The QRS hammer stop system has been designed as a reliable, easy to install and use solution for silencing the acoustic piano by preventing the hammers from hitting the strings. This feature is very useful when use in conjunction with the QRS PNOscanII MIDI system and MIDI sound module, providing silent practice mode where the pianist listens to their performance wearing headphones. Another innovative use is digital mode which allows the user to turn the piano into other instruments such as an organ, string section or a variety of other sounds.

The hammer stop system has been carefully engineered to allow precise blocking of the hammer at the point of action travel known as let-off or escapement. The system employs specially formulated rubber as a contact surface which provides an accurate and consistent braking point allowing the hammers to be safely stop with minimal noise. Unlike other systems that use felt or open cell rubbers, the QRS system will remain stable for many hours of use and the overall accuracy will remain consistent over the entire keyboard range.

There are basically two types of piano construction which you will encounter with grand pianos. There is a standard design and a focus beam design. The QRS Hammer Stop system has been designed to reliably retrofit into either type without compromising the structure of the piano.

Although the system should fit into most of the piano models without requiring measures beyond this guide however you may encounter a piano that requires slight modifications such as grinding a low spot in a plate casting or you may find the need to cut excess material off the top edge of a bumper rail for instance. In any case if modifications are required to make the system function properly, the mods should be minor.
Before beginning the installation process you will need to determine if minimum space requirements are met with your particular piano brand / model.

The QRS Hammer stop system was designed from the ground up to be as flexible as possible, allowing the system to be installed into most models of grand pianos. The size of key Hammer stop components is minimized to allow the components to be squeezed into very close areas while still maintaining excellent strength characteristics.

The most common area that can cause difficulty or prevent the Hammer stop from fitting into a particular piano is the space starting at the bottom of the pin block up to the low point of plate. The amount of available space in this area varies widely among piano models.

Take a look at FIG A. below. Points A and B show the represent the vertical space needed for the hammer stop rail and the points between C and D represents the front to back space required.

The minimum distance between point A and B must not be less than 3/4" and a minimum of 1" between C and D with the hammer in the up position. The space in the A/B area must be great enough to allow the hammer stop rail to remain flush or above the bottom of the pin block so that the action / hammer assembly clears the shaft / bumper rail when removing it.
Locating the stop rail bearings requires only a few simple measurements. Using care to acquire accurate measurements and transfer them inside the piano case will make your installation reasonably easy and successful. Please refer to FIG C below relative to taking required measurements. These 2 measurements represent the center axis of the hammer stop rail main shaft.

**Depth measurement**

Measure between these points and subtract 1 inch. This will be the front / back position for the center of the shaft.

**Height measurement**

Measure from bedding point of key frame to top of hammer at rest position.
Layout center points for bearing as shown below. Use this method for Bass and Treble bearing placement. See page 5 for web bearing location in focus beam designs.

Depth measurement take from action as in FIG C.

Center point of main shaft and bearing centers, based on the 2 measurements taken from action.

Height measurement take from action as in FIG C.

Pencil mark from key frame edge. Measure from this line back by the depth distance measured from action as in FIG C.

Bass end inside view of grand
Component placement

Assemble the main bearing components. Be certain to use the correct screw supplied to hold the bearing seat onto the bearing mount. Tighten the screw 1/8 - 1/4 turn past head to plastic contact.

USE CARE NOT TO OVER_TIGHTEN! DAMAGE TO PLASTIC CAN OCCUR!!

Use a pencil to hang the bearing mount in it's proper location relative to lines drawn on sidewall of piano.

Using another pencil, trace the 2 slots.

Locate the main bearings to the piano case. Place a pencil through the bearing hole with the point of the pencil centered on the previously marked center lines while pressing the bearing mount firmly to the sidewall and trace the two slots onto the wood. Once the slots are marked use an 1/8" drill to pilot drill at the midpoint of the slot area.

Fasten the bearing assemblies with the #6 x 5/8" pan head screws. At this point the bearing should be very close to the correct location although there is plenty of up / down and left / right adjustment should you need to adjust the position.
Focus beam bearing location

Referencing the pencil mark you made on the keybed previously, measure from the mark in toward the cast flange to the front edge of a combination square as shown in FIG D.

While the square is in place at the proper depth make a vertical line on the flange. Also place a horizontal line at the same height used to place the bass and treble end bearings.

These intersecting lines indicate the center point of the main shaft and bearings. See FIG D.

Use one of the web bearings as a template, holding the web bearing against the flange at about 30 to 40 degrees from vertical and the bottom of the bearing pointing forward, center the bearing hole over the center lines and trace the 2 slots onto the casting. The dotted lines show where the bearing was being held to mark the slot area.

It is possible that certain piano models may require the bearings be oriented at a different angle than shown here.
With the 2 bearing slots marked on the flange, use a center punch to carefully dimple 2 places in the center of the slot marks to allow accurate drill indexing.

Do not drill the actual bearing center location. The shaft / bearing does not extend into or through the web. Fig E.

Proceed to drill the two 11/64" holes at the 2 center punched locations. It is very important that the two holes are drilled straight and level. The holes need to be drilled clear through the flange. The 2 holes will be used to mount both bearings to the flange. Fig F

Using a true and square wood block cut to the height of the drill bit can aid in keeping the drill bit level and straight. Set the block on the key bed in front of the bit and reference the edge of the block to the drill bit by sight. A combination square will also do the job.

It is a good idea to cover the components in the drilling area with plastic or polyfoam to avoid getting metal chips into the action parts.
Assemble the web bearings. Use care when tightening the bearing retainers. The #2 screws are threading into plastic and only need to be tightened to the point where the screw head touches the plastic surfaces. There is no significant force on the retainers and only serve to prevent the bearing from possibly walking on the shaft during transport.

Once the two web bearings are assembled they can be mounted onto the cast web of the piano. Use two elliptic washers on the screw head side. The flats of the nuts will need to be aligned with the slot relief so that the nuts set down into the flange slots.

Tighten the screws as tight as possible using a standard sized #1 screw driver. Cracks in the bearing seat could occur from over tightening if you attempt to tighten the nuts with a socket or wrench. It’s OK to hold the nuts with pliers while tightening.

Depending on the particular piano you are working on the cast flange might be a different size and shape requiring a different position. Mount the bearing at some angle which will allow you to adjust the bearing / shaft both forward / backward as well as up / down should you need to fine tune the placement.

The flange wall can vary from model to model and can have some tapper from top to bottom. Normally the tapper is minimal and the bearings can be applied directly to the flange. If the tapper is severe you may need to use a shim to compensate.

With flanges aligned to the layout lines and secured with the bolts, washers and nuts cut the extra bolt length off flush with the nuts using a rotary cut-off tool or fine tooth hacksaw blade. Once the bolts are cut, re-tighten the nuts.
Take a measurement of the key frame rest block thickness. You will use this measurement to determine the overall shaft length.

As you find the optimum position for the shaft / bumper assembly relative to the hammer shanks you will need to determine the specific shaft overhang distance and shaft length. The main shaft is longer than needed to provide flexibility in alignment and will need cut at both ends. When cutting the steel shaft it is recommended that you cut a bit long and grind or file to exact length.

The bass end of the shaft must extend past the key frame edge by the width of the key frame rest block minus 1/16".

To determine shaft overhang on the treble end use hammer shank #88 as a reference point and measure across the shaft to a distance equal to the distance between damper wire #88 and the side wall of the piano case where the bearing mount is attached.

Once you have the shaft / bumper assembly aligned with the hammer shanks and the shaft ends marked for the proper overhang, compare the distance between your shaft end marks and the distance between the inside walls of the piano case. The total shaft length should be within 1/8" of the total width inside piano case. Proceed to cut the steel shaft. Bevel ends of shaft after cutting.
Locating the main shaft and bumper rails relative to hammers.

Place the main shaft across the hammer shanks at about 1” forward from the hammers. The bass end of the shaft is recognized by the holes which are spaced further apart. Proceed to check the left / right shaft position observing how the pre-tapped holes align relative to the hammer shank sections. In most cases not all hole groups will be centered within the hammer sections. You will need to find a position for the main shaft that does not place the shaft holes outside the hammer shank section boundaries. In the illustration below you will notice the shaft holes in the tenor section fall well inside the hammer shank section, however in the mid treble section the shaft holes are not centered in that section. This is an acceptable scenario because there is still one of the shaft holes in the hole group that remains inside the hammer shank boundary of the mid treble section allowing the hammer bumper to be mounted as required.

Once you have the shaft aligned with the hammer shank groups make a reference mark on the shaft at the exact center of the 1st hammer shank in the bass and tenor sections. You will need this reference mark for realignment later during the installation.
Locating the main shaft and bumper rails

Focus beam type

When installing into a focus beam model piano the shaft will be cut into two sections. One length will be for the bass section and the other length will cover the remaining hammer sections. Follow the basic layout instructions of the non-focus beam page except you will focus attention primarily to hammer shank / shaft hole alignment of the bass section first.

Additionally take measurements from the last damper wire in the bass section to the cast flange where the web bearing is mounted as well as the first damper wire of the tenor section to the treble side of the cast flange. You will then transfer those measurements to the main shaft using the corresponding hammer shanks and marking the shaft. This will be the shaft overhang needed to engage the web bearings. fig M and fig N.

Depending on the piano model, you may find that laying out the bass shaft and cutting it to length prior to laying out the treble end will make alignment of the tenor / treble section easier. This also allows the option of flipping the treble shaft section end for end as an additional option which can work well for shaft hole alignment in some cases. In all case the bass shaft assembly should always remain at the bass end of action.
At this point you have located and aligned the threaded main shaft holes with the hammer shank sections and made reference marks on the shaft at note #1 and at the location of the 1st hammer shank of the tenor section. You will now place the 4 hammer shank bumpers across the shaft and align the slots of the bumpers with the appropriate shaft holes.

Place a mark at the end of each bumper so that there is 1/4" of the aluminum overhanging each end of the hammer shank groups. Cut each of the bumpers at the marks and file or sand rough edges. You may find that during the final assembly it is necessary to file some additional length from some bumpers but it's best to start slightly longer than actually needed and trim to fit.
QRS Grand Hammer stop installation guide
For focus beam bearing location only

Once bumpers are cut to length apply the self-adhesive felt strips to the inside surface of each bumper. Keep the felt centered between the bend and the edge. Apply the felt in 3 sections cutting the felt so that it comes up to the edge of the slots entirely without over-hanging the slot.

Apply the rubber stripping to the outside surface of the narrow edge of the tenor, mid-treble and treble bumpers. Do not apply the rubber to the bass bumper at this point. There is one small section of single string notes at the bass end of the action which use a thicker rubber strip as included in the kit. Should the shaft / bumper assembly shift slightly to one side or the other during the final installation you can compensate at that time.

It is critical to proper function of the stop rail system that the rubber be applied straight and without bumps or waves.

Prepare the main shaft by sliding on a bearing at 4 points along the steel shaft. Install one bearing between each bumper space which is at same location as the action break points. Please note that these bearings are specially designed to maintain their position on the steel main shaft during use and are very snug. DO NOT LUBRICATE AND DO NOT USE TOOLS TO GRIP THE BEARING!

Get the bearing started squarely over the end of the shaft and then tap the bearing with a soft face hammer or small block of wood to get it fully onto the shaft. Use care to tap on the face of the bearing only and not to hit it on the edges which will damage it. Once the bearing is fully on the shaft it should slide along the shaft with reasonable hand force.

If you are working with a shaft that has been cut to length, be sure to put a smooth bevel on the cut ends to ease bearing installation.
QRS Grand Hammer stop installation guide

For focus beam bearing location only

Once all shaft components are installed you can install the bumpers which are now cut to length. The bumpers are secured with two flat washers and two 4-40 cap screws.

At this point just lightly snug the screws enough to hold the bumpers at the mid point of their adjustment range. Don not fully tighten at this point.

With a focus beam type piano you will have additional components at the shaft ends on each side of the cast flange.

There are 2 rail links that must be placed onto the shaft before the bearings. When placing the rail links take notice of the 10 degree rotation of the inner square hole in relation to the rest of the part. This offset is intended to position the link arm in a slight downward projection which helps clear the cast flange when the shaft rotates.

Use the thin bearings for a focus beam installation at the cast flange location.

Once all shaft components are installed you can install the bumpers which are now cut to length. The bumpers are secured with two flat washers and two 4-40 cap screws.

At this point just lightly snug the screws enough to hold the bumpers at the mid point of their adjustment range. Don not fully tighten at this point.
At this stage of the installation the main bearings and flange bearings have been installed. Continue the installation by installing the hardware that couples the rail links together. The hardware included allows for a couple options, again depending on your specific model of piano.

If the cast flange which hangs down from the plate is short and does not extend forward to far you can use the 1/4” aluminum tube and 4-40 all-thread stud. Simply cut the tube to the needed length, insert the stud through the links and tubing and fasten securely with 2 washers and nuts.

If the cast web extends downward and or outward too far to use the tube, use the saddle which allows the links to be joined around the cast flange. As long as there is no interference with the action the saddle can be used in any case.
QRS Grand Hammer stop installation guide
For non-focus beam installation

With all of the components prepped and the bearing mounts installed into the piano you can now continue by installing the main shaft / bumper assemblies.

In a standard, non-focus beam type piano, place the main bearing seats onto the bearings at both the bass and treble ends of the main shaft assembly. fig J.

Place the shaft / bumper assembly into the piano case and set the bearing seats onto the main bearing mounts. Install a #4 screw and washer through the slot of the bearing seat and turn screw in until the head touches the plastic. It is assumed that the bearing is reasonably close to the correct location when you installed the mount. There is one additional hole on each end of the bearing mount as well as the slot in the seat to allow compensation for misalignment if needed. fig K.

At this point check if the shaft is cut to the correct length. The shaft needs just less than 1/8" of left to right moment for unrestricted rotation of assembly. If the shaft is rubbing against the piano side walls as you place it in position, grind the required amount to gain the side to side clearance.

Once both ends of the shaft are secured to the bearing mounts check that the assembly rotates freely and that the bumpers can be rotated 90 degrees from a vertical position. When the rubber faces toward the key bed the system is engaged and when the rubber faces forward the system is disengaged. The system must be disengaged when removing the action.

If you find that one of the bumpers is hitting the plate or other piano structure you may need to lower the assembly using the adjustment slots in the main bearing mounts. In all cases the shaft / bumper assembly must not be lower than the tip of the hammers at rest. This assures that the hammers will not catch on the main shaft when sliding the action in or out.

If the bumpers are hitting the pin block when you rotate the shaft toward the disengaged position you can lower the bumpers using the adjustment slots. In most cases the bumpers will be extending below the shaft 1/8" to 1/4" in their final adjusted position. fig L.

Measure the top of the hammer shank at the point of escapement or let off at one inch forward of the hammers, to the lowest bedding point of the key frame. This distance is very close to the final distance needed between the bumper rubber and the key bed.
QRS Grand Hammer stop installation guide

Final steps of installation

At this point you should have the shaft / bumper assembly installed and verified that the assembly rotates freely from vertical to 90 degrees horizontal.

You can now install the mid bearing mounting brackets and mid bearing mounts. You will notice that the metal bearing mount brackets are built with an offset. When the bracket is installed correctly the offset places the bearing in the center of each action break and is also typically the center of the sostenuto bracket.

There should be a shaft bearing that you previously installed at each break, between bumpers. Attach the bearing seats to the shaft by sliding the opening of the seat over the shaft beside the bearing and then moving the seat over the bearing into position.

You will use 3 mid bearings in a non-focus beam type installation and 2 mid bearings in a focus beam type. With the mid bearing seat now engaged with the shaft bearing you can attach the mid bearing mount to the metal mount bracket. Before snugging the screws on on the mid bearing mount / bracket, position the bracket to the wood beam behind the damper wires. When positioning the bracket, find the position that imposes no stress on the main shaft which would cause binding. The mid bearings should only support the shaft assembly along it's natural path. While holding the bracket / bearing assembly in this position trace the entire slot of the bracket onto the wood.

Remove the bracket / bearing mount and pre-drill 2 holes within the traced slot area. Keep the screws about 1” apart and inside the slot area, allowing enough room to allow for vertical adjustment of the bracket. Fig O.

It is common to see the main belly timber with a taper in which case you should shim under the bottom screw of the bracket to prevent distorting the bracket when tightening the screws. Cutting a wedge of wood and drilling a hole for the screw to pass through makes an ideal shim, but a flat washer can also be used. Fig P.

The shaft assembly should be now installed with all support bearings in place. Recheck the shaft assembly for binding during rotation. If the shaft assembly does not rotate freely you need to readjust one or more of the mid bearings. Fig Q.
QRS Grand Hammer stop installation guide

Final steps of installation

To complete the installation you need to connect the control cable to the actuator lever and adjust the bumpers to the proper height.

Drill a 1/2" hole through the rear belly beam at a point under and to the left of the damper tray. This hole will allow you to route the control cable to the under side of the piano and to the underside of the key bed where the control lever will be installed. You will need to use an extra long drill bit or a drill bit extension as you should drill from the inside of the piano case.

Route the end of the control cable through the 1/2" hole from under the piano toward the actuator lever. Insert the bent end of the cable core into the middle hole of the shaft lever so that the end of the cable core points toward the treble side of piano and secure the cable core into the shaft lever with the 1/16" lock collar as seen in fig R.

Place a steel "R" clamp at the very end of the cable housing and secure it to the main bearing mount using the hole on the lower, right side of bearing mount. Allow the cable to flow from the clamp toward the 1/2" hole without a sharp bend. As the cable exits the hole it will be pointed toward the rear of the piano. Route the cable in a gentle loop so it faces toward the front of the piano where you will mount the control lever.

Install the control lever with an orientation as shown in fig T.

Pushing the lever away from the user position disables the hammer stop system. Pulling the lever toward the user position engages it.

When adjusting the lever position set the shaft / bumper assembly fully in one of it's two positions and set the lever to the corresponding positions then tighten the lock screw firmly.
QRS Grand Hammer stop installation guide

Final steps of installation

The final steps in the installation involves setting each bumper to the correct height so that the hammers contact the bumpers at exactly the right point to allow a natural feel of the keyboard.

If the measurements taken earlier in the install process are reasonably accurate you will need to make just small adjustments to the height of the bumpers. The actual adjustment is done using the small cap head screws that hold the bumper to the shaft. At this point the cap screws should only be slightly snug and will not be fully tightened until the final adjustment is complete.

It is critical to understand what the keyboard should feel like when the system is properly adjusted. We will use the term "crunchy" to describe the feel of keys that require slightly too much force to send action to through escapement or let-off. This is the point at which the jack disengages from the knuckle. There is a very fine line between the bumper being too low or too high relative to where it contacts the hammer shanks. Too low and the keys become "crunchy", too high and you will hear the hammer bumping the strings. When the system is adjusted correctly you can play the keys normally with good feel maintained across the keyboard. It is important to realize the intention of this system is to silence the piano under normal playing conditions. At some point if a player is striking the keys with extreme force, some hammers may hit the string causing it to sound to some degree.

To make this fine adjustment of the bumper height easier, we suggest making some simple height adjustment tools. It can be as simple some sticks that are a 1/2” shorter than the distance between the key bed and the bottom of the bumper with a 1” flat head screw threaded into the end. Adjust the screw until it just touches the bottom of the bumper when setting on the key bed. Use this as your starting point and then thread the screw in or out the same amount you want to move the bumper up or down.

You will find that normally it is easier to adjust one side of a bumper at a time. Loosen one cap screw just enough to allow the bumper to pivot while fully loosening the screw on the end to are adjusting. Work back and forth from end to end.

After you have made initial adjustments to the bumpers and have placed the action back into the piano, make notes about the feel for each section as you play.

When you have made your final adjustments to the system, be sure to check that all screws have been tightened. Remember that 1/8 to 1/4 turn past contact for plastic parts should be adequate and over tighening will damage the parts.