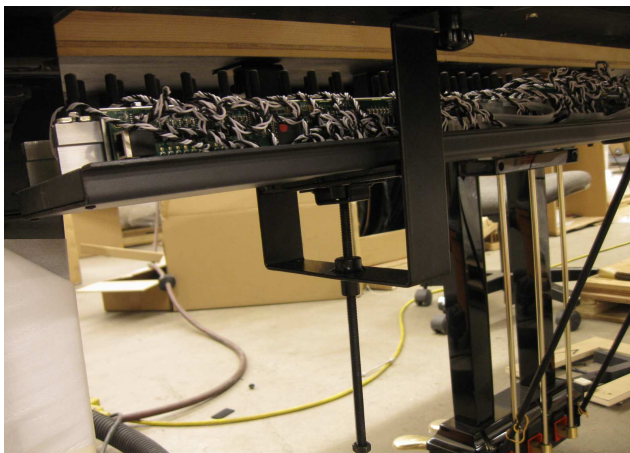
5. Drill a 5/16" hole, 3/4" deep into the key bed at these locations. Do the same at the other end of the key solenoid tray for the other tool.

NOTE: A simple template can be made to quickly locate the insert locations. (See Ill. 4)
 Due to obstacles, such as a keybed screw, it may be necessary to place the threaded inserts at a different location than 8.25" (20.5cm).

6. Now with a 5mm Allen, install the inserts until they are flush with the key bed. (See Ill. 3)
7. Now secure the LP maintenance tools at these locations supporting the key solenoid tray with the LP tool. (See Ill. 5)

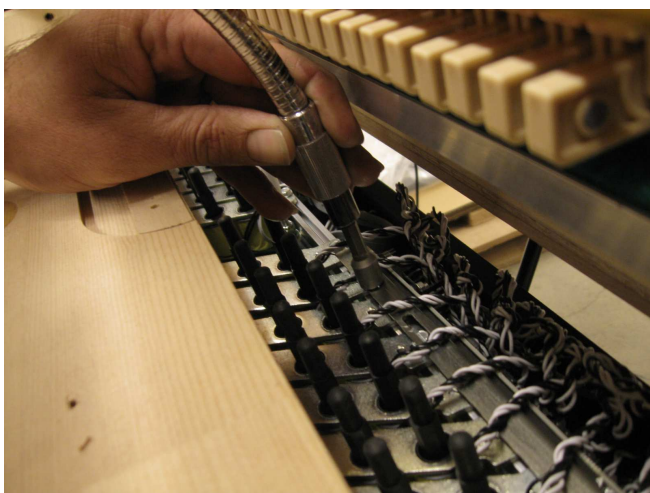


III. 5 – Tools attached to keybed

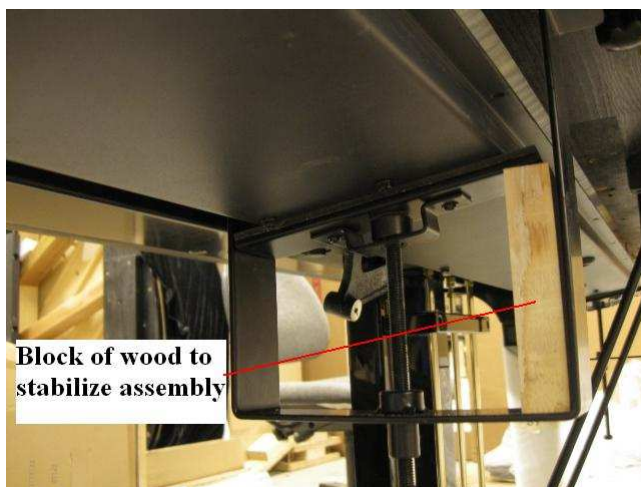


III. 6 – Solenoid tray lowered

8. Remove all mounting screws from the key solenoid tray and lower the tray slowly. Lower 1" at a time, from side to side, until there is access to the system. Usually 3" is plenty of room for servicing. (See III. 6)
9. It is best to remove the action and work inside the action cavity looking thru the strings. A flexible extension works very well with the 1/4" magnetic bit. (See III. 7)



III. 7 – Removing parts

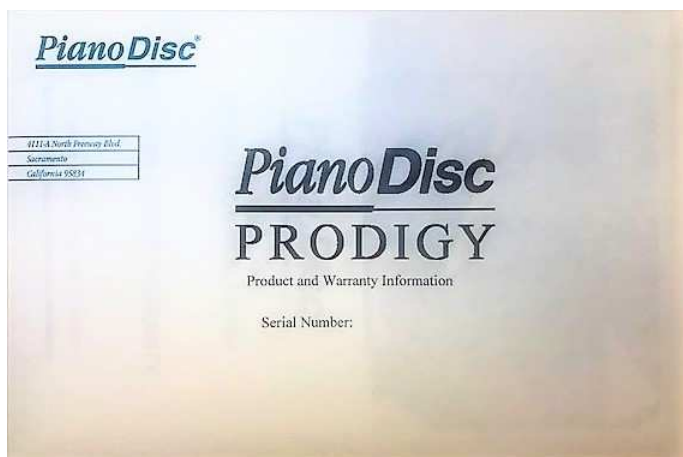


III. 8 – Wood block support

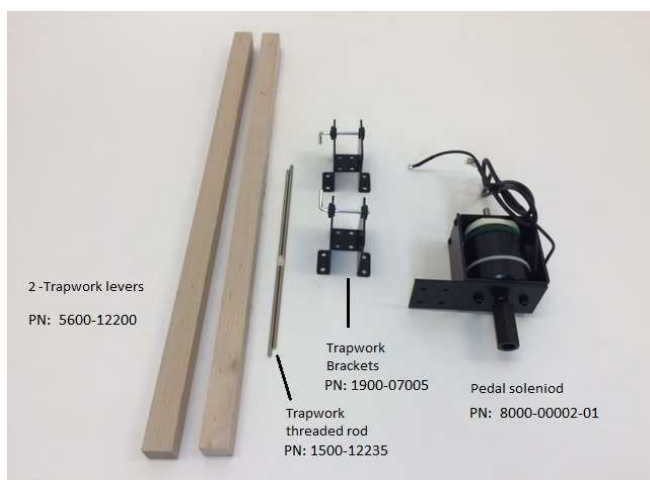
10. To stabilize the key solenoid tray a block of wood can be placed on the back side of the LP tool. This not only stabilizes the tray but angles the assembly for better access. (See III. 8)

PianoDisc Parts ID

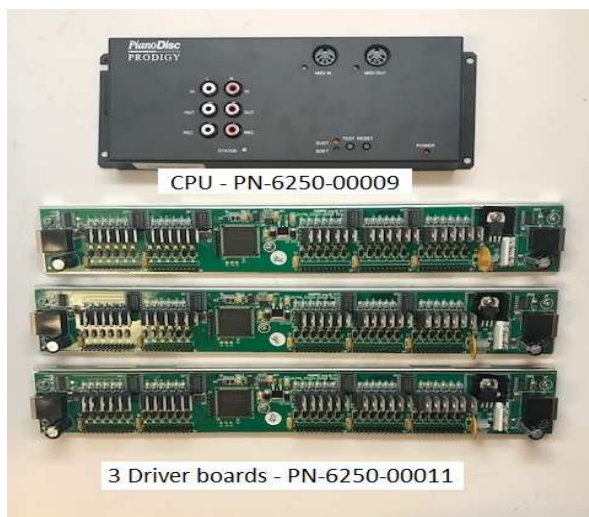
The following is a complete inventory of parts and part numbers within the Low Profile kit.



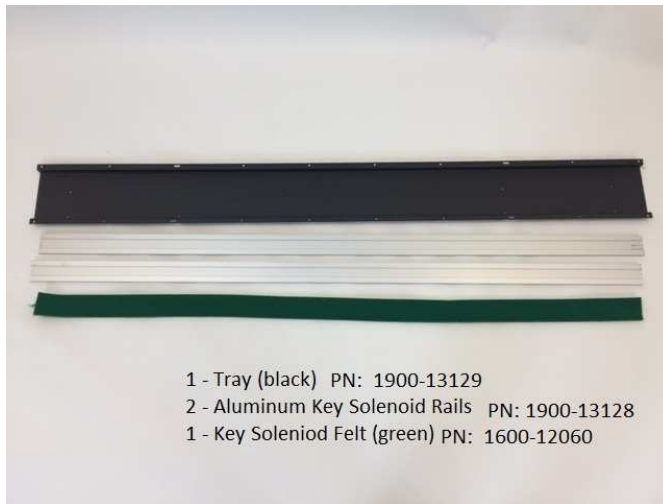
5600-15000-Trapwork Hardware Baggie



PianoDisc Parts ID (cont.)



PianoDisc Parts ID (cont.)



PianoDisc Parts ID (cont.)

